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# REPORT

ON THE

## ZOOLOGICAL COLLECTIONS

MADE IN THE

## INDO-PACIFIC OCEAN

DURING THE

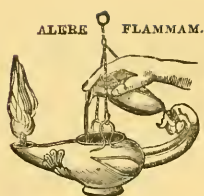
VOYAGE OF H.M.S. 'ALERT'

1881-2.



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1884.



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SUMMARY OF THE VOYAGE . . .	By DR. R. W. COPPINGER.
MAMMALIA . . . . .	By O. THOMAS.
AVES . . . . .	By R. B. SHARPE.
REPTILIA, BATRACHIA, PISCES.	By A. GÜNTHER.
MOLLUSCA . . . . .	By E. A. SMITH.
ECHINODERMATA . . . . .	By F. J. BELL.
CRUSTACEA . . . . .	By E. J. MIERS.
COLEOPTERA . . . . .	By C. O. WATERHOUSE.
LEPIDOPTERA . . . . .	By A. G. BUTLER.
ALCYONARIA AND SPONGIIDA..	By S. O. RIDLEY.

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## PREFACE.

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THE zoological collections made during the Surveying-voyage of H.M.S. 'Alert' in the years 1878-82, under the command of Capt. Sir G. Nares and his successor Capt. J. Maclear, were presented by the Lords Commissioners of the Admiralty to the Trustees of the British Museum.

A narrative of the voyage has been given by Staff-Surgeon R. W. Copping, in his work 'Cruise of the 'Alert'' (London, 1883, 8vo).

The principal parts of the Survey, and consequently the Collections, fall into three distinct sections, viz.:—1, that of the Southern extremity of the American continent; 2, that of the coasts of North-eastern Australia and Torres Straits; and 3, that of the groups of Oceanic Islands in the Western Indian Ocean, situated between the Seychelles and Madagascar.

The first of these collections has already been reported upon in Proc. Zool. Soc. 1881; but the two others surpass it so much in extent and importance as to be quite beyond the scope of a periodical publication, and therefore the Trustees considered it best that a full account of them should be prepared in the form of a separate work. With the exception of the 'Challenger' Expedition, none of the recent voyages has contributed so much to our knowledge of the Littoral Invertebrate Fauna of the Indo-Pacific Ocean as that of the 'Alert.' Irrespective of a number of specimens set aside as duplicates, not less than 3700, referable to 1300 species, were incorporated in the National Collection; and

of these more than one third (490) were new additions, if not to science, at any rate to the Museum.

The best thanks of zoologists are due to the Lords of the Admiralty, to the late Hydrographer, Capt. Sir F. Evans, K.C.B., and to the Commanders of the 'Alert,' from whom Dr. Coppinger received every encouragement in the prosecution of his zoological work.

Finally, although the following pages are by themselves a lasting testimony to the great service rendered by Dr. Coppinger to the National Museum and to the cause of science, I must not allow this opportunity to pass without duly acknowledging the energy and skill with which he performed this work. The collections were made with singular judgment, the specimens (many of them most fragile and delicate) preserved, labelled, and packed with the greatest care; and, beside, full lists were prepared by him giving additional, and in many cases most valuable, information. When we bear in mind that all this work was done in the leisure hours which Dr. Coppinger could spare from his strictly official duties, we may be encouraged in the hope that on future occasions similar advantage will be taken of the opportunity which a voyage of Survey offers to a man of science.

The collections were worked out immediately after their arrival; but the completion of this Report was considerably delayed by the removal of the Department from Bloomsbury to South Kensington.

ALBERT GÜNTHER,

*Keeper of the Department of Zoology.*

British Museum,  
June 20, 1884.

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THE  
 ZOOLOGICAL COLLECTIONS  
 OF  
 H.M.S. 'ALERT.'

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SUMMARY OF THE VOYAGE.

BY  
 R. W. COPPINGER, M.D., Staff-Surgeon R.N.

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DURING the summer of 1878 it was resolved by the Admiralty to equip a vessel for the performance of special surveying-work on the western shores of Patagonia, among the South-Pacific Islands, and on the eastern and northern shores of Australia; in addition to which, it was the wish of the Hydrographer of the Navy, Captain (now Sir Frederick) Evans, F.R.S., that no opportunity should be lost of collecting objects of natural history whenever the requirements of the survey brought the vessel into regions whose zoology was hitherto but imperfectly known. It was in accordance with these views that on the 20th August, 1878, H.M.S. 'Alert' was commissioned at Sheerness, with a complement of 120 officers and men, by Captain Sir George Nares, who, by a happy coincidence, had commanded the same vessel in the Polar Expedition of 1875-76. On the 20th of the following month we sailed from Plymouth.

On the outward voyage we touched for a few days at Madeira and St. Vincent respectively; and at both of these places some shallow-water dredging was accomplished, resulting in the acquisition of a small collection of marine invertebrates, in which, as might have been expected, there was little, if any thing, of special interest.

During our further voyage through the South Atlantic a course was held which brought us over the Hotspur and Victoria Banks—submerged coral-reefs which are situated between the parallels of  $17\frac{1}{2}^{\circ}$  and  $12^{\circ}$  S. lat., and are about 180 miles from the east coast of Brazil. In these two places we plied our dredges in depths ranging from 35 to 39 fathoms, obtaining thereby a large number of zoological specimens, among which were several novelties in the classes of Sponges and Polyzoa. The collection made at these stations proved to be of special interest, as it helped to fill up a gap unavoidably left by the 'Challenger' expedition in the marine zoology of the South Atlantic.

On the 27th November we anchored in the estuary of the river Plate, off Monte Video, where we remained until the 14th December. Sailing on the latter date, we shaped a course for the Falkland Islands, and arrived at Stanley Harbour on the 26th inst. A few weeks prior to the time of our visit to the Falklands a peculiar avalanche of semifluid peat had poured down from the summit of one of the low hills, laying waste a portion of the settlement.

We again put to sea on the evening of the 27th December, and steering to the eastward, entered the Strait of Magellan on the first day of the year 1879. After stopping for a few days at the Chilian settlement of Sandy Point, we proceeded to our surveying-ground among the channels on the west coast of Patagonia. Here we spent the greater portion of the two succeeding years, executing surveys of previously uncharted waters, and adding to those which had been partially effected by our predecessors in the same field; but during the more rigorous winter months we each year proceeded north to Coquimbo, on the Chilian coast, where our ship was refitted and fresh supplies of stores were obtained\*. As the requirements of the survey necessitated our visiting and anchoring in a great many bays and inlets in this remote region, frequent opportunities occurred for shallow-water dredging, so that we were able to make a large collection of marine invertebrates—a branch of research to which our attention was more especially directed, as we were aware that in other departments of biology the work done by the 'Erebus' and 'Terror,' 'Nassau,' and 'Challenger' of our own navy, as well as by many foreign vessels, left little to be desired.

During the month of March 1880 a visit extending over a few days was made to Skyring Water, a large and almost completely landlocked sheet of water situated to the eastward of the Cordillera, and, so far as we yet know, only accessible by ship through a narrow channel by which it communicates with the main Strait of Magellan. And here I should remark that in the month of July 1879, and during the surplus time allotted for refitting our ship on the Chilian coast, a brief visit was made to the island of St. Ambrose, which lies about 500 miles to the north-west of Coquimbo.

\* During the winter of 1879-80 Sir George Nares returned to England, and was succeeded in the command of the 'Alert' by Captain Maclear, formerly of the 'Challenger' Expedition.

On the 14th June, 1880, we bade adieu to the South-American coast and sailed for Tahiti, spending much time on the way in searching for the so-called Minerva Reef, which was reputed to exist some 60 miles to the north-east of Manga Reva, one of the Paumotu group. Arriving at Tahiti on the 6th of August, we made a stay of twelve days at that interesting island, when we again got under way and pursued a circuitous route towards the great Fiji group.

The first place at which we touched on this voyage was Nassau Island, whence we proceeded to the Union group, in  $80^{\frac{1}{2}}^{\circ}$  S. lat., passing within sight of Tema Reef and the Danger Islands, which were found to be incorrectly placed on the charts. We made a short stay at Oatáfu, the most westerly island of the Union group, and thence proceeded to Fiji.

We anchored off the settlement of Levuka in the island of Ovalau, Fiji, on the 18th of September, and remained there until the 10th of October. We then steamed over to Tongatabu, in the Friendly Islands, where we made a pleasant stay of ten days, but subsequently spent some very dull weeks, aggravated by unusually boisterous weather, in an uneventful search for the La Rance Bank, the non-existence of which was, however, satisfactorily demonstrated. We returned to Levuka on the 4th of December, and remained in harbour for ten days, when we entered upon the last portion of our Pacific cruise, viz. the voyage from Fiji to Sydney.

We arrived at Sydney on the 23rd of January, 1881, and remained there, refitting, until the 15th of April, when we steamed up the east coast of Australia to our next surveying-ground.

During the ensuing six months we visited Port Curtis, Port Molle, and Port Denison on the east coast of Queensland; Lizard Island, Flinders Island, Clack Island, Bird Island, Percy Islands, Clairemont Islands, and Albany Island, adjoining the coast; and while engaged on the survey of the Prince of Wales Channel, in Torres Straits, we anchored off Wednesday, Thursday, Friday, Horne, West, Prince of Wales, Hammond, Goode, and Booby Islands. In all these localities marine specimens were collected, as well as in the more open parts of the Prince of Wales Channel, where the depth rarely exceeds 30 fathoms. A good many interesting specimens were also obtained through the assistance of the pearl-shell divers, who have an extensive and lucrative industry in these waters.

On leaving this channel we proceeded westwards through the Arafura Sea, sounding and dredging, until we reached Port Darwin, in North-west Australia. Here we remained from the 3rd to the 18th of November, when we again got under way and steamed through the Eastern Archipelago to Singapore. We reached this port on the 18th November, 1881, and remained there for two and a half months, spending most of the time in dock, where our ship underwent an extensive refit. We now received orders to undertake a survey of the Amirantes and neighbouring islands and reefs in the South-Indian Ocean, using Seychelles as our base for

supplies. We accordingly sailed from Singapore on the 5th February, 1882, and steered for the Seychelle Islands, touching on the way at Colombo.

On the 4th of March we reached Bird Island, the most northerly of the Seychelle group; and as we remained at anchor there until the following morning, we had an opportunity, among other things, for exploring the island and accomplishing some dredging-work in the shallow water about the ship. On the next day we steamed over to Mahé, the chief island of the group. After some days spent here in provisioning and coaling the ship, during which time our boats did some useful dredging in the channel between Mahé and St. Anne's Islands, we steamed over to the Amirante group, the most northerly of which is only about a day's run from Mahé. We had orders to make a survey of the Amirantes, and, as far as time would permit, of the other coral islands which extend thence in an irregular chain southward towards Madagascar.

The Amirante group consists altogether of twenty-one low coral islets, resting, with the exception of Ile des Roches (which is separated by a deep channel), on an extensive coral bank, which is 89 miles in length, with an average breadth of 19 miles, and whose long axis lies in a N.N.E. and S.S.W. direction. It is included between the limits of  $4^{\circ} 50\frac{1}{2}'$  and  $6^{\circ} 12\frac{1}{2}'$  S. lat., and  $53^{\circ} 45'$  and  $52^{\circ} 50\frac{1}{2}'$  E. long., and is thus about 700 miles distant from the nearest part of the East-African coast. Some of the islets and sand-cays of which it is composed, and which are included in the above enumeration, are so arranged in clusters that for all practical purposes the group may be regarded as consisting of nine islets, which have been named African, Eagle, Darros, Des Roches, Poivre, Etoile, Marie Louise, Des Neufs, and Boudeuse Islands.

From the Amirantes we moved over to Alphonse Island, which occupies an isolated position 60 miles S.W. by S. of the southern extremity of the Amirante Bank; and thence proceeded to Providence Island, which is about 240 miles from the Amirantes in a S.W. by S. direction, and about 200 miles from Cape Amber, in Madagascar. After a short stay at each of these islands, we steamed over to the Glorioso group, which consists of three islands, also of coral formation, and situated about 120 miles W. by N. of the northern extremity of Madagascar. Every effort was made to investigate the fauna and flora of these islands as far as time and other circumstances would permit, so that sufficient materials were accumulated to connect their natural history with that of Seychelles to the northward and Madagascar to the southward.

With our departure from the Glorioso Islands the surveying operations of the 'Alert' were brought to a close. On the 12th of May we reached Mozambique, whence, after a stay of a few days, we proceeded on our homeward voyage, stopping *en route* at Algoa Bay, Simon's Bay, Cape of Good Hope, St. Helena, and Fayal (in the Azores), and arrived in Plymouth Sound on the 3rd of September, 1882, after an absence of nearly four years.

## PART I.

## THE COLLECTIONS FROM MELANESIA.

## MAMMALIA.

BY

OLDFIELD THOMAS.

THE Mammalia collected by Dr. Coppinger are too few in number and of too common occurrence to be deserving of special notice; but a very interesting series of Melanesian skulls was obtained by him from various islands in the Pacific, and of these the most important measurements are given in the following notes.

## 1. Skull of Torres-Straits Islander. (PLATES I. &amp; II. fig. A.)

Male. Adult.

"Native chief of Nagheer Island, Torres Straits."—*R. W. C.*Length<sup>1</sup> 174; gl. occ.<sup>2</sup> 181. Breadth<sup>3</sup> 144. Height<sup>4</sup> 136.Maximum frontal breadth<sup>5</sup> 115; minimum frontal breadth<sup>6</sup>99. Horizontal circumferences—preauricular<sup>7</sup> 237, total<sup>8</sup> 514.Transverse arcs—frontal<sup>9</sup> 286, bregmatic<sup>10</sup> 303, parietal<sup>11</sup> 323,occipital<sup>12</sup> 273. Longitudinal arcs—frontal<sup>13</sup> 121, parietal<sup>14</sup>129, occipital<sup>15</sup> 113. Foramen magnum—length<sup>16</sup> 35, width<sup>17</sup>29. Basinasal length<sup>18</sup> 105. Basialveolar length<sup>19</sup> 112. Bi-zygomatic breadth<sup>20</sup> 136. Height of—face<sup>21</sup> 98, malar<sup>22</sup> 25,alveolus<sup>23</sup> 22. Auriculo-orbital length<sup>24</sup> 72. Nasal height<sup>25</sup>50, width<sup>26</sup> 24. Maxilla—length<sup>27</sup> 65, width<sup>28</sup> 67.Mandible—bicondylar width<sup>29</sup> 126, bigoniac width<sup>30</sup> 99, symphy-sial height<sup>31</sup> 33, molar height<sup>32</sup> 29, coronoid height<sup>33</sup> 63, gonio-symphysial length (l. side)<sup>34</sup> 81. Ramus—height<sup>35</sup> 71, antero-posterior breadth<sup>36</sup> 35. Bigoniac arc<sup>37</sup> 194.Indices—latitudinal<sup>38</sup> 82·8, altitudinal<sup>39</sup> 78·2, frontal<sup>40</sup> 68·7,gnathic<sup>41</sup> 106·7, nasal<sup>42</sup> 48·0.

<sup>1</sup> 9–12 <sup>13</sup> 19 <sup>27</sup> 28 <sup>33</sup> 34 <sup>39</sup> taken according to Flower, Journ. Anthropol. Inst. x p. 172 (1881), and Cat. Coll. Surg. i. p. xvii (1879).

<sup>2–8</sup> 13–17 <sup>20–26</sup> 29–32 <sup>34–37</sup> 41–42, Broca, Instrum. Crâniol. (Paris, 1875).



Subbrachycephalic, prognathous, just above leptorhine.

Glabella prominent, about No. 3 of Broca's scale. Inion scarcely developed.

This skull is unusually broad for a Melanesian, and has a somewhat low nasal index; it agrees, however, very well with No. 1193 of Prof. Flower's Catalogue \* ("The cranium of a Papuan, from one of the islands in Torres Strait, ♂"), and its extreme prognathism shows that it undoubtedly belongs to the Melanesian race. It has undergone considerable occipital flattening on the left side, either from sleeping on a hard wooden pillow or some similar cause; and this has no doubt caused the brain-case to be abnormally broad.

The present specimen is said to be the skull of the last chief of the island of Nagheer, and is ornamented with two long strings of glass beads and tassels of red calico hanging from the zygomata. It has its orbits filled with red clay, on which are fastened oblong bits of mother-of-pearl for eyes; there is an artificial nose carved in wood and painted red, and a red band of paint passes across the forehead. The right upper canine, lost after death but before the preparation of the skull, has been replaced by a wooden tooth. The four posterior teeth in the right lower jaw have all been lost during life, and their alveoli have quite closed up.

## 2. Skull of Torres-Straits Islander. (PLATES I. & II. fig. B.)

Male [?]. Adult.

"Native woman of Nagheer Island, Torres Straits."—*R. W. C.*  
Length 178; gl. occ. 181. Breadth 136. Height 137. Maximum frontal breadth 112; minimum frontal breadth 95. Horizontal circumferences—preauricular 230, total 503. Transverse arcs—frontal 283, bregmatic 300, parietal 320, occipital 267. Longitudinal arcs—frontal 130, parietal 126, occipital 112. Foramen magnum—length 38, width 31. Basinasal length 103. Basialveolar length 105. Bizygomatic breadth 129. Height of—face 86, malar 24, alveolus 16. Auriculo-orbital length 68. Nasal height 49, width 26. Maxilla—length 61, breadth 63.

Mandible—bicondylar width 117, bigoniac width 93, symphysial height 31, molar height 24, coronoid height 52, gonio-symphysial length 88. Ramus—height 64, antero-posterior breadth 31. Bigoniac arc 197.

Indices—latitudinal 76.4, altitudinal 77.0, frontal 69.9, gnathic 101.9, nasal 53.1.

Subdolichocephalic, hypsiccephalic, mesognathous, and platyrrhine. Glabella low, about No. 1. No inion. Median line of nose very prominent.

Similarly prepared to the last, the only differences being that the strings of beads from the zygomata are shorter and without

\* *Op. cit.* p. 222.



tassels, and there is a blue crescent-shaped mark on the glabella, just below the supraorbital red line.

Although stated to be a "woman of Nagheer," there can be little doubt, from its general appearance, that this skull is that of a man. It is a remarkably fine and typical head, and has therefore been thought worthy of a figure. The peculiar roof-like shape of the crown is noticeable, a state of skull called "ill-filled" by Dr. Cleland.

"These skulls are placed on the graves where the bodies of their original possessors lie, and are surrounded with idols, models of snakes, &c., which are supposed to guard the dead."

### 3. Cranium of Solomon Islander.

Female. Adult.

"Solomon group; particular island unknown."—*R. W. C.*

Length 187; gl. occ. 187. Breadth 130. Height 133. Maximum frontal breadth 110; minimum frontal breadth 100. Horizontal circumferences—preauricular 243, total 510. Transverse arcs—frontal 276, bregmatic 294, parietal 304, occipital 265. Longitudinal arcs—frontal 133, parietal 126, occipital 117. Foramen magnum—length 33, breadth 28. Basinasal length 102. Basialveolar length 102. Bizygomatic breadth 129. Height of—face 80, malar 21, alveolus 12. Auriculo-orbital length 68. Orbit—width\* 39, height\* 34. Nasal height 47, width 25. Maxilla—length 56, width 63.

Indices—latitudinal 69.5, altitudinal 71.1, frontal 76.9, gnathic 100.0, orbital 87.2, nasal 53.2.

Dolichocephalic, mesognathous, platyrrhine; orbit mesoseme.

Glabella low, about No. 1 of Broca's scale. Nasal spine long, No. 4. Occipital crest scarcely visible.

### 4. Cranium of Mallicollo Islander, New Hebrides.

Male. Aged. All the teeth gone and alveoli closed up.

Length 170; gl. occ. 182. Breadth 128. Height 138. Maximum frontal breadth 107; minimum frontal breadth 91. Horizontal circumferences—preauricular 232, total 481. Transverse arcs—frontal 276, bregmatic 301, parietal 320. Longitudinal arcs—frontal 131, parietal 139, occipital 104. Foramen magnum—length 29, width 25. Basinasal length 103. Bizygomatic breadth 137. Height of malar 22. Auriculo-orbital length 68. Orbit—width 39, height 35. Nasal height 48, width 30.

Indices—latitudinal 75.3, altitudinal 81.2, frontal 71.1, orbital 89.7, nasal 62.5.

Subdolichocephalic, hypsiccephalic, very platyrrhine; orbit megaseme.

Glabella very thick and gorilla-like, approaching No. 4 of Broca's

\* Flower, Cat. Coll. Surg. i. p. xviii.

scale. Inion long and recurved, between Nos. 4 and 5. Sutures all very simple, in marked contrast to those of the next specimen. Zygomata very prominent. Squamosals widely separated from frontal.

### 5. Skull of Mallicollo Islander, New Hebrides.

Female. Adult.

Length 173; gl. occ. 178. Breadth 135. Height 134. Maximum frontal breadth 101; minimum frontal breadth 95. Horizontal circumferences—preauricular 218, total 488. Transverse arcs—frontal 252, bregmatic 293, parietal 336. Longitudinal arcs—frontal 134, parietal 137, occipital 104. Foramen magnum—length 34, width 29. Basinasal length 90. Basialveolar length 91. Bizygomatic breadth 129. Height of—face 82, malar 19, alveolus 16. Auriculo-orbital length 61. Orbit—width 36, height 33. Nasal height 42, width 24. Maxilla—length 50, breadth 60.

Mandible—bicondylar width 116, bigoniae width 97, symphyseal height 25, molar height 21, coronoid height 56, gonio-symphyseal length 81. Ramus—height 49, antero-posterior breadth 33. Bigoniae arc 177.

Indices—latitudinal 78.0, altitudinal 77.5, frontal 70.4, gnathic 101.1, orbital 91.7, nasal 57.1.

Subdolichocephalic, mesognathous, platyrrhine; orbit megaseme.

Glabella about No. 1. Nasal spine No. 3. No inion.

Occipital prominent, lambdoid suture full of large Wormian bones. Epipteric bones on both sides. Auditory meatus flattened and oval-shaped, evidently owing to pressure applied to the mandible.

These two last specimens, presented to Dr. Coppinger by Mr. Boyd, of Ovalau, show the artificially produced absence of forehead and general depression of the frontal and prominence of the parietal and occipital regions characteristic of Mallicollo skulls, and described by Prof. Busk in the 'Journal of the Anthropological Institute'\*. Prof. Flower has also figured some monumental heads from the same island, showing a similar artificial deformity†.

### 6. Skull of Banks Islander.

Young. Basilar suture open and wisdom teeth still hidden in the bone.

"Merilava†, Banks group; presented by Mr. Boyd, of Ovalau."—*R. W. C.*

Length 170, gl. occ. 172. Breadth 124. Height 133. Maximum frontal breadth 108; minimum frontal breadth 89. Horizontal circumferences—preauricular 230, total 470. Trans-

\* vi. p. 200, pls. ix.-xii. (1877).

† J. A. I. xi. p. 85, pl. vi. (1882).

‡ Also spelt "Meralaba" (Whitmee, J. Anthr. Inst. viii., map facing p. 261: 1878).

verse arcs—frontal 270, bregmatic 291, parietal 313, occipital 260. Longitudinal arcs—frontal 130, parietal 111, occipital 112. Foramen magnum—length 34, breadth 29. Basinasal length 97. Basialveolar length 91. Bizygomatic breadth 120. Height of—face 86, malar 17, alveolus 17. Auriculo-orbital length 66. Orbit—width 36, height 34. Nasal height 51, width 22. Maxilla—length 50, width 62.

Mandible—bicondylar width 110, bigoniae width 72, symphysial height 27, molar height 23, coronoid height 54, gonio-symphysial length 82, condylo-coronoid length 33. Bigoniae arc 175. Indices—latitudinal 72·9, altitudinal 78·2, gnathic 93·8, orbital 94·4, nasal 43·1.

Lambdoid suture unusually complicated, with numerous Wormian bones.

### 7. Skull of Banks Islander.

Still younger than 6.

“Merilava, Banks group; presented by Mr. Boyd, of Ovalau.”—*R. W. C.*

Length 163; gl. occ. 166. Breadth 123. Height 124. Maximum frontal breadth 98; minimum frontal breadth 92. Total circumference 455. Transverse arcs—frontal 242, bregmatic 267, parietal 300, occipital 244. Foramen magnum—length 32, breadth 27. Basinasal length 84. Basialveolar length 81. Bizygomatic breadth 111. Auriculo-orbital length 57. Orbit—width 33, height 32. Nasal height 36, width 23. Maxilla—length 44, width 55.

Mandible—bicondylar width 100, symphysial height 21, coronoid height 45, gonio-symphysial length 69, condylo-coronoid length 23.

Indices—latitudinal 75·5, altitudinal 76·1, gnathic 96·4, orbital 97·0, nasal 63·9.

These two Banks-Island skulls are of great interest, as showing a distinct tendency towards (probably a youthful stage of) the artificial deformity noticed in the Mallicollo skulls, and hitherto supposed to be peculiar to the natives of that island. The present specimens, however, prove that the flattening process is also practised to a certain extent in the neighbouring island of Merilava.

### 8. Calvaria of Fijian.

Male. Middle-aged. Coronal suture nearly closed.

“From an old tumulus near the village of Buretta, Ovalau.”—*R. W. C.*

Length 197; gl. occ. 200. Breadth 132. Height 141. Maximum frontal breadth 114, minimum 103. Horizontal circumferences—preauricular 250, total 542. Transverse arcs—frontal 312, bregmatic 318, parietal 327, occipital 280. Longitudinal arcs—frontal 130, parietal 152, occipital 120. Basinasal length 109.

Indices—latitudinal 67·0, altitudinal 71·6, frontal 78·0, stephanic 90·4.

Dolichocephalic and hypsicephalic.

Glabella not prominent, No. 2 of Broca's scale. Inion No. 1.

This skull has unfortunately lost all the bones of the face; but nevertheless the conformation of the brain-case is such as to show its near relationship to the pure Melanesians of Viti Levu, agreeing very closely with the male "Kai Colo" skulls described by Prof. Flower. The forehead is slightly broader than in any of his specimens (103 against 99 millim.), and the altitudinal index is somewhat lower (70·5 against 72·2). Otherwise the present skull agrees with Prof. Flower's figures and description.

### 9. Cranium of Fijian.

Female. Middle-aged. Posterior teeth lost during life.

"Kai Colo, from cave at Livoni, Ovalau, Fiji."—*R. W. C.*

Length 175; gl. occ. 175. Breadth 121. Height 130. Maximum frontal breadth 100, minimum 83. Horizontal circumferences—preauricular 218, total 475. Transverse arcs—frontal 274, bregmatic 281, parietal 294, occipital 245. Longitudinal arcs—frontal 123, parietal 128, occipital 110. Foramen magnum—length 32, breadth 26. Basinasal length 93. Basialveolar length 95. Bizygomatic breadth 117. Height of face 81, malar 19·2, alveolus 11. Auriculo-orbital length 68. Orbit—width 36, height 32. Nasal height 46, width 25.

Indices—latitudinal 69·1, altitudinal 74·3, frontal 68·6, stephanic 83·0, gnathic 102·2, orbital 88·9, nasal 54·3.

Dolichocephalic, hypsicephalic, mesognathous; orbit just below megaseme; and platyrrhine.

Glabella low, No. 1 of Broca's scale. Parietal eminences prominent.

This cranium is interesting as belonging to one of the "Kai Colos," or pure-blooded mountaineers of Fiji, whose cranial characters have been fully worked out by Prof. Flower (*J. Anthr. Inst.* x. p. 153: 1881). It agrees very closely with the skulls from Viti Levu described by that author, most of the actual dimensions and indices coming within the very narrow limits of variation found by him in his five female Kai Colos. The forehead, however, is very much narrower than usual, the minimum frontal diameter being, as given above, only 83 millim., with a frontal index of 68·6 (Broca, *Instr. Crân.* p. 172), while Prof. Flower's five female Kai Colos average for these numbers 94 millim. and 77·0 p. c., the lowest breadth being 89 millim. and the lowest index 75·0.

"The Kai Colos were the old hill-inhabiting tribes of Fijians, and were distinct from the coast-tribes, with whom they were frequently at war. Their power was broken by the renowned Fijian chief 'Cacobau,' now dead. Livoni, in Ovalau Island, was one of their strongholds, where these skulls were found by Mr. McCorkill, a settler, who presented them to me."—*R. W. C.*

## B I R D S.

BY

R. BOWDLER SHARPE.

v v

THE birds were obtained in the islands of Torres Straits, at Port Molle and Port Curtis in Queensland, and at Port Darwin in North-western Australia. In the following notes the references to other works have been limited to the 'Catalogue of Birds in the British Museum,' as far as this work is published, and to Mr. Ramsay's useful list of Australian birds (Proc. Linn. Soc. N. S. W. vol. ii. pp. 177-203), where the best illustration of their geographical distribution is to be found.

1. *Cerchneis cenchroides* (V. & H.).

*Sharpe, Cat. B. Brit. Mus.* i. p. 431.

*Tinnunculus cenchroides*, *Ramsay, Pr. Linn. Soc. N. S. W.* ii. p. 177.

a. Port Denison, May 1881.

2. *Ninox peninsularis*, *Salvad.*

a. ♀. Thursday Island, Torres Straits. Bill yellow with black tip; feet and iris yellow.

The British Museum contains a good series of this apparently well-marked species, which differs from *Ninox connivens* by the rufous streaks on the lower parts. The following is a description of Dr. Coppinger's specimen:—

*Adult female.* General colour above dull sooty brown, darker on the head, which is blackish brown, forming a tolerably distinct cap; scapulars brown like the back, with large white markings on the outer web, forming a continuous white line on each side of the back; wing-coverts almost entirely uniform, with only here and there a spot of white, a little plainer on the outer web of the median and greater coverts, the latter of which are washed with pale rufous; bastard-wing feathers and primary-coverts uniform sooty brown; quills dark brown, barred on both webs with lighter brown, taking the form of whity-brown notches on the outer web; inner secondaries spotted with white on the outer and barred with white on their inner webs; lower back and rump sooty brown, with more or less concealed spots of white; upper tail-coverts deep brown; tail-feathers dark brown, plainly though narrowly barred and tipped with whity brown, these light bars being eight in number besides the terminal one; lores, base of forehead, and plumes over the eye



and round the fore and lower part of the latter white, with hair-like black shaft-lines; ear-coverts dark brown; chin and cheeks white, the hinder part of the latter streaked with dusky brown; lower throat tinged with yellow and streaked with blackish centres to the feathers; remainder of under surface white, slightly tinged with yellow and broadly streaked with dark brown on the fore neck and chest and with rufous-brown on the breast and abdomen; thighs and tarsal plumes yellowish, spotted with brown; under tail-coverts white, with a few heart-shaped spots near the end of the feather; axillaries and under wing-coverts deep yellowish buff, broadly streaked with chocolate-brown, the central markings more or less irregular in shape; quills dusky brown, barred with white, somewhat ashy whitish on the quills, but very pure white on the lower series of under wing-coverts, which resemble the lower surface of the quills in appearance. Total length 15 inches, culmen 0.85, wing 10.2, tail 6.5, tarsus 1.45.

### 3. *Corvus coronoides*, V. & H.

*Sharpe, Cat. B. Brit. Mus.* iii. p. 20.

a. ♂ ad. Port Molle, Queensland, May 1881.

### 4. *Oriolus flavicinctus* (King).

*Sharpe, t. c.* p. 206.

*Mimeta flavocincta*, *Ramsay, t. c.* p. 188.

a. ♀. Port Darwin, Oct. 1881. Bill flesh-colour; legs and feet slaty grey; iris bright red.

A smaller bird than the Cape-York examples (wing 5.2 inches), with rather a smaller alar speculum. The black centres to the feathers of the upper surface are wider, and the bird consequently appears darker; but this is probably due to abrasion and wearing away of the plumage.

### 5. *Sphecotheres flaviventris*, Gould.

*Sharpe, t. c.* p. 225; *Ramsay, t. c.* p. 188.

a, b. ♀. Thursday Island, Aug. 1881. Iris black.

### 6. *Chibia bracteata* (Gould).

*Sharpe, t. c.* iii. p. 236; *Ramsay, t. c.* p. 182.

a, b. ♂. Friday Island, Aug. 1881.

c. ♂. Port Darwin, Oct. 1881. Iris orange-colour.

### 7. *Grallina picata* (Lath.).

*Sharpe, t. c.* p. 272; *Ramsay, t. c.* p. 180.

a. ♂. Port Curtis, April 1881.

8. *Pinarolestes rufigaster* (Gould).*Sharpe, t. c. p. 296.**Colluricincla rufigaster, Ramsay, t. c. p. 181.*

- a. Thursday Island, June 10, 1881.

9. *Graucalus hypoleucus*, Gould.*Sharpe, Cat. B. Brit. Mus. iv. p. 36; Ramsay, t. c. p. 180.*

- a. ♀. Thursday Island, August 1881.

10. *Graucalus melanops* (Lath.).*Sharpe, t. c. p. 30; Ramsay, t. c. p. 180.*

- a. ♂ imm. Port Molle, Queensland, May 1881.  
b. ♀ imm. Thursday Island, July 1881.

11. *Lalage leucomelæna* (V. & H.).*Sharpe, t. c. p. 106.**Campephaga leucomela, Ramsay, t. c. p. 181.*

- a. ♀ ad. Friday Island, Sept. 1881. Iris dark brown; bill black; legs and feet dark grey.  
b. ♀ juv. Thursday Island, July 1881. Iris black; bill black; legs and feet dark grey.

Count Salvadori (Orn. Papuasias, ii. p. 163) separates the Australian form of this species from the Papuan, which he calls *Lalage karu* (Less.). This view seems to me to be correct, for the Papuan race appears to have less white on the wing-coverts and to be permanently barred below, whereas the adult male of the Australian *Lalage* is uniform on the under surface.

12. *Lalage tricolor* (Swains.).*Sharpe, t. c. p. 92.**Campephaga humeralis, Ramsay, t. c. p. 181.*

- a. ♂ imm. Port Darwin, Oct. 24, 1881.

13. *Pseudogerygone magnirostris* (Gould).*Sharpe, t. c. p. 223.**Gerygone magnirostris, Ramsay, t. c. p. 133.*

- a. Thursday Island, Sept. 1881.

14. *Myiagra latirostris*, Gould.*Sharpe, t. c. p. 381; Ramsay, t. c. p. 182.*

- a. ♂. West Island, Sept. 1881.

15. *Myiagra nitida*, Gould.*Sharpe, t. c. p. 375; Ramsay, t. c. p. 182.*

- a. ♂. Fitzroy Island, May 1881.

16. *Myiagra rubecula* (Lath.).*Sharpe, t. c. p. 373; Ramsay, t. c. p. 182.*

- a. ♂. Percy Island, April 1881.  
b. ♂. Port Molle, May 1881.

17. *Myiagra concinna*, Gould.*Sharpe, t. c. p. 374; Ramsay, t. c. p. 182.*

- a. ♂. Booby Island, Aug. 31, 1881.  
b. ♀. Booby Island, Aug. 1881.  
c. ♂. West Island, Sept. 1881.  
d. Friday Island, July 1881.  
e. ♂. Friday Island, Aug. 1881.  
f. Thursday Island, Sept. 1881.

The differences between this species and *M. rubecula* are, to my mind, not satisfactorily established; but until better specimens reach the British Museum from N.W. Australia (the habitat of the typical *M. concinna*) it will be difficult to settle the question.

18. *Rhipidura rufifrons* (Lath.).*Sharpe, t. c. p. 319; Ramsay, t. c. p. 182.*

- a. ♂. Booby Island, Aug. 1881.

19. *Rhipidura tricolor* (V.).*Sharpe, t. c. p. 339.**Sauloprocta motacilloides, Ramsay, t. c. p. 182.*

- a, b, c. Port Curtis, April 1881.  
d. ♀. Port Darwin, Oct. 1881.

20. *Piezorhynchus nitidus*, Gould.*Sharpe, t. c. p. 416; Ramsay, t. c. p. 182.*

- a. ♀. Horn Island, Torres Straits, Sept. 1881. Iris orange-red; bill greenish grey; legs and feet dark.  
b. ♀. Thursday Island, Aug. 1881. Iris dark; bill horn-colour, black at tip; legs and feet grey.

21. *Piezorhynchus medius*, sp. n.

- a. ♂. Port Molle, May 1881. Iris black; bill light grey; legs and feet dark.



Agrees with *P. trivirgatus* of Timor in its black upper tail-coverts, which in the type specimens of *P. gouldi* are grey.

In the 'Catalogue of Birds' (vol. iv. p. 419) I united Gould's *Monarcha albiventris* with *Piezorhynchus gouldi*, but I now believe that I was wrong in doing so. It may be a matter of opinion whether the three forms here alluded to are more than local races or subspecies; but it is certain that the white-flanked individuals, *P. albiventris* (Gould), have the upper tail-coverts blackish, whereas in the rufous-flanked birds, *P. gouldi* (Gray), the tail-coverts are grey. Thus my "Key to the Species" (*t. c.* pp. 413, 414) will have to be modified as follows:—

- a*<sup>5</sup>. Upper tail-coverts black.
- a*<sup>6</sup>. White ending to outer tail-feathers not exceeding an inch in length.
- b*<sup>6</sup>. White ending to outer tail-feathers 1·0–1·2 inch.
- a*<sup>7</sup>. Four outer tail-feathers white at the ends; black throat-stripe narrow .. *trivirgatus*.
- b*<sup>7</sup>. Three outer tail-feathers white at the ends; black throat-stripe broad.
- a*<sup>8</sup>. Sides of body orange-rufous .... *medius*.
- b*<sup>8</sup>. Sides of body white ..... *albiventris*.
- b*<sup>5</sup>. Upper tail-coverts grey; sides of body orange-rufous ..... *gouldi*.

## 22. *Cisticola exilis*, Vig. & Horsf.

*Sharpe, Cat. B. Brit. Mus.* vii. p. 269; *Ramsay, t. c.* p. 185.

*a.* N. Australia (not labelled).

A specimen in winter plumage.

## 23. *Cracticus nigrigularis* (Gould).

*Gadow, Cat. B. Brit. Mus.* viii. p. 95.

*Cracticus robustus*, *Ramsay, t. c.* p. 180.

*a.* ♂. Port Curtis, Queensland, April 1881. Iris black; bill grey, with the tip black; legs and feet black.

## 24. *Pachycephala melanura*, Gould.

*Gadow, t. c.* p. 185; *Ramsay, t. c.* p. 181.

*a.* ♂. West Island, Sept. 1881.

*b, c.* ♂. Booby Island, Aug. 1881.

I am unable to follow Dr. Gadow in his conclusions respecting *P. melanura* and its allies, *P. clio*, *P. macrorhyncha*, and *P. obiensis*, all of which he unites together as a single species. Count Salvadori has kept them distinct; and their specific characters I have endeavoured to set forth in the following "Key":—

- a. Upper tail-coverts olive-yellow like the back; outer aspect of secondaries distinctly grey; pectoral collar joined to ear-coverts ..... *melanura*.
- b. Upper tail-coverts black; outer aspect of secondaries olive-yellow, with which they are margined or washed externally.
  - a'. Pectoral collar joined to ear-coverts ..... *clio*.
  - b'. Pectoral collar separated from ear-coverts.
    - a''. Upper surface olive-greenish; wings externally washed with greenish grey .... *macrorhyncha*.
    - b''. Upper surface golden olive; wings externally washed with the same colour .. *obiensis*.

After having gone over the series in the British Museum, which likewise served as the basis of Dr. Gadow's studies, I regret that I must entirely disagree with him. He appears to me to have argued from immature specimens when he tries to show the variation of the species and attempts to prove that they run one into another. If it were possible to find in the same island examples of these *Pachycephalæ* with the black breast-band united to the ear-coverts and others with this disunited, *all being fully adult birds*, then Dr. Gadow would have proved his point; but this is exactly what does *not* take place, the difference in coloration being accompanied by a different habitat. It is not right to compare immature birds of one form with adults of another, because in their young stages all these species are unquestionably very difficult to distinguish apart; but if fully adult birds are compared, I do not think there ought to be any difficulty in determining four distinct species.

Again, with regard to his observations that the colouring of the upper tail-coverts "is of no specific importance," some attention must be given to the age and condition of the specimens. In the group with the upper tail-coverts black, it will be found that the basal ones are always more or less tipped with olive, and that it is the *long* ones which are black. If, therefore, the latter are shot away, a superficial observer would jump at once to the conclusion that the upper tail-coverts are olive-yellow. Even in this case the yellow-washed quills (instead of grey) would enable one to distinguish the *P.-macrorhyncha* group from *P. melanura*. Then, again, it would appear from moulting specimens that the upper tail-coverts when first grown have more olive-yellow on the margins than in the fully adult bird. Therefore in these *Pachycephalæ*, as in other birds, only fully plumaged specimens should be compared, if one is to understand the relations of the various species.

There can be no doubt that the locality "Celebes" attached to the specimen from the Gould Collection is erroneous; and Mr. Wallace has remarked on the absence of the genus in the above island, in the essay quoted by Dr. Gadow.

25. *Pachycephala rufiventris* (Lath.).

Gadow, *t. c.* p. 208; Ramsay, *t. c.* p. 181.

- a. ♂. Port Darwin, October 1881.  
 b. ♂. Port Darwin, October 1881.  
 c. ♀. Port Molle, May 3, 1881.

26. *Cinnyris frenata* (Müll.).

Gadow, *Cat. B. Brit. Mus.* ix. p. 85; Ramsay, *t. c.* p. 191.

- a. ♂. Prince of Wales Island, Aug. 1881.  
 b, c. ♂ ♀. Thursday Island, July 11, 1881.

27. *Myzomela obscura*, Gould.

Gadow, *t. c.* p. 143; Ramsay, *t. c.* p. 190.

- a, b. ♂. Thursday Island, Aug. 1881.  
 c. ♀. Thursday Island, Aug. 1881.

The following are the measurements of the sexes :—

	Total length.	Culmen.	Wing.	Tail.	Tarsus.
♂ . . . .	5·1	..	2·75	2·1	0·7
♂ . . . .	4·8	0·8	2·6	2·1	0·75
♀ . . . .	4·8	0·7	2·45	2·0	0·65

I may supplement Dr. Gadow's description of this species by remarking that there are two distinct shades of colour observable in a series of the present species, the birds from Port Darwin and "Northern Territory" (ex Gould Coll.) being more mouse-coloured, and this is the form which is seen in South-eastern New Guinea. The specimens from Queensland, Cape York, and the islands of Torres Straits are browner, sometimes inclining to rusty brown. Another character which Dr. Gadow omits to mention is the blackish shade in the centre of the throat; it is apparently a mark of an adult bird, and is not confined to one sex, but appears to be equally distinct in the female.

28. *Zosterops albiventer*, Reichenb.

Sharpe, *Cat. B. Brit. Mus.* ix. p. 164.

*Zosterops flavogularis*, Ramsay, *t. c.* p. 191.

- a. ♀. West Island, Torres Straits, Sept. 1881. Iris greyish brown; bill dark brown; legs and feet greyish brown.

This species is very rarely seen in collections, and was for a long time known only from the figure in the 'Voyage au Pôle Sud.' It was originally described from Warrior Island in Torres Straits, and appears to be a recognizable species. It seems to be the *Z. flavigularis* of Masters (Proc. Linn. Soc. N. S. W. i. p. 56), described from

different islands in Torres Straits, one of the localities mentioned by the last-named author being Warrior Island, whence the original type of *Z. albiventris* came.

29. *Zosterops lutea*, Gould.

*Sharpe, t. c. p. 183; Ramsay, t. c. p. 191.*

a. ♀. Port Darwin, Oct. 1881. Bill horn-colour; legs grey.

This specimen is rather duller in colour than a male from Cape York, and much paler yellow below, this brighter colour being probably due to sex, as the Cape-York bird is evidently an adult male. The female measures:—Total length 4.1 inches, culmen 0.45, wing 2.2, tail 1.65, tarsus 0.6.

30. *Manorhina garrula* (Lath.).

*Gadow, t. c. p. 260.*

*Myzantha garrula, Ramsay, t. c. p. 191.*

a. ♂. Port Curtis, Queensland, April 1881.

b. ♂. Port Curtis, April 1881.

Young birds are washed on the back with olive-yellow, and are much darker above and below, not showing the whitish bars at the tips of the mantle-feathers.

31. *Stigmatops ocularis* (Gould).

*Ramsay, t. c. p. 189.*

*Glyciphila ocularis, Gadow, t. c. p. 213.*

a. ♂. Percy Island, April 1881.

32. *Stigmatops subocularis*, Gould.

*Ramsay, t. c. p. 189.*

*Glyciphila subocularis*, pt., *Gadow, t. c. p. 215.*

a. ♂. Port Darwin, Nov. 1881. Bill, legs, and feet black.

Dr. Gadow has united the present species to *S. ocularis*, and considers that intermediate forms occur between them. This I do not find from an examination of the series in the British Museum, for I have found no difficulty in referring the specimens either to one or the other of the above-named species. On the other hand, Count Salvadori seems to be quite right in uniting the Aru-Island birds with the Australian, as they are only a little larger and somewhat darker in colour. He adds that the specimens marked *Ptilotis limbata*, Temm., from Timor, in the Leiden Museum, are also identical with the Australian *S. ocularis*. Timor

specimens are certainly very closely allied to the latter, but have rather a clearer grey throat and a more pronounced cheek-stripe; but in any case it appears to me better to place *P. limbata* in the genus *Stigmatops*, along with its congener *S. ocularis*, and not to consider it a *Ptilotis*, as Dr. Gadow has done. His plate in the 'Catalogue' gives too much of a brown colour to the bird, and the orange spot behind the eye is too strongly pronounced.

Nor can I agree with Dr. Gadow concerning his *G. chloris*, the only actual specimens of which in the British Museum are the two from Mysol, those from the Aru Islands and Lomboek being true *S. ocularis*.

### 33. *Ptilotis notata*, Gould.

Gould, *Ann. & Mag. Nat. Hist.* xx. p. 269 (1867); Ramsay, *t. c.* p. 189.

*Ptilotis analoga*, pt., Gadow, *t. c.* p. 227.

a. ♂. Prince of Wales Island, Aug. 1881.

b. ♂. Thursday Island, July 7, 1881.

This is the species which Count Salvadori unites under the name of *P. analoga* (Reichenb.) in his 'Ornitologia della Papuasias' (vol. ii. p. 327), and in all his identifications he is followed by Dr. Gadow, who even goes further than Count Salvadori in his suppression of species, and adds *P. flavirictus* of the latter author as a final offering to the manes of the dominant form, *P. analoga*. It seems doubtful, however, to me whether Dr. Gadow has really ever seen the true *P. flavirictus* of Count Salvadori, which is from the Fly River, the specimens which he supposes to belong to that species being from South-eastern New Guinea: Salvadori refers all his specimens from this part of the island to *P. analoga*.

Putting aside the question of the length of bill, which certainly varies very much, even in specimens from the same locality, the shape of the ear-tuft ought not to be overlooked; and we find that there are two distinct forms, the birds from Dorey, Mysol, and Waigiou having an elongated yellow ear-tuft. This is accompanied by a very Bulbul-like character, viz. a fluffy rump with strongly marked subterminal shades of blackish brown, the lateral feathers tipped with white, and reminding one of *Pinarocichla* or *Polioptilus*.

All specimens examined by me from other localities have a rounded yellow ear-tuft instead of a longitudinal one, and may be classed under three headings:—1st. *P. aruensis*, nob. (*Hab.* Aru Islands), where the rump is mottled, as in the New-Guinea birds; and 2nd, *P. notata*, Gould. The latter species embraces two forms, a large one and a small one (*P. gracilis*, Gould), the last-named being apparently only found in South-eastern New Guinea and the Cape-York Peninsula. Neither of the two forms of *P. notata* show the mottling on the rump of *P. aruensis* or *P. analoga*.

I may add that the specimens from Cape York, referred by the

late Mr. Forbes to *P. chrysotis* (P. Z. S. 1878, p. 124, and Report Voy. H.M.S. 'Challenger,' ii. p. 88) really belong to *P. notata*.

34. *Ptilotis lewinii*, Swains.

*Ramsay, t. c. p. 189; Gadow, t. c. p. 229.*

a b. Port Moller, Queensland, May 1881.

35. *Ptilotis fasciogularis*, Gould.

*Gould, P. Z. S. 1851, p. 285; Ramsay, t. c. p. 189; Gadow, t. c. p. 240.*

a. ♀. Port Curtis, Queensland, April 1881.

36. *Ptilotis flava*, Gould.

*Ramsay, t. c. p. 189; Gadow, t. c. p. 246.*

a. ♀. Port Denison, Queensland, May 1881.

37. *Ptilotis unicolor*, Gould.

*Gadow, t. c. p. 249.*

*Stomiopera unicolor, Ramsay, t. c. p. 189.*

a. ♂ ad. Port Darwin, Nov. 2, 1881.

38. *Philemon argenteiceps* (Gould).

*Ramsay, t. c. p. 190; Gadow, t. c. p. 272.*

a. ♂. Port Darwin, Oct. 1881.

39. *Philemon buceroides*, Swains.

*Ramsay, t. c. p. 190; Gadow, t. c. p. 272.*

a. ♀. Thursday Island, Torres Straits, July 1881.

40. *Philemon citreogularis* (Gould).

*Ramsay, t. c. p. 190; Gadow, t. c. p. 277.*

a. ♂. Port Curtis, Queensland, April 1881.

b. ♀. Port Darwin, Oct. 1881.

It would seem that the yellow throat is strictly peculiar to the young, and is accompanied by an absence of the white linear tufts to the breast-feathers. The latter are often assumed, however, before the yellow on the throat has disappeared.



41. *Dicæum hirundinaceum*, *Shaw*.*Ramsay, t. c. p. 191.**a, b. ♂. Thursday Island, July 1881.**c. ♀. Port Darwin, October 1881.*42. *Petrochelidon nigricans* (*V.*).*Hylochelidon nigricans, Ramsay, t. c. p. 179.**a. ♂ ad. Port Molle, Queensland, May 1881.*43. *Donacicola castaneothorax*, *Gould*.*Donacola castaneothorax, Ramsay, t. c. p. 187.**a, b. ♂. Port Darwin, Nov. 1881.**c. ♂. Port Darwin, Oct. 1881.**d, e. ♀. Port Darwin, Oct. 1881.**f. ♂. West Island, Oct. 1881.**g. ♂. Thursday Island, June 1881.**h, i, k, l. Thursday Island, July 1881.*44. *Artamus leucorhynchus* (*L.*).*Artamus leucopygialis, Ramsay, t. c. p. 179.**a. ♂. Port Denison, May 1881.**b. ♀. Port Darwin, Nov. 1881. Iris brown.*45. *Pitta simillima*, *Gould*.*Ramsay, t. c. p. 187.**a. ♂. West Island, Sept. 1881.*46. *Merops ornatus*, *Lath.**Ramsay, t. c. p. 179.**a. ♀. West Island, Oct. 1881.**b. ♀. Prince of Wales Island, Aug. 21, 1881.*47. *Dacelo gigas* (*Bodd.*).*Ramsay, t. c. p. 179.**a. ♂. Port Curtis, Queensland, April 1881.*48. *Dacelo leachii*, *Vig. & H.**Ramsay, t. c. p. 179.**a. ♀. Possession Island, Endeavour Strait, July 1881. Bill brown; legs and feet grey; iris red.*



This interesting specimen is not easy to determine, being in size like *D. cervinus* and in colour like *D. leachii*. As I endeavour to show below, these species, however, run into each other so much that it is impossible to define the exact characters of each.

Since I wrote my 'Monograph of the Kingfishers,' our knowledge of the great Laughing Jackasses of Australia has not been much increased. The range of true *Dacelo* has been extended to South-eastern New Guinea, where *Dacelo intermedius* of Salvadori replaces *D. cervinus* of the Australian continent; but otherwise the number of species in Australia has remained the same as it was on the completion of that work.

A comparison, however, of the large series of Laughing Kingfishers now in the British Museum raises great doubts in my mind as to the validity of some of the species admitted by me up to 1871; and I therefore add a few notes on the birds now before me.

The chief difference between *D. cervinus* and *D. leachii* is supposed to consist in the smaller size, the buff-coloured breast, and the blue outer web of the external tail-feather of the former. It seems to me now that this last is a character of no value; for it is evident that the young males commence with a rufous tail like the old females, and that they gain their blue tails by the gradual expansion of the blue cross bands, which unite by degrees until the whole tail becomes uniform blue. Thus there arrives a time in the development of the tail when the outer web of the tail-feather has not quite lost its bars before becoming uniform, and thus the barring of the tail, considered to be a specific difference between *D. cervinus* and *D. leachii*, is of very little importance. As regards the other characters, we shall see what they are worth; and in order to trace the development of the species, I add a description of a young *D. cervinus*:—

*Nestling.* General colour above dark brown, with scarcely perceptible lighter brown edges to the feathers of the mantle and scapulars; least wing-coverts brown like the back; median and greater series brown, tipped with pale verditer-blue or light greenish cobalt; bastard-wing brown, washed with blue; primary-coverts blackish, externally greenish blue; quills blackish, externally deep blue, greener on the primaries, which are white near the bases of both webs; the secondaries edged with white at the tips, the inner ones brown like the back; lower back and rump pale silvery cobalt; upper tail-coverts bright rufous, barred with black; tail-feathers bright rufous, paler at the ends, barred with dark blue, these blue bands margined above and below with black, the bands broader near the base and narrower towards the ends; the blue bands at the base of the middle feathers already coalescing into one uniform blue base; head nearly uniform dark brown, the feathers broadly centred with blackish, the edges somewhat mottled with reddish-brown markings; the nape lighter, the crest-feathers being whiter, with narrow dark-brown centres; hind neck clear fulvous, with more or less distinct zigzag cross lines of brown; lores tawny buff, as also the feathers below the eye, the latter with blackish

shaft-streaks; ear-coverts dusky brown; cheeks clear fulvous, with central streaks of light brown, breaking up into irregular cross lines on some of the feathers; throat and fore neck white, with irregular zigzag cross lines of light brown; remainder of under surface of body clear fulvous, crossed with zigzag lines of brown; under tail-coverts uniform and deeper buff; axillaries like the breast and barred across in the same manner; under wing-coverts whiter and crossed distinctly with blackish bars, broader and forming a distinct patch on the median lower coverts near the edge of the wing.

The above description is taken from a young male shot near Port Essington.

An old bird, with more than half his tail-feathers blue, has his plumage very much abraded and the crest-feathers reduced to hair-like brown plumes. The blue ends to the wing-coverts are almost entirely worn off; but on the breast he is replacing his faded plumage by a clean moult, the new feathers being very broadly centred with blackish; the under surface of the body is dirty buff, with brown zigzag cross bars, becoming less distinct on the throat.

Compared with young birds, the old *D. cervina* are very much paler buff below and less distinctly barred underneath, the collar round the hind neck is nearly uniform, with scarcely any remains of zigzag cross-barring, while the head and crest are white or buffy white, streaked with brown down the centre of the feathers; but the whole head is distinctly streaked, instead of being uniform brown as in the young birds. The cobalt-blue on the shoulders is, of course, much more brilliant and more developed than in the young ones.

The mode in which the barring on the under surface becomes less and the head more streaked is well shown in an immature male bird, which has the head losing its uniformity for the streaked stage, and yet retains the rufous upper tail-coverts of the immature stage, while the tail is only half overshadowed with blue.

The differences between the young and old specimens of *Dacelo cervinus* seem to me perfectly comprehensible; but the relations of *D. leachii* and *D. occidentalis* are not so clear. There is considerable variation in length of wing throughout the whole series. All our specimens of *D. leachii* have more or less remains of their old rufous-barred tail, but they are all completing their change to the uniform blue tail, and consequently the outer feathers are in more or less irregularly blue-banded stages; but every proof is furnished that the outer feather will become perfectly blue, like the corresponding stage in *D. cervinus*, so that the character of the barred outer tail-feather will not hold.

Undoubtedly *D. leachii* is a larger and more powerful bird than *D. cervinus*. It is often similarly fulvous on the breast; but the zigzag bars are coarser and are continued higher up on the throat, as well as being strongly developed on the collar round the hind neck. The older the bird becomes, however, it is evident that, as in *D. cervinus*, the cross-markings on these parts become more and more

obsolete, and there is no difference between the two species excepting the larger size and whiter under surface of *D. leachii*.

The types of *D. occidentalis* from the Gould Collection are now in the Museum; and for the same reason that I dismissed the barred outer tail-feather as a character for separating *D. leachii* from *D. cervinus*, so I must refuse to consider it a mark of distinction between *D. cervinus* and *D. occidentalis*. The nearly uniform coloration of the under surface is a much more peculiar feature; but in the female there are some zigzag markings on the flanks. That this uniform under surface is somewhat accidental is proved by the fact that none of Dr. Elsey's specimens in the British Museum, procured in the same locality as Mr. Gregory's birds, are entirely without cross bars below.

In the species from South-eastern New Guinea the appearance of cross bars on the under surface seems to be the exception and not the rule, the collar round the hind neck being also perfectly uniform. As with the Australian species, the cross bars are a sign of immaturity, being accompanied by a more uniform brown head.

It would appear therefore, from a consideration of the above series, that not one of the characters employed for the separation of these four Laughing Kingfishers is of permanent value. The barring of the tail-feathers must be set aside, being merely dependent upon age; but taking *D. cervinus* as the central form or leading type of the blue-tailed Jackasses of Australia, we find that eastwards (in Queensland) it varies to the extent of becoming a larger bird, whiter underneath, and always more or less barred on the under surface, the throat included (*D. leachii*). In the western part of its range the bird has a tendency to become uniform underneath (*D. occidentalis*); but this may be due to the bleaching effect of the climate, and it is evident that *D. intermedius* can only be looked upon as another pale race, being led up to by the western specimens of *D. cervinus*.

#### 49. *Halcyon sanctus* (V. & H.).

*Ramsay, t. c. p. 179.*

a, b. ♀. Thursday Island, Aug. 7, 1881.

c. ♂. Thursday Island, July 1, 1881.

#### 50. *Halcyon macleayi*, J. & S.

*Ramsay, t. c. p. 179.*

a. ♂. Thursday Island, Aug. 1881.

#### 51. *Halcyon sordidus* (Gould).

*Ramsay, t. c. p. 179.*

a. ♀. Port Darwin, Nov. 1881.

52. *Centropus phasianus* (Lath.).*Ramsay, t. c. p. 192.*

- a. ♀. Possession Island, Endeavour Strait, July 1881.
- b. ♀. Port Molle, Queensland, May 1881.

53. *Cacatua galerita* (Lath.).*Gould, Handb. B. Austr. ii. p. 2.**Plectolophus galerita, Ramsay, t. c. p. 192.*

- a. ♀. Hammond Island, Torres Straits, Aug. 1881.

54. *Trichoglossus novæ hollandiæ* (Gm.).*Ramsay, t. c. p. 194.*

- a. ♂. Prince of Wales Island, July 1881.
- b. ♂. Port Molle, May 1881.

55. *Trichoglossus chlorolepidotus* (Kuhl.).*Ramsay, t. c. p. 195.*

- a. ♀ ad. Port Curtis, Queensland, April 1881.

56. *Macropygia phasianella*, Temm.*Ramsay, t. c. p. 196.*

- a. ♀. Port Molle, Queensland, May 1881.

57. *Geopelia humeralis* (Temm.).*Erythrauchena humeralis, Ramsay, t. c. p. 196.*

- a. ♂. Port Curtis, Queensland, April 1881. Iris bright yellow.
- b, c. ♂. Horn Island, Torres Straits. Iris red.
- d. ♂. Thursday Island, June 10, 1881. Cere purplish red.
- e. ♀. Friday Island, July 16, 1881. Iris yellow.

58. *Geopelia tranquilla*, Gould.*Ramsay, t. c. p. 196.*

- a. ♀. Port Curtis, Queensland, April 1881. Iris dark.
- b. ♂. Port Darwin, Nov. 1881.

59. *Ptilopus swainsoni*, Gould.*Gould, Handb. B. Austr. ii. p. 106; Ramsay, t. c. p. 195.*

- a. ♂ ad. Port Molle, May 1881. Iris light yellow; bill green; legs and feet grey.

- b. ♀ imm. Port Molle, May 1881. Legs and feet greenish grey.
- c. ♀ juv. Port Molle, May 1881. Legs and feet red; bill black.
- d. Pull. Thursday Island, July 1881. Bill, legs, and feet black; iris brown.
- e. ♂ juv. Prince of Wales Island, Aug. 1881. Iris reddish orange; bill greenish black; legs and feet olive-brown.
- f. ♂ ad. Booby Island, Aug. 1881. Soft parts as in preceding.
- g. ♂ juv. Booby Island, Aug. 1881. Legs and feet greenish grey.

The very interesting series collected by Dr. Coppinger ranges from the tiny nestling to the fully adult bird. The age of a specimen is easily determined by its under tail-coverts, which are yellow in the immature birds and deepen into rich orange in the adult ones. It will be noticed that young birds were found, both in May and August, just beginning to put on the bright plumage of the breast; those killed in August are getting the rose-coloured crown. This either shows that the breeding-times are not identical in Torres Straits and at Port Molle, or that more than one brood is reared in the year.

#### 60. *Megapodius duperreyi*, Less.

*Oustalet, Bibl. Hautes Etudes*, xxii. p. 17 (1881).

*Megapodius assimilis*, *Masters*; *Ramsay, t. c.* p. 196.

- a. ♀. Prince of Wales Island, Torres Straits, Aug. 1881. Bill reddish brown, with yellow edges; legs bright orange; iris light reddish brown; scales of toes dark reddish brown.
- b. ♂. Booby Island, Aug. 1881. Iris dark brown.

M. Oustalet, who has recently written a monograph of the Megapodes, unites *M. tumulus* of Australia and *M. assimilis* of Masters with the well-known *M. duperreyi*; and on looking over the series in the British Museum, I confess that his opinion seems to be well founded.

#### 61. *Rallus philippensis*, L.

*Hypotænidia philippensis*, *Ramsay, t. c.* p. 199.

- a. ♂. Channel Rock, June 1881. Iris red.

#### 62. *Porphyrio melanonotus*, Temm.

*Ramsay, t. c.* p. 199.

- a. ♀. Booby Island, Aug. 1881. Iris bright orange-red.

#### 63. *Æsacus magnirostris* (Geoffr.).

*Ramsay, t. c.* p. 196.

- a. ♀. Port Molle, Queensland.

64. *Hæmatopus longirostris*, V.*Ramsay, t. c. p. 197.*

- a. ♀. Wednesday Island, July 1881. Iris deep orange; eyelid red.

65. *Ægialitis mongolicus* (Pall.).*Ramsay, t. c. p. 197.*

- a, b. ♀. Channel Rock, June 1881.  
c. ♀. Port Molle, May 1881.

66. *Charadrius fulvus* (Gm.).*Charadrius longipes, Ramsay, t. c. p. 197.*

- a. ♀. Suva, Fiji, Oct. 12, 1880.  
b. Tongatabu, Nov. 1880.

67. *Totanus incanus*, Gm.*Totanus brevipes, Ramsay, t. c. p. 197.*

- a. ♀. West Island, Torres Straits, Sept. 1881.

68. *Larus novæ hollandiæ*, Steph.*Ramsay, t. c. p. 201.*

- a. ♀ ad. Thursday Island, July 1881. Iris white; eyelid red.  
b. ♀ ad. Thursday Island, Aug. 1881. Iris light grey; eyelid orange; bill blood-red, with dark tips; legs and feet orange-red.  
c. ♂ juv. Thursday Island. Iris dark; bill dark horn-colour; legs and feet grey, with black claws.  
d. Pull. Channel Rock, June 1881. Iris brown; bill horn-colour; legs and feet light brown.

69. *Anous stolidus* (L.).*Sharpe, Rep. Trans. Venus, Birds, p. 9; Saunders, P. Z. S. 1876, p. 669; Ramsay, t. c. p. 202.*

- a. ♂. Torres Straits, Oct. 4, 1881.

70. *Sterna bergii*, Licht.*Saunders, P. Z. S. 1876, p. 657; Ramsay, t. c. p. 201.*

- a. ♀. Tongatabu, Nov. 1880.  
b. ♀. Suva, Fiji, Oct. 12, 1880.  
c. ♀. Port Molle, Queensland, May 1881.  
d, e. ♂ juv. Port Denison, Queensland, April 1881.



71. *Sterna dougalli*, Mont.

Saunders, P. Z. S. 1876, p. 652; Ramsay, t. c. p. 201.

a. ♂ juv. Channel Rock, Torres Straits, June 1881.

A very interesting specimen of the Roseate Tern in young plumage. It has been identified, like the other Terns, by Mr. Howard Saunders.

72. *Sterna caspia*, Pall.

Ramsay, t. c. p. 201.

a. ♀. Channel Rock, June 1881.

73. *Sterna anæsthesia* (Scop.).

Saunders, P. Z. S. 1876, p. 664; Ramsay, t. c. p. 201.

a. ♀ juv. Off Booby Island, Torres Straits, Aug. 16, 1881. Bill and feet black; iris lead-colour.

b. ♂ ad. Prince of Wales Channel, Torres Straits, Sept. 1881.

74. *Nycticorax caledonicus* (Lath.).

Ramsay, t. c. p. 199.

a. ♂. Thursday Island, June 1881. Iris orange-colour; space round eyes greenish yellow.

75. *Demiegretta sacra* (Gm.).

Ramsay, t. c. p. 199.

a. ♂. Thursday Island, June 1881. Iris yellow.

76. *Butorides javanica* (Horsf.).

Ramsay, t. c. p. 199.

a. ♀. Thursday Island, June 1881. Legs and feet yellow; iris yellow.

77. *Microcarbo melanoleucus* (V.).

Salvad. Orn. Papuasia etc. iii. p. 410.

Graculus melanoleucus, Ramsay, t. c. p. 203.

a. ♀ ad. Horn Island, Torres Straits, Sept. 1881. Iris dark; bill and throat olive-green; legs and feet dark olive-green.



## REPTILIA, BATRACHIA,

AND

## PISCES.

BY

ALBERT GÜNTHER.

THE REPTILES collected in Torres Straits belong to the following species:—

*Chelonia viridis*. *Varanus gouldii* (Thursday Isl.), *Varanus timorensis* (Thursday and Prince of Wales Isls.), *Varanus prasinus* (New Guinea), *Lialis burtonii* (Thursday Isl.), *Gymnodactylus platyrus* (Pt. Curtis).

Of *Diemenia torquata*, a Snake hitherto known from a single example only, a second specimen was obtained in Queensland.

Two species of TREE-FROGS were obtained—the common and widely spread *Hyla cerulea* on Thursday Isl., and the allied *Hyla dolichopsis* in New Guinea.

The collection of FISHES comprised fifty species, the majority of which were previously known to inhabit this district of the Indo-Pacific. Those to which the greatest interest is attached are two species of *Branchiostoma*; three Teleosteans seem to be undescribed.

**Trachynotus coppingeri.** (PLATE III. fig. A.)

$$D. 6 \mid \frac{1}{24}. \quad A. 2 \mid \frac{1}{23}.$$

The height of the body is a little less than one half of the total length (without caudal), the length of the head is contained thrice and three fourths in it. Scales very conspicuous, arranged above and below the lateral line in a regular series, which is composed of about 85 scales. The snout is rather longer than the eye, and less obtuse than in the typical species of the genus. The eye is situated far below the upper profile of the head, and two ninths of the length of the head. Checks covered with minute scales; the remainder of the head scaleless. Dorsal and anal lobes produced, pointed, but not extending to the posterior end of the fins; caudal lobes long, two fifths of the length of the body. Uniform silvery; fins greyish.

A single specimen, 6 inches long, was obtained at Percy Island on the coast of Queensland.

**Syngnathus trachypoma.**

D. 21. Osseous rings 18+33.

Allied to *S. grayi*. Base of the dorsal fin elevated. The length of the snout is two fifths of that of the head, its upper surface is armed with several spines; forehead high, abruptly descending towards the snout. Eyes large, with broad prominent supraciliaries which bear several denticulations on their edges; the space between the eyes is very broad and deeply concave. Occiput high, with large tubercles, the middle of which are arranged in a longitudinal crest. Operculum with radiating striæ, the upper and strongest of which is bent upwards. Humerus raised into a high prominence which, like all the surrounding scutes, is deeply pitted. Body not deeper than broad; edges of the scutes prominent and strongly serrated. Tail not much longer than the body including the head. Vent below the middle of the dorsal fin, which stands on four rings. Caudal fin small. The prominent portions of the head, the upperside of the body and tail, and perhaps also the side of the trunk are provided with lacerated tentacles. No well-defined markings can be distinguished, the coloration consisting of marbling of brown with mother-of-pearl patches. The tentacles are of the same colour as the body.

One specimen was obtained at Thursday Island, two others at Prince of Wales Island. The dimensions of the largest are:—

Total length.....	50 lines.
Length of tail .....	29 „
Length of head .....	7 „
Length of snout .....	2½ „

**Doryichthys serialis.** (PLATE III. fig. B.)

D. 21. Osseous rings 14+20.

This is a short species with a compressed body and short tail. The ridges are distinct, but slightly spinous on the tail only. Lateral line uninterrupted, passing into the lower ridge of the tail. Snout more than half as long as the head, straight; eye of moderate size; interorbital space narrow. Head half as long as the trunk; bones of the head pitted and irregularly sculptured. Operculum with a very distinct straight ridge along its middle. Vent midway between the end of the gill-cover and the root of the caudal, and behind the middle of the dorsal fin. Dorsal fin standing on six rings, four of which belong to the trunk. Caudal very short. Each side of the body is ornamented by two series of black dots, one series being above and the other below the lateral line; one pair of dots corresponds to each of the rings. Some other inconstant black dots are scattered about between the two series; a black band runs through the eye from the upper end of the operculum along each side of the snout.

Two specimens were collected at Port Molle. Their dimensions are :—

Total length.....	27 lines.
Length of tail .....	11½ „
Length of head .....	5 „
Length of snout .....	2¾ „

### BRANCHIOSTOMA.

The recent discovery of a second undoubtedly distinct species of Leptocardian on the coast of Australia (*Epigonichthys cultellus*) as well as the acquisition of several well-preserved examples, for which we are indebted to Dr. Coppinger, induced me to reexamine all the specimens in the British Museum, which, having been preserved in spirit for a great many years, were by themselves not reliable evidence as to the question whether the European Lancelet is a cosmopolitan form, or represented by several distinct species in other parts of the globe.

J. Müller (' Ueber d. Bau d. *Branchiostoma*,' p. 84) was unable to observe any differences between Brazilian and European specimens ; and I not only took the same view, but considered specimens from Indian and Australian localities to be referable to one species only.

I have now convinced myself that this view (Cat. Fish. viii. p. 513) is incorrect, and that Sundevall was quite right in drawing attention to the number of myocommas as an excellent taxonomic character. This number can be ascertained even in specimens in an indifferent state of preservation, and varies very little ; whilst the extent in depth and length of the delicate fin which surrounds the posterior part of the tail is a much less reliable character, subject to much alteration by the spirit, if great care is not taken in the preservation of the specimens.

The species of *Branchiostoma* would then be the following :—

#### 1. *Branchiostoma elongatum*.

Sundevall, *Æfvers. Vet.-Akad. Förhandl.* 1852, p. 147 ; and 1853, p. 12.

Myocommas  $49 + 18 + 12 = 79$ .

Coast of Peru.

Of this species I have not seen specimens.

#### 2. *Branchiostoma bassanum*.

Myocommas  $44 + 13 + 18 = 75$ , or

$43 + 15 + 17 = 75$ , or

$45 + 14 + 17 = 76$ .

Body lower than in *B. lanceolatum* ; dorsal and anal fins low, with the caudal portion slightly wider ; vent lateral ; (oral cirrhi 10+11).

These are the specimens from Bass-Straits which I formerly referred to *B. lanceolatum*.

3. *Branchiostoma belcheri*.

*Amphioxus belcheri*, Gray, *P. Z. S.* 1847, p. 35.

*Branchiostoma belcheri*, Gray, *Chondropt.* p. 150.

Myocommas  $37 + 14 + 13 = 64$  (Borneo).

$37 + 14 + 14 = 65$  (Prince of Wales Isl.).

This Lancelet is very similar to, but rather more elongate than, *B. lanceolatum*, and the fins, instead of being dilated behind, gradually decrease in width towards the extremity of the tail.

The specimens were collected partly by Sir E. Belcher during the cruise of H.M.S. 'Samarang' on the coast of Borneo, partly by Dr. Coppinger at Prince of Wales Island, Torres Straits.

4. *Branchiostoma caribæum*.

*Sundevall*, *l. c.* 1853, p. 12.

Myocommas  $37 + 14 + 9 = 60$  (*Sundevall*).

$37 + 14 + 9 = 60$ .

$37 + 13 + 9 = 59$ .

Distinguished from *B. belcheri* and *lanceolatum* by the shortness of its tail and by the attenuated form of the extremities of the body.

St. Thomas ; Rio de Janeiro ; mouth of the Plate river.

I am indebted for specimens of this species to the kindness of Prof. Ed. Van Beneden, who obtained them in great numbers in the Bay of Botafogo ; they are the same species on which Moreau made his researches on the structure of the notochord (*Bull. Ac. Roy. Belg.* 1875, p. 312). The name of *Amphioxus mülleri* (Kröyer, MS.) was adopted for them ; but, as this has never been described, it is doubtful whether the name was intended for this or some other species.

5. *Branchiostoma lanceolatum* (*Pall.*).

Myocommas  $35 + 12 + 12 = 59$  (Polperro).

$36 + 14 + 11 = 61$  (Scandin., *Sundevall*).

$34 + 13 + 13 = 60$  (Naples).

$35 + 12 + 13 = 60$  (Naples)\*.

Coasts of Europe ; Atlantic coasts of North America.

6. *Branchiostoma cultellum*.

*Epigonichthys cultellus*, Peters, *Berl. MB.* 1876, p. 327 (c. fig.).

Myocommas  $32 + 10 + 10 = 52$ , or

$31 + 11 + 10 = 52$ .

Anterior part of the dorsal fin high ; fin between branchial porus

\* I take this opportunity of correcting an error on p. 63 of 'Study of Fishes,' where in fig. 28 the letters *b* and *c* have inadvertently been reversed.

and extremity of tail very rudimentary or partly absent. Vent in, or nearly in, the median line.

Moreton Bay (*Peters*); Thursday Island (*Dr. Coppinger*).

In our specimens the fin occupying the median line between the branchial or abdominal pore and the caudal extremity is rather more distinct than would seem to have been the case in the specimens described and figured by Peters; and consequently the position of the vent is, at least in some of our specimens, rather lateral than median. Whether these differences are owing to the better state of preservation of our specimens, or related to the difference of locality, I am not prepared to decide; but assuming the latter to be the case, I should not consider them sufficient for specific distinction. Further, as our specimens show distinct traces of a postanal fin and a sub-lateral position of the vent, they clearly indicate that *Epigonichthys* cannot be maintained as a distinct genus.

## MOLLUSCA.

BY

EDGAR A. SMITH.

WITH the exception of Mr. John Brazier's report on the Mollusca of the 'Chevert' expedition \* there does not appear to have been published any work of importance treating exclusively on the forms of North and North-eastern Australia. Dr. Tapparone-Canefri has written a few papers on the fauna of Papua, and a large number of species have, at various times, been described in different works and periodicals by Reeve, A. Adams, Watson, and others, from Port Essington, Torres Straits, and the coast of Queensland.

Many of the species found in this district range as far as, or even further north than, the Philippine Islands, and westward to Swan River, and, even in a few cases, to Ceylon and the Mauritius; but the general character of the fauna may be regarded as Malayan, although many of the species appear to be limited in their distribution and not as yet met with in the Archipelago.

## I. CEPHALOPODA.

1. *Octopus polyzenia*. (PLATE IV. figs. A-A 3.)

*Gray, Cat. Cephal. Anteped. Brit. Mus.* p. 13.

Animal small (perhaps young), minutely and closely granulated upon the back of the body, head, arms, and connecting web; the lower surface of the body, head, funnel, and web above it being more sparsely granulated. Body (in spirit) wider than long, rounded at the end, exhibiting a faint central ventral groove from the opening at the neck to the extremity. Head broad but narrower than the body, with a single papilla near the upper hinder edge of the ocular opening. Arms not very long; three upper pairs subequal in length, ventral pair rather longer. Lower surface and membrane between them very minutely granulous. Membrane between the arms extending about one third their length and also in a narrow strip up the side of them, but between the dorsal pair it is almost entirely wanting. Cups on the upper arms gradually decreasing in size from near the mouth to the extremity, on the three other pairs of arms enlarging gradually as far as the sixth pair (these being nearly twice as large as any on the dorsal pair), and then gradually

\* Proc. Linn. Soc. New South Wales, vols. ii. and iii.



lessening in diameter towards the tips; about one hundred in number on the longest arms, rather prominent, especially the largest, alternating in two series, almost, if not quite, from the commencement. Length from end of the body to angle between the upper arms 20 millim., width of body 13, length from subsiphonal opening to the extremity only 10; largest arm, from mouth to tip, 40 millim.

*Hab.* Thursday Island, Torres Straits, 4-5 fathoms, sandy bottom ('Alert'); Port Essington (*B. Mus.*).

This species (in spirit) is of a pale dirty olive tint on the ventral surface and very much darker above. The inner surface of the arms is also light olive, the suckers having a brown hue. At first I was inclined to consider that this olive colour might be the result of staining by the juices of an *Aplysia* which was contained in the same bottle. On examining the type from Port Essington, which I had not an opportunity of doing when drawing up the above description, I find that the same colour prevails.

## 2. *Octopus tenebricus*. (PLATE IV. figs. B-B 3.)

Animal of a uniform dark purplish chocolate-colour. Body (in spirit) longer than wide, smooth, bearing upon the back and sides scattered cirri. Head as broad as the body, very prominent at the eyes, much constricted in front and behind in the cervical region; also ornamented with a few tufts, the largest one being placed above but slightly behind each eye. A small one in front of each eye and a similar one just behind them appear to be constant in position; these are simple elongate papillæ, whilst the larger ones are branched. The web between the arms is rather small, externally papillose, and extends in a narrow strip up the back of the arms, forming a sort of acute carina. Upper or dorsal pair of arms smallest and shortest, the two lateral pairs about equal and the ventral only a trifle shorter, all gradually tapering to very fine points. Lower surfaces narrower, bearing two rows of very prominent suckers, of which the first four form a single series, the rest (about 120 on the longest arms) alternating in position. The first cup is very small, the next a trifle larger, and so on until about the tenth is reached, when they attain their greatest diameter, namely  $1\frac{1}{3}$  millim.; this size is maintained a short distance up the arm, when the cups gradually diminish as the extremity is approached.

*Dimensions.* Body, from base of funnel to extremity, 13 millim., width 11; longest arm 72 millim., shortest 50 in length.

*Hab.* Port Denison, N.E. Australia, 3-4 fathoms, sand and rock bottom.

This species bears considerable resemblance to *O. aculeatus* of d'Orbigny, but may be distinguished by the difference of colour, the different relative length of the arms, the narrowness of their lower surface, the greater prominence of the suckers, the regularity of the uniserial four at the base, and the smaller number of the external cirri or papillæ.



3. *Octopus maculosus*. (PLATE IV. fig. C.)

*Hoyle, Trans. Roy. Physical Soc. Edinb.* 1884.

Body short, about as broad as long, dirty buff beneath, of a dark bluish slate-colour upon the back, minutely dotted on both sides, the dots being scarcely visible to the naked eye except upon the pale ventral surface, smooth below and above, merely wrinkled by contraction of the skin, without granulation or cirri. Head narrower than the body, a little prominent at the sides or eyes, of the same colour above as the body. Siphuncle buff. Arms alternately banded with dark slaty blue and buff, the former colour predominating, ornamented here and there with pale, more or less ovate rings upon some of the dark bands. Dorsal pair rather shorter than the rest, which are subequal, connected by a strong interbrachial membrane, which joins the two ventral arms a little lower down than these and the two adjoining. Cups alternating in two rows, very slightly prominent, close together, buff on a slaty-blue ground, and thus conspicuous, about one hundred in number on the longest arms and a few less on the dorsal pair, of the same size on all the arms, the largest of them situated towards the lower part, the rest gradually lessening towards the extremity.

Length of body 22 millim., diam. 26; length from end of body to membrane between lower pair of arms 43 millim.; diam. of head 20; length of longest arm from the mouth to the tip 78 millim.; largest cup  $1\frac{3}{4}$  wide.

*Hab.* Port Jackson.

The peculiarity of the colour of this species readily distinguishes it from all others previously described.

## II. GASTROPODA.

1. *Conus lizardensis*.

*Crosse, Journ. de Conch.* 1865, vol. xiii. p. 305, pl. ix. fig. 5; *Sowerby, Thes. Con.* iii. pl. 288. fig. 642.

*Hab.* Lizard Island, N.E. Australia (*Crosse*); Arafura Sea, N. Australia, 32–36 fath. (*Coppinger*).

The single specimen from the latter locality is about the same size as the type described by M. Crosse, but differs in having the spire less elevated, although consisting of an equal number of whorls. The twofold character of the spiral ridges, the strong raised lines of increment, and the fine sculpture upon the top of the volutions are all maintained.

2. *Conus aculeiformis*.

*Reeve, Conch. Icon.* pl. 44. figs. 240 *a, b*; *Sowerby, Thes. Conch.* iii. pl. 202. fig. 370.

*Hab.* Island of Mindanao, Philippines (*Cuming*); Arafura Sea, 32–36 fath. (*Coppinger*).

In form the specimen obtained by Dr. Coppinger agrees to a great extent with *C. aculeiformis*, Reeve, but almost entirely lacks the lateral inclination of the anterior narrowed extremity. The spiral sulci on the body-whorl are narrower, and exhibit a decidedly less amount of subpunctate sculpture caused by the impressed lines of growth. The raised interstices are markedly flatter and broader, and do not exhibit the brown dotting so characteristic of Reeve's species. These differences may probably be accounted for by the younger state of the single specimen from the Arafura Sea, which, being dredged in a dead condition, has in a great degree lost its coloration. The spire offers scarcely any differences, the proportionate height, the coronation of three or four whorls succeeding the smooth glossy nucleus, the smooth ridge immediately below the suture, the finer lira beneath it in the concavity of the whorls, and the elevated margin beneath this being precisely as in the larger shell described by Reeve, with the exception of the ridge beneath the suture, which is rather broader and more flattened.

### 3. *Terebra exigua*.

*Deshayes, Proc. Zool. Soc.* 1859, p. 301; *Reeve, Conch. Icon.* pl. 26. fig. 84.

*Hab.* Thursday Island, Torres Straits (*Coppinger*); East Australia (*Deshayes*); Andaman Islands (*Colonel Wilmer* in Brit. Mus.).

The type of this species is described as having a length of 19 millimetres, but the single shell in the Cumingian collection is scarcely 15 long. One from the Andaman Islands measures 21 millimetres, and the one now recorded from Torres Straits exceeds that in length by four.

### 4. *Pleurotoma (Drillia) torresiana*. (PLATE IV. figs. D-D 1.)

Shell fusiform, strong, robust, longitudinally costate and spirally lirate, having the ribs white or yellow, stained either with bright red or brownish black in the interstices, and ornamented with two bands of the same colour upon the last whorl. Volutions 12, having a duplex wavy ridge above, beneath which they are excavated and then convex at the sides; the concavity is rather deep and traversed by three or four spiral striæ. The costæ are obsolete in the concavity, a trifle oblique, thickest above, attenuating inferiorly, thirteen in number on the last two whorls, two of them on each being large swollen white varices. The ribs are crossed by spiral liræ, there being seven or eight on the penultimate, and about twenty-four on the last whorl, besides one or more finer ones in the interstices between them. The columella is smooth, covered with a thin callus, developed into a tubercle at the upper part. Labral sinus deepish in the concavity above. Length 34 millim., width 10; aperture 13 long.

*Hab.* Friday Island, Torres Straits, and Prince of Wales Channel, 7-9 fathoms.

This is a more robust species than *P. varicosa* of Reeve, is differently coloured, has more prominent spiral ridges, a larger number of costæ, fewer swollen varices, and a more undulating duplex ridge bordering the whorls above. These two, together with *Drillia tuberosa*, Smith, from Japan, form a small group of species peculiar on account of the varicose ribs which strengthen the shell at intervals.

5. *Pleurotoma (Drillia) laterculata*. (PLATE IV. figs. E-E 1.)

*Pleurotoma laterculata*, Sowerby, *Proc. Zool. Soc.* 1870, p. 253.

*Hab.* China Seas (Sowerby); var. Port Molle, Queensland, 12-20 fms., rocky bottom (*Coppinger*).

As the description given by Sowerby is altogether inadequate, I herewith append a more detailed one drawn up from the type specimen presented by Mrs. Lombe Taylor to the British Museum.

Shell fusiform, whitish, much spotted and variegated with reddish brown, principally between the longitudinal ribs, with a light violet aperture. Whorls probably 11; two apical broken away; the rest very concave above, angulated at the middle, a little convex beneath and contracted towards the suture, strengthened with rather oblique costæ (about 10 or 11 on the upper whorls), irregularly continuous up the spire, somewhat obsolete in the concavity of the whorls, which are also ornamented with two thread-like pale liræ round the middle forming a kind of double angle, continuous between and upon the costæ, where they become subacutely prominent; beneath these, in the penultimate and the antepenultimate volutions, there is a third near the suture. Last whorl encircled with about thirteen similar pale liræ, besides interlying finer ones, and several at the extremity which are very oblique. Canal straight, feebly recurved, together with the aperture equalling less than half the whole length of the shell. Columella perpendicular, covered with a thin callosity, developed into a tubercle close to the upper extremity of the outer lip. The latter is thin at the margin, has a strong swollen varix behind, arcuately prominent at the middle, with a well-marked sinus above in the concavity. Length 30 millim., width 10; aperture with canal 14 long.

*Variety.* Shell of similar form and with the same sculpture, but much less highly variegated. Of a dirty white colour, stained in the concavity of the whorls at the lower part next the suture and round the middle of the last between the ribs with pale olive-brown. Extremity of the body-whorl and the swollen varix suffused with a reddish tint. Aperture pale lilac or whitish. The entire surface of this species is seen, by the aid of a lens, to be striated with minute spiral striæ, crossed by lines of growth. The most striking feature is the two white fine lirations at the middle of the whorls; and although at times there may be one or two beneath them, none appear to be found in the concavity above. The two apical whorls are smooth, glossy, and convex.

6. *Pleurotoma* (*Glyphostoma*) *spurca*. (PLATE IV. figs. F-F1.)

*Clavatula spurca*, *Hinds*, *Voy. 'Sulphur,'* p. 17, pl. 5. fig. 14; *Reeve*, *Conch. Icon.* fig. 312.

*Pleurotoma rava*, *Reeve* (*non Hinds*), *Conch. Icon.* fig. 250.

*Hab.* Port Molle, Arafura Sea, N. Australia, 32-36 fms., and Port Darwin, N.W. Australia (*Coppinger*).

This interesting species is subject to considerable variation both in form and sculpture, but is nevertheless generally very easily recognized by the transverse plaits on the columella and the large deep and laterally directed sinus near the upper end of the much thickened labrum, which is armed within with five or six denticles or short liræ not reaching the crenulated edge. The basal canal is contracted and a little recurved. The type has ten costæ upon the last whorl, but this number is sometimes exceeded by two more. The principal liræ are normally two in number upon the upper volutions, one being at the middle, the other below, nodulous upon the costæ. Above these, occupying the upper part of the whorls, are a few uninterrupted thread-like liræ, about four upon the penultimate and antepenultimate whorls. The body-whorl has about fifteen principal spiral liræ, two of which pass above the extremity of the outer lip. Some varieties have three or even four subequal principal liræ on the lower half of the upper whorls, and twenty to twenty-four upon the last, but all agree in having the finer lines above, which also at times exceed the typical number. The largest specimen considerably exceeds the dimensions of *Hinds's* type. It is 18 millim. in length and 6 in width, measuring above the aperture, which is 8 long. Another smaller example is remarkable for the shortness of the mouth: it is 12 long, 4 broad, with an aperture  $4\frac{1}{2}$  in length.

7. *Pleurotoma* (—?) *gracilentia*, var.

*Pleurotoma gracilentia*, *Reeve*, *Conch. Icon.* fig. 114.

Var.=*Pl. contracta*, *Reeve*, *l. c.* fig. 116.

Var.=*Pl. fusoides*, *Reeve*, *l. c.* fig. 349.

*Hab.* Arafura Sea, N. Australia, 32-36 fms.; bottom—sand, mud, and shells (*Coppinger*); Philippine Islands (*Cuming*).

This species does not conveniently fall into any of the recognized groups of *Pleurotomidæ*. In form it resembles some species of *Daphnella*, but has not the minutely reticulated nuclear whorls of that section, and the labral notch is hardly at, but a trifle below, the suture. I fail to perceive any sufficient characters to separate specifically the three so-called species described by *Reeve*; indeed *Pl. contracta* and *Pl. fusoides* are all but identical. The type of *P. gracilentia* is a trifle more attenuated than the other two, but scarcely differs in any other respect. All are longitudinally costate and spirally lirate, the costæ numbering about twelve on a whorl, attenuated above at the suture, and becoming obsolete upon the body-volution towards the narrowed anterior end; the principal

transverse liræ are nodose on crossing the ribs, three in number upon the upper whorls, a fourth being present upon the lower part of the penultimate and sixteen to eighteen on the last. Another feature worth noticing is the presence of a finer thread-like line above the uppermost of the chief liræ, which runs in a slight concavity at the upper part of the whorls.

The aperture is narrow, as is the shell itself, not greatly contracted at the canal, and occupies rather less than half the length of the shell. The columella is subperpendicular, a little tortuous and smooth, without liræ or tubercles. The outer lip is thickened with an exterior rib, but thin and sharp at the extreme margin. It is widely and semicircularly notched above just below the suture in the faint concavity of the whorl, and generally in adult shells bears a small tubercle within close to or just below the sinus, with which exception it is smooth.

### 8. *Pleurotoma (Daphnella) axis*.

*Pleurotoma axis*, Reeve, *Conch. Icon.* fig. 311.

*Hab.* Port Molle, 14 fms. (*Coppinger*); Philippines (*Cuming*).

The apical whorls of this, as in all the other species of the group *Daphnella*, are microscopically cancellated by oblique criss-cross lines. The four or five succeeding volutions are coarsely cancellated by longitudinal costæ and spiral ridges, the points of intersection being subnodose. Beyond this the remaining whorls (about three in number) are destitute of the costæ, exhibiting only spiral ridging of different degrees of fineness and intermediate finer striæ crossed only by the lines of growth.

One of these ridges towards the upper part of the whorls is especially prominent, giving them a somewhat shouldered appearance, and between this and the upper *thickened* margin there is a decided concavity. The aperture is elongate, contracted anteriorly into a distinct and somewhat recurving canal, together occupying a little less than half the total length of the shell. The labrum is a trifle thickened, presenting exteriorly a slightly swollen appearance, has a rather deep slit above at the suture, is smooth within, and crenulated finely along the edge.

### 9. *Pleurotoma (Daphnella) arafurensis*. (PLATE IV. fig. G.)

Shell fusiform, whitish, faintly banded with light brown, spirally ridged and striated and marked with the flexuous lines of growth. Whorls 7; two apical globose, microscopically reticulated, but appearing smooth under an ordinary lens, rather large; the remaining five are convex, a little constricted beneath the suture, and spirally ridged and striated. The upper whorls have four or five principal liræ, the uppermost falling just beneath the slight constriction, and the others below at equal distances. The whorls are thickened at or immediately under the sutural line with an elevated



ridge, and between this and the first lira and in the interstices between the other liræ the surface is finely striated. The last whorl is elongate, has about thirty-one ridges in addition to the minute interstriation. The aperture is narrow, contracted anteriorly into a short, broadish canal, together equalling almost half the total length of the shell. The columella is perpendicular, curving a little to the left in front, and coated with a very thin callosity. The labrum is thickened exteriorly, arcuate in the middle, faintly sinuated towards the lower extremity, and rather deeply notched in the slight constriction of the whorl *near* but not *at* the suture.

Length 15 millim., diam. of last whorl above the mouth  $4\frac{1}{3}$ ; aperture 7 long, 2 wide.

*Hab.* Arafura Sea, N. Australia, 32–36 fms.

This species is peculiar on account of the absence of longitudinal costæ. The outer lip is smooth in the single specimen at hand, but in other and more mature shells it might be more or less dentate within.

#### 10. *Cythara cylindrica*, var. (PLATE IV. figs. H–H 1.)

*Mangelia cylindrica*, Reeve, *Conch. Icon.* sp. 9.

Var. = *M. lyricea*, Reeve, *l. c.* sp. 30.

*Hab.* Port Curtis, 7 fms. (*Coppinger*); Philippine Islands (*Cuming*).

This species differs from the typical *Cytharæ* in having no transverse liræ on the columella, in this respect agreeing with *C. hornbeckii*, Reeve, *C. turricula*, Reeve, and *C. vitiensis*, Smith.

The variety (*C. lyricea*) is a trifle larger than the normal form, and the riblets are rather stronger at the upper termination. With these feeble distinctions the differences end. In both forms a minute tubercle is sometimes, but not always, met with upon the upper part of the columella, and about fifteen fine liræ may be counted within the exteriorly thickened labrum, which is shallowly sinuated near the suture, and prominently areuated when viewed laterally. The longitudinal costæ number about fourteen on the penultimate whorl, and the principal transverse thread-like liræ about eight, but upon the last volution there are as many as twenty-six. The entire surface is beautifully cancellated with minute raised lines of growth and microscopic spiral liræ, a feature seen only in well-preserved shells and under a powerful lens. The sculptured whorls are six in number, the remaining two apical ones being smooth and glassy.

The single specimen, in beautiful condition, from Port Curtis, presents certain differences which it may be as well to mention. At the upper part the whorls exhibit a faint concavity a little beneath the suture, of which I perceive a trace in the type of the species, but not in the variety (*C. lyricea*), and the costæ are rather more numerous, there being about 17 upon the penultimate whorl,



but the spiral liræ are normal in this respect. The measurements are:—

Type: length  $10\frac{1}{3}$  millim., diameter 3.

Var. from Port Curtis: length  $12\frac{1}{2}$ , diam. 4.

### 11. *Murex tenuispira*.

*Lamarch*; *Küster*, *Con.-Cab.* p. 27, pl. 11. fig. 3, and pl. 20. fig. 3;  
*Reeve*, *Conch. Icon.* fig. 85; *Kiener*, pl. 7. fig. 1; *Sowerby*, *Gen. Rec.*  
& *Foss. Shells*, pl. 225. fig. 2; *Thes. Conch.* pl. 380. fig. 7.

*Hab.* Torres Straits, 7–10 fms. (*Coppinger*); Darnley Islands, Torres Straits, 20–30 fms. (*Brazier*); Amboina (*Quoy & Gaimard*); Moluccas (*Kiener*).

### 12. *Murex coppingeri*. (PLATE V. fig. A.)

Shell clavately fusiform, whitish, indistinctly banded with pale brown. Whorls 9– $9\frac{1}{2}$ , three apical smooth, slightly convex, glassy; the rest angulated near the middle, sloping above, somewhat contracted below at the suture, trivariçose, bicostate between the varices: the latter have a single upturned spine arising at the angle, which is marked by a prominent ridge. The ribs are rather obsolete above the angle, and a trifle oblique below it. The slope of the whorls is traversed by about four thread-like liræ, which are most strongly developed upon the upper part of the varices. The lower part of the whorls is ornamented with a few similar liræ. The three varices on the last whorl bear eight principal spines: of these the uppermost is longest and stoutest; three rest upon the labrum, and five upon the right side of the canal. In addition to these are four or five secondary or smaller intermediary spines on the outer lip, and a small erect one between each of those upon the canal. The body-whorl is transversely lirate throughout, the liræ being unequal, the larger running parallel with the larger spines, which are somewhat acutely ridged behind and of a brownish tint. The aperture is white, exhibiting traces of three pale brownish zones. The outer lip is thin at the edge and denticulated. The canal is straight, curving a little to the right near the tip. Length 58 millim.; aperture and canal 41 long.

*Hab.* Arafura Sea, Dundas Straits, 17 fms.

This may prove eventually a remarkable variety of *M. nigrispinosa* of Reeve, the only species it is likely to be confounded with. That species, although attaining a larger size, consists of only eight whorls, whilst in *M. coppingeri* I count nine and a half. The nucleus of the latter consists of two and a half, which are a little convex, together forming a blunt-topped cone. In the former species there are two nuclear volutions very convex, forming a globose apex. Both species have three varices to a whorl; but in the interstices in *M. nigrispinosa* three or even more nodose costæ are met with, whilst in the present species there are but two, and these

are not nodulous. The whorls in the latter are not so rounded, decidedly more angular above, much more finely spirally ridged, and bear upon the varices shorter, thicker, and more curved spines, which are not purple-black tipped, but white, except along the back, where there is a slight ridge of pale brown. *M. tribulus* has a different apex, more convex whorls, different coloration, and much coarser and nodose spiral ridging. The number and position of the spines is seen to be very similar in all three species when closely and carefully compared.

### 13. *Murex acanthostephes*. (PLATE V. fig. B.)

*Murex* (*Tribulus*) *acanthostephes*, *Watson, Journ. Linn. Soc., Zool.* vol. xvi. p. 596.

*Hab.* Arafura Sea, N.W. Australia, in 32–36 fms.; bottom—mud, sand, and shells.

The ‘Challenger’ specimen was dredged very near the same spot, in 28 fms.

Shell in form and general aspect rather like *M. tenuispina*, Lamarck, but with a shorter spire, fewer spines, and a non-canaliculate suture; whitish, stained irregularly with light olive-brown. Whorls convex, subangular and carinated above the middle, with two or three fine spiral raised lines above the angle upon the sloping and somewhat flattened upper portion, and two or three similar lines below the angle. Varices three on a whorl, bearing five spines upon the convex part and six on the very straight beak, with three or four minute secondary ones reflexed and appressed to the surface. The uppermost of all, arising from the carina at the upper part of the whorls, is the longest, slightly curved, very erect, and almost parallel with the axis of the shell. The next, No. 2, is minute, No. 3 a little shorter than No. 1 and arcuate, No. 4 much smaller, and No. 5 a little smaller than No. 3.

The spines on the canda are straighter than those above, horizontal, or at right angles to the axis, the third, counting from above, being a trifle the longest, the rest on each side becoming successively shorter. The body-whorl is transversely lirate throughout, the liræ varying in coarseness, the strongest corresponding to the longest spines, and being only slightly wavy, whilst some of the intermediary ones are almost subnodular. The three nuclear whorls are light brown, glossy, and larger than those of *M. tenuispina*. The fourth whorl has about eleven short, open, and a little upturned spines, forming a very pretty coronation at a subcentral angle, and has no spiral lines above or below it, but a second series of hollow spines below at the suture, smaller than those above. Length 37 millim.; diameter 12, exclusive of spines.

*M. tenuispina*, a near ally, has longer and more numerous spines, a longer and more pointed spire terminating in a smaller apex, a conspicuously channelled suture, and its sculpture is more pronounced, the spiral ridges being more granular and the lines of

growth more conspicuous. In *M. acanthostephes*, at the base of the spines on the canal there is a small dark spot on one side, which is best seen when the shell is wetted.

#### 14. *Murex macgillivrayi*. (PLATE V. fig. C.)

*Dohrn, Proc. Zool. Soc.* 1862, p. 203.

*Murex macgillivrayi* (Mörch!), *Sowerby, Thes. Conch.* vol. iv. p. 3, fig. 162 (wrongly coloured).

*Hab.* Lizard Island (*Macgillivray*). Port Curtis, Queensland, 0–11 fms.; Port Darwin, 8–12 fms.; and Prince of Wales Channel, Torres Straits, 7–9 fms. (*Coppinger*).

The figure in Sowerby's 'Thesaurus' gives no idea of the colour of this species. The specimens described by Dohrn are overcleaned, and much of the painting is removed. These were in consequence correctly characterized as "white, with yellowish liræ." The shells collected by Dr. Coppinger at Port Curtis are in fresh and perfect condition, and show the true colouring of the species. It is a yellowish shell, exhibiting three purplish-brown bands on the body-whorl, of which the uppermost is the broadest, being situated around the broadest part of the volution. The central one is the narrowest in the four specimens under examination, and placed midway between the other two, the lowermost falling at the base of the convexity, or, in other words, immediately below the third spine on the varices. The spiral liræ are fine, reddish, in some examples more deeply coloured than in others, and terminate at the margin of the labrum in red dots, which fall between the lobe-like prolongations. Other larger examples from Port Darwin have the three purplish-brown bands less pronounced and the general tint paler. All have the canal blotched with brown in front below the spine on the dextral margin. One of these blotches, situated between the second and third spines, is constantly the longest. Within the aperture the external banding is seen, and the cavity of the last varix, when not filled with callus, is almost black, forming a dark submarginal stripe. The canal is long and straight, tapering, and blotched with brown in two or three places.

The specimens from Torres Straits are paler than the Port-Curtis examples, have but little trace of the bands, and have the uppermost spine longer, curved, and upturned.

#### 15. *Murex axicornis*.

*Lamarck; Kiener's Coq. Viv.* pl. 42. fig. 2; *Reeve, Conch. Icon.* pl. 15. fig. 37, pl. 10. fig. 37, var.; *Küster's Con.-Cab.* pl. 21. fig. 3; *Sowerby, Thes. Conch.* pl. 382. fig. 31.

*Hab.* Moluccas; Philippines (*Reeve*); Prince of Wales Channel, 5–7 fms., and Thursday Island, Torres Straits, 4 fms. (*Coppinger*); Palm Island, N.E. Australia (*Brazier*).

This shell is remarkably prickly when in perfect condition, by reason of the scaly character of the transverse ridges. The single and rather young shell from Thursday Island has the spire of a delicate pink colour. A second example, from Prince of Wales Channel, belongs to the black-brown variety figured by Reeve (pl. x. fig. 37).

#### 16. *Murex cervicornis*.

*Lamarck: Kiener's Coq. Viv.* pl. 20. fig. 2; *Sowerby, Genera Rec. Foss. Shells*, fig. 4; *id. Thes. Conch.* pl. 382. fig. 30; *Reeve, Conch. Icon.* fig. 66; *Kobelt, Conch.-Cab.* pl. 31. figs. 5, 6.

*Hab.* Thursday Island, 4 fms.; Prince of Wales Channel; Torres Straits, 7-9 fms.; Port Darwin, 8-12 fms.; and Clairmont Island, 11 fms. (*Coppinger*); Darnley Island, Torres Straits, 20-30 fms. (*Brazier*).

One specimen obtained by Dr. Coppinger is peculiar on account of the unusual shortness of the canal, and the presence of one, instead of two, spines upon it. Another example is remarkable for its uniform rich brown tint, the ordinary colour of this interesting species being considerably paler.

#### 17. *Murex territus*.

*Reeve, Conch. Icon.* figs. 167 *a, b*; *Sowerby, Thes. Con.* pl. 9. fig. 77 (fronds on varices incorrect).

*Murex nubilus* (= *territus*, *jun.*), *Sowerby, Proc. Zool. Soc.* 1859, p. 428, pl. 49. fig. 4; *Thes. Conch.* fig. 71.

*Hab.* Wide Bay and Port Curtis (*Mus. Cuming*); Port Molle, 15 fms., and Port Curtis, 0-11 fms. (*Coppinger*).

Although the figures respectively representing the types of *M. territus* and *M. nubilus* would not lead one to consider them the same species, still on actual comparison such proves beyond a doubt to be the case.

The shell described by Reeve is a fine specimen (alas! like very many of Mr. Cuming's shells, terribly spoiled by acid in cleaning), with the frondose varices well developed. The three brown bands so conspicuous in the young shell (*M. nubilus*) are only visible on the varices in the adult. The canal is a little arcuate, nearly closed, and somewhat recurved, and bears three principal spines, as mentioned by Sowerby in his description of *M. nubilus*. Only two are seen in the figures of *M. territus*, a result due to a fracture of the third in the shell figured; but the presence of it is seen on the penultimate varix in the same illustration. Although, as a rule, there is but a single tubercle between the varices, yet in some specimens a second smaller one is developed. The two nuclear whorls are smooth, convex, and reddish.

18. *Murex monodon*.

*Sowerby; Reeve's Conch. Icon.* figs. 21 *a, b*; *Sowerby, Thes. Conch.* iv. pl. 385. figs. 55, 56; *Küster, Con.-Cab.* pl. 16. figs. 1, 2.

*Murex aranea, Kiener, Coq. Viv.* pl. 36. fig. 1.

*Hab.* Albany Island, North Australia, 3–8 fms. (*Coppinger*); Duplech's Island, Torres Straits (*Reeve*).

A single specimen from Albany Island belongs to the pale variety (fig. 21 *a*, *Con. Icon.*) with a reddish-pink peristome, and has a remarkable frond on the labrum, the second from the top, measuring 55 millimetres in length. The tooth on the labrum exhibits a remarkable development in this species.

19. *Fusus hanleyi*.

*Trophon hanleyi, Angas, Proc. Zool. Soc.* 1867, p. 110, pl. xiii. fig. 1.  
*Fusus hanleyi (E. Smith!), Sowerby, Thes. Conch.* p. 83, fig. 145.

*Hab.* Port Jackson (*Angas and Coppinger*); Port Curtis (*Coppinger*).

Mr. Sowerby erroneously attributes this species to me; the coarseness of his figure renders it of but little use, that in the 'Proceedings' being far preferable.

20. *Fusus heptagonalis*.

*Reeve, Conch. Icon.* fig. 26 *a, b*; *Sowerby, Thes. Conch.* fig. 132.

*Hab.* —? Port Molle, Queensland (*Coppinger*).

The colouring of Sowerby's figure is totally incorrect, and it is not nearly so accurate with regard to sculpture as that in the 'Conehologia Iconica.' This species is not always heptagonal, the number of ribs in three cases out of four being eight instead of seven. When in fine condition the spiral ridges of this species are finely imbricately scaled by the parallel wavy lines of growth. The only specimen obtained by Dr. Coppinger is in a bad state of preservation, and of a considerably more dwarfed or stunted growth than the type and two other specimens in the British Museum. It is, however, adult, exhibiting the thickened lip and eight liræ within of an adult shell. The canal, too, is short, and the last whorl has an inconspicuous pale zone around the middle, also observable in one of the other specimens above referred to.

21. *Fusus cereus*. (PLATE V. fig. D.)

Shell short, ovately fusiform, pale yellowish, ribbed, and transversely scabrously lirate. Whorls about 8, the remaining six thickened beneath the suture by a stout ridge, then obliquely sloping, angled at the middle and contracted at the base, strengthened with eight stout costæ, which are obliquely continuous up the spire, and crossed by four spiral squamose liræ, two of them around the lower half of the whorls being twice as thick as the other two above, and particularly prominent upon the ribs. The last volution, in



addition to these four, has about nine other equally stout liræ, exclusive of four or five finer ones upon the extremity; all are prettily scaled. The aperture is ovate, contracted anteriorly into a short canal, which is much inclined to the left. The columella is smooth, covered with a thin callus, and the outer lip is armed within with about six coarsish liræ. Length 18 millim., width  $8\frac{1}{2}$  millim.; aperture and canal 9 millim. long, 3 millim. wide.

*Hab.* Port Curtis, 7 fms.

## 22. *Urosalpinx contracta*.

*Buccinum contractum*, *Reeve, Conch. Icon.* fig. 53.

? *Buccinum funiculatum*, *Reeve, l.c.* fig. 61.

Var. = *Urosalpinx innotabilis*, *Smith, Proc. Zool. Soc.* 1879, pl. xx. fig. 32.

*Hab.* Prince of Wales Channel, 5–7 fms. (*Coppinger*); Philippine Islands (*Reeve*); Bombay (*W. T. Blanford*); Japan for *U. innotabilis*.

The operculum of this species resembles that of *Purpura*. The species is rather variable in form, the number of costæ, in colour, and the length of the basal or anterior canal.

The typical form is rather longer, and has a more prolonged canal than the variety from Japan, has more brown colouring, and an additional longitudinal rib. All have from seven to eight elongate denticles or liræ within the labrum, which is thickened within and without, and acute and crenulated along the margin.

## 23. *Tritonidea curtisiana*. (PLATE V. fig. E.)

Shell ovate-fusiform, yellow, banded with white round the middle of the last whorl, with the ribs subalternately white also. Volutions about 8, obliquely coarsely costate, and spirally closely ridged, a trifle convex. Costæ nine on a whorl, attenuated and produced almost to the base of the last. Spiral liræ prominent on the ribs, four in number on the upper whorls, and about sixteen on the last. Aperture small, ovate, narrowed anteriorly, bluish white. Lip thickened, furnished with about nine fine liræ reaching to the margin, which is dotted with dark brown between them. Columella covered with a thin callosity, upon which rest eight or nine transverse tubercles, with brown dots between them. Length 14 millim., diam.  $6\frac{1}{2}$  millim.; aperture with canal 7 millim. long.

*Hab.* Port Curtis, 1–11 fms. (*Coppinger*).

This species is represented in the present collection by a single specimen; and it is remarkable on account of the peculiarity of its colour, its small size, and comparative solidity.

## 24. *Columbella fulgurans*, *Lamarck*.

*Hab.* West Island, Prince of Wales Channel, Torres Straits (*Coppinger*).



This species has also been recorded from several localities in North-east Australia by Mr. Brazier in his account of the Mollusca of the 'Chevert' expedition.

### 25. *Columbella scripta*, Lamarck.

*Hab.* Port Molle, Queensland, and Prince of Wales Channel, 5-7 fms.

*C. versicolor*, Sowerby, *C. variegata*, Menke, *C. bidentata*, Menke, and *C. tigrina*, Duclos, appear to be synonymous with this species.

### 26. *Columbella pardalina*.

*Lamarck*; *Duclos*, *Monog.* pl. 2. figs. 13, 14; *Kiener*, pl. 4. fig. 3; *Reeve*, *Conch. Icon.* figs. 75a-c.

*Hab.* Port Molle, on the reef (*Coppinger*); Philippine Islands (*Cuming*).

A single specimen from Port Molle is somewhat narrower than specimens from the Philippines collected by Mr. Cuming.

### 27. *Nassa coronata*, Bruguière.

*Hab.* Port Molle, Queensland, on the beach.

A single specimen from this locality is of a uniform light brown tint, with a blotch of a darker colour on the back of the body-whorl.

### 28. *Nassa thersites*, Bruguière.

*Hab.* Port Denison, on the beach.

### 29. *Nassa algida*, var.

*Reeve*, *Conch. Icon.* pl. 22. figs. 145a, b.

*Hab.* West Island, Prince of Wales Channel, Torres Straits (*Coppinger*).

This pretty variety is not so broad a shell as the type, almost white, upon which colour the rows of squarish, light brownish spots appear more conspicuous than usual. There are nine whorls, of which the two apical are smooth and convex, the four succeeding ones strongly ribbed and transversely grooved a little beneath the suture, the furrow dividing the ribs into two unequal parts. The three last volutions are smooth, and a little more convex than the sculptured ones above. The length is 20 millim., and the diameter 9 millim.

### 30. *Nassa unicolor*.

*Buccinum læve sinuatum*, *Chemnitz*, *Con.-Cab.* iv. pp. 54, 59, pl. 125. figs. 1194, 1195.

*Buccinum unicolorum*, *Kiener*, *Cog. Fiv.* p. 60.

*Buccinum unicolor*, *id. l. c.* pl. 19. fig. 69.

*Nassa* (Alectrion) *unicolor*, *A. Adams*, *P. Z. S.* 1851, p. 106.

*Nassa unicolorata*, *Reeve*, *Conch. Icon.* fig. 17.

*Nassa rutilans*, *Reeve*, *l. c.* p. 147.

*Nassa lævis*, *H. & A. Adams*, *Genera Mol.* vol. i. pp. 116 & 119, pl. 12. fig. 7.

*Nassa* (*Zeuxis*) *unicolora*, *Kiener*, *Adams*, *l. c.* p. 119.

*Hab.* Cape York, N. Australia (*Jukes*); Torres Straits (*Brazier*); Port Curtis and Port Molle, Queensland, 12–20 fms. (*Coppinger*); Sir C. Hardy's Island (*Jukes*).

New Zealand, the locality given by *Reeve* for *N. rutilans*, is probably incorrect.

The operculum of this species is unguiculate, curved, with a terminal nucleus and simple unserrated edges.

### 31. *Nassaria suturalis*, var.

*Hindsia suturalis*, *A. Adams*, *Proc. Zool. Soc.* 1853, p. 183; *Sowerby*, *Thes. Conch.* iii. pl. 220. figs. 15, 16; *Kobelt*, in *Küster's Con.-Cab.*, *Purpuracea*, pl. 77. figs. 11, 12.

*Hindsia bitubercularis*, *A. Adams*, *P. Z. S.* 1853, p. 183; *Sowerby*, *l. c.* fig. 5; *Kobelt*, *l. c.* figs. 9, 10.

*Nassaria recurva*, *Sowerby*, *l. c.* figs. 17, 18.

*Nassaria sinensis*, *Sowerby*, *Thesaurus*, figs. 8, 9; *Kobelt*, fig. 8.

*Hab.* Port Darwin, North-west Australia, 8–12 fms. (*Coppinger*); China Sea, Philippine Islands, and Ceylon (*Adams* and *Sowerby*).

A single specimen from Port Darwin agrees precisely with the variety *sinensis*. After a careful examination of the so-called species which I have united above, I cannot detect any constant differences. The above variety I believe to be founded on non-adult shells for two reasons:—first, I find only six whorls, exclusive of the smooth apical ones, being one less than in the typical *suturalis*; and, secondly, the aperture is larger, a result due to the less degree of thickening of the labrum and columella. It is true that the suture is less excavated, but this concavity is variable in specimens undoubtedly normal. The number of costæ is also inconstant, varying from nine to twelve on a whorl; in the former case, as might be expected, being thicker than in the latter. The tuberculation and liration on the columella depend for the amount of their development upon age, adult shells having a larger quantity and a greater expansion of the free columellar callosity than young specimens, but the liræ within the outer lip, when countable, are generally about nine in number.

### 32. *Phos scalaroides*.

*A. Adams*; *Sowerby's Thes. Conch.* vol. iii. pl. 221. fig. 13.

*Hab.* Prince of Wales Channel, Torres Straits, 9 fms. (*Coppinger*).

This form I cannot separate satisfactorily from *P. plicatus* and *P. textilis*, both of *A. Adams*; and I am of opinion that were the

series before me larger, there would be little difficulty in showing the specific identity.

The single specimen from Torres Straits is smaller than the type in the Cumingian collection, and consists of nine whorls, three of which form the smooth pinkish nucleus. The brown zone around the middle of the body-whorl is uninterrupted, and passes up the spire just above the suture, beneath which the whorls are also stained with the same colour. The columella is smooth, with the exception of one or two elongate tubercles at the upper part; and the labrum is armed within with about fifteen fine liræ, running far within the aperture.

### 33. *Phos senticosus*, var.

*Murex senticosus*, *Linn.*

Var.=*Phos muriculatus*, *Gould.*

Var.=*Phos angulatus*, *Sowerby.*

*Hab.* West Island, Prince of Wales Channel, Torres Straits (*Coppinger*); Port Essington, 7 fms. (*Jukes* in Brit. Mus.).

The variety *muriculatus* cannot, I think, be distinguished from the well-known *P. senticosus*, of which it has the aspect of being a dwarfed form. The style of coloration is similar, and the difference in sculpture is very slight indeed, not sufficient to warrant, in my opinion, a specific separation. In the British Museum I find a series graduating from the short stumpy form of *P. muriculatus* to the more graceful elongate outline of *P. senticosus*, the latter consisting of eight whorls, exclusive of the smooth apex, and the former of six, other specimens intermediate with regard to length having seven. *P. angulatus* appears to offer very slight differences beyond the absence in a greater or less degree of colour.

### 34. *Purpura bitubercularis*, var.

*Lamarck*; *Kiener, Coq. Viv.* pl. xi. fig. 32; *Reeve, Conch. Ic.* fig. 37;

*Küster, Conch.-Cab.* pl. 31 a. figs. 3-8.

= *Purpura kienerii*, *Deshayes, Anim. sans Vert.* vol. x. p. 101.

Var.=*Purpura undata*, *Reeve* (? *Lamarck*), *Conch. Icon.* fig. 43.

*Hab.* Philippine Islands (*Cuming*); Port Essington (*Jukes*); Arakan coast (*Blanford*); Pelew Islands (*Dr. King*); Port Moller, Queensland (*Coppinger*).

This species varies considerably in the length and development of the tubercles. The two small specimens from Queensland have them short and obtuse, as represented in fig. 3 of Küster. Some other forms, which have been described under various names, may eventually be considered conspecific with this: such are *P. luteostoma*, Chemnitz, *P. alveolata*, Reeve, *P. clavigera*, Küster, and perhaps *P. bronai*, Dunker. I cannot, however, agree with Tryon that *P. hippocastanum* should also be classed with this species. I should here observe that the specimen figured by Reeve as *P. undata* of Lamarck is unquestionably a variety of this species (*bitubercularis*),

and appears to correspond with Kiener's idea of the Lamarekian shell (Coq. Viv. fol. 34, f. 81) and also with the specimen figured by Küster (Con.-Cab. pl. 23. f. 5). But whether all or none of these figures delineate the true *P. undata* appears to me questionable. However, I do not believe that the West-Indian shell which has been assigned to it by d'Orbigny (Ramon de la Sagra's Hist. Cuba, vol. ii. p. 145) and those figured by Tryon (Man. Conch. f. 82, 100, 103, and 109) can beyond a doubt be considered Lamarek's species. The dimensions he gives, namely 22 lines in length, exceed those of the West-Indian examples; nor does the description of the colour, "albo et fusco-nigricante longitudinaliter undatimque picta," apply well to those shells, but admirably suits the specimens figured by Küster, Reeve, and Kiener. The locality, "Monte Christi, West Columbia," given by Reeve for his shell is no doubt erroneous, and applies to two others on the same tablet, considered by Cuming the same species, but which on careful examination prove to be without doubt examples of *P. biserialis*, Blainville (= *P. bicostalis*, Reeve, ? of Lamarek). This species has a character not found in *P. bitubercularis* and its varieties, namely the oblique plications on the lower part of the columella; and *P. fasciata* of Reeve, which is also conspecific with *P. undata*, d'Orb. (non Lamk.), and *P. forbesii*, Dunker, also has on the columella a distinguishing character which has not been noticed, viz. a small brown stain, most observable in fresh specimens, at the inferior end, and an oblique mark of the same colour in a line with the raised ridge at the base of the body-whorl.

### 35. *Purpura* (*Cronia*) *amygdala*.

*Purpura amygdala*, Kiener, *Coq. Viv.* p. 39, pl. 10. fig. 26; *Chenu, Man. de Conch.* fig. 807.

*Buccinum amygdala*, Reeve, *Conch. Icon.* fig. 60.

*Hab.* Port Denison, 4 fms. (*Coppinger*); Home Islands, off Cape Grenville, N.E. Australia, also Moreton Bay, Port Jackson, and Port Darwin (*Brazier*).

The operculum of this species is normally Purpureoid, although the basal channel of the aperture is unusually narrower than in the genus.

### 36. *Sistrum undatum*, var.

*Ricinuia fuscillum*, Reeve (non Chemnitz), *Conch. Icon.* pl. 4. fig. 28.

*Hab.* Port Darwin (*Coppinger*); Port Essington (*Jukes* in Brit. Mus.).

This variety is also quoted from the north coast of Australia by G. and H. Nevill (*Journ. Asiatic Soc. Bengal*, 1875, vol. xlv. pt. 2, p. 83). It differs from the typical form of this well-known species in its greater breadth, in having fewer and larger nodose plications, and in the fineness and closeness of the transverse squamose ridges.

37. *Sistrum tuberculatum*.

*Purpura tuberculatum*, *Blainville, Nouv. Arch. du Mus.* vol. i. 1832, p. 204, pl. 9. fig. 3.

*Ricinula tuberculata*, *Reeve, Conch. Icon.* fig. 11.

*Purpura tuberculata*, *Kiener, Cog. Vir.* pl. 5. fig. 10.

*Purpura granulata*, *Duclos, Ann. Sci. Nat.* 1832, vol. xxvi. pl. 2. fig. 9.

? *Purpura marginalba*, *Blainville, l. c.* p. 212, pl. 10. fig. 6.

*Hab.* Lord Hood and Elizabeth Islands (*Cuming*); Madagascar and Red Sea (*Blainville*); New Holland and the Friendly Islands (*Kiener*); Port Essington, Port Jackson, Brisbane, Japan, Stewart Island, and Lord Hood's Island (*Brit. Mus.*); Port Molle and Port Curtis, Queensland (*Coppinger*); Seychelles and Amirantes Islands (*Dufo*); Reunion (*Deshayes*); Mauritius (*Martens*).

38. *Latirus angustus*. (PLATE V. fig. F.)

Shell narrow, fusiform, of a rich brown colour. Whorls  $11\frac{1}{2}$ ; the two apical ones smooth, forming a bluntish apex, the rest strongly ribbed and spirally ridged. Ribs a little oblique, very broad, rounded, with scarcely any interstices, not reaching the upper boundary of the whorls. Transverse liræ or ridges strong: three principal ones on the upper whorls; the uppermost, or that almost bounding the suture, a little wavy, scarcely affected by the longitudinal costæ; the two others situated round the middle of the whorls, prominent, and rather acute on the ribs; between these are fine thread-like liræ, generally one in each interstice. Last whorl similarly lirated throughout with large and small ridges. The entire surface of the shell exhibits between the transverse liræ coarse lines of growth. Aperture small, subpyriformly ovate, brownish white within, with about four slender white liræ not reaching to the margin of the labrum, which is crenulated and dotted with brown at the ends of the exterior ridge. Columella covered with a prominent brownish callosity bearing two fine transverse plaits, one at the middle and the other below it. Canal almost straight and nearly closed. Length 38 millim., diameter 9.

*Hab.* Fitzroy Island, Queensland (*Coppinger*); Andaman Islands (*teste G. B. Sowerby, jun.*).

This species may be recognized by its slender form, in which respect it somewhat resembles *L. lancea*. Viewed with the unassisted eye, the whorls appear to be encircled by three transverse prominent liræ, of which the uppermost is nearly simple, whilst the two inferior ones are undulate upon and between the ribs. The specimen said to have come from the Andaman Islands, apparently adult, is smaller than that from Queensland, being 26 millim. long and  $6\frac{1}{2}$  broad, but in other respects similar.



39. *Turbinella (Tudicula) armigera*. (PLATE V. fig. G.)

*Tudicula armigera*, A. Adams, *Proc. Zool. Soc.* 1855, p. 221; Kobelt, *Conch.-Cab., Purpuracea*, iii. p. 20; Tryon, *Man. Conch.* vol. iii. p. 144, pl. 58, fig. 411.

*Hab.* Moreton Bay (*Strange*); Port Curtis, 0-11 fms., and Port Molle, 14 fms. (*Coppinger*).

As the Latin diagnosis given by Adams is defective in several important points, I here give a more ample description of this remarkable species. Shell clavately fusiform, whitish, longitudinally streaked with reddish brown, clothed with a rather thin, somewhat fibrous, yellowish epidermis. Spire short, concavely conical, obtuse and mamillated at the apex. Whorls 6; the two nuclear ones smooth, convex; the three following nearly flat or a little concave and sloping, angled at the lower part near the suture, bearing at the angle a series of upturned, slightly recurved hollow spines, ornamented with fine wavy spiral lirations both above and below the angle. Last whorl like the three preceding at the upper part, but having the spines, about nine in number, much longer, increasing in length with the growth of the shell; body of whorl a trifle convex, indistinctly variced or costate beneath each spine, bearing three to five liræ armed with numerous short hollow spines, the interstices being ornamented with two or three thread-like lirations; lower part of the whorl prolonged into a straight canal occupying about half the length of the entire shell, bearing two oblique rows of spines, those of the upper series being considerably longest: a third row is also indicated at the lower part, and the entire rostrum is obliquely lirated throughout. Aperture ovate, white or pinkish white. Outer lip thickened, erenulated at the margin, with about eight liræ within. Columella covered with a large erect spreading callosity extending from the upper extremity of the labrum to the lower end of the aperture, armed with three plaits, of which the lowermost is the thickest. Operculum ovate, acute at the nucleus, which is terminal, brown. Length 65 millim., greatest diam. 30.

This beautiful shell was originally placed in *Tudicula*, one of those non-admissible divisions of Bolton, and subsequently a new genus, *Tudicula*, was proposed by H. and A. Adams (*P. Z. S.* 1863, p. 429) for the reception of this and a second species, *T. spinosa*, also from Port Curtis. A third form, *T. inermis*, has more recently been described by Mr. G. F. Angas, presumed to have come from Singapore. All of these species have the plaits on the columella, the mamillated apex, and the largely developed and prominent callosity on the inner lip as in the typical forms of *Turbinella*, e. g. *T. pyrum* and *T. rapa*, and differ mainly in the greater length of the canal. The operculum, too, is essentially the same; and therefore the utility of this generic division becomes very questionable.



40. *Turbinella (Tudicula) spinosa*. (PLATE V. fig. H.)

*Tudicula (Tudicula) spinosa*, H. & A. Adams, *Proc. Zool. Soc.* 1863, p. 429.

*Hab.* Port Curtis (*Coll. Cuming*); Prince of Wales Channel, Torres Straits, 9 fms. (*Coppinger*).

This species is not entirely white as originally described, but has an interrupted zone of pale brown around the last whorl immediately beneath the crown of short hollow spines at the angle towards the upper part of the whorl. The spines correspond in number and position with the longitudinal rounded pliae (usually averaging about eleven or twelve on the last whorl), are directed obliquely upwards and a little backward, and increase in length with the growth of the shell, but do not attain any thing like the dimensions of some in the preceding species. Messrs. Adams give the number of folds on the columella as three; whilst in three out of four specimens before me I find four, of which the two lowermost are very close together and might be regarded as constituting one duplex plait. In the type specimen this feature is less conspicuous, still a slight groove subdivides it. The second or central fold is the most prominent in every example. The liræ within the aperture are fine, ten or eleven in number, and extend into the interior as far as the eye can reach. The columellar callosity is free, prominent, and joins the upper extremity of the labrum. The canal is remarkably straight, nearly closed, and occupies considerably more than half the total length of the shell. The type is 38 millim. long and 16 broad at the periphery; but another specimen is 21 wide, and probably, if perfect, would have a length of 50.

Mr. Tryon's supposition that this species (*Man. Con.* vol. iii. p. 144) is "probably identical with *T. armigera*" and that *T. inermis* (wrongly attributed to Sowerby instead of Angas) "is simply a depauperated specimen of the same species," is altogether wrong, all three being undoubtedly distinct.

41. *Mitra proscissa*, var. (PLATE V. fig. I.)

*Reeve, Conch. Icon.* fig. 177; *Sowerby, Thes. Conch.* pl. 355. fig. 264, and pl. 356. fig. 282.

Shell ovately fusiform, acuminate at the apex, olive-brown, irregularly spotted and streaked in a longitudinal direction with white, and encircled round the middle of the last whorl with a zone of the same colour. Volutions about 10; the upper ones flat at the sides, separated by a deep subcanaliculate suture, strengthened with three strong spiral costae, of which the uppermost is a trifle the thickest and situated immediately beneath the suture; the two others are equidistant, the lowermost leaving a furrow between it and the suture beneath. The interstices are rather strongly sculptured by elevated lines of growth. Upon a portion of the penultimate and upon the body-whorl the two lower of these three ridges become double, each being divided by a shallow groove, and the uppermost is bipartite. In addition to these the last whorl, which is convex at the sides, is encircled by a fourth duplex costa, and

again below this by about seventeen others, having the furrows between them sculptured like those of the spire. The aperture is narrow, brownish within, about half as long as the shell. The columella is four-plaited, and the outer lip crenulated at the edges. Length 37 millim., diam. 13.

*Hab.* Port Curtis, Queensland (*Coppinger*); island of Ticao, Philippines (*Cuming*).

The above description has been drawn up from two specimens differing in certain particulars from the type, one from each of the above localities. In the British Museum there are two examples of the typical form from Kurrachee and Bombay, presented by W. T. Blanford, Esq., by whom they were collected. The variety differs in having the spire ungraduated, a feature giving the outline a very different form, and in having some of the upper liræ upon the last and preceding whorls double; both forms have that immediately beneath the suture more or less tripartite on the last volution, but in the variety this peculiarity extends to the penultimate whorl.

#### 42. *Mitra peasei*.

*Dohrn*, *Proc. Soc. Zool.* 1860, p. 366; *Sowerby*, *Thes. Conch.* iv. pl. 357. fig. 76.

*Hab.* Port Molle (*Coppinger*); Australia (*Dohrn*).

The figure in Mr. Sowerby's work of this species represents the spire too suddenly tapering, the aperture too wide, and the plaits on the columella should be less equal in size and five in number instead of four. The specimen from Port Molle is not absolutely identical with the type described by Dohrn; it is rather shorter, yellowish, with a white zone at the upper part of the whorls, and another round the middle of the body-whorl. But the principal difference lies in the greater coarseness of the spiral ridges: of these the upper volutions have three, the penultimate four, and the last about twenty-four; the uppermost beneath the suture is a duplex one, and those upon the body-whorl become gradually finer towards the anterior end. The five plaits on the columella gradually diminish in size until the lowermost is almost obsolete, indeed in one specimen in the Cumingian collection it is entirely wanting. The grooves between the ridges are crenulated by elevated lines of growth, which in the specimen from Port Molle are particularly strongly developed.

#### 43. *Mitra (Turricula) corrugata*.

*Mitra corrugata*, *Lamarck*; *Reeve*, *Conch. Icon.* figs. 57 *a*, *b*; *Kiener*, *Coq. Viv.* pl. 22. fig. 67; *Sowerby*, *Thes. Conch.* vol. iv. pl. 354. figs. 41, 42.

*Hab.* Port Molle, on the beach.

A specimen from the above locality, of immature growth, is peculiar in wanting the fourth small lowermost fold on the columella usually met with in this species, in other respects according very closely with the form depicted by Reeve's figure 57 *b*.

44. *Voluta volva*, var. (PLATE V. fig. K.)(Chemnitz?), *Reeve, Conch. Icon.* fig. 24.*Voluta pallida*, *Gray, Kiener, Coq. Fiv.* pl. 48.*Hab.* Thursday Island, Torres Straits, 3-4 fathoms.

Typical specimens of *V. volva* should be uniformly of a fleshy buff tint, exhibiting the slightest indication of two bands of a somewhat darker colour across the body-whorl; the normal volutions should be spotted with dark brown immediately beneath the suture, and stained with yellowish brown above it, and the aperture at a short distance from the margin of the lip should be of a lighter brown. Two specimens from Swan River, presented to the British Museum by Capt. Mangles, R.N., possess the above characteristics, but in addition have numerous, more or less wavy and zigzag pale brownish lines, most conspicuous upon the two indistinct transverse zones, extending downwards from the suture, but not reticulating in a longitudinal direction. The only specimen obtained by Dr. Coppinger, although having the labrum much broken away, still possesses considerable interest in that it resembles the specimens just mentioned, but with all the tints much darkened, in which respect it approximates more closely to *V. reticulata*, *Reeve*; indeed the group of *Volutes* from North, North-west, and West Australia includes a number of species which appear to have several characters in common, and present considerable difficulty of distinction: such are, in addition to those previously mentioned, *V. turneri*, *Gray*, *V. prae-texta*, *Reeve*, and *V. ellioti*, *Sowerby*.

45. *Ranella rana*.*Murex rana*, *Linn., Hanley, Ipsa Linn. Conch.* p. 284.*Ranella albivaricosa*, *Reeve, Conch. Icon.* fig. 2; *Kobelt, Con.-Cab.* p. 133 pl. 38. figs. 4, 5, 8, 9.*Bursa süensonii*, *Mörch, Cat. Földi*, p. 106.Var. = *Ranella subgranosa*, *Beck, Reeve, Conch. Icon.* fig. 1; *Sowerby, Conch. Ill.* fig. 18; *Kobelt, Con.-Cab.* p. 135, pl. 39. fig. 2.= *Ranella beckii*, *Kiener, Coq. Fiv.* p. 5, pl. 4. fig. 1.*Hab.* Port Moller, Queensland, 14 fms., rock.

Other localities attributed to this species are China and Ceylon (*albivaricosa*); Philippine Islands and China (*subgranosa*); Nicobar Islands (*süensonii*).

46. *Ranella pulchella*.*Forbes, Voyage of the 'Rattlesnake,'* vol. ii. (1852), p. 382, pl. 3. figs. 6 a, b.*Ranella jucunda*, *A. Adams, Proc. Zool. Soc.* 1853, p. 70.

*Hab.* North Australia (*Adams*); dredged in 8 to 11 fms. water, on a bottom of sand and shells, between Cumberland Island and Point Slade (lat. 21° S., long. 149° 20' E.) (*Forbes*); Port Curtis,

11 fms., and Port Molle, 14 fms. (*Coppinger*); Palm Island, Cape York, Cape Grenville, Darnley Island, &c. (*Brazier*).

The two embryonic whorls of this pretty species are smooth, glossy, and very convex. The colour of the fresh specimen from Port Curtis is light yellowish brown, with a dark brown band at the upper part of the whorls immediately beneath the suture. The operculum is ovate, rather acuminate below, concentrically striated, with the nucleus near, but not at, the lower extremity.

#### 47. *Natica (Lunatia) plumbea*.

*Natica plumbea*, *Lamarek, Philippi in Küster's Con.-Cab.* p. 51, pl. 8. figs. 3, 4; *Reeve, Conch. Icon.* figs. 34 *a, b*.

*Natica strangei*, *Reeve, l. c.* figs. 81 *a, b*.

Exemplum distortum = *Natica leucophæa*, *Reeve, l. c.* figs. 51 *a, b*.

*Hab.* Port Denison, Queensland, on the shore (*Coppinger*); Cape Upstart, and from north of Cape Hillsboro', N.E. Australia, crawling on sand- or mud-banks at low-water mark (*J. B. Jukes* in Brit. Mus.); Port Essington (*Capt. Wickham, R.N.*); Brisbane Water (*Strange*); New South Wales (*Angas*), &c.

#### 48. *Natica limpida*. (PLATE V. fig. L.)

Shell subglobose, thinnish, semitransparent, whitish, somewhat narrowly unbilicated, glossy, sculptured with fine lines of growth. Spire small, culminating in an obtuse apex. Whorls  $3\frac{1}{2}$ , very convex, rapidly increasing, separated by a simple linear suture, beneath which there is a narrow opaque-white margin. Aperture rather more than semicircular, narrower above than at the lower part. Columella slightly oblique, straightish or only feebly arcuate, a little thickened, somewhat expanded at the upper part, and joined to the extremity of the outer lip by a thin callosity. Outer lip (viewed laterally) a trifle oblique, and exhibiting near the suture a small shallow sinuation. Umbilicus rather narrow, without any internal ridge. Operculum unknown. Length 8 millim.; greatest diameter 9, smallest  $6\frac{1}{2}$ .

*Hab.* West Island, Prince of Wales Channel, Torres Straits, 7 fms.

This may prove eventually to be the young state of the species, a supposition partly based upon the larger size of the nuclear whorls and partly upon the thin semitransparent character of the shell.

#### 49. *Natica (Mamma) columnaris*.

*Natica columnaris*, *Récluz, Reeve, Conch. Icon.* figs. 19 *a, b*.

*Hab.* Prince of Wales Channel, 9 fms. (*Coppinger*); Philippine Islands (*Cuming*); Ceylon (*E. W. H. Holdsworth* in Brit. Mus.).

50. *Natica* (*Mamma*) *cumingiana*.

*Natica cumingiana*, Récluz, *Reeve, Conch. Icon.* figs. 13 *a, b*; *Philippi, Con.-Cab.* p. 47, pl. 7. fig. 5.

Var.=*Natica powisiana*, Récluz, *Reeve, l. c.* figs. 22 *a, b*; *Philippi, l. c.* p. 46, pl. 7. fig. 4.

Var.=*Natica draparnaudi*, Récluz, *Journ. de Conch.* vol. ii. pl. 5. fig. 11; *Reeve, l. c.* figs. 44 *a, b*.

*Hab.* Port Molle, Queensland.

The only specimen from this locality is half-grown, white, with a broad and gradually enlarging band of a rich brown colour round the body-whorl, with another narrower yellowish one beneath the suture, and a third, also of a yellowish tint, bordering the carina circumscribing the umbilicus; this is less open than in the adult shell figured by Reeve.

51. *Eulima martinii*, var.

*A. Adams, Thes. Conch.* pl. 169. fig. 5; *Sowerby, Conch. Icon.* fig. 6.

Shell elongate-pyramidal, slightly recurved and laterally flexuous towards the apex, white, rather transparent behind the varices (perhaps due to the youth of the specimen), which are in a single oblique series from the labrum upwards. Whorls very slightly convex, eleven remaining in the single shell under examination, which may not be full-grown; apical ones broken off. Outlines of the spire for the most part rectilinear, but a little contracted near the summit, thus giving the shell a somewhat club-shaped appearance. Last whorl broad, indistinctly obtusely angled at the periphery. Aperture pyriform, oblique. Outer lip prominent near the middle, feebly sinuated above. Columella arcuate, thickened with a reflexed callosity which joins the upper termination of the labrum. Length 19 millim., diam. 7; aperture  $5\frac{1}{2}$  long,  $3\frac{1}{3}$  wide.

*Hab.* Warrior Reef, Torres Straits, on a bottom of pearl-shells (*Avicula margaritifera*) (*Coppinger*); China Sea (*Adams*); Darnley Island, Torres Straits (*Brazier*).

This is as broad a shell as *E. martinii* of A. Adams, and is solely distinguished by the greater height of the whorls. Having but one specimen (and that probably not adult) to base an opinion upon, it would be unwise to hold it distinct on account of this single difference. Sowerby gives the locality of this species "St. Helena," which is unsupported by any authority and almost certainly a mistake.

52. *Strombus campbelli*.

*Gray, Griffith's An. King., Moll.* pl. 25. fig. 6; *Sowerby, Thes. Conch.* pl. 6. figs. 22, 23; *Reeve, Conch. Icon.* fig. 45; *Chenu, Manuel*, fig. 1600.

*Hab.* Port Denison (4 fms.), Port Molle, and Friday Island,



Torres Straits (*Coppinger*); Cape Grenville, North-east Australia (15 fms.), and Long Island, Torres Straits (*Brazier*).

The operculum is narrow, deeply and acutely serrate on one margin, smooth on the other, and has a raised ridge running from the smaller end almost to the opposite extremity.

53. *Terebellum subulatum*, *Lamarek*.

*Hab.* Flinders Is., Clairmont Is., North-east Australia, 11 fms. (*Coppinger*).

54. *Cypræa arabica*, *Linn*.

*Hab.* Port Molle coral-reef.

55. *Cypræa lynx*, *Linn*.

*Hab.* Port Molle coral-reef.

56. *Cypræa annulus*, *Linn*.

*Hab.* Port Molle coral-reef.

57. *Cypræa erronea*, *Linn*.

*Hab.* Port Molle, Queensland (*Coppinger*); New South Wales, rare! (*Angas*).

The only example of this species from the above locality is of unusually small size. It is only 19 millim. in length and  $10\frac{1}{2}$  wide.

58. *Cypræa walkeri*.

*Gray, Reeve, Conch. Icon.* figs. 50 *a, b*, &c.

*Hab.* Flinders Is., Clairmont Is., North-east Australia, 11 fms., sand and mud (*Coppinger*); Philippine Islands (*Sowerby, Thes.*); Palm Island and Cape Grenville, North-east Australia, also Darnley Island, Torres Straits (*Brazier*).

59. *Ovula (Radius) angasi*.

*Ovulum angasi*, *Adams, Reeve, Conch. Icon.* figs. 43 *a, b*.

*Volva angasi*, *Angas, Proc. Zool. Soc.* 1867, p. 207.

*Hab.* Port Curtis, 11 fms., sand and shell bottom (*Coppinger*); Port Curtis (*Reeve*); Watson's Bay, New South Wales, on a branch of red *Gorgonia*, amongst the rocks at extreme low water (*Angas*).

In the brief description in the 'Conchologia Iconica' one or two important characters are not noticed. The dorsal surface of the shell towards both ends is very prettily sculptured in an oblique direction with fine wavy striae, as indicated in the figure in the above work, the waviness being due to the fine transverse lines of growth. The colour is white, more or less transparent,



with the extreme tips tinged with orange or pink. The ventral surface is peculiarly humpy near the middle, owing to a considerable deposit of callus. Figure 43 *a* represents the dextral outline rather too prominent, and both this and fig. 43 *b* delineate the shell too broad and the outer lip too thick.

#### 60. *Littorina scabra*.

*Linn., Philippi's Abbild.* vol. ii. p. 221, pl. 5. figs. 3-7; *Reeve, Conch. Icon.* figs. 21 *a-d*.

*Hab.* Thursday Island, Torres Straits, in mangrove-swamps.

#### 61. *Littorina filosa*.

*Sowerby, Genera Rec. & Foss. Shells*, fig. 5; *Reeve, Conch. Syst.* pl. 212. fig. 5; *Conch. Icon.* figs. 24 *a-c*; *Philippi, Abbild.* vol. iii. pp. 46 & 55, pl. 6. fig. 4, and pl. 7. figs. 1, 2.

*Hab.* Roko Island, Endeavour Strait, North Australia, in mangrove-swamps.

#### 62. *Littorina mauritiana*, *Lamarck*.

(*Var. diemenensis*.)

*Hab.* Port Jackson (*Coppinger*).

This species is very variable in size, the difference in this respect being the only distinction between the typical form and the variety named *L. diemenensis* by Quoy and Gaimard (*vide* Philippi's excellent monograph of this genus in the 'Abbild. und Beschreib. neuer Conch.' vol. ii. p. 195). *L. antipodum* of Philippi (*l. c.* pl. 4. fig. 2) and *L. acuta* of Menke are also small varieties. The European *L. neritoides* of Linn. (= *Turbo caruleseens* of Lamarck) is considered the same species by Mr. Tenison-Woods (Proc. Linn. Soc. N. S. Wales, vol. iii. pp. 65-72); but this determination, I think, requires still further substantiation, and I rather incline with Philippi to retain that form as distinct. *Littorina sicca* is a well-known West-Indian species, but is also recorded from the Red Sea and Kangaroo Island, South Australia, by Philippi, who remarks that it is scarcely separable from *L. mauritiana*, with the exception of colour and, in most cases, a slight difference in the transverse striation (*l. c.* p. 165). Mr. Tenison-Woods believes it to be only a variety, but at the same time is not prepared to assert this positively. He also fails to see any specific difference between this shell and *L. africana* (Krauss), Philippi. I should here point out that the shell figured by Reeve (*Conch. Icon.* figs. 37 *a, b*) is not the true Philippian species, but merely *L. mauritiana*; and consequently if Mr. Tenison-Woods based his opinion upon that figure he is certainly correct. *L. africana* is compared by its author with *L. neritoides*, from which it is said to differ in sculpture, form, and the columella.

The *L. levis* of Reeve is also *L. mauritiana*, and quite distinct from the *L. lavis* of Philippi (*l. c.* vol. iii. p. 10, pl. 6. fig. 6), which is also from the Mauritius. *L. undulata* of Gray is also considered a variety of *L. mauritiana* by Mr. Tenison-Woods (*l. c.* p. 72); but here I think he overstrains the power of variation. Besides the difference in form and colour, the violet columella and sculpture readily distinguish that shell. In adopting the Lamarekian name *L. corulescens*, even supposing the Mediterranean and Australian shells were the same species, I think Mr. Tenison-Woods is wrong, considering what is said upon this point by Philippi (*op. cit.* vol. ii. p. 166), Hanley ('*Ipsa Linnæi Conchylia*,' p. 326), Jeffreys, and others.

### 63. *Risella lutea*.

*Trochus luteus*, Quoy & Gaimard, *Voy. 'Astrolabe'* vol. iii. p. 271, pl. 62. figs. 8-11; Kiener, *Cog. Viv.* pl. 38. fig. 2.

*Trochus cicatricosus*, Jonas, *Philippi's Abbild.* pl. 2. fig. 2.

*Bembicium luteum*, Philippi, *Zeitsch. Mal.* 1846, p. 132.

*Risella lutea*, Philippi, *Küster's Con.-Cab.* p. 4, pl. 1. figs. 1, 2.

*Risella kielmannseggii*, Zeebor, *Verhandl. zool.-botan. Gesellsch. Wien*, 1866, vol. xvi. p. 913; *Voy. 'Novara'*, pl. xi. figs. 11 a-d.

*Hab.* Port Jackson, Port Denison, Port Curtis, and Port Molle (*Coppinger*).

This genus has been suppressed by Mr. Tenison-Woods (*Proc. Linn. Soc. N. S. Wales*, 1879, vol. iii. p. 61); but, in my judgment, it may be retained with advantage as distinct from *Littorina*. The Trochoid form and flattened base of the species is not approached in that genus, and the character of the columella is very different.

According to Mr. Tenison-Woods there is but one species of *Risella* in Australia (*R. melanostoma* of Gmelin), under which name he includes fifteen varieties or species, which have been named and described by Lamarek, Quoy, Gray, Philippi, and others.

Although the separation of many species or constant local forms seems impossible, we must not therefore ignore their existence. *Risella bruni* is a South-Australian shell, and does not attain any thing like the size of several of the other species, e. g. *R. nana*, *R. melanostoma*, and *R. imbricata*. Although it might be possible to get together an immense series of specimens which would unite step by step the two most extreme forms, nevertheless the *R. bruni* would still remain the small species from South Australia, and the other, the *R. imbricata* from Sydney, Port Stephens, &c., would also be recognizable as such.

I am far from admitting the validity of all the described species; but there are some, I think, which may be retained, at all events, with convenience. It is not my intention now to discuss this subject further, but, in conclusion, will call attention to Philippi's monograph of the genus, which has been altogether overlooked by Crosse (*Journ. de Conch.* 1864) and by Tenison-Woods; it was published in 1853 in Küster's '*Conchylien-Cabinet*,' and contains the following

species, not mentioned by the above authors :—*R. fimbriata*, *R. flavescens*, *R. grisea*, and *R. plicatula*. Another species which has also escaped attention is the *Trochus melanostoma* of Reeve (Proc. Zool. Soc. 1842, p. 185; Conch. Syst. vol. ii. pl. 218. fig. 16). This is the same as *Risella fimbriata* of Philippi, which I think should be regarded as a large form of *R. melanostoma*, Gmelin; and with this species I would also unite *R. flavescens* and *R. plicatula* of Philippi. Dunker has also described a species from Sydney under the name of *R. crassa*, which appears to be remarkable on account of a thickened channelled lip (Mal. Blät. 1861, vol. viii. p. 42).

*R. kichmannseggi*, Zelebor, is the *R. lutea*, Quoy, of which *R. imbricata* may be a variety. The two following species resemble *Risella* in form, but have the concentric multispiral operculum of *Trochus*, from which they are distinguished by their non-pearly apertures—*Trochus tantillus*, Gould, and *Risella isseli*, Semper. The *Tectarius luteus* of Gould, *Risella infracostata*, Issel, *R. parvula*, Dunker (?=*tantillus*), and *Trochus conoidalis* of Pease will probably have similar opercula; these four species differ from *Risella* not only in the operculum, but in being narrowly perforated. The statement with regard to *Risella aurata* being the male of *R. nana* (although both are hermaphrodite) made by Mr. Tenison-Woods (Proc. Linn. Soc. N. S. Wales, vol. i. p. 244), and that “all breed freely with one another,” seems to me to require some further corroboration. He himself hesitates to assert positively that either of these two forms are incapable of reproducing their own kind, “for there are many places on the coast where no species can be found except the variety now known as *R. aurata*.” This, in my judgment, proves that that species at all events is self-propagating; yet Mr. Tenison-Woods says that specimens of this species kept in glass jars for a few weeks did not become fertile. Experiments made for so short a time are far from conclusive, especially when made under such artificial conditions.

#### 64. *Rissoina clathrata*.

*A. Adams*, Proc. Zool. Soc. 1851, p. 265; *Schwartz von Mohrenstern*, Denkschrift. Akad. Wissenschaft. Wien, 1861, vol. xix. pt. 2, p. 154, pl. vi. fig. 49; *Smith*, Journ. Linn. Soc. vol. xii. p. 553.

*Hab.* Prince of Wales Channel, 7 fms. (*Coppinger*); Philippine Islands (*Cuming*); var. *minor*, from the Caroline Islands (*J. Brazier*).

The specimen obtained by Dr. Coppinger is of a yellow-wax colour, faintly tinged with rose towards the apex and at the aperture. It has the upper whorls broken off, the remaining four and a half measuring 10 millim. in length. The figures in Küster's ‘Conchylien-Cabinet,’ pl. iv. figs. 12, 13, do not give the faintest idea of this species, and probably represent another.

65. *Rissoina curtisi*. (PLATE V. fig. M.)

Shell elongate, thick, white, very coarsely cancellated. Number of whorls unknown, the apex being broken off; the remaining four are obliquely sloping at the upper part, and, with the exception of the last, biangulated at the sides, the angles being caused by the prominence of two spiral liræ upon the longitudinal costæ. A third lira is seen at the base of the whorls at the suture. The costæ are about fourteen on a whorl, about as thick as the transverse ridges, and nodulous at the points of intersection. The body-whorl has five spiral liræ, the lowermost being separated from those above by a broad smooth furrow, in which the costæ are almost obsolete. Aperture obliquely subovate, rather widely channelled in front. Columella oblique, covered with a thin callosity, which at the base forms the sinistral side of the canal. Labrum much thickened exteriorly, acute at the margin, and (viewed laterally) is produced to the left at the front part.

Probable length about 7 millim.; actual length of remaining four whorls  $5\frac{1}{2}$  millim., width  $2\frac{1}{3}$ .

*Hab.* Port Curtis, 7 fms.

This species might be considered a dwarfed, strongly cancellated form of *R. clathrata*; it is less slender, has fewer and stouter costæ, and the spiral liræ are also thicker and two in number upon the upper whorls exclusive of those at the suture, whilst in the species referred to there are three. The outer lip is much thickened and the aperture rather more contracted.

66. *Cerithium morus*.

*Lamarck, Anim. sans Vert.* ed. 2, vol. ix. p. 302; *Kiener, Coq. Viv.* p. 52, pl. 15. fig. 1; *Sowerby, Thes. Conch.* figs. 159–161; *id. Conch. Icon.* fig. 42.

Var. = *Cerithium moniliferum*, *Dufresne, Kiener, Coq. Viv.* p. 49, pl. 16. fig. 3; *Sowerby, Thes.* figs. 163, 165; *id. Conch. Ic.* fig. 20.

Var. = *Cerithium carbonarium*, *Sowerby* (non *Philippi*), *Conch. Icon.* fig. 59.

*Hab.* Philippine Islands (*Cuming*); Samoa Islands (*Rév. S. J. Whitmee* in *Brit. Mus.*); Port Jackson, 7 fms.; Friday Island, Roko Island, Endeavour Strait, and West Island, Prince of Wales Channel, Torres Straits (*Coppinger*); Dungeness Island, Torres Straits (*Brazier*); Hall Sound, New Guinea (*Brazier*).

The small group of species to which *C. morus* belongs, including *C. tuberculatum* of Linnæus as defined by Hanley ('*Ipsa Linnæi Conchyliæ*,' p. 276, pl. iv. fig. 4), *C. lemniscatum*, *C. breve*, and *C. variegatum*, Quoy and Gaimard, *C. petrosum* and *C. rugosum* of Wood (non Lamarck) = *C. patiens*, Bayle, *C. moniliferum*, *Kiener, C. gemma*, *C. purpurascens*, *C. bifasciatum*, *C. pupa*, and *C. nigro-fasciatum* of Sowerby, is very perplexing, owing to the great similarity in sculpture of the various species.

1. *C. tuberculatum*, to which I unite as varieties *C. variegatum*,

*C. pupa*, and *C. petrosus*, may be recognized in all its forms by the oblique varix on the back of the body-whorl, a feature not found in *C. morus* and *C. patiens* (= *rugosus*). The typical form and the variety *C. variegatum* are pupiform, having the spire acutely conical towards the apex and the last whorl scarcely broader than the preceding one. The granulations appear to be never in more than three rows on the upper whorls, but on the penultimate a fourth is frequently, but not always, observable adjoining the lower suture. The body-whorl has normally seven principal series of granules; but in many instances the minor or intermediate series attain as large a size as the principal ones, when the number of rows may be nine to a dozen or even more. The variations in colour are considerable: normal specimens are whitish varied with black, brown, and white tubercles.

The var. *variegatum* is irregularly blotched with light or dark brown, and some specimens are almost entirely of a uniform dark brown (Conch. Icon. fig. 41 *a*). Another has a light brown band immediately beneath the suture and a second broader one at the base of the body-whorl, as in *C. pupa* (Conch. Icon. fig. 84), which is remarkable on account of the remoteness of the tubercles on sub-distant longitudinal costæ. All of these forms of the variety *variegatum* have a more or less lilac-tinted aperture; but in others (*vide* Conch. Icon. figs. 41 *b, c*) it is white, and the style of colouring reverts more to the typical form of the species. The form which has been named *C. petrosus* (Wood, Index Test. Suppl. pl. iv. fig. 9 of *Strombus*) and its varieties (Sowerby, Thes. Conch. figs. 171, 172; Conch. Icon. figs. 43 *a, b*) differ very considerably from the normal *C. tuberculatum*; but in the specimen depicted by the two last figures we find the connecting link.

In the type figured by Wood, now in the British Museum, the tubercles are much compressed and united laterally so as to form liræ continuous on and between longitudinal folds; however, upon the uppermost volutions the granules become more prominent.

The colouring of this shell is similar to that of the variety *C. pupa*, excepting some of the tubercles and liræ being black, indicating a return to the black nodulation of the typical *C. tuberculatum*.

2. *C. morus*, the synonymy of which is given above, has three rows of granules on the upper whorls, and if a fourth be present on the penultimate whorl, as is sometimes the case, it invariably consists of much smaller tubercles than those on the three other series. The last varix is situated on the side of the body-whorl exactly opposite the labrum, and never on the back of it, as in *C. tuberculatum* and its varieties. The principal rows of granules on this whorl are six in number, and may best be counted upon the labrum, where the sixth or lowermost terminates at a little distance from the canal, those actually ending at the canal being secondary or smaller series and wind round the short basal cauda of the whorl. The labrum also becomes more thickened in adult specimens of this species than in *C. tuberculatum*. The specimens collected by Dr.



Coppinger at Port Jackson are like fig. 59 in the Conch. Icon. (*C. carbonarium*, Sow. non Phil.), but a little narrower, and those from West Island in Torres Straits are of a peculiar short stunted growth.

3. *C. patiens*, Bayle, = *C. rugosum*, Wood (non Lamarek), of which species *C. breve*, Quoy and Gaimard, appears to be a variety, may be only a form of *C. morus*; still there is a character about the coarse ribbing and granulation and the blotchy irregularity of the painting which seems to demand their separation. Besides, MM. Quoy and Gaimard state that the animals present certain differences.

In conclusion, I should observe that the *C. tuberculatum* of Sowerby (Conch. Icon. figs. 21 *a, b*) is a peculiarly coloured specimen of this species (*C. patiens*); also that the shell figured as *C. bornii* (Thes. fig. 175; Conch. Icon. fig. 26) is the true *C. carbonarium* of Philippi, fig. 59 of the Conch. Icon. not representing the latter species, but merely, as already stated, a form of *C. morus*.

*C. tuberculatum*, as defined by Lamarek and Kiener, is a common Red-Sea species, which has been named *C. cœruleum* by Sowerby (Thes. Conch. vol. ii. p. 866, pl. 179. figs. 61, 62).

#### 67. *Cerithium nigro-balteatum*. (PLATE V. fig. N.)

Shell elongate, pyramidal, white, banded with brownish black above the suture, around the middle and base of the last whorl. Volutions about twelve, constricted above at the suture, longitudinally strongly costate and spirally ridged and sulcated. The costæ are prominent, about nine in number on the upper whorls, somewhat interrupted by the depression beneath the suture. The spiral ridges are rather prominent upon the costæ and unequal in thickness; there are about four principal ones and several smaller intervening ones. On the body-whorl (in the single specimen under examination) the costæ are rather finer and about eleven in number—one, a little stouter than the rest on the left side, extending to the base and forming a lateral varix, the others becoming obsolete a little below the middle, where the whorl is somewhat angulated and concave below the angle. The transverse principal liræ number about six, of which the two lowermost are granulous, white, and situated between the dark base and the zone above the middle. The lower part of the whorl is finely concentrically striated and lirate. Aperture broadly suboval, oblique. Basal canal short, oblique, slightly recurved. Columella obliquely arcuate, blackish. Labrum thickened by the last costa, grooved and lirate within. Length 15 millim., diameter 6.

*Hab.* Prince of Wales Channel, 5–7 fms.

This species is readily recognized by the peculiarity of its colours, the depth of the subsutural depression, and the concave base of the last whorl.



68. *Cerithium torresi*. (PLATE V. fig. O.)

Shell elongate-pyramidal, white, blackish towards the apex, ornamented with transverse series of dark-brown dots upon the liræ between the longitudinal granose costæ. Whorls 11, very slightly convex, separated by a deepish suture, costate and transversely lirate, the points of intersection of the ribs and ridges being developed into prominent white nodules. The spiral liræ which become nodulous are three in number in the upper whorls, the uppermost being situated close to the suture, the next a little above the middle, and the lowermost below it, but more remote from the suture than the uppermost. In addition, there are one or more simple thread-like lines revolving between the granulous ridges, which are also articulated with brown. The body-whorl has about eight principal transverse ridges, of which the three uppermost are the thickest, the two next rather finer and also granulous, the three remaining ones being still more slender and more feebly nodulous. The longitudinal ribs are about twelve on a whorl, one of them being swollen or varicose. The last varix on the body-whorl is situated on the left of the aperture; this is small, obliquely oval, terminating anteriorly in a short, oblique, and very slightly recurved canal. The columella is considerably arched, white, covered with a thin callosity, developed at the upper part into an elongate ridge which runs within the aperture. Labrum varixed externally, also thickened a little within and shallowly grooved, the grooves corresponding with the external ridges. Length  $1\frac{1}{2}$  millim., diam. 5; aperture  $4\frac{1}{2}$  long and  $2\frac{1}{2}$  wide.

*Hab.* Prince of Wales Channel, Torres Straits, 3-4 fms.

69. *Cerithium (Colina) macrostoma*.

*Cerithium macrosotoma*, *Hinds, Voy. 'Sulphur'*, p. 27, pl. xvi. figs. 11, 12; *Sowerby, Thes. Conch.* pl. 184. fig. 219; *id. Conch. Icon.* figs. 118 *a, b*.

Var. = *Colina pupiformis*, *A. Adams, Proc. Zool. Soc.* 1853, p. 176, pl. xx. fig. 14 (enlarged).

= *Cerithium pupiforme* (*A. Adams*), *Sowerby, Thes. Conch.* vol. ii. pl. 184. fig. 221; *id. Conch. Icon.* figs. 122 *a, b* (bad!).

Var. = *Colina costata*, *A. Adams, P. Z. S.* 1854, p. 86.

= *Cerithium costiferum*, *Sowerby, Thes. Conch.* vol. ii. pl. 184. figs. 222; *id. Conch. Icon.* figs. 117 *a, b*.

Var. = *Colina pygmæa*, *H. Adams, Proc. Zool. Soc.* 1867, p. 308, pl. 19. fig. 19.

*Hab.* Thursday Island, Torres Straits, 5-7 fms. (*Copinger*); Straits of Macassar, 11 fms. (*Hinds*); Damagnete, Philippine Islands (*Cuming* for *C. pupiformis*); Philippine Islands (*Cuming* for *C. costata*); Borneo (*H. Adams* for *C. pygmæa*).

The above-named and so-called species I believe to be mere variations of one and the same shell. Compare the extreme forms (*C. macrostoma* and *C. pygmæa*), and one perceives a vast difference in outline and the number of whorls; but even here several features in common will be found, namely the spotted expanded outer lip,

the oblique pale brown stripes on the narrowest extremity of the body-whorl, the longitudinal more or less nodulous costæ subobsolete on the last whorl, and the transverse striation and liræ. The number of whorls seems to vary very considerably in the ten specimens under examination, and the apex of the spire appears to be invariably broken off. When this has occurred the animal closes the top with a smooth, shelly, spiral callosity, and it becomes a matter of uncertainty how many whorls may have been lost. This will account for the great difference in the number of *remaining* volutions in the following specimens:—No. 1 (the type of *C. pygmaea* from the collection of the late Henry Adams) has six and a half normal whorls left; Nos. 2, 3, and 4 have seven each, 5 and 6 have eight each, No. 7 has nine, No. 8 ten, No. 9 eleven, and No. 10 has twelve. The number of whorls represented in the figures of *C. macrostoma* are not reliable, as fig. 12 represents seventeen, whilst fig. 11 (evidently taken from the same specimen) exhibits but fifteen. The costæ are also somewhat variable in number and prominence, but invariably become more or less obsolete on the contracted body-whorl, where, being crossed by the spiral sulci, they present the granular aspect described by A. Adams in his diagnosis of *C. costata*. The outer lip, which is very liable to be broken away, is expanded, thickened but not varixed, grooved externally and spotted with red lines, which for the most part fall in the grooves referred to. Within it is smooth, and in full-grown specimens exhibits a slight tubercular prominence, above which a small sinus is observable, close to the suture.

#### 70. *Cerithium* (*Rhinoclavis*) *fasciatum*.

*Cerithium fasciatum*, *Brug., Kiener, Coq. Viv.* pl. 20. figs. 1-1 c;  
*Sowerby, Conch. Icon.*, *Vertagus*, figs. 9 a, 9 b.

*Hab.* Friday Island, Torres Straits.

The young specimen from this locality is very like Sowerby's figure 9 b, but the lower part of the last whorl is white entirely.

#### 71. *Cerithium* (*Rhinoclavis*) *vertagus*.

*Cerithium vertagus*, *Linn., Kiener, Coq. Viv.* pl. 18. fig. 2.  
*Vertagus vulgaris*, *Schumacher, Essai Nouv. Syst.* p. 223; *Adams, Genera*, i. p. 285, pl. 30. figs. 1-1 c.

*Hab.* Port Molle, Queensland, and Friday Island, Torres Straits, on the beach.

#### 72. *Cerithium* (*Rhinoclavis*) *kochi*.

*Cerithium kochi*, *Philippi, Abbild.* iii. pl. 1. fig. 3; *Sowerby, Thes. Conch.* vol. ii. pl. 176. figs. 13-15; *id. in Reeve's Conch. Icon.*, *Vertagus*, figs. 26 a, b.

*Hab.* Red Sea (*MacAndrew*); East Africa (*Philippi*); Mauritius (*Möbius*); Amirantes Islands, at Poivre Island in 20 fms., and Ile

des Roches in 13 fms., also Friday Island and Prince of Wales Channel (5-7 fms.), Torres Straits (*Coppinger*); Zebu, Philippines (*Mus. Cuming*); Nagasaki (*Lischke*); Matoza Harbour, Japan, 6 fms. (*Capt. St. John*).

### 73. *Cerithium granosum*.

*Kiener, Coq. Viv.* pl. 4. fig. 3; *Sowerby, Conch. Icon.* fig. 73.

*Hab.* Friday Island, Torres Straits (*Coppinger*); Port Essington (*Brit. Mus.*); Red Sea (*Kiener*).

### 74. *Cerithium novæ-hollandiæ*.

*A. Adams; Sowerby's Thes. Conch.* vol. ii. pl. 178. fig. 54; *Reeve, Conch. Icon.* fig. 30.

*Hab.* Port Molle, Queensland, Prince of Wales Channel, and Friday Island, Torres Straits (*Coppinger*); Cape York, Mud Bay, N. Australia (*Brazier*).

### 75. *Lampania australis*.

*Cerithium australe* (*Q. & G.*); *Kiener, Coq. Viv.* pl. 8. fig. 2.

*Hab.* Port Curtis.

### 76. *Pyrazus sulcatus*, *Born*.

*Hab.* Thursday Island, Roko Island, in mangrove-swamps (*Coppinger*); Dungeness Island, Torres Straits (*Brazier*).

### 77. *Telescopium fuscum*, *Schumacher*.

*Hab.* Roko Island, Endeavour Straits, in mangrove-swamps.

### 78. *Siliquaria anguina*, *Linn.*

*Sowerby, Conch. Icon.* figs. 7 a-7 c.

*Hab.* Port Darwin, 8-12 fms.

The single specimen from the above locality belongs to the purplish-rose variety of the species.

### 79. *Siliquaria ponderosa*.

*Mörch; Sowerby's Conch. Icon.* pl. 2. fig. 3.

*Hab.* Port Molle, Queensland, and Prince of Wales Channel, Torres Straits, 5-7 fms.

### 80. *Narica cancellata*.

*Chemnitz; Récluz, Mag. de Zool.* 1845, pl. 119; *Sowerby, Conch. Icon.* figs. 1 a, b (*Vanikoro*).

*Hab.* Port Molle, 12-20 fms. (*Coppinger*); Moluccas and Lord

Hood's Island (*Récluz*); Oomaga Reef (*Jukes*); Mauritius (*Martens*); Home Islands, off Cape Grenville, N.E. Australia, and Darnley Island, Torres Straits (*Brazier*).

With this species *N. cidaris* and *N. petitiana* have very close relationship, and, indeed, at present I cannot appreciate their points of distinction.

### 81. *Nerita chrysostoma*.

*Récluz*; *Reeve*, *Conch. Icon.* pl. iv. figs. 18 a, b.

*Hab.* Friday and Thursday Islands, Torres Straits, and Endeavour Straits, N. Australia (*Coppinger*); Philippine Islands (*Cuming*).

With this species should probably be united *N. Le guillouana*, *N. savieana*, *N. longii*, *N. aurantia* (all of *Récluz*), and *N. funiculata*, *Reeve*.

### 82. *Nerita melanotragus*.

*Nerita atrata*, *Reeve* (non *Chemnitz*), *Conch. Icon.* figs. 16 a, b; *Hutton*, *Manual Moll. New Zealand*, p. 89; *Angas*, *Proc. Zool. Soc.* 1865, p. 175; *op. cit.* 1867, p. 212.

*Nerita nigra* (*Quoy & Gaimard*), *Gray*, *Dieffenbach's New Zealand*, vol. ii. p. 240.

*Hab.* New Zealand, common in the north, not found south of Wellington (*Hutton*); Australia and Tasmania (*Hutton*); Port Jackson (*Coppinger*, *Angas*, &c.); Norfolk Island (*Brenchley*); Raoul or Sunday Island, Kermadec Islands (*MacGillivray*, *Voy. of H.M.S. 'Herald'*).

I am inclined with Deshayes\* and Martens† to consider the shell figured by *Reeve* not the *N. atrata* of *Chemnitz*. That author describes both lips as white, whereas the species figured by *Reeve* has the outer lip remarkably margined with black. Besides, the localities quoted in the 'Conchylien-Cabinet,' namely the coast of Guinea and the West Indies, do not support *Reeve's* identification. It is not, however, improbable that the *Nerita* mentioned by *Chemnitz* in the concluding paragraph of his description may have been the *N. atrata* of *Reeve*, for he states it to have been brought from the South Seas by one of the expeditions under Captain Cook. I cannot find any species described by *Quoy* and *Gaimard* under the name *N. nigra* quoted by *Gray* in *Dieffenbach's* work, although they figure the animal only of a *Nérite noirâtre* in the 'Voyage de l'Uranie et la Physicienne.' The shell of that species they do not describe, on account of its bad condition. The *N. punctata*, Q. & G., from the Mauritius is placed as a synonym of the present species by Mr. *Angas* (*Proc. Zool. Soc.* 1865, p. 175); but that species I consider perfectly distinct, being probably the same as the *N. nigerima* of *Chemnitz* as figured by *Reeve*, which varies to a considerable extent in the amount of white dotting. The spire of *N. punctata* is described as "convexa, prominenti." The aperture is said to be

\* Anim. sans Vertèbres, ed. 2, vol. viii. p. 603.

† Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen, p. 292.

"blanche, quelquefois un peu jaunâtre, avec des plis en arrière," and the operculum is "rougeâtre." None of these features are present in *N. melanotragus*; its spire is scarcely raised above the last whorl, the labrum is margined with intense black, the columella is white and destitute of the "plis en arrière," and the operculum is flesh-coloured, marked with two arcuate purplish-black stripes. Not finding any name which can be retained for this species, I have imposed upon it that of *N. melanotragus*, being descriptive of the black labrum. The name *N. nigra* appears in the 'Conchylien-Cabinet,' and was given by Chemnitz to another species. If such were not the case I would have applied it to this species, as was done by Gray to specimens brought home by Dr. Dieffenbach from New Zealand.

### 83. *Nerita costata*.

*Chemnitz*; *Reeve, Conch. Icon.* figs. 6 a, b.

*Hab.* N.E. Australia, beach.

### 84. *Nerita lineata*.

*Chemnitz*; *Reeve, Conch. Icon.* fig. 13.

*Hab.* Straits of Malacca (*Chemnitz*); Port Essington and Philippine Islands (*Reeve*); Port Molle, 12-20 fms., and Port Curtis, in mangrove-swamps above high-water mark (*Coppinger*).

### 85. *Nerita squamulata*.

*Le Gillou, Revue Zool.* 1841, p. 344; *Reeve, Conch. Icon.* figs. 63 a-f.

*Hab.* Port Curtis, Port Denison, Port Molle, Queensland, 12-20 fms., on a rocky bottom (*Coppinger*); Singapore and Philippine Islands (*Reeve*); Samoa Islands (*Brenchley*); Pelew Islands (*King*).

### 86. *Nerita signata*.

*MacKay*; *Reeve, Conch. Icon.* pl. x. figs. 44 a, b.

*Hab.* Friday Island, Torres Straits, in mangrove-swamps.

One small specimen, obtained at the above locality, has the ridges of a blackish colour articulated with creamy white, the interstices being of a dirty white colour.

### 87. *Turbo concinnus*.

*Philippi, Con.-Cab.* p. 44, pl. xi. fig. 6 (published in Lief. 65 in the year 1847).

=*T. articulatus*, *Reeve, Conch. Icon.* sp. 39 (1848).

*Hab.* Port Molle, Queensland, on a coral-reef (*Coppinger*).

The operculum of this species is solid, convex, more or less pale greenish, coarsely granular, especially near the outer margin, and exhibits a slight, obliquely arcuate depression extending from the centre to the opposite or inner side.



88. *Trochus (Isanda) coronata*. (PLATE V. figs. P-P 2.)

*A. Adams, Proc. Zool. Soc.* 1853, p. 189, & 1854, pl. 27. fig. 5; *Genera Rec. Moll.* pl. 46. fig. 2; *Chemm. Man. Conch.* fig. 2616.

Var.=*I. lepidus*, *A. Adams, P. Z. S.* 1853, p. 190.

*Hab.* Port Curtis, 7 fms., and Friday Island, Torres Straits, on the beach (*Coppinger*); South Australia (*Cuming*).

With the exception of differences in colour and the height of the spires, there appears to be little or no sufficient reason why the two above-named forms should be specifically separated. The subangulation of the body-whorl, said to exist in *I. lepidus*, is very slight and equally present in *I. coronatus*. The types of the latter are described as being ornamented with white transverse lines and brown spots, arranged in transverse series and having a broad white band at the sutures. This band is not in fact at the suture, but just below the coronation of the whorls, the latter portion and the channelled top being coloured like the greater part of the shell. This style of painting is far from constant. Two specimens presented to the British Museum by A. Adams, Esq., lack the conspicuous white band, but have the entire surface covered with oblique, slightly wavy, pinkish-brown stripes, resting upon a pinky-white ground. A single specimen dredged by Dr. Coppinger at Port Curtis exhibits the typical coloration, with the exception of having a second white transverse zone just below the periphery of the last volution. Another example from Friday Island more nearly resembles the variety previously mentioned; but the oblique stripes are less regular, being more interrupted and in the form of spots.

Mr. Adams describes the inner lip of this genus as "straight, forming an angle with the outer lip." This description is scarcely accurate. All the specimens which I have examined have the columella a little oblique, slightly incurved at the upper part and middle, and then prominent anteriorly, terminating in an indistinct subtruncation, or, in other words, it is subnotched at the base at the termination of the double series of tubercles surrounding the umbilicus. It is very slightly expanded and connected with the upper extremity of the outer lip by a thin callosity (which is subtubercular in adult shells) upon the whorl close to the end of the columella. The aperture has a thin coating of nacre, which in worn shells is not very apparent.

89. *Trochus (Calliostoma) speciosa*.

*Ziziphinus speciosus*, *A. Adams, Proc. Zool. Soc.* 1854, p. 38; *Reeve, Conch. Icon.*, *Ziziphinus*, sp. 9, figs. 9 a, b.

*Hab.* Port Curtis, Queensland, 7-11 fms. (*Coppinger*); Moreton Bay (*Mr. Strange*).

In form this species approaches *T. contus* of Philippi, which, however, in addition to difference in colour, does not possess the peculiar smooth orange-yellow callosity at the umbilical region so



characteristic of *T. speciosus*. *Zizyphinus comptus*, A. Adams, is a different species from that described by Philippi, and has since been described by Sowerby under the name of *T. poupineli*.

#### 90. *Trochus* (*Calliostoma*) *decoratus*.

*Trochus decoratus*, Philippi, *Con.-Cab.* pl. 13. fig. 1.

*Zizyphinus decoratus*, Reeve, *Conch. Icon.* fig. 28; A. Adams, *Proc. Zool. Soc.* 1851, p. 165.

*Hab.* "——?" (*Philippi*); Brisbane waters, East Australia (*Reeve*); Sydney and Port Jackson (*Coppinger* and *Lieut. A. Smith, R.N.*).

The interior of the aperture of this species, close to the outer and basal margin, is thickened with a whitish and more or less cloudy pearly deposit, which conceals to some extent the beautiful iridescence observable further within.

#### 91. *Trochus* (*Calliostoma*) *rubropunctatus*.

*Zizyphinus rubropunctatus*, A. Adams, *Proc. Zool. Soc.* 1851, p. 167; *Reeve, Conch. Icon.* fig. 56.

*Hab.* ———? (*Adams & Reeve*); Albany Island, N. Australia, in 3–4 fms. on a muddy bottom, and Port Darwin, N.W. Australia, 8–12 fms. (*Coppinger*).

This is a most charming little species, and readily recognized by its peculiar painting and remarkable sculpture. Adams describes the colour as "lutescens." I should rather consider it pale fleshy pink, with dark red dots in the interstices between the oblique costæ and the transverse or spiral ridges. The latter are said to be four in number on the last whorl; but on careful examination I find six, of which four are, however, more prominent than the rest. The upper volutions are encircled by three principal liræ, and a fourth secondary one at the suture. The points of intersection of these spiral ridges and the oblique costæ are produced into quite acute nodules or prickles. The base of the shell is almost flat, ornamented with about six concentric liræ, which are more or less granulous, with the interstices exhibiting strong lines of growth and translucent nacre. The colour closely approaches the rest of the surface, varied with brown dots both upon and between the granules.

#### 92. *Trochus* (*Thalotia*) *torresi*. (PLATE VI. fig. A.)

Shell sharply conical, subperforated or with the perforation concealed, greenish (sometimes pinkish red), with oblique white narrow stripes and darker green (or rosy black) spotting at the base of the whorls and upon the angle of the last. Volutions about 8, flat, margined at the lower part with two rows of closely packed granules rather more prominent than five others above. Between these, in well-preserved specimens, very fine liræ (one in each interstice) and oblique lines of growth are discernible. Last whorl rather acutely angled at the periphery, beneath with about nine concentric rows of

granules alternating with others very much finer, having smaller and subobsolete tubercles. The aperture is obliquely subquadrate. Columella a little arcuate at the upper part, white, reflexed over the white umbilical region and subtruncate anteriorly. Height 12 millim., diam.  $9\frac{1}{2}$ ; another specimen is 13 high, and 12 in width.

*Hab.* Prince of Wales Channel, Torres Straits.

There are two varieties of this pretty species, which may be termed the green and pink. The former is represented by four specimens in the Museum (three belonging to the Cumington collection) and the latter by two, which fact, however, can hardly be accepted as indicating the relative abundance of the two forms.

In the green variety the base in three out of the four examples is somewhat pinkish, radiately streaked with white, whilst in the fourth specimen it is green with irregular streaks and has a more tessellated aspect. The perforation is small, and may either be concealed by a thin callosity or remain open.

This is a smaller species than *T. fragum* (Phil.), has more numerous granules (of which there are *five* instead of *four* rows, besides the basal girdle), and intervening fine liræ are generally to be met with on the spire, which are wanting in Philippi's shell. I should also observe that the columella of *T. fragum*, judging from the figure, is less incurved than in this form.

### 93. *Trochus* (*Monilea*) *lifuana*. (PLATE VI. figs. B, B 1.)

*Fischer, Journ. de Con.* 1878, vol. xxvi. p. 63.

*Monilea lifuana*, *Fischer, l. c.* 1879, vol. xxvii. p. 30, pl. 3. fig. 5.

*Trochus lifuanus*, *Fischer in Kiener's Coq. Viv.* p. 388, pl. 116. fig. 4.

Shell suborbicular, only slightly elevated, moderately thick, narrowly umbilicated, spirally lirate and striated throughout, and marked with rather distinct lines of growth, pinkish white, varied with large brownish blotches and transverse lines articulated with white and dark purplish brown. Whorls  $5\frac{1}{2}$ –6, convex, separated by a deepish suture. Last whorl compressed, convex and concentrically striated beneath, obtusely subangled at the periphery. Spire not much elevated, having slightly convex outlines. Umbilicus narrow, perforate to the apex, margined with a thickened spiral white or spotted callus and furnished with a second more elevated one within, which terminates on the columella in a lateral yellowish projection. Aperture quadrately subcircular, oblique, only thinly nacreous within. Columella oblique, arcuate, thickened by the ends of the two spiral callosities of the umbilicus and slightly reflexed. Outer lip (viewed laterally) obliquely excurved above the periphery and broadly sinuated beneath. Height  $6\frac{1}{2}$  millim.; greatest diameter 9, smallest  $7\frac{2}{3}$ .

*Hab.* Prince of Wales Channel, Torres Straits, 7 fms.

The colouring in the two specimens from this locality is very similar, differing only in the amount and size of the blotches, which

have a somewhat radiating disposition on the spire. Both specimens have a series of small patches around the periphery of the body-whorl and a second below it on the under surface. They are considerably smaller than those described by Fischer, but may not be full-grown; this is probably the case, as the umbilicus is more open than in the shells from Lifu. The whorls also exhibit little or no trace of an angle above the middle.

#### 94. *Trochus* (*Monodonta*) *labio*.

*Linn., Philippi in Küster's Con.-Cab.* p. 166, pl. 27. figs. 1-3, & pl. 44. fig. 8.

*Hab.* West Island, Prince of Wales Channel, Torres Straits (*Coppinger*); Darnley Island (*Brazier*).

#### 95. *Trochus* (*Labio*) *zebra*, *Menke*.

*Hab.* Port Jackson (*Coppinger & Angus*).

This species is the *T. tenuatus* of Quoy & Gaimard, 1834 (not *T. tenuatus*, Wood, 1828), and *Labio porcatus* of A. Adams is only a slight variety.

Philippi (*Con.-Cab.* p. 160) is inclined to consider *T. zebra* merely a variation of *T. constrictus*, and possibly he is correct; still I think further evidence is requisite in order to place this supposition beyond a doubt.

Specimens of this species are in the British Museum from N.E. Australia, Port Jackson, Port Phillip, Tasmania, and New Zealand.

#### 96. *Trochus* (*Perrinia*) *elisis*.

*Trochus elisis*, *Gould, Proc. Bost. Soc. Nat. Hist.* 1849, vol. iii p. 92; *Otia Conch.* p. 57; *Wilkes, Explor. Exped. Moll.* p. 178, Atlas, pl. 13. figs. 216-216 c.

*Thalotia elisa*, *Gould, Otia*, p. 245.

*Hab.* Port Molle, Queensland, 12-20 fms. (*Coppinger*); Singapore (*Gould*); Island of Capul, Philippines, on the reefs at low water (*Cuming*).

The two specimens of this beautiful species from Port Molle are peculiar in having four spiral liræ instead of three upon the upper whorls, and those beneath the periphery of the last rather finer than in the Philippine examples. The deep suture and the character of the sculpture rather suggest *Perrinia* than *Thalotia* as the section for this species.

#### 97. *Trochus* (*Euchelus*) *atratus*.

*Turbo atratus*, *Gmelin, Syst. Nat.* p. 3601.

*Trochus atratus*, *Philippi, Conch.-Cab.* p. 174, pl. 27. fig. 14.

*Monodonta canaliculata*, *Lamarck, An. s. Vert.* no. 20; *Delessert, Recueil*, pl. 37. fig. 1; *Quoy & Gaimard, Voy. Astrucabe*, pl. 64. figs. 21-25 (as *Trochus*).

*Euchelus denigratus*, *H. & A. Adams, Gen. Rec. Moll. i. p. 418, pl. 47. figs. 6-6b.*

Var. = *Monodonta sulcifera*, *A. Adams, Proc. Zool. Soc. 1851, p. 175.*

Var. minor = *Euchelus brunneus*, *Adams & Angas, MS. ? in Mus. Cuming & Angas.*

*Hab.* Port Molle and Port Curtis, Queensland (*Coppinger*).

This species varies considerably in size and colour. The typical form, as figured by Philippi, is a small strong shell of a black-brown colour, the spiral granulous ridges being articulated with yellowish white. The columellar tooth is well developed; the aperture small and strongly sulcate within, especially at the base. Another form is considerably larger, having a total length of 25 millim. In this variety, which is generally of a lilac-black colour, paler between the ridges, the articulation upon the latter is less conspicuous, the tooth on the columella smaller, the aperture more slightly sulcate, and the whole structure of the shell proportionally thinner than the typical form. *Monodonta sulcifera* is a light-coloured variety, with very little articulation or spotting, and of *immature* growth. This accounts for the words "*labro tenui*" and "*columella ad basin trisulcata*" in Adams's diagnosis. The latter feature is not strongly marked even in the type, and in the adult shell it becomes obliterated by the deposition of callus and naere. *Euchelus brunneus*, which appears to be a MS. name attached to shells in the Cumingian collection and to a series presented to the British Museum by Mr. G. F. Angas, is a dwarf variety, and with the exception of size (10 millim. in length) agrees in all respects with the normal form. The following is the geographical distribution of the species:—

Nicobar Islands (*Chemnitz*); Tonga-Tabon, Vanikoro (*Quoy*); Kingmill Island, Timor, Flores (*Martens*); New Guinea, Fiji Islands (*Brit. Mus.*); N.E. Australia, Torres Straits and Port Essington (large var. in *Brit. Mus.*); Roebuck Bay, North Australia (var. *sulcifera*); Moreton Bay (*Angas*) and Sydney (*Mus. Cuming*) for var. *brunnea*.

### 98. *Bankivia (Leiopyrga) picturata*. (PLATE VI. figs. C-C 2.)

*Leiopyrga picturata*, *H. & A. Adams, Ann. & Mag. Nat. Hist. 1863, vol. xi. p. 19; Angas, Proc. Zool. Soc. 1865, p. 181, 1867, p. 216.*

*Hab.* St. Vincent's Gulf, South Australia (*Angas*); Middle Harbour, Port Jackson (*Angas and Coppinger*); Stuart Island, New Zealand (*C. Truill*).

This is a very pretty species, presenting variations in colouring very similar to those of the common *E. varians*. The form originally described by Adams is whitish, ornamented with fine undulating longitudinal red-brown or pinkish lines, which, at the sutures and at the periphery of the last whorl, are darker and assume the appearance of spots.

Another variety has the middle of the whorls encircled by a plain narrow zone, without the series of spots at the periphery of the last.

Messrs. Adams described these spots as being "round" in the specimen they examined; in those before me they are rather angular, being the zigzag turn of the longitudinal lines. A third variety has a pale band round the middle of the last volution which falls at the lower part of the upper ones, the upper portion being pinkish or closely lined with pink. The lower half of the body-whorl has a broad pinkish band beneath the central white one, which is succeeded by a narrower plain zone, which in turn is followed by another fine pink one.

A fourth form, with the exception of the upper part of the spire and the umbilical region, is of a uniform greyish violet.

The largest specimen is twelve millim. long, and consists of eight whorls. The spiral sulcation and ridging is much more developed in some specimens than others. In the largest there is quite a strong keel near the base of the upper whorls, which gradually diminishes upon the last. In others the whorls are almost smooth, with the exception of the base of the last, which invariably presents a few sulci circumscribing the narrow umbilicus. The presence of the latter peculiarity and the very slight difference in the columella do not appear to me sufficient characters to separate this species generically from *Bankivia*. The general form of the shell, its texture, and the style and variation of painting are the same. Other points of resemblance are the thickening or margination of the whorls at the suture, the striation or sulcation of the base of the last, the non-pearly aperture, and finally their geographical distribution.

A second species (?) of the section *Leiopyrga* has been briefly described by A. Adams (P. Z. S. 1863, p. 507) from Port Essington, under the name of *L. cingulata*. It presents similar variations in colouring as in the other species, and, indeed, might even be considered another form of it with the carinations and liræ more pronounced.

### 99. *Stomatella cancellata*.

*Krauss, Südaf. Moll.* p. 93, pl. 5. fig. 26; *A. Adams in Sowerby's Thes. Conch.* vol. ii. p. 836, pl. 174. figs. 6-9; *Sowerby, Conch. Icon.* figs. 13 a, b.

*Hab.* Table Bay, Cape of Good Hope (*Krauss*); Islands of Bohol and Luzon, Philippines (*Mus. Cuming*); Prince of Wales Channel, Torres Straits, in 3-4 fms., and Port Curtis (*Coppinger*).

### 100. *Stomatia rubra*.

*Lamarck; A. Adams in Sowerby's Thesaurus*, vol. ii. p. 842, pl. 175. figs. 53-56; *Genera Rec. Moll.* pl. 49. figs. 9-9 b (animal); *Sowerby, Conch. Icon.* figs. 8 a, b; *Dunker, Index Moll. Mar. Japon.* pl. vi. figs. 11-13.

*Hab.* Philippine Is. (*Cuming*); Korea (*A. Ad.*); Port Essington, 7 fms., mud (*Jukes in Brit. Mus.*); Port Darwin, 8-12 fms., mud and sand (*Coppinger*).



101. *Haliotis* (*Teinotis*) *asinina*, Linn.

*Hab.* Port Molle on coral-reef.

A single young specimen was collected, having but five perforations open. The two nuclear whorls are fleshy pink and smooth, and the radiating ridges are beset with fine granules alternately turquoise-blue and scarlet.

102. *Dentalium javanum*.

*Sowerby, Thes. Conch.* vol. iii. p. 102, pl. 223. fig. 12; *Conch. Icon.* fig. 14.

*Hab.* Java (*Sowb.*); Malacca, coarse sand, 12 fms. (*Cuming* in Brit. Mus.); Port Darwin, 8–12 fms., sand and mud (*Coppinger*).

This species is very nearly related to *D. octogonum* of Lamarck. The eight ridges are conspicuously acute, the interstices being flattish, and marked only with cross lines or striae of growth. The colour of this shell is white, varying to pale green.

103. *Scutus unguis*.

*Patella unguis*, Linn. *Syst. Nat.* ed. 12, p. 1260 (part.); *Hanley, Ipsa Linn. Conch.* pl. 3. fig. 4.

*Hab.* Flinders and Clairmont Islands, N.E. Australia, 11 fms. (*Coppinger*), also Thursday Island.

For full synonymy of this species I would refer the reader to a paper by the author on this genus in the 'Journal of Conchology,' vol. ii. pp. 252–264. The animals from the above locality are yellowish or buff, copiously blotched and stained irregularly with blackish grey, the sole of the foot being of a uniform buff tint. The shells are of the same width (13 millim.); but one of them is 25 millim. long, the other only  $23\frac{1}{2}$ , which gives to the former a more elongate appearance.

104. *Fissurella jukesii*.

*Reeve, Conch. Icon.* fig. 45 (only half-grown).

Juv. = *F. fimbriata*, *Reeve, Conch. Icon.* fig. 104.

*Hab.* Port Darwin, N.W. Australia (*Coppinger*); Port Molle, Queensland (*Jukes*).

This species may be recognized by the elevated squamous character of the radiating ridges, which are more or less tinted with pale rose. In the young state the apex is more conical than in older shells, and the foramen (as is usually the case in immature specimens of this genus) is more central.

105. *Fissurella singaporensis*.

*Reeve, Conch. Icon.* figs. 100, 101.

*Hab.* Port Molle, Queensland, coral-reef, Port Curtis beach, and Port Darwin, N.W. Australia, 8–12 fms. (dead) (*Coppinger*); Singapore (*Reeve*).

This form is allied to *F. ticaonica*, but may be separated on



account of its more central and differently shaped foramen, which is larger, wider, and broadly ovate. The more median position of it considerably alters the contour of the shell.

### 106. *Fissurella quadri radiata*.

*Reeve, Conch. Icon.* fig. 108.

*Hab.* Port Molle, Queensland (*Coppinger*); Island of Negros, Philippines (*Cuming*).

The single specimen from Port Molle is rather more elevated than the type from the Philippines, but a second example from the latter locality has an equally high elevation. The Australian shell is 18 millim. long,  $11\frac{1}{2}$  broad, and  $10\frac{1}{2}$  in height. The type has the same length and width as the preceding specimen, but is only 8 millim. high.

*F. ticaonica*, *Reeve*, is rather more elongate than this species, has finer radiating costæ, the foramen is rather more anterior and circumscribed with the exception of the posterior end by a narrow dark olive line, which is more or less visible on the exterior. *F. quadri radiata* is not always four-rayed, but may be altogether white or have the costæ, principally the larger ones, spotted with olive and flesh tints. However, judging from the few specimens under examination, where rays are present, they appear to be of the number and in the positions depicted by *Reeve*.

### 107. *Chiton jugosus*.

*Gould, Proc. Bost. Soc. Nat. Hist.* 1846, vol. ii. p. 142; *Wilkes's Explor. Exped.* p. 317, fig. 430; *Otia*, p. 3, & p. 242 (*C. Lophyrus j.*). *Chiton concentricus*, *Reeve*, 1847, *Conch. Icon.* pl. 16, fig. 95.

*Hab.* New South Wales (*Gld.*); New Zealand (*Reeve*); Port Jackson (*Coppinger*, *Angas*, and *Rev. R. L. King*); Newcastle (*Dr. Dieffenbach* in *Brit. Mus.*).

Confirmation of the New-Zealand locality of this species is still wanting.

### 108. *Chiton (Ischnochiton) curtisianus*. (PLATE VI. fig. D.)

Shell oval, flattish, of a dirty dark greyish colour, having a conspicuous black broadish line from end to end down the middle of the back, with a pale one on each side of it, and with the mantle patched alternately light and dark, irregularly granulated throughout. Valves arched, not carinate at the vertex, with very indistinct lateral areas, exhibiting strong concentric lines of growth, especially conspicuous at the sides and anterior margins. Front plate well curved anteriorly, the posterior margin being broadly sinuated. Second plate longer than the other intermediate valves, slightly incurved on each side, the central outcurved point in front, rather peaked in the middle of the hinder edge. The third, fourth, fifth, sixth, and seventh valves are very short in comparison with their width in proportion as 1 is to 3. The jugal sinus is large and

areuate. Last valve of a narrow acutely elliptic form, with the muero probably near the centre. Interior of the plates greenish blue, stained dark brown in the middle. Lamina of insertion in the front plate with about ten notches at unequal distances, leaving different-sized teeth between them, which are striated on both sides, but more strongly externally, their edges being sharp, but not smooth. The central plates have a single minute notch on each side, the insertion-lamina being comparatively smooth on the upper surface and marked with a small brown spot on each side against the edge of the valve. Tail-plate much thickened within along the posterior edge, which is roughened by fine cross striæ, there being no prominent teeth, and of course no notches. Mantle-margin covered with small subimbricating oval granules. Length without margin 16 millim.; width of fourth plate 9.

*Hab.* Port Curtis (*Coppinger*).

The granules of the surface have an irregular concentric disposition, following to some extent the lines of growth.

#### 109. *Chiton* (*Ischnochiton*?) *adelaidensis*.

*Reeve, Conch. Icon.* fig. 123.

*Hab.* Port Moller, Queensland (*Coppinger*); Port Adelaide (*Reeve*).

The entire surface of this species is minutely granosely reticulated, the front valve, the lateral areas of the narrow central valves, and the hinder area of the posterior are in addition somewhat irregularly radiately sulcate. The prevailing colour is pale greenish, streaked and dotted with red, the posterior margin of the valves being paler than the general tone of the shell, and conspicuously spotted with the same red colour. The grains of the mantle are smooth, arranged in alternate greenish and reddish patches, and individually have a dark spot generally on the outer side, which is only seen under a lens; those near the valves are considerably smaller than those situated towards the edge of the girdle. Having parted the valves of one of the specimens I find the front one has the margin of insertion divided into seventeen unequal, squarely cut, slightly crinkled, sharp-edged teeth, of which the two outer on each side are the largest. The sixteen slits between the teeth are very small and shallow. The second, third, fourth, fifth, and sixth valves have on each side a single very small narrow central notch, from which a groove or depression runs to the apex of each valve; the seventh is probably abnormal, having a single notch on the right side and two on the left, and the terminal valve has nineteen similar slits.

#### 110. *Chiton* (*Callistochiton*) *antiquus*.

*Chiton antiquus*, *Reeve, Conch. Icon.* fig. 169.

*Callistochiton sarcophagus*, *Carpenter, MS. in Coll. Cuming.*

*Hab.* Australia (*Reeve*); Port Moller, Queensland (*Coppinger*); Port Jackson, rare (*Angas*).

Reeve's figure of this species is much enlarged, the type shell

being only 14 millim. in length. The number of radiating ridges in the terminal valves varies considerably: the type has ten in the front one, and nine in the posterior; the single specimen from Port Molle has the same number in front, but one less behind; a third example has seventeen anterior and sixteen posterior ones. The central valves are arched, but exhibit a carina at the vertex. The two radiating costæ are sometimes more or less double at the outer extremities. The longitudinal thread-like liræ are rather granular through being connected with the still finer cross raised lines; they are fairly regular upon the greater part of the surface, but down the centre form an irregular network, not unlike the reticulation of a thimble. The interior of the valves is for the most part pale greenish white, but towards the straight posterior margin of the central ones a buff tint prevails. The lamina of insertion in the front valve is divided (a single specimen only has been examined) by eight minute notches into nine subequal squarely-cut curved teeth, together forming a festooned semicircle; from each slit a feeble groove runs to the vertex corresponding to an external rib. The central valves have a single notch on each side immediately beneath the termination of the anterior of the two external ridges. The lamina is turned outward at this point and also at the other rib, forming a little festoon. The last plate has nine notches, one corresponding to each rib, with a single (probably unusual) exception, where there are two. The vertex in this valve is central. The scales of the girdle are excessively minute, densely crowded, hardly visible under an ordinary lens, and in alternate light and dark patches.

111. *Chiton* (*Callistochiton*) *coppingeri*. (PLATE VI. fig. E.)

Shell elongate, greenish white, stained with a dark green colour along each side near the girdle, with a paler indistinct stripe on each side of the central line, the apex of the valves being somewhat livid. Central valves with a straight posterior margin, arched, with only the faintest indication of a carina at the vertex. Lateral areas somewhat raised, with two radiating rows of coarse transverse rugæ, of which the hinder or marginal are the largest. The surface between them is finely granular. Central areas covered with a more or less criss-cross granulation, the granules at the centre being very minute, and gradually increasing in size towards the sides, where there is very little of the criss-cross arrangement seen at the vertex, but rather a longitudinal disposition of them. The front valve is minutely granulated and has about twenty fine radiating ridges, here and there some of them bifurcating near the circumference. Posterior valve rather large, concave behind the subcentral mucro, in front of which the surface is sculptured in the same manner as the front of the central valve, as is usual with most, if not all, *Chitons*. The posterior half is finely grained and sparsely covered with pustules of different shapes and sizes, the coarsest being near the margin and the smallest near the centre. The insertional plates are thin, with twelve slits in the last, at unequal

distances, eleven in the front one, and one on each side of the intermediate valves. The interior is pale bluish, the latter valves having an olive-brown stain radiating from the vertex behind on each side, and the two terminal valves have marks of the same colour near the middle.

The girdle is covered with alternately pinkish and dark greyish patches of fine oval compressed imbricating scales, of which those towards the outer margin are much smaller than those near the valves.

Length without girdle 21 millim.; diameter of fifth central plate 8. *Hab.* Port Jackson (*Coppinger*).

This species is closely allied to *C. antiquus*, but is differently and more finely sculptured and the scales on the mantle are larger.

### 112. *Chiton (Acanthopleura) spiniger*.

*Chiton spiniger*, *Sowerby, Conch. Ill.* fig. 68; *Reeve, Conch. Icon.* fig. 75; *Gray, 1857, Guide Moll. Brit. Mus.* p. 184 (*Maugeria*); *Dall, Bull. U.S. Nat. Mus.* i. p. 80 (*Acanthopleura*).

*Chiton granatus*, *Reeve, Conch. Icon.* fig. 24.

*Chiton macgillivrayi*, *A. Adams, Proc. Zool. Soc.* 1855, p. 120.

*Acanthopleura glareosa*, *MS. in Mus. Cuming.*

*Maugeria owenii*, *Gray, Guide Moll.* p. 184.

? *Chiton borbonicus*, *Deshayes, Moll. de Réunion*, p. 37, pl. v. figs. 12, 13.

? *Chiton piceus*, *Reeve (non Gmelin), Conch. Icon.* fig. 70.

= *Chiton obesus*, *Shuttleworth, Bern. Mittheil.* 1853, p. 79.

? *Chiton cunninghamii*, *Reeve, l. c.* fig. 18.

*Hab.* Philippine Islands (*Cuming*); Port Essington (*Jukes*); Port Molle and Clairmont and Bird Islands (*Coppinger*); Fiji, for *C. macgillivrayi*.

The specific difference, if it exist, between the West-Indian *C. piceus* of Gmelin and *C. spiniger* is not very apparent. On close comparison I find that the central valves of the former are as a rule more peaked posteriorly, the colour within is bluish, with a conspicuous mark, almost black, at the jugal sinus. On separating these valves the greatest diameter is found to exist at the posterior margin, the laminae of insertion narrowing in front. On the contrary, in *C. spiniger* the greatest width is across the laminae anterior to the lateral notch. There appears to be very little difference in the insertion-teeth of the first and last valves of these two forms.

### 113. *Chiton (Acanthopleura) incanus*.

*Chiton incanus*, *Gould, Proc. Bost. Soc. Nat. Hist.* 1846, vol. ii. p. 145; '*Otia*,' pp. 6, 248 (*Maugeria*); *Wilkes's Explor. Exped.* p. 315, figs. 432, 432 a.

*Hab.* New South Wales (*Gould*); Port Jackson (*Coppinger*); Stewart Island, New Zealand (*C. Traill, Esq., in Brit. Mus.*).

Externally this species bears considerable resemblance to *C. spiniger*, both as regards the sculpture of the valves and the character

of the girdle. On parting the valves a feature is at once discovered in the posterior one which enables us to distinguish the species: in this the margin is very much thickened within, of a dark brown colour, smooth, flattened, and destitute of teeth, whilst in *C. spiniger* the latter are strongly developed and coarsely striated. The colour of the interior also differs: *C. incanus* is stained with dark brown, the centre of the valves exhibiting a large defined black-brown mark over the jugal sinus, the laminae of insertion being whitish. The central valves have a single, very small slit on each side, and the front one has about nine: the former, with the exception of the seventh, are broadest across the posterior margin, as is also the case in the closely allied West-Indian *C. piceus*, whilst in *C. spiniger* the greatest diameter is across the laminae of insertion in front of the notch. The jugal sinus appears to be rather deeper than in the latter species. The specimens from Stewart Island, presented to the British Museum by Mr. C. Traill, agree in all respects with this species; the form, sculpture, and the insertion-plates are quite the same.

#### 114. *Chiton* (*Schizochiton*) *incisus*.

*Chiton incisus*, Sowerby, *Proc. Zool. Soc.* 1841, p. 61; *Reeve, Conch. Icon.* fig. 43.

*Chiton elongatus*, *Reeve, l. c.* figs. 40 *a, b*.

*Schizochiton incisus*, Gray, *Proc. Zool. Soc.* 1847, p. 169; *Shuttleworth, Bern. Mittheil.* 1853, p. 68; *H. & A. Adams, Genera Rec. Moll.* vol. i. p. 477, pl. 54. figs. 6, 6 *u*.

*Hab.* Island of Zebu, Philippines (*Cuming*); Raines Island, Torres Straits (*Duce*); Clairmont and Bird Islands, N.E. Australia (*Coppinger*).

The mantle is thick, of a somewhat spongy texture, alternately buff and dark brown, the latter colour falling opposite the middle of the valves and forming interrupted irregular narrow stripes. The spines upon it are very short, scattered, and of two colours, brown and white. The raised ridges, generally six in number on the terminal valves, but sometimes varying to seven or eight, and two on the central ones, are remarkable in being studded with minute blackish beads. The longitudinal fine ridges are peculiarly flat-topped, those on the central areas being straight, whilst on the lateral areas and the front valve they are wavy or zigzag. The lamina of insertion in the front valve is thin, externally striated, with six notches corresponding to the radiating costae on the outer surface. In the central valves the lamina is considerably produced in front, with a single small slit on each side; in the last valve it is thickened posteriorly, interrupted in the middle by a large sinus, is coarsely striated on the outside, and is slit in three or four places. The interior of the valves is greenish, stained with brown in the middle.



115. *Chiton (Macandrellus) costatus*. (PLATE VI. fig. F.)

*Acanthochites costatus*, *H. Adams & Angas, Proc. Zool. Soc.* 1864, p. 194; *Angas, l. c.* 1867, p. 224.

*Macandrellus costatus*, *Dall, Bull. U.S. Nat. Mus.* i. p. 81, fig. 40 (dentition).

*Hab.* Port Jackson (*Angas and Copping*).

The single specimen before me, preserved in spirit, shows the girdle to be of a pale buff colour, thick, fleshy, the outer margin being delicately ciliated with a minute fringe of white spicules. The tufts of spicules are seven in number along each side, and four surrounding the front valve. The middle of the central valves is occupied by a raised, transversely substriated flattened ridge, on each side of which the surface is granulated or rather squamose, the scales being flat, imbricating, rather large, and disposed in rather regular series. The lateral areas are well defined by a raised keel. The front valve has five radiating costæ, and apparently the same number of slits in the thin lamina of insertion, of which the three central are quite distinct, and the two outer ones only feebly indicated. The single notch on each side the intermediate valves is also very slight. The posterior valve has a raised, somewhat ex-centric and pointed mucro, from which six more or less distinct radiating ridges descend to the margin, beneath which the lamina of insertion is scalloped by a similar number of notches.

116. *Chiton (Acanthochiton) asbestoides*. (PLATE VI. fig. G.)

Shell small, greyish brown, with a pale line on each side the middle of the central valves, slightly converging behind, leaving a dark wedge-shaped space between them. Surface covered with a coarsish granulation, the granules being somewhat flattened, and those at the vertex of the central valves rather smaller than the rest. The lateral areas are not defined in these valves; the posterior curved margins are produced in the middle, at times almost forming a right angle; their insertion-plates are large, thin, produced anteriorly, with a very slight notch quite close to the hinder margin on each side; the sinus between them in front is deep and arcuate. The first valve has a straighter posterior margin than the succeeding ones, and a semicircular outline in front; the lamina of insertion is rather deep, thin, feebly striated exteriorly, and interrupted by five very small subequidistant notches. The last valve is conspicuously small, transversely subovate, depressed-conical, with a nearly central mucro; insertion-plate very large, laterally produced, with only two notches behind. Interior of the valves bluish. Mantle very minutely spinulose, bearing very conspicuous compact tufts of silky spicules along the sides, not at all unlike in their fibrous texture that of asbestos. Length 15 millim., width of the broadest central valve  $5\frac{1}{2}$ .

*Hab.* Flinders Island, Bass's Straits (*Joseph Milligan*); Port Moller, Queensland (*Copping*).



The single specimen from the latter locality is rather more coarsely granulated than those from Flinders Island, which have been examined by the late Dr. P. P. Carpenter, and bear his manuscript name *asbestoides*.

### 117. *Chiton (Tonicia) fortiliratus*.

*Chiton fortiliratus*, *Reeve, Conch. Icon.* fig. 112.

*Hab.* Port Darwin, 8-10 fms., sand and mud (*Coppinger*); Raines Island, Torres Straits (*Reeve*).

The single specimen collected by Dr. Coppinger is of a greyish-pink colour, copiously blotched with black along the sides of some of the valves. The head-plate is regularly well-curved forward, rather high, the posterior margin being obtusely angled in the middle. The inserted edge is much thickened, coarsely striated exteriorly and on the broad margin, and divided into nine unequal parts by eight short narrow slits. The exterior surface is coarsely subsquamately granulated throughout, and exhibits numerous minute black raised dots, disposed in rather irregular radiating series. The second valve is long in comparison with those which follow, feebly peaked behind; the fourth, fifth, and sixth plates are about equal in width and a trifle broader than the third and seventh. All the intermediate valves are very coarsely ridged and sulcated on the central areas, and coarsely grained and minutely black-dotted at the sides. The ridges are flat-topped, clean-cut, nearly smooth, attenuated posteriorly, wavy, converge on each side towards the front, and the intervening grooves are finely punctate. All have the hinder margin nearly straight, and but very feebly pointed at the posterior apex. The laminae of insertion of these valves are thin, narrow at the sides, moderately deeply sinuated in front, strongly striated above in rear of and for a short distance in front of the single minute lateral slit on each side. The posterior valve is strong and thick, obtusely mucronated at the centre, very coarsely striated and serrated upon the thickened inserted margin, which is subdivided by about ten distinct notches. The interior of the valves is light livid bluish, with a reddish stain along the middle of all, with the exception of the last. The mantle, as described by Reeve, is simply "horny." Length without girdle 18 millim., diameter of fifth valve 9.

The type is a larger specimen, being 24 millim. long, with an extreme width of 13.

### 118. *Chiton (Chitonellus) striatus*.

*Chitonellus striatus*, *Lamarck, An. s. Vert.* ed. 2, vol. vii. p. 481; *Sowerby, Gen.* fig. 4; *id. Conch. Ill.* fig. 62; *Reeve, Conch. Icon.* fig. 4; *Conch. Syst.* pl. 135. fig. 1.

*Chitonellus oculatus*, *Reeve (? of Quoy), l. c.* figs. 7 a, b.

Var. = *Chitonellus gunnii*, *Reeve*, fig. 5.

*Chitonellus rostratus*, *Reeve*, fig. 6.

*Cryptoplax striata, gunnii, rostrata*, *Adams, Genera*, vol. i. p. 484; *Angus, Proc. Zool. Soc.* 1867, pp. 224, 225.

*Hab.* Raines Island, Torres Straits (*Reeve*, for *C. rostratus* and *C. striatus*), Port Lincoln (*J. B. Harvey*), Newcastle (*Dr. Dieffenbach*), Port Jackson (*Coppinger, Richardson, Jukes, King*)—all in *Brit. Mus.*; Flinders Island (*J. Milligan*); Tasmania (*Reeve, C. gunnii*); Tasmania (*Macgillivray and Gunn*, in *Brit. Mus.*).

The variety *gunnii*, from South Australia and Tasmania, may be recognized by the valves being narrower, with the exception of the first two. This form also appears to attain a larger size than specimens from New South Wales and other localities further north. A specimen in spirit, from the mouth of the river Tamar, Tasmania, presented to the British Museum by J. Macgillivray, exceeds four inches in length. The mantle of the southern form also appears to be rather less densely covered with the minute conical spines. The number of gills on each side varies with age, and even in individual specimens: I have found 30 or 31 on each side in specimens of equal size from both regions—that is, north and south; and in the largest specimen before referred to there are 37 on the right side and 34 on the left, and there is no appearance of any having been removed. The plates of insertion offer no distinctions, each having three slits in the front valve and none in the rest, as is the case in all *Chitonelli*. The colour both of the valves and mantle seems to agree very closely in all the varieties. The *C. rostratus* of *Reeve* I cannot in any way distinguish from the shells figured by him as *Lamarek's C. striatus*, and the same observation also applies to his notion of *Quoy's C. oculatus*. What the latter may in reality be is an uncertainty to me at present, for I cannot identify any specimen in the British Museum with it.

### 119. *Chiton (Chitonellus) burrowi*.

*Chitonellus larvæformis*, *Reeve (non Burrow)*, *Conch. Icon.* fig. 3.

*Hab.* Port Molle (*Coppinger*); Port Adelaide (*Reeve*).

This curious species is known by the small size of the valves, the remoteness from one another of the fourth, fifth, and sixth, and the excessively short and densely packed spines on the mantle. The single specimen in spirit, from Port Molle, is of a buff colour, copiously mottled with green: this accords with a specimen (also in spirit) mentioned by *Reeve*, collected by *Capt. Belcher* in the Straits of Macassar.

The dried specimens are greyish, more or less rose-tinted.

The sculpture of the valves is very like that of *C. striatus*, consisting of a central smoothish ridge, with two or three finer and more or less wrinkled ones on each side, the front valve of course being wrinkled throughout and lacking the central smooth ridge. They are yellowish at the murex or posteriorly, and pinkish red in front. The plates of insertion are like those of *C. striatus*, and of a pale greenish colour.

*C. larvaformis* (Blainville), in Burrow's 'Elements of Conchology' (1815), p. 191, pl. 28. figs. 2, 3, 4, is not this species as supposed by Reeve, but is beyond question the same as *C. fasciatus* of Quoy, = *C. cruciformis*, Sowerby (Genera Rec. & Foss. Shells, fig. 5), = *C. lavis*, Lamarck, 1819 (Anim. sans Vert. vol. vi. p. 317). The crude figure of *C. larvaformis* in Blainville's 'Malacologie' (1827), pl. 87. fig. 6, is probably also merely a young specimen of the same species, judging from the sculpture and form of the detached valves. In the drawing of them *in situ* on the back of the animal, the anterior ones are rather narrow. The valves figured by Burrow are still preserved in the British Museum; but I cannot find the dried animals or that in spirit which he mentions.

Blainville's figure represents the mantle as clothed with comparatively longish spines, and the gills extend nearly halfway up the side of the foot. In *C. burrowi*, on the contrary, the gills are very short, do not occupy a third of the length, and are only 22 in number.

*C. oculus* of Quoy and Gaimard I believe to be a young state of their *C. fasciatus*. In the British Museum there are some small specimens of this species which answer very closely to the description; they have the two dark bands meeting over the back, the posterior valves narrow and separated, and the three anterior ones pale greenish and surrounded by a border of short black spines with a pale zone outside it. The other spines on the mantle in the smallest specimen are a trifle longer than usual and very closely packed. The gills are said to number twenty on each side in *C. oculus*, being three less than in *C. fasciatus*, a discrepancy accounted for by age; for in adult specimens of *C. striatus* I find a few more than in the young.

#### 120. *Tornatella solidula*.

Linn.; Reeve, *Conch. Icon.* figs. 3 a, b.

Var. = *T. coccinata*, Reeve, *l. c.* figs. 1 a-c.

*Hab.* Friday Island, Torres Straits, on the beach; also Port Jackson.

This species has a wide geographical range, having been recorded from many localities in the Indian and Pacific oceans. The so-called species *T. affinis*, A. Adams, should, I think, be regarded as a small form of *T. solidula*.

#### 121. *Cylichna arachis*.

*Bulla arachis*, Quoy & Gaimard, *Voy. Astrolabe*, Zool. vol. ii. p. 361, pl. 26. figs. 28-30; A. Adams, *Thes. Conch.* vol. ii. p. 590, pl. 125. fig. 134.

*Hab.* Port Jackson (*Coppinger* and *Angas*); Port King George (Q. & G.); Tasmania, Stewart Island, New Zealand (*Brit. Mus.*).

#### 122. *Atys naucum*.

Linn.; Reeve, *Conch. Icon.* figs. 1-1 c.

*Hab.* Friday Island, Torres Straits (*Coppinger*); also recorded

from Torres Straits, New Ireland, New Britain, and Solomon Islands by Brazier.

123. *Haminea cuticulifera*. (PLATE VI. fig. H.)

*Smith, Ann. & Mag. Nat. Hist.* 1872, ix. p. 350.

*Hab.* Port Jackson and New Zealand.

Dr. Coppinger dredged this species at the first locality in 7 fathoms. It must not be confused with *H. brevis*, Quoy, which is a shorter shell with more convex outlines. I would here call attention to a few inaccuracies in Professor Hutton's English translation of the original Latin diagnosis ('Manual of New-Zealand Mollusca,' p. 122). The epidermis was described by me as whitish, not "white," and I did not say it was "shining near the vertex." The word shining applied to the whole of the surface, and is followed by a comma which disconnects it from the words "verticem basimque versus luteo tincto" which succeed. "Incrementi lineis et superius basique transversim subdistanter striata" is thus rendered—"transversely subdistantly striated with lines of growth, both above and below." Capt. Hutton makes the labrum "thin, thickened in the middle," whilst no such thing is said in the diagnosis. The words are "labrum tenue, verticis medio junctum et ibi incrassatum."

124. *Akera soluta*.

*Hab.* Port Jackson (*Coppinger*); Philippines, North Australia, Zanzibar, Mauritius, Ceylon.

In addition to the other synonyms of this species, I would add *A. tenuis* of A. Adams (Thes. Conch. vol. ii. p. 573, pl. 121. fig. 45; and Conch. Icon. figs. 7a, 7b). I have carefully scrutinized the type and can see no distinction. Angas (P. Z. S. 1867, p. 227) comes to a similar conclusion. The more slender form referred to by Sowerby in the 'Conch. Icon.' is altogether a variable character in this shell; the elevation of the spire above or its depression beneath the body-whorl is likewise an unreliable characteristic.

125. *Doridium marmoratum*. (PLATE VI. figs. 1-I 4.)

Animal (in spirit) blackish, copiously mottled with a dirty buff colour. Cephalic disk longer than wide, rather narrower in front than behind, with a thickened twofold margin anteriorly and at the sides, more expanded and simple posteriorly. Hinder dorsal disk a little shorter than the front one, lobed posteriorly on each side, with an intermediate sinus, with a free margin at the sides, but not in front, where it is covered by the hinder free extension of the cephalic disk. Viewed posteriorly, the animal is truncate, terminating in a curved expansion of the dorsal disk on each side, which conceal the gills beneath them. Foot extending the whole length of the animal, with a duplex margin in front below the

mouth and for a short distance along the sides, and then simple and gradually increasing in the width of the expansion towards the end, where it is very wide beneath the branchia; it is stained with black on the inside of the edge. Branchial plume posterior, concealed between the foot and the hinder lobes of the dorsal disk. Head presenting exteriorly a small lobe on each side the oral opening.

*Shell* internal, situated at the hinder extremity above the branchia, white, calcareous, uncoiled, consisting of one or two volutions, thickened at the free "sutural line," convex externally and concave within, cup-shaped at the commencement, with the outer edge extended by a broadish membranous expansion.

Total length 33 millim.; cephalic disk 18 long and 16 wide at the broadest part; shell with a greatest diameter of 8 millim., and about 2 in height.

*Hab.* Thursday Island, Torres Straits, 4-5 fathoms, on a sandy bottom.

The only species which appears to have been recorded from the Australian coasts is *Aglaiia lineolata*, figured by H. & A. Adams in the 'Genera of Recent Mollusca,' vol. iii. pl. 58. fig. 4. This differs, however, in the form of the anterior dorsal disk and its small size in proportion to the hind part of the animal, in addition to which the colour and markings appear to be quite distinct. *Aglaiia giglioli*, from Japan, described by Tapparone-Canefri (Voy. Magenta, p. 110, pl. 1. fig. 18), may be distinguished by the posterior lobation of the cephalic disk, different colour, and apparent different position of the branchial plume.

*Doridium cyaneum*, *D. nigrum*, and *D. guttatum*, described by Dr. Von Martens from the Indian Ocean, have not yet been figured. Until all these exotic species have either been compared or much more amply described and illustrated, there will remain much uncertainty respecting the identification of all or any one of them.

## 126. *Pleurobranchus angasi*. (PLATE VI. figs. K, K 1.)

Animal (in spirit) uniformly pale buff, elongate ovate. Mantle probably smooth in life, wrinkled by contraction, not very widely produced at the free margin. Foot broad, tapering behind, roundly subtruncate in front, where there is a thickening forming a double margin beneath the proboscis. The frontal veil is straight in front, angular at the sides, which are grooved. Tentacles shortish, slit at the outer side, with the minute eye-specks at their base behind. Branchial plume consisting of about sixteen leaflets. Penis spine-like, very acute, and slightly curved at the tip.

Shell placed well forward, the pale apex being posterior. It is brown in front, glossy, and beautifully iridescent on the exterior. It consists of about a whorl and a half, the nucleus being spiral and hollow within. The last whorl is much prolonged by additional strongly defined concentric layers, and also ornamented with fine yet distinct transverse striæ. The columella is arcuate, and has an umbilical groove parallel with it.



Length of animal 17 millim., diam. 7; length of shell, from nucleus to opposite end,  $4\frac{1}{2}$ .

*Hab.* Port Jackson (*Coppinger*).

This may be the *P. delicatus* of Pease, but there appear to be certain differences in the shells of the two forms which may be of specific value.

### 127. *Dolabella rumphii*.

*Cuvier, Ann. du Mus.* v. p. 437, pl. 29. fig. 1.

*Hab.* N.E. Australia (*Coppinger*); Moluccas (*Rumphius*); Timor (*Péron*); Waigiou (*Quoy and Gaimard*); Mauritius (*Rang and von Martens*).

There is no indication of any caudal prolongation in the specimen before me, the hinder end being (in spirit) very broad and obtusely curved.

The shell agrees with the figure given by Rang (*Hist. Nat. des Aplysiens*, pl. 1).

### 128. *Aplysia sparsinotata*.

Animal of a pale colour in spirit, varied with a few dark distant dots along the sides, caudate posteriorly. Middle of back between the mantle-lobes in front of the shell, also the inner surface of the anterior portion of the lobes themselves, exhibiting irregular brownish patches. Lobes commencing a short distance behind the dorsal tentacles, and terminating behind at about the same distance from the end of the body. Oral tentacles moderately large and long; posterior conical, acuminate, not far apart.

Shell elongate, rather beaked behind, sharply arcuate in front, 15 millim. long, 10 broad. Animal about 45 in length.

*Hab.* Same as *A. piperata*.

### 129. *Aplysia piperata*.

Animal (in spirit) olivaceous, minutely and closely dotted everywhere, with the exception of the foot, with black: hinder third part of the body sometimes paler than the rest, from which it is marked off by a blackish band passing right round the animal. Lobes of the mantle narrowish in front, where they arise quite close to the posterior tentacles, considerably dilated behind. Oral tentacles large, long, and pointed; posterior small, close together, conical.

Shell white, concave within, subquadrate. Length 27 millim., width 22. Animal about 80 long.

*Hab.* Thursday Island, Torres Straits, 4-5 fms., sandy bottom.

Peculiar on account of the position of the posterior tentacles, close to the origin of the mantle-lobes.

### 130. *Aplysia denisoni*.

Body (in spirit) high, exhibiting a distinct pedal disk, produced posteriorly into a caudal termination. The entire surface wrinkled,



dirty whitish, black-veined in the wrinkles (? stains only). Mantle-lobes moderately large, commencing in front some distance behind the posterior tentacles and terminating a little in advance of the cauda. Anterior tentacles large, compressed, much dilated. Posterior tentacles large, cylindrical, with the apical slit not extending halfway down the outer side, placed a little nearer the oral tentacles than the beginning of the mantle-lobes. Eyes minute, situated near the outer anterior base of tentacles.

Shell very thin, straw-colour, 30 millim. long and 27 broad.

Animal about three inches in length in its contracted state.

*Hab.* Port Denison, Queensland.

This species is remarkable for the large size of the oral tentacles.

### 131. *Stylocheilus*, sp.

*Hab.* Thursday Island, Torres Straits, 4-5 fms., on a sandy bottom.

There are four specimens from the above locality evidently belonging to the genus *Stylocheilus*, which, having lost all colour and being in rather poor condition, I refrain from describing. One of them, the smallest, differs from the rest in having a decidedly larger branchial opening in the mantle, which is not, I am of opinion, due to any contraction in the other three. All present a feature not mentioned by Gould in his description of the genus, viz. a duplicature of the anterior margin of the foot. In the figure, however, of *S. quercinus* (Wilkes's Explor. Exped., Atlas, Mollusca, pl. 16. f. 271) this peculiarity is indicated, of which a better idea is given in Savigny's figure of *Aplysia savignyi*, Atlas to the Explorations in Egypt, pl. 2. figs. 22, also copied in Rang's Hist. Nat. des Aplysiens, pl. 20. f. 2.

### 132. *Miamira nobilis*.

*Bergh*, Journ. Mus. Godeffroy, 1874, Heft vi. pl. 1. fig. 5; 1875, Heft viii. p. 53, pl. 8. figs. 1-30, pl. 9. figs. 1-4; *Semper*, Reisen Philippinen, Bd. ii. pl. 33. fig. 2; *Bergh in Semper's Reisen*, vol. ii. Heft 10, p. 411.

*Hab.* Port Denison, Queensland, 4 fms. (*Coppinger*).

Only a single specimen of this beautiful Nudibranch was obtained by Dr. Coppinger. It still retains in spirit the vivid orange spots, which in time will probably disappear. Dr. Semper found this species at the Philippines, and it has also been met with at Amboina (*Martens*) and the Samoa Islands.

### 133. *Ceratosoma tenue*.

*Abraham*, Ann. & Mag. Nat. Hist. 1876, vol. xviii. p. 141, pl. 7. figs. 5-5b; *Proc. Zool. Soc.* 1877, p. 234.

*Hab.* Thursday Island, Torres Straits, 4-5 fms.

This species and *C. caledonicum* of Fischer (Journ. de Conch. 1876, p. 92) may eventually prove to be identical, in which case

the latter name should be retained, having a few months' priority of publication.

The single specimen from Torres Straits agrees with the excellent description given by Mr. Abraham except in respect of the greater proportional length of the caudal portion of the body, which equals half the entire length of the animal, and the greater breadth of the foot, two differences probably due to the various degrees of contraction at death.

#### 134. *Doris* (*Platydoris*) *infrapicta*.

Body flattened, clongate oval. Mantle softish, fleshy, finely granular above, smooth beneath the widely expanded border. Foot broad, rounded at both ends, widely spreading all round except beneath the mouth, where it is more narrowly expanded, and has a narrow lamina above, which is notched in the middle and is produced a little in advance of the edge of the foot itself. Oral tentacles compressed, curving forward. Rhinophores short, with comparatively few laminae, pointed at the apex. Branchial plume six-lobed, each lobe trifurcate above, surrounding the small central yellow six (?) -lobed anus.

Colour pale buff, variegated with a dirty brownish tint above. Beneath, the mantle-expansion is copiously stained and blotched with dark chocolate-brown, except near the border, which is pale and unspotted. Foot spotted with the same colour, especially towards the centre, the margin being pale and destitute of markings. Length 50 millim., width 32; foot 43 long, 18 broad.

*Hab.* Queensland, 4 fms.

This species appears to be closely related to *D. inframaculata*, Abraham, from Amboina. It differs in coloration somewhat, the greater width of the foot, which is not "truncate in front," the softer character of the mantle, and the coarser granulation of its dorsal surface.

#### 135. *Plocamophorus insignis*. (PLATE VI. figs. L, L 1.)

Body elongate, ending posteriorly in a laterally compressed and obliquely truncate termination; (in spirit) of a pale colour, dotted with black along the sides close to the foot, on the oblique carinate margin of the posterior end, and on the sides of this caudal extremity, which also exhibits a few small rounded tubercles. Branchial plume a little posterior to the middle of the back, trilobed, one lobe central, anterior, the other two lateral, one on each side, bifurcate, all branching above. Anus stellate, situated between the lateral lobes. On the back, a little behind the branchiae, is situated a single black-spotted elongate papilla on each side. Foot elongate, with a double margin in front, finely tuberculated in the groove between the two edges, much attenuating posteriorly. Head with the frontal margin black-dotted, bearing a fringe of about eight slender prolongations; beneath this and between it and the mouth is a

narrow lamella, which on each side becomes rather broader, forming a small lappet of supraoral tentacles. Rhinophores rather lateral, far apart, conical, acute at the tips, carinate on the outside, concentrically lamellato-striated. Length 27 millim.

*Hab.* North Australia, Albany Island, 4 fms.

### 136. *Bornella digitata*.

*Adams & Reeve, Voy. 'Samarang,'* p. 67, pl. 19. fig. 1; *Alder & Hancock, Trans. Zool. Soc.* vol. v. p. 140, pl. 33. figs. 8, 9; *Bergh in Semper's Reisen Arch. Philippinen*, vol. ii. p. 301, pl. 37. figs. 14-19, & pl. 38. figs. 13-22.

*Hab.* Port Denison, Queensland, 4 fms. (*Coppinger*).

I have three specimens before me, which offer certain differences in the number of lobes on the branchial papillæ and even in the number of the papillæ themselves. All these have the four anterior pairs branchiferous, and in each case the two foremost pairs have two branchial tufts at the inner base (in contraction), but the two hindmost pairs exhibit considerable variation. In specimen No. 1 both pairs are provided with three tufts, of which the central one is very small. Specimen 2 has three tufts adjoining each of the third pair and two to each of the fourth. Example 3 has three tufts at the base of the left papilla of third pair, and two at the base of the opposite one of the same pair; of the fourth pair the right papilla is provided with three plumes or tufts and the left with two.

The annexed table will best illustrate the variation in the lobation of the papillæ:—

	First pair.	Second.	Third.	Fourth.	Fifth.	Sixth.
No. 1 . . . . .	3 lobes.	2	2	1	1*	1
„ 2 . . . . .	3 „	3	2	2	1	1*
„ 3 . . . . .	3 „	2	2	1	1	1*

The number of the frontal lobes is also very variable. In specimen No. 1 there are eighteen in both groups, in No. 2 twelve on the left and eleven on the right, and in No. 3 the left consists of sixteen and the right group of twelve.

Considering these variations, it appears to me very probable that *B. arborescens* of Pease is only a variety of this species. The original account by Pease differs considerably from that given by Bergh. The number of lobes on the six pairs of papillæ according to these authors varies, and even the number which are gill-bearing.

### 137. *Oncidium (Peronia) punctatum*?

*Oncidium punctatum*, *Quoy & Gaimard, Voy. de l'Astrolabe, Zoologie*, vol. ii. p. 215.

*Hab.* Albany Island and Thursday Island, N. coast of Australia (*Coppinger*).

\* These are not in pairs, but consist of a single simple papilla on the central dorsal line.

Four specimens from the above localities appear to agree fairly with the superficial description given by the zoologists of the 'Astrolabe,' whose examples were obtained at Port Dorey in New Guinea.

### III. CONCHIFERA.

#### 1. *Teredo* (*Xylotrya*) *antarctica*? (PLATE VII, figs. E-E 2.)

*Hutton, Cat. Marine Moll. New Zealand*, 1873, p. 59; *Journ. de Conch.* 1878, vol. xxvi. p. 43; *Man. N. Z. Moll.* 1880, p. 133.

*Hab.* Auckland to Dunedin (*Hutton*); Port Denison, Queensland (*Coppinger*).

The specimens from Port Denison, which may belong to this species, are very like *T. norvegicus* and *T. palmulata* externally. The sculpture is similar, but the notch or angle in the anterior side is not quite so deep as in the former. The interior of the valves has not a distinct ridge marking off the posterior lobe. The pallets, wanting in the specimens before me, are said to be "elongate, slightly curved, penniform."

#### 2. *Saxicava arctica*.

*Mya arctica*, *Linn.*

*Hab.* Port Jackson (*Coppinger*).

Four specimens from the above locality and others in the British Museum, also from New South Wales, I am unable to separate from this northern form. Dr. Gwyn Jeffreys and others have also failed to distinguish Australian from Arctic examples.

#### 3. *Venus lamellaris*.

*Antigona lamellaris*, *Schumacher, Essai*, p. 155, pl. 14. fig. 2.

*Venus lamarekii* (*Gray*), *Reeve, Conch. Icon.* figs. 39 a, b.

*Venus lamellaris*, *Pfeiffer in Küster's Con.-Cab.* p. 142, pl. 8. figs. 10, 11.

Var.=*Venus nodulosa*, *Sowerby, Thes. Conch.* pl. 153, fig. 16.

*Hab.* Friday Island, Torres Straits.

A single valve from this locality is rather longer than usual, having a length of 53 millim. and a height of 38.

#### 4. *Venus toreuma*.

*Gould, Wilkes's Explor. Exped.* p. 419, figs. 537, 537a; *Reeve, Conch. Icon.* figs. 64 a, b.

*Venus jukesii*, *Deshayes, Cat. Brit. Mus.* p. 100; *Pfeiffer, Con.-Cab.* p. 217, pl. 35. figs. 7-9.

*Venus sculpta*, *Deshayes, Reeve, l.c.* fig. 5.

*Hab.* Port Molle, Queensland, 14 fms., on a rocky bottom (*Coppinger*); Port Essington (*Jukes* for *V. jukesii*): mudflats at Facing Island, Port Curtis (*Brit. Mus.*); Sooloo Sea (*Gould*).

A specimen from the last locality but one is almost globular and

has a remarkably deeply sunken lunule; it is 34 millim. long, 31 high, and 28 in diameter.

### 5. *Venus torresiana*. (PLATE VI. figs. M-M 2.)

Shell subovate, moderately thick, nearly equilateral, concentrically finely ridged and radiately sulcated, white, irregularly rayed, streaked, and spotted with lightish brown. Anterior and posterior ends subequal, obtusely rounded, the latter rather the narrower; ventral margin broadly arcuate. Posterior dorsal slope straightish, rather more oblique than in front. Lunule narrowly cordate, generally of a chocolate-brown colour, partly so or merely whitish. Umbones small, red at the tip. Concentric ridges somewhat flattened, crowded, and subnodulous anteriorly through being crossed by the radiating striae, thin and lamellar behind. Striae less distinct on the central portion of the valves than at the extremities, and finer and closer together down the posterior side than elsewhere. Interior more or less pinkish, finely crenulated at the margin. Pallial sinus moderate, sharply rounded. Length 16 millim., height  $12\frac{1}{2}$ , diameter 8.

*Hab.* West Island, Prince of Wales Channel, and Thursday Island, Torres Straits, 4 fms. (*Coppinger*).

This species is somewhat like *V. (Chione) mesodesma*, Quoy and Gaimard, but is distinguished by its greater length and difference of colour in the interior. It is also not so high, the concentric riblets are thin and lamellar posteriorly; and the presence of radiating striae at once separates it from the New-Zealand form. There are several specimens from the above localities, all having a rosy tip to the beaks, the lunules more or less dark-coloured, the ridges thin posteriorly, and the striae in the same region finer and more numerous than elsewhere.

### 6. *Venus gladstonensis*.

*Angas, Proc. Zool. Soc.* 1872, p. 612, pl. 42. fig. 8.

*Hab.* Port Curtis (*Angas* and *Coppinger*).

This species is remarkable for the fineness of the concentric lamellae, which exhibit the radiating slender lirae on the outer side as is the case with other species. The crenulation of the inner margin of the valves is also excessively fine, and the pallial sinus is of moderate size and not very acute.

### 7. *Venus subnodulosa*.

*Hanley, Cat. Bivalve Shells*, p. 360, pl. 16. fig. 19; *Reeve, Conch. Icon.* fig. 102; *Deshayes, Cat. Conch. Biv.* p. 143, as *Chione*.

*Hab.* Philippine Islands (*Hanley*); Moreton Bay (*Strange* in coll. Cuming); Port Curtis (*Coppinger*).

This species is remarkable for the stoutness of the concentric ribs, which are rendered more or less subnodose by fine radiating



sulci cutting across them. The margin of the valves within is denticulate everywhere except down the posterior dorsal slope, the denticles on the edge of the lunule being finer and closer together than elsewhere. The pallial line is posteriorly nearly straight, or even a little *incurved* just before the commencement of the sinus, which is rather deep. The interior is generally somewhat rosy, especially towards the beaks.

8. *Cytherea (Caryatis) coxeni*. (PLATE VII. figs. A-A 2.)

Shell small, inequilateral, subtrigonally oval, white, variegated with pale zigzag brown or reddish lines forming an irregular broken-up network. Anterior dorsal margin straightish, much descending, sharply curving at the end into the upturned ventral outline. Posterior slope much longer, somewhat arcuate and less oblique than the anterior. Hinder extremity produced, roundly acuminate. Lower margin widely curved, about equally ascending at both ends. Umbones small, well curved over towards the front. Lunule longish heart-shaped, a little sunken, slightly elevated along the middle, and defined by an impressed line. Area indistinct. Surface of the valves finely sulcate-striated, the intervening liræ being somewhat rounded, much crowded at the sides, some of them not extending quite to the lateral outlines, especially posteriorly. Central cardinal tooth of the left valve thick, triangular, the two others slender and lamellar; posterior in the right valve elongate, the central erect, conical, free. Posterior muscular scar nearly circular, the anterior narrower, ovate. Pallial sinus moderately deep, rather wide, squarely truncated at the end. Length 13 millim., height  $10\frac{1}{2}$ , diameter 7.

*Hab.* Port Molle, Queensland, 14 fms.

This species I am unable to identify as the young stage of any known larger species. It apparently becomes more pointed behind as it increases: so that if it be the early growth of the species, the adult form will be much produced at that part. *C. minuta*, Koch, has no coloured pattern and a different pallial sinus.

The form of this species resembles very closely that of *C. pura*, Deshayes, a species found at Callao in South America. It is, however, more strongly concentrically lirated, is ornamented with pale brown zigzag lines and dots, and the form of the pallial sinus is quite different.

9. *Cytherea (Caryatis) albina*.

*Lamarck?*; *Römer, Monogr. Venus, Novitat. Conch.* p. 87, pl. 23. figs. 5-5 b.

*Hab.* Port Molle, Queensland (*Coppinger*).

The shell from the above locality agrees with Römer's determination of this species; and two specimens from Cape York in the Museum, named *D. bullata* of Sowerby by Deshayes (*Cat. Conch. Biv.* p. 70), are also referable to it, for they have not the straightish ventral margin of that species.



10. *Dosinia histrio* (var. *alba*).

*Gmelin*; *Römer, Monogr. Dosinia, Novitat. Conch.* p. 33, pl. 6. figs. 2 & 3.

*Artemis variegata* (*Chenu*), *Reeve, Conch. Icon.* figs. 33 a-c.

*Hab.* Clairmont Island, N.E. Australia (*Coppinger*).

A fine specimen from the above locality is entirely white, with the exception of the extreme tips of the beaks, which are of a pale rose tint, a feature apparently common in most white examples of the species. The specimen in question is  $37\frac{1}{2}$  millim. in length, the same in height, and 20 in diameter. In this species the dorsal area is very distinct and smooth in the left valve, but sculptured with the terminations of the concentric lamellæ in the right. On the contrary, the half of the lunule in the latter valve is generally greater than the remainder of it in the left.

11. *Dosinia deshayesii*.

*A. Adams*; *Römer, Monogr. Dosinia, Novitat. Conch.* p. 55.

*Hab.* Prince of Wales Channel, Torres Straits, 9 fms. (*Coppinger*); North Australia (*Cuming*).

12. *Circe pectinata*.

*Venus pectinata*, *Linn.*

*Hab.* Thursday Island and West Island, Torres Straits (*Coppinger*).

13. *Circe australis*.

*Sowerby, Thes. Conch.* ii. pl. 137. figs. 16, 17; *Reeve, Conch. Icon.* fig. 19.

*Hab.* Friday Island, Torres Straits, on the beach (*Coppinger*); N.E. coast of Australia (*Brit. Mus.*).

One specimen from Friday Island is peculiar on account of the unusual stylo of its coloration. It is white, with a large orange-brown patch covering the greater part of the surface, and exhibits a total absence of colour within.

14. *Circe (Lioconcha) castrensis*.

*Linn.*, vide *Römer's Monograph, Novitat. Conch.* pl. 44.

*Hab.* Port Denison, Queensland, 4 fms.

The variety of this well-known species from the above locality is very closely depicted by the second figure from the top on the left side of Römer's plate.

15. *Tapes hiantina*.

*Venus hiantina*, *Lamarck*; *Delessert, Recueil*, pl. 10. fig. 8; *Philippi, Abbild.* vol. iii. p. 21, pl. 8. fig. 1.

*Tapes hiantina*, *Römer, Monogr. Tapes, Novitat. Conch.* p. 99, pl. 34. fig. 1; *Reeve, Conch. Icon.* figs. 28 a, b.

*Hab.* Friday Island, Torres Straits.

16. *Tapes malabarica*.

*Chemnitz*; *Römer, Monog. Tapes, Novitat. Conch.* p. 34, pl. 10. figs. 3-3 d.

*Hab.* Port Molle, 14 fms. (*Coppinger*); Malabar, Molueca and Philippine Islands (*Römer*).

17. *Tapes variegata*.

*Sowerby*; *Römer, l. c. suprâ*, p. 78, pl. 27. figs. 2-2 e.

*Hab.* Port Curtis, 7 fms. (*Coppinger*); Philippine Islands and Japan (*Römer*).

18. *Tapes araneosa*.

*Venus araneosa, Philippi, Abbild.* vol. iii. p. 25, pl. 7. fig. 6.

*Tapes araneosa, Römer's Monogr., Novitat. Conch.* p. 53, pl. 19. fig. 1.

*Hab.* Port Darwin, N.W. Australia, 8-12 fms.

The locality of this species I believe has not hitherto been recorded. In the single specimen before me the umbones are all but terminal, so that the anterior end is even more perpendicular than as represented by Dr. Römer's figures. *T. deshayesi* is not unlike this species as regards its general form; but the anterior end is hardly so short, and the concentric sculpture decidedly coarser.

19. *Tapes (Textrix) textrix*.

*Venus textrix, Chemnitz.*

*Hab.* Port Jackson (*Coppinger*).

Two young examples of this well-known species are of a buff colour, mottled with bluish white at the umbones, and spotted with red-brown on the dorsal margins.

20. *Venerupis crenata*.

*Lamarck; Delessert, Recueil*, pl. 5. fig. 2; *Pfeiffer, Con.-Cab.* pl. 31. figs. 22, 23; *Sowerby, Conch. Icon.* fig. 3; *Reeve, Conch. Icon.* fig. 5 (as *Cypricardia serrata*).

*Hab.* Port Jackson (*Coppinger*).

21. *Trapezium vellicatum*, var.

*Cypricardia vellicata, Reeve, Conch. Icon.* pl. 2. fig. 7.

*Hab.* Port Darwin, 8-12 fms., bottom mud and sand (*Coppinger*); Philippine Islands (*Cuming*).

The North-Australian variety of this species is peculiar on account of the absence of the coloured rays which distinguish the typical form.

22. *Petricola lapicida*.

*Venus lapicida*, Chemnitz, *Con.-Cab.* x. p. 356, figs. 1664-5; *Sowerby, Conch. Icon.* (*Petricola*) figs. 22, 24; *Martens in Von der Decken's Reisen in Ost-Afrika*, vol. iii. p. 66, pl. 3. figs. 3 a, b.

*Hab.* West Indies (*Chemnitz, d'Orbigny, &c.*); North Australia (*J. R. Elsey in Brit. Mus.*); West Island, Prince of Wales Channel, Torres Straits (*Coppinger*); Zanzibar (*Peters, teste Martens*).

This and the *Venus divaricata* of Chemnitz I regard as one species, and from his description of the former it seems probable that he had before him specimens which to a great extent had lost the fine zigzag sculpture mentioned in his description of the latter. The raised oblique ridges from the umbones down the posterior slope have various degrees of development in different specimens, in some existing only near the posterior margin of the valves, whilst in others they extend the whole distance from the beaks downwards, and, again, in young shells they may be altogether wanting. These ridges are easily removed, and seem to be superimposed upon the zigzag sculpture beneath. After a careful examination of Australian specimens and others from the West Indies, I cannot detect any material specific differences.

The example figured by Dr. E. von Martens as *P. divaricata* is unusually peaked at the umbones.

23. *Psammobia modesta*.

*Deshayes, Proc. Zool. Soc.* 1854, p. 319; *Reeve, Conch. Icon.* fig. 3.

*Hab.* Port Jackson (*Coppinger*); Moreton Bay (*Deshayes*).

The single specimen before me is rather narrower than that figured in the 'Conchologia Iconica,' is purplish lilae within for the most part, yellowish near the muscular scars, and exhibits the pinkish rays on the ventral margin. The epidermis is brightish yellow. Oblique striæ are sometimes present at the central portion of the valves, but are not conspicuous.

24. *Psammobia gracilenta*. (PLATE VII. figs. B-B 2.)

Shell concentrically striated, transversely elongate, very inequilateral, almost twice as long as high, not very compressed, dirty whitish with a few diaphanous zones and several light reddish narrow rays beneath a thin pale yellowish-olive epidermis, very narrowly gaping at both ends. Anterior dorsal margin of the valves about twice as long as the posterior, subrectilinear, and nearly parallel with the ventral. Hinder dorsal edge oblique, a little arcuate. Lower margin straightish, obliquely curving upward in front and more sharply turning at the opposite extremity. Interior bluish white, iridescent, exhibiting the reddish rays. Beaks small, adjacent, posteriorly inclined. Ligament short, but prominent, placed on a conspicuous ligamental plate in each valve behind the umbones. A second minute ligament exists immediately in front of them and

is partly enclosed when the valves are shut. Cardinal teeth two in each valve, those of the right most prominent. Front dorsal margin of right valve narrowly grooved just within, simple in the left. Corselet linear. Posterior muscular impression rotund-pyriform, anterior more elongate. Pallial sinus moderate, extending forward beyond the middle of the valve. Length  $19\frac{1}{2}$  millim., height 10, diam. 5.

*Hab.* Prince of Wales Channel, 9 fms.

A very elongate narrow species, recalling to mind certain slender forms of the genus *Donax*.

## 25. *Tellina semen*.

*Hanley, Thesaurus*, vol. i. p. 249, pl. 56. fig. 8; (? *Sowerby, Conch. Icon.* vol. xvii. fig. 232, bad!).

*Hab.* Thursday Island, Torres Straits, in 5-7 fms.

Among the specimens from this locality is one of a purplish-rose tint, the rest being white like the type. The hinge of this species is composed of two cardinal teeth in the right valve (the posterior one larger and bifid, with one lateral tooth on each side and a groove between it and the margin), and of a single bifid cardinal in the left valve with a marginal lateral tooth or prominence on each side. The pallial sinus is very large, almost reaching to the anterior scar.

The form of this species is very similar to that of *T. obtusalis*, Deshayes, which is the same as *T. malaccana*, Sowerby (*Conch. Icon.* figs. 281a and 125). The posterior end, however, is not so obtuse and the form is not so like that of a *Donax*. In *T. obtusalis* the concentric striae are rather coarser than in the present species, and become very much finer anteriorly, so that in that part the shell is more glossy and comparatively smooth, which is not the case in *T. semen*. Another form, *T. semitecta*, Sowerby, from New South Wales, is very closely related to the present species, and is mainly distinguished by its rather more elongate form, and finer and less elevated sculpture at the hinder extremity.

## 26. *Syndosmya elliptica*. (PLATE VII. figs. C, C 1.)

*Tellina elliptica*, *Sowerby, Conch. Icon.* fig. 223 (bad!).

*Hab.* Port Jackson (*Angas and Coppinger*).

The type and a second specimen of this species were presented to the British Museum by Mr. Angas in 1871. Neither of these nor a third collected by Dr. Coppinger exhibit the sinuation at the posterior end of the ventral margin depicted in Sowerby's figure. His words "concentrically ridged behind the angle" are scarcely applicable, for in the first place there is only the feeblest indication of an angle and the sculpture behind it consists of mere concentric striation. The hinge-characters show this species to belong to the genus *Syndosmya*, and *Tellina simplex* of the same author (*Conch. Icon.* sp. 240) requires a similar location. The hinge of the present species consists of two cardinal teeth in the right valve, the posterior larger

and bifid, and two in the left, of which the anterior is the larger and bifid. A single lateral tooth occurs in the right valve on each side not far from the cardinals, with a groove between them and the margin. Left valve with a slight tooth-like projection on the margin on each side fitting into the grooves in the other valve. The pallial sinus is large and deep. Internal cartilage minute, narrow, oblique, posterior to the cardinal teeth. External ligament small. The largest specimen measures 13 millim. by  $9\frac{1}{2}$ . *T. alba* of Wood is somewhat like this species, but is more acute posteriorly, the detail of its dentition is different, and the cartilage larger.

### 27. *Macraa eximia*.

(*Deshayes*); *Reeve, Conch. Icon.* fig. 31 (rayed variety).

*Hab.* Port Denison, Queensland (*Coppinger*); Port Curtis, Moreton Bay (*coll. Cuming*); N.E. coast of Australia (*Brit. Mus.*).

There are altogether eight specimens of this species in the Museum, three of them being ornamented with numerous reddish rays, and the remaining five uniformly white beneath the greyish and yellowish epidermis.

### 28. *Macraa producta*, var.

*Spisula producta*, *Angas, Proc. Zool. Soc.* 1867, p. 909, pl. 44. fig. 7.

*Hab.* Port Jackson (*Angas* and *Coppinger*).

The three shells dredged by Dr. Coppinger are probably a variety of this species. They are all small, apparently immature, and differ from the types presented to the Museum by Mr. Angas in being less produced posteriorly. They are proportionally longer from the umbones to the ventral margin, which exhibits a very faint incurvation near the hinder extremity, and the posterior dorsal slope is a trifle more arcuate.

### 29. *Macraa (Oxyperas) coppingeri*. (PLATE VII. figs. D-D 2.)

Shell transversely elongate, triangular, a little inequilateral, rather compressed, thinish, narrowly gaping posteriorly, smooth towards the beaks, concentrically plicately ridged elsewhere, white, covered with a pale yellowish epidermis, spotted somewhat sparsely throughout with brownish dots, and ornamented on the dorsal areas with cross lines of a deeper brown, and with a large patch of the same colour on the hinder slope of each valve. Umbones moderately acute, not large, inclining towards and situated a trifle in advance of the centre. Lunule sunken, not circumscribed by acute edges, extending more than halfway down the anterior slope. Posterior area as deep as the lunule and a trifle longer, smoothish, not much affected by the terminations of the concentric ridges. Two lateral teeth on each side in the right valve, separated by a deep groove quite approximated to the cardinal teeth in front and the cartilage-pit behind. The latter is large, deep, and located posterior to the beak. The cardinal tooth is small, insignificant, bounds the ligament, and has a cross piece above it immediately beneath the apex of the



umbo. In the left valve, the single lateral tooth on each side is elongate, narrow, and erect. Only one cardinal tooth (unless the front raised edge of the ligamental fossa be considered a tooth), which is elongate, but little raised, situated between the pit and edge of the lunule. Muscular scars pyriform, the front one elongate, the posterior more rounded. Pallial sinus extending halfway across the valves, sharply rounded at the end. A second sinuation within the other, and consequently shorter and less acutely curved, is a remarkable feature in both valves of the single perfect shell before me: in a separate valve this is not noticeable, but may have been obliterated, as the specimen is somewhat sea-worn. The inner surface of this species is glossy and radiately substriated, one impressed ray from the umbones to the end of the mantle-sinus being especially conspicuous. Length  $36\frac{1}{2}$  millim., height 24, diameter 12.

*Hab.* Thursday Island, Torres Straits, 4-6 fms.

This very interesting species bears a rather close relationship to *Mactra triangularis* of Lamarck; it is, however, quite distinct. It is a trifle shorter, less angular, not so strongly concentrically costate, has an excavated lunule and a sunken area not defined by carinate edges, and the dorsal margins not prominent, forming a keel on each side; the umbones as in *M. triangularis*. *M. aspersa*, Sowerby, is a more finely sculptured shell, more rounded posteriorly, with a shallower lunule and a narrower dorsal area. The pallial sinus in the present species reaches halfway across the valve, whilst in *M. aspersa* it has a further extension and lacks the duplex feature described previously.

### 30. *Mactrinula angulifera*.

*Mactra angulifera*, Deshayes, *Proc. Zool. Soc.* 1854, p. 70; Reeve, *Conch. Icon.* fig. 83.

*Hab.* Island of Ticao, Philippine Islands (*Cuming*); Port Curtis (*Coppinger*).

Behind the conspicuous keel which marks off the posterior area, about midway between it and the margin, there are one or two minor ridges. In the Cumingian collection there is a second specimen, somewhat larger than that figured by Reeve, having a length of 32 millim. and a width of 47.

### 31. *Cardium reevianum*.

*Dunker, Novitates Conch.* p. 22, pl. 6. figs. 6, 7, 8.

*Hab.* Port Darwin, 8-12 fms., bottom mud and sand (*Coppinger*); Port Essington (*Mus. Cuming*).

*Cardium vertebratum*, Jonas (*Zeitschr. für Malak.* 1844, p. 33), from West Australia, is apparently closely related to the present species.

### 32. *Cardium hystrix*.

*Reeve, Conch. Icon.* figs. 40 *a, b*; *Römer, Conch.-Cab.* p. 112.

*Hab.* Corrigidor, Philippines (*Cuming*); Flinders and Clairmont Islands, N.E. Australia (*Coppinger*).



33. *Cardium*, sp. jun.

*Hab.* Port Curtis, Queensland (*Coppinger*).

The two young shells from the above locality are closely allied to *C. unicolor*, Sowerby.

34. *Chama divaricata*.

*Reeve, Conch. Icon.* fig. 20.

*Hab.* Torres Straits, 10 fms., sand and shell bottom (*Coppinger*); island of Samar, Philippine Islands (*Cuming*).

35. *Chama pulchella*.

*Reeve, Conch. Icon.* figs. 10 *a*, *b*.

*Hab.* Port Molle, Queensland, 12 fms. (*Coppinger*); Cape Upstart (*Jukes*).

The posterior brown ray is generally rather deeply sunken in this species.

36. *Cardium maculosum*, var.

*Wood, General Conch.* p. 218, pl. 52, fig. 3; *Reeve, Conch. Icon.* fig. 76; var., *Sowerby, Conch. Ill.* fig. 63.

*Cardium multistriatum*, *Sowerby, Conch. Ill.* fig. 59.

*Cardium arenicolum*, *Reeve, Conch. Icon.* fig. 78.

*Hab.* Port Molle, Queensland, 14 fms. (*Coppinger*); Ceylon (*Holdsworth* in *Brit. Mus.*); Molucca and Philippine Islands (*Cuming*); —? (*Wood*).

A single shell from Port Molle, nearly an inch long, differs from all specimens of this species which I have examined in having fewer ribs, separated by broader intervening sulci, especially down the anterior side, and in being yellowish with less and paler blotching with reddish purple except within the valves, where, on account of not being concealed by a deposit of callus, it is especially vivid. The number of costæ in this specimen is forty, and in typical examples there are usually about ten more. *Cardium modestum* of Philippi is also an allied species, with still fewer and stouter ribs, numbering altogether about thirty-five or thirty-six. *C. multistriatum* was originally described by Sowerby in the *Proc. Zool. Soc.* without a locality, and subsequently was stated by him to come from St. Elena, West Colombia; but this, I am inclined to think, requires corroboration.

37. *Cardium multispinosum*.

*Sowerby*; *Reeve, Conch. Icon.* fig. 10; *Römer in Küster's Con.-Cab.* p. 67, pl. 12, figs. 1, 2.

*Hab.* Port Molle, Queensland, 14 fms. (*Coppinger*); China (*J. Reeves* in *Brit. Mus.*); Philippine Islands (*Cuming*).

The number of ribs in this species may vary from thirty-one to

thirty-seven, the latter number being attained by the only small specimen (about a quarter the size of the adult shell) from Port Molle.

### 38. *Cardium* (*Hemicardium*) *unedo*.

*Cardium unedo*, *Linn.*

*Hab.* Port Molle, Queensland, on the beach.

This species has a wide distribution, having been recorded from the Mauritius, Ceylon, Philippine Islands, Cochin China, Cambodja, West Australia, and it has also been met with at the Solomon, Fiji, and other islands in the Pacific.

### 39. *Corbula tunicata*.

*Hinds, Reeve, Conch. Icon.* fig. 5.

*Hab.* Port Molle, 14 fms.; Prince of Wales Channel, Torres Straits, 5-7 fms.; Arafura Sea, N.W. coast of Australia, 32-36 fms., and Port Darwin, 8-12 fms. (*Coppinger*); Philippine Islands (*Cuming*); South Africa (*Hinds*); Port Jackson (*Angas*).

### 40. *Corbula fortisulcata*.

*Smith, Proc. Zool. Soc.* 1878, p. 819, pl. 50. figs. 23-23 *b*.

*Hab.* Port Darwin, N.W. Australia, 8-12 fms., sand and mud bottom (*Coppinger*); Port Essington (*Jukes*); and Andaman Islands (*Wilmer*).

### 41. *Corbula scaphoides*.

*Hinds, Proc. Zool. Soc.* 1843, p. 56; *Reeve, Conch. Icon.* fig. 24.

*Hab.* Port Molle, Queensland, 14 fms. (*Coppinger*); Cape York, N. Australia, in 5 fms., muddy sand and sea-mud (*J. Macgillivray* in Brit. Mus.); Singapore and Philippine Islands (*Hinds*).

The specimens described by Hinds were only half the length of the adult shells collected by Dr. Coppinger and Mr. Macgillivray.

### 42. *Lucina* (*Divaricella*) *ornata*.

*Lucina ornata*, *Reeve, Conch. Icon.* fig. 48.

*Lucina* (*Divaricella*) *angulifera*, *Martens, Moll. Mauritius*, p. 321. pl. 22. fig. 14.

*Hab.* Friday Island, Torres Straits (*Coppinger*); Port Jackson (*J. B. Jukes* in Brit. Mus.); coast of Africa (East or West?) (*Capt. Owen, R.N.*, in Brit. Mus.); Mauritius (*Robillard*): —? (*Reeve*).

This species should, I think, be separated from the West-Indian *L. dentata*, Wood (= *L. divaricata*, Lam. non Linn., = *L. serrata*, d'Orb.), to which it has been united by Pfeiffer in the 'Conchylien-Cabinet,' ed. 2, Veneracea, p. 269.

The incised lines are deeper, and form a more acute angle at the point of divarication. The type specimen is somewhat abnormal

in form, the more usual outline being represented by Reeve's fig. 47 *b*, which he wrongly ascribes to the West-Indian species. The difference in the angle of divarication of the ridges is at once seen by comparing the two figures 47 *a* and 47 *b*.

43. *Diplodonta subcrassa*. (PLATE VII. figs. I, II.)

Shell roundly subquadrangular, only moderately inflated, thickish, decidedly inequilateral, dirty white, not glossy. Anterior side shorter than the posterior, somewhat pointed at the extremity; hinder side very broad, squarish, yet rounded. Posterior dorsal margin straightish, only a trifle oblique; anterior a little concave near the beaks, then feebly curved and suddenly descending. Ventral outline arcuate, considerably upcurving in front. Surface concentrically finely striated, somewhat uneven through periodic interruptions of growth. Umbones small, contiguous, incurved, pellucid, located in advance of the median line. Hinge-teeth rather strong, posterior of the right valve and anterior in the left stout, subequal, bifid, and the anterior in the former is rather thicker than the hinder in the latter, which is sublamellar. Muscular scars somewhat small, deepish, subequal. Interior of the valves not very glossy, roughish.

Length 15 millim., height 14, diameter  $8\frac{1}{2}$ .

*Hab.* West Island, Prince of Wales Channel, Torres Straits, 7 fms.

This is rather a solid species and peculiarly acuminate at the extremity in front, with rather conspicuous lines indicating periodic growth.

44. *Diplodonta sublateralis*. (PLATE VII. fig. K.)

Shell very inequilateral, much broader behind than in front, scarcely longer than high, moderately inflated, white, finely concentrically sculptured with the lines of growth. Posterior dorsal margin nearly horizontal, straight at first, then gradually curving into the broadly arcuate lateral outline. Front dorsal edge somewhat oblique, scarcely recurved near the beak, but afterwards rounding into the side margin, which is very much more suddenly curvate than at the opposite end. Ventral margin more sharply arched than the posterior, but less so than the anterior. Umbones small, acute, only slightly elevated, situated far in advance of the centre. Hinge-plate narrow in the right valve, conspicuously grooved in front of the two cardinal teeth; of these the anterior is very small, lamellar, and falls perpendicularly beneath the beak, the posterior being about three times as thick and deeply bisected. The ligamental furrow is narrow and  $5\frac{1}{2}$  millim. in length. The muscular scars are subequal, the posterior a trifle broader. Length  $19\frac{1}{2}$  millim., height  $18\frac{1}{2}$ , diameter 10.

*Hab.* Torres Straits, 7-10 fms.

Only a right valve of this species was obtained by Dr. Coppinger, which, however, is apparently distinct in form, the chief distin-

guishing character in species of this genus. It recalls to mind *D. lateralis*, mihi, from the island of Rodriguez, although it is sufficiently distinct in form. The anterior side is longer, the beaks less lateral, and the height of the shell in proportion to the length is greater.

#### 45. *Kellia jacksoniana*. (PLATE VII. figs. F, F 1.)

Shell obliquely and subquadrately rounded, rather convex, pale grey, a little transparent towards the umbones, inequilateral; anterior end, or that toward which the beaks incline, much shorter than the posterior. Front margin obliquely curved; base straightish, but little arcuate. Hinder extremity produced somewhat at the lower part. Surface a little glossy, concentrically striated, some of the striae towards the margin more pronounced than those nearer the umbones. The latter a trifle prominent above the hinge-line, approximated, terminating in an incurved vitreous glossy apex. Teeth strong; in the right valve one immediately beneath the umbo and another posterior to the ligament; the left valve has two beneath the umbo and one posterior to the ligament. Muscular scars large, placed high up, the anterior subpyriform, the posterior longer. Pallial impression joining the scars high up on their outer margin. Length 7 millim., width  $8\frac{1}{2}$ , diam. of closed valves nearly 5.

*Hab.* Port Jackson (*Coppinger*).

*K. rotunda*, Deshayes, and *K. solida*, Angas, are also Port-Jackson species and the nearest allies of the present one. The former is almost as long as broad, nearly equilateral, of a thinner growth, and has slighter teeth; the latter is more solid, more transverse, rather more equilateral, is opaque white, highly glossy, has the interior thickened and subpunctate, and the pallial impression appears to join the lower extremity of the muscular scars.

#### 46. *Scintilla cuvieri*.

*Deshayes, Proc. Zool. Soc.* 1855, p. 174; *Sowerby, Thes. Conch.* vol. iii. p. 180, pl. 235. figs. 59, 60; *id. Conch. Icon.* figs. 15 a. b.

? Var. = *S. flavida*, *Deshayes, l.c.* p. 175; *Sowerby, Thes.* fig. 64; *Conch. Icon.* fig. 24?

*Hab.* Port Moller, Queensland (*Coppinger*); Baclayon, island of Bohol, Philippines (*Cuming*); Basay, island of Samar (*Cuming*, for var. *flavida*).

The figures of this species in the 'Conch. Icon.' are most inaccurate, and that in the 'Thesaurus,' although much better, is not quite correct. The umbones are smaller, more acute, and incline anteriorly, and the colour is not nearly so bright as depicted in the figure. The representation of the var. *flavida*, fig. 64, is still more unfaithful; the hinder margin is not obliquely truncate, but curved. I cannot discover any material distinction in this variety. It is smaller, which may be a matter of age, and the type is slightly narrower than the type of *S. cuvieri*; but of both forms I have

before me gradations in respect to length and breadth. Both are slightly narrower in front than behind, sculptured with fine concentric striæ and more or less indistinct shallow radiating markings, a feature unnoticed by Deshayes. Although the dentition is described by that author as somewhat different, I am bound to say, after a most careful examination, that both the number and position of the teeth are absolutely similar. In the left valve I find three teeth, the anterior one being very small at the termination of the inner margin of the hinge-plate, which is grooved on both sides of the beak. The central tooth is large, prominent, situated immediately beneath the point of the umbo, and the third is insignificant and posterior to the narrow oblique ligament. The right valve has a large prominent tooth a little in front of the apex of the umbo, and generally the extremity of the inner edge of the grooved hinge-plate is raised into a tooth-like prominence behind the ligament, which extends not only within the valves, but also along the hinge-line just above the teeth. The single specimen from Port Molle and one in the Cumingian collection are peculiar in having two or three of the shallow radiating impressions towards the hinder ventral extremity deeper, thus producing a wavy margin to the valves at that particular spot.

47. *Scintilla aurantiaca*. (PLATE VII. figs. H, H 1.)

*Deshayes, Proc. Zool. Soc.* 1855, p. 179; *Sowerby, Thes. Conch.* vol. iii. p. 176, pl. 234. fig. 5.

*Hab.* North Australia, under stones at low water (*Jukes*); island of Nairai, Fiji, at low water (*Brit. Mus.*); Port Molle, Queensland (*Coppinger*).

The specimens from Port Molle agree precisely with the types of *S. aurantiaca* in the national museum. There are some other species which I cannot distinguish from it; these are *S. faba*, Desh., *S. Forbesii*, Desh., *S. pallidula*, Desh., *S. ambigua*, Desh., *S. borneensis*, Desh., and *S. adamsi*, Desh. The last and *S. faba* are placed by Sowerby in the group of "species with no hiatus" in the ventral margin. This location is incorrect, for both gape slightly, and in fact Deshayes, in his description of the latter, says "margine inferiore angustissime hiante." This opening appears to be subject to variation in shells which are unquestionably the same specifically; and therefore I believe it probable that all the above-mentioned so-called species will prove to be variations of Lamarck's *Psammobia aurantia*, which, according to Sowerby's figure (*Conch. Icon.* fig. 20, *S. mauritiana*), has an extremely wide gape beneath. The latter species is said to be synonymous with *S. aurantia* by Deshayes (*Anim. sans Vert.* vol. vi. p. 180, *Galeomma aurantia*), and von Martens expresses a similar opinion (Möbius, 'Meeresfauna Mauritius &c.' p. 322). Deshayes (*P. Z. S.* 1855, p. 167) says that the Lamarckian shell is a *Galeomma*.

The animal of Dr. Coppinger's shells agrees with the description



given by Quoy and Gaimard of their *Psammobia vitrea* and with the figure in Möbius's work above referred to, pl. xxi. figs. 10 *a, b*. The foot protrudes at the narrower end of the shell; it is small when retracted, of a boot-like form, roundly carinate at the base, pointed at the tip, and furnished with what is probably a byssiferous process at the posterior end ("talon," Q. & G.); this is of an opaque white colour. The mantle is open in front and the anterior half of the ventral margin for the passage of the foot, and united along the rest of the basal and hinder margins, where there is a minute siphonal perforation. The surface of the mantle beneath is covered with papillæ, and the membranous marginal expansion in life probably covers nearly the entire surface of the shell, for even in spirit specimens it still extends halfway up the valves. There are two labial palpi on each side. From this description the close relationship with *Galeomma* is very apparent.

The dentition of this species, according to my observation, does not agree with the description given by Deshayes. In the right valve I find a prominent tooth a little in front of the beak, and a second more remote behind it; the left valve has two teeth, of which the anterior is the smaller, just beneath the umbo, and a third a little behind it. The ligament is externally visible, being attached to the hinge-line above the teeth, a portion of it being internal above and between the teeth.

#### 48. *Scintilla alberti*. (PLATE VII. figs. G, G 1.)

Shell small, pellucid, milky white, considerably inequilateral, transversely oblong, shorter and narrower in front of the umbones than behind them, moderately swollen. Lateral and dorsal margins curved, ventral rather rectilinear. Surface glossy, exhibiting (under the lens) distinct concentric lines of growth and also minute radiating and somewhat interrupted striæ, visible only under a compound microscope. Umbones small, slightly elevated above the hinge-margin, not quite adjacent, the valves being closed. Cardinal teeth insignificant, consisting of a single subumbonal denticular slight obtuse prominence, which is more distinct in the left than in the right valve. Ligament small, visible externally, extending on both sides of the apices of the beaks, but further posteriorly than in front. Height  $5\frac{1}{2}$  millim., width 4, length  $7\frac{1}{2}$ .

*Hab.* West Island, Prince of Wales Channel, Torres Straits (*Coppinger*).

*S. hydatina*, Deshayes, appears to be more closely related to this species than to any other in the genus. It is, however, higher, more equilateral, flatter, with more equal sides and a curved ventral margin.

#### 49. *Crassatella pulchra*.

*Reeve, Conch. Icon.* fig. 16.

*Hab.* Thursday Island, Torres Straits, 3-4 fms. (*Coppinger*); Port Essington (*Capt. Wickham, R.N.*, in Brit. Mus.).



This so-called species, also *C. donacina*, Lamarek, *C. cumingii*, A. Adams, *C. castanea*, Reeve, *C. erronea*, Reeve, and *C. decipiens*, Reeve, I believe to be mere variations of one and the same form, namely *C. kingicola*, Lamarek. The composition of the hinge is the same in all, and the peculiar colouring of the interior is similar (*vide* Reeve, fig. 16, and Delessert, pl. iv. fig. 1 b). The variation in form is partly due to age; for instance, a young *C. decipiens* has the form of *donacina*, and it is only towards maturity that the posterior end becomes markedly produced; and the same observation applies to *C. erronea*. The amount of concentric ribbing is not constant; but all intermediate forms are met with, from *C. castanea* and *C. donacina* (type), which have least, to *C. pulchra*, which has most, being eostate throughout, except at the posterior extremity. The pallial line in every specimen examined does not appear to be parallel with the margin of the valve, but becomes gradually more remote anteriorly, the space between it and the margin being radiately shallowly subsulate, seen better in some lights than others. The epidermis scarcely varies at all: in some examples it appears to have lost the dull bloom which covers others; but this defect is the result of friction, for a dull specimen in perfect condition is easily rendered glossy by merely being rubbed with a wet cloth, the bloom disappearing as it does from fruit under similar circumstances. Judging from the specimens in the British Museum with reliable localities attached to them, it appears that the species ranges from Queensland on the east side of Australia, along the north coast to Swan River on the west. I find a specimen of the variety *cumingii* from Port Curtis and another from Sandy Cape on the north-east coast; var. *pulchra* from Port Essington; vars. *decipiens* and *castanea* from Swan River.

#### 50. *Modiola*, sp.

*Hab.* Port Molloe.

A single distorted specimen only is before me, remarkably like the European *M. barbata*.

#### 51. *Modiola glaberrima*.

*Dunker*; *Reeve, Conch. Icon.* fig. 48.

*Hab.* Sydney (*Dunker*); Port Jackson (*Coppinger* and *Angas*).

#### 52. *Modiolaria miranda*. (PLATE VII. fig. N.)

Shell transversely elongate, highest at the middle, of pale greenish tint, varied with a few indistinct light reddish irregular markings, not glossy, rather strongly radiately ridged at both ends and very finely on the central portion of the valves. Whole surface concentrically striated, producing a subgranose appearance upon the costulae; the anterior are about ten in number, the posterior about

twice as many, and produce a denticulate margin to the valves. Interior slightly iridescent. Umbones small, glossy, not radiately sculptured like the rest of the shell. Length 6 millim., height  $3\frac{2}{3}$ , diam. 3.

*Hab.* Dundas Straits.

This is a very prettily sculptured species, approaching, as regards outline, *M. varicosa*. It is, however, quite distinguishable by the greater coarseness and subgranular character of the radiating anterior and posterior ridges.

The single specimen described above may not be full-grown; but I conjecture it never attains a much larger size.

### 53. *Modiolaria varicosa*. (PLATE VII. figs. M, M 1.)

Gould, *Proc. Bost. Soc. Nat. Hist.* 1861, vol. viii.; *Otia Conch.* p. 176.

*Hab.* Port Jackson (*Coppinger*); Sydney (*Gould*).

This pretty little species was figured by Reeve (*Conch. Icon.* fig. 83) as the young of *Modiola strigata*, Hanley; and this must have induced Gould to observe that it "is marked like" that species, for in reality there is very little resemblance in the painting of the two shells. The radiating sculpture is faintly indicated in the above figure by means of scratched lines, but these are only noticeable under a lens.

### 54. *Lithodomus teres*.

*Modiola teres*, *Philippi*, *Abbild.* vol. ii. p. 148, pl. 1. fig. 3.

*Lithodomus teres*, *Reeve*, *Conch. Icon.* fig. 13.

*Hab.* Pacific Ocean (*Phil.*); Philippine Islands (*Cuming*); Port Denison, Queensland (*Coppinger*).

The anterior perpendicular striae are rather coarse in this species; the raised interstices between them are very conspicuous at the margin, and gradually become finer as they ascend the valves, sometimes furcating at one or more of the concentric lines of growth. The interior is pinkish or bluish, and more or less iridescent.

### 55. *Arca navicularis*.

*Bruguère*; *Philippi*, *Abbild.* vol. ii. pl. 3. fig. 2; *Reeve*, *Conch. Icon.* fig. 70; *Wood*, *Index Test.* pl. 9. fig. 5.

Var. = *Arca linter*, *Jonas*, *Philippi*, *l. c.* fig. 1.

Var. = *Arca subquadrangula*, *Dunker*, *Philippi*, *l. c.* fig. 3.

Var. = *Arca cumingii*, *Dunker* (*MS. in coll. Cuming*); *Adams*, *Genera Moll.* ii. p. 533.

*Hab.* Port Molle, Queensland (*Coppinger*); Port Phillip, China, Cape Capricorn, Amboina (*Brit. Mus.*).

The varieties respectively called *A. linter* and *A. subquadrangula* are distinguished only by very variable characters, such as form and the amount of ligament, which in this group of Arks are of little value.

56. ? *Arca imbricata*.

*Bruguère*; *Reeve, Conch. Icon.* fig. 73.

*Hab.* Port Molle, Queensland, 12 fms. (*Coppinger*); Geelong, Port Philip (*Mus. Cuming*); Port Essington and N.E. Australia (*Brit. Mus.*).

The specimens from the above localities belong to one species, and so closely resemble, with the exception of colour, West-Indian examples of this species, that I hesitate to separate them specifically. I fail to discover any good distinctions between *A. cunealis*, *Reeve*, *A. kraussi*, *Philippi*, and *A. imbricata* = *A. umbonata*, *Lamarck*, except that the two former generally, but not always, have more rhomboidal grooves on the ligament.

57. *Arca (Barbatia) lima*.

*Arca lima*, *Reeve, Conch. Icon.* fig. 101.

*Hab.* Port Molle, 14 fms., and Thursday Island, 2-6 fms. (*Coppinger*); Buriat and Corrigidor, Philippines (*Cuming*).

"Light brown, stained with brown, spotted with brown, posteriorly covered with a thin, very fine bristly epidermis." Such is the erroneous description given by *Reeve* of this species. It is, in fact, a purely white shell throughout, and all the brown stains and spots are merely the remains of the epidermis. The entire surface is ornamented with very numerous close-set fine radiating riblets, which are finely granular, the granules so placed as to form concentric series. About half a dozen of the costæ down the posterior side and a few at the anterior end are thicker than the rest on the central portion of the valve, and consequently have larger granules, those behind being further apart also. The few ribs towards the middle being duplicate, as stated by *Reeve*, is an individual rather than a specific character. The interior is white, and the margin crenulated, the crenulation corresponding in coarseness with the radiating costæ.

58. *Arca (Barbatia) tenebrica*.

*Arca tenebrica*, *Reeve, Conch. Icon.* fig. 105.

*Hab.* Samar, Philippines (*Cuming*); Port Essington (*Capt. Wickham* in *Brit. Mus.*); Port Curtis (*Dr. Coppinger*); Bombay (*Mus. Cuming*).

The surface of this species is minutely reticulated with excessively fine radiating and concentric liræ, of which the former are the coarser, subgranular, and generally alternating finer and coarser. The valves exhibit an indication of a faint depression down the middle, from the umbo to the centre of the ventral margin, which in some specimens is slightly incurved or sinuated at that part. It is also thickened within, smooth, and rounded.

The interior is bluish white and radiately striated, the striæ being

particularly conspicuous at the pallial line, where they terminate. The muscular scars are large, well defined by a line radiating from the umbones. Hinge-teeth rather numerous, minute in the centre, considerably larger at both ends. In the type there are forty, and a specimen about half-grown has thirty-five. The ligament is narrow, but very coarsely striated transversely. The epidermis is thinnish and somewhat fibrous near the margins, especially posteriorly.

#### 59. *Arca* (*Barbatia*) *symmetrica*.

*Arca symmetrica*, *Reeve, Conch. Icon.* sp. 117, and fig. 120.

? Var. = *Arca zebuensis*, *Reeve, l.c.* fig. 117, sp. 120.

*Hab.* Port Molle, Queensland, 12–20 fms. (*Coppinger*); Bay of Manila (*Cuming*).

In the 'Conchologia Iconica' the numbers of the figures 120 and 117 should be reversed. The specimens of *A. symmetrica* which were described by Reeve are of a greenish tint, and not so oblique as *A. zebuensis*. The sculpture in both consists of fine radiating liræ, rendered minutely granular by the concentric lines of growth. The liræ vary but little in thickness, with the exception of a few finer intermediate ones here and there and those on the posterior extremity, which are a trifle stouter. *A. zebuensis* differs, in addition to its extra obliquity before referred to, resulting from the less central position of the umbones, in being a trifle more finely lirate. One of the specimens from Port Molle is somewhat intermediate in form, being more oblique than *A. symmetrica* and less so than *A. zebuensis*. The measurements of two specimens will indicate to what extent the form and proportions may vary:—

No. 1. Height  $7\frac{3}{4}$  millim., length 11, diameter 8.

No. 2. „  $6\frac{3}{4}$  „ „ 11, „  $6\frac{1}{2}$ .

#### 60. *Arca* (*Trisis*) *tortuosa*.

*Arca tortuosa*, *Linn.*

*Hab.* Singapore and Malacca (*Cuming*); North-west Australia (*Du Boulay*) and China (*Reeves*), in Brit. Mus.; Port Curtis in 11 fms., sand and shell bottom (*Coppinger*).

The right valve of this well-known and remarkable shell always appears to retain more of the epidermis than the left. The foot and mouth of the animal, as might be expected, are at the narrow end of the shell. The foot (in spirit) is small, narrow, and grooved beneath, retaining a small byssus.

#### 61. *Leda darwini*. (PLATE VII. figs. L–L.2.)

Shell a little inequilateral, rather convex, transversely irregularly ovate, acuminate posteriorly, thinnish, glossy, moderately coarsely concentrically ridged and sulcate throughout, except upon the lunule and area, the ridges being finer and the sulci broader on a slightly depressed portion of the surface down the posterior side, which is of

a transparent white colour, and not pale olive-green like the rest of the surface. At the anterior end a few oblique lines, commencing at the ridge which borders the lunule, fall across the concentric sculpture, but are only noticeable in certain lights. The dorsal margin is very faintly arcuate in front and scarcely descending, a trifle more oblique behind, and rectilinear except near the extremity, where there is a very feeble sinuation. The lower outline is broadly arcuate, considerably upcurving in front, and at its junction with the dorsal edge forms an obtuse or rounded angle; at the posterior end it ascends more gently (the curve being indistinctly interrupted by a very faint prominence which defines the portion of the surface upon which the concentric ridges are finer than elsewhere), producing with the dorsal slope a sharpish rostrate end. The umbones are rather large and prominent, coarsely concentrically sculptured, situated a little posterior to the centre, and incline somewhat towards the hinder side. The dorsal areas are distinctly defined by elevated margins, and the posterior is broader than the anterior or lunule. Teeth about 43 in number, whereof about 16 are on the posterior side, and the rest in front. The interior of the valves is transparent milky white, and the margin is acute and smooth. The pallial sinus is deep, narrow, and rounded at the end. Length  $17\frac{1}{3}$  millim., height  $9\frac{2}{3}$ , diameter 7.

*Hab.* Port Darwin, 8–12 fms., mud and sand bottom.

This species is very closely related to *L. confusa*, Hanley. It is, however, thinner, not so equilateral, more coarsely sculptured, has more prominent umbones, and the margin of the valves is not minutely crenulated within.

## 62. *Malleus legumen*.

*Reeve, Conch. Icon.* fig. 2.

*Hab.* Philippine Islands (*Cuming*); Port Curtis (*Coppinger*).

The interior of this species is waxy white, except the upper part of the nacreous portion beneath the ligament, where there is a large dark purplish spot. The non-nacreous portion exhibits a raised sub-central ridge extending from the margin of the pearly lining nearly to the lower extremity.

## 63. *Avicula lata*.

*Gray, 1845, Appendix to Eyre's Central Australia*, p. 435, pl. 6. fig. 1;  
*Reeve, Conch. Icon.* fig. 5.

*Avicula serrulata, Dunker, Zeitschr. f. Malak.* 1848, p. 178; *Conch.-Cab.* ed. 2, p. 18, pl. 5. figs. 1, 2.

*Hab.* West Island, Torres Straits, in 7 fms., sand (*Coppinger*); Port Essington (*J. B. Jukes* in *Brit. Mus.*); Raine's Island, Torres Straits (*Lieut. Ince, R.N.*, in *Mus. Cuming*); Moluccas (*Dunker*).

Reeve and Dunker appear to have been unaware that this species was both figured and described by Gray. Apparently, as a rule, it is longer than either of the specimens figured in the 'Conch. Icon.' or



'Conch.-Cab.' That collected by Dr. Coppinger has the auricle præcisely like that of Dunker's specimen, this form of it being, judging from the series before me, more usual than that figured by Reeve.

#### 64. *Avicula rufa*.

*Dunker, Conch.-Cab.* p. 53, pl. 19. figs. 7, 8.

*Hab.* Java (*Dunker*); West Island, Prince of Wales Channel, Torres Straits, 7 fms., sandy bottom (*Coppinger*).

All three specimens from the latter locality exhibit several white radiating lines on both valves, as indicated in the figure 8 referred to. The presence of these rays appears to have been rather exceptional in the Javan specimens examined by Dunker.

#### 65. *Avicula smaragdina*.

*Reeve, Conch. Icon.* fig. 45.

*Hab.* Moluccas? (*Reeve*); N.E. Queensland (*Coppinger*).

The young stage of this species has not the very prolonged oblique form of the adult. The figure in Reeve's work is much too vividly coloured, nor does it indicate any rays of spots of a darker tint which generally adorn both valves. The ear of the left valve is coarsely concentrically wrinkled and extends a little within the valve. This species may be the *Mytilus meleagridis* of Chemnitz (*Conch.-Cab.* viii. p. 143, fig. 726).

#### 66. *Avicula zebra*.

*Reeve, Conch. Icon.* fig. 36; *Dunker, Conch.-Cab.* p. 60, pl. 21. fig. 3.

*Hab.* Moreton Bay (*Reeve*); Port Denison, Queensland, 3-4 fms. (*Coppinger*).

The two specimens obtained at the latter locality were attached to a species of Polyzoa, and in a similar position to the types as figured in the 'Conchologia Iconica,' namely with the umbones directed downwards.

#### 67. *Melina cumingii*.

*Perna cumingii, Reeve, Conch. Icon.* xi. fig. 3.

*Hab.* Australia (*Reeve*); Port Curtis (*Coppinger*).

The specimen figured by Reeve is higher than long, but another in the Cumingian collection has these proportions reversed.

#### 68. *Crenatula nigrina*.

*Lamarck; Reeve, Conch. Icon.* fig. 1 a.

*Hab.* Red Sea (*Reeve*); Albany Island, west coast of Australia (*Coppinger*).

This species, also *C. bicostalis* and *C. mytiloides*, as determined by Reeve, are probably slight variations of one and the same form.

69. *Spondylus multisetosus*.

*Reeve, Conch. Icon.* fig. 11.

*Hab.* Philippine Islands (*Cuming*); Warrior Reef, Torres Straits (*Coppinger*).

The principal ridges which support the largest spines are about twelve in number on the upper valve, pale or yellowish between the spines, at the base of which they are stained with a dark sanguineous colour. The interior of the valves is margined with purplish brown, and the straight hinge-line is finely striated within transversely; the flat hinge-area of the lower valve is also finely striated across.

70. *Spondylus victoriæ*.

*Sowerby, Proc. Zool. Soc.* 1859, p. 428, pl. 49. fig. 8.

Var.=*Spondylus wrightianus*, *Crosse, Journ. de Conch.* 1872, vol. xx. p. 360, vol. xxi. p. 253, pl. 9. figs. 1, 1a.

*Hab.* New Caledonia (*Mus. Cuming*); Flinders and Clairmont, Islands N.E. Australia, 11 fms., sand and mud bottom, and Port Molle, 10 fms. (*Coppinger*); Nichol Bay, Australia (*Crosse* fide *Wright*).

The description of this species given by Sowerby is very insufficient, and his locality, "Gulf of California," incorrect. He describes the number of large costæ as four; but as a rule there are five, which even appear in his own figure.

In the lower or attached valve the number of large spine-bearing ridges in the three specimens before me is seven; these spines are generally straighter than those on the upper valve, and channelled on the upperside. Sowerby's figure exaggerates the wavy character and breadth of the upper spines.

The surface of the valves and the hinge-area agree with Crosse's description of the variety *wrightianus*, which has the spines on the upper valve straighter, and less spreading at the extremities. The single specimen dredged by Dr. Coppinger has the spines of a pinkish-buff colour, whilst those in the type are pure white.

71. *Pecten leopardus*.

*Reeve, Conch. Icon.* fig. 145.

Var.=*Pecten kuhnoltzi*, *Bernardi, Journ. de Conch.* 1863, vol. viii. p. 378, pl. 13. fig. 1.

Var.=*Pecten solaris*, *Sowerby (non Born)*, *Thes. Conch.* pl. 12. fig. 22; *Dunker in Philippi's Abbild.* vol. i. pl. 2. fig. 2; *Reeve, Conch. Icon.* fig. 92.

*Hab.* Moreton Bay, Queensland (*Reeve*); Arafura Sea, Dundas Strait (*Coppinger*); New Caledonia (*Bernardi*); Amboina (*Dunker*, for var. *solaris*).

It is not surprising that M. Bernardi did not recognize his shell in *P. leopardus*, considering how inadequate a description is given by Reeve. I have carefully compared red-rayed specimens from

New Caledonia with the type from Moreton Bay, and am convinced that they constitute but a single species. The sculpture is the same in both, and the blood-red stain within the valves of a crescent form, leaving the centre and margin white, is present in adult specimens of each, but not always in the young. The only distinction appears to be a little variation of colouring on the upper valve, which in the typical form is white, with the ridges stained and blotched with "fulvous rust," whilst the variety has the costæ more uniformly tinted with "red" or pinkish brown, some of them being much paler than others; but I do not ever find them alternately white and red. The darker ones are usually in pairs, but just on the right of the centre three dark rays come together. In other words, the shell may be described as having four rays, three of them tinting two adjacent costæ each, the fourth covering three. This same distribution of pale and darker rays holds good in the typical form and is faintly indicated in Reeve's figure; and in the handsomer variety, *P. solaris*, the same peculiarity is met with and is well portrayed in Philippi's work. This charming form has the interior similarly stained with blood-red as in the two other varieties. This cannot, I consider, be the species described by Born as *Ostrea solaris*, which differs greatly in form, especially with regard to the auricles. The only shell having similar small ones, as far as I can discover, is *P. superbus*, Sowerby; this is not, however, "orange"-coloured, has unequal dorsal slopes, narrower costæ, and deeper grooves. Born's figure, however, is unreliable, for it represents a shell 40 millim. in length from the hinge-line to the opposite margin, and nearly 42 millim. across, whilst his measurements, given in the text, are—length 39 millim., width  $30\frac{1}{2}$  millim.

## 72. *Pecten singaporinus*.

Sowerby, *Thes. Conch.* vol. i. p. 74, pl. 13. fig. 55, pl. 14. fig. 71;

Reeve, *Conch. Icon.* fig. 74.

*Pecten pica*, Reeve, *Conch. Icon.* figs. 115 *a, b*.

*Pecten cumingii*, Reeve, *l. c.* figs. 140 *a, b*.

*Hab.* Singapore (*Sowb.*); New Zealand (*Reeve*, for *pica*); Port Curtis (*Coppinger*); Moreton Bay (*Reeve*, for *cumingii*).

I cannot discover any distinction between *P. pica* and this species. The anterior auricle of the right valve is destitute of colour, and the serrated margin beneath it is also white. *P. cumingii* is a fine growth of the same, having the peculiarities above mentioned, but with the costæ slightly stouter.

## 73. *Pecten dringi*.

Reeve, *Conch. Icon.* figs. 152 *a, b*.

*Hab.* Port Molle, Queensland, 14 fms. (*Coppinger*); Bathurst Island, N.W. Australia (*Reeve*); Cape Capricorn, E. Australia (*Brit. Mus.*).

Purplish and brownish-purple forms of this species appear to

be more common than the variety figured by Reeve (fig. 152*a*), which does not represent the full dimensions of the species. The largest specimen in the Museum is 45 millim. high and 40 millim. in width.

#### 74. *Pecten funebris*.

*Reeve, Conch. Icon.* fig. 85.

*Hab.* Bathurst, Australia (*Reeve*); Swan River and Port Essington (*Brit. Mus.*); Port Curtis, Queensland (*Coppinger*).

The sculpture of this species resembles that of the young of *P. asperimus*, consisting of numerous fine costæ bordered on each side by a much finer and less elevated one, and all bearing prickly scales. The interior is pale olive, with paler radiating grooves and a purplish border all round.

#### 75. *Amussium pleuronectes*.

*Hab.* Flinders and Clairmont Islands, N.E. Australia (*Coppinger*); China.

#### 76. *Lima (Mantellum) fragilis*.

*Chemnitz; Sowerby, Thes. Conch.* vol. i. p. 86, pl. 22. figs. 34-36; *id. Conch. Icon.* figs. 18*a*, *b*.

*Hab.* Port Molle, Queensland (*Coppinger*); Mauritius (*Martens*); Torres Straits (*Jukes*); Philippine Islands (*Cuming*); Port Essington, Oomaga Reef, Fiji Islands (*Brit. Mus.*).

#### 77. *Placuna lobata*, var.

*Sowerby, Conch. Icon.* pl. iv. fig. 4*a*, pl. v. fig. 4*b*, var.

*Placenta planicostata, Dunker, Journ. de Conch.* 1879, vol. xxvii. p. 214, pl. 9. fig. 2.

*Hab.* Port Essington (*Brit. Mus.*); Torres Straits (*Coppinger*).

The colouring of Sowerby's figure is ridiculous, the yellow ground-colour being purely imaginary. The type is whitish towards the umbones, but light purplish red elsewhere, rayed with a much darker tint, the rays being narrower than as depicted in the figure.

The single specimen from Torres Straits has the ground-colour light purplish red like the type, but the slightly elevated rays are white instead of being darker.

## ECHINODERMATA.

BY

F. JEFFREY BELL.  
P. 2

THE chief points of interest attached to the 'Alert' collection of Echinoderms may be indicated as follows:—

Though there are no new Echinoidea, there are some very precious series of some species, *Marelia planulata* being notably well represented. Similarly the series of some of the Asterids has given us evidence of a variability that would be almost incredible but for the careful registration of the localities of the species. Rare and new forms of Ophiurids and Asterids will, on inspection of the succeeding systematic list, be found to be well represented: *Ophiothrix* has a large number of forms, the exact delimitation and definition of which has been to me a matter of just as much anxiety and doubt as it has been to my predecessors; but a study of the collection has led me to a somewhat important conclusion, in that I have been compelled by the evidence to attach much less weight than some have done to the characters of the coloration\*.

The question of coloration of forms has taken on almost a new aspect since the publication by Mr. Seeborn of his views as to the value of the pattern of colour in the Turdinæ (Cat. Birds B.M. v. p. viii); while, on the other hand, the recent statements of such experienced entomologists as Butler, who thinks that in time it will be impossible to decide, without rearing from the egg, whether any form is a species, a hybrid, or a variety (Trans. Ent. Soc. 1880, p. 200), and Elwes, in whose opinion (*l. c.* p. 134) climate, food, and conditions of life will more than account for the change in tint of certain representative species, seem to indicate that in the group of the Lepidoptera, where coloration has been so much attended to, those who are among the most experienced are learning to doubt its value, and to recognize, as the professed students of ichthyology (see Günther's 'Study of Fishes,' pp. 176-182) would seem to have done, that in coloration there is great variation. It would be a matter for regret if, when the views of others are advancing, the describer and systematist of Echinoderms should make a backward

\* Lütken, "Le système général de coloration constitue un caractère important qu'il ne faut pas négliger dans la distinction des *Ophiothrix*" (Vid. Selsk. Skr. (5) Bd. 8, ii. p. 104); and compare the descriptions of all writers on the genus.



step. Coloration can only be safely used when the hypothesis that the genus or group is of so late an origin as not to have yet developed definite structural characters by which its species may be discriminated is not controverted by any one species; where it is, the character must be less freely used, probably to disappear more and more, not so much with the increased evolution of the genus as with our increased knowledge of it.

The succeeding pages contain an account of, or the names of, 124 species, very fairly divided among the 5 orders. Of these there are 30 new species, 15 of which belong to the Crinoids and the other 15 to the remaining orders. There is no new Echinid; but I have had to suggest a new name for the form which by some has been regarded as *Salmacis globator*.

## ECHINOIDEA.

### 1. *Phyllacanthus annulifera*.

*A. Agassiz, Rev. Ech. p. 387\*.*

A most valuable and important series for exhibiting the variation of this species.

Thursday Island; Port Molle (14 fms.); Port Curtis; Prince of Wales Channel; Albany Island; Port Darwin.

### 2. *Diadema setosum*.

*A. Agassiz, Rev. Ech. p. 274.*

Port Molle; coral-reef.

### 3. *Salmacis bicolor*.

*A. Agassiz, Rev. Ech. p. 471.*

A good series, with spines well preserved on most from Port Molle.

### 4. *Salmacis sulcata*.

*A. Agassiz, Rev. Ech. p. 476.*

Port Denison (4 fms.); Port Molle (14 fms.).

### 5. *Salmacis alexandri*.

*Salmacis globator, Alex. Agassiz (not L. Agassiz), Rev. Ech. p. 473; 'Challenger' Reports, iii. p. 113.*

*Salmacis globator, form a, Bell, P. Z. S. 1880, p. 433, pl. xli. fig. 1.*

In the third part of my "Observations on the Characters of the

\* As a rule, I shall give only one bibliographical reference, and that to the 'Revision of the Echini' of Prof. Alex. Agassiz.

Echinoidea," I directed attention to the marked discrepancies which obtained between the descriptions given by Louis and Alexander Agassiz respectively of the species known as *S. globator*. I then figured and gave careful descriptions of the tests of two forms which I distinguished as form  $\alpha$  and form  $\beta$ . I adopted that course in the hope that Prof. Alexander Agassiz would explain the reasons which had led him to omit any notice of the species referred to by his father. In the 'Challenger' Report the species is merely recorded, and reference made to the 'Catal. Raisonné' of Agassiz and Desor; fortunately the specimens are now in the British Museum collection, and an inspection of them is, of course, sufficient to show the characters of the form which Mr. Alex. Agassiz looks upon as being *S. globator*. I find them to be examples of what I have called form  $\alpha$ , or, in other words, they are not representatives of L. Agassiz's species *globator*.

As the species reappears in the 'Alert' collection, it has been necessary to direct attention to the various points and to propose a name for the species. No appellation will, I think, be more suitable than that of *alexandri*; and, at the time of giving a definite name, one is also able to have the pleasure of adding a definite locality.

West Island, Prince of Wales Channel.

#### 6. *Temnopleurus toreumaticus*.

*A. Agassiz, Rev. Ech.* p. 463.

One of the specimens (diameter 18.5 millim.) has all the spines which are preserved on it perfectly white, without any bands whatever. Smaller specimens in the British Museum collection have a number of, but not one has all, its spines thus totally white.

Port Denison (4 fms.); Prince of Wales Channel.

#### 7. *Temnopleurus granulatus*.

*Toreumatica granulosa*, *Gray, P. Z. S.* 1855, p. 39.

*Temnopleurus granulatus*, *Bell, P. Z. S.* 1880, p. 425.

A good series, with the general colour of the spines dark, and not light, ringed with red as in the specimens from the Japanese seas.

Port Denison.

#### 8. *Temnopleurus bothryoides*.

*Pleurechinus bothryoides*, *A. Agassiz, 'Challenger' Rep.* iii. p. 108.

This is one of the most important of Dr. Copping's finds, for with the exception of a single, though perfect, test in the collection of the British Museum, which was obtained by Sir E. Belcher off Borneo, and presented by the Admiralty in 1844, no complete example had ever been examined till the return of the 'Challenger.' The largest specimen taken by Dr. Copping is a little larger than

any one of the three collected by the officials of that great circum-navigating expedition.

Though the term *Pleurechinus* is due to L. Agassiz, and the specific name *bothryoides* to his incomplete comprehension of the *Cidaris bothryoides* of Klein and Leske, I have confined my "synonymy" to Alexander Agassiz's Report on the 'Challenger' specimens, as it is there only that any such definite information is given as would enable a zoologist to recognize examples of the species. The result to which my own study of the specimens and of the definitions has led me has, I think, been essentially confirmed by the investigation into the structure of the test which, at my suggestion, Prof. Martin Dunean was allowed to make\*.

Looking, first of all, at the general form of the test, the observer is struck by its greater proportional height; thus we find specimens with an absolute diameter of 20, 18, or 17 millim. respectively having a proportional height of 58.5, 66.6, and 60. In no known examples of any other species of *Temnopleurus* is the proportional height more than 63.63 millim.†, and this is a rare case, which obtains with a specimen only 11 millim. wide. The examination of the dental apparatus did not show any real point of difference between this species and *T. hardwickii*. As in other species of this genus, the abactinal area is much more prominent in younger than in older specimens, while the characters of the furrows between the plates is only intermediate between the extreme condition presented by *T. torreumaticus* and that which is seen in the species just mentioned.

As to the minute construction of the test, Dr. Duncan finds that "there is a generic relation between *Temnopleurus* and *Pleurechinus*, and the only important distinction is the absence of crenulation in the last-named type." To this crenulation or its absence Dr. Duncan attaches more importance than do many naturalists who have devoted themselves to this group, and he finds in consequence that "the classificatory position assigned by A. Agassiz to *Pleurechinus* in the 'Revision' must be conceded, and it is a subgenus or section of *Temnopleurus*." Notwithstanding the weight of the authority of Agassiz and Dunean, I am bound to say that I feel still the importance of the objections long ago urged by D'Archiæ and Haimc‡, "Quant aux crénelures des tubercules, on sait que cette particularité n'a également qu'une valeur très-secondaire, puisqu'on la voit déjà disparaître dans une certaine portion du genre *Cidaris*, sans qu'on puisse découvrir chez les espèces à tubercules lisses aucune autre différence concomitante;" and that being so, I can find no reason which will justify the retention of a genus never very accurately defined.

The largest specimen in the 'Alert' collection has a diameter

\* Journ. Linn. Soc. (Zool.) xvi. p. 447.

† P. Z. S. 1880, p. 424.

‡ Anim. foss. de l'Inde, p. 202 (1853). The student should be reminded that Prof. Martin (Notes Leyd. Mus. ii. p. 75) accepts the genus *Pleurechinus*.

of 20·5 millim. and is 12 millim. high; the abactinal area is 4·5 and the anal area is 2 millim. in diameter. The short primary spines, which, as in the other specimens, have two or three short bands of bright red on their white surface, have the neighbouring suckers of a purplish-slate colour, and these give a deeper and richer appearance than ordinary to the test. The abactinal area is not so conspicuous as in the smaller specimens, and only one of the genital plates has more than three tubercles.

Thursday Island; Prince of Wales Channel.

### 9. *Echinus angulosus*.

*A. Agassiz, Rev. Ech.* p. 489.

With a little hesitation I refer to this species three specimens from Thursday Island, and one from Prince of Wales Channel. The species is a wide-ranging one, and apparently presents a good deal of variation.

### 10. *Echinus darnleyensis*.

*J. E. Tenison-Woods, Proc. Linn. Soc. N. S. W.* ii. p. 165.

In accepting this species, I should like to do so only provisionally, as a systematic revision of the exceedingly troublesome genus to which it belongs may show it to be only part of one of the very variable species which are associated under the emended genus *Echinus*.

Thursday Island (4 fms.) and Prince of Wales Channel.

### 11. *Tripneustes angulosus*.

*Hipponoe variegata, A. Agassiz, Rev. Ech.* p. 501.

*Tripneustes angulosus, Bell, P. Z. S.* 1879, p. 657.

The coloration of this specimen is more marked than any I have yet had the opportunity of examining; the short white spines are found either on white areas, the middle of which is occupied by a black patch, or on broad black bands, rather more than half as wide as the white areas at the ambitus.

The single small specimen collected was found at Levuka, Fiji.

### 12. *Strongylocentrotus erythrogrammus*, *Val.*

*Strongylocentrotus eurythrogrammus, A. Agassiz, Rev. Ech.* p. 441.

It may perhaps be pointed out that the spelling of the specific name as here adopted is not only that which is etymologically correct, but is the very same as that which was proposed by Valenciennes ('Voy. Vénus,' Zoophyt. pl. vii. fig. 1), and adopted by Lütken and Verrill: it is true that in the 'Catal. Raisonné' of L. Agassiz and Desor (1846) we find the spelling *eurythrogrammus*,

and that the last-named naturalists were followed by Dujardin and Hupé. I am led to make these remarks from the fact that throughout the 'Revision of the Echini' the mode of spelling which is both etymologically and historically incorrect is not only adopted, but is ascribed to Valenciennes, to Lütken, and to Verrill, and is, curiously enough, carried on into the lately published Report on the Echinoida collected by the 'Challenger' Expedition.

Port Jackson.

### 13. *Echinometra lucunter*.

*A. Agassiz, Rev. Ech. p. 431.*

Port Molle (beach); Levuka, Fiji.

### 14. *Fibularia volva*.

*A. Agassiz, Rev. Ech. p. 509.*

Prince of Wales Channel.

### 15. *Clypeaster humilis*.

*A. Agassiz, Rev. Ech. p. 510.*

Port Molle (4 fms.).

### 16. *Laganum depressum*.

*A. Agassiz, Rev. Ech. p. 518.*

Torres Straits; Prince of Wales Channel.

The British Museum contains specimens collected by H.M.S. 'Challenger' in the Arafura Sea.

### 17. *Laganum decagonale*.

*Peronella decagonalis, A. Agassiz, Rev. Ech. p. 520.*

*Laganum decagonale, Bell, Ann. & Mag. N. H. (5) xi. p. 130.*

The investigations which I have been able to make into the value of the generic and specific characters of the Laganidæ (Ann. & Mag. Nat. Hist. (5) xi. p. 130) have led me to the conclusion that no valid grounds exist for the generic or subgeneric separation of "*Peronella*" from *Laganum*.

Prince of Wales Channel; Thursday Island.

This appears to be one of those species around which misapprehensions have collected; the earlier and not ungraceful method of registration which induced De Blainville\* to associate with this species the name of the naturalist to whom he owed his specimen has, no doubt in haste, been regarded by Professor Alexander Agassiz† as indicating Lesson to be the author of the species.

\* Dict. Sci. Nat. vol. xlviii. p. 229; Man. d'Act. p. 215.

† Rev. Ech. p. 47, and much less accurately on p. 148.



Strangely enough, De Blainville himself is not free from error in the matter, for after Lesson's name he places the words "Voyage de l'Uranie," a voyage with which Lesson had not the close relation that he had with that of the 'Coquille,' and in the account of which no Echinoderms are described or figured.

### 18. *Echinoneus cyclostomus*.

*A. Agassiz, Rev. Ech. p. 550.*

A very small specimen from Prince of Wales Channel.

### 19. *Maretia planulata*.

*A. Agassiz, Rev. Ech. p. 570.*

A very fine series in spirit from Flinders, Clairmont, and dried specimens from Clairmont Island.

### 20. *Lovenia elongata*.

*Agassiz, Rev. Ech. p. 575.*

Thursday Island ; Torres Straits.

### 21. *Breynia australasiæ*.

*A. Agassiz, Rev. Ech. p. 578.*

An excellent series from Port Denison, Thursday Island, and Prince of Wales Channel.

### 22. *Echinocardium australe*.

*A. Agassiz, Rev. Ech. p. 580.*

Port Jackson ; Flinders, Clairmont ; Port Darwin (12 fms., mud and sand).

## ASTEROIDEA.

### 1. *Asterias calamaria*.

*Perrier, p. 43\*.*

Port Jackson. The two specimens are very different in appearance : one has eleven arms, of which none are remarkably smaller than the rest ; the other, which has five arms left, and appears to have had six, has one arm much longer than the others, and has three small subequal arms.

\* For the majority of the Asteroidea I shall give only one reference, and that to Perrier's 'Révision des Stellérîdes' (Paris, 1875), following its pagination as a separate work.

2. *Asterias polyplax*.

*Perrier*, p. 63.

A small specimen with two long, two short and stout, and four shorter and more delicate arms.

Port Jackson, March 1881.

3. *Echinaster purpureus*.

*Othilia purpurea*, *Gray, Ann. & Mag. N. II.* (1) vi. p. 282.

*Echinaster fallax*, *Müll. & Trosch. Syst. Asterid.* p. 23; *Perrier*, p. 106.

While some have six and another five arms, not markedly differing in length, another has one very long arm, with a madreporite on either side of its base, and four shorter arms, of which one is very much shorter than the rest; it bears, however, indications of injury and subsequent repair.

Port Molle; Port Denison; Thursday Island, 4-6 fms.

4. *Metrodora subulata*.

*Gray, Ann. & Mag. N. II.* (1) vi. p. 282.

Flinders, Clairmont; Alert Island, 7 fms.

5. *Linckia lævigata*.

*Perrier*, p. 137.

A dried specimen still retains very well its blue coloration.  
Clairmont Island.

6. *Linckia nodosa*.

*Perrier*, p. 153.

There is not, I think, any doubt that the four specimens from the Arafura Sea (32-36 fms.) and Prince of Wales Channel (7 fms.) are representatives of this species, of which Prof. Perrier has given an admirable description; the specimens, however, on which that description is based bore no indication of any locality.

The specimens are very much finer than those measured by M. Perrier, R being equal to 213, 118, and 104 millim., with *r* 23, 18, and 13. The disk with 18 millim. radius has apparently received some injury; but it may be that, in this species, there is a difference in the sexes, and that the specimen in question is in a different condition of generative maturity to the others; it is impossible, however, to settle the question, as the example has been dried.

7. *Linckia marmorata*.

*Ophiaster marmoratus*, *Michelin, Mag. Zool.* 1845, *Zooph.* p. 21, pl. 10.  
*Linckia marmorata*, *Perrier*, p. 135.

If I am correct in referring to this species a series of specimens from Port Molle and Fitzroy Island, it will be easy to understand how it is that M. Michelin's species was never again recognized till the Paris Museum came into the possession of his type; that would appear to be the only example that they possess, and, as M. Perrier points out, the "type" is obviously young. The specimens before me are clearly enough all representatives of the same species; but were any one of them described it is quite possible that from the description alone of that single specimen it would be easy to regard some others of the series as belonging to another form.

In the first place, though all the specimens are provided with the intermediate plate that connects into a pentagon the terminal one of the "rangée de plaques qui occupe la ligne médiane dorsale de chaque bras," the extent to which this is evident varies a good deal, and one would hardly think it worthy of especial note in the largest example were not attention directed to it by the better-marked characters of some of the smaller. Secondly, the smallest specimen has the dorsal plates covered with coarse granulations; of some of these, at any rate, it would be appropriate to say (again quoting Perrier) "les granules voisins de leur centre sont un peu plus gros que les autres;" on the other hand, one, two, or more granules near the centre acquire, in the larger specimens, a much greater predominance, and give a somewhat different appearance to the creature; in the largest specimen these again have disappeared, and the whole surface of the plates is more uniformly granular. Thirdly, the dorsal plates may lose the regularity of outline which is so well marked (if not exaggerated?) in Michelin's figure, and which is expressed by M. Perrier in the words "sensiblement carrée," and become narrower at the angles at which the pores are placed; this is perhaps due to the greater development in the number of pores, of which as many as seven may in some cases be found within the limits of one area. Lastly, it is only in the smallest specimens that we find a double row of tubercles fringing the adambulacral spines; in all the larger specimens the row is single, or, in other words, one row of tubercles ceases to grow proportionately, and becomes obscured in the general granulation of the actinal surface.

The only considerable point of difference between these specimens and that figured by Michelin lies in the remarkable coloration of his specimen; if, however, M. Desjardin's example from the island of Mauritius was immediately dried, it might have retained its colour; while Dr. Coppinger's specimens, which were placed in spirit, might very possibly have had part of their colouring-matter dissolved out. The largest example has *R* equal to 50 millim.

Prince of Wales Channel, 7 fms.

8. *Linckia pauciforis*.

*Martens, Arch. f. Nat.* xxxii. (1866), p. 69.

In only one example is one of the arms otherwise than perfect; but this does not seem to have been budded out in place of one cast off, but to have been bitten or broken off not far from its tip.

Three dry specimens from Bird Island, N.E. Australia; coral-reef.

9. *Linckia megaloplax*.

Arms five.  $R=67$ ,  $r=9$ , or  $R=7.5$   $r$  about. Adambulacral spines flattened, one for each plate, with blunted end; externally to and alternating with these are somewhat shorter papilliform spines; the general granulation of the actinal surface of the disk extends between these latter; externally to them there is a row of larger spines, the distribution of which is extremely irregular, for while at some points they are almost as closely packed as those of the more internal row, they are at others separated from one another by the distance of three or four of the inner spines. The rest of the abactinal surface is closely covered with subequal granules of some size. The abactinal surface is traversed very regularly by six rows of poriferous spaces, which are comparatively large and markedly rectangular; the smallest spaces are found in the lowest row on either side; a short distance from the tip of each arm the spaces completely disappear, and the granulation becomes a little more prominent, and there is here, as in some allied species, a large specially modified plate with one or more large tubercles upon it. The disk itself is covered with large pore-areas, and the only noticeable character is the large and distinct, though not projecting, madreporic plate. The pore-areas are about 2 millim. wide, and the length of the madreporic plate, around which the granules are very distinct, may be 4 millim. The colour of the abactinal surface is deep brown or black, whilst that of the actinal surface is lighter.

In a specimen smaller than that which has formed the chief basis of this description the two surfaces are, towards the free end of the arm, distinguished from one another by the development of some short marginal spines. In another, dried, specimen, intermediate in size between these two, the spines at the upper and lower margins of the sides of the arm, though insignificant, are both larger and more numerous.

The idea that the younger forms would have a larger supply of spines is opposed by the fact that in a still smaller specimen these spines are altogether absent\*, while the skeletal plates are stouter than in the specimens which bear the spines. The question now arises as to whether there are three stages—(a) one in which the ossicles are so stout that no defensive spines are needed in addition; (b) one in which growth has proceeded so rapidly that the bars of

\* Cf. *Ann. & Mag. N. H.* (5) viii. p. 441.

the ossicles have diminished in proportional thickness while increasing in length, and so having lost their earlier stoutness, now require external aid; and (c) a final condition, in which equilibrium is again established, the ossicles themselves being again stouter,—or whether we have to do with two sets of variations from a common stock, due to some slight differences in the environment. But this is a complex and difficult question, which can only be satisfactorily answered by one who has at hand the living wealth of the Australian seas.

Port Curtis; Fitzroy Island; Albany Island; Port Denison, 8–12 fms.

#### 10. *Linckia*, sp.

A very small specimen, from West Island, Torres Strait, presents that interesting peculiarity of three smaller and three larger arms, hinting thereby at a division of the disk instead of gemmation from a single arm; it is the smallest heteractinic *Linckia* I have seen, the longest arm measuring only 6 millim.

#### 11. *Anthena flavescens*.

*Perrier*, p. 276.

Port Jackson, 0–5 fms.

The Museum collection contains also specimens of this species from Fremantle, W. Australia.

#### 12. *Oreaster gracilis*.

*Pentaceros gracilis*, *Perrier*, p. 246.

*Oreaster gracilis*, *Lütken*, *Vid. Med.* 1871, pp. 260, 261.

A selected series of five specimens, all from Port Denison (4 fms.), exhibit remarkably well the great change which occurs in this species, even after a considerable size has been attained. The smallest, which has R equal to 93·5 millim., has five tubercles, about 10 millim. high, one at the central end of each median row of tubercles: in another, with R equal to 108 millim., the tubercles, though a little stronger, are no higher and are here only to be found on three of the angles of the disk; this specimen, like another which is a little larger, has the lateral and marginal spines very well developed: two specimens, with R equal to 118 and 140 millim. respectively, have these spines less well developed, and the diminution is the more marked in the larger specimen; the smaller has one large central tubercle, and the larger has each of the whole set of five reduced to growths which are hardly larger than the other spines on the disk.

A specimen with six arms, one of which has been injured and has commenced to grow again, was collected at Port Molle.



13. *Oreaster nodosus*.

*Asterias nodosa*, *Linnaeus*, *Syst. Nat.* ed. xii. p. 1100.  
*Pentaceros turritus*, *Perrier*, p. 240.

Fine specimens from 4 fms., Port Denison.

14. *Oreaster*, sp.

A single dried specimen of a very interesting and, apparently, new form was also collected at Port Denison. Unfortunately, in the process of drying the disk has so fallen in as to completely alter what must have been a very different height in the living specimen, and, as may be supposed, the lophial line has also suffered.

15. *Stellaster belcheri*.

*Gray*, *P. Z. S.* 1847, p. 76.

Port Curtis.

16. *Stellaster inaei*.

*Gray*, *P. Z. S.* 1847, p. 76.

A fine series of dried specimens was collected, and as there are some in which R was no more than 30 millim., while in others it was equal to 95 millim., we are able to see the great variability in the number and presence of the spinous tubercles, which may be very feebly or exceedingly well developed.

This is not one of those species in which we find that the smaller or younger specimens are the more richly provided with tubercles; but with this we have to correlate (1) the solidity of the skeleton, and (2) the small size and consequent slight defensive power of these tubercles, even when they are well developed.

One specimen, which, unfortunately, is very much injured, has a "greater radius" of as much as 120 millim.

Port Molle; Port Curtis (5-11 fms.); Port Denison (6 fms.); Albany Island (6 fms.); Thursday Island; and Arafura Sea.

17. *Pentagonaster coppingeri*.

This species belongs to the *Astrogonium* section of the genus as arranged by Prof. Perrier, for the two rows of marginal plates are richly provided with granules, and with one or two larger granules which can hardly be called spines.

Arms five.  $R=91$ ,  $r=46$ . Arms 24 millim. wide at base, narrowing rather rapidly; marginal plates exceedingly well developed; pedicellariae reduced.

The central region of the disk is a little elevated, the thickness there being about double that of the margin of the disk; the whole abactinal surface consists of a close arrangement of ossicles, the surfaces of which are coarsely granulated; the granules are a little

longer in the median line of each ray, where they form a remarkably regular series, continued on to the disk, but they become more or less ill-defined on the raised portion; the granules on the rest of the plates present no peculiarities, saving that they are a little longer on the sides of the raised portion of the disk. The respiratory pores on this surface are rather large, scattered, and simple. The supero-marginal plates are as much as 7 millim. high in the widely open angle of the arms; they are narrow, wider above than below; as these plates pass outwards they decrease in length and increase in breadth; they next decrease in size generally, and finally they are again, though much smaller, of the same general form as those of the angles of the arm; the terminal three or four touch in the middle line: of these plates there are about 23 on the side of each ray; the condition of their armature is, perhaps, best described by saying that some of the granules elongate to form small spinous tubercles. The madreporic plate is situated about one third of the radius from the centre of the disk; it is prominent, 5.5 millim. long, and has the form of an irregular elongated oval. The infero-marginal plates are likewise about 23 in number, and their form in different regions presents very much the same variations as those of the supero-marginal series; the granules, however, do not present the same tendency to become spinous, though they are all rather longer and not quite so closely packed. The adambulacral spines form a fringe of four flattened subequal spines, in addition to which two smaller outer ones may be attached to the same ossicle; beyond these there are two or three much stouter spines, and beyond these again there may be two or three spines, the tips of which may be pointed. The granulation of the intermediate plates presents very much the same characters as that of the infero-marginal plates.

This species may be distinguished from *P. singularis* or *P. miliaris* by the length of its arms, and the shape and closer packing of the plates of the abactinal surface; from the former it is also distinguished by having the adambulacral spines shorter and blunter, though they are by no means as blunt as in *P. miliaris*, where the adambulacral groove is so wide.

Colour: the specimen whose admeasurements have been given in the above description is dark slate; another, in which  $R=82$  and  $r=26$ , is light stone-coloured; in it the disk is not elevated.

Port Curtis, 5-11 fms.; Prince of Wales Channel, 3-5 fms.

### 18. *Pentagonaster validus*.

This is a second new species which belongs to the *Astrogonium* division of the genus. The arms are distinct, rounded, and stout, the anns central and sometimes very distinct; the granulation of the ossicles is rather coarse, and only a few larger granules are found scattered over the abactinal surface; there are three rows of adambulacral spines.

As five specimens of this form were collected we are able to

determine to some extent its range of variation: this, as we might have expected, is most markedly presented by the characters of the spinous protuberances formed by the hypertrophy of some of the granules on the abactinal surface; the smallest specimen is without any special spines. Of three larger and subequal specimens, that which is a little the smallest has a more prominent granule developed here and there along the middle lines of the rays, and some six, still more prominent, at the centre of the disk; the other two have much more prominent spinous granules at what may be called the base of the rays, and some smaller protuberances around the centre of the disk; these latter are, in the largest specimen of all, quite inconspicuous.  $R$  is about equal to  $2r$ ;  $R=72, 58$ ;  $r=34, 27$ .

Arms 29 or 26 millim. wide at the base, narrowing hardly at all till quite near their end; marginal plates very well developed, equal in either series, and 13 or 14 in number; pedicellariæ scarce.

The central region of the disk is not distinctly elevated; with increase in size the ossicles of the abactinal surface become less closely packed than in the smaller forms; and three rows of ossicles can be quite distinctly made out; the investing granulation is not especially coarse; the intervening pores may be set singly or disposed in groups of three or four. With increase in size, likewise, the boundary line between the two sets of marginal plates becomes more distinct; from the angle of the arm outwards the supero-marginals increase in breadth till the last two or three, but they are always at least twice as long as they are broad; the terminal two or three touch in the middle line. The infero-marginals are a little stouter, but have otherwise much the same proportions as the upper series.

The intermediate plates are distinct from one another and are covered by large distinct granules. The innermost row of adambulacral spines are 6 or 7 in number, and are more delicate than the two stouter ones which are placed outside them; those of the outermost row are smaller and more irregular, and are not easily distinguished from the granules of the ventral plates.

Madreporic plate rather large, distinct,  $\frac{1}{3}$  to  $\frac{1}{2}r$  distant from the centre; the anus often distinguished by its periphery of eight or ten small plates.

The dried specimens are yellowish or light slate-coloured; but there is no information as to what is their colour when alive or fresh.

The species is very distinct from *P. dilatatus* of Perrier, which species has perhaps been founded on forms which were only varieties of the *Astrogonium miliare* of Gray.

Thursday Island, Torres Straits, 3-5 fms.; sand.

### 19. *Dorigona longimana*.

Pentagonaster longimanus, *Perrier*, p. 228.

Percy Island, Queensland; Prince of Wales Channel, Aug. 1881, 7 fms.

20. *Asterina belcheri*.

*Perrier*, p. 320.

With four madreporites.

Port Jackson, 0-4 fms.

This is the first locality that has been given for this species.

21. *Asterina calcar*.

*Perrier*, p. 296.

Port Jackson.

22. *Asterina cepheus*.

*Asperiscus cepheus*, *M. & Tr. Syst. Ast.* p. 41.

*Asterina cephea*, *Perrier*, p. 315.

I follow Prof. Perrier in using Müller and Troschel's specific name, on the ground that, though Gray's name *burtoni* has the precedence by two years, the "type" is not to be found, and the description is useless for any purposes of identification. As *cephus* is obviously a proper name, I prefer to use it without making any alterations in its termination.

Thursday Island.

23. *Asterina gunnii*.

*Perrier*, p. 298.

A small specimen from Port Molle.

24. *Asterina regularis*.

*Verrill, Trans. Connecticut Acad.* i. p. 250.

A small specimen: Port Molle.

A good series in spirit: Port Jackson.

What seems to be a young specimen of this species was also taken at Port Jackson.

25. *Asterina* (*Nepanthia*) *brevis*. (PLATE VIII. figs. A, A'.)

*Perrier*, p. 321.

As Prof. Perrier's description would appear to be based on a single small dried specimen in the British Museum, I give the measurements of two specimens preserved in spirit:—

$R=32, 44$ ;  $r=9, 12$ ; or  $R=2.7$  or  $2.8 r$ ,

and a figure of the largest specimen.

Albany Island (8 fms., sand and mud); Thursday Island (4 fms., coral).

26. *Patiria crassa*, *Gray*.

*Perrier*, p. 326.

Port Curtis.

27. *Luidia*, sp.

A single dried specimen of a species of this genus was taken at Port Darwin. Though it is not in a condition to be described, it is right to direct attention to it, as no species of *Luidia* is mentioned either by Prof. Perrier or by Mr. Tenison-Woods in their lists of Starfishes of the Australian seas. The example in question was greatly injured during life, and the arms, of which there are only five, differ considerably in form and length. It cannot be regarded as belonging to Gray's species *L. hardwickii* on account of the greater stoutness of the ventral plates and of the spines found on them; the tufts on the paxillæ are likewise made up of stouter spinules, and the characters of the adambulacral spines will, it is almost certain, be found to be very different when a more satisfactory specimen is obtained.

28. *Astropecten coppingeri*.

Dr. Coppinger has forwarded examples of a species already represented in the Museum, but of which I have never been able to find a description. The species, however, is not, I should imagine, a rare one, and it is certainly one that has not yet been recorded as from the Australian seas.

It is distinguished by the fact that it has only four spines on each series of supero-marginal plates, and these are confined to the two plates on either side of the apex of the interradial angle.

$R=30.5$ ,  $r=8$ . Breadth of arm at base 7.5 millim. Arms taper gradually and regularly; about twenty-five supero-marginal plates, which are higher than broad and very high in the angle of the arm, where they are narrower at their ventral ends; the plates that do not bear spines are regularly covered with a somewhat coarse granulation, which may almost become spinous; the two terminal plates are large, prominent, and smooth; the space between the arms and on the disk is regularly filled with not large paxillæ, provided generally with a central tubercle and a circlet of from eight to ten tubercles around their head. The spines of the infero-marginal plates are prominent and lie on the sides of the arms, so that they are visible from the abactinal surface. Internally to these long stoutish spines, three smaller ones are to be found on the actinal surface in the same transverse line; the intermediate space is filled up by a coarse granulation or by spinous processes. The spines bordering the ambulacral groove are closely packed; there are three or, more rarely, two on the side of each plate; these are elongated and rather delicate; beyond this internal row there is a row of stouter shorter spines, and beyond these are others which become more or less confounded with the covering of the ventral plates.

Madreporic plate not detected. The characters of the paxillæ already described do not hold for the region of the disk, where



there is a closer and more regular granulation. The coloration, which becomes blotched in the dried specimens, is found in an example sent by Dr. Coppinger to consist of an irregular darkish patch at each angle of the disk, and an irregular patch, extending on to the marginal plates, occurs twice on the length of each arm.

In a much smaller specimen (in which  $R=9$ ) the spines are only developed on one plate on either side of the apex of the angle of the arm, and only two distinct spines are to be seen on the ventral plates. In a specimen in which  $R=16$  the second spine is fairly developed on some, small on others, and absent from the rest of the plates nearest but one to the apex; on all of the ventral plates a third, and on some the fourth, spine is now to be made out.

Of several specimens collected at Alert Island one has at some of its angles three spine-bearing plates.

In addition to the specimens from Thursday Island, Alert Island, and Prince of Wales Channel (7 fms.), the British Museum contains three specimens which were collected in "Australia" by Macgillivray in 1862.

### 29. *Astropecten polyacanthus*.

*M. & Tr.* p. 69.

A fine series of ten specimens were taken in 0-5 fms., at Port Jackson. In the case of two examples there are three spineless ossicles succeeding the plate at the angle of the arm; in all the other cases the more ordinary condition of two such ossicles only is found to obtain. The smallest specimen has  $R$  equal to 15 millim., and the largest  $R$  equal to 36 millim. Some variability is to be noted in the tenuity of the arms.

### 30. *Archaster typicus*.

*M. & Tr.* p. 65.

Three dried specimens from Port Denison, 4 fms.

### RETASTER.

*Perrier, Nouv. Arch. du Mus.* (2) i. p. 55\*.

### 31. *Retaster insignis*.

*Sladen, J. Linn. Soc., Zool.* xvi. p. 200.

On receiving these specimens I recognized that they were representatives of a species then undescribed; since that time, however, an account of the species has been published by Mr. Sladen in his Preliminary Notice of the 'Challenger' Collection. The follow-

\* I am indebted to Mr. W. Percy Sladen for this reference.

ing notes will add a little to our knowledge of this form. Not one of the three specimens collected by Dr. Coppinger (there were two in the 'Challenger' collection) distinctly presents that cruciform arrangement of fibres in the dorsal areae which was so striking in the specimens seen by Mr. Sladen; in some of the areae it is indistinctly marked, and in not rare cases the areae are divided into two; the number of pores hardly exceeds fifty; the areae may be square as well as rhomboidal, or may be triangular or have the angles rounded. There is not that difference in hue between the tissue covering the areae and that covering the spinelets which Mr. Sladen observed; but there may be great differences in colour, specimens being ashy grey or deep brown. The minor radial axis is respectively 60, 48.9, and 44.7 millim.

Port Molle, and Thursday Island (4 fms., coral).

## OPHIUROIDEA.

### 1. *Pectinura gorgonia*.

*Lyman, Prel. List*, p. 3\*.

This is one of the species that extends as far west as Mauritius, in a dried specimen from which island all the transverse bands on the arms have disappeared, and the number of arm-spines is as many as twelve.

Port Jackson, 0-5 fms.

### 2. *Pectinura infernalis*. (PLATE VIII. fig. B.)

*Ophiarachna infernalis*, *M. Tr.* p. 105.

*Pectinura infernalis*, *Lyman, Bull. M. C. Z.* iii. p. 222; and *Prel. List*, p. 3.

The three naked plates between the radial shields, which are so markedly referred to in the original description, and are so well seen in Mr. Lyman's figure, are not always so distinctly developed, as may be seen by the figure which is now given.

Port Molle; Thursday Island; Prince of Wales Channel; a young specimen from Port Darwin.

### 3. *Pectinura megaloplax*.

Very large naked radial shields; disk elsewhere covered with a coarse granulation, beneath which are largish plates, somewhat puffed; the arms wide at their insertion, slightly carinated. Large accessory mouth-shields present in all the interradii; pores between first and second ventral arm-plates only; about seven rather delicate lateral arm-spines; upper arm-plates not broken.

\* The bibliographical references are here chiefly confined to Mr. Lyman's Preliminary List' (Cambridge, U. S. A., 1880).

Diameter of disk 19 millim., length of arm about 83 millim. from the edge of the disk, width of arm at disk 6 millim., height of same 5 millim. Fourteen mouth-papillæ of fair size, the outermost the largest; four stout teeth; mouth-plates with six sides, the aboral the longest and the adoral the shortest, longest hardly longer than broadest axis; accessory mouth-plates large, longer than broad, straight within, convex without; side mouth-shields distinct, inclined to be triangular, broader within than without; granulated space between mouth-papillæ and mouth-shield very small.

Lower arm-plates at first wider than long, but varying a good deal in shape; proceeding outwards the adoral edge becomes shorter and shorter as the side arm-plates encroach more and more upon the ventral middle line. The upper arm-plates at the base of the arms are very wide, about four times as wide as they are long, further out they become narrower, and towards the tip of the arm are very much encroached upon by the side plates; as a rule there are seven spines on the plates. Tentacle-scales two.

This fine form stands nearest to *P. marmorata*, from which it may be distinguished by (i.) the much larger radial shields, (ii.) the wider arm-bases, (iii.) smaller number of arm-spines, (iv.) larger accessory mouth-shield, and (v.) proportionately shorter arms.

Port Molle (14 fms.).

### OPHIOPINAX, g. n.

It appears to be necessary to establish a new genus for the reception of the form hitherto known as *Pectinura stellata*, owing to the remarkable and regular arrangement of the large plates on its disk; this, which is only obscurely seen in smaller specimens, becomes very prominent in such larger examples as were obtained during the voyage of the 'Alert.'

The genus may be defined as follows:—Two elongated genital clefts; mouth-papillæ, teeth. Accessory oral shields; arm-spines delicate, attached to the outer edge of the side arm-plates. Radial shields large, separated by several radial or interrarial plates from one another. All the disk, except the radial shields, is covered by granules, but there are no spines or spinous processes. Teeth (in four rows) stout, blunt. Side arm-plates extend on to both actinal and abactinal surfaces; side mouth-shields naked.

The extraordinary development of the plates between the radial shields, both of the same and of the neighbouring sets, appears to have escaped the notice of Ijungman and Grube; nor can it, I imagine, have been noticed by Mr. Lyman, as he retains *O. stellata* of Ijungman in the emended genus *Pectinura*.

At this time it appears convenient to redescribe and figure the species.

4. *Ophiopinax stellatus*. (PLATE VIII. fig. C.)

*Pectinura stellata*, *Lyman, Prel. List*, p. 3.

Disk somewhat pentagonal, not puffed, with a central rosette of plates varying a good deal in the extent to which it is well defined, and occupying about half the upper surface: in some cases a central plate and two not very regular circlets of variously sized plates of irregular form can be made out. The interrarial series of plates, which extend from the rosette to the edge of the disk, are stouter and more prominent than the radial series: they are composed of three or four plates varying in size and form, and sometimes paired at the margin of the disk; the larger median have smaller plates on either side. The radial series may, for its undivided portion, be formed by a single plate, but, as a more general rule, there are three; there are no smaller marginal plates. The bifurcated band which embraces the base of the arm has usually three pieces on either half. Just below the margin of the disk there is a prominent plate, which is placed interradially; in shape this is irregularly cordiform; above, on either side, it is bounded by a compressed or diamond-shaped plate; between it and the mouth-plate there is a pair of smaller plates and several still smaller plates intervening; on the side there is an elongated plate, with two smaller ones, lying along the edge of the genital slit. The radial shields are large and triangular, and fill up all the space on the disk between the radial and interrarial plates which is not occupied by the rosette.

The inner mouth-shields have a straight outer edge, the sides are at first straight, and then bending inwards meet one another at a more or less acute angle; they are longer than broad; the space between them and the edges of the mouth is rather loosely granular; the outer mouth-shields are about as broad as long, and have a slightly convex outer edge; the umbo is well marked, and that shield is not divided; the side mouth-shields are well developed, and are separated from the genital slits by a small granulated patch.

Seven mouth-papillæ, the three innermost small, the innermost smallest; the next three large, increasing in size from within outwards; the outermost again small.

The arms begin to narrow immediately after leaving the disk, and become very delicate at their free ends; in a well-developed specimen, in which the disk measures 17 millim. in diameter, they are 70 millim. long, 5 millim. wide, and 4.5 millim. high at their insertion into the disk. Upper surface carinated; upper arm-plates about three times as wide as they are long, but, owing to the invasion of the side arm-plates, the aboral is longer than the adoral edge; both these edges are straight.

There is a pair of pores between the first and second lower arm-plates; the lower, like the upper, arm-plates have their aboral longer than their adoral edges, and this, as on the upper surface, is due to the encroachments of the side arm-plates, and is more strongly marked near to, than far from, the disk. None of the edges of these

plates are curved; the plates themselves are at first broader than long, but during their gradual diminution in size they have at one time their aboral edge equal to their longitudinal axis; still further out they are longer than broad. About six, short, poorly developed spines are found on each of the side arm-plates near the disk, of which the largest are median in position; they diminish in number and size as they approach the free end of the arm. Two small tentacle-scales.

Upper surface (in alcohol) dark yellow, with spots or patches of brown: the whole of the actinal surface pale flesh-colour. Although, as a rule, three consecutive segments are coloured by a darker transverse patch, there may be only two, or there may be four so ornamented, and, as irregularities, one or more than four; but the coloration always extends on to the sides of the arm, though it never passes on to the lower surface. Or the whole may be very many shades darker, and then the darkest parts are not especially remarkable; this last mode of coloration appears to be by far the most common.

Port Moller, Queensland, 14 fms., rock; and Port Denison, 3-4 fms.

In some examples, which are very much smaller, from Torres Straits the radial shields are oviform, the upper arm-plates are not nearly so wide nor so distinctly carinated; the central rosette may be only barely indicated, though the central plate is very distinct; the plates of the interradiar series have no small marginal secondary plates. The side arm-plates at the base of the arm are proportionately much larger, and in consequence diminish the breadth of the lower as well as of the upper arm-plates. Striking as is the difference in effect produced by these differences in character, they are, I think, only to be ascribed to age.

### 5. *Ophiopeza conjungens*.

This species seems to strengthen the opinion, more than once expressed by Mr. Lyman, that the genera *Ophiopeza* and *Pectinura* are barely to be distinguished. Without a divided mouth-shield, it has the arms not rounded, as in *O. fallax*, but keeled above, as is so often the case in *Pectinura*.

Most closely allied to *O. fallax*, it may be distinguished by the somewhat coarser granulation of its disk, the smaller number of mouth-papillæ, and the broadened upper arm-plates.

Disk pentagonal, flattened, 17.5 millim. diam. in one example, completely covered by a delicate and regular granulation (of about twenty granules to 1 millim.), the underlying scales not large; the radial shields, in perfect specimens, only indicated by depressions. Mouth-shields not divided, wider than long, with a wide convex adoral edge, straighter sides, and a barely convex aboral margin. Side mouth-shields small; the space between the mouth-shield and the edge of the jaws is marked by a granulation, much coarser than that which obtains elsewhere on the disk. Mouth-papillæ seven,



stout, the penultimate one about twice as wide as those on either side of it.

The arms, which are not more than four times the diameter of the disk, are very delicate at their tip, strongly carinated superiorly on the proximal portion; the upper arm-plates have pretty straight oral and aboral edges, about twice and a half as wide as they are long; the lower arm-plates are encroached upon by the side plates, which extend far towards the middle line; near the disk they are wider than long and hexagonal in form; further out the two lateral angles widen out, the sides gradually become straighter, and a quadrangular replaces the hexagonal form; towards the distal end of the arm the ventral plates are longer than broad. Arm-spines, near the disk, eight, the median longer than those above or below them; quite close to the disk they may be long enough to extend to the edge of the next plate; rapidly, however, they become shorter, though they do not diminish either rapidly or notably in number. Tentacle-scales two on the most proximal joints, one beyond. A pore between the first and second arm-plates.

Colour, in alcohol, brownish, with some blackish spots on the disk; these are also found on the arms; three or four successive plates often much darker than those in front of or behind them.

Port Molle (14 fms., rock); Port Curtis; Port Denison; Thursday Island.

Specimens of this species, bearing as locality "Indian Ocean," have long been in the Museum.

Specimens of what may be the young of this species were taken in the Prince of Wales Channel.

#### 6. *Ophiolepis annulosa*.

*Lyman*, p. 4.

Clairmont Island; Port Darwin.

#### 7. *Ophioplocus imbricatus*.

*Lyman*, p. 4.

Port Darwin.

#### 8. *Ophiactis savignii*.

*Lyman*, p. 14.

Port Jackson, 0-5 fms.

#### 9. *Ophionereis dubia*.

*Lyman*, p. 25.

Thursday Island; Albany Island; Prince of Wales Channel; Torres Straits.

10. *Ophiocoma brevipes*.

*Peters, Archiv für Natur.* 1852, p. 85 ; see *Lyman*, p. 27.

Mr. Lyman (Prel. List, p. 27) gives as synonyms of this, his own *O. insularia* (about which there will, I suppose, be no dispute), the *O. ternispina* of Martens, an unnamed specimen of which, from the island of Mauritius, has been for many years in the collection of the British Museum and has for a long time been a source of much disquiet to myself (I am now persuaded that this is a specimen to which Dr. von Martens would have given the name *ternispina*), *Ophiocoma variegata* and *O. brevispinosa* of E. A. Smith, from the island of Rodriguez. I do not know that a more western locality than the island just named has ever been recorded by a zoologist ; at any rate, Dr. Haacke did not detect the species among the Ophiurids collected by Prof. Möbius in the island of Mauritius\*, unless he has been, as is possible, misled by the definition of *O. squamata* given by Müller and Troschel ; the three or four lateral spines, the two tentacle-scales, and the square markings on the upper arm-plates might deceive a hasty nomenclator, but they could not, I think, mislead any one who refers to the second edition of Lamarck (vol. iii. 1840), p. 225, where he will find references to the plates of Link and O. F. Müller. Although the species there figured is regarded by the editors as distinct from *O. squamata*, the resemblance between such an Ophiurid as this *Ophiocoma* and the *Ophiothrix pentaphyllum* figured by the two just-mentioned naturalists, is so very slight that we are forbidden from supposing that the *Ophiura squamata*, Lamk. (*Ophiocoma squamata*, M. & Tr.), is a near ally of an *Ophiothrix* or *Ophiothrix*-like form.

The variations exhibited by this very widely distributed species are indeed remarkable. It seemed for a time that the larger number and smaller size of the mouth-papillæ at the inner angles of *O. variegata* and of *O. brevispinosa* would indicate a certain difference ; but a difference of quite equal extent can be detected in the mouth-organs of a single specimen. The hollow square marking on the upper arm-plates, which, when well developed, seems to give such a characteristic appearance to the arms of this species, may be replaced by a black patch, or there may be a transverse bar, or there may be only the two lines left which run parallel to the long axis of the arm ; again, there may be spots, or the coloration may be fairly uniform. The colour of the disk may be pale, spotted, or reticulated ; the mouth-shields spotted or uniform in colour.

Levuka, Fiji.

\* Möbius, 'Beiträge zur Meeresfauna der Insel Mauritius' &c. (Berlin, 1880). In what follows I may seem to speak somewhat harshly of Dr. Haacke's services ; but I am bound to point out that the list of Ophiurids given on p. 50 of this work has no scientific value whatever. *O. dentata* has been for many years regarded, first by Lyman (1865) and since by others, as "only a middling-sized *O. echinata*;" the type of *O. squamata* has been lost, "and nobody can tell what it was, though it might have been *O. brevipes*." Dr. Haacke makes no reference to either of these judgments.

11. *Ophiocoma scolopendrina*.*Lyman*, p. 26.

Port Molle.

12. *Ophiarthrum elegans*.*Peters*, *Wiegmann's Arch.* 1852, p. 82.

Though the British Museum possesses several specimens of this species, the present is especially useful, as it is the first which has come to hand in which even one of the "sehr zerbrechlich" arms has been preserved entire. As the disk measures 18 millim., and this complete arm rather more than 120 millim., we find that the object now in hand presents very much the same proportions as the specimen described by Dr. Peters. In an example from Torres Straits, which has been some years in the possession of the Trustees, there is an arm which is in a sense complete, but it was obviously broken during life; and though the disk is of very much the same diameter as that just added to the collection, this arm only measures 60 millim.

Dr. Coppinger's specimen was collected at Levuka, Fiji.

## OPHIOTHRIX.

In addition to the series hereafter mentioned and described, there were indications of other species, not sufficiently good to justify description, but quite well enough marked to point to the great wealth of *Ophiothrix*-forms in the seas where these dredgings were made.

13. *Ophiothrix fumaria*.*Lyman*, p. 34.

As this is a very rare species, the following notes may be of interest:—

Radial shields naked, large, with a curve along their basal edge, each separated from its fellow by a low ridge on which granules are generally developed. Each pair of radial shields is separated by some seven rows of prominent granules; these granules occupy all but the very central portion of the disk, and form a spinous patch on the lower surface. Mouth-shields irregularly oval, pretty sharply angulated proximally and very narrow distally, so that the bridge between the genital slits is very narrow. Only the median portion of the interbrachial space is spinous.

Upper arm-plates a good deal encroached upon by the side arm-plates, so that, for the greater part of the arm, they are wider along their distal than their proximal edge; spine-ridge of side arm-plates not specially well developed; lower arm-plates rectangular, a little

broader than long. Six arm-spines, the uppermost the longest, as long as two or three arm-plates, swollen at their tip, only faintly thorny. One tentacle-scale.

Disk with a large number of blue patches and dots; arm-plates above faint reddish pink, with dots of blue at the sides, and broad transverse bands of blue at regular intervals. Colour-markings below less pronounced.

Port Jackson, 0-5 fms.

#### 14. *Ophiothrix cæspitosa*.

*Lyman, Chall. Rep.* p. 218.

Though the 'Challenger' found but few representatives of this species, it is apparently one of the most common in the neighbourhood of Sydney.

Port Jackson, March 1881.

#### 15. *Ophiothrix martensi*.

*Lyman*, p. 36.

If I am right in ascribing to this species examples from Thursday Island and Port Darwin, it is one which must be regarded as exhibiting very remarkable variations in coloration. The original specimens, collected by Prof. Semper in the Philippines, were described by Mr. Lyman as being in colour, "above, bright indigo, with a darker line along the arm, bounded by a lighter one on either side; below, paler indigo, with a white line along the arm." In a smaller specimen, "the blue lines along the arms were continued to the centre of the disk, but were not margined by lighter lines." In the two specimens collected on "Aug. 7, 1874" (in the neighbourhood of the Fiji Islands), by the 'Challenger,' and determined by Mr. Lyman, I observe that there is a faint indication of a white line on either side of the blue lines on the disk, and that the white line on the ventral surface is, at places, broken across by a patch of indigo.

On either side of these "typical specimens" there would appear to be a light and a dark variety. In the latter the whole creature may be deep purple, the two white lines on the arms being at regular distances invaded by purple patches of such a size as to leave only spaces of white equal to themselves; and as these patches are symmetrical on either side of the middle line, the original white lines come to be represented by nothing more than paired patches of white; similarly the white line below disappears, or rather is forced out to the sides, and appears only as a thin marginal line. The light variety is no less interesting; with the exception of the radiating lines, the disk above is altogether white, and even these lines may

become less conspicuous and much reduced; the white lines along the arm are broken into by blue patches, much less extensively developed than in the dark form; on the lower surface of the arm the blue lines may be present as continuous tracts, or they may here and there be interrupted by white.

Port Curtis; Thursday Island; Port Darwin.

#### 16. *Ophiothrix striolata*.

*Lyman*, p. 36.

Thursday Island.

#### 17. *Ophiothrix galatæa*.

*Lyman*, p. 36.

Port Darwin.

#### 18. *Ophiothrix ciliaris*.

*Lyman*, p. 35.

Port Jackson, 0-5 fms.; Port Molle.

#### 19. *Ophiothrix rotata*.

*Martens*, *Arch. f. Nat.* 1870, p. 258.

A single specimen, without doubt referred to this species, differs in one or two points from that described by Dr. von Martens. In the Berlin-Museum specimen the diameter of the disk is 7 millim., and the length of the arms 35 millim. In our specimen the arms must have been nearly 150 millim. long, while the diameter of the disk is 12 millim. The upper spines are not more than twice the width of the arm, instead of four times. The original describer makes two statements with regard to the colour of the oral shields:—"Unterseite der Scheibe mit den Mundschildern und die Armstacheln blass"; and "Das der Madreporenplatte zugehörige Mundschild ist merklich grösser, an den Seiten nicht eingebuchtet und weiss, nicht wie die andern violett." In the specimen now under examination there is some violet marking on each one of the mouth-shields.

Thursday Island, 3-4 fms.

So far as the present collection allows me to form any ideas with regard to the range of variation within the limits of a "species," and the value of the colour-markings on which previous investigators have laid, and, as it seemed, justifiably, very considerable stress, I am inclined to the view that the variation is very much greater than was supposed, and that, after all, colour-marking, though an important aid in the discrimination of the species, can hardly be said to have the value which has been attached to it. The doubts first raised by a study of *O. martensi* (*vide supra*) are not a little strengthened by the three specimens now lying before me, which, I have little



doubt, will be seen, when a large series is to hand, to be nothing more than varieties of *O. rotata*. As none of the arms are complete, the measurements I could give might only be deceptive; in them the upper arm-spines are proportionately larger than in the specimen already spoken of; the bands separating the plates, the character of which has given rise to the specific name, may vary in breadth on one and the same disk; and the granules may be in narrow or broad bands, and may be so greatly elongated that they may more correctly be spoken of as spines; the marking would by some be spoken of as exceedingly characteristic, for there extend from the disk on to the arms two lines of dots of blue; at every fourth plate, when regular, the two dots of either side fuse, and the spot enlarges into a blue patch; an exactly similar marking is to be seen on the lower surface. In the specimen unhesitatingly placed with *O. rotata* there is not this definite arrangement of the dots.

I have thought it right to direct attention to these peculiarities, but a full and satisfactory discussion of the subject must be based on a much larger series of specimens.

These examples were also from Thursday Island.

## 20. *Ophiothrix punctolimbata*.

*Martens, Arch. f. Nat.* 1870, p. 257.

Port Curtis; Port Molle; Thursday Island, 3-4 fms.; Prince of Wales Channel; Warrior Reef.

The specimen from Port Curtis, which is smaller than the others, has the lateral spines proportionately longer, more echinulated, and much more glossy.

## 21. *Ophiothrix longipeda*.

*Lyman*, p. 35.

Port Curtis; Port Molle.

## 22. *Ophiothrix microplax*.

Disk large, covered with short spines, less thick on the radial shields; ends of the not-thorny arm-spines faintly clavate. Proportion of arms to disk about 6 to 1.

The disk is rather large (20 millim. in diameter) and is covered with very short spines, which may almost be described as spinous granules; these are not so closely packed on the radial shields or on the actinal surface as on the rest of the disk. The radial shields are small, elongated, triangular, the straight base of the one faces that of the other; the plates of each pair are separated by several elongated scales, which carry a few longer spines. There is some imbrication of the scales on the actinal surface of the disk.

Arms at least six times the diameter of the disk, not diminished in width for some distance out. Just beyond the disk there are three large upper and four much shorter spines: the lowest, which is the smallest, is very small; gradually this disappears, and then the following one gets smaller and smaller till it disappears. The upper spines are faintly echinulated near their tip; the uppermost but one is generally rather the longest, but is never more than equal to about the length of two of the upper arm-plates.

The edge of the genital slit is fringed by some elongated plates; the bridge is pretty wide; the mouth-shields are large and stout, rather longer than broad, and have a notch in the middle of their inner edge.

The lower arm-plates have pretty even sides and are of about the same length as breadth; the tentacle-scale is only distinct at the proximal end of the arm. The upper arm-plates are twice as broad as long, broader along their distal than their proximal edge.

General colour of disk yellowish grey, the radial shields violet, the upper arm-plates washed with slate-grey and having a faint white line along their middle; the spines light-coloured, but darker towards their tip; the actinal surface lighter; the mouth-shields prominent by their whiteness.

Port Darwin.

### 23. *Ophiothrix darwini*.

Disk somewhat pentagonal, with delicate spines on its upper surface, but the radial shields naked. Colour light pink, green, or lemon in places, with a few dark spots.

Length of arms perhaps not more than six or seven times the diameter of the disk.

The large radial shields form right-angled triangles, the perpendicular side being separated from that of its fellow by a very narrow line and by only a single row of rare spines; a slight notch separates the plates at the periphery of the disk. The interradial spaces are about as broad as the base of the radial shields, and are richly covered with delicate spinules, these extend on to the actinal surface, but leave a bare band bordering the genital slits; the bridge between the slits is narrow; mouth-shields broader than long, somewhat irregularly lozenge-shaped in form. The lower arm-plates are very regularly arranged, and are only slightly oblong, many being almost completely square. The upper arm-plates are broader than long, the aboral edge three-sided, the adoral sides long, and the consequent form that of a not very regular hexagon. Four or five arm-spines, the lowest not peculiarly short, and the uppermost equal to five upper arm-plates in length, echinulated at their free end. There appear to be two very small tentacle-scales.

The larger of the two specimens presents the following markings:—There are three black dots on each of the mouth-shields; some of the lower arm-plates are light green, the adoral edges of others are marked by a black spot, and this is rendered the more conspicuous

by the fact that two successive plates are so marked, and that then there is an interval of two or more not so distinguished. Three or four blackish dots are to be found on the radial shields, along the line of the vertical side; by pairs or threes the upper arm-plates are faint pink or light green, and the pink ones are distinguished by each having a black dot.

I have taken advantage of the locality of this well-marked and really beautiful species to associate with it a name honoured by us all.

Port Darwin, 7-12 fms., mud and sand.

#### 24. *Ophiothrix melanogramma*.

Disk pentagonal in appearance, completely covered with fine spinules, which are a good deal longer and rarer on the actinal surface. Arms 4-5 times the diameter of the disk, tapering very delicately; the upper surface marked by a black line, which extends a good way on to, but does not reach, the centre of the disk.

The radial shields are almost completely obscured by the spinulation, which is very delicate; mouth-shields broader than long, the inner sides meeting at an acute angle, the outer edge rather evenly rounded, the bridge between the genital slits very narrow; seven or eight arm-spines, the two lowest very small, the upper one as long as five or six upper arm-plates, but the uppermost of all is not the longest; the upper spines are richly and delicately echinulated, and, owing to the great eneroachment of the side arm-plates on the upper surface of the arm, the spines of either side come to lie very close to one another, and soon obscure the arm itself. One small tentacle-scale. The lower arm-plates have a concave notch on their adoral edge, have a short side passing into the short lateral edge, and are three-sided on their aboral face, so that they form an irregular hexagon which is broader than long. Owing to the size of the side arm-plates, the upper arm-plates are lozenge-shaped.

This species has a most elegant appearance, the black band already spoken of relieving the whiteness of all the other parts, while a kind of feathery appearance is given to the arms by the delicate plates and long glassy spines.

Prince of Wales Channel.

#### 25. *Ophiomaza cacaotica*.

*Lyman*, p. 37.

The coloration of these specimens is very far from the chocolate of Mr. Lyman's type; but three specimens collected in one locality (Gulf of Suez) are—one chocolate-coloured, one quite light, and one intermediate. A discussion, however, of the characters of the variations of this species will be more profitable when our series is larger.

Port Molle; Prince of Wales Channel.

26. *Euryale aspera*, Lamk.*Lyman*, p. 43.

(a) One specimen, Port Molle, 12 fms. ; bottom, rock and sand : of a dark black colour.

(b) Several specimens, Port Curtis : all lighter in colour.

## HOLOTHUROIDEA.

A considerable number of specimens belonging to less than twenty species were collected, *Colochirus tuberculosus* being extremely well represented ; in the case of rarer or less well-known species, unfortunately, a single representative was often all that was obtained, so that in some cases conclusions have been arrived at which cannot be regarded as any thing more than provisional. Where a number of specimens were collected, or where the species was already represented in the British Museum, evidence was frequently obtained as to the wide extent of variation within the limits of apparent species ; and this has especially made the work of discrimination an anxious and difficult one. Other difficulties were presented by the extreme density of the integument of some of the species and our slight knowledge of the characters of the group. On the other hand, the work of bibliographical research has been but slight, the three more important workers at the group (Professors Semper, Selenka, and Ludwig\*), having published works of remarkable exactness and care.

The arrangement followed is that of Prof. Semper.

1. *Synapta grisea*.*Semper, Hol.* p. 11.

The condition of the single specimen did not admit of an anatomical investigation, so that the characters of the calcareous ring were not discovered ; the form of the anchoring-plates is, however, exactly that of the species described by Semper under this name. That the species has a wide distribution would seem to be shown by its presence in this collection, and by its being represented by a specimen from the Indian Ocean in the Leyden Museum †.

Fitzroy Island, Queensland.

2. *Cucumaria maculata*.*Semper, Hol.* p. 47.

From the external characters of the single specimen one would hardly be led to associate it with this species ; but in the case of

\* Dr. Théel's work does not seem to touch the present collection.

† See Ludwig, Notes Leyd. Mus. iv. p. 128.

Holothurians it is especially necessary to remember the words of Fabricius, "In spiritu vini mire deformatur, ita ut non pro eadem habeatur"\*. The remarkable spicules are, however, an exact copy of those figured by Semper; and there seems to be no good reason for erecting on it a new species.

Port Jackson, 0-5 fms.

### 3. *Cucumaria semperi*. (PLATE IX. fig. A.)

Body elongated, 5-sided; suckers regularly arranged in two rows, except at the two ends of the body; the suckers darker than the other parts, being almost black; the rest of the body of a mulatto tint (in spirit), or slate-grey, or whitish. Body widest in the middle. Length 36, 25 millim.; greatest breadth 10, 8.5 millim.

Retractors inserted at a little more than one third of the whole length from the anterior end; Polian vesicle large; calcareous ring long, and composed of a number of pieces, as in *C. conjungens* or *C. citrea*. Genital tubes delicate, about 6 millim. long, attached to the mesentery at about the middle of the body.

The supporting-rods in the suckers are not unlike folding eye-glasses in form, and are somewhat similar to those of *Ocnus pygmaeus*; the plates in the integument are spherical, the framework very delicate and consisting, as seen in a surface view, of a central bar connected at either end with the peripheral encircling piece by two bars making an acute angle with one another. They are present in great numbers.

Port Denison; Torres Straits.

### 4. *Ocnus*, sp.

A single specimen of what is apparently an undescribed species is in the collection; but its form is so characteristic that I have not thought it right to injure it in any way. It is distinguished externally by the soft interspaces in the integument, the greyish-white colour, and the elongated narrow form of the body.

Port Darwin, 12 fms.

### 5. *Colochirus tuberculosus*. (PLATE IX. fig. B.)

*Colochirus anceps*, Semper, *Hol.* pp. 57, 239, *ibique citata*.

There is a very large series of this species, and the specimens differ very considerably among themselves, not only in appearance but in the extent to which the colouring-matter has been dissolved out; only one retains any indication of the red pigment. The variations exhibited by the specimens as they have come to the Museum (some being quite white, others slate-grey, and others

\* Fauna Grœnl. p. 354.



almost black), the differences in the extent to which the papillæ are developed, and the comparatively much greater firmness of the integument of the younger specimens help us to understand how it is that several different names have been given to this widely distributed species. On the other hand, it is well to still bear in mind that our knowledge of Holothurian organization is not yet so complete as to justify us in definitely asserting that fresh differential marks do not yet remain to be discovered; if there are such, the series now regarded as single may be shown to contain representatives of more than one form.

As the only illustration of the spicules appears to be that which has been given by Prof. Semper, I have had views made of them from the side to show the characters of the free projecting processes, and from below showing the inside of the hemisphere.

Port Molle: Port Denison; Torres Straits; Alert Island (Torres Straits), 17 fms., sand.

### 6. *Colochirus australis*.

*Ludwig, Semper's Arbeiten*, ii. p. 88.

This species, which is represented by only one specimen from Port Molle (14 fms.), was more richly so in a collection forwarded some three years ago from Port Jackson by Mr. J. Brazier. I do not, however, find that the suckers are in them brown in colour, while the tentacles are rather black and white than brown and yellow. Neither of these are, however, points of any real importance. I find, from Mr. Ramsay's collections, that this species is very abundant in Port Jackson.

### 7. *Actinocucumis difficilis*. (PLATE IX. fig. C.)

I have had the greatest difficulty in assuring myself of the specific distinctness of this form from the *A. typica* of Ludwig, the variations exhibited in the present collection impressing one with the necessity of the greatest care in the delimitation of species.

The species may perhaps be most conveniently described by pointing out the several characters by which it is to be distinguished from *A. typica*. The ambulacral papillæ on the dorsal surface are rare, and the suckers are not in more than four rows for each ray; the differences in the form of the spicules will be best seen by comparing the figures now given with those drawn by Professor Ludwig. The retractors are inserted rather further back, being found at 24 millim. from the anterior end in a specimen 65 millim. long, and at 22 millim. in one 70 millim. long; the genital tubes are shorter than in *A. typica*, being not more than 15 millim. long in any specimen examined. The Polian vesicle would also appear to be shorter, being only 7.5 millim. long in a specimen of 65 millim. length. It may be added that the loop of the intestine is exceedingly short; that the tentacles, which are not always 20, sometimes seem to

belong to an outer, and at others to an inner circle on the disk ; and that the colour which in some cases is light brown, in others is purplish grey.

Albany Island ; Torres Straits.

Quite recently an example of this species has been received from Kurrachee.

### 8. *Thyone mirabilis* (?).

*Thyone mirabilis*, *Ludwig, Semper's Arbeiten*, ii. p. 93.

The form of the spicules would perhaps allow us to place the single specimen here with doubt referred to this species either with it or with *Holothuria dietrichii* of Ludwig, the supporting-rods in the suckers of the latter not being figured. Though our specimen has much more the form and colour, so far as one may judge from the description, of the *Holothurian*, the eight large arborescent and two small tentacles, the scattered sucker-feet, and the unarmed anal orifice exactly determine its generic affinities.

Port Denison.

### 9. *Thyone sacellus* \*.

*Stolus sacellus*, *Selenka, Zeit. f. wiss. Zool.* xvii. p. 355.

*Thyone rigida*, *Semper, Holothurien*, p. 66.

*Thyone sacella*, *von Marenzeller, Verh. z.-bot. Ges. Wien*, 1881, p. 134.

Torres Straits.

### 10. *Thyone okeni*. (PLATE IX. fig. D.)

The two specimens of this species are in remarkably good condition for examination, as one died with its tentacles fully expanded and the other was laid open by the collector.

With the exception of the terminal plate in the suckers I have not been able to detect any calcareous bodies either in the suckers or the integument ; and if any such are present they must be exceedingly small and very rare. This characteristic brings this species into proximity to the *T. villosa* of Semper, where, as in this, the suckers are very closely packed.

Elongated in form, very dark brown in colour (in spirit), tentacles of about the same shade ; suckers closely packed and distributed over the whole body, their radial arrangement in the region of the anus very obscurely indicated. Anus without teeth. Retractors inserted very nearly as far back as the middle of the body. Calcareous ring of ten pieces, the radial similar to the interradial, elongated, and wider below than above (fig. D). Calcareous plating extends some way along the enteric tract (fig. D). Genital tubes numerous, very slender and long, inserted behind the middle point of the length of

\* Prof. Selenka has been kind enough to inform me that *sacellus*, as used by him, is a diminutive form of *saccus*, not of *sacer*.

the body. Polian vesicle? Length 85, 62 millim.; greatest breadth 17·5, 17·5 millim.

Port Jackson.

Save in the complete absence of spicules this species would not appear to have any resemblance to the *T. inermis* of Heller, the shorter body of which, attenuated at both ends, is said to have a very thin integument and to be of a yellowish-grey colour.

### 11. *Thyonidium schmeltzii*.

*Ludwig, Semper's Arbeiten*, ii. p. 94.

As there is only one specimen of this species, I have been obliged to content myself with an examination of the integuments, where the "morgensternähnliche Gebilde" were found in abundance in the outer layer.

Warrior Reef, Torres Straits.

### 12. *Orcula cucumiformis*.

*Semper, Hol.* p. 244.

Port Molle.

### 13. *Phyllophorus proteus*. (PLATE IX. figs. F, F'.)

Body varying greatly in form, being saccular, swollen, or elongated; in the last case it is narrower behind than in front, and pretty regularly convex above. The integument, which is rather thick, may be black, and the colour rendered more marked by the lightness of the suckers, as there may be merely dark longitudinal bands, or the whole body may be greyish, and the only black spots the tips of the suckers. The suckers themselves always have a wrinkled appearance, but no definite statement can be made as to their arrangement on the body.

The retractors are triangular in form and considerably enlarged at their origin; the buccal ring is well developed, the radial pieces being very large, and the interrational dagger-shaped; both are rather deeply excavated above (fig. F'). The spicules in the suckers present an appearance not unlike that seen in the zoogloea-stage of *Bacterium termo*; the spicules of the integument are more or less four-sided, four-chambered bodies, made up of somewhat delicate bars, forming a trellis-work.

Port Molle; Clairmont and Thursday Islands; Alert Island (7 fms., sand).

### 14. *Stereoderma validum*. (PLATE IX. figs. E, *a-f*.)

Body elongated, tapering more at its posterior than at its anterior end; the ventral surface a little convex, the dorsal concave. A

specimen measuring 46 millim. in length has a greatest width of 20 and a greatest depth of 15 millim. The dorsal surface slopes gradually to the two sides, which are marked off from the ventral surface by the development along the lateral line of from three to six short, conical, sharp denticle-like processes. From the median dorsal line to this line the scattered suckers increase in number; they are, however, much more numerous on the ventral surface, and more regularity of distribution is to be observed along the ventral median line than in any other part. The suckers are provided with stout plates, but no special terminal plate was detected. The calcareous plates in the skin are on the general plan of those in *S. unisemita*; but the bars do not appear to be so stout, and there may be at least seven pores. The ten pieces of the calcareous ring are all equal, and the retractor muscles are not especially strongly developed. As in *S. unisemita* there is, comparatively, a feeble development of the digestive and respiratory organs; but these characters, as well as the stiffness of the tentacles, are rather points of generic importance.

A more complete generic diagnosis will be made when the two species have been carefully compared.

Two young specimens have the integument much thinner.

Port Jackson, 0-5 fms., where it is, as other collections show, exceedingly common. Also from North Dunbar Island, China seas, and from between Ball's Head and Goat Island (*coll. Brazier*); and two dried specimens, purchased in 1848 of Mr. Cuming, from Brisbane Water, N. S. W.

In the definition of the genus given by Prof. Selenka there occur the words "Körper mit einfachen Füßchen bedeckt, die in der rechten (oder linken) Flanke in einer Doppelreihe stehen;" and the presence of this more distinct set of suckers is implied in the specific term of the American species, *unisemita*. In the present species, of which there is a good supply of specimens, I observe that the double row occupies the middle of the trivium, but that it varies considerably in the extent to which it is distinctly developed. Some modification of the generic diagnosis must therefore be made, and the suckers be spoken of as scattered over the body, but having a tendency to form a regular double row in some part of the trivium\*.

### 15. *Stichopus variegatus*.

*Semper, Hol.* p. 73.

A single, rather small specimen from Port Moller.

\* Since working out this species I have had the opportunity of examining another member of the genus from Kurrachee; for *S. murrayi* see *Proc. Zool. Soc.* 1883, p. 61.

Mr. Ramsay tells me that the naturalists of Sydney have been in the habit of regarding *S. validum* as the *Holothuria spinosa* of Quoy and Gaimard: this determination cannot, I think, be accepted.

16. *Holothuria lineata*.

Ludwig, *Semper's Arbeiten*, ii. p. 103.

One specimen from Thursday Island; skin very thick.

17. *Holothuria peregrina*.

Ludwig, *Semper's Arbeiten*, ii. p. 105.

With considerable doubt I refer to this species a single specimen from Thursday Island.

18. *Holothuria modesta* (?).

*Holothuria modesta*, *Semper's Arbeiten*, ii. p. 106.

Professor Ludwig described his species from a single specimen, and, curiously enough, there is only one specimen in the 'Alert' collection. The characters of the supporting rods in the suckers leads me to believe that the two are forms of the same species; but a full examination is not possible with a single representative.

Torres Straits.

19. *Holothuria macleari*. (PLATE IX. fig. G.)

As will be seen by the figures, the spicules of this species present a considerable resemblance to those of *H. tigris*, with which, as it would seem, it must be closely allied.

As there is but a single specimen, presenting well-marked external characters, I think it right to limit myself to an account of these. Body elongated, trivium flat, bivium convex, anus round, unarmed, without (perhaps having lost) any distinct indications of pentamerous marking; ambulacral papillæ on the convex back, three rows of not very regularly arranged suckers on the trivium. An appearance of ringing both above and below is produced by the white colours and transverse setting of the papillæ and suckers respectively; as the former are less numerous than the latter, there are only about thirty bivial rings, while on the trivium two or three rings are here and there confluent and present a kind of longitudinal marking.

The single specimen is 49 millim. long and 10 millim. wide.

"Clairmont and Bird Islands," N.E. Australia.

A specimen from the island of Rodriguez, in the possession of the British Museum, apparently belongs to this species.



## CRINOIDEA.

In the preparation of this portion of my Report I have had the very considerable advantage of the kindness of Mr. P. Herbert Carpenter, whose work on this group is so well known to, and so highly appreciated by, his fellow-workers. Mr. Carpenter has not only been good enough to favour me with his opinion on many of the species and specimens in the present collection, but, at what must have been considerable trouble to himself, he copied out for me the notes that he had been able to make at various times and places on the "type specimens" of the species named by the illustrious founder of the system of this group; thanks to this act of kindness, I have probably escaped from some of the numerous pitfalls which, with the advance of our knowledge, now surround the student who applies himself to Johannes Müller's descriptions of the different species. As Mr. Carpenter will, in the progress of time, publish his studies on these Müllerian types, I have thought it proper on this occasion to do little more than merely note the presence of such forms in this collection.

The proportion of undescribed to described species is no doubt appalling; but on making a careful estimate I do not find it to be practically greater than in the case of my predecessors. In a Note which I communicated to the Zoological Society in May 1882 I gave a list of all the described species, which was very nearly complete: therein were enumerated 37 *Antedons* and 21 *Actinometræ*. Of these, 7 *Antedons* and 4 *Actinometræ* were first described in 1881, from the collection of the Leyden Museum, by Mr. Carpenter. In that paper the percentages of new to all the known species were respectively 23 and 23; the percentages to new species in the collection respectively 70 and 40.

As there are here described 12 new species of *Antedon*, my percentage to the 37 described forms is 32·5, to all the species mentioned in this Report it is 75; on the other hand, there are some 5 new species of *Actinometra*, giving a percentage of 23·5 to all the described forms, and of 38 to those enumerated in the accompanying list.

Against this higher proportion we must, however, set off the fact that five of the earlier species had been described by Müller from the specimens in the Leyden Museum.

But the whole story has not yet been told: without, of course, wanting in any way to tie Mr. Carpenter down to details, I may add that his examination of the 'Alert' collection was made after he had examined the collection of Crinoids brought together by the officers of H.M.S. 'Challenger,' and entrusted to him for description. Only a single form among the "new species" in the present collection has been detected by Mr. Carpenter to be one of the treasures which he has described, but whose description he has not yet published:

the interesting *A. jukesi*, of which Mr. Carpenter has already indicated the more essential characters, is indeed represented in this collection, as it is probably in any fair collection of the marine fauna of the Australian coast.

Yet, again, in a paper which will be shortly published in the 'Journal of the Linnean Society'\*, Mr. Carpenter describes eight out of the nine specimens of *Antedon* from the Hamburg Museum as new, and he speaks in the introduction as estimating the species of Comatulids at something like 400.

Further, it is of great significance to observe that many of the species here enumerated or described were collected at one station only.

Lastly, we note that the number of *Antedons* is larger than might have been expected; for in the Moluccas "*Antedon* seems to be comparatively rare"†, while of the 29 species here enumerated, 16 belong to that genus. From such material as has passed through my hands, I am inclined to think that on the northern and eastern coasts of Australia we shall find *Antedon* to be rather more abundantly represented in species than *Actinometra*; the time, however, for any generalization is still far off.

In entering into the detailed enumeration of the proportion of new to old species, I had not in view the purpose of apologizing for the presence of so many new forms in this collection, but rather the desire of directing attention to facts which can only be within the knowledge of a limited number of special students; those who know how few species of *Comatulæ* have been described, and how rich in novelties not only new collections but old museums are, will not think that there is any suspicious wealth of new species in the very valuable and important collection by which Dr. Coppinger has more than doubled the number of specimens and species in the possession of the British Museum‡.

So large a number of new species should be presented in some kind of arrangement, either in the form of a phylogenetic table or of a "key." The former being an impossibility at present, on account of our unsatisfactory knowledge of the ancestry of the Comatulidæ, and keys being, of all things, the most unscientific, I propose to give formulæ for all the species of Comatulids here described, basing those formulæ on the method I proposed to the Zoological Society§, as improved by the suggestions of Mr. Carpenter ||.

\* Journ. Linn. Soc. xvi. p. 487.

† Notes Leyd. Mus. iii. p. 191.

‡ [The above is allowed to stand, though written some eighteen months ago, as it puts more forcibly than a briefer and colder statement could, the present tenuity of our knowledge of Crinoid species and the wide area that is opening up to us.—Dec. 4, 1883.]

§ P. Z. S. 1882, p. 530.

|| P. Z. S. 1882, p. 731. I retain A' as the sign for *Actinometra*, as *a* is used in the formulæ of the cirri; and I propose to use *br* for the brachials, as *b* is likewise used in the formulæ of the cirri. Similarly I omit the 10, as A 10 followed by A 3 (in such a list as the following) is very apt to mislead.

## ANTEDON.

adeonæ .....	$A. \frac{b}{b}$	reginæ .....	$A. 2.(2) \frac{b}{b}$
milberti .....	$A. \frac{b}{b}$	articulata .....	$A. 2.2 \frac{c}{b}$
pinniformis .....	$A. \frac{a}{b}$	irregularis .....	$A. 3.(2) \frac{b}{b}$
carpenteri .....	$A. \frac{a}{a}$	elegans .....	$A. 3. \frac{(2)}{(3)} \frac{b}{c}$
pumila .....	$A. \frac{b}{a}$	gyges .....	$A. 2.2 \frac{c}{b}$
bideus .....	$A. \frac{b}{a}$	briareus * .....	$A. 3.2.(2) \frac{b}{a}$
loveni .....	$A. \frac{b}{x}$	microdiscus .....	$A. 3.3.(3) \frac{c}{c}$
decepiens .....	$A. (3) \frac{b}{b}$		

## ACTINOMETRA.

solaris .....	$A'R \frac{br}{2} \cdot \frac{a}{a}$	alternans .....	$A'3.2.3.2 \frac{0}{0}$
intermedia .....	$A'R \frac{br}{2} \cdot \frac{b}{a}$	paucicirra .....	$A'R \frac{d.br}{2} \cdot \frac{a}{a}$
robusta .....	$A'R \frac{br}{2} \cdot \frac{b}{b}$	multifida .....	$A'3.2.2 \frac{b}{a}$
cumingi .....	$A' \frac{a}{a}$	variabilis .....	$\left\{ \begin{array}{l} A'3.2 \frac{a}{a} \\ A'3.3 \frac{a}{a} \\ A'3.(2).(2) \frac{a}{a} \end{array} \right.$
coppingeri .....	$A' \frac{b}{a}$		
jukesi .....	$A'R \frac{d.br}{2} \cdot \frac{0}{0}$		
parvicirra .....	$A'3.3. \frac{(ab)}{a}$		

From the table of *Antedon* formulæ some facts become at once apparent:—

( $\alpha$ ) There are six examples among the more than ten-rayed forms in which the arms are not a regular multiple of ten—that is, not 20, 40, or 80; this is clear from the sign for the palmar or post-palmar being in these cases placed within brackets.

( $\beta$ ) In all cases cirri are developed, and these are rarely very numerous or very long.

( $\gamma$ ) In no case is the radial axillary a syzygy.

A moment's inspection of the table of formulæ for the *Actinometra* will reveal to the student a number of interesting facts:—

( $\alpha$ ) Three species have the same structural characters, and only

\* A study of this species is sufficient to show the advantage of Mr. Carpenter's proposal to register the number of joints in each division over my proposal to register rather the syzygies first of all, as *A. briareus* has no syzygies on the palmars or succeeding joints where the arms divide again.

differ in comparatively unimportant details, of a kind which are probably *adaptive*.

( $\beta$ ) There is a marked tendency to the development of a small number of short cirri\*.

( $\gamma$ ) And ten species have lost the cirri altogether.

( $\delta$ ) Of the eleven species the formula of no two is exactly the same.

### 1. *Antedon adeonæ*.

*Comatula adeonæ*, J. Müller, *Gattung Comatula*, p. 15†.

A white line, which extends along the middle of the radials, the rest of which is of a reddish purple, is continued for a short though varying distance along each of the arms.

There is a curious error in connexion with this species which does not seem to have been noticed. Lamarck described it as "*C. radiis pinnatis denis* &c.;" de Blainville, while quoting Lamarck, refers also to his own figures in his 'Atlas' (pl. xxvi.); in this reference he is followed by J. Müller and by the editors of the second edition of Lamarck. The figures, however, when referred to are seen to be those of a species with twenty arms and with cirri nearer thirty than twenty. It is not perhaps necessary at this distance of time to waste time in inquiring what species it is that de Blainville has there figured.

Port Curtis and Port Denison.

### 2. *Antedon milberti*.

*Comatula (Alecto) milberti*, J. Müller, p. 19.

The rich supply of this species in the present collection‡ amply justifies the doubts which Mr. Carpenter has expressed to me as to the exactness of the locality (North America) ascribed by Müller to this species.

Port Mollé; Port Denison; Prince of Wales Channel; Torres Straits.

### 3. *Antedon pinniformis*.

P. H. Carpenter, *Notes Leyd. Mus.* iii. p. 180.

Dundas Strait, N.W. Australia.

\* So far as we know at present, *c* rarely appears in the formula of an *Actinometra*; in words, the cirri are rarely very numerous (more than 30) or very long (with more than 40 joints).

† The essay on *Comatula*, the pagination of which is here quoted from its separate copy, was published in 1849 in the 'Abhandl.' of the Academy of Berlin for 1847, where it occupies pp. 237-265.

‡ It is also well represented in a collection of Mr. E. P. Ramsay's, of the Australian Museum, Sydney.

#### 4. *Antedon carpenteri*. (PLATE X. figs. A, a-c.)

Centrodorsal a flattened disk; about 12 marginal cirri, of almost 20 short joints, of which the lowest are almost twice as broad as they are long; it is not till we reach the penultimate one that we see a distinct spine, though the dorsal surface of most of them is produced into a minute protuberance.

First radials not visible; the second do not or do only slightly touch, united to the third by ligament. Ten arms. First brachials touch, they are nearly oblong and more than twice as wide as long; the second are a little wider on their outer than their inner side; the third with a syzygy; fourth to sixth oblong, seventh wider on inner than outer side, eighth wider on their outer than inner, and so on alternately; twelfth and thirteenth serrated at their distal edge; the fourteenth syzygial. Thence from four to seven joints between each syzygy. 130-180 joints in the arm.

The second pinnules on the fourth brachial are very stout, with extraordinarily wide joints, which are armed on either side by spinous projections; the first pinnule is a little longer than the third.

Colour white, with purple bands or patches, not always developed at the syzygies. The middle line of the arm often white.

Arm about 40 millim. long, disk 6 millim. in diameter, cirri less than 9 millim. long.

This species has some considerable resemblances to *A. serripinna*, from which, however, the pinnules alone would, as Mr. Carpenter assures me, be sufficient to distinguish it.

Port Curtis.

#### 5. *Antedon pumila*. (PLATE X. figs. B, a-b.)

Centrodorsal rather wide, rounded; with about 25 cirri, in three rows, very delicate, of about 12 joints, which, from the fourth onward, are a good deal longer than broad, hourglass-shaped, but a little wider at their distal than at their proximal ends; some are also produced into a small spinous ventral process; no dorsal spine developed till the penultimate, and that is small.

First radials just visible, second not in contact; axillaries triangular in shape, sloping backwards in the middle line. Ten arms. First brachial longer without than within, the second within than without and projecting backwards in the middle line; the third a syzygy wider within than without. The succeeding joints may be incised, so as to leave a lozenge-shaped space between every two; when this disappears, the joints which have projected strongly forwards on either side alternately become more evenly oblong.

Syzygies 3, 8, 12, 15; then a little rarer.

Pinnules delicate, the second longer than the first, with elongated joints which are a little wider at their distal than at their proximal end and are produced into a minute spine.



Arm about 30 millim. long, cirri 7 millim., diameter of disk 3.5 millim.

Colour creamy white, in spirit.

Port Jackson, 0-5 fms.

The above description was originally drawn up from the single specimen received from the 'Alert,' which in spirit had a creamy-white colour and appeared to be hardly mature. Since its arrival the Museum has acquired specimens from Neison's Bay, which are no larger and are a little darker or grey in colour; these specimens, of which I have been able to examine a number, bear witness to their maturity by the presence of a large number of ova attached to the pinnules.

#### 6. *Antedon bidens*. (PLATE XI. figs. A, a-c.)

Centrodorsal prominent; about 20 cirri, with about 20 joints, a number of which have two minute processes on their dorsal side; the penultimate spine is small; none of the joints are distinctly longer than broad, but a number of them have a shallow lateral excavation along their distal edge.

First radials just visible; second very wide, in contact; third almost triangular, not quite twice as long as the second, and forming a convex protuberance with it. Ten arms. First brachials in contact, a little wider on their outer than their inner side, as are also the second brachials, which form with the first a convex protuberance; the third brachials, which are syzygies, have a sharp distal edge, as have the succeeding joints; these soon become wedge-shaped, and form a strong overlap on either side alternately; after some time this diminishes, and the more terminal joints of the arm form rather bead-like swellings on either side.

Syzygies 3, 9, 14; 4-6 joints between the succeeding syzygies.

The first pinnule is very stiff and long, with the most proximal joint the longest; it is placed on the second brachial, has some 12 joints, of which the more basal are much longer than broad, and which are also stouter than those on the sixth brachial, which, again, are a little stouter than those on the fourth. The pinnules then gradually diminish in size, and then again increase further out.

The arms are stiff, and somewhat compressed from side to side: they are about 45 millim. long; diameter of disk 5 millim., of centrodorsal 3.3; length of cirri about 8 millim.

The original colour was probably purple.

Torres Straits.

#### 7. *Antedon loveni*. (PLATE X. figs. A, a-e.)

Centrodorsal large, as large as the disk, excavated in the centre, with about 20 cirrus-sockets (cirri lost).

First radials just visible, second oblong with a convex median protuberance along their distal edge; axillary pentagonal, not a

syzygy. Ten arms. First brachials wider without than within, in contact, with a convex median protuberance along their distal edge; the second with sides a little more regular; the third almost square, a syzygy. The fourth to seventh joints a little wider than long; eighth or ninth a syzygy. The succeeding joints wedge-shaped, with their free margins a little overlapping and slightly toothed. About 5-8 joints between the succeeding syzygies.

The earlier pinnules are extraordinarily stiff; the first, which is on the second brachial, is much shorter than the second or third, which are of about the same length and made up of rather less than 20 joints, most of which are longer than wide, and have their distal edge enlarged and slightly denticulated. There are 10 or 12 stiff pinnules; the succeeding ones are shorter, and then again longer.

Arms more than 120 millim. long; disk not more than 7 millim. in diameter. The radials and the earlier brachials have their infero-lateral edge produced into a kind of ledge. The more proximal joints have the appearance of being tuberculated, and there is a faint median dorsal ridge; at the sides they are compressed.

Colour dark slate.

The stiff pinnules, the long arms, and the small disk are very striking characters in this species.

Port Denison.

The large *Myzostomum* found on it has been named *M. coriaceum* by Dr. Graff.

### 8. *Antedon decipiens*. (PLATE XI. figs. B, *u.*)

Centrodorsal small; cirri on three levels, about 20 in number, with 25 joints, of which the fourth to tenth are longer than wide; the rest, which gradually become shorter, are provided with a well-marked spine; these decrease towards the end, but the penultimate one is larger again.

First radials quite distinct; the second oblong, three times as long as wide, partly in contact; the third almost triangular. The arms may or may not divide, so that there are from about 14 to 18. The first brachials or first distichals are always wide, and touch; where the arms divide there are three distichals, and the axillary may be a syzygy. The first brachials, which have sharp overlapping distal edges, are pretty regularly oblong; at about the seventh they become alternately wider on either side, to again become more regular later on.

Syzygies 3, 12-15, 22-25; then from 10-12 joints between each syzygy.

First pinnule on second distichal (when present), that and the one on the third brachial short; those on fifth to ninth much longer, the basal joints very stout, the free ends very delicate, and their outer side produced into a well-marked conical process. The succeeding pinnules are shorter, and these again increase in length; they are not composed of a large number of joints.

Disk small. Arms about 70 millim. long, cirri about 16 millim. Colour white; pinnules sometimes banded with darker.

This species presents some resemblances to *A. pinniformis* of Carpenter.

Arafura Sea (32-36 fms.); Dundas Strait; Prince of Wales Channel.

I provisionally associate with this, as a variety, two specimens from St. 144, in which the cirri are rather more numerous and more jointed, in which the whole animal appears to be more slender and delicate, and the colour ashy grey.

### 9. *Antedon reginæ*. (PLATE XII. fig. A, *a*.)

Centrodorsal hidden by the cirri; cirri about 30, with 30 stout and laterally compressed joints, about 20 of which are provided with a well-marked spine.

First radials not visible, second broader than long, in contact; third short, with a very slight backward projection in the middle line. Two broad distichals. Thirty-five arms; if the arms divide a second time there are two palmars, and the third brachial is a syzygy; if the arm does not divide a second time, the fifth brachial is a syzygy. At first the joints are fairly regular, though much shorter than wide; later on they become more or less, though never very strikingly, wedge-shaped.

Syzygies on the ninth joint; then from 9-14 between each.

The first pinnule is shorter than the second, which is of some length, and the third than the fourth; most of the pinnules are very short.

Length of arms about 70 millim., cirri about 24 millim. Disk deeply incised, 10 millim. in diameter.

Colour, flesh-coloured.

Port Moller.

### 10. *Antedon articulata*.

Comatula (*Alecto*) *articulata*, Müll. *Gat. Comat.* p. 27.

Port Moller.

### 11. *Antedon gyges*. (PLATE XII. figs. B, *a*, *b*.)

Centrodorsal flattened, rounded, with cirri in three rows, rather more than 40, with rather more than 30 joints, the fifth to the tenth longer than broad, the succeeding joints shorter, and provided, first of all, with a convex dorsal edge; this narrows into a wide spinous protuberance, which becomes more and more spiny till the fairly well-marked penultimate spine is reached.

The single specimen has 41 arms.

First radials completely, second largely obscured; the third triangular, not a syzygy; a slight median conical protuberance in the

line of junction of the second and third. Distichals 2; palmars 2: in neither case is the axillary a syzygy, and in both cases there is a slight conical protuberance where the two joints meet, and in both cases also the more proximal of the two joints is in close lateral contact with its fellow. First brachials a little wider along their outer than their inner side; along the latter they are again in close contact with their fellow; as the second brachial is also wider without than within, there is a feebly-marked diamond-space interval. The third brachial is nearly oblong, and, being syzygial, has somewhat the appearance of a dice-box. For the next three or four joints there is no wedge-shaped arrangement; at first feebly indicated, it rapidly becomes more marked; further out it diminishes, and the terminal joints are nearly oblong. As in *A. flagellata* (see Carpenter, Notes Leyd. Mus. iii. p. 183), the earlier brachials are flattened on their outer side.

The first syzygy is on the third brachial, the next about the fifteenth, and there are then intervals of 9-10 joints between the syzygies.

The species is at once to be distinguished from *A. flagellata* by the fact that the third is shorter than the first pinnule; of the first three the second is the longest. The first is on the second brachial, and is but little shorter than the second; the first three pinnules all have broad basal and elongated distal joints, but though longer than the next succeeding they are by no means remarkable in their length.

Colour: brownish flesh-coloured arms; the peristome very much darker; the cirri much darker on their ventral than their dorsal aspect.

Disk incised, with a diameter of 7.5 millim.; arms about 80 millim. long; cirri 21 millim. long.

Thursday Island.

## 12. *Antedon irregularis*. (PLATE XIII. figs. A, *a-c*.)

Centrodorsal flattened, small; cirri marginal, in two rows, about 25 in number (but there may be not more than 15), with 30-35 joints, the lowermost short, fourth to ninth longer than wide, then again shortening; no spine, except on the penultimate joint, and that exceedingly small.

First radials not (or barely) visible; second wide, in contact, with a median convex protuberance; the third almost perfectly triangular.

Arms 11-22. Three joints in the first division, the axillaries syzygies; when there is a second division there are two joints, the axillaries not syzygies. The earlier joints of the arm have a well-rounded convex dorsal surface and are broader than long; soon, however, they become very markedly wedge-shaped and form a prominent projection alternately on either side. Towards the end of the arms these disappear.

Syzygies 3:10:19, or 3:11:21, or 3:13:21, or 3:14:21, or 3:15:22; then from 6-10 joints between each.

First pinnules very short; third and fourth the stoutest and longest, quite stiff, with well-developed broad lower joints, each of which has a marked protuberance on either side; the succeeding ones shorter, and then again longer.

Arms about 85 millim. long, the longest cirri 24 millim.; diameter of disk 6 millim.

Colour: pale flesh, occasionally with a dark band here and there, especially at the syzygies; sometimes there is a good deal of brown. The cirri are typically banded purple and white.

Prince of Wales Channel; Torres Straits.

This species has some resemblance to *A. decipiens*; but it may be distinguished from it by ( $\alpha$ ) the absence of spines from the joints of the cirri, ( $\beta$ ) the broader lower pinnules, and ( $\gamma$ ) the greater length of the more distal pinnules.

### 13. *Antedon elegans*. (PLATE XIII. fig. B, $\alpha$ .)

Centrodorsal small and flattened; cirri marginal, in two rows, 25-30, with 40 joints, the fifth to tenth rather longer than broad; the succeeding ones with a short conical spine, which diminishes in the more distal ones, but enlarges again somewhat as a penultimate spine.

First radials just visible; second wide, barely in contact; the third comparatively short. Thirty arms. The three distichals pretty long; the axillary a syzygy. If the arms divide again there are generally two joints, when the axillary is not a syzygy; but there may be three joints, and then the axillary is a syzygy. The earlier brachials have even sides; they then become wedge-shaped, but do not overlap. Still further out, they become shorter and project a little at the sides; towards the free end of the arm the upper face of each joint is sharply convex.

Syzygies 3:11:22; then 9-13 joints between each.

The first two pinnules are stiff and long, longer and stouter than the third and fourth; none of the following are long, but the rather more distal are the longer.

The disk is deeply incised, and the margins of the rays provided with a well-developed and characteristic calcareous plating.

Arms delicate, 95 millim. long, cirri 30 millim.; disk (owing to the incisions) only 8 millim. in diameter.

Arms pinkish flesh-colour above, much darker below; the cirri ringed purplish and white. In a younger specimen there are purplish spots on the arms above.

Port Moller.

A disk from Thursday Island probably belongs to this species.



14. *Antedon briareus*. (PLATE XIV.)

Centrodorsal flattened; 15-20 marginal delicate cirri, formed of a few short joints.

Arms more than 70.

First radials obscured; second in contact, at least three times as long as they are broad; third widely triangular. Three distichals, the axillary a syzygy; two palmars. If there is another division there are again two joints; no syzygy. The first five or six brachials have nearly even edges; the succeeding ones are markedly wedge-shaped. A syzygy on the third brachial; succeeding syzygies rare.

Second pinnules longer than first, very delicate, made up of a number of small joints; the succeeding pinnules stouter and more fleshy.

This is one of the species in which there is a very considerable difference in the length of the arms; here some of the arms may be as much as 110 millim. long, while others are only 75 millim. There is an interradial plating, extending as far as the distichal axillary.

The colour (in spirit) is dark brown.

Port Denison.

15. *Antedon microdiscus*. (PLATE XV.)

Centrodorsal rather large and prominent; the cirri marginal, in two or three rows, from 30-50 in number, with from 50-70 joints, none of which are markedly longer than broad; as a rule, the distal two thirds have an inconspicuous dorsal spine, and in the larger specimen the penultimate spine is hardly more conspicuous.

The first radials visible; all very short and wide, the second not in contact. Three distichals, the axillary a syzygy. Three palmars, the axillary normally a syzygy. The arms may divide again, and of the three joints the axillary may or may not be a syzygy. Probably as many as 90 arms in an adult. The earlier brachials have fairly even edges, are well rounded above and flattened at their sides; the next succeeding are faintly wedge-shaped, the distal edge of each projecting alternately on either side into a slight protuberance; further out, the wedge-form disappears. The arms generally, though slender, are very firm and stiff and are set very close to one another.

Syzygies 3, 22-25, 40-41; then from 10-12 joints between each.

The earlier pinnules exceedingly long in the adult, with very stout slightly keeled basal joints; the second, which is a good deal longer than the first, has as many as 50 joints and is quite fine at its free end; the more distal joints are provided with a spine or tuft of spines.

The stiff straight arms are about 150 millim. long; the cirri measure nearly 50 millim.; the disk, with rounded incisions, has a diameter of about 12 millim.

The disk and the arms, as far as their last division, are largely

washed with purple; the middle line of the arms is lighter, but patches or spots of purple are to be found at the sides; the lower surface is a little lighter on the disk than on the arms, where it is almost black.

Port Molle, 12 fms.

Three smaller specimens already in the collection of the British Museum, from Nicol Bay, N.W. Australia, must, I think, be referred to this species. The smallest of these has not more than 30 cirri, nor have they more than 40 joints; their spines, and especially the penultimate one, are better developed. There are only about 50 arms, and in some cases there are only two palmars (when the axillary is not a syzygy). The ground-colour is purplish, marked with yellow bands.

### 16. *Actinometra solaris*.

*P. H. Carpenter, Notes Leyd. Mus.* iii. p. 192; *Journ. Linn. Soc., Zool.* xvi. p. 514.

Two specimens of different sizes do, I think, undoubtedly belong to this species, to which specimens have not unfrequently been assigned that are to be distinguished by what are apparently good specific characters.

Prince of Wales Channel.

The greatest difficulties attend the exact delimitation of the specific characters of this species; and the question whether they vary within wide limits or are, rather, sharply defined cannot yet be answered. For the purposes of exact knowledge it seems to be at present the better course to try and recognize points of difference between allied forms; we must by experiment and experience discover which of the characters of a Comatulid afford trustworthy criteria in the discrimination of species; so few forms have, as yet, been described, and so little criticism has been brought to bear on what work has been done, that our knowledge of how species are to be defined and delimited is as yet in a very elementary condition.

The only consolation is to be found in the reflection that what may seem, with wider knowledge, to be a "bad species" is justifiably regarded now as a "good one," and that wary specific discrimination is often a considerable aid to the exact and accurate knowledge of the characters of complex and elaborate forms.

The two specimens here ascribed to *A. solaris* present the following characters:—

There are 12 cirri, and there may be only 18 joints in a cirrus; the more proximal joints of the arms of the smaller specimen are more "knobby" than the correspondingly placed joints in the larger. In both cases the arms are at their widest a little distance from the disk; the keels on the basal joints of the second pinnule are well marked in the smaller specimen; but in neither case are there any very prominent keels on the basal joints of the third pinnules.

Arm of the larger specimen about 120, of the smaller about 85 millim. long; in the former the first pinnule is about 20 and the cirri 16 millim. long.

Both of the specimens are white and without any dorsal median line; dark spots or marks prominently developed on the pinnules.

For the present, at least, I associate with *A. solaris* a specimen from Warrior Reef, in which the characteristic keel to the pinnule is developed and in which the cirri do not seem to have been more than twelve in number, but in which the number of cirrus-joints would appear to be less than fifteen.

There are also specimens from Port Curtis and Torres Straits which, though still small, hardly promise to ever have the stout arms which are so characteristic of the adult; further experience will, I think, show them to be "dwarfs."

From the Arafura Sea we have received a comparatively small specimen, which is chiefly remarkable for the smaller number of its cirrus-joints.

In Dundas Strait there were dredged some small specimens which approach in character *A. pectinata* and *A. purpurea*, but give us, with our present scanty information, but little aid in determining the character or limits of these species.

From Thursday Island we obtained a somewhat injured and large specimen belonging to the "type" of *A. solaris*, but which completely eludes my attempts to understand it.

Under the name of *A. albonotata* I was inclined to separate a specimen from Albany Island, which is to be distinguished from the form to which the name *A. solaris* is ordinarily restricted by the larger number (20-25) of cirri, and the less prominent keels on the basal joints of the second pinnules. The general facies, however, of the specimen is distinctly that of *A. solaris*, with the exception of the rather remarkable coloration, which has led to the proposal of a distinctive name. When, however, we make a careful comparison between the pattern of this coloration and that of the two specimens first described and unhesitatingly referred to *A. solaris*, we see that there is really a striking resemblance between the two, and we are again led to the reflection that great circumspection is to be exercised whensoever we are tempted to make use of difference in colour as a distinguishing mark. I have already stated that there are black patches or spots on the pinnules of the first-described pair of specimens; what we find in the one now under consideration is that these spots having greatly increased in number, and become more extensive than the white, have caused the white ground to assume the appearance of spots on a dark ground. The extreme limit of the species seems, however, to be reached by this form; and as the cirri are more numerous than usual, and the basal joints of the second pinnule less strongly keeled, I propose to speak of it as *A. solaris*, var. *albonotata*.

We must not be tempted by the difficulties of specific discrimination to make use of mere coloration: there are in the collection two specimens of *A. solaris* from Thursday Island, one of which is uni-

formly purple, while the other has the purple relieved by a white median dorsal line and by some white pinnules.

I trust that with an increase in our knowledge and with a larger series of specimens the preceding discussion will be found, long as it must have seemed, to be of some aid in the determination of the characters and limits of the species; with such scanty information as we possess at present it would be to the last degree rash to venture on any kind of prophesy. Were I to make one, however, I should say that many of the variations, which at present there is a tendency to regard as of specific importance, will be found to present less constancy of arrangement when large series are brought together for examination. In the work of enlarging our knowledge of the species of Crinoids the British Museum may well look to those English colonists who live on such sea-boards as that of the Australian coasts, and who have opportunity to do some dredging in their waters.

The student will believe that it was not without much study that I instituted the species now succeeding; since I did so I have had the opportunity, thanks to the kindness of Mr. E. P. Ramsay, of examining a collection of Australian Echinoderms; and it was with a certain amount of satisfaction that I obtained from it specimens which exhibited a close resemblance to *A. intermedia*, and led me to think that I was justified in regarding its differential characters as constant and definite.

Standing midway between *A. solaris* and *A. robusta* it may be distinguished as

### 17. *Actinometra intermedia*.

As Mr. Carpenter has pointed out, it appears to be possible, in part at any rate, to distinguish *A. solaris* from *A. robusta* by the character of the keels, which, in the former, are so strikingly developed on the basal joints of the second pinnule. Basing myself on the theory that the keel is constantly present on the basal joints of the second pinnule of *A. solaris* (Plate XVI. fig. A, *a*), and that it is never found on those of *A. robusta* (fig. A, *b*), I venture to think that, in the case of *A. intermedia*, we have to do with a form in which constantly the keels are never as well developed as in *A. solaris*, and never so slightly as in *A. robusta*, while at the same time there are considerable differences in the extent of the development of the keel, not only within the limits of the species but even of the individual (*cf.* figs. A, *c*, *d*).

The following appear to be the more characteristic marks of the species:—A general resemblance to *A. solaris*; but there are about 18 cirri, with from 18–20 joints; first pinnules not specially long, of rather more than 40 joints; basal joints of second pinnules with a not conspicuous keel, and with one which varies in the extent to which it is developed. Arms widest a slight distance from the disk.

A specimen with an arm 120 millim. long has the cirri 15.5 millim. long, the first pinnule 20 millim. long, and the arms 3 millim. at their widest; in other words, these measurements are very much the same as those of the specimens of *A. solaris* lately referred to. The faint white line which is so often seen along the middle of the dorsal surface of the arms is to be seen in some specimens; and in some cases we may observe the black spots on the pinnules, to which attention has already been directed.

It will be clear enough to the student that the specimens now under discussion present several points of considerable difficulty; but, though they have the general facies of *A. solaris* and on the other hand a larger number of cirri and a feebler keel, thereby approaching *A. robusta*, they, at the same time, present sufficient constancy in the retention of their differential characters to prevent our believing that the differences that we observe have not passed within the influence of the laws of heredity.

Albany Island.

### 18. *Actinometra robusta*.

*Actinometra robusta* (Lütken, MSS.), *P. II. Carpenter, Journ. Linn. Soc., Zool.* xvi. p. 517.

In specimens of this comparatively well-marked form from "St. 144,"\* which were somewhat smaller than those described by Mr. Carpenter, I noted that the basal joints of the arm were not so distinctly knobbed, and that there was a faint carination to the basal joints of the second pinnule. On the other hand, in a larger specimen from Port Curtis, which appeared to be particularly well developed, the knobs were very prominent.

With regard to the specimens from St. 144, Dr. Coppinger notes that they were "originally of a purple colour."

### 19. *Actinometra stota*.

Among the present collection of Crinoids Mr. Carpenter recognized a single specimen of a species which he has distinguished as *A. stota*, n. sp., and of which he will give a full account in his forthcoming Report on the Comatulæ of the 'Challenger' Expedition.

Port Mølle.

### 20. *Actinometra cumingii*.

*Comatula cumingii*, *J. Müller*, p. 19.

A delicate specimen with 10 cirri, the cirri having about 12 joints and no penultimate spine, and most of the joints being a

\* Probably Thursday Island.



little longer than broad, is referred to this species. Two of the arms which have undergone injury are now giving rise to four and three arms respectively.

Port Mollo.

### 21. *Actinometra coppingeri*. (PLATE XVI. fig. B.)

Centrodorsal small; 17–20 cirri in two rows, with from 17–20 joints, the fourth to sixth longer than broad, the rest shorter; the spines, including the penultimate one, obscure.

First radials hardly visible, the second three times as wide as long, partly in contact; the axillary almost triangular, not a syzygy. The specimen under examination has 12 arms, but the normal number is probably 10. First and second brachials wider on their outer than their inner side, the first in contact, the third a syzygy; it and the next two oblong; the succeeding ones wedge-shaped and the distal edges slightly dentated; further out the joints more regularly oblong.

Syzygies on the third and tenth, and then at about every fifth joint.

First pinnules on the third brachials longer than the second, and the second a little longer than the third; the fourth again rather longer. The succeeding ones of a fair length.

Length of arms about 70 millim., of cirri 7·5 millim.; diameter of disk 4·5 millim.

Colour creamy white.

Flinders, Clairmont.

### 22. *Actinometra jukesi*.

*P. H. Carpenter, P. R. S.* 1879, p. 390.

A technical description of this species will be given by Mr. P. Herbert Carpenter in his Report on the Comatulidæ of the 'Challenger' Collection. It is evidently a common form.

Albany Island; Prince of Wales Channel.

### 23. *Actinometra parvicirra*.

*Actinometra parvicirra* (Müller), *P. H. Carpenter, Notes Leyd. Mus.* iii. p. 204, *ibique citata*.

A small specimen, from Warrior Reef, was determined for me by Mr. Carpenter; another from Port Mollo has less than 20 arms, as in some of the specimens in the Paris Museum. It is of interest to note that this appears to be, like *A. carinata*, a species of exceedingly wide range, for Mr. Carpenter found two specimens of it from Peru in the collection of the Hamburg Museum.

**24. *Actinometra alternans*.**

*P. H. Carpenter, Notes Leyd. Mus.* iii. p. 208.

An example of this interesting species was determined for me by Mr. P. H. Carpenter; the stumps of two cirri are still present. Port Moller.

**25. *Actinometra paucicirra*. (PLATE XVII. fig. A, *a*.)**

Centrodorsal small, low, rounded, with 5 or 6 marginal cirri of 15–18 joints, a number of which are longer than broad; the penultimate spine exceedingly small.

First radials visible, second radials very wide, not in contact, united with the third by a syzygy. Twenty arms; two joints in the distichals united by a syzygy, the more prominent joints in contact. First and second brachials united by a syzygy; third and fourth pretty regularly oblong; the fifth faintly wedge-shaped; after this the wedge-shaped form becomes more marked, but the edges do not overlap.

Syzygies on the eighth and twelfth, then from 3–5 joints between each. First pinnules longer than the second, and the third than the fourth; the first alone of any considerable size: its joints produced into very prominent edges. The succeeding pinnules small; later out they enlarge somewhat, but are never at all long.

Arms about 70 millim. long, cirri 8 millim., disk 7 millim. in diameter. A slight development of calcareous deposit between the bases of the arms.

Colour creamy white above, rather darker below.

Prince of Wales Channel; Thursday Island.

**26. *Actinometra multifida*.**

*Comatula multifida*, *J. Müll.* p. 26.

Percy Island, Queensland; Albany Island; Prince of Wales Channel.

**27. *Actinometra variabilis*. (PLATE XVII. fig. B, *a*.)**

Centrodorsal of moderate size, concave in the middle, with 10 marginal cirri, of about 15 joints; very faint indications of spines on the most distal only.

First radials visible, second exceedingly wide in proportion to their length, in contact; the third almost perfectly triangular, not a syzygy; there are normally three distichals, and the axillary is a syzygy; there are two palmars and no syzygy, or three palmars and a syzygy. If there is another division there are two joints, and the axillary is not a syzygy. Arms from 60–90.

The first four or five brachials have the sides pretty even, the succeeding are very distinctly wedge-shaped, and the distal edge becomes faintly denticulated. Further out the wedge becomes wider, and the denticulation disappears.

Syzygies 3, 10, 14; then about three joints between each. The pinnules generally are delicate and short, the first rather the longest.

Arms not very long, thin; cirri about 10 mm. long; disk as much as 30 mm. in diameter, owing to the extensive development of the interradiar plating which extends to the distichal axillaries.

Colour yellowish green with darker spots, patches, or lines; the ends of the arms and the lower surface darker, or the upper surface may be of a pale flesh-colour.

Thursday Island.

### 28. *Actinometra*, sp. juv.

It is very possible that a young specimen from Dundas Strait belongs to a species, *A. purpurea*, of which a single example is alone known; and that, as Mr. Carpenter informs me, is in rather bad condition. It is to be hoped that further exploration will result in the discovery of more representatives of this incompletely known form.

### GENERAL REMARKS ON DISTRIBUTION.

After concluding the survey of the Echinoderms collected in the Australian seas by Dr. Coppinger, I arrived at certain results, which it is unnecessary now to state; for my views have since been profoundly modified by what I have since learnt from a closer study of the marine fauna of Port Jackson than was possible with the comparatively scanty material that was in my hands two years ago, when the body of this Report was being framed.

I have learnt since, thanks to the opportunities afforded me by arrangements made with Mr. E. P. Ramsay, the Curator of the Australian Museum, Sydney, what are the characters of the Port-Jackson fauna, and what is the extent of its resemblance to that of Port Molle and Torres Straits.

I have, in the first place, learnt that no view can be more erroneous than one which speaks of an Australian (marine) fauna without some sort of qualification; Cape York and Port Molle are as much part of Australia as Port Jackson, but between the two faunæ the resemblance is as slight as is in the nature of things possible.

This statement is abundantly proved by the first two tables of distribution which I now give, and which are based on the 27 Echinids and 16 Ophiurids from the collection of the Sydney Museum.

TABLE I.—Echinoidea of Australian Museum, Sydney.

		South of the tropics.	Inter- tropical species.
1.	<i>Phyllacanthus parvispinus</i> .....	*	
2.	<i>Goniocidaris tubaria</i> .....	*	
3.	— <i>geranoides</i> .....	*	
4.	<i>Diadema setosum</i> .....	.....	*
5.	<i>Centrostephanus rogersi</i> .....	* <sup>1</sup>	
6.	<i>Echinothrix calamarina</i> .....	.....	*
7.	<i>Salmacis alexandri</i> .....	*	A
8.	— <i>bicolor</i> .....	.....	*
9.	— <i>sulcata</i> .....	.....	*
10.	— <i>dussumieri</i> .....	.....	*
11.	<i>Amblypneustes ovum</i> .....	*	
12.	— <i>sp.</i> .....	*	
13.	<i>Strongylocentrotus erythrogrammus</i> .....	*	A
14.	— <i>tuberculatus</i> .....	○	
15.	<i>Sphærechinus australiæ</i> .....	* <sup>2</sup>	
16.	<i>Echinostrephus molare</i> .....	○	
17.	<i>Echinometra lucunter</i> .....	○	A
18.	<i>Heterocentrotus mammillatus</i> .....	.....	*
19.	<i>Echinanthus testudinarius</i> .....	*	*
20.	<i>Laganum decagonale</i> .....	.....	*
21.	— <i>peronii</i> .....	* <sup>3</sup>	
22.	<i>Arachnoides placenta</i> .....	.....	*
23.	<i>Maretia planulata</i> .....	*	A
24.	<i>Lovenia elongata</i> .....	*	A
25.	<i>Brennia australasiæ</i> .....	○	A
26.	<i>Echinocardium australe</i> .....	*	A
27.	<i>Hemiasiter apicatus</i> .....	*	

TABLE II.—Ophiuroidea of Australian Museum, Sydney.

1.	<i>Pectinura stellata</i> .....	.....	*
2.	— <i>gorgonia</i> .....	*	A
3.	<i>Ophioplocus imbricatus</i> .....	.....	*
4.	<i>Ophioglypha multispina</i> .....	*	
5.	<i>Ophiactis resiliens</i> .....	*	
6.	<i>Amphiura constricta</i> .....	*	
7.	<i>Ophionereis schayeri</i> .....	*	
8.	<i>Ophiocoma scolopendrina</i> .....	.....	*
9.	— <i>erinaceus</i> .....	.....	*
10.	<i>Ophiarthrum elegans</i> .....	.....	*
11.	<i>Ophiothrix longipeda</i> .....	.....	*
12.	— <i>cæspitosa</i> .....	*	
13.	— <i>fumaria</i> .....	*	
14.	— <i>sp.</i> .....	*	
15.	— <i>sp.</i> .....	*	
16.	<i>Euryale aspera</i> .....	.....	*

○ means that the species is, in this collection, known only from Lord Howe's Island; A, that the 'Alert' found the species within the tropics.

<sup>1</sup> Reported by Agassiz from New Caledonia; <sup>2</sup> from the Mauritius; <sup>3</sup> from the Philippines.

It will be seen, then, that of the Echinids 19 were found south of the tropical line, and 11, or 57·5 per cent., were not found either by the 'Alert' or 'Australian Museum' collectors within the tropics. Of the Ophiurids 9 were found south of the line, and only one also within it, so that of this class 88·8 per cent. were found only to the south of the tropics.

When we turn to the lists of the 'Alert' collections in the 'Australian' seas and in the western part of the Indian Ocean, we find a very different story.

*Echinids*.—Of the 28 species collected within the tropical seas of Australia, four only, or 14·2 per cent., were found also at Port Jackson, while no less than 23, or 72 per cent., were found also in the tropical parts of the western Indian Ocean.

TABLE III.—List of Echinoidea collected by the 'Alert' (to which is added a statement of such as are found also north of the equator, but within the tropics).

		South of the tropics.	Inter- tropical. 'Australia.'	South Japanese Seas.	Western Indian Ocean.
1.	<i>Cidaris metularia</i> .....	.....	*	.....	*
2.	<i>Phyllacanthus annulifera</i> .....	.....	*		
3.	— <i>baculosa</i> .....	.....	.....		*
4.	<i>Diadema setosum</i> .....	.....	*	.....	*
5.	<i>Astropyga radiata</i> .....	.....	*	.....	*
6.	<i>Salmacis alexandri</i> .....	*	*		
7.	— <i>bicolor</i> .....	.....	*	.....	*
8.	— <i>sulcata</i> .....	.....	*	*	*
9.	<i>Temnopleurus toreumaticus</i> ...	.....	*	*	*
10.	— <i>granulosus</i> .....	.....	*	*	
11.	— <i>bothryoides</i> .....	.....	*	*	
12.	<i>Echinus angulosus</i> .....	*	*	.....	*
13.	— <i>darnleyensis</i> .....	.....	*		
14.	<i>Toxopneustes pileolus</i> .....	.....	*	*	*
15.	<i>Tripneustes angulosus</i> .....	.....	*	.....	*
16.	<i>Strongylocentrotus erythro-</i> <i>grammus</i> .....	*	*		
17.	<i>Echinometra lucunter</i> .....	.....	*	*	*
18.	<i>Fibularia volva</i> .....	.....	*	.....	*
19.	<i>Clypeaster humilis</i> .....	.....	*	.....	*
20.	— <i>scutiformis</i> .....	.....	*	.....	*
21.	<i>Laganum depressum</i> .....	.....	*	.....	*
22.	— <i>decagonale</i> .....	.....	*	*	*
23.	<i>Echinoneus cyclostomus</i> .....	.....	*	.....	*
24.	<i>Maretia planulata</i> .....	.....	*	.....	*
25.	<i>Lovenia elongata</i> .....	.....	*	.....	*
26.	<i>Brynia australasiae</i> .....	.....	*	*	*
27.	<i>Echinocardium australe</i> .....	*	*	*	*
28.	<i>Brissus unicolor</i> .....	.....	*	.....	*
29.	<i>Metalia sternalis</i> .....	.....	*	.....	*



The Asterids tell a not dissimilar story: of the 26 species found in the intertropical Australian seas, 3 only, or 11·5 per cent., were found also at Port Jackson, while 8, or 30 per cent., were found also in the western seas.

*Ophiuroidea*.—Twenty-nine species were found in the intertropical Australian seas; and of these 3, or 10 per cent., were found also at Port Jackson, while 16, or more than 50 per cent., were found in the western parts of the Indian Ocean.

It is useless, in the present condition of our knowledge, to appeal to the Holothuroidea or the Crinoidea.

TABLE IV.—List of Asteroidea collected by the 'Alert.'

		South of the tropics.	Inter- tropical. 'Australia.'	South Japanese Seas.	Western Indian Ocean.
1.	<i>Asterias calamaria</i> .....	*			
2.	— <i>polyplax</i> .....	*			
3.	<i>Echinaster purpureus</i> .....		*	.....	*
4.	<i>Metrodora subulata</i> .....		*		
5.	<i>Linckia lævigata</i> .....		*	.....	*
6.	— <i>nodosa</i> .....		*		
7.	— <i>marmorata</i> .....		*	.....	*
8.	— <i>multiforis</i> .....		*	.....	*
9.	— <i>pauciforis</i> .....		*		
10.	— <i>diplex</i> .....		.....		*
11.	— <i>megaloplax</i> .....		*		
12.	<i>Seytaster variolatus</i> .....		.....	.....	*
13.	<i>Anthenea flavescens</i> .....	*			
14.	<i>Oreaster gracilis</i> .....		*		
15.	— <i>nodosus</i> .....		*		
16.	— <i>lincki</i> .....		.....	.....	*
17.	<i>Stellaster belcheri</i> .....		*	*	
18.	— <i>incei</i> .....		*		
19.	<i>Pentagonaster coppingeri</i> .....		*		
20.	— <i>validus</i> .....		*		
21.	<i>Dorigona longimana</i> .....		*		
22.	<i>Culeita schmideliana</i> .....		*	.....	*
23.	<i>Gymnasterias carinifera</i> .....		*	.....	*
24.	<i>Asterina belcheri</i> .....	*			
25.	— <i>calcar</i> .....	*			
26.	— <i>cephesus</i> .....		*	.....	*
27.	— <i>gunnii</i> .....	*	*		
28.	— <i>regularis</i> .....	*	*		
29.	— <i>brevis</i> .....		*		
30.	<i>Patiria crassa</i> .....		*		
31.	<i>Astropecten coppingeri</i> .....		*		
32.	— <i>polyacanthus</i> .....	*	*	*	*
33.	<i>Archaster typicus</i> .....		*	*	*
34.	<i>Retaster insignis</i> .....		*		

TABLE V.—List of Ophiuroidea collected by the 'Alert.'

		South of the tropics.	Inter- tropical, 'Australia.'	South Japanese Seas.	Western Indian Ocean.
1.	<i>Pectinura gorgonia</i> .....	*	*	.....	*
2.	— <i>infernalis</i> .....	.....	*	.....	*
3.	— <i>megaloplax</i> .....	.....	*		
4.	— <i>stellata</i> .....	.....	*		
5.	<i>Ophiopeza conjungens</i> .....	.....	*	.....	*
6.	<i>Ophiolepis annulosa</i> .....	.....	*	.....	*
7.	<i>Ophioplocus imbricatus</i> .....	.....	*	.....	*
8.	<i>Ophiactis savignii</i> .....	*	*	*	*
9.	<i>Ophionereis dubia</i> .....	.....	*	*(var.)	*
10.	<i>Ophiocoma brevipes</i> .....	.....	*	.....	*
11.	— <i>scolopendrina</i> .....	.....	*	.....	*
12.	— <i>erinaceus</i> .....	.....	*	.....	*
13.	— <i>pica</i> .....	.....	*	.....	*
14.	<i>Ophiarthrum elegans</i> .....	.....	*	.....	*
15.	<i>Ophiarachna incrassata</i> .....	.....	*	.....	*
16.	<i>Ophiothrix trilineata</i> .....	.....	*	.....	*
17.	— <i>propinqua</i> .....	.....	*	.....	*
18.	— <i>longipeda</i> .....	.....	*	.....	*
19.	— <i>cæspitosa</i> .....	*			
20.	— <i>martensi</i> .....	.....	*		
21.	— <i>striolata</i> .....	.....	*		
22.	— <i>galatææ</i> .....	.....	*		
23.	— <i>ciliaris</i> .....	*	*		
24.	— <i>rotata</i> .....	.....	*		
25.	— <i>fumaria</i> .....	*			
26.	— <i>punctolimbata</i> .....	.....	*		
27.	— <i>microplax</i> .....	.....	*		
28.	— <i>darwini</i> .....	.....	*		
29.	— <i>melanogramma</i> .....	.....	*		
30.	<i>Ophiomaza cacaotica</i> .....	.....	*		
31.	<i>Euryale aspera</i> .....	.....	*		

The collections of the 'Alert' afford us, then, another justification for the view of the existence in the Indo-Pacific of a widely distributed common fauna.

It must, however, be carefully borne in mind that *the greater part of this common fauna is restricted to the inter-tropical zone*; what little we know of the fauna of the Southern Japanese seas leads us to think that the common forms are to be found there also.

The majority of extra-Australian naturalists have as yet failed a little in recognizing the lesson which these collections bring so prominently forward—a lesson already being learnt by those who have the best opportunities of examining the characters of the Australian fauna; the term *Australian*, without definition or limitation, affords no exact information†. It is greatly to be regretted that in his tables of the distribution of the species collected

† As is well known, Dr. Günther has long since recognized this as regards Fishes, and has instituted a South-Australian District (Introd. Study of Fishes, p. 283).

by the 'Challenger,' Mr. Alexander Agassiz should have devoted one to the species of "West, South, and North-East Australia—New Zealand;" nor can we wonder when we find one who, ten years ago (Rev. Ech. p. 230), spoke of the Australian as the "most typical of all the districts," saying in 1881 that the "whole of the Australian field seems to be cut out of the Indo-Pacific realm." It is clear that these statements oppose each other, and that a more accurate representation of the facts would be made in terms like the following:—The species found on the northern and north-eastern shores of Australia have a wide range eastward and westward, but gradually disappear as we pass southwards.

In fine, an Australian Echinoderm-fauna, as conterminous with the Australian shores, does not exist.

It may be convenient for the student if I sum up the points in which Dr. Coppinger's collections have most advanced our knowledge.

*Asteroidea*.—Two faunal lists of the Australian Asteroidea have been published during the last few years; one by our great authority on this subject, Professor Perrier\*, of the Jardin des Plantes, the other, which, as I imagine, was partly based on it, by the Rev. J. E. Tenison-Woods†. It has been difficult so to marshal the facts contained in these essays as to be able to render easily intelligible the advances now made in our knowledge; this is chiefly due to the fact that while M. Perrier (justified, no doubt, by the evidence in his hands) distinguished between the fauna of the northern and of the other coasts of Australia, Mr. Woods was preparing a list which should be of use to the Australian student generally. Further than this, the present collection is from the northern and the eastern coasts of Australia.

It is not necessary to give all the steps by which I have worked out the question of how far our knowledge of the distribution of the Asteroidea is increased by the present collection. Put shortly, we find that while Mr. Woods's compilation was of value as giving us certain information as to the localities of *Tosia ornata*, which was described by Müller and Troschel from an unknown habitat, and of the *Patiria ocellifera* of Gray, the locality of which could only be guessed at from the fact of its having been described in the Appendix to the Voyage of the 'Fly,' Mr. Coppinger's collection enables us to fix one locality at least for *Anthenea flavescens* and *Nepanthia belcheri*, extends the range of *Linckia marmorata* from Mauritius to Australia, gives more southern stations for *Archaster typicus* and *Stellaster belcheri*, extends *St. incci* westward from Cape York to the Arafura Sea, and puts in Port Denison as intermediate between Cape York and South Australia.

It may be, perhaps, useful if I point out that definite information is still wanting as to the exact habitats of *Asterias fungifera*, *Anthenea acuta*, *Nectria ocellifera*, *Oreaster australis*, *O. franklini*, *O. nodulosus*‡, *Tosia astrologorum*, and *T. aurata*. It is hardly

\* Nouv. Arch. du Mus. (2) i.

† Philos. Soc. Adelaide, 1878-9, p. 89.

‡ Since this was written the Trustees have purchased two specimens of *O. nodulosus* from N.W. Australia.

sufficient to say "Mers australes," New Holland, or Australia in dealing with a continent which extends over 30 degrees of latitude and 40 of longitude, howsoever wide the distribution of the dwellers on its shores may be; nor could it be permitted by one who would study a collection of Port-Jackson specimens, and then take up the corresponding forms from Port Molle or Torres Straits (cf. Tables I.-V. of Distribution).

*Ophiuroidea*.—*Ophiopanax stellatus*, described from Singapore, and found by the 'Challenger' at lat.  $11^{\circ} 37' N.$ , long.  $123^{\circ} 32' E.$ , has now been found at Port Molle, Port Denison, and Torres Straits. If *Ophiothrix fumaria* has been correctly identified, this is apparently the first time that a definite locality has been ascribed to it; *O. martensi* has been shown to be very common in the Australian seas; *O. galatææ* (from the Nicobars) and *O. punctolimbata* (Java) have their distribution extended eastwards; *O. rotata* has been extended from Mindanao to Thursday Island; and *O. ciliaris*, known from the "Indian Ocean," has been seen to appear at Port Jackson.

If we might with justice attempt any generalization from such facts as these, we should be led to a belief in the significance of the free-swimming larva as affecting the extent of the distribution of not-stalked Echinoderms.

With regard generally to the Echinoidea, it may be said that in seven cases we have the area of distribution increased: *Diadema setosum*, *Salmacis bicolor*, *Temnopleurus toreumaticus*\*, *T. granulosus* have never yet been found on the eastern coast of Australia; *Clypeaster humilis* and *Marettia planulata* have been reported from New Caledonia, but not from such a locality as Port Molle or Clairmont†. *Temnopleurus bothryoides*, found by the 'Challenger' in the Arafura Sea and Kobi, Japan, is now known from an intermediate locality. The members of this class bear ample witness to the now well-known fact that Indian-Ocean and Pacific specimens invade largely the Australian seas.

A question which presented itself to me, but on which I can throw but little light by way of answer, might perhaps be formulated thus: What differences are there between the forms of the eastern and northern and the western coasts of Australia? ‡

To the south of the East-Indian islands there lies an area of deep sea almost free from islands, and having sweeping across it, in obedience to the laws of motion, a current with a south-westerly direction from the equator; this current sweeps, as we know, round the Cape of Good Hope, and there comes into contact with the southern con-

\* Mr. Tenison-Woods reports it from "all the coasts of Australia, but rare outside the tropics."

† But *M. planulata* was taken at Port Jackson by the 'Challenger'; the presence of this species in the Australian seas is additionally interesting from the fact that a form allied thereto, *M. anomala*, has been described by Prof. Martin Duncan (Q. J. Geol. Soc. xxxiii. p. 52).

‡ For Echinoderms, as for Fishes (see Günther, 'Introd. Study of Fishes,' p. 284), the western half of the south coast of Australia is still almost a *terra incognita*. It is earnestly to be hoped that the investigation of this area may be soon undertaken.

necting or southern Australian currents, which form probably the northern boundary of the Antarctic circle, and along the lines of which some species are now satisfactorily known to be extensively distributed\*. This south-westerly current leaves on its east the western shores of Australia, and it seemed to be interesting to make a definite examination of this question: Have the species in extending westward along the northern shores of Australia, and thence southward, become specially modified in their journey?

Interesting as such a discovery would have been, it must be said that the view that there might be a fauna special and peculiar to the western coast of Australia cannot be in any way sustained either by a consideration of the Echinoidea of the present collection or by a general review of the distribution of the Order.

The voyage of the 'Gazelle' resulted in the discovery at Naturalist Channel, or Mermaid Straits, of four of the species noted in our list—*Salmacis sulcata*, *Echinometra lucunter*, *Lovenia elongata*, and *Breynia australasie*; *Salmacis alexandri* (*globator*) is known from the west coast; and all the following species would appear to be found on the westerly as well as the easterly coasts of the continent:—*Goniocidaris geranoides*, *G. tubaria*, *Centrostephanus rogersi*, *Amblypneustes griseus*, *A. pallidus*, *Microcyphus zigzag*, *Sphaerechinus australasie*, and *Echinocardium australe*; or about 25 per cent. of the Echinoidea found on other parts of the Australian coast have already been found on the western shores, and no species are known to be peculiar to them.

It is, no doubt, reasonable to suppose that the species which are widely distributed in the Indo-Pacific will be found on the western coast of Australia, and that the more southerly forms will be represented by the species of *Amblypneustes*, *Microcyphus*, or *Holopneustes*, which we are in the habit of regarding as truly "Australian."

A somewhat similar story is told by the Ophiuroids.

Till lately fourteen species of Asteroids were known only from Western or South-western Australia; but Mr. Woods reports *Culcita pentangularis* from N.E. Australia, *Pentagonaster dubeni* from S. Australia, and *Tosia australis* from S. Australia and Tasmania; while the present collection enlarges the range of *Patiria crassa*.

Although there appeared at one time to be good reason for disagreeing with Martin†, the present amount and weight of evidence in our hands goes to point to the existence of a tropical oceanic fauna; to-day, as in those Tertiary times when a wider sea separated the Australian from the Asiatic continent, there are forms whose breadth of range is coincident rather with isothermal lines than topographical boundaries.

For the elucidation of the details of this tropical fauna, we may look with almost more than confidence to the information afforded by the species of Crinoids: here, however, the cabinet naturalist can as yet only appeal to the collector.

\* Evidence as to this was given by the earlier collections of the 'Alert' in the Straits of Magellan (see P. Z. S. 1881, pp. 1-141).

† Notes Lycd. Mus. ii. p. 73 *et seq.*



## CRUSTACEA.

BY

E. J. MIERS.

THE Crustacea collected by Dr. R. Coppinger on the north-western, northern, and north-eastern coasts of Australia are very numerous; and are interesting not only on account of the large number of new or rare species obtained, but also on account of the careful manner in which in nearly every instance the nature of the sea-bottom and depth of water &c. was recorded.

Until the publication of Mr. W. A. Haswell's comprehensive work on the Podophthalmious and Edriophthalmious Crustacea of Australia\*, but few systematists had dealt specially with this department of the fauna of this district.

To the Australian species enumerated by Milne-Edwards in his great work†, numerous additions were, however, made by Prof. J. D. Dana in the Report on the Crustacea collected by the United States Exploring Expedition under Commodore Wilkes‡, these being, with few exceptions, from the coast of New South Wales.

In 1856 Dr. J. R. Kinahan§ published an account of a small collection of marine Decapoda collected by himself at Port Phillip, Victoria; and in 1865 Dr. Hess|| gave a systematic account of the then known species of Decapoda of Eastern Australia, based upon the work of previous authors and a collection from Sydney in the Museum of Göttingen.

In the same year appeared the Report by Prof. Camil Heller on the Crustacea collected by the Austrian frigate 'Novara'¶, wherein twenty-four species are enumerated, also from Sydney. Reference may also here be made to an account of the Astacidae of Australia ("Ueberblick der neuholländischen Flusskrebse") by Dr. von Martens\*\*.

Mr. Haswell's recently published and very useful Catalogue, which was not received until this Report was considerably advanced,

\* 'Catalogue of the Australian Stalk- and Sessile-eyed Crustacea.' Sydney, 1882.

† 'Histoire Naturelle des Crustacés' (1834-40).

‡ United States Exploring Expedition, vols. xiii. & xiv., Crustacea (1852-53).

§ Journal of the Royal Dublin Society, vol. i. pt. 3, p. 111 (1856).

|| Archiv f. Naturgeschichte, xxxi. p. 127 (1865).

¶ 'Reise der österreichischen Fregatte Novara,' Crustaceen (1865).

\*\* Monatsbericht der Akad. Wissensch. Berlin, p. 615 (1868).

contains not only the results of his own previous researches on the Australian Stalk- and Sessile-eyed Crustacea (which are to be found in a series of papers communicated to the Linnean Society of New South Wales \*, wherein a very considerable number of species new to science are described and illustrated), but also gathers into a form convenient for reference nearly all the work of earlier authors—not merely what is contained in the special memoirs referred to above, but also the numerous Australian species described and incidentally noticed in the publications of A. White, Spence Bate, A. Milne-Edwards, and others, or in my own papers.

In this Catalogue no fewer than 540 species of Podophthalmious and Edriophthalmious Crustacea are described; but, large as this number may appear, it is necessarily very far from being a complete enumeration of the Stalk- and Sessile-eyed Crustacea of this great continent, which presents in its different regions such diverse conditions of temperature and climate. This will appear from the large number of species described in the following pages, which are either new to science or not included in the 'Catalogue'; and I may add that, had time and opportunity allowed, it would have been possible to largely add to the list of unrecorded Australian species from the rich material accumulated in the National Collection alone.

In the present memoir 203 species and well-marked varieties of Crustacea and Pycnogonida are enumerated from the Australian seas, besides several which are described or incidentally referred to, but which do not belong to the Australian fauna. Forty-five new or undescribed species and ten varieties are described for the first time; while of the total number (193 in all) of species and varieties of Australian Podophthalmia and Edriophthalmia noticed in the following pages, ninety-six are not included in Mr. Haswell's catalogue. Among the species described as new are several to which White applied specific names but never characterized; these names have been, of course, adopted. Besides the new species, several hitherto very imperfectly known from the existing descriptions (and therefore only to be identified with some uncertainty) have been redescribed and illustrated.

*Geographical Distribution.*—As regards the geographical range of the species, I have not thought it necessary (nor, indeed, would it be possible within the limits of this Report) to give all the hitherto recorded localities, many of them being common and widely-ranging Oriental forms which occur (or may occur) on every coast-line within the wide Indo-Pacific or Oriental region. Full particulars, however, are given of the Australian localities, and many are now for the first time recorded on the authority of specimens in the British-Museum collection obtained by the naturalists of H.M.S.S. 'Rattlesnake' and 'Herald,' and by the late Messrs. Dring, J. B. Jukes, and other gentlemen, by whose zeal and discrimination our National Collection has so greatly benefited. In the case

\* Journal of the Linnean Society of N. S. Wales, iii.—vi. (1879–82).

of the more widely ranging species, I have given (where I have not previously done so) the localities whence the British Museum possess specimens, which will serve to indicate generally with sufficient accuracy the distribution of the species, or, in some cases, the *lacunæ* which yet remain in the series preserved in the National Collection.

With few exceptions, the species were dredged in comparatively shallow water, on which account it is the more remarkable that so many novelties were obtained. Of the species already described, a large proportion (more than one third) are widely distributed throughout the Oriental or Indo-Pacific regions, from the Mascarene Islands (or African coast) on the east, to the Fiji, Samoa, or Sandwich islands on the west, while many others are at present known only from the Indo-Malayan section of this area, ranging probably from the Sea of Bengal to the coasts of China and Japan.

While the littoral and shallow-water Crustacea which are distributed throughout the great Indo-Pacific region are not, *as a general rule*, found beyond the limits of this vast area of distribution, yet there are a certain number which have a far wider range: thus, in the present memoir, *Alpheus edwardsii*, *Alpheus minus*, *Penæus velutinus*, *Gonodactylus chiragra*, and *Caprella aquilibra* are instances of species which are more or less widely distributed throughout the Atlantic region, and it is probable that future research will largely add to the number of such forms. In regard to the Amphipoda the affinity of the Australian with the European fauna is very remarkable; and among the few species included in the present Report instances (*Leucothoë spinicarpa*, *Caprella aquilibra*) occur where I have identified Australian examples with well-known European types, while in several other instances the distinctions are so slight as to be scarcely of specific importance: hence I must qualify the opinion I formerly expressed as to the improbability of the species of such widely distant regions ever being actually identical\*.

Appended is a list of the principal localities where the specimens were dredged, with Dr. Coppinger's notes on the depth of water and nature of the sea-bottom; the numbers are those attached to the several bottles containing the dredgings, and are referred to throughout the Report.

#### *List of the Localities.*

- Port Jackson. 0-5 fms., February and March 1881 (No. 90); 5-7 fms., rock and mud, April 1881 (No. 104).  
 Port Curtis. 7-11 fms., sand and shells, April 1881 (Nos. 85, 87, 88, 92); beach, April 1881 (No. 96).  
 Percy Island. 0-5 fms., sand and coral (No. 91).  
 Port Molle. Beach, sand (No. 95); beach and coral-reef (No. 98); beach between tide-marks (No. 103); 5-12 fms., coral (No. 118); 14 fms., rock (No. 93); all in May 1881.

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\* Ann. & Mag. Nat. Hist. ser. 5, v. p. 125 (1880), and P. Z. S. p. 62 (1881).

- Port Denison. 4 fms., rock and sand, May 1881 (Nos. 111, 122).  
 Fitzroy Island. 10 fms., mud and shells, 26th May, 1881 (No. 113).  
 Flinders, Clairmont. 11 fms., sand and mud, May 1881 (No. 108).  
 Off Clairmont. Coral-reef (No. 151).  
 Torres Straits. 10 fms., sand (No. 158).  
 Thursday Island, Torres Straits. Mangrove-swamps, June 1881 (No. 124); land-crabs from holes in the hills, July 1881 (No. 125); beach, June 1881 (No. 167); 3-4 fms., sand, August 1881 (Nos. 145, 175, 177); 4-5 fms., sand, July 1881 (No. 165); 4-6 fms., rock and sand, June 1881 (No. 130).  
 Friday Island, Torres Straits. Beach, September 1881 (No. 154); 10 fms., sand, October 1881 (No. 153).  
 Warrior Reef, Torres Straits. Crabs from the interior of pearl-shells, August 1881 (No. 137).  
 Prince of Wales Channel. 7 fms., sand, September 1881 (Nos. 142, 169); 9 fms., sand, September 1881 (No. 157).  
 West Island, Prince of Wales Channel. Beach, coral, September 1881 (No. 149).  
 Arafura Sea, N.W. Australia. 32-36 fms., mud, sand, and shells, October 1881 (No. 160).  
 Dundas Straits, N. Australia. 17 fms., mud, October 1881 (No. 161).  
 Port Darwin, N. Australia. Beach, mud and sand, October 1881 (No. 176); 7-12 fms., sand and mud, October 1881 (No. 173).

As will be seen from the foregoing list, the localities where the most abundant opportunities offered for collecting, and where, consequently, the largest number of species were obtained, are Thursday Island in Torres Straits and Ports Curtis and Molle on the Queensland coast; but the dredgings of most scientific interest are unquestionably those made off the north coast in the Arafura Sea, and at Port Darwin and in Dundas Straits, not only on account of the new and rare species therein obtained, but also because these localities had not previously been explored for Crustacea. The dredging in the Arafura Sea was also the only one made in any considerable depth of water (32-36 fms.), the next in point of depth being that at Dundas Straits, 17 fms. (No. 161). The collection was received in two distinct consignments, which are referred to as the "first" and "second" collection.

*List of the Species, showing their Geographical Range.*

[N.B. The species and varieties of Podophthalmia and Edriophthalmia which are distinguished by an asterisk are those not included in Mr. Haswell's Catalogue. The species placed within brackets are those which do not form part of the collection made by Dr. Copping.]

PODOPHTHALMIA.

DECAPODA.

BRACHYURA.

- Achaus lacertosus*, Stimpson. E. and N. Australia (Dundas Straits).  
 \*— *affinis*, sp. n. N., N.E., E., and W. Australia.  
*Camposcia retusa*, Latreille. N., N.E., and W. Australia; Oriental Region.

- Oncinopus aranea*, De Haan. N. and N.E. Australia; Japan; Mindoro Sea; New Hebrides.
- Menæthius monoceros* (Latreille). N., N.E., and W. Australia; Oriental Region.
- Huenia proteus*, De Haan. N. and N.E. Australia; Japan; China; Philippine Islands.
- Egeria arachnoides* (Rumph.). N. and N.E. Australia; Indian, Malayan, and Chinese seas.
- Chorilibinia gracilipes*, Miers. N. and N.E. Australia; Papua.
- Paramithrax* (*Chlorinoides*) *coppingeri*, Haswell. N. and E. Australia; Japan.
- \* — (—) *aculeatus*, M.-Edw., var. *armatus*, n. N. and N.E. Australia (Thursday Island to Port Curtis).
- Hyastenus diacanthus* (De Haan). N., N.E., E., and W. Australia; Philippine Islands, Chinese and Japanese Seas.
- (*Chorilia*) *oryx*, A. M.-Edwards. N., N.E., and W. Australia; Oriental Region.
- \* — (—) *planasius* (Ad. & White). N.E. Australia; Chinese seas.
- \* — (—) *convexus*, sp. n. N.E. Australia (Port Molle).
- Navia serpulifera*, M.-Edwards. N. and W. Australia.
- Schizophrys aspera*, M.-Edw. N. Australia; Oriental Region.
- [\* — *dama* (Herbst). W. Australia.]
- \* *Pseudomicippa* ? *varians*, Miers. N., N.E., and W. Australia.
- Micippa thalia* (Herbst). N., N.E., and W. Australia; Oriental Region.
- \* — *philyra* (Herbst). N., N.E., and W. Australia; Oriental Region.
- *curtispina*, Haswell. N. and N.E. Australia.
- Paramicippa spinosa* (Stimpson). E. Australia.
- Lambrus longispinus*, Miers. N. and N.E. Australia; Shanghai.
- \* — *lavicarpus*, Miers. N.W. Australia (Arafura Sea).
- *longimanus* (Linn.). N. and N.E. Australia; Oriental Region? (Mauritius, Javan Sea, &c.).
- *nodosus*, Jacq. & Lucas. N., N.E., and W. Australia; New Zealand.
- *turriger*, White. N. and N.W. Australia; Borneo and Philippine Islands.
- *hoplonotus* (var. *granulosus*, Miers). N. and N.E. Australia; Ceylon; Philippines; New Caledonia.
- (*Parthenopoides*) *harpax*, Ad. & White. N. and N.E. Australia; China; Borneo.
- Cryptopodia fornicata* (Fabr.). N., N.E., and E. Australia; Indian and Malaysian seas; Japan, China.
- *spatulifrons*, Miers. N., E., and W. Australia.
- Gonatonotus pentagonus*, Ad. & White. N. and N.E. Australia; Javan sea; Borneo.
- Euxanthus huonii* (Lucas). N. and N.E. Australia.
- [\* — *sculptilis*, Dana. N.E. Australia; Philippines; Fiji Islands.]
- \* — *tuberculosis*, sp. n. N. Australia (Thursday Island and Warrior Reef).
- \* *Hypocælus punctatus*, sp. n. N. Australia (Thursday Island).
- Atergatis floridus*, Linn. N., N.E., and W. Australia; Oriental Region.
- Lophozozymus epheliticus*, Linn. N.W., N.E., and E. Australia; Java; Philippines.
- \* *Galene granulata*, sp. n. N. Australia (Port Darwin).
- \* *Halimede* ? *coppingeri*, sp. n. N.W. Australia (Arafura Sea).



- \**Actæa rüppellii* (Krauss). N. and N.E. Australia; Oriental Region (from Natal to Red Sea and eastward to Norfolk Island?).
- \*— *areolata*, Dana. N.E. Australia; Sooloo Sea or Balabac Straits.
- \**Banareia inconspicua*, sp. n. N. Australia (Port Darwin).
- \**Xantho macgillivrayi*, sp. n. N.E. Australia (Port Molle, Port Curtis).
- \**Cycloxanthus lineatus*, A. M.-Edwards. N.W. and N. Australia; New Caledonia and Lifu.
- \**Carpilodes venosus*, M.-Edwards. N.E. Australia; Oriental Region.
- Leptodius exaratus* (M.-Edwards). N.E. and W. Australia; Oriental Region.
- \*— *lividus* (De Haan). N.E. Australia; Japan.
- Chlorodius niger* (Forskål). N., N.E., and E. Australia; Oriental Region.
- \**Chlorodopsis granulatus* (Stimpson). N. and N.E. Australia (Port Darwin, Port Denison, and Port Molle); Hong Kong; Philippines; Singapore.
- Etisus levimanus*, Randall. N.E. and E. Australia; Oriental Region.
- Etisodes electra*, Herbst. N.E. Australia; Oriental Region.
- *anaglyptus*, M.-Edw. N.E. Australia; Philippine Islands.
- Menippe* (*Myomenippe*) *lequilloui*, A. M.-Edw. N.E. and W. Australia (Port Curtis and Swan River); Indian and Indo-Malayan seas.
- Pilumnus respertilio*, Fabr. N.W., N., and N.E. to E. Australia; Oriental Region.
- \*— *pulcher*, sp. n. N. Australia (Islands of Torres Straits).
- *rufopunctatus*, Stimpson. E. and S. Australia.
- *lanatus*, Latr. N.E. and E. Australia; Tasmania? East Indies (Latr.).
- \*— *semilanatus*, sp. n. N. and E. Australia (Prince of Wales Channel, Cape Capricorn, Moreton Bay).
- \*— *seminudus*, sp. n. N. and N.E. Australia (Thursday Island, Port Denison).
- *cursor*, A. M.-Edwards? N.E. Australia; New Caledonia and Samoa Islands.
- \*— *labyrinthicus*, sp. n. N. and N.E. Australia (Thursday Island, Port Molle).
- ? *pugillator*, A. M.-Edwards? N.E. and E. Australia; Loyalty Islands; Lifu.
- Actumnus setifer* (De Haan). N., N.E., and W. (?) Australia; Oriental Region.
- Cryptocaloma fimbriatum* (M.-Edwards?). N. and N.E. Australia; Java.
- Pilumnopus serratifrons*, Kinahan. E. and S. Australia; New Zealand.
- Ozius guttatus* (var. *speciosus*, Hilgendorf). N.E. Australia; Oriental Region.
- Neptunus pelagicus* (Linn.). N., N.E., E., and W. Australia; New Zealand; Oriental Region.
- [\*— *armatus*, A. M.-Edwards. W. Australia, Shark Bay.]
- \*— (*Amphitrite*) *hastatoides* (Fabricius). N. and N.W. Australia (Friday Island, Arafura Sea); Indian Ocean, Hong Kong, &c.
- Achelous granulatus* (M.-Edwards). N. and N.E. Australia; Oriental Region.
- \*—, var. *unispinosus*, n. N. Australia (Prince of Wales Channel).
- \**Thalamita admete* (Herbst). N.W., N.E., and E. Australia; Oriental Region.

- Thalaimita sima*, M.-Edwards. N., N.E., and W. Australia; New Zealand; Oriental Region.
- [\*— *chaptali*, Audouin. Red Sea; Ceylon.]
- *stimpsonii*, A. M.-Edwards. N. and N.E. Australia; Malaysian Islands; Sunday Island; New Caledonia.
- \*— *crenata*, Rüppell. N. and N.E. Australia (Torres Straits, Port Molle, Percy Island); Oriental Region.
- \**Goniosoma variegatum* (Fabricius). N. Australia (Port Darwin); S. and E. Asian seas; India to Japan.
- \*— *spiniferum*, sp. n. N.E. Australia (Port Molle).
- Nectocarcinus integrifrons* (Latr.). N.E., E., and S. Australia; Tasmania; Red Sea?; Oceania.
- \**Lupocyclus rotundatus*, Ad. & White. N. and N.E. Australia; N. Borneo.
- \**Kraussia nitida*, Stimpson. N. Australia (Thursday Island); Philippines; Japanese and Chinese seas.
- \**Telphusa (Geotelphusa) crassa*?, M.-Edwards. N. Australia (Thursday Island, Cape York); Philippines?
- [\*— *leichardtii*, sp. n.? E. Australia.]
- Gelasimus signatus*, Hess. N.E., E., and W. Australia.
- Ocypoda ceratophthalma* (Pallas). N. to E. Australia; Oriental Region; St. Christophers (??).
- *kuhlii*, De Haan. N. and W. Australia; Oriental Region.
- \**Macrophthalmus punctulatus*, sp. n. E. Australia (Port Jackson).
- \**Euplar (Chenostoma) bosci* (Audouin). N.E. Australia (Port Molle); Oriental Region.
- \**Camptoplar coppingeri*, gen. et sp. n. N. Australia (Prince of Wales Channel).
- Pseudorhombila vestita* (De Haan), var. *sexdentata* (Haswell)? N.W. Australia (Arafura Sea).
- \*— *sulcatifrons* (Stimpson), var. *australiensis*, n. N.E. Australia (Port Molle).
- \**Ceratoplar arcuata*, sp. n. N. Australia (Port Darwin).
- \*— ? *lævis*, sp. n. N.W. Australia (Arafura Sea).
- Metopograpsus messor* (Forskål). N. to E., N.W., and W. Australia; Oriental Region.
- Chasmagnathus (Paragrapsus) lævis*, Dana. N.E. to S.E. Australia; New Zealand.
- \**Sesarma bidens*, De Haan? N.E. Australia; Oriental Region?
- \*—, sp. N.E. and E. Australia.
- \**Pinnotheres villosulus*, Guérin-Ménéville. N. Australia (Warrior Reef, Torres Straits); Timor.
- Mycteris longicarpus*, Latreille. N.W., N. to E., and W. Australia; Tasmania; Indo-Malaysian and China seas; New Caledonia.
- Haliscarcinus ovatus*, Stimpson. N.E., E., and S.W. (?) Australia.
- Leucosia ocellata*, Bell. N.E. and N.W. Australia.
- *whitei*, Bell. N., N.E., and W. Australia.
- \*— *craniolaris*, L. (var. *levimana*, n.). N. Australia; Indian, Indo-Malaysian, and Chinese seas.
- Myra carinata*, Bell. N.E. Australia; Celebes; Philippines; Hong Kong.
- *affinis*, Bell. N. and N.E. Australia; Philippines.
- *mammillaris*, Bell. N.E. and S. Australia (Port Denison, Adelaide).
- *australis*, Haswell? N., N.E., and W. Australia.
- Phlyxia crassipes*, Bell. N., N.E., and S. Australia.
- *lambriformis*, Bell. N., N.E., and S. Australia (Port Darwin to Bass Straits).

- Nursia sinuata*, Miers. N.E. and E. Australia.  
 [\*— *abbreviata*, Bell. E. Australia; Moreton Bay.]  
*Nursilia dentata*, Bell. N.W. and N.E. Australia; Oriental Region (Fiji Islands, Seychelles).  
 \**Iphiculus spongiosus*, Ad. & White. N.W. Australia (Arafura Sea); Philippine Islands.  
*Arcania pulcherrima*, Haswell. N.W. to N.E. Australia; Borneo.  
*Lithadia sculpta*, Haswell. N.W. and N.E. Australia.  
 \**Oreophorus reticulatus*, Ad. & White. N. Australia (Thursday and Friday Islands); Straits of Sunda; Philippines.  
 \*— *frontalis*, sp. n. N.E. Australia (Port Molle).  
*Matula victrix* (Fabricius). N. to E. and W. Australia; Oriental Region.  
 \*— *inermis*, sp. n. N. Australia (Islands of Torres Straits).  
*Calappa hepatica* (Linn.). N.E. to E. Australia (Clairmont Island, Trinity Bay, West Hill, Sydney); Oriental Region.  
*Dorippe dorsipes*, L. N., N.E., N.W., and W. (?) Australia; Oriental Region (Zanzibar and Ibo to Japan).  
 \*— *australiensis*, sp. n. N.E. and E. Australia (Port Denison and Moreton Bay).

## ANOMURA.

- Cryptodromia lateralis*, Gray. N.E. to S. and W. to N.W. Australia; Tasmania; New Zealand; Philippines and Japan.  
 \**Petalomera pulchra*, sp. n. N. Australia (Prince of Wales Channel).  
 \**Paratymolus bituberculatus*, Haswell (var. *gracilis*, n.). N. and N.E. Australia.  
 \*— *sexspinosus*, sp. n. N. Australia (Friday Island).  
 \**Diogenes rectimanus*, sp. n. N. Australia (Prince of Wales Channel).  
 \**Pagurus imbricatus*, M.-Edwards. N. and W. Australia (Thursday Island, Shark Bay).  
 \*— *hessii*, sp. n. N.W. Australia (Arafura Sea).  
 \**Clibanarius tenuatus* (M.-Edwards). N.E. and W. Australia (Port Molle, Shark Bay).  
 \**Eupagurus compressipes*, sp. n. N.E. Australia (Port Denison).  
 \*— *kirkii*, sp. n. N.W. Australia (Arafura Sea).  
*Petrolisthes japonicus*, De Haan (var. *inermis*, Haswell). N.E. and W. Australia; seas of China and Japan.  
 \*— *lamarckii* (Leach). N.E. Australia (Flinders Island, Port Molle); Philippine Islands.  
 \*— *haswelli*, sp. n. N. and N.E. Australia (Thursday Island, Port Curtis); Koo-Keang-San.  
 [\*— *rugosus*, M.-Edw. N. Australia; India, Karachi.]  
 \*— *annulipes*, White. N. and N.E. Australia (Thursday Island, Port Denison, &c.); Philippine Islands; Seychelles.  
 — ? *corallicolus* (Haswell). N.E. Australia (Port Molle).  
 \**Polyonyx obesus* (White, ined.). N. to N.E. Australia (Port Darwin to Port Denison); Philippine Islands.  
*Pachycheles pulchellus* (Haswell). N. and N.E. Australia (Thursday Island, Albany Island, Holborn Island, Port Molle).  
 \**Porcellana nitida*, Haswell, var. *rotundifrons*, n. N.W., N., and N.E. Australia (Arafura Sea, Port Darwin, Dundas Straits, Friday Island, Port Denison).  
 — *dispar*, Stimpson. E. and S.E. Australia.  
 \*— *quadrilobata*, n. sp. N.E. Australia (Port Denison).  
*Galathea australiensis*, Stm. N.W. to S.E. Australia (Arafura Sea to Port Stephens).

- Galathea elegans*, White. N. and N.E. Australia; Borneo; Philippines.  
 \**Munida spinulifera*, sp. n. N.W. Australia (Arafura Sea).  
 \**Mastigochirus quadrilobatus*, Miers. N. Australia (Prince of Wales Channel); Philippines.

## MACRURA.

- \**Gebia carinicauda*, Stimpson. N. Australia (Thursday Island, &c.); Hong Kong.  
 \**Gebiopsis darwini*, sp. n. N. and S.W. Australia (Port Darwin); Singapore.  
 \**Axiu plectorhynchus*, Strahl. N.E. Australia (Port Molle); Luzon.  
 \**Thalassina anomala* (Herbst). N.W. Australia (Nicol Bay); N. Australia (Thursday Island); Philippines, Borneo, &c.; Penang; Fiji Islands.  
*Alpheus edwardsii*, Audouin. N. to E. Australia (Ports Darwin and Essington to Sydney); Oriental Region; Atlantic Region (Cape Verdes?, W.-American coast from N. Carolina to the Abrolhos, Brazil); coast of California.  
 [\*— *gracilidactylus*, sp. n. Fiji and Sandwich Islands.]  
 [\*— *obesomamus*, Dana. N.E. Australia (Port Molle); Fiji Islands; Mauritius.  
 \*— *gracilipes*, Stimpson. N.E. and S. Australia (Port Molle, Flinders Island); Corean Channel; Ceylon; Tahiti.  
 \*— *minus*, var. *neptunus*, Dana. N. and S.E. Australia (Thursday Island, Port Jackson); Oriental Region (to Panama).  
 — *comatularum*, Haswell. N. Australia (Albany Island, Thursday Island, &c.); Ceylon; Singapore.  
 — *villosus*, Milne-Edwards. N. Australia (Warrior Reef, Thursday Island).  
 \**Pontonia (Conchodytes) tridactnae*, Peters. N. and N.E. Australia (Warrior Reef, Keppell Islands); Fiji and Samoa Islands; Djeddah; Ibo.  
 \**Harpilius inermis*, sp. n. N.E. Australia (Port Molle); W. Australia (Shark Bay).  
 [\*— *spinuliferus*, sp. n. *Hab.?*]  
 \**Anchistia petithouarsi*, Audouin? N.E. Australia (Port Molle); Oriental Region (Red Sea to Ousima, Japan).  
 \**Coralliocaris tridentata*, sp. n. N. Australia (Thursday Island).  
*Palemon (Leander) intermedius*, Stimpson. E. Australia (Port Jackson, Sydney?); Tasmania; S.W. Australia (King George's Sound); Fiji Islands.  
*Sicyonia ocellata*, Stimpson. N. to E. Australia (Thursday Island, Port Jackson?); Hong Kong; Ceylon.  
*Penaeus granulosus*, Haswell. N. and N.E. Australia (Port Darwin, Thursday Island, Darnley Island, Cape Grenville).  
 — *relutinus*, Dana. N. Australia (Port Darwin, Thursday Island, Albany Island); W. Australia (Shark Bay); Oriental Region; Senegambia (Goree Island); West Indies? (St. Thomas?).  
 \*— *batesi*, sp. n. N. Australia (Albany Island).

## STOMATOPODA.

- Squilla nepa*, Latr. N. to S.E. Australia (Port Darwin to Sydney); Oriental Region.  
*Gonodactylus chiragra* (Fabr.). N. and N.E. Australia (Port Essington to Port Molle); S.W. Australia (Swan River); Oriental Region; Mediterranean; W. Indies; Brazil; W. coast of N. America?

*Gonodactylus graphurus*, White (ined.), Miers. N.W. to N.E. Australia (Nicol Bay to Port Curtis); Oriental Region.

## EDRIOPHTHALMIA.

## ISOPODA.

- Ligia gaudichaudii*, var. *australiensis*, Dana. N.E. to E. Australia (Port Molle to New South Wales); Singapore? Ceylon?
- Ceratothoa imbricata*, Fabr. N.E., S., and W. Australia (Port Essington, Sydney, Port Jackson, Murray River, Shark Bay); China; Madras; Calcutta; Java; New Zealand.
- \**Cirolana multidigitata* (Dana). N. Australia (Albany Island); W. Australia (Swan River); Philippines; Borneo.
- \*—— *schiodtei*, sp. n. N.W. Australia (Arafura Sea); Torres Straits.
- \*—— *tenuistylis*, sp. n. N. Australia (Prince of Wales Channel).
- \*—— *lata*, Haswell, var. *integra*. N. to S.E. Australia (Albany Island to Port Stephens).
- \**Rocinela orientalis*, Schiödte & Meinert. N. to E. Australia (Prince of Wales Channel to Moreton Bay); Oriental Region (Gulf of Suez to Philippines).
- [\**Æga meinerti*, sp. n. S. Australia, King George's Sound.]
- \**Cymodocea longistylis*, sp. n. N. Australia (Thursday Island); Singapore.
- \**Cerceis bidentata*, M.-Edw. (var. *aspericaudata*, n.). N. Australia (Prince of Wales Channel).
- Cilicæa latreillei*, Leach. N. to S.E. Australia (Thursday Island to Port Stephens); S. Australia (King George's Sound).
- *latreillei* (var. *crassicaudata*, Haswell). N.W. to N.E. Australia (Arafura Sea to Holborn Island).
- [\*—— (var. *longispina*, n.). Bass's Straits.]
- [\*—— *antennalis* (White, ined.). W. Australia, Swan River.]
- Haswellia carnea* (Haswell). E. and S.E. Australia (Port Jackson, Port Stephens).

## ANISOPODA.

*Paranthura australis*, Haswell. N. and E. Australia (Dundas Straits, Port Jackson).

## AMPHIPODA.

- Ephippiphora kröyeri*, White. N. to N.E. Australia (Dundas Straits to Port Denison); Tasmania; New Zealand?
- Leucothoe spinicarpa*, Abildgaard (var. *commensalis*, Haswell). N. to S. Australia, along E. coast (Thursday Island to Western Port); Great Britain, Scandinavia, &c.; Red Sea?
- \*—— *brevilactyla*, sp. n. N. Australia (Thursday Island).
- Melita australis*, Haswell. N.E. to S. Australia (Port Denison to Western Port).
- Mæra ramsayi*, Haswell. N. and E. Australia (Prince of Wales Channel, Port Jackson).
- *rubromaculata* (Stm.). N. Australia (Dundas Straits); N.E. to S.E. Australia (Port Denison to Port Stephens).
- \*—— ? *crassimana*, sp. n. E. Australia (Port Jackson).
- Megamæra suensis*, Haswell. N. and N.E. Australia (Sue Islands, Albany Island, Port Denison).
- \*—— *thomsoni*, sp. n. N. Australia (Albany Island, Prince of Wales Channel, Thursday Island).
- Podocerus australis*, Haswell. E. Australia (Port Jackson).



*Caprella æquilibra* (Say). E. Australia (Port Jackson); New Zealand; Hong Kong; Mediterranean; Norway; Britain; E. coast of United States; Brazil.

\*— *attenuata*, Dana? E. Australia (Port Jackson); Rio de Janeiro.

#### OSTRACODA.

*Cypridina albo-maculata*, Baird. N. Australia (Port Darwin, Dundas Straits); W. Australia (Swan River).

#### CIRRIPIEDIA.

*Balanus trigonus*, Darwin. E. Australia (Port Jackson and Sydney); New Zealand; Malaysian seas; W. coast of America; Peru; Columbia; California.

— *amaryllis*, Darwin. N. to E. Australia (Port Darwin to Moreton Bay); Philippines; Malaysian archipelago; mouth of the Indus.

*Acasta sulcata*, Lam. (var.?). N. to E. Australia (Albany Island to Moreton Bay); S. Australia; W. Australia (*Lamarck*).

#### PYCNOGONIDA.

*Achelia levis*, Hodge, var. *australiensis*, n. E. Australia (Port Jackson).

*Phoxichilidium hockii*, sp. n. N. Australia (Dundas Straits, Thursday Island, Prince of Wales Channel).

#### DECAPODA.

#### BRACHYURA.

##### 1. *Achæus lacertosus*, Stimpson.

Here is somewhat doubtfully referred a small male specimen from Port Jackson (0-5 fms.), which differs from Stimpson's diagnosis only in the somewhat slenderer merus-joint of the chelipedes, which resembles that of *A. breviceps*, Haswell (a species which Mr. Haswell in his latest work regards as synonymous with *A. lacertosus*), in being of a somewhat trigonous form; the palm or penultimate joint is thin-edged along its upper margin, but scarcely carinated.

The specimen I refer to *A. lacertosus* also bears some resemblance to the European *A. cranchii* in the absence of a neck-like constriction behind the orbits, and in the comparatively short ambulatory legs, the dactyli of the last three pairs being rather strongly falciform. In *A. cranchii*, however, the eye-peduncles have a tubercle on their anterior margin, the distal end of the merus of the outer maxillipedes is more distinctly truncated, and the ambulatory legs are even shorter.

In the second collection received from Dr. Coppinger are two females from Dundas Strait, North Australia (No. 161), which scarcely differ, except in the somewhat broader carapace.

##### 2. *Achæus affinis*.

Carapace subtriangular and moderately convex, with the surface uneven, but the regions not very distinctly defined; the postorbital region is constricted. The rostrum is moderately prominent, the

frontal lobes very small and subacute. On the cardiac region is a bilobated prominence, which is usually very much elevated; there is a small angulated prominence on the hepatic regions, and occasionally one or two granules on the branchial regions, which are not at all convex. Eye-peduncles with a blunt tubercle in the middle of their anterior margins. The merus-joints of the outer maxillipedes are narrowed and subacute at their distal ends where they are articulated with the next joints. The chelipedes (in both sexes) are rather slender; margins of the arm, wrist, and palm usually with a few granules or spinules; merus somewhat trigonous; fingers as long as the palm, and somewhat incurved, with their inner margins denticulated, and having between them when closed (in the males) a small hiatus at base. The ambulatory legs are slender, filiform, and very much elongated, the second legs being, in an adult male, four times as long as the postfrontal portion of the carapace; the dactyli of the two posterior pairs only are distinctly falciform; both chelipedes and ambulatory legs are scantily clothed with long hairs. Length of carapace (including rostrum) of an adult male about 5 lines (10.5 millim.), breadth about 3 lines (6 millim.); length of second leg about 1 inch 8 lines (42 millim.): an adult female has the carapace relatively somewhat broader, length nearly  $5\frac{1}{2}$  lines (12 millim.), breadth 4 lines (8.5 millim.).

The bilobated prominence on the cardiac region and tuberculated eye-peduncles serve to distinguish this species. The cardiac prominence is much more elevated in the females than in the males in the Museum Collection.

There is an adult male of this species in the first collection received from Dr. Coppinger, obtained at Port Denison, Queensland, at a depth of 4 fms. (No. 111); also an adult female from Port Jackson, 5-7 fms. (No. 104), and one from Moreton Bay, Queensland (*Warwick*); one from Shark Bay, West Australia (*F. M. Rayner*, H.M.S. 'Herald'); and other Australian specimens without special indication of locality in the Museum collection.

In the second consignment made by Dr. Coppinger were an adult male and two females from Thursday Island, 3-4 fms. (No. 177); and a female from Prince of Wales Channel, 7-9 fms.

### 3. *Camposcia retusa*, Latreille.

Several females are retained for the British-Museum collection from Thursday Island, 3-4 fms. (Nos. 175-177). It is recorded by Mr. Haswell from Cape Grenville and Port Denison. Specimens are in the British-Museum collection from Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald').

There are also specimens in the Museum collection from the Philippine Islands, Guimaras and Bureas (*Cuming*), and Fijis, Ngau (*H.M.S. 'Herald'*); also specimens from the Mauritius (*Lady F. Cole*) are probably not distinct, but are much covered with foreign overgrowth. Thus it is widely distributed throughout the Oriental Region.

4. *Oncinopus aranea*.

*De Haan, Faun. Japon., Crust.* p. 100, pl. xxix. fig. 2 (♂ ♀), and pl. H (1839).

*Oncinopus neptunus*, *Adams & White, Zool. 'Samarang,' Crust.* p. 1, pl. ii. fig. 1 (1848).

*Oncinopus subpellucidus*, *Stimpson, Proc. Ac. Nat. Sci. Philad.* p. 221 (1857); *Haswell, Cat. Australian Stalk- and Sessile-eyed Crust.* p. 5 (1882).

*Oncinopus angulatus*, *Haswell, Proc. Linn. Soc. N. S. Wales*, iv. p. 433 (1880).

Specimens are in the collection from Port Jackson, 5-7 fms. (No. 104), and Port Molle, 14 fms. (No. 93). Besides the above specimens the British-Museum series includes examples from Port Jackson (*J. Brazier &c.*), from Brisbane Water, Queensland (*Macgillivray*, H.M.S. 'Rattlesnake'), from the Mindoro Sea (*A. Adams*, H.M.S. 'Samarang'), and from the New Hebrides (*J. Macgillivray*).

*Oncinopus subpellucidus*, Stimpson, from Port Jackson, only differs (according to its author) from *O. neptunus* in the somewhat smaller and slenderer terminal and penultimate joints of the posterior legs, and can scarcely be regarded as distinct. *Oncinopus araneus* of De Haan (the species on which the genus was originally founded) was regarded by Adams and White as distinct from *O. neptunus*, on account of the much shorter legs, more deeply-incised front, with more angulated lobes; but there is an adult specimen from Port Jackson, in Dr. Coppinger's collection, in which the legs are only twice as long as the carapace, and quite as robust as in De Haan's figure of *O. araneus*; and in a male from Brisbane Water, Queensland, in the Museum collection, the chelipedes have their palms dilated, just as in the Japanese species. In consideration of the evident variability of the length and robustness of the legs in this genus, I have considered it necessary to unite all the described species under De Haan's original designation, *O. araneus*.

5. *Menæthius monoceros* (Latr.).

A male is in the collection from Port Denison, Queensland, 4 fms. (No. 111). I have in a previous Report\* remarked upon the wide distribution of this common Oriental species, and for the numerous synonyma would refer to A. Milne-Edwards's report on the Crustacea of New Caledonia†.

A female received in Dr. Coppinger's second collection from Prince of Wales Channel (No. 169) differs widely in its broader, much more strongly tuberculated carapace from the male from Port Denison; in these particulars it closely resembles specimens from the Mauritius in the British-Museum collection. Specimens from Shark Bay, West Australia (*Surgeon Rayner*, H.M.S. 'Herald') nearly approach the Mauritius specimens in these particulars.

\* Philosoph. Trans. Roy. Soc. clxviii. p. 485 (1879).

† *Vide* Nouv. Archiv. Mus. Hist. Nat. viii. p. 252 (1872).

6. *Huenia proteus*.

*De Haan, Faun. Japon., Cr.* p. 95, pl. xxiii. figs. 4, 5 ♂ (elongata), fig. 6 ♀ (heraldica), and pl. G (1839); *Adams & White, Cr. in Voy. 'Samarang,'* p. 21, pl. iv. figs. 4-7 (1848); *Haswell, Proc. Linn. Soc. N. S. Wales*, iv. p. 437 (1880); *Cat. Austr. Crust.* p. 9 (1882).

*Huenia dehaani, White, Proc. Zool. Soc.* p. 223 (1847).

*Huenia proteus*, var. *tenuipes*, *Adams & White, Cr. 'Samarang,'* p. 22, pl. iv. fig. 5 (1848).

*Huenia proteus*, vars. *elongata* and *heraldica*, *Adams & White, t. c.* p. 21 (1848).

Among the Crustacea collected by Dr. Coppinger are an adult male from Fitzroy Island, Queensland, 10 fms. (No. 113); a male and female from Port Denison, 4 fms. (No. 122); and a male from Thursday Island, Torres Straits, 4-6 fms.

From the second collection were retained for the British Museum a considerable series from Thursday Island, 3-4 fms. (No. 177), a female from Prince of Wales Channel (No. 142), and four specimens from West Island, Torres Straits, 7 fms.

If the various species of *Huenia* mentioned above are rightly united under the designation *H. proteus*, it will follow that there are but three species, so far as at present known, referable to this genus—one, *H. proteus*, ranging (as Mr. Haswell has already shown) from Japan and China, southward through the Philippine Islands to the coast of Queensland and islands adjacent; another, *H. pacifica*, Miers\*, from the Fiji Islands; and a third, *H. grandidieri*, A. M.-Edwards†, from Zanzibar. It is possible that a larger series would show that *H. pacifica* is no more than a marked variety of the very variable *H. proteus*; it differs, however, from all the specimens of that species I have seen in the form of the rostrum, which is not only much longer and slenderer, but also much narrower above at base.

The other described species of *Huenia* belong, as I have shown (*t. c.* pp. 5-6), to other genera.

7. *Egeria arachnoides* (*Rumph.*).

Here is referred an adult male from Port Molle, 14 fms. (93), a locality already mentioned by Mr. Haswell (*Cat.* p. 12).

This specimen presents the characters cited by Mr. Haswell (*Proc. Linn. Soc. N. S. Wales*, iv. p. 439) as belonging to the specimens he refers to *Egeria herbstii*—*e. g.* the orbits are widely open above, the eye-peduncles are very short and thick, and there is a spine at the distal end of the third joint of the ambulatory legs, which, however, is very small in the two posterior pairs. These characters can, however, hardly be considered of specific importance; in a smaller female from Albany Island, 3-4 fms., and in several

\* *Ann. & Mag. Nat. Hist.* ser. 5, iv. p. 5, pl. iv. fig. 3 (1879).

† *Ann. Soc. Entom. France*, sér. 4, v. p. 143, pl. iv. fig. 2 (1865).

specimens in the British-Museum collection scarcely any traces exist of the meral spines above mentioned. I may add that I have observed a considerable degree of variation in the length of the rostrum in the large series of specimens of this species in the collection of the British Museum. In the type specimen of *Egeria indica* of Leach in this collection the third joint of the outer maxilliped does not in reality present any peculiarity of form, nor does this specimen differ from ordinary adult examples of the genus.

I believe, then, it will be necessary to unite under one specific designation the three forms *Egeria arachnoides*, *E. herbstii*, and *E. indica*, mentioned by Milne-Edwards\*, and that to this species the name *arachnoides* must be applied rather than the Linnean designation *longipes*, because Linnæus's description of his *Cancer longipes* † differs in several particulars from *Egeria arachnoides*; thus he says "*manus ovate, muricate,*" or "*scabræ,*" whereas in *Egeria arachnoides* the hands are always elongated and smooth; moreover, in the middle line of the carapace are five (not four) tubercles or short spines; other distinctions might be mentioned.

Specimens of *Egeria arachnoides* are in the Museum collection from the Indian Ocean (*Hardwicke*), Philippine Islands, Zebu (*Cuming*), Shanghai (*purchased of Jamrach*), Port Curtis, Australia (*J. Macgillivray*), &c.; several other N.E. Australian localities are recorded by Mr. Haswell.

The species designated *Egeria longipes*, M.-Edw., by Adams and White‡, if correctly characterized, differs from any specimen of the genus I have seen in its very much broader, transverse front, and may belong to a distinct species.

### 8. *Chorilibinia gracilipes*.

*Miers, Ann. & Mag. Nat. Hist.* ser. 5, xix. p. 7, pl. iv. fig. 4 (1879);  
*Haswell, Proc. Linn. Soc. N. S. Wales*, iv. p. 439 (1880); *Cat. Austr. Crust.* p. 17 (1882).

In Dr. Coppinger's first collection two adult females were received from Port Molle, 14 fms. (No. 93), and one from Albany Island, 3-4 fms. (No. 109). In the second collection are a male and female from Port Darwin, 7-12 fms. (No. 173).

The types in the British Museum are from Papua, and Mr. Haswell records the occurrence of this species at Cape Grenville.

### 9. *Paramithrax (Chlorinoides) coppingeri*, *Haswell*.

An adult female is in the collection from Port Darwin, 12 fms., and two small males from Dundas Strait, 17 fms. (No. 161). Haswell's specimens were from Whitsunday Passage (H.M.S. 'Alert').

\* *Hist. Nat. des Crustacés*, i. pp. 291, 292 (1834).

† *Mus. Lud. Ulrici*, p. 446 (1764); *Syst. Nat.* ed. xii. p. 1047 (1766).

‡ *Crust. in Zool. Voy. H.M.S. 'Samarang'* p. 6 (1848).



Other specimens of this species are in the British Museum from Moreton Bay (purchased), and from the collection of H.M.S. 'Samarang,' without precise indication of locality.

The spines of the carapace vary considerably in number and length; in an adult female from Moreton Bay the two posterior spines of the carapace are absent; in a small male from the same locality both are present, although very small; in Dr. Coppinger's specimens one only is developed. In none of the specimens I have examined are the spines of the carapace knobbed at the tip. These specimens principally differ from Haswell's description in having but a single broad and usually dentated lobe behind the three straight, acute, spinous teeth of the upper orbital border, as in De Haan's figure of *P. longispinus*. They are only distinguished from *P. longispinus* by the form of the hands of the chelipedes, the palms (alike in males and females) being slenderer, with the upper margins straight, and the fingers straight and meeting along their inner edges, which are entire, without spines or tubercles on their inner margins. It is not stated if this character exists in the types of *P. coppingeri*; and I am therefore somewhat doubtful if our specimens belong to that species, which may after all be synonymous with *P. longispinus*. In the latter event the Museum examples referred to *P. coppingeri* would apparently require a distinct specific appellation.

10. *Paramithrax* (*Chlorinoides*) *aculeatus*, var. *armatus*.  
(PLATE XVIII. fig. A.)

I thus designate a series of specimens in the collection which apparently approach so nearly the *Chorinus aculeatus* of Milne-Edwards as to render it unadvisable to separate them specifically in the absence of figures of *C. aculeatus*. As Milne-Edwards's description\* is somewhat brief, I subjoin the following description of an adult example in Dr. Coppinger's collection:—

Carapace more or less pubescent, subpyriform, moderately convex, with five spines arranged in a median longitudinal series, of which two are situate on the gastric, one on the cardiac, and one on the intestinal region, and one on the posterior margin; there are also two strong and outwardly-divergent spines on each of the branchial regions. The rostral spines are long, acute, curving outward, and separate from one another, even at their bases, by a distinct interspace; the upper orbital margin has two deep fissures; the præocular spine is strong and curves upward; there is also a strong postocular spine, which has a tooth on its posterior margin; posterior to this, on the sides of the carapace, is another small spine. On the inferior surface of the carapace (on the pterygostomian region) are three tubercles arranged in an oblique line; and posterior and parallel to these an oblique crest, which terminates in a tooth or short spine. There is a strong tooth directed downward on the interantennal septum, and

\* *Vide* Hist. Nat. Crust. i. p. 316 (1834).

at the distal end of each basal antennal joint two teeth, whereof one is directed downward and one outward. The legs are more or less pubescent. The chelipedes are slender; the atm or merus-joint denticulated on its lower surface, and armed above with three or four short spines; the wrist or carpus rather obscurely bicarinated; hand (in both sexes) smooth, slender, naked, somewhat compressed, and twice as long as broad, or even longer; fingers straight and acute. The ambulatory legs are of moderate length; the merus-joints usually bear two well-developed distal spines, but one of these is occasionally absent; there is usually a short spine or tubercle at the distal end of the following joint, which is most distinct in the first pair of ambulatory legs; dactyli slightly curved. Length of the largest specimen (an adult female) to base of rostrum about  $1\frac{1}{8}$  inch (30 mm.), of rostral spines  $\frac{1}{12}$  inch (15 mm.), greatest breadth rather over  $\frac{5}{8}$  inch (22 mm.); length of first ambulatory leg about  $1\frac{1}{2}$  inch (38 mm.).

There are in the first collection several specimens of both sexes from Port Curtis, 7-11 fms. (Nos. 85, 87). In the second collection are two males from Thursday Island, 3-4 fms. (No. 175).

The spines of the dorsal surface of the carapace vary considerably in length.

Several of the specimens are more or less thickly covered with an overgrowth of Polyzoa and Sertularians (*Thuiaria* and *Crisia*), and with a species of *Zoanthus*.

From *P. aculeatus*, as described by Milne-Edwards, this variety is distinguished only by the form of the postocular spine (see fig. A), and by the existence (usually) of two spines at the distal end of the merus-joints of the ambulatory legs. From the *P. halimoides*, recently described by me, it is distinguished by having two spines on each branchial region, the form of the postocular tooth, &c. Several other species of this subgenus have been described, none of which are to be confounded with *P. (Chlorinoides) aculeatus*. *P. spatulifer*, Haswell, a species dredged at Port Stephen, is at once distinguished by its bifurcated rostral spines, &c.

### 11. *Hyastenus diacanthus* (*De Haan*).

A male and three females of this very common species are retained for the collection from Thursday Island, Torres Straits, 3-6 fms. (Nos. 130, 175), one was received from Port Denison, another from Port Molle, 14 fms. (93), another from Port Curtis, 0-11 fms. (92), and another from Port Darwin (12 fms.). As is very usual with *H. diacanthus*, these specimens are more or less covered with sponges, &c.

I have already referred to the synonyma and general distribution of this species\*.

In a very small female in the collection, from Port Denison,

\* Proc. Zool. Soc. pp. 19, 26 (1879); Cat. New-Zeal. Crust. p. 9 (1876).

4 fms. (No. 122), length to base of rostrum little over 5 lines (11 mm.), and in a small male from Dundas Straits (No. 161), the rostral spines are relatively somewhat shorter, and there are only very small tubercles in the place of the lateral epibranchial spines: it is not improbably a young example of *H. diacanthus*. There are specimens presenting very similar characters in the collection of the British Museum without definite locality (*H.M.S. 'Samarang'*) and from Penang (*India Museum*).

There are specimens in the British-Museum collection from the following points on the Australian coast:—Dunk Island, and lat.  $20^{\circ} 58' S.$ , long.  $149^{\circ} 12' E.$ , between Cumberland Island and Slade Point (*J. Macgillivray*, *H.M.S. 'Rattlesnake'*), Brisbane Water (purchased), Moreton Bay (purchased), Swan River (*Dring*), Shark Bay, West Australia (*Rayner*, *H.M.S. 'Herald'*).

## 12. *Hyastenus* (*Chorilia*) *oryx*.

*Hyastenus oryx*, *A. M.-Edwards*, *Nouv. Archiv. Mus. Hist. Nat.* viii. p. 250, pl. xiv. fig. 1 (1872); *Haswell*, *Proc. Linn. Soc. N. S. Wales*, iv. p. 442 (1880); *Cat. Austr. Crust.* p. 20 (1882).

To this species are referred specimens from several different localities; *e. g.* from the first collection two males and a female from Port Molle—the males obtained between 5 and 14 fms. (Nos. 93, 118), and the female on the beach (No. 95); and a female from Port Denison, 4 fms. (No. 122); also from the second collection a good series from Thursday Island, 3–5 fms. (Nos. 165, 177), and Prince of Wales Channel, 7 fms. (No. 169), one female.

M. A. Milne-Edwards's types were from New Caledonia; Mr. Haswell records this species from Darnley Island, Torres Straits; and there are specimens in the collection of the British Museum from Raine's Islet, North-east Australia (*J. B. Jukes*), Shark Bay, West Australia (*Rayner*, *H.M.S. 'Herald'*), and other Australian specimens without special indication of locality (*Bowerbank*); also from the Philippine Islands, Corregidor (*Cuming*), and Chinese seas (*H.M.S. 'Samarang'*).

In the second part of this Report its occurrence is noted at Providence Island, Mascarenes.

The length of the rostral spines and prominence of the præocular tooth or lobe seems to vary considerably in this species with the age of the specimen. I regard the *Lepidonaxia defilippii* of Targioni-Tozzetti\*, founded on a female example, as very possibly a mere variety of *H. oryx*, from which it scarcely differs except in these particulars and in the less numerous and prominent tubercles of the carapace. Certainly it is congeneric with that species.

\* 'Zoologia della Magenta.' Crostacei, p. 5, pl. i. figs. 4–6, 8, 10, 11 (1877).

13. *Hyastenus (Chorilia) planasius*.

Pisa planasia, *Adams & White, Crust. in. Zool. Voy. 'Samarang,'*  
p. 9, pl. ii. figs. 4, 5 (1848).

*Hyastenus planasius*, *A. M.-Edwards, N. Arch. Mus. Hist. Nat.* viii.  
p. 250 (1872).

A small male was obtained at Port Denison with *H. oryx* (No. 122). The original types (and specimens in the Museum collection) were from the Chinese seas.

14. *Hyastenus (Chorilia) convexus*. (PLATE XVIII. fig. B.)

Carapace subpyriform, somewhat scantily pubescent; gastric region elevated, rounded and convex; cardiac region also somewhat elevated and rounded; branchial regions with three low rounded prominences: no lateral epibranchial spine; the præocular angle of the orbit is prominent, but can scarcely be said to be produced in the form of a spine; there are two spines on the pterygostomian region, between the lateral margins of the buccal cavity and the sides of the carapace. Spines of rostrum slender, nearly straight, and strongly divergent. Postabdominal segments distinct. Basal antennal joint with a small spine or tooth at its antero-external angle. Chelipedes of male of moderate length; merus or arm rather slender and nearly smooth; wrist with a very small tooth on its inner margin; palm not twice as long as broad, somewhat inflated, with a small tubercle on its upper margin; fingers about as long as the palm, arcuated, meeting only toward the apices, which are minutely denticulated and acute; upper finger with a tubercle or small tooth on its inner margin near the base; the fingers (when closed) have between them a wide hiatus. Ambulatory legs very slender and smooth: the anterior pair much the longest, the three following diminishing successively in length. The colour of the single specimen examined is a uniform light yellowish brown. Length of carapace a little over 5 lines (11 mm.); greatest breadth nearly 4 lines (8 mm.); length of rostral spine a little over 3 lines (7 mm.), of chelipede about 6 lines (nearly 13 mm.), of first ambulatory leg rather over 10 lines (22 mm.).

The unique male example was obtained at Port Molle, 14 fms. (No. 93), and in size and form of the chelipedes is very comparable to *H. gracilirostris*, Miers, from the Fijis, from which, however, it is at once distinguished by the absence of spines on the carapace, &c.

15. *Naxia serpulifera*, *M.-Edw.*

Thursday Island, 4-6 fms. (No. 130), two young males (first collection). A good series of different ages and of both sexes from the same locality has been retained from the second collection (175).

Specimens are in the British-Museum collection from Shark Bay,



West Australia (*Rayner*, H.M.S. 'Herald'), and from Raffles Bay (*Mus. Paris*).

Its occurrence at Port Essington is mentioned by *Mr. Haswell*.

### 16. *Schizophrys aspera* (*M.-Edw.*).

A nearly adult female is in the collection from Thursday Island, 3-4 fms. (No. 175).

Professor Alphonse Milne-Edwards \* has united, I believe rightly, under the designation *S. aspera* several so-called "species" described by various authors, and I may refer to his memoir for information on the geographical distribution of this very variable species. Nevertheless, it may be found useful to distinguish two or three varieties under the different specific names formerly adopted, characterized by the armature of the carapace, rostrum, and chelipedes.

The specimen from Thursday Island is referred to the typical *S. aspera*, M.-Edwards (although in it the tooth on the middle of the lower orbital margin is obsolete). To the typical form (with which *S. serratus*, White, and *S. spiniger*, White, may be considered identical) are also referred specimens in the Museum collection from the Red Sea (?), Mauritius (*Lady F. Cole*), Madagascar (*Rev. Deans Cowan*), Ceylon (*Dr. W. Ondaatje*), and Philippine Islands (*Cuming*), and perhaps a very fine adult male from Japan (purchased).

To the variety *spinifrons*, A. M.-Edwards, characterized by possessing an accessory spinule on each rostral spine, belong specimens from Torres Straits (*J. B. Jukes*), Lizard Island (*J. B. Jukes*), and Fiji Islands, Ngau, Ovalau (*H.M.S. 'Herald'*).

I may add that there are in the British-Museum collection specimens of the very distinct species *S. dama* (Herbst) from Shark Bay and King George's Sound, West Australia (*H.M.S. 'Herald'*). This species is not mentioned in *Mr. Haswell's* recently published Catalogue.

Kossmann has recently † proposed a very different classification of the species of this genus, which he regards as a subgenus of *Mithrax*. He proposes (unnecessarily, as I believe) a new specific designation, *M. triangularis*, for the typical species generally designated *S. aspera* (M.-Edwards).

### 17. *Pseudomicippa* ? *varians*.

*Pseudomicippa* ? *varians*, *Miers, Ann. & Mag. Nat. Hist.* ser. 5, iv. p. 12, pl. iv. fig. 8 (1879).

In *Dr. Coppinger's* first collection a female with ova, from Port Denison, 4 fms. (No. 111), is referable to this species; in the second collection is an adult male and female from Thursday Island, 3-5

\* *Nouv. Archiv. Mus. Hist. Naturelle*, viii. p. 231, pl. x. fig. 1 (1872).

† 'Zool. Ergeb. einer Reise im Küstengeb. des rothen Meeres,' (i.) p. 11 (1877).



fms. (Nos. 165-175). In the female the gastric region is less convex than in the type specimens, which are from W. Australia, Shark Bay.

*Microhalimus deflexifrons*, Haswell (*t. c.* p. 435, pl. xxv. fig. 2, and Catalogue, p. 7, 1882), from Port Jackson, is very nearly allied to this species, and may only be a variety of it; it differs, however, in the less hairy carapace with fewer tubercles and somewhat more robust ambulatory legs, also in having a spine at the antero-external angle of the basal antennal joint (in *P. varians* there is only a small tooth).

In my original notice of this species, I merely pointed out the diagnostic characters distinguishing it from *P. tenuipes*, A. M.-Edwards, which it closely resembles, on which account perhaps Mr. Haswell may have omitted to note the affinity of his *Microhalimus deflexifrons* with both. The diagnosis of the genus *Microhalimus* given by Mr. Haswell is scarcely sufficient for its proper identification.

### 18. *Micippa thalia*.

*Cancer thalia*, *Herbst, Naturg. Krabben u. Krebse*, iii. Heft 3, p. 50, pl. lviii. fig. 3 (1803).

*Paramicippa sexspinigera*, *White, List Crust. Brit. Mus.* p. 9 (1847).

*Micippa thalia*, *Gerstaecker, Arch. f. Naturg.* xxii. p. 109 (1856); *Alph. M.-Edwards, Nouv. Archiv. Mus. Hist. Nat.* viii. p. 238, pl. vi. fig. 1 (1872).

*Micippa thalia*, var. *caledonica*, *Kossmann, Zool. Ergebn. roth. Meer. Crust.* p. 8, pl. iii. fig. 4 (1877).

*Micippa inermis*, *Haswell, Pr. Linn. Soc. N. S. Wales*, iv. p. 445, pl. xxvi. fig. 3 (1880); *Cat. Austr. Crust.* p. 24 (1882).

A single female in the first collection, from Port Denison, 4 fms. (No. 111), is apparently to be referred to this species; it is of small size and densely pubescent. In the second collection is an adult female from Thursday Island, 3-4 fms. (No. 175). Specimens are in the British-Museum collection from Swan River (*Dring*), designated by White *P. sexspinigera*, and from Pa-tchu-san (*H.M.S. 'Samarang'*); they vary somewhat in the length of the spines of the dorsal surface of the carapace.

*Micippa inermis*, Haswell, from Gloucester Passage, Queensland, and Port Denison (*H.M.S. 'Alert'*), scarcely differs except in the uniformly tuberculated carapace, and must, I think, be united with *M. thalia*.

### 19. *Micippa phillyra* (*Herbst*).

A male and female from Thursday Island, 3-4 fms. (No. 175), and another male and female from the same locality and depth, but larger, in the second collection, are referred here.

There are specimens in the British-Museum collection dredged between Percy Islands and the mainland in 7 fms. (*J. Macgillivray*, *H.M.S. 'Rattlesnake'*); Torres Straits (*J. B. Jukes*); W. Australia, Shark Bay (*Rayner*, *H.M.S. 'Herald'*); Philippine Islands, Gui-

maras, Luzon (*Cuming*), and the Mauritius (*Lady F. Cole*), besides others without special indication of locality.

In the larger individuals the spines of the lateral margins are more developed, and the orbits more open above than in the specimens described and well illustrated by A. Milne-Edwards. The *Paramicippa spatulifrons* (*Micippa spatulifrons*, A. M.-Edw.), to which Mr. Haswell refers specimens from Cape Grenville, is principally distinguished by the dilated palms of the chelipedes, with fingers meeting only at tips; the lateral margins are not armed with prominent spines as in *M. superciliosa*, Haswell.

## 20. *Micippa curtispina* (Haswell).

An adult female is in Dr. Coppinger's second collection from Thursday Island, 3-4 fms. (No. 175), and a smaller male from Prince of Wales Channel, 7-9 fms.

Haswell's types were from Port Denison.

This species is very distinctly characterized by the form of the rostrum, which is not merely deflexed but curves round so as to be inflexed at the apex; the lateral subapical lobes of the rostrum, which are very little prominent and rounded in Mr. Haswell's figures, are obsolete in the specimens I have examined.

## 21. *Paramicippa spinosa* (Stimpson).

Several specimens are in the collection from Port Jackson, obtained at depths not exceeding 7 fms. (No. 104). There are in the collection of the British Museum specimens from New Zealand and Brisbane Water, besides others from Port Jackson. It also occurs, according to Mr. Haswell, at Port Stephens.

The *Micippa superciliosa* of Haswell (*t. c.* p. 446, pl. xxvi. fig. 2), from Darnley Island, Torres Straits, is an interesting and apparently very distinct form, intermediate between this species and the *Micippa philyra* (Herbst). It differs from *P. spinosa* in the acute lateral spines of the rostrum &c., and from *M. philyra* in the compressed and dilated palms of the chelipedes with fingers which, when closed, meet only at the tips, on which account I should be inclined to refer it to the genus *Paramicippa*.

## 22. *Lambrus longispinus*.

*Lambrus longispinus*, Miers, *Ann. & Mag. Nat. Hist.* ser. 5, xix. p. 18 (1879).

*Lambrus spinifer*, Haswell, *Proc. Linn. Soc. N. S. Wales*, iv. p. 451, pl. xxvii. fig. 1 (1880); *Cat. Austr. Crust.* p. 35 (1882).

Port Molle, 14 fms. (No. 93), eight specimens, males and females; Port Curtis, 11 fms. (No. 87), one male—first collection: both localities anticipated by Mr. Haswell.

In the second collection are two males and a female from Thursday Island, 3-4 fms. (No. 175), and a small female obtained on the beach at Port Darwin (No. 176).

Nearly all of these specimens present the rostral characters attributed by Haswell to his *L. spinifer*, but in one example of the series the lateral teeth of the rostrum are absent. Traces of them, as very obscure tubercles, exist in the typical examples of *L. longispinus* in the British-Museum collection.

In some of the specimens the spines of the cardiac and branchial regions and of the posterior and postero-lateral margins are much more strongly developed than in others. Besides the above mentioned Australian localities, Mr. Haswell records this species from Darney Island, and Cape Grenville.

### 23. *Lambrus lævicarpus*, Miers.

Two small males are in Dr. Coppinger's second collection, obtained in the Arafura Sea off the N.W. coast of Australia at a depth of 32-36 fms. (No. 160). They agree in all particulars with the typical specimen, without definite locality, in the Museum collection.

### 24. *Lambrus longimanus* (Linn.).

To this species as I have defined it ('Annals', xix. p. 21, 1879) are to be referred an adult male specimen from Flinders, Clairmont, obtained at a depth of 11 fms. (No. 108); a male and a female from Port Molle, 14 fms. (No. 93); and a female of large size, with ova, from Fitzroy Island, 10 fms. (No. 113).

This species, as I have already noted, ranges from the Mauritius through the Indian and Malaysian seas to the North-eastern coast of Australia.

### 25. *Lambrus nodosus* (Jacquinot and Lucas).

A small male in the first collection from Port Denison, 4 fms. (No. 122), belongs here. Specimens from the same locality are recorded by Mr. Haswell, the original types being from New Zealand. In the second collection are a male and a female from Thursday Island, 3-4 fms. (Nos. 175-177).

Small specimens of this species have a considerable resemblance to the *L. intermedius*, described by myself from the Corcan seas\*, where also are perhaps to be referred small specimens from Shark Bay, W. Australia (Rayner, H.M.S. 'Herald'), in the British-Museum collection, from which *L. nodosus* is distinguished by the prominent and globosely-rounded tubercles of the chelipedes. In *L. intermedius* the marginal tubercles of the chelipedes are flattened and (in the typical specimen) the palms are quite smooth on their upper surfaces. Very small granules exist, however, on the

\* Proc. Zool. Soc. p. 30 (1879).

upper face of the palms in one (the largest) of the Shark-Bay specimens.

As there are in the British-Museum collection adult examples undoubtedly referable to *L. nodosus* from Shark Bay, collected by Lieut. Suckling, R.N., and presented by W. Wykeham Perry, Esq., it is possible that *L. intermedius* may represent merely a young condition of this species.

## 26. *Lambrus turriger*, White.

An adult male and female, in somewhat imperfect condition, are in the second collection, from the Arafura Sea, 32-36 fms. (No. 160).

These specimens are certainly identical with specimens from the Philippine Islands (*Cuming*) and Borneo (*Admiralty*), designated *L. turriger* by White, although in the adult male received from Dr. Coppinger the spines of the carapace are considerably longer than in the largest of these examples.

Mr. Haswell mentions the occurrence of *L. turriger* at Darnley Island.

As the description and figure of Adams and White\* give an inadequate idea of this very remarkable form, I subjoin the following description of the principal specific characters, based upon an examination of Dr. Coppinger's adult male:—

The carapace is somewhat rhomboidal, constricted behind the orbits; the front prominent, triangulate, acute and deflexed, with a small tooth or tubercle on each side near the base. The carapace is armed with long spines, whereof one is situate on the gastric, one (very long) on the cardiac, and one (very long) on each branchial region; these spines are vertical; there is besides a shorter spine behind and in front of each of the branchial spines, and two, directed obliquely backwards, on the posterior margin of the carapace. The chelipedes are very long, more than  $4\frac{1}{2}$  times as long as the carapace, slender, and approaching more nearly to a cylindrical form than in any other species I have examined; the palm is scarcely more dilated than the wrist; and both arm, wrist, and palm are closely tuberculated both on their upper and under surfaces; the anterior and posterior margins are armed with longer tubercles or short spines, nearly as in the figure of Adams and White. In the smaller examples some of the shorter spines of the carapace may not be always developed, but the four long vertical spines of the gastric, cardiac, and branchial regions and the two spines of the posterior margin are always distinct.

## 27. *Lambrus hoplonotus*, var. *granulosus*, Miers.

Three specimens from Flinders, Clairmont, N.E. Australia, 11 fms. (No. 108, first collection), and one from Port Darwin, 12 fms. (second collection), agree more nearly with this variety than with any other of this protean species, but exhibit a marked approach to var. *longiocularis* in the subspiniiform tubercles of the gastric, cardiac, and

\* Zoology H.M.S. 'Samarang,' Crustacea, p. 26, pl. v. fig. 2 (1848).

branchial regions; the margins of the rostrum are, however, minutely denticulated, and the eyes do not project so much beyond the orbits as in the latter-mentioned variety. There can be no doubt that the two pass into one another by insensible gradations.

The range of *L. hoplonotus* (so far as ascertained) is from Ceylon eastward, through the Philippine Islands to the N.E. coast of Australia, whence Mr. Haswell records it from Darnley Island, Cape Grenville, and Port Denison; also from Albany Island and Port Molle (*H.M.S. 'Alert'*).

M. A. Milne-Edwards mentions its occurrence at New Caledonia.

### 28. *Lambrus* (*Parthenopoides*) *harpax*.

*Lambrus harpax*, *Ad. & White, Zool. 'Samarang,' Crust.* p. 25, pl. vi. fig. 3 (1848); *Haswell, Proc. Linn. Soc. N. S. Wales*, iv. p. 450 (1880); *Cat. Austr. Crust.* p. 32 (1882).

? *Lambrus* (*Parthenope*) *sandroekii*, *Haswell, t. c.* p. 452, pl. xxvii. fig. 2 (1880); *Cat.* p. 36 (1882), var.

An adult female bearing numerous ova is in the first collection from Thursday Island, Torres Straits (No. 130), and a small and imperfect male from Port Molle (No. 93); also an adult and a smaller male from Thursday Island, 3-4 fms. (No. 177) (second collection).

Mr. Haswell mentions the occurrence of this species at Albany Passage (*H.M.S. 'Alert'*).

In the adult specimens the depressions separating the branchial from the gastric and cardiac regions are wide and deep, and these regions are convex and covered with low tubercles; there is a deep concavity on the postfrontal region; the front itself is almost vertically deflexed; the margins of the carapace are armed with about a dozen oblong laminate teeth, which increase in size towards the postero-lateral angles, and whose margins are themselves crenulated; the postero-lateral marginal spines are large and laciniated (*i. e.* each bearing two or three smaller lateral spines or teeth). The chelipedes are robust and more or less tuberculated; arm strongly dentate on its anterior margin and with two or three spines on its posterior margin. Palm with a curved longitudinal series of larger rounded tubercles on its inner surface; the tubercles on its outer surface also showing a disposition to arrangement in longitudinal series; its inferior margin thin-edged and granulated. Fingers dentated on their inner margins, upper finger with a high dentated crest. Ambulatory legs compressed; third, fourth, and fifth joints somewhat eristated above; in the last pair the crests are more elevated and interrupted, and there are two or three spines on the lower margins of these joints. Length of the largest specimen (female) about 1 inch 2 lines (30 millim.), and greatest breadth (not including lateral branchial spines) about 1 inch 1 line (28 millim.).

The above description, although not exhaustive, will suffice (when compared with that given by Adams and White in their work above cited) to indicate the manifold differences between what I regard as the adult and young of this species. A specimen marked as the



type of their description is in the collection of the British Museum, and is of very small size (length 6 lines,  $12\frac{1}{2}$  millim.); surface of the carapace nearly smooth, with the regions little prominent and but slightly granulated; a spine on the gastric and cardiac regions and a somewhat obscure ridge on the branchial regions; teeth of the antero-lateral margins nearly confluent, postero-lateral spines with scarcely any traces of lateral teeth &c. Very similar characters are exhibited by the small specimen from Port Molle (No. 93). In the smaller male from Thursday Island (No. 177) and in two specimens from the Australian seas, the largest of which measures about 10 lines (21 millim.), and which were dredged by Mr. Macgillivray during the voyage of H.M.S. 'Rattlesnake,' in 7 fms. between Percy Island and the mainland, in lat.  $21^{\circ} 50' S.$ , long.  $150^{\circ} 20' E.$ , there is a considerable approach to the larger specimens from Thursday Island: in all the spines of the gastric and branchial regions are nearly obsolete; but in two specimens the carapace is nearly smooth, in the others it is granulated nearly as in the large specimen from Dr. Coppinger's collection, the spines of the postero-lateral angles are less prominent and less distinctly lacinated than in that example, though bearing distinct traces of lateral teeth.

I have entered thus fully into the distinctions observable between these specimens, because of the great degree of variability that exists in many species of Parthenopidæ; no one, I think, comparing two specimens at opposite ends of the series would regard them as belonging to one and the same species.

### 29. *Cryptopodia fornicata* (Fabr.).

Port Curtis, 11 fms. (No. 87), a female, first collection; Thursday Island (No. 175), second collection, a young male. Specimens are in the British-Museum collection of this common species from the Indian Ocean (*General Hardwicke*); Borneo (from the *India-Museum collection*); Philippine Islands, Mindoro (*Cuming*); Japan (*Jamrach*); Lizard Island (*J. Macgillivray*); and Moreton Bay (*Warwick*). Additional Australian localities mentioned by Mr. Haswell are Brook Island, Cape Grenville, and Port Denison.

It was collected in the Chinese seas during the voyage of H.M.S. 'Samarang.'

A very small male from Thursday Island (No. 165) has the carapace and under surface of the chelipedes smooth, the gastric depression shallow, and scarcely any trace of the oblique ridges on the branchial regions usually characteristic of *C. fornicata*.

### 30. *Cryptopodia spatulifrons*, Miers.

An adult male was received with Dr. Coppinger's second collection from Thursday Island, 3-4 fms. (No. 175), and a smaller male from Prince of Wales Channel, 7 fms. (No. 169).

The larger example has the carapace more distinctly and coarsely pitted than the typical specimen in the Museum collection from

Shark Bay (*H.M.S. 'Herald'*); the smaller specimen, which is referable to the variety I have designated *lavimana*, is not pitted at all, and the carapace is granulated only on the posterior part of the cardiac region, on the elevated parts of the branchial regions, and on the posterior and postero-lateral margins.

Mr. Haswell records a variety from Port Jackson which has the carapace ornamented with numerous small circular brown spots. In the specimens I have examined the carapace is generally uniformly pinkish or whitish; but in the largest male from Thursday Island it is whitish, with a few large blotches of brownish pink on the gastric and branchial regions and posterior margin.

### 31. *Gonatonotus pentagonus*.

*Gonatonotus pentagonus*, Adams & White, *Proc. Zool. Soc.* p. 58 (1847); *Zool. H.M.S. 'Samarang,' Crust.* p. 33, pl. vi. fig. 7 (1848); Miers, *Proc. Zool. Soc.* p. 29 (1879); Haswell, *Proc. Linn. Soc. N. S. Wales*, p. 455 (1880); *Cat. Austr. Crust.* p. 38 (1882).

Two very small females are in the collection from Thursday Island, 4-6 fms. (No. 130), first collection, length little over 3 lines (7 millim.); and a somewhat larger male from the same locality, 3-4 fms. (No. 177), second collection. The largest specimen in the Museum collection, a male from near Billiton Island, in the Javan sea, is about 6 lines (nearly 13 millim.) in length. Mr. Haswell records this species from Port Denison; the typical example of Adams and White was from Borneo.

*Gonatonotus crassimanus* of Haswell is a very nearly allied but apparently well-characterized species from Port Jackson, differing, as its author notes, in its more deeply-cleft rostrum and in other points.

### 32. *Euxanthus huonii* (Lucas).

A male from Clairmont, east coast of Australia, obtained from a coral-reef (No. 151), belongs here.

Mr. Haswell mentions ('Catalogue,' p. 47) its occurrence at Cape Grenville.

M. Alph. Milne-Edwards remarks\* that *Euxanthus sculptilis*, Dana, should perhaps not be distinguished from *Eu. huonii*. If the two species are to be united, Dana's specific name will, I believe, have priority; but I prefer to regard them for the present as distinct. In *Eu. huonii*, as described and figured by A. Milne-Edwards, and in the specimen of the 'Alert' collection, the black coloration of the fingers extends along the outer surface of the palm; no trace of this is apparent in Dana's figure of his *Eu. sculptilis*, nor in two specimens in the British-Museum collection, one of which is from the Philippine Islands and designated, I think, by M. A. Milne-Edwards *Eu. huonii*, the other from Trinity Bay, N.E. Australia; both I refer, at least provisionally, to *Eu. sculptilis*.

\* *Nouvelles Archives du Muséum*, i. p. 291 (1865).

33. *Euxanthus tuberculosus*. (PLATE XIX. fig. A.)

Carapace transverse, moderately convex, everywhere covered with numerous closely-set rounded tubercles, which in the adult are themselves distinctly punctulated; similar tubercles cover the outer surface of the wrist and palm of the chelipedes and the posterior surface of the ambulatory legs; the cervical suture and the suture defining the anterior part of the mesogastric lobe are deep and well defined; the tubercles are smallest, but yet distinct, on the cardiac and intestinal regions and posterior and postero-lateral margins; the frontal margin is divided by a rather deep median notch; the antero-lateral margins are divided into four rounded tuberculated lobes, the first of which is often scarcely distinguishable. The parts of the body immediately below the antero-lateral margins are granulated, but the rest of the inferior surface is nearly smooth, the sternum and postabdomen rather coarsely punctulated; the basal antennal joint enters (in the adult) well within the inner orbital hiatus; the merus-joint of the outer maxillipedes is transverse and much shorter than the preceding joint. The chelipedes are robust; the merus or arm short, and tuberculated at its upper and distal extremity; wrist and palm (as stated above) closely tuberculated on their upper and outer surfaces, the tubercles, even in the adult, somewhat conical and acute; inner margin of the palm having some small granules; fingers shorter than the palm, denticulated on their inner margins, and having between them when closed scarcely any hiatus; mobile finger granulated above at base; both fingers obtuse and rounded at apex, or (in the smaller examples especially) even somewhat excavated. The fourth to sixth joints of the ambulatory legs are compressed, tuberculated; the tubercles (of the superior margin especially) high, conical, and acute; the dactyli are small, slender, armed with small subspiniiform granules, and pubescent distally, with a small naked terminal claw. Length of the largest adult example (from which the description is taken) 11 lines (23 millim.), greatest width nearly 1 inch 4 lines (33 millim.).

Of this species, an apparently adult but not full-sized male and female are in the second collection from Thursday Island (No. 167), obtained on the beach; a young male from the same locality (No. 177), and another young example from Warrior Reef, Torres Straits, 10 fms. (no. 137). There are in the British-Museum collection a male from N. Australia (*Dr. J. R. Elsey*), and an adult male from the Australian seas without definite locality, from which the description and figure are taken (*Dr. J. S. Bowerbank*). The coloration varies in the different examples, all of which are preserved in spirit: the two specimens which have been longest in the collection are a chocolate-brown; the two largest specimens in the 'Alert' collection (No. 167) are of a deep purplish red, and the two smallest of a bright orange hue.

As the basal antennal joint enters well within the inner orbital hiatus (see fig. a), this species must, I think, be referred to the genus *Euxanthus*, from all the species of which genus known to me

it differs in the character of the tuberculation of the carapace and legs. In the smaller examples the tubercles are much smaller and more acute, and these specimens have much the aspect of certain *Actææ*, e. g. *A. granulata*, Audouin, and *A. carcharias*, White; from both of which species they may be distinguished upon the most superficial examination by the smoothness of the sternum and post-abdomen.

A small specimen from Tasmania in the British-Museum collection, designated "*X. peronii*, M.-Edw.," in, I think, Prof. A. Milne-Edwards's handwriting, and two from Bass Straits, received with fishes of H.M.S. 'Challenger' collection, are intermediate between this genus and *Actææ*, and are principally distinguished by the smooth, more distinctly separated and rounded tubercles of the carapace and the longer spines of the ambulatory legs. I believe the *Xantho spinosus* of Hess to be identical with *A. peronii*.

*Actæodes polyacanthus*\*, from the Red Sea, comes very near this species, but has five acute antero-lateral marginal teeth, &c.

*Euxanthus maculatus*, Haswell† (which is only known to me by the author's brief diagnosis), from Darnley Island, differs in the form of the teeth of the antero-lateral margins and the existence of longitudinal rows of pits on the outer surface of the hands.

### 34. *Hypocœlus punctatus*. (PLATE XIX. fig. B.)

The carapace is transverse, somewhat broader in proportion to its length than are specimens of *H. sculptus* in the Museum collection. As in that species it is everywhere strongly lobulated, the lobules rounded, convex, and separated by deep intervening grooves, the cervical suture being even wider and deeper than the rest; the lobules are rather coarsely punctulated. The front is rather obscurely bilobed (besides the rounded lobe over the inner orbital angle); the antero-lateral margins are strongly arcuated and cristiform, with scarcely any indications of any antero-lateral teeth except the last, which is small and little prominent; the postero-lateral margins are shorter than the antero-lateral margins and deeply concave. The inferior parts of the body are more or less coarsely pitted; the pterygostomian cavity is smaller than in *H. sculptus*, but rather wider than in a specimen of *H. granulatus* in the Museum collection, nearly ovate in outline, and divided along its greatest width by a crest running parallel to that part of the antero-lateral margin that borders the cavity above. The basal antennal joint enters the inner orbital hiatus, but not so deeply as in *H. sculptus*. The chelipedes resemble those of *H. sculptus*; the wrist and palm, however, are strongly pitted on their upper and outer surfaces, whereas in specimens of *H. sculptus* in the Museum collection these pits are absent from the wrist and from the upper surface of the palm. Fingers

\* *Chlorodius polyacanthus*, Heller, Sitz. Akad. Wien, xliii. (i.) p. 339, pl. ii. fig. 21 (1861).

† Proc. Linn. Soc. N. S. Wales, vi. p. 751 (1881); and 'Catalogue,' p. 48 (1882).



nearly as in *H. sculptus*. The ambulatory legs are slender, with the penultimate and antepenultimate joints rugose and pitted. The colour (in a spirit-specimen) is reddish upon a yellowish ground. Length of carapace  $8\frac{1}{2}$  lines (18 millim.), breadth about 1 inch (25 millim.).

A single male was obtained at Thursday Island, 3-4 fms. (No. 175).

It may be at once distinguished from *Hypocælus sculptus* (M.-Edwards) and *H. granulatus* (De Haan) by the crest or ridge dividing the cavities of the pterygostomial regions (fig. b).

The species of this curious genus appear to be rare. I have seen no specimens of *H. punctatus* except the unique type example. Of *H. sculptus* there are in the Museum three specimens—one from the Red Sea (*J. Burton*), one from the Gulf of Suez (*R. MacAndrew*), and one from the Mauritius. Of *H. granulatus* there is but one specimen, a mutilated male without indication of locality, in the national collection.

### 35. *Atergatis floridus* (Linn.).

Of this very common and widely distributed species five specimens (males and females), obtained on a coral-reef at the Clairmont Islands, N.E. coast of Australia (No. 151), are retained for the British Museum.

Specimens are in the national collection from Port Essington, Trinity Bay (*J. Macgillivray*, H.M.S. 'Rattlesnake'), and Swan River (*H. Dring*); also from Port Natal (purchased), and from the Philippine Islands, Guimaras (*H. Cuming*); Java, Karang-bollong, and Amboina (*Dr. P. Bleeker*); Indian Ocean (*Old Collection*); Ceylon, Galle (*Dr. W. Ondaatje*); Duke of York Island (*Rev. G. Brown*); Sunday Island (*J. B. Jukes*); Minerva Reef (*H.M.S. 'Herald'*); Fiji Islands, Ovalau, Totoya (*H.M.S. 'Herald'*); Samoa Islands, Upolu (*Rev. S. J. Whitmee*); and others with less definite indication of locality.

### 36. *Lophozozymus epheliticus* (Linn.).

Port Molle (No. 95). A small male, having the beautiful coloration usual in this common species, was obtained on the beach.

Mr. Haswell mentions its occurrence at Cape Grenville (as *L. octodentatus*).

Specimens are in the collection of the British Museum from New South Wales (*G. Krefft*); Darnley Island (*J. B. Jukes*); Nicol Bay, N.W. Australia (*Mr. Du Boulay*); Philippine Islands (*Cuming*); Java (*Bleeker Collection*); and others without definite locality.

The coloration, both in dry and spirit specimens, is variable; ordinarily carapace and legs are crimson or orange-red with white spots, but sometimes the white greatly predominates, and the red forms irregular patches and reticulating lines.



37. *Galene granulata*. (PLATE XX. fig. A.)

Carapace narrower in proportion to its length than *Galene bispinosa*, Herbst, the whole of the upper surface granulated, the granules, however, somewhat unevenly disposed; the cervical and cardiaco-branchial sutures are distinctly defined. In *G. bispinosa* (Herbst) the carapace is granulated only near the lateral margins. The two median teeth of the front are distinctly developed, but the two lateral teeth (those over the inner orbital hiatus) are obsolete; these teeth are very distinct in *Galene bispinosa* (Herbst). The antero-lateral margins have three distinct tuberculiform teeth; there are but two developed in *G. bispinosa*; the palms of the chelipedes are granulated over the whole of their outer surface, whereas in *G. bispinosa* the granulations exist only at the base, near the articulation with the wrist.

Of *G. granulata* there is but one specimen in the collection, a small male from Port Darwin, 7-12 fms. (No. 173).

The characters enumerated above, important though they may appear, may possibly be found to be dependent on the age and size of the specimen, the length of whose carapace is only  $5\frac{1}{2}$  lines ( $11\frac{1}{2}$  millim.), less than one fourth of the length of an adult example of *G. bispinosa* from Singapore (*A. R. Wallace*) in the Museum collection, and which is the only specimen I have examined; but I do not feel justified in uniting the two forms in the absence of any specimens with transitional characters. Both the specimens of *G. bispinosa* and of *G. granulata* are imperfect, that of *G. bispinosa* having lost the postabdomen, and that of *G. granulata* all except one of the ambulatory legs.

38. *Halimede? coppingeri*. (PLATE XX. fig. B.)

In this curious little species the carapace is anteriorly somewhat deflexed, with the antero-lateral margins somewhat shorter than the postero-lateral; body and legs are alike covered with a close velvety pubescence. The *sulci* defining the regions of the carapace are indistinguishable; the carapace is tuberculated, the tubercles rather large, and arranged in rather irregular transverse series. The front is divided by a median notch into two rather prominent rounded lobes, on either side of which the exterior angles form less prominent teeth. The upper orbital margin has a large blunt tubercle behind the outer frontal lobes. The antero-lateral margins have four very distinct tuberculiform teeth, the first of which is situated immediately behind the exterior angle of the orbit. The epistoma is transverse, the pterygostomian regions without spines or tubercles. The postabdomen in the female has all the segments distinct. The eye-peduncles are short and robust; the antennules nearly transversely folded; the basal antennal joint reaches beyond the subfrontal process, and thus enters within the inner orbital hiatus; the two following joints are slender; the flagellum filiform and rather long. The merus-joint of the outer maxillipedes is, as

usual, nearly quadrate, with the anterior margin straight, and has the next joint articulated with it at its antero-internal angle. The chelipedes are subequal and moderately robust; the merus or arm short, trigonous, its upper margin distally armed with three or four teeth; carpus or wrist very distinctly tuberculated on its upper and outer surface; palm with only three or four tubercles appearing through the pubescence at base; fingers little shorter than the palm, pubescent, except at and near the tips, which are acute, regularly denticulated, and closing along their inner margins. The ambulatory legs are slender, rather long, and densely pubescent; the merus-joints have a tubercle at their distal, and the carpus-joints one at their proximal ends. Colour cinereous grey. Length of the single specimen examined (a female) about  $3\frac{1}{2}$  lines (nearly 8 millim.), breadth about  $4\frac{1}{2}$  lines (nearly 10 millim.).

This specimen was dredged in the Arafura Sea, at a depth of 32–36 fms. (No. 160).

In the structure of the antennæ and orbits (see fig. *b*) this species resembles *Euxanthus* and *Liagore*, but the form of the strongly tuberculated and densely hairy carapace seems to preclude its being assigned to either of these genera. In these particulars and in the slender ambulatory legs it more closely resembles *Halimede fragifer*, De Haan; and I have accordingly assigned it to the genus *Halimede*, although with some uncertainty, since De Haan in his description does not say whether the basal antennal joint enters within the inner orbital hiatus or is merely in contact with the sub-frontal process; if the latter, our new species will, I think, have to be made the type of a new generic division.

### 39. *Actæa rüppellii* (Krauss).

To this species must, I think, be referred a small and very hirsute female from Port Molle, 14 fms. (No. 93), and a somewhat larger female with very prominent and distinctly granulated areolæ on the carapace, obtained at Port Denison, 4 fms. (No. 122), first collection; also two small females from Thursday Island, 3–4 fms. (No. 177), second collection.

There are specimens in the British-Museum collection from the Mauritius (*Old Collection*) and Malaysian seas (*coll. Dr. Bleker*); perhaps also a specimen from Norfolk Island, 23 fms. (*H.M.S. 'Herald'*), belongs here.

I have already, in my report on the late Dr. Bleker's Malaysian collection\*, given the leading references to the synonyma of *Actæa rüppellii*.

### 40. *Actæa areolata*, Dana?

To this species are very doubtfully referred several specimens of both sexes from Port Molle, obtained either on the beach (Nos. 95, 103) or at a depth of 14 fms. (No. 93). The largest example mea-

\* Ann. & Mag. Nat. Hist. ser. 5, v. p. 232 (1880).

tures 5 lines ( $10\frac{1}{2}$  millim.) in length, and about  $8\frac{1}{2}$  lines (18 millim.) in breadth.

In two of these specimens the coloration is reddish brown, with the very short pubescence of a brownish hue; the three others (103) are much paler, and the pubescence is of a light hue.

These specimens agree with Dana's description and figures in most particulars, and especially in the very considerable transverse width of the carapace, very concave postero-lateral margins, and very short pubescence of the carapace, wherein they differ from most other species of *Actæa*; the lobes of the antero-lateral margins of the carapace are, however, very indistinct and are themselves interrupted; and the areolæ of the upper surface appear to be much more strongly defined and separated by deeper furrows than in Dana's figure\*. His specimens were from the Sooloo Sea or Balabac Straits.

*Actæa consobrina* of Alphonse Milne-Edwards† is a closely allied species from Upolu, which, as far as can be learned from the very brief diagnosis, is only distinguished by the lighter coloration and 4-lobed antero-lateral margins. It may not be distinct from *A. areolata*, or, if distinct, perhaps our specimens should be referred to it.

#### 41. *Banareia inconspicua*. (PLATE XIX. fig. C.)

Carapace transverse, moderately convex, everywhere clothed with rather short hairs, beneath which the surface is granulated; similar hairs cover the upper surface of the legs; the carapace is not lobulated, nor are the interregional sutures visible: the front is 4-lobed, the lobes small, rounded, and equidistant. The antero-lateral margins are longer than the postero-lateral, unevenly granulated, with very obscure traces of division into teeth or lobes; the postero-lateral margins are strongly concave. The epistoma is almost linear-transverse; the anterior margin of the buccal cavity projects, and is divided by two very distinct fissures. The post-abdomen presents nothing remarkable. The antennules are obliquely folded; the antennæ have a rather stout basal joint, which reaches to the infero-lateral angle of the front, and a rather long flagellum. The ischium-joint of the outer maxillipedes is but little longer than the merus, which is nearly quadrate. The chelipedes are nearly smooth and unarmed, without spines or tubercles; the merus or arm is trigonous, its upper and lower margins fringed with hairs; the wrist is clothed with hair on its upper and outer surface, the angle on its inner surface prominent, but without a tooth or spine; palm also hairy above and on the upper part of its outer surface, naked on the lower part, where it is punctulated, and granulated on its lower margin; fingers nearly as long as the palm, naked (except at the base of the upper margin of the mobile finger or

\* U.S. Explor. Exped. xiii Crust. i. p. 162, pl. viii. fig. 1 (1852).

† Journal Museum Godeffroy, iv. p. 79 (1873).

dactyl, where there are a few hairs), acute at their apices, and denticulated on the inner margins only at base, the margins (in their distal half) thin-edged and entire. Ambulatory legs of moderate length and rather compressed; the dactyli very short. Colour (in spirit) purplish or fuscous brown. Length a little over 5 lines (11 millim.), breadth nearly 8 lines ( $16\frac{1}{2}$  millim.).

Two specimens (males) were obtained on the beach at Port Darwin (No. 176).

The absence of any distinct lobation of the carapace or of distinct antero-lateral marginal teeth is very characteristic of this species, which is also distinguished by its quadrilobate front. (See fig. c.)

I at first referred this species to the genus *Actæa*, not having observed the notches in the front of the endostome\*, which in one specimen are nearly obliterated. In a specimen sent by Mr. Haswell from Port Denison, which in its narrower carapace connects this species with *Atergatopsis*, these notches are deep and well defined. In two specimens in the Museum collection which I refer to the typical *Banareia armata*, A. M.-Edwards (since they agree with that species in all particulars except in the notches of the endostome), they are nearly obliterated.

The genus *Banareia* apparently connects the genera *Actæa* and *Atergatopsis*, and will have, perhaps, to be united with the latter, with which it agrees in the somewhat broader basal antennal joint and narrow naked acute finger-tips.

#### 42. *Xantho macgillivrayi*. (PLATE XX. fig. C.)

Carapace transverse, of the form usual in this genus, with the cervical suture and the depressions separating the prominences of the postfrontal, gastric, hepatic, and branchial regions very distinct; these lobules are themselves granulated, the granules being for the most part disposed in short transverse raised lines or low ridges, which are most prominent on the anterior part of the carapace; the intestinal region is plane and more or less punctulated. The front is rather prominent, and (in an adult example) more than one fourth the greatest width of the carapace, and is divided by a very slight median notch into two truncated lobes, exterior to which on each side is a small and less prominent tooth, formed by the inner and upper angle of the orbit; the antero-lateral margins are armed with four rather small but acute and well-defined teeth, which increase regularly in size from the first to the last; the subhepatic and pterygostomial regions and the postero-lateral margins of the carapace are granulated. There is a small tooth at the outer and another at the inner suborbital angle. The male postabdomen is 5-jointed, the third to fifth segments coalescent; that of the female is 7-jointed. The eye-peduncles are small, and thickened at their bases. The basal antennal joints are in contact with the subfrontal lobes. The outer maxillipedes present nothing remarkable, having the ischium-

\* Annales de la Soc. Entom. de France, sér. 4, ix. p. 168, pl. viii. (1869).



joint longitudinally canaliculated, and the merus truncated at its distal end, and with the antero-external angle little prominent. The chelipedes are moderately robust; merus or arm very short, trigonous; carpus or wrist nearly as large as the merus, with a rather prominent tooth on its inner margin, and its upper and outer surfaces marked with raised reticulating or anastomosing granulated lines or ridges; palm longer than the wrist, with somewhat similar sculpture on the upper surface, which has also two longitudinal depressions; on the outer surface the granulations (on the larger chelipede) are almost wholly obliterated, but in the smaller chelipede (which is the left in the two males I have examined) they cover the whole of the outer surface; the inner surface of the palms are smooth; fingers purplish brown, the coloration not extending over any part of the inner or outer surface of the palms. The mobile finger is canaliculated above, and has a very prominent tooth on its inner margin at base. Ambulatory legs of moderate length; merus-joints nearly smooth, but with their upper margins thin-edged and almost carinated; the two following joints are roughened, and marked on the sides with longitudinal depressions; terminal joints clothed with a dense velvety pubescence. The colour (of specimens preserved in spirit) is a pale yellowish brown. Length of the carapace of the largest specimen (a male) about  $7\frac{1}{2}$  lines (16 millim.), greatest width nearly 11 lines (23 millim.).

A male and female are in the collection from Port Molle, obtained on the sandy beach (Nos. 95, 103), and a male of larger size from Port Curtis, 7-19 fms. (No. 85). In the female the outer surfaces of both palms are vermiculated, and the fingers are pale purplish.

A male is in the British-Museum collection from Facing Island, Port Curtis, obtained under stones at low water (*J. Macgillivray*, H.M.S. 'Rattlesnake').

This species has much the aspect of a *Leptodius*, and is distinguished from all with which I am acquainted by the armature of the carapace and chelipedes. It bears a very considerable resemblance to a species from Marseilles in the Museum collection (*Coll. Leach*), referred by Leach, but wrongly, to *Xantho poressa* of Olivi\*, and designated by White (in manuscript) *X. confusus*, in which, however, there are no transverse granulated lines on the carapace, which is punctulated anteriorly. I have much pleasure in naming it after the late Mr. Macgillivray, by whom a specimen was collected, and by whose exertions the carcinological collections of the British Museum have been so much benefited.

*X. hirtipes*, M.-Edwards, to which is referred a specimen without special locality in the Museum collection, has some indications of raised lines upon the carapace, but has a much less prominent straighter front.

#### 43. *Cycloxanthus lineatus*, A. M.-Edw.

To this species are referred, though with some hesitation, two

\* 'Zoologia Adriatica,' p. 48, pl. ii. fig. 3 (1792).



females in the second collection, the one obtained at Friday Island, Torres Straits, 10 fms. (No. 158), and the other in the Arafura Sea, 32-36 fms. (No. 160). These specimens are both of very small size, one with ova measuring only  $2\frac{1}{2}$  lines (5 millim.) in length. They differ from M. A. Milne-Edwards's description and figure in being (in spirit) of a uniform ashy-grey colour, and in having the surface of the carapace very uneven, well-marked depressions existing at the back of the cardiac region and in front of each branchial region; the surface of the body, viewed under the microscope, is minutely and very closely granulated, but appears smooth to the naked eye.

Milne-Edwards's examples are from New Caledonia and Lifu, and are much larger, the carapace measuring over half an inch (13 millim.) in length. The inequalities of the carapace observable in our specimens may very probably disappear as the animal increases in size; therefore I do not regard the Australian specimens as belonging to a distinct species.

*Cycloxanthus punctatus*, Haswell (Catalogue, p. 50), from the Paramatta River, seems to be a very distinct form, to judge from the brief diagnosis\*.

#### 44. *Carpilodes venosus*, M.-Edw.

A female from Port Molle (No. 95), obtained on the beach, belongs here.

This specimen (preserved in spirit) is of a deep purplish-red hue, and has the *sulci* defining the araeoles of the carapace very distinctly defined, and altogether corresponding in arrangement with the same *sulci* in De Haan's figure of his *C. obtusus*, which is, I believe, a mere variety of this species. The length of this example is a little over 7 lines (15 millim.), and its greatest width nearly 1 inch (25 millim.).

In a larger female example from the Japanese seas, presented to the British Museum by Capt. H. C. St. John, R.N., and received since the publication of my report on the Podophthalmia of his collection—length of carapace over 10 lines (22 millim.), width 1 in. 5 lines (36 millim.)—the colour (in spirit) is a lighter orange-red, and several of the *sulci* of the carapace less distinctly defined or partially obliterated; this is no doubt due to the greater age of the specimen.

Stimpson† mentions the occurrence of *C. venosus* (as *Liomera obtusa*) at Ousima Island in the Japanese seas; and there is a specimen in the British-Museum collection from the Philippine Islands, Corregidor (*Cuning*), designated *C. venosus*, and others from Sir C. Hardy's Island, dredged in 11 fms. (*J. B. Jukes*), &c. Its range extends from the Mauritius to New Caledonia.

\* It may be useful here to mention that *Panopeus acutidens*, Haswell (*t. c.* p. 51, pl. i. fig. 2), is scarcely to be regarded as distinct from *Epixanthus dentatus* (*Panopeus dentatus*, Ad. & White), of which there are authentic specimens in the British-Museum collection.

† Proc. Ac. Nat. Sci. Phil. p. 31 (1858).

The Oriental specimen referred by White (List Crust. Brit. Mus. p. 13, 1847) to *C. venosus* certainly does not belong to this species.

#### 45. *Leptodius exaratus* (M.-Edw.).

Here are referred, at least provisionally, an adult male from Port Curtis (No. 95), obtained on the beach, and two smaller specimens dredged in 7-11 fms. at the same locality (No. 85), also six specimens obtained on the beach between tide-marks at Port Molle (No. 103).

The Port-Curtis examples and one from Port Molle (in spirit) are of a yellowish-brown or greenish hue; the five remaining examples from the latter-mentioned locality are purplish red, the carapace being obscurely punctulated with spots of a similar but darker hue. Several of these specimens, in the form of the teeth of the antero-lateral margins and in the lesser distinctness of the areolation of the carapace, resemble *L. gracilis* (Dana), as do also specimens in the British-Museum collection from Australia, the Mauritius, and the Fiji and Sandwich Islands; but these are connected by such gradual and insensible gradations with the more convex distinctly-areolated and irregularly-toothed specimens referred to *L. exaratus*, that I must regard *L. gracilis* as very doubtfully distinct.

Prof. Alphonse Milne-Edwards and others have referred to the wide geographical distribution of this common Oriental form\*; and on this account, and also because of the uncertainty I at present feel regarding the true specific limitations of *L. exaratus*, I think it at present needless to refer in detail to the numerous examples in the British-Museum collection which belong to it or to closely allied types. I may note, however, the occurrence of several varieties (as I believe) of this species at Shark Bay, W. Australia (*H.M.S. 'Herald'*).

#### 46. *Leptodius lividus*.

*Xantho lividus*, *De Haan, Faun. Japon., Crust.* p. 48, pl. xiii. fig. 6 (1835).

Seven small specimens, males and females, are in the collection; the carapace of the largest male measures but 5 lines (nearly 11 millim.) in length and 8 lines (17 millim.) in width; these specimens (in spirit) are of a pale greenish or brownish yellow, and agree in all particulars with De Haan's diagnosis, except that the chelipedes have their palmar joints (like the wrists) rather coarsely granulated or even rugose on the upper and on the upper part of the outer surfaces.

These specimens were obtained on the beach at Flinders Island, under stones.

They are connected by a nearly complete series of intermediate forms (such as *L. distinguendus*) with *Leptodius exaratus*.

\* *Nouv. Arch. Mus. Hist. Nat.* ix. p. 223 (1873).

A complete revision of the genus would be necessary, based upon the comparative study of types and of a much larger series of specimens than the Museum at present possesses, in order to determine the real value of the characters ascribed to several of the species, which I think will be shown hereafter to be merely synonyms of earlier-described forms. (See on this question Kossmann, Zool. Ergeb. roth. Meer. pp. 32, 33, 1877.)

Two very small males obtained on the beach at Thursday Island (second collection, No. 167) are apparently intermediate in many characters between this genus and *Etisodes*, which they resemble in general appearance. The basal antennal joint enters the inner orbital hiatus, but the flagellum is just excluded from it, and the carapace is broader than in *Etisodes* and is shaped as in *Leptodius*; the frontal lobes are truncated, not sinuated as in *Leptodius lividus*; the anterior margin straight; there are five distinct acute antero-lateral marginal teeth; the carapace is slightly lobulated and granulated anteriorly, plane and smooth posteriorly; the carpus and palms of the chelipedes rugose; the ambulatory legs somewhat compressed. Length of carapace barely 4 lines.

#### 47. *Chlorodius niger* (Forsk<sup>2</sup>).

A single female of this very common Oriental species was obtained at Port Denison in 4 fms. (No. 111).

A specimen is in the British Museum from Port Jackson (*Cuming*).

*C. niger* ranges from the Red Sea and the Mascarene Islands eastward through the Indian Ocean and Malaysian archipelago to the islands of the Pacific (Samoa and Sandwich Islands).

Specimens are in the collection of the British Museum from Egypt (*Col. J. Burton*); the Gulf of Suez (*R. MacAndrew*); Red Sea, Dædalus Shoal (*Lt.-Col. Playfair*); El Tor (*Major MacDonald*); Seychelles (*Dr. E. P. Wright*); Ceylon, Galle (*Dr. W. Ondaatje*); Balabac Straits (*Smithsonian Institute, Wilkes Expedition*); New Guinea (*Dr. Bleeker's Coll.*); Philippine Islands, Guimaras (*Cuming*), designated *C. hirtipes* by Adams and White: Keeling or Coe's Islands (*Lt. Burnaby, R.N.*); Samoa Islands, Upolu (*Rev. S. J. Whitmee*), and Sandwich Islands (*W. H. Pease*).

Perhaps the *Chlorodius rufescens*, Targioni-Tozzetti\*, from Java, should be added to the synonymy of this species, from which it is distinguished by its author by the longer, more convex carapace, with more acute areolæ and marginal lateral teeth. MM. A. M.-Edwards and De Man have noticed considerable variation in the degree of acuteness of the antero-lateral marginal teeth and adjacent tubercles in *C. niger*†.

\* 'Crostacei della Magenta,' p. 43, pl. iv. figs. 6-8, 10-12, 14, 18 (1877).

† Vide 'Notes from the Leyden Museum,' ii. p. 174 (1880).

48. *Chlorodopsis granulatus*. (PLATE XXI. fig. A.)

? *Pilodius granulatus*, Stimpson, *Proc. Acad. Nat. Sci. Philad.* p. 34 (1858).

In this little species, which has never been figured, and is only known by Stimpson's brief diagnosis, the carapace is transverse, rather depressed, and very distinctly lobulated on its upper surface; the lobules or arcolets granulated, covered with a close velvety pubescence, and separated one from another by naked interspaces; the antero-lateral margins have four distinct spiniform teeth, near to which are one or two minute spinules or granules, there being no tooth or spine at the outer orbital angle; the front is rather broad, projects but little, and is divided by a median incision into two rounded lobes, which are separated by a wider sinus from the outer frontal angles, which are in contact with the basal antennal joints; the orbital margins are entire. The male postabdomen is 5- or 6-jointed, two or three of the intermediate joints being coalescent. The basal antennal joint is robust, and its outer and distal angle enters the inner orbital hiatus, from which the flagellum is just excluded; the merus-joint of the outer maxillipedes is truncated at its distal end. Chelipedes moderately robust; merus or arm short, trigonous and unarmed; wrist and palm covered externally with small granules, wrist with one or sometimes two acute teeth on its inner margin; fingers as long or nearly as long as the palm, the mobile finger with two longitudinal series of acute granules on its upper margin; the fingers are regularly denticulated on their inner margins, and have between them scarcely any interspace when closed. The ambulatory legs are compressed, without spinules, but have a series of minute denticles on the upper margins of the merus-joints only. Colour (in spirit) light yellowish brown, fingers a much deeper brown; this coloration extends also over a great part of the inner and outer surfaces of the palm. The arcolets of the carapace, pterygostomial regions, and legs are pubescent; the ambulatory legs clothed on their margins with longer hairs. Length of the largest male rather over 4 lines (9 millim.), greatest breadth 6 lines (nearly 13 millim.).

A specimen is in the collection from Port Denison, 4 fms. (No. 111), and four were collected on the beach at Port Molle (Nos. 95, 103). Stimpson's specimens were from Hong Kong.

In another male from Port Molle (No. 103) the carapace is nearly naked and the fingers black; this coloration forming also a broad black cineture covering the greater part of the inner and outer surface of the palms.

In a male in the second collection, obtained on the beach at Port Darwin (No. 176), which is probably no more than a variety of this species, the fingers are pinkish and scarcely differ in coloration from the rest of the palm, and have between them (when closed) a wider hiatus; the palm also is slenderer than in the other males I have examined. (See fig. *a'*.)

*Chlorodopsis granulatus* is evidently very nearly allied to *C. me-*

*lanochirus*, A. M.-Edwards\*; but the spiniform teeth of the antero-lateral margins are much more prominent, the anterior margin of the merus of the chelipedes is not tuberculated, the ambulatory legs not spinulose. In a specimen from the Philippines (*Cuming*) that I refer to *C. melanochirus*, in the British Museum, the hands of the chelipedes in the male are much more robust, and the merus and two following joints of the ambulatory legs strongly spinulose, not only on the outer margins, but also on the posterior surface. From most of the other species of this genus it is distinguished either by the different coloration of the hands (fig. *a*) and the form of the antero-lateral marginal teeth, or the absence of spinules on the ambulatory legs.

*Chlorodopsis areolatus* (Milne-Edwards), a species originally described from New Holland, and referred to in the second part of this Report, is easily distinguishable by the form of the frontal lobes and antero-lateral marginal teeth.

#### 49. *Etisus lævimanus*, Randall.

A male of this very common Oriental species was obtained at Port Molle, on the beach (No. 95).

Mr. Haswell records it from Holborn Island, near Port Denison.

The British-Museum collection includes specimens from Trinity Bay and Facing Island, Port Curtis (*J. Macgillivray*, H.M.S. 'Rattlesnake'); Moreton Bay (*purchased of Warwick*); Torres Straits (*J. B. Jukes*); Blackwood Bay (*J. B. Jukes*); Singapore (*purchased*); Fiji Islands, Vanua-Levu, Bau (*Rayner*, H.M.S. 'Herald'); New Hebrides (*J. Macgillivray*); Samoa Islands (*Rev. S. J. Whitmee*); also specimens without locality designated *E. macrodactylus*.

Dr. F. Hilgendorf† has already referred to the synonyma of *E. lævimanus*, which ranges in a westerly direction to the Red Sea and Mozambique.

#### 50. *Etisodes electra*.

? *Cancer electra*, *Herbst*, *Naturg. Krabben u. Krebse*, iii. (2) p. 34, pl. xli. fig. 6 (1801).

? *Cancer metis*, *Herbst*, *t. c.* p. 36, pl. liv. fig. 3 (1801).

*Etisus metis*, *White*, *List Crust. Brit. Mus.* p. 126 (1847).

*Etisodes frontalis*, *Dana*, *Proc. Acad. Nat. Sci. Philad.* p. 77 (1852); *U.S. Expl. Exped.* xiii. Cr. i. p. 187, pl. ix. fig. 3 (1852); *Haswell*, *Cat. Austr. Crust.* p. 56 (1882).

*Etisodes rugosus*, *Lucas*, *Crustacés in Voyage au Pôle Sud*, iii. p. 33, pl. iv. fig. 2 (1853).

*Chlorodius dentifrons*, *Stimpson*, *Proc. Acad. Nat. Sci. Philad.* p. 34 (1858).

\* *Nouv. Archiv. Mus. Hist. Nat.* ix. p. 228, pl. viii. fig. 5 (1873).

† *Monatsb. Akad. Wiss. Berlin*, p. 791 (1878).



*Etisodes sculptilis*, Heller, *Sitz. Akad. Wien, Math.-nat. Klasse*, xliii. (i.) p. 333 (1861); *A. M.-Edwards, Nouv. Archiv. Mus. Hist. Nat.* ix. p. 236, pl. ix. fig. 2 (1873).  
*Chlorodius samoensis*, Miers, *Ann. & Mag. Nat. Hist.* ser. 4, xvi. p. 341 (1875).

A small female was obtained on a coral-reef off Clairmont (No. 151).

Mr. Haswell records it from Holborn Island (as *E. frontalis*). In the British-Museum collection are specimens from the Gulf of Suez (*R. MacAndrew*); Philippines (*Cuming*); Samoa Islands (*Rev. S. J. Whitmee*, types of *Chlorodius samoensis*); Sandwich Islands (*W. H. Pease*); and others without special locality.

In this very variable species the front is usually 4-lobed (without including the inner orbital angle), but sometimes the submedian incisions are so shallow that the lateral lobes are scarcely defined; it also varies much in the distinctness of the areolation of the carapace and the granulation of the chelipedes. I have little doubt, however, that all the forms referred to in the synonymical citations given above are varieties of one widely distributed Indo-Pacific species.

### 51. *Etisodes anaglyptus* (*M.-Edw.*).

An adult female from Clairmont, obtained on a coral-reef (No. 151), belongs here.

This specimen certainly belongs to the same species as do two specimens in the British-Museum collection from the Philippine Islands (*Cuming*), referred by White to *E. anaglyptus*; but these all differ from Milne-Edwards's figure in the large illustrated edition of Cuvier\* in having the frontal lobes divided by a deeper median fissure, and these lobes are themselves not merely truncate but also have the distal ends slightly convex, and the teeth of the antero-lateral margins are somewhat more conical and acute than in that figure. I may add that the lobules of the carapace have a few scattered punctulations, the tuberculation on the outer surface of the hands shows a disposition to arrangement in longitudinal series, and the black coloration of the fingers in the male extends over the inner and outer surface of the palms.

### 52. *Menippe* (*Myomenippe*) *legouilloui*, *A. M.-Edw.*

Several specimens are in the collection from Port Curtis, obtained either on the beach (Nos. 88, 96) or dredged at 7-11 fms. (No. 85). Length of the largest specimen about 1 inch 7 lines (40 millim.), greatest breadth about 2 in. 3 lines (57 millim.). In the smaller specimens the distinctions between the median and the rest of the frontal teeth are much less marked than in the full-sized example.

In the British-Museum collection there are, besides, only a specimen from Swan River, and another from the Malaysian seas,

\* 'Règne Animal,' Crustacés, Atlas, pl. xi. fig. 4.

without definite locality, from the collection of the late Dr. Bleeker, and already referred to in my report on that collection.

### 53. *Pilumnus vespertilio* (*Fabr.*).

Five specimens were collected on the beach at Port Molle (Nos. 95, 103) (first collection). From the second collection are retained a female from Thursday-Island beach (No. 167), a male from a coral-reef at Clairmont (No. 151), a female from West Island, Prince of Wales Channel (No. 149), and a small female from Dundas Straits, N.W. Australia, 17 fms. (No. 161). In nearly all the hairs with which the carapace is clothed are of a cinereous colour. Hess mentions its occurrence at Sydney. It is said by Mr. Haswell to be common in Australia on coral-reefs.

A very large series of specimens of this widely distributed species is in the Museum collection, from the following localities:—Mauritius (*Old Collection*); Seychelles (*Dr. E. P. Wright*); Java (*coll. Dr. Bleeker*); Timor Laut (*H. O. Forbes*); N.W. coast of Australia, Nicol Bay (*Mr. du Boulay*); Madjica-Sima group (*H.M.S. 'Samurang,'* types of *P. ursulus*); Philippine Islands, Siquijor (*Cuming*); Cumberland Island, Sir C. Hardy's Island (*J. B. Jukes*); New Zealand (*Dr. A. Sinclair, R.N.*); Fiji Islands, Vanua Levu, Bau (*H.M.S. 'Herald'*); Samoa Islands, Upolu, &c. (*Rev. S. J. Whitmee*); New Hebrides (*J. Macgillivray*); besides others without definite or well-authenticated localities.

I have in my report on the late Dr. Bleeker's collection of Malaysian Crustacea given the principal references to the synonyma of this species.

### 54. *Pilumnus pulcher*. (PLATE XXII. fig. A.)

In this species the carapace is regularly convex and somewhat orbiculate, the antero-lateral margins being as long as the postero-lateral and regularly arcuate; the upper surface of the body and legs is rather thinly clothed with very long fulvous hairs, beneath which the carapace is granulated; the median frontal lobes are very prominent, deflexed, and divided by a very narrow (or closed) median fissure; the orbital margins are denticulated; between each of the four principal spines of the antero-lateral margins are three or four scarcely smaller spinules. The pterygostomian regions are smooth; the sternum coarsely punctated. All the segments of the postabdomen distinct in both sexes. The basal antennal joints are robust and reach to the subfrontal processes; the merus-joints of the outer maxillipedes small and smooth. The chelipedes are moderately robust, and in the specimens examined nearly of equal size; arm short, trigonous, smooth, with a strong spine near the distal end of its upper margin; wrist granulated externally, with only a small spinule near the distal end of its inner margin; palm with three spines on its upper margin (see fig. *a*), its outer surface strongly tuberculated, the tubercles arranged in longitudinal series,

largest near the base of the lower (immobile) finger; fingers brown, the coloration not extending over the inner or outer surface of the hands, inner margins rather obscurely but regularly denticulated, apices acute; ambulatory legs rather long for a species of the genus. Length of the carapace of the largest male nearly 11 lines (23 millim.), breadth 1 inch  $\frac{1}{2}$  line (27 millim.).

There is in Dr. Coppinger's collection a small female from Warrior Reef, Torres Straits, and a yet smaller male from Albany Island, 3-4 fms.; also in the second collection an adult male from Thursday Island, 3-4 fms. (No. 177). In the Museum collection is an adult male from Torres Straits (*Mr. McFarlane*). I cannot identify this species with any of the Australian forms described by Mr. Haswell.

From the *Pilumnus bleekeri*, recently described by me\*, which inhabits New Guinea, and which this species somewhat resembles in external appearance, it is distinguished by the much narrower fissure of the front, different spinulation of the antero-lateral margins, and the three spines on the upper surface of the palms of the chelipedes.

In *Pilumnus vestitus*, Haswell (Cat. p. 68), from Port Jackson and Port Stephens, which has the carapace covered with stiff yellow hairs as in *P. pulcher*, the surface is not granulated, and the spinulation of the carapace and chelipedes is different.

### 55. *Pilumnus rufopunctatus*, Stimpson.

Three specimens (two males and a female) were obtained at Port Jackson, 5-7 fms. (No. 104).

Mr. Haswell records it from Port Stephens and Western Port.

It nearly resembles the following species (*P. lanatus*), which occurred with it, but is distinguished by the granulations of the chelipedes extending over the whole of the outer surface of the hand, and the tuberculation of the carapace, which, however, seems to be a variable character, &c.

Possibly the *P. rufopunctatus* of Stimpson is itself to be identified with *P. tomentosus* of Milne-Edwards. This is a point which cannot be satisfactorily determined from the very brief diagnosis of the latter author.

### 56. *Pilumnus lanatus*, Latreille? (PLATE XXI. fig. B.)

As the *P. lanatus* has been only very briefly described, and the identification of this species must be regarded as uncertain, I append the following detailed description:—

In the specimens I thus designate the carapace is moderately convex, of the usual shape, and, as well as the legs, is covered with a short dense brown pubescence, which is absent in great measure from the inferior surface of the body and from the anterior and

\* Ann. & Mag. Nat. Hist. ser. 5, v. p. 235 (1880).

lower surfaces of the hands; the front is moderately deflexed, and is divided by a median notch into two rounded lobes; the antero-lateral margins are somewhat shorter than the postero-lateral, with only the three posterior teeth distinct, these are small and spiniform. The orbits are tuberculated on their margins, but without any distinct spinules; the inner suborbital angle is rather prominent. All the postabdominal segments are distinct in both sexes. The basal antennal joint apparently does not reach to the front; the merus-joint of the outer maxillipedes is short and transverse; the chelipedes in the male have the merus-joint short and trigonous, with a tooth near the distal end of its upper margin; carpus and palm granulated on their outer surface, but the granules for the most part concealed by the pubescence; there is a small tuberculiform or subspiniform tooth on the inner margin of the carpus or wrist; the hand (for so small a species) is large, its inner surface naked, smooth, and polished, and the granulations usually obsolete on the naked part of the outer surface in the larger chelipede; the fingers are chocolate-brown, the coloration not extending over any part of the palm, and the upper finger has scarcely any traces of teeth on its inner margin. The ambulatory legs are closely pubescent. Length of the largest male in the collection a little over  $4\frac{1}{2}$  lines (10 millim.), breadth about  $6\frac{1}{2}$  lines (14 millim.); length of largest chelipede about  $10\frac{1}{2}$  lines (22 millim.).

Ten specimens are in the collection, from Port Jackson, 5-7 fms. (No. 104).

Either the right or the left chelipede may be the larger in the male. Occasionally the granulations of the hands are distinct even upon the naked part of the outer surface; there are several females in the series of very small size, yet bearing ova.

There is in the British-Museum collection a specimen from Percy Island (*H.M.S. 'Herald'*). Possibly also a small male from Tasmania (*R. Gunn*) is to be referred here.

Finally, there are in Dr. Coppinger's collection a series of very small specimens from Port Denison, 4 fms. (No. 111), of much paler colour than those collected at Port Jackson, and two from Port Curtis, 11 fms. (No. 87), which perhaps belong to this species.

This species bears some resemblance to *P. hirsutus*, Stimpson, which Mr. Haswell records from Port Jackson, but differs (in the adult at least) in the close brown pubescence, and in having a series of tubercles or small spines on the carpus (not merus) of the ambulatory legs. In the specimens from the Japanese or Korean seas referred to *P. hirsutus* in the Museum collection there is but a single spinule at the distal end of the carpus of these legs. *Pilumnus fissifrons*, Stimpson, from Port Jackson, differs in having the carapace distinctly areolated and the antero-lateral marginal teeth normally developed.

If our specimens should prove to belong to an undescribed species, I would propose for them the name of *P. humilis*.

57. *Pilumnus semilanatus*. (PLATE XXII. fig. B.)

The carapace is not very convex; a few granules exist near the antero-lateral teeth; its anterior part (*i. e.* the frontal and post-frontal regions and parts adjacent to the antero-lateral margins) is clothed with longish hairs, which are altogether absent from the gastric, cardiac, and branchial regions, which are nearly plain and smooth; the cervical suture only is distinct in some specimens; the frontal lobes are scarcely defined by a median notch, and are very little prominent; the antero-lateral margins much shorter than the postero-lateral, and armed with three teeth, the first of which is blunt and is itself crenulated, the second dentiform, and the third very small; no tooth exists at the exterior angle of the orbit, but immediately behind it are sometimes one or two small granules; the orbital margins are rather obscurely denticulated; the pterygostomian regions nearly smooth; all the postabdominal segments are distinct; the basal antennal joint barely reaches to the subfrontal process; the merus-joint of the outer maxillipedes is nearly quadrate. The chelipedes are of moderate size; arm with a small spine near the distal end of its upper margin; wrist granulated externally, the granules inconspicuous, and with a small spine on its inner margin; palm also granulated above and externally, the granules large and showing a tendency to disposition in longitudinal series, and becoming more crowded toward the lower margin; fingers brownish, the coloration not extending over the palm; legs slender and proportionately rather long. Length of the largest perfect specimen rather over 4 lines (9 millim.), breadth 5 lines (nearly 11 millim.).

Three small specimens (a male and two females) are in the first collection, but unfortunately without definite locality; the label with particulars respecting habitat (if there existed any) was lost when the bottle (No. 123) came into my hands. In the second collection two males from Prince of Wales Channel, 7-9 fms.

Either the left or the right hand may be the larger.

There are in the collection of the British Museum a male and a female specimen preserved dry, and collected by Mr. J. Macgillivray (H.M.S. 'Rattlesnake') off Cape Capricorn, in 15 fathoms, on a muddy, sandy, and shelly bottom, that I refer to this species; also an adult male from Moreton Bay (purchased). The coloration of Dr. Copping's spirit-specimens is purplish, that of the dry examples reddish brown.

This species bears some slight resemblance to *P. monilifera*, Haswell, from Tasmania (*vide* Cat. p. 65, pl. i. fig. 3), which, however, has the carapace and limbs covered with a short close pubescence, and the front much more deeply incised, the carapace more granulated.

58. *Pilumnus seminudus*. (PLATE XXI. fig. C.)

This species resembles the foregoing in having the gastric, cardiac, and branchial regions of the carapace smooth and naked; but it may



be at once distinguished by the following characters:—The carapace is broader in proportion to its length, and its anterior parts clothed with a close velvety pubescence, which also extends over the upper and outer surface of the wrist and palm of the chelipedes; the two posterior teeth of the antero-lateral margins are more distinctly spiniform, the basal antennal joint does not nearly reach to the sub-frontal process; the granulations of the wrist and palm are much more inconspicuous, those of the outer surface of the palm appear, through the pubescence, to be arranged in four distinct longitudinal series (fig. c); the ambulatory legs are slenderer.

Colour (in spirit) purplish brown, hairs cinereous. Length of the largest specimen, a female, about  $5\frac{1}{2}$  lines (nearly 12 millim.), breadth about  $7\frac{1}{2}$  lines (16 millim.).

There is a male in the first collection from Port Denison, 4 fms. (No. 111), and a female in the second collection from Thursday Island, 4–5 fms. (No. 165).

Mr. Haswell has described a species (*Pilumnus inermis*\*) from Port Jackson which apparently resembles this and the preceding species in having the anterior parts only of the carapace clothed with hairs, which are long as in *P. semilanatus*. It differs, however, in the less distinctly toothed antero-lateral margins of the carapace, in the form of the front, which is entire, not notched, and in the disposition of the granules of the chelipedes, both from *P. semilanatus* and *P. seminudus*.

*Pilumnus levimanus*, Dana†, is apparently allied to this and the foregoing species, but has the carapace almost wholly naked, and the larger hand rounded above and quite smooth, with only some faint traces of minute tubercles toward the base. It has been recorded from Borneo and New Caledonia.

In *Pilumnus nitidus*, A. M.-Edwards‡, from New Caledonia, which is another nearly allied species, the two anterior teeth of the antero-lateral margins of the carapace are obsolete.

### 59. *Pilumnus cursor*?

? *Pilumnus cursor*, A. M.-Edwards, *Nouv. Archiv. Mus. Hist. Nat.* ix. p. 244, pl. ix. fig. 4 (1873).

In the specimen I thus very doubtfully designate the carapace is nearly smooth, with the anterior portion moderately deflexed, antero-lateral margins much shorter than the postero-lateral, which are nearly straight and convergent posteriorly; both carapace and limbs are scantily clothed with very short hairs, among which a few longer hairs are interspersed; the frontal lobes are divided by a rather deep and wide median fissure; the antero-lateral margins are armed with three spines, besides a smaller but distinct spine at the exterior angle of the orbit. The basal antennal

\* Proc. Linn. Soc. N. S. Wales, vi. p. 544 (1881); Catalogue, p. 70 (1882).

† Crust. U.S. Expl. Exp. xiii. p. 237, pl. xiii. fig. 11 (1852).

‡ *Nouv. Arch. Mus.* ix. p. 249, pl. x. fig. 2 (1873).

joint barely reaches to the subfrontal angle, but attains to a level with the apex of the inner suborbital lobe; the antennal flagella are much elongated. The chelipedes (in the single male examined) are rather slender and nearly equal; the arm has two spines at the distal end of its upper margin; the wrist is armed with several spines, the strongest one being on the inner margin; the palm has its upper margin and outer surface armed with small spines or spiniform tubercles disposed in longitudinal series; these are with difficulty discernible through the hairs covering this joint; fingers brown, and distinctly dentated on their inner margins. The ambulatory legs are elongated and slender, and have their upper and lower margins clothed with long hairs. Colour reddish (in spirit), with purplish markings. Length about  $2\frac{1}{2}$  lines (5 millim.), breadth 3 lines (nearly 7 millim.); length of penultimate ambulatory limb nearly 6 lines (12 millim.).

The single specimen (a male) was obtained at Port Denison, 4 fms. (No. 111).

*P. cursor*, A. M.-Edwards, was founded on specimens from New Caledonia and the Samoa Islands; the description differs from the above in several minor particulars; but I have thought it better to regard the Australian example before me as identical with this species than to run the risk of unnecessarily adding to the synonyma. Mr. Haswell (Cat. p. 67) records it from Port Molle.

#### 60. *Pilumnus labyrinthicus*. (PLATE XXII. fig. C.)

In this curious form the surface of the carapace is everywhere covered with raised curved or sinuated ridges, which are separated by wide depressions; the body and legs are covered with a dense close brown pubescence; from most of the ridges and from the teeth of the antero-lateral margin of the carapace spring longer setæ, and the margins of the ambulatory legs are also fringed with longer hairs. The frontal lobes, which are scarcely separated as usual by a median notch, are rather broad, straight, and but little prominent; the antero-lateral margins are somewhat shorter than the postero-lateral, and are armed with three distinct teeth, that of the exterior orbital angle being obsolete. The orbital margin is somewhat thickened; the epistoma rather longer in proportion to its breadth than is usual. The basal antennal joint is short, scarcely attaining to the subfrontal process, and not nearly reaching to the apex of the very prominent lobe at the inner suborbital angle. The chelipedes are rather small and (like the carapace) are densely pubescent, besides being clothed with longer hairs; the outer surface of the wrist or carpus is tuberculated beneath the hairy coat; the palm is clothed externally with long dense hairs; the upper margin of the palm bears three distinct tubercles; the fingers are slaty coloured, dentated on their inner margins and acute at their apices. The ambulatory legs are densely hairy and of moderate length. Length of carapace nearly 4 lines (8 millim.), breadth about  $4\frac{1}{2}$  lines (9 millim.).

One specimen (a male) was obtained at Port Molle, 14 fms. (No. 93); in the second collection are an adult female and two smaller specimens from Thursday Island, 3-5 fms. (Nos. 165, 177).

In many of its characters this species resembles *P. vespertilio*, but differs in the curious sculpture and less dense hairiness of the carapace, the prominent teeth of the antero-lateral margins, and the existence of distinct teeth on the upper margin of the palm (fig. c).

In the very remarkable sculpture of the carapace it somewhat resembles *P. vermiculatus*, A. M.-Edwards\*, from New Caledonia; but in that species the vermiculations are much less numerous, the front is much deflexed and in a continuous line with the upper orbital margin, the teeth of the antero-lateral margins are much more obtuse, &c.

### 61. *Pilumnus* ? *pugilator* ?

? *Actumnus pugilator*, A. M.-Edwards, *Nouv. Arch. Mus. Hist. Nat.* ix. p. 195, pl. vii. fig. 1 (1873); *Haswell, Cat. Austr. Crust.* p. 72 (1882).

Here is referred, though with some hesitation, a fine male from Port Molle, 14 fms. (No. 93); also a male and two females in the British-Museum collection, preserved dry, and dredged by Mr. Macgillivray in 17 fathoms between Percy Island and the mainland, on a bottom consisting of coarse sand and shells. M. A. Milne-Edwards says that the regions of the carapace in his unique example (obtained at the island of Lifu) are distinct, whereas in the Australian examples I have before me scarcely any traces of the intervening depressions exist: moreover the form of the seriatly disposed tubercles of the outer surface of the chelipedes is very peculiar and characteristic; these tubercles are separated, indeed, at their bases, but have their heads dilated and in contact with one another, and the heads are also armed (usually on one side only) with laterally projecting spinules. This disposition cannot be seen except under a lens of considerable power, and hence may have been unnoticed by M. A. Milne-Edwards.

Mr. Haswell gives Darnley Island as an additional Australian locality for this species.

### 62. *Actumnus setifer*.

Cancer (*Pilumnus*) *setifer*, De Haan, *Faun. Japon.*, Cr. p. 50, pl. iii. fig. 3 (1835).

*Actumnus tomentosus*, Dana, *Proc. Ac. Nat. Sci. Phil.* p. 82 (1852); *U.S. Explor. Exped.* xiii. Cr. i. p. 243, pl. xiv. fig. 2 (1852); A. M.-Edwards, *Nouv. Arch. Mus. Hist. Nat.* i. p. 285 (1865); Targioni-Tozzetti, *Crostaeei del Viaggio della 'Magenta'*, p. 56, pl. ix. figs. 22-24, 26, 29 (1877); *Haswell, Cat. Austr. Crust.* p. 73 (1882).

*Actumnus setifer*, A. M.-Edwards, *t. c.* p. 287, pl. xv. fig. 5 (1865);

\* *Nouv. Arch. Mus. Hist. Nat.* ix. p. 247, pl. ix. fig. 6 (1873).

*Richters, Decapoda in Möbius' Beitr. zur Meeresfauna der Insel Mauritius und der Seychellen*, p. 148 (1880).

In the collection is a male from Thursday Island, Torres Straits, 4-6 fms. (No. 130); a female from Port Denison, 4 fms. (No. 111); another from Percy Islands, Queensland, obtained at a depth not exceeding 5 fms. (No. 91); and three small specimens from Port Molle, 14 fms. (No. 93).

There are specimens in the British-Museum collection, that appear to be referable to this species, from Australia (*J. S. Bowerbank, Esq.*) and Sir C. Hardy's Island, dredged in 11 fms., on a bottom of coarse sand (*J. B. Jukes*); also from the Philippine Islands, Corregidor (*Cuming*), Fiji Islands, Totoya (*H.M.S. 'Herald'*), and New Hebrides (*J. Macgillivray*). A specimen from Shark Bay, W. Australia (*F. M. Rayner, H.M.S. 'Herald'*) has a more coarsely pubescent carapace, and may be distinct.

Dana founded *A. tomentosus* upon a female from Tahiti or Upolu, in which the regions of the carapace were apparently somewhat less distinctly defined than in the specimens I have seen, and the granulations of the chelipedes more irregularly disposed.

A careful comparison of the descriptions above cited with the series in the Museum collection shows that certain of the characters which have been hitherto regarded as of specific value are by no means as constant as has been hitherto supposed.

In most of the Australian specimens I have seen the antero-lateral margins are 4-lobed, without any traces of spiniform teeth. Indications of these, however, exist in one specimen from Sir C. Hardy's Island, one out of two from the Philippines, and one from the New Hebrides in the Museum collection. In most of the specimens the carapace is clothed with a close velvety pubescence, and the upper margin of the chelipedes finely and closely granulated; but in the specimen from New Hebrides and one from the Philippines the pubescence is much more scanty and the granulations of the hands more acute, especially toward the upper margins.

The finger-tips of the species of this genus are generally scarcely to be described as excavated, but rather as obtuse, and the transition is effected to *Pilumnus* by almost insensible gradations through such species as *P. dehaani*, Miers\*, which, indeed, may be merely the young of *A. setifer*, but differs not only in the acute antero-lateral marginal teeth and finger-tips, but also in the relatively shorter antero-lateral margins and entire obliteration of the regions of the carapace. A specimen nearly resembling *P. dehaani* is in Dr. Coppinger's collection, from Port Denison (No. 111); in it, however, the tubercles of the chelipedes are less conical and acute. In the small specimens I refer to *A. setifer*, from Port Molle, the regions of the carapace are fully as well defined as in the adult.

Dr. F. Richters (*t. c.* p. 148) records this species from the Mauritius: hence its range evidently extends throughout the Oriental region.

\* *Proc. Zool. Soc.* p. 32 (1879).



**CRYPTOCŒLOMA**, gen. nov.

Carapace transverse, nearly flat above, with the antero-lateral margins much shorter than the postero-lateral, and forming with the apparent frontal margin (as viewed from above) an unbroken curve. Epistoma narrow-transverse. Palate or endostome with the longitudinal ridges nearly obsolete. Orbits transverse, with the margins subentire, not visible from above, but concealed beneath the projecting anterior margin of the carapace (see Plate XXIII. fig. A). Abdomen of female 7-jointed. The basal antennal joint reaches to the subfrontal process, and partly occupies the inner orbital hiatus. Outer maxillipedes with the merus-joint quadrate. Chelipedes subequal and of moderate size. Ambulatory legs compressed.

**63. Cryptocœloma fimbriatum.** (PLATE XXIII. fig. A.)

*Pilumnus fimbriatus*, *M.-Edwards, Hist. Nat. Crust.* i. p. 416 (1834) ? ;  
*Haswell, Cat. Austr. Crust.* p. 66, pl. i. fig. 4 (1882).

The carapace is transverse, its upper surface nearly flat ; the antero-lateral margins are much shorter than the postero-lateral, and armed only with one or two inconspicuous granules or spinules ; the postero-lateral margins are nearly straight, and slightly convergent posteriorly ; the upper surface is obscurely granulated toward the lateral margins, and the cervical suture is faintly but distinctly defined. The apparent frontal margin is thin, entire, and forms a continuous and unbroken line with the antero-lateral margins, the orbits being altogether inferior. The margin thus formed is bordered with a thick fringe of very close-set cinereous hairs, beneath which are much longer hairs of a yellowish hue ; the real front, however, is narrow-transverse, nearly vertically deflexed, with its anterior margin arcuated and having a small median notch. The eyes lie closely within the transverse inferior orbits, whose margins are nearly entire. The epistoma is narrow-transverse ; very faint indications exist of longitudinal palatal ridges. All the segments of the postabdomen (which is rather narrow in the female) are distinct ; the first segment only reaches to the bases of the fifth ambulatory legs. The antennules are transverse ; the basal antennal joint just attains to the subfrontal lobe, and partly occupies the inner orbital hiatus. The ischium-joint of the rather broad outer maxillipedes is but little longer than the merus-joint, which is nearly quadrate, but shallow-excavate at its antero-internal angle at the place of articulation with the next joint ; the exognath is narrow, straight, and just reaches to the distal end of the merus. The chelipedes are subequal, the merus trigonous and very short ; the carpus granulated above, with a small tooth on its inner margin near the distal end, the outer margin fringed with very long fulvous hairs ; similar hairs border the upper surface of the palm and mobile finger ; the palm is granulated externally, and somewhat compressed ; fingers rather obscurely granulated on their inner margins and acute at the apices, with



scarcely any intermarginal hiatus. The ambulatory legs are deficient except one fifth leg, which has the joints except the last compressed and bordered with long hairs; the upper margin of the merus is acute and obscurely crenulated; dactyl hairy, styliiform, and short, with a small terminal claw. Colour (in spirit) light yellowish white. Length of carapace  $3\frac{1}{2}$  lines ( $6\frac{1}{2}$  millim.), breadth  $4\frac{1}{2}$  lines (about  $9\frac{1}{2}$  millim.).

The single female in the collection was obtained at Thursday Island, 4-5 fms. (No. 165).

There is also a female in the Museum collection obtained near Java (*H.M.S. 'Samarang'*).

As I have examined no male specimens of this curious species, and am ignorant of the position of the male verges, I do not venture to remove it from the vicinity of *Pilumnus*, in which genus it is retained by Mr. Haswell. There is, I think, no doubt of the specific identity of our example with the specimen figured in the 'Catalogue of Australian Crustacea,' though whether this be identical with the *P. fimbriatus* of M.-Edwards remains somewhat uncertain, on account of the brevity of the diagnosis of the latter author. This species certainly cannot be retained in *Pilumnus* as at present restricted; and I am inclined to think it should be removed from the Cancroidea to the Grapsoidea. I am, however, unable at present to indicate its exact affinities.

Mr. Haswell records it from Port Molle.

#### 64. *Pilumnopus serratifrons* (Kinahan).

Two specimens are in the collection from Port Jackson (No. 104).

The British Museum contains specimens from Port Jackson (*Cuming*), Port Phillip, Victoria (*Dr. J. R. Kinahan*), and the Australian seas, no definite locality (*Stutchbury*); also from New Zealand.

In my 'Catalogue of the New-Zealand Crustacea,' p. 21 (1876), I have already pointed out the possible identity of *Pilumnopus crassimanus*, A. M.-Edwards, with *P. serratifrons*. I believe Mr. Haswell is right in regarding *Heteropanope australiensis*, Stimpson, as also synonymous with this species (Cat. p. 70).

#### 65. *Ozius guttatus*, var. *speciosus*.

*Ozius speciosus*, *Hilgendorf*, in *Van der Decken's Reisen in Ost-Afrika*, iii. p. 74, pl. ii. fig. 1 (1869).

An adult female is in the collection from Flinders Island, North-east Australia. Mr. Haswell records it from Port Denison and Port Curtis.

To the same variety, as I think it must be designated, belongs an adult female in the British-Museum collection from Mauritius (*Lady Frances Cole*).

In the typical form of *Ozius guttatus*, as described and figured by Prof. Alph. Milne-Edwards in his Report on the Crustacean Fauna

of New Caledonia, the frontal teeth are much smaller and less prominent than in either Hilgendorf's figure of his *O. speciosus* or in the two specimens I have before me. As, however, Prof. A. Milne-Edwards had evidently a larger series for examination, and unites *O. guttatus* and *O. speciosus*, I do not venture to regard the two forms as distinct species.

Mr. Haswell records *O. guttatus* from Port Denison and Port Curtis.

This species has evidently a wide Oriental range, having been found in the Red Sea, at Zanzibar, Mauritius, Batavia, Torres Straits, and New Caledonia.

#### 66. *Neptunus pelagicus* (Linn.).

Of this very common Oriental species two males are in the first collection from Port Curtis, 7 fms. (No. 88), and a male from Prince of Wales Channel, 3-4 fms., in the second collection. Specimens from the same locality are in the collection of the British Museum, obtained during the voyage of H.M.S. 'Rattlesnake' by Mr. Macgillivray, and also from the following Australian localities:—Port Jackson (*J. Macgillivray*); Sydney (*R. Schütte*); Swan River (*J. B. Jukes*); Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'); also from New Zealand (*Sowerby*).

Besides the above, there are specimens in the Museum collection from the Red Sea (*Major J. Burton*, *Major MacDonald*); Gulf of Suez (*R. MacAndrew*); Zanzibar (*Dr. Kirk*); Pondicherry, Indian Ocean (*Gen. Hardwicke*); Penang (*Dr. Cantor*); Borneo (*Bleeker's coll.*); Celebes, Badjoa, &c. (*Dr. Bleeker's coll.*); Timor Laut (*H. O. Forbes*); Philippine Islands, Zebu (*Cuming*); Shanghai, Cheefoo (*Swinhoe*); Japan (*Mus. Leyden*); Honolulu (*H.M.S. 'Challenger'*); New Caledonia (*Macgillivray*); also others, without special indication of locality, from the collections of the 'Herald,' 'Rattlesnake,' and 'Samarang.'

The *Neptunus armatus*, A. Milne-Edwards, from Shark Bay, W. Australia\*, of which the types, from the collection of H.M.S. 'Herald,' are in the British-Museum collection, is not referred to in Haswell's Catalogue. The specimens are of small size and probably not fully grown. Both carapace and limbs are slightly pubescent. The carapace is relatively somewhat narrower, and the antero-lateral teeth broader and less distant one from another than in *N. pelagicus* of about the same size, which otherwise this species very closely resembles.

#### 67. *Neptunus* (*Amphitrite*) *hastatoides* (Fabricius).

Three examples are in Dr. Coppinger's second collection from Friday Island, Torres Straits, 10 fms. (No. 153), and a series of

\* Arch. du Mus. d'Hist. Nat. x. p. 322, pl. 33. fig. 2 (1861).

smaller specimens from the Arafura Sea, 32-36 fms. (No. 160). In these latter the carapace is more convex and the spines at the postero-lateral angles of the carapace less developed. Although smaller, most of these are adult, since among them are females with ova.

There are besides in the British-Museum collection a female from the Indian Ocean (*Gen. Hardwicke*), several specimens from Hong Kong (*Dr. W. A. Harland*), and others, without definite locality, from the collections of H.M.SS. 'Herald' and 'Samarang.'

68. *Achelous granulatus* (*M.-Edw.*). (PLATE XXIII.  
fig. B, var.)

A male of this common and widely distributed species is in the collection from Friday Island, Torres Straits, 13 fms. (No. 153). An enumeration of the localities whence the Museum possesses specimens is given in my Report on the Crustacea collected at Rodriguez by the naturalists of the British Transit-of-Venus Expedition\*, to which should be added the following:—Seychelles (*Dr. E. Perceval Wright*), and Loyalty Islands, Lifu (*Rev. S. J. Whitmee*). It is recorded by Mr. Haswell from Palm Island (as *Amphitrite gladiator*).

A specimen from Prince of Wales Channel, 7 fms. (No. 169), differs from all the specimens of *A. granulatus* that I have examined in wanting the submedian spine of the posterior margin of the arm of the chelipedes (see Plate XXIII. fig. B); it may be designated var. *unispinosus*. The carapace is less granulated and the teeth of the antero-lateral margins less produced and spiniform than is usual in this species, and much less so than in the specimen from Friday Island.

69. *Thalamita admete* (*Herbst*).

Here are referred a small female from Port Molle, 5-12 fms. (No. 118), in the first collection, and another from Port Jackson, 5 fms., and five males (adult and young) found on a coral-reef at Clairmont Islands, N.E. coast of Australia (No. 151), in the second collection.

In the smaller examples of this species the minute rudimentary fourth tooth of the antero-lateral margins is occasionally deficient, as has been noted by A. Milne-Edwards in *Thalamita savignyi*.

Specimens are in the British-Museum collection from Conway Reef (*H.M.S. 'Herald'*), and also from the Fiji Islands (*H.M.S. 'Herald'*), Samoa Islands (*Rev. S. J. Whitmee*), and Sandwich Islands (*W. H. Pease*).

I regard the *Thalamita savignyi* of Prof. A. Milne-Edwards† as probably merely a variety of *Th. admete*, Herbst. Specimens apparently referable to this variety are in the British-Museum collection from the Gulf of Suez (*R. MacAndrew*) and Nicol Bay, N.W. Aus-

\* Phil. Trans. clxviii. p. 488 (1879).

† Arch. du Mus. d'Hist. Nat. x. p. 357 (1861).

tralia (*M. du Boulay*). It is retained as a distinct species by Kossmann, who unites, however, under the designation *Th. prymna*, several of the species regarded as distinct by A. M.-Edwards (*vide* 'Zool. Reis. roth. Meer.' i. p. 17, 1877).

#### 70. *Thalamita sima*, *M.-Edw.*

Small specimens are in the first collection from Port Molle, obtained between tide-marks (No. 103) and at 14 fms. (No. 93); and in the second collection, from Thursday Island, 3-4 fms. (Nos. 175, 177), 4-5 fms. (No. 165), and Port Darwin, obtained on the beach (No. 176).

In three very small specimens from Port Denison, Queensland, 4 fms. (No. 111), two of which are females with ova, the median lobes of the front are sinuated, and the front thus appears very obscurely 6-lobed. This is probably a peculiarity due to the small size of the specimens examined; the breadth of the carapace of one of the females is barely 4 lines ( $8\frac{1}{2}$  millim.).

Of this species there are specimens in the British-Museum collection obtained between Cumberland Island and Point Slade and off Cape Capricorn (*J. Macgillivray*, H.M.S. 'Rattlesnake'); also from Moreton Bay and Port Jackson, and from Swan River (*J. B. Jukes*) and Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'); also from New Zealand (*purchased*), and from the Indian Ocean (*General Hardwicke*), and Aku Sima, Japan (*Capt. H. C. St. John*); besides others without special indication of locality. A. Milne-Edwards records it from New Caledonia. The specimens from the Indian Ocean have the chelipedes more distinctly tuberculated than the other examples in the collection, but cannot, I think, on this account be separated, even as a distinct variety. From the *Thalamita chaptali*, noticed below, *T. sima* is distinguished not only by the much more acute lateral teeth of the carapace, the last of which is rather more prominent than the rest, but also by the smoother sternum and by the well-developed spines of the palms of the chelipedes. In *T. chaptali* the last of the antero-lateral teeth is (if any thing) smaller than the preceding tooth, and the palmar spines are nearly obsolete\*.

\* I may take this opportunity of noting that there is now in the collection of the British Museum a specimen from Ceylon (*E. W. H. Holdsworth*) apparently referable to this exceedingly rare *Thalamita*, originally described from the Red Sea, of which A. Milne-Edwards, when he published his Monograph of the Portunidae (Arch. Mus. II. N. x. p. 360, 1861), wrote:—" Cette espèce paraît extrêmement rare, elle n'existe dans aucun Musée, soit de France, soit de Angleterre, soit de Hollande."

This example is an adult male, and agrees very well with M.-Edwards's description and Savigny's figure of *T. chaptali*, except as regards the chelipedes, the arm of which is strigose, and the wrist and palm and fingers very closely and distinctly granulated; the sternum is also finely sculptured. As some indications of granulations appear on the wrist of the left-hand chelipede in Savigny's figure, I do not venture to regard our specimen as distinct. Should future researches, however, demonstrate it to be so, it may be designated *T. holdsworthi*.

71. *Thalamita stimpsonii*, A. M.-Edw.

A male and female are in Dr. Coppinger's first collection from Port Molle, obtained, one on the beach (No. 95), and the other on the coral-reefs in that harbour. In the second collection is a female from Port Darwin, found on the beach (No. 176).

Specimens are in the British-Museum collection from the following Australian localities:—Port Curtis (*J. Macgillivray*, H.M.S. 'Rattlesnake'); Torres Straits (*J. B. Jukes*); and N. Australian coast (*Dr. J. R. Elsey*). There are also specimens from New Guinea and Amboina (*Dr. Bleeker's collection*), and Sunday Island (*J. B. Jukes*), besides others without special indication of locality.

Recorded by Mr. Haswell from Port Denison &c.

This may perhaps be a mere variety of the following species; but I do not venture to unite the two, since adult examples of *T. stimpsonii* seem to be distinguished from adult *T. crenata* not merely by the small fourth lateral marginal tooth, but also by the more transverse carapace and more granulated palms of the chelipeds.

72. *Thalamita crenata*, Rüppell.

An adult male is in the collection, from Port Molle, 14 fms. (No. 93).

There is also in the British-Museum collection a female from the Percy Islands, off the Queensland coast (*J. Macgillivray*, H.M.S. 'Rattlesnake'); a male from Torres Straits (*J. B. Jukes*); also from the Mauritius (*Lady F. Cole*); Natal (*F. M. Rayner*, H.M.S. 'Herald'); Timor Laut (*H. O. Forbes*); India, Karachi (*Karachi Museum*); Philippines (*Cuming*); the Samoa Islands (*Rev. S. J. Whitmee*); and others without special locality.

73. *Goniosoma variegatum*.

*Portunus variegatus*, *Fabricius, Entomologiæ Systematicæ Supplementum*, p. 364 (1798); *M.-Edwards, Hist. Nat. des Crustacés*, i. p. 465 (1834).

*Cancer callianassa*, *Herbst, Naturgesch. d. Krabben u. Krebse*, iii. Heft 2, p. 45, pl. liv. fig. 7 (1801).

*Charybdis variegatus*, *De Haan, Crust. in Siebold, Fauna Japonica*, pp. 10-42, pl. i. fig. 2 (1835).

*Charybdis truncatus*, *De Haan, t. c. p. 65, pl. xviii. fig. 2* (1837), *nec Fabricius?*

*Goniosoma callianassa*, *A. Milne-Edwards, Archives du Muséum*, x. p. 382 (1861).

*Goniosoma variegatum*, *Miers, Proc. Zool. Soc.* p. 33 (1879).

I append a description of the species I suppose to be the *variegatus* of Fabricius, the synonyma of which are somewhat confused.

Carapace somewhat hexagonal in shape, with the postero-lateral angles rounded, pubescent, with the gastric and epibranchial ridges



smooth. Front 8-lobed, the lobes rounded, the median scarcely more prominent than the rest; the fissure between the median lobes and between the second and third lobes narrow-linear, those between the first and second and the third and fourth lobes triangulate. Antero-lateral margins armed with six teeth, whereof the first is subtruncated, the second to fifth triangulate and acute and directed forward, the sixth about twice as long as the preceding and laterally projecting. Chelipedes short and robust, arm or merus-joint with two strong spines near the distal end of its anterior margin, its posterior margin convex, smooth, and angulated at a point midway from either extremity; wrist with a strong spine on its inner margin, and three smaller spines on its outer surface; palm with three spines, whereof one is situated at the proximal end close to the articulation with the wrist, and two on the upper surface; there is none above the base of the mobile finger; the carinae of the upper and outer surface of the palm and the intervening parts are nearly smooth; the fingers are armed along their inner margins with triangulate teeth, which fit closely between one another when the fingers are closed, and which are themselves divided into several smaller teeth. The second to fourth ambulatory legs are slender, smooth; the penultimate joint of the fifth leg is not denticulated on its inferior margin; there is a spine at the distal end of the inferior margin of the merus-joint. Length of the carapace of the largest example about  $\frac{3}{4}$  inch (19 millim.), breadth to base of lateral epibranchial spines about 1 inch (25 millim.).

A single specimen is in the second collection, a male from Port Darwin, 12 fms.

There are in the British-Museum collection several specimens of what is probably a mere variety of this species from Karachi (*Karachi Museum*), referred to by A. M.-Edwards as *G. callianassa*, which differ in having wider fissures between the median and the second and third teeth of the front. The first tooth of the antero-lateral margins is more distinctly truncated, and the last spine is shorter; also the spines of the arm, wrist, and palm of the chelipedes are much shorter, those of the upper surface of the palm being reduced to mere spinules, and the palm itself much more turgid, as in A. Milne-Edwards's description.

#### 74. *Goniosoma spiniferum*. (PLATE XXIII. fig. C.)

A single specimen is in the collection, obtained at Port Moller, between tide-marks (No. 103), which is evidently nearly allied to, and in M. A. Milne-Edwards's arrangement must be classed near to, *Goniosoma affine* (Dana), from Singapore. It differs, however, in the form of the frontal lobes, the median and submedian being broadly rounded and separated by narrow and not deep fissures. The fissure between the second and third lobe on each side is much deeper, and, although narrow, wider than those between the median and submedian lobes; the third lobe is itself narrower than these,

and is separated by a triangulate notch from the rounded fourth lobe or internal orbital angle. The basal joint of the antennæ is armed with a minutely granulated or denticulated ridge. The merus-joint of the anterior legs has four spines on its anterior margin, including a very small spinule at its antero-internal angle; the wrist has a strong spine on its inner margin and two small spinules on its outer surface; and the palm (as in *G. affine*) has five spines on its upper surface, the two anterior being very small. The fifth ambulatory legs have a strong spine, situated nearly at the distal end of the posterior margin of the merus-joint, and another on the posterior margin of the carpus; the flattened terminal joint has a small spinule at its distal extremity, but is otherwise unarmed.

From the preceding species, to which it is very nearly allied, *G. spiniferum* is distinguished by the greater transverse width of the carapace, the different form of the frontal lobes and of their intervening fissures and of the lateral teeth (see the figure). *Gonio-soma hellerii*, A. M.-Edwards\*, from New Caledonia, which resembles this species in having five spines on the upper surface of the palm, and the merus-joint of the fifth ambulatory legs armed with a strong distal spine, differs in the form of the carapace and frontal lobes, and has the penultimate joint of the fifth ambulatory legs denticulated on its posterior margin, &c.

#### 75. *Nectocarcinus integrifrons* (Latr.).

There are three females of this species in Dr. Coppinger's collection, from Port Jackson, 0-7 fms. (Nos. 90, 104).

A specimen from the same locality is in the British-Museum from the collection of Mr. Cuming, and another dredged in the same harbour on the Sow and Pigs Bank, and presented by John Brazier, Esq.; also from Port Curtis (*H.M.S. 'Herald'*) and New Zealand, Bay of Islands (*Antarctic Expedition*); also from Oceania (*J. Macgillivray*, *H.M.S. 'Rattlesnake'*); and others without special locality.

Dr. Kinahan records it from Port Phillip, Victoria.

#### 76. *Lupocyclus rotundatus*, Adams & White.

A female is in the collection from Port Molle, Queensland (first collection, No. 118), and another from Friday Island, 10 fms. (second collection, No. 153), which I think must be referred to this species, although the carapace is somewhat broader, more convex, and less distinctly granulated, and the frontal lobes more acute than in the adult specimen in the British-Museum collection from Balambangan, N. Borneo, on which presumably the description of Adams and White was founded.

As the Bornean example is a male, the distinctions between the

\* Bull. Soc. Entom. de France, vii. p. 282 (1867).

two may be sexual. In two smaller examples from Balambangan (male and female), in the collection of the British Museum, the carapace is even more strongly granulated than in the adult, and this is not uncommon in the Portunidæ, *e. g.* in certain species of *Neptunus*.

M. de Man has quite recently recorded this species from the island of Amboina (*vide* Notes Mus. Leyden, v. p. 153, 1883).

#### 77. *Kraussia nitida*, Stimpson.

Two small specimens (males) from Thursday Island, 4-5 fms. (No. 165), evidently belong here.

The distinctions between this species and *K. integra* (De Haan), are very slight, *K. nitida* differing, as Stimpson has noted, only in its somewhat narrower carapace, with more prominent and excavated frontal lobes; yet these distinctions are constant and easily perceived in the specimens I have examined.

Specimens referable to *K. integra* are in the Museum collection from the Philippines, Siquijor (*Cuming*), and also from the 'Sama-rang' collection without special locality.

#### 78. *Telphusa* (*Geotelphusa*) *crassa*?

? *Telphusa crassa*, A. M.-Edwards, *Nouv. Arch. Mus. Hist. Nat.* v. p. 177, pl. ix. fig. 2 (1869).

A female in imperfect condition is in the collection, obtained at Thursday Island, Torres Straits (No. 125), that I refer, though with some doubt, to this species, as M.-Edwards's diagnosis is very short, and the specimen figured of much smaller size than the one I have before me. In this example there is a rudimentary epibranchial tooth, the sides of the anterior part of the carapace are faintly striated, shallow depressions indicate the anterior part of the cervical suture, and the chelipedes are more unequal than in the figure of M.-Edwards; there is a strong spine on the inner margin of the wrist, behind and below which is a second, much smaller tooth; the palm is nearly smooth; the fingers longer than the palm, with rather small denticulations and having between them, when closed, but a small interspace. Length of carapace about 1 inch 4 lines (35 millim.), greatest breadth 1 inch 4 lines (45 millim.).

There is a series of four specimens in the Museum collection, obtained by Mr. MacFarlane on one of the islands of Torres Straits, which are apparently referable here. The smaller agree, except in having some indications of a postfrontal crest, with the description of Milne-Edwards; but in the larger there exist much more distinct traces of the exterior orbital and lateral epibranchial teeth. In the male the fingers have between them, when closed, but a small interspace.

In two specimens from E. Australia, the smaller of which was received with fishes of H.M.S. 'Challenger' collection, the carapace is coarsely punctulated in front, perfectly smooth above, and less convex, with scarcely any traces of the depressions indicative of the cervical suture, or of the postfrontal crest and lateral teeth. These probably belong to a distinct species; the larger have been designated in MS. *T. leichardti*.

Specimens are in the British-Museum collection from the Philippines, R. Naga or Bicol (*Cuming*), which belong to *T. crassa* or to a closely allied species; in the male the larger chelipede has the mobile finger arcuated, both are rather strongly denticulated on their inner margins, and have between them, when closed, a wide interspace. These specimens were designated by White *T. obesa* (in manuscript); but this name has been applied by Prof. A. Milne-Edwards to a very nearly allied form from Zanzibar, which differs apparently only in having an even more distinct postfrontal crest, and yet more strongly arcuated and dentated fingers to the larger chelipede. If distinct, the Philippine examples may be designated *T. cumingii*.

It is worthy of note that although Milne-Edwards in his description says there exists no postfrontal crest in *T. crassa*, some indications of one appear in the figure. His species may, however, be identical with the one here designated *T. leichardti*, in which case the specimens I name *T. crassa* must receive a new specific appellation.

#### 79. *Gelasimus signatus*, Hess.

A series of specimens is in the collection, of both sexes and of different sizes, from Port Curtis, some of which were collected at 7-11 fms. (No. 85).

These examples agree with the description and figure of Hess \* in nearly every particular, and there can be no doubt of their identity with his species; but the margins of the somewhat triangular, flat, inferior face of the arm are minutely granulated, and can scarcely be described as furnished "with two rows of pearl-shaped tubercles," as stated by Hess, whose specimens were from Sydney.

There are in the collection of the British Museum specimens from Swan River (*Dring*), which I regard as belonging to this species. In the largest, the tooth or lobe of the middle of the inner margin of the lower finger, which is generally very characteristic of this species, is not developed. These specimens were referred by my predecessor, Mr. Adam White †, to *G. forceps*, M.-Edwards; but that author says that the larger chelipede in *G. forceps* is smooth, and the merus-joints of the ambulatory legs appear to be even broader and more dilated than in *G. signatus*.

No specimens had been seen by Mr. Haswell (who regarded the

\* Archiv f. Naturgeschichte, p. 146, pl. vi. fig. 6 (1865).

† List Crust. Brit. Museum, p. 36 (1847).

locality given by Hess as doubtful) at the time of the publication of his Australian Catalogue.

### 80. *Ocypoda ceratophthalma* (Pallas).

An adult female was collected at Friday Island on the beach (No. 154). A specimen is in the Museum collection from Moreton Island, N. S. Wales. It is mentioned by Mr. Haswell as occurring at Cape Grenville, Palm Island, &c.

### 81. *Ocypoda kuhlii*, De Haan.

Five examples, males and females, were obtained on the beach at Thursday Island (No. 167).

An adult male from Shark Bay, W. Australia (*Rayner*, H.M.S. 'Herald'), and possibly a small mutilated example from Nicol Bay, N.W. Australia (*M. du Boulay*), belong here.

For remarks upon the specimens of this and the foregoing species in the Museum collection, I may refer to my recent memoir\* on the genus. Both are widely distributed Oriental species. Since the publication of that paper, specimens have been received from Timor Laut (*H. O. Forbes*) of *O. ceratophthalma*.

Haswell (Catalogue, p. 95) mentions the occurrence on the tropical coasts of *O. cordimana*, a species of which I have seen no examples from Australia. Since he particularly mentions the absence of a stridulating ridge, there can be no doubt that his specimens belonged to this species and not to *O. kuhlii*.

### 82. *Macrophthalmus punctulatus*. (PLATE XXV. fig. A.)

The carapace is nearly quadrate and relatively narrow, being but little broader than long; the cervical suture is in its posterior part very distinctly defined; the surface is uneven, punctulated, without spines or tubercles, but clothed with a few scattered hairs, which are more numerous, though not dense, on the postero-lateral parts of the branchial regions; the front is about one third of the total width of the anterior part of the carapace, with its anterior margin nearly straight; the antero-lateral margins are nearly straight and 3-toothed (the tooth at the external orbital angle included); the posterior lateral tooth is very small. The male postabdominal segments are all of them distinct. The first two joints of the slender antennal peduncle are contained within the large inner orbital hiatus; the epistome is transverse and very short, almost linear: the merus-joint of the outer maxillipedes is truncated at its distal end, and nearly as large as the preceding joint. The chelipedes (for so small a specimen) are well developed and are subequal; merus and carpus are smooth, without spines or tubercles, merus more or less hairy on its inner surface and upper margin; the palm is but little longer

\* Ann. & Mag. Nat. Hist. ser. 5, x. p. 384, pl. xvii. fig. 8 (1882).



than its greatest vertical depth, which is at the articulation with the mobile finger, smooth and polished externally, its upper margin not ecarinated, its inner surface with a dense patch of hair; the lower margin of the immobile finger is in a straight line with the lower margin of the palm, its upper or inner margin is denticulated and has a strong tooth or lobe in the middle; the inner margin of the mobile finger has a smaller tooth near its base; the fingers, when closed, meet only toward their apices, having an hiatus between them, which is hollowed out into a deep, nearly semicircular cavity at the base of the immobile finger; this cavity is margined with hairs. The ambulatory legs are slender, somewhat compressed, and the margins somewhat thinly clothed with hair. Colour, in spirit, brownish. Length of carapace nearly 3 lines (6 millim.), breadth  $3\frac{1}{2}$  lines (somewhat over 7 millim.); length of chelipede about  $5\frac{1}{2}$  lines (over 11 millim.).

The single specimen (a male) was obtained at Port Jackson, 5-7 fms. (No. 104).

In the relatively narrow and quadrate carapace this species may be compared to such forms as *Macrophthalmus pacificus*, Dana\*, to which species apparently belong specimens recently received from Timor Laut (*H. O. Forbes*), *Macrophthalmus bicarinatus*, Heller†, and *M. quadratus*, A. Milne-Edwards‡.

*M. pacificus* and *M. bicarinatus* differ in their narrower front, &c.; *M. quadratus* has but two lateral marginal teeth, and no lobe or tooth on the inner margin of the immobile finger. *Macrophthalmus setosus*, an Australian species very briefly characterized by Milne-Edwards§, has, I suppose, a wider carapace. Specimens provisionally referred to this species in the British-Museum collection are certainly very distinct from our new species.

*Macrophthalmus latifrons*, Haswell||, from Port Phillip, has the carapace finely granulated, the immobile finger of the chelipeds deflexed, &c.

In many of its characters our species approaches *Euplax* (*Chænostoma*) *boscii* and *E. crassimanus*, Stimpson, in both of which there are but two teeth on the lateral margins of the carapace. In *Hemiplax hirtipes*, Heller, not to mention other distinctions, the fingers are only minutely denticulated on their inner margins. In the absence of catalogues or systematic lists of the species, it is with great hesitation that I venture to describe this as a new form among so many nearly allied species.

### 83. *Euplax* (*Chænostoma*) *boscii* (*Audouin*).

A small male is in the collection from Port Molle (No. 95).

This example in its coloration and all other characteristics coin-

\* U.S. Exploring Expedition, Crust. xiii. p. 314, pl. xix. fig. 4 (1852).

† Reise der Novara, Crust. p. 36, pl. iv. fig. 2 (1865).

‡ Nouv. Archiv. Mus. Hist. Nat. ix. p. 280, pl. xii. fig. 6 (1873).

§ Ann. Sci. Nat. sér. 3, Zool. xviii. p. 159 (1852).

|| Catalogue, p. 90 (1882).

cides with Dana's description and figure of a specimen from the Fijis (see Explor. Exp., Cr. xiii. p. 313, pl. xix. fig. 3). For remarks on the variation of the form of the chelipedes and for synonyma, I may refer to M. A. Milne-Edwards (Nouv. Archiv. Mus. Hist. Nat. ix. p. 281, 1873). This species apparently ranges from the coasts of Egypt southward to Natal, and eastward to the islands of the Pacific (*e. g.* New Caledonia, Fijis).

The specimen from Port Molle differs from Savigny's original figure of this species\* in its much less distinctly granulated carapace; but specimens from Mozambique, received in the final consignment of H.M.S. 'Alert,' have the carapace as strongly granulated as in that figure.

### CAMPTOPLAX, gen. nov.

Carapace trapezoidal, anteriorly deflexed, with the antero-lateral much shorter than the postero-lateral margins, which are straight and converge slightly to the posterior margin. Front of moderate width. Endostome or palate without longitudinal ridges. Post-abdomen (of the male) covering at base the whole width of the sternum, and touching the bases of the fifth ambulatory legs, 7-jointed. Eyes short, with thick peduncles. Antennules transversely plicated. Basal antennal joint short, not reaching to the subfrontal process. Outer maxillipede broad, not gaping, with the merus-joint transverse and much shorter than the ischium; the exognath slender, straight, and reaching to the outer distal angle of the merus. Chelipedes of moderate length. Ambulatory legs with the margins of the merus-joints cristated. The male verges arising directly from the base of the fifth ambulatory legs, and not contained in sternal channels.

This genus is apparently allied to *Pilumnoplax* and *Heteroplax*, Stimpson†, from both of which it is distinguished by the absence of palatal ridges and by the form of the basal antennal joint (Plate XXIV. fig. *a*), and also by the position of the male verges. In the latter character it would seem to be allied to the West-Indian genus *Frevillea*, A. M.-Edwards‡, which, however, differs apparently in the larger orbits and longer eye-peduncles, &c.

#### 84. *Camptoplax coppingeri*. (PLATE XXIV. fig. A.)

The carapace is subtrapezoidal, little broader than long, the anterior portion abruptly deflexed, and with three broad and shallow transverse depressions, whereof the anterior is situated on the deflexed postfrontal region, one in the middle line of the carapace, and one near to the posterior margin; the surface of the carapace is covered with a very close velvety overgrowth, amid which are numerous

\* *Vide* Savigny, Crustacés de l'Égypte, pl. ii. fig. 1.

† Proc. Acad. Nat. Sci. Philad. pp. 93, 94 (1858).

‡ Bull. Mus. Comp. Zool. viii. p. 15 (1880).

small pits; this coating, which is apparently the natural covering of the species, is entirely absent from the transverse depressions, but covers in great part the ventral surface of the body and the legs. The front is rather less than one third the greatest width of the carapace and is notched in the middle; the very short antero-lateral margins are armed with three rather obscure teeth, whereof the first is situated at some distance from the orbit and the last at the angle formed by the junction of the antero-lateral with the postero-lateral margins, which is also the point at which the carapace is deflexed. The male postabdomen is as broad at base as the sternum and is 7-jointed; the first two joints shorter than the rest, the last subtriangulate with a rounded apex. The antennules are nearly transversely plicated; the basal antennal joint reaches nearly to the subfrontal process; the following joints are slender, the flagellum somewhat elongated. The maxillipedes (whose form is described above) have the fifth joints articulated with the merus at its antero-internal angle. The chelipedes, for so small a species, are rather robust; merus trigonous and more or less granulated; carpus (or wrist) and palm granulated on their upper and outer surfaces, the granulations disposed in reticulating lines, the intervening spaces or pits between which are smooth; the fingers are shorter than the palm, acute at the apices, and dentated and meeting along their inner margins. The ambulatory legs are of moderate length; the merus-joints are rather slender, trigonous, with the margins thin-edged or carinated, as are also the upper margins of the two following joints; the dactyli are slender and styliiform. The male verges arise directly from the bases of the fifth ambulatory legs, and are not contained in sternal channels; they are rather broad at base and strongly recurved at the distal extremities. Colour (in spirit) whitish. The length of the largest example I have seen is barely  $2\frac{1}{2}$  lines (5 millim.), and width less than 3 lines (6 millim.).

Two male specimens were collected in Prince of Wales Channel, at 7-9 fms. (No. 169).

85. *Pseudorhombila vestita* (*De Haan*), var. *sexdentata*, *Haswell*.  
(PLATE XXIV. fig. B.)

?? *Eucrate sexdentatus*, *Haswell*, *Cat. Austr. Crust.* p. 86 (1882).

The carapace and legs are scantily pubescent; the carapace is little broader than long and is anteriorly deflexed; the front is about one third the greatest width of the carapace, with its anterior margin straight and entire, the antero-lateral margins shorter than the postero-lateral and armed with three teeth (including the tooth or lobe at the outer orbital angle); the posterior tooth is longest, spiniiform, and projects laterally; the upper margins of the orbits are sinuated, the lower obscurely granulated, and there is a very wide hiatus on the inner side of the orbit. All of the postabdominal segments are distinct; the second and third segments, although laterally produced, do not reach quite to the bases of the fifth

ambulatory legs. The eye-peduncles are very short and thick, with very large corneæ; the antennules are transverse; the basal joint of the antennæ is slender, and although longer than the two following joints, does not reach to the subfrontal process; the ischium-joint of the outer maxillipedes is rather short and broad, but longer than the next joint and longitudinally sulcated; the merus is quadrate, the slender exognath reaches to the distal end of the merus. The chelipedes are subequal and of moderate size, and, as already stated, pubescent; the merus or arm is trigonous and has a tooth near the distal end of its upper margin; the carpus is armed with a strong spine on its inner surface; palm somewhat shorter than the fingers, the margins not cristated, the fingers regularly denticulated and meeting along their inner margins and acute at their apices, but without a tuft of hair at base. The ambulatory legs are slender, with the joints somewhat compressed and scantily pubescent; the margins of the penultimate and terminal joints of the last pair of legs are fringed with long hairs, but the terminal joint of the last pair of legs is styliform and not dilated. The bases of the male verges lie in wide open *canaliculi* of the sternum, and these organs (in the single specimen examined, which is probably not adult) are nearly straight. Colour (in spirit) whitish. Length of the carapace of the male  $3\frac{1}{2}$  lines (nearly 8 millim.), breadth  $4\frac{1}{2}$  lines (nearly 10 millim.); length of chelipede when fully extended nearly  $\frac{1}{2}$  inch (12 millim.), of second ambulatory leg about  $7\frac{1}{2}$  lines (16 millim.).

Two specimens, one a male and the other sterile, were collected in the Arafura Sea, 32-36 fms. (No. 160).

Haswell's types were from Holborn Island, Port Denison (20 fms.). As, in his brief description, he does not mention the pubescence of the carapace, and as his specimens differ in coloration, it is possible that ours are distinct; and if so, I would propose to designate them *P. haswelli*.

*Carcinoplax vestitus*\*, as figured by De Haan, differs in its somewhat narrower front, in the shorter, less prominent third antero-lateral spine, more quadrate carapace, less compressed chelipedes, and in the absence of long cilia from the terminal joint of the *dactyli* of the fifth ambulatory legs.

The distinctions between the genera *Carcinoplax*, *Eucrate*, and *Pilumnoplax* of Stimpson† are very slight, and a revision of the group is urgently needed. If, as is probable, all three genera should have to be united, the designation *Pseudorhombila* will, I think, take precedence, since De Haan's name *Eucrate* differs by a letter only from the earlier name *Eucratea*, and *Curtonotus* had previously been used in the Coleoptera.

\* *Cancer (Curtonotus) vestitus*, De Haan, in Siebold, Fauna Japonica, Crust. p. 51, pl. v. fig. 3 (1835).

† Proc. Acad. Nat. Sci. Philad. p. 93 (1858).



86. *Pseudorhombila sulcatifrons* (Stimpson), var. *australiensis*.  
(PLATE XXIV. fig. C.)

As this variety may prove to be specifically distinct, I subjoin the following description :—

As in *Heteroplax dentata*, Stimpson, the carapace is slightly transverse, anteriorly somewhat deflexed, posteriorly plane; it attains its greatest width at the third lateral tooth. The front is about half the width of the carapace; its anterior margin is faintly transversely sulcated, without any median fissure, and is straight; there is, however, a small notch on each side close to the lateral angles, which thus are separated as small teeth. The antero-lateral margins of the carapace are much shorter than the postero-lateral and armed with four teeth (the outer orbital angle included); the third tooth is larger and more prominent than the others, the fourth the smallest; there is a small median notch in the middle of the upper orbital margin; slight transverse inequalities are apparent on the front of the gastric region and on the sides of the carapace near the lateral teeth. The postabdomen is triangulate, with the segments distinct, the penultimate and the last being the longest; the second segment covers the whole width of the sternum and reaches to the bases of the fifth legs. The eyes are placed upon rather short thick pedicels. The antennules are rather long and transversely folded. The basal antennal joint is slender, and although longer than either of the following joints, does not reach to the frontal margin; the flagellum is elongated. Scarcely any traces are visible of palatal ridges. The merus-joint of the maxillipedes is quadrate, and much shorter than the preceding; the next joint is articulated with it at its antero-internal angle. The chelipedes are of nearly equal size; merus trigonous, short, with a tooth near the distal end of its upper margin; carpus smooth externally, with a spiniform tooth on its inner margin; palm smooth externally, moderately convex; fingers about as long as the palm, denticulated on their inner margins and having between them scarcely any interspace when closed. Ambulatory legs rather long, with the joints very slender, unarmed; the last three with their margins somewhat scantily pubescent. Length of carapace nearly 3 lines (6 millim.), breadth nearly 4 lines (8 millim.); length of ambulatory leg of third pair about  $6\frac{1}{2}$  lines (14 millim.).

The single specimen was obtained at Port Molle, 14 fms. (No. 93), and is apparently a female, although possessing an unusually narrow postabdomen. It differs from *Heteroplax dentata* and *H. transversa*, Stimpson\*, in having the second tooth of the antero-lateral margins as long as the preceding, and also, it would appear, the shorter thicker eye-peduncles, and from the latter also in the narrower carapace. From the typical *P. sulcatifrons* (Stimpson), from Hong-Kong, it is distinguished only by the non-emarginate

\* Proc. Acad. Nat. Sci. Philad. p. 94 (1858).



front and the absence of the woolly patch on the outer surface of the wrist.

*Litocheira bispinosa*, Kinahan, from Port Phillip\*, which in many of its characters seems to be allied to *Pseudorhombila sulcatifrons*, is at once distinguished by having but a single spine behind the exterior orbital angle. Specimens are in the British-Museum collection from Port Curtis (*H.M.S.* 'Herald'). Mr. Haswell, in his Catalogue, omits reference to this species, and to several others described by Kinahan.

The species described by Haswell as *Eucrate affinis* (Catalogue, p. 86) is, I think, identical with typical *P. sulcatifrons* (Stimpson). The type was from Holborn Island, near Port Denison (20 fms.).

I have quite recently described, under the name *P. sulcatifrons*, var. *atlantica*†, a specimen from Goree Island, Senegambia, which is scarcely distinguishable from Oriental examples of this species.

### 87. *Ceratoplax arcuata*. (PLATE XXV. fig. B.)

Carapace longitudinally convex, scarcely broader than long and not wider behind than in the middle; the surface, when viewed under a lens of sufficient power, is seen to be covered with a very short pubescence; the sides are anteriorly arcuated, posteriorly parallel: the antero-lateral margins, which are acute, are divided by three slight notches, but can scarcely be described as dentated. The front forms with the antero-lateral margins a continuous curved line; it is somewhat deflexed, obscurely sinuated in the middle, with the exterior angles rounded off and not prominent, and has some longer hairs on its upper surface. The first two segments of the postabdomen in the male are very much shorter than the following, almost transversely linear in shape; the first segment, although laterally produced, does not reach to the bases of the fifth ambulatory legs. The eye-peduncles fit closely into the orbits (which are not deep) and have their anterior and upper margins acute and clothed with rather long hairs; the small corneæ are lateral, and are visible only in an inferior view. The epistoma is transversely linear; the antennules transversely plicated; the basal (or real second) antennal joint is slender, and does not nearly reach to the inferior margin of the front (see fig. *b*); the flagellum is of moderate length. There are no distinct palatal ridges. The outer maxillipedes are broad in proportion to their length; the ischium-joint little broader than long; the merus transverse, its extero-dorsal angle prominent. The chelipedes are moderately large, the right a little the larger, and the margins of the joints are for the most part clothed with rather long hairs; the carpus or wrist is angulated on its inner surface, with some long hairs at the angle; the palm is little longer than broad, and vertically deepest at the place of articulation with the mobile finger, its margins are not cristated, its outer surface smooth and

\* Journ. Roy. Dublin Soc. i. p. 121, pl. iii. fig. 1 (1858).

† *Vide* Ann. & Mag. Nat. Hist. ser. 5, viii. p. 259 (1881).

naked except toward the margins, the lower margin is in a straight line with the lower margin of the immobile finger; the fingers are little shorter than the palm, acute at apices, and rather strongly denticulated along their inner margins. The ambulatory legs are slender and somewhat elongated, the dactyli styliform and straight, the margins (of the fifth pair especially) are clothed with longish hairs. The male verges are slender; their bases lie in narrow *canaliculi*, which are partially open above. Colour (in spirit) light yellowish. Length nearly 3 lines (6 millim.), breadth about 3 lines ( $6\frac{1}{2}$  millim.).

The single male in the collection was obtained at Port Darwin, at a depth of 12 fms.

This species is distinguished from *Typhlocarcinus nudus* and *T. villosus*, Stimpson, by the form of the merus-joint of the outer maxillipedes and the acute anterior margins of the ocular peduncles, in which characters it agrees with *Ceratoplax*; in the form of the carapace and the structure of the antennæ it agrees better with *Typhlocarcinus*; but the very name of the latter genus prevents my assigning to it a species which has the organs of vision normally developed. Both this and the following species must, I think, be regarded as intermediate forms between *Typhlocarcinus* and *Ceratoplax*. The fifth ambulatory legs are much shorter than the preceding, as in *Asthenognathus inaequipes*, Stm.: but, unlike that species, the ambulatory legs are all very slender.

*Rhizopa gracilipes*, Stimpson, to which this species is nearly allied, is described as having minute eyes, a straight frontal margin, a strong median frontal suture, and glabrous chelæ.

#### 88. *Ceratoplax? lævis*. (PLATE XXV. fig. C.)

In this species the carapace is transverse, smooth and shining, longitudinally moderately convex, with only a very few punctulations; the front somewhat deflexed, more than one third the width of the carapace, entire, with an indistinct transverse line of scanty hairs across its upper surface; the antero-lateral margins are much shorter than the postero-lateral, acute, entire, and bordered with a few hairs; the postero-lateral margins are straight and convergent to the posterior margin. The orbital margins are entire, the orbits widest internally. The epistoma is very narrow-transverse. There are no longitudinal ridges on the endostome or palate. The postabdominal segments (in what appears to be the young female) are all of them distinct and all narrow except the last, which reaches to the bases of the fifth ambulatory legs. The eye-peduncles are thick and hairy above the corneæ, distinct, and black; the basal antennal joint, which is of moderate size, reaches to the subfrontal lobe (see fig. c). The ischium-joint of the outer maxillipedes is little longer than broad; the merus is transverse, with its antero-external angle prominent and rounded; there is no notch at the antero-internal angle. The chelipedes are subequal and of moderate size; the merus short and trigonous, with a strong tooth near the distal end of its upper

margin; the wrist smooth, its inner margin angulated, the angle with a fringe of long stiff hairs, its anterior margin and outer and upper surface have also some hairs; the palm is scarcely longer than vertically deep, its upper margin (and that of the mobile finger at base) closely fringed with long stiff hairs, and there are some shorter hairs on the lower margin; the outer surface is smooth, with a few scattered punctulations; the fingers are scarcely longer than the palm, denticulated on their inner margins and acute at their apices, with scarcely any intramarginal hiatus. The ambulatory legs are slender and somewhat hairy; the tarsi styliform, straight, and longer than the penultimate joints. Colour (in spirit) yellowish white. Length of carapace about  $2\frac{1}{2}$  lines (5 millim.), breadth about 3 lines ( $6\frac{1}{2}$  millim.).

The single specimen (a female) was dredged in the Arafura Sea, 32–36 fms. (No. 160).

From the preceding species (*C. arcuata*) this form is at once distinguished by the very differently shaped, smooth, and transverse carapace, longer basal antennal joint, &c.

*Ceratoplax ciliata*, Stimpson, the type of the genus, from the N. China Sea, has the body transversely semicylindrical, palm of chelipedes with depressed granulations on its outer surface, &c.

M. A. Milne-Edwards has described a genus and species (*Notonyx nitidus*) from New Caledonia\*, which in many of its characters and in external appearance is very like *Ceratoplax*? *lavis*. It is described and figured, however, as having the carapace, eyes, and chelipedes entirely glabrous, there is apparently no tooth on the upper margin of the arm, and the dactyli of the ambulatory legs are carinated; the carapace is more quadrate, and the merus of the outer maxillipedes longer, not transverse, with the antero-external angle less prominent.

### 89. *Metopograpsus messor* (*Forskål*).

This common and widely distributed species is represented in the first collection by a male and female from Port Molle, obtained on the beach (No. 95), and two males from Port Curtis, 0–19 fms. (Nos. 85–92); and in the second collection by a small female from the beach at Thursday Island (No. 167) and a male and female from West Island, Prince of Wales Channel (No. 149). Specimens are in the British Museum from Facing Island, Port Curtis, obtained under stones at low water (*J. Macgillivray*, H.M.S. 'Rattlesnake'). The other Australian localities whence there are specimens in the Museum collection are:—Port Essington; Nicol Bay, N.W. Australia (*M. du Boulay*); Keppel Islands, from mud among mangrove-roots (*J. Macgillivray*); Moreton Bay (*purchased of Warwick*); and Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald').

Specimens also are in the collection of the Museum from the Gulf of Suez (*R. MacAndrew, Esq.*); Red Sea (*Major J. Burton*); Mada-

\* Nouv. Archiv. Mus. Hist. Nat. ix. pp. 268, 269, pl. xii. fig. 3 (1872).

gascar (*Rev. Deans Cowan*); Mauritius (*Lady F. Cole*); Rodriguez (*G. Gulliver*); Indian Ocean, Celebes, Macassar, &c. (*coll. Dr. Bleeker*); Keeling Islands (*Lieut. Burnaby, R.N.*); various islands of the Fiji group (*H.M.S. 'Herald'*); Samoa Islands, Upolu (*Rev. S. J. Whitmee*); Sandwich Islands (*U.S. Exploring Expedition* and *W. H. Pease*); besides others without special or with insufficiently authenticated locality.

All the Australian examples I have seen, with one exception, appear to belong to the variety (as at most I consider it) described by Milne-Edwards as *intermedius*. One, however, of the specimens obtained at West Island (No. 149) must, on account of its coloration, be referred to the variety designated *thukujar* by Owen. The colour is not indicative of geographical races or subspecies, since of this latter variety I have examined specimens both from the Mauritius and the Sandwich Islands. Mr. Kingsley, in his recent "Synopsis of the Grapsidæ,"\* does not regard these forms even as varieties, but unites them all under the one designation *M. messor*.

#### 90. *Chasmagnathus (Paragrapsus) lævis*, Dana.

A male and female from Port Jackson, 0-7 fms. (one numbered 104), are referred here. They differ somewhat from the New-Zealand examples which I suppose belong to this species, in the British-Museum collection, in having but very few or no yellow spots on the surface of the carapace. In the New-Zealand examples (*Sowerby*), and others without definite locality in the Museum collection, both carapace and legs are plentifully mottled with yellow, and the front is perhaps a trifle more rounded at its lateral angles; but in other particulars the specimens are so nearly alike that I do not venture to regard them as belonging to distinct species.

Mr. Kingsley, in his "Synopsis of the Grapsidæ" above referred to (p. 222), has referred to the synonyms of this species. He unites the genera *Chasmagnathus* and *Paragrapsus*, and the distinctions between the two are certainly very slight; but it may be convenient to reserve the name *Paragrapsus* as a subgeneric designation, at least, for the species with less convex body and broader less deflexed front, which, in what may be regarded as the typical *Chasmagnathi* (e. g. *C. convexus* and *C. granulatus*), resembles that of *Helice tridens* in being strongly curved downward, with an arcuated anterior margin that does not project in the middle line over the antennular region.

The range of *C. lævis*, as far as at present ascertained, is restricted to the north and south-eastern shores of Australia and the New-Zealand coasts.

#### 91. *Sesarma bidens*, De Haan ?

Port Curtis, 7-9 fms. (No. 85). Two specimens (males). These examples are referred with little hesitation to *S. bidens*,

\* Proc. Acad. Nat. Sci. Philad. p. 190 (1880).



although the beaded row of granules on the upper margin of the mobile finger is much less distinctly marked than in the specimen figured by De Haan.

Several species of this genus have been described agreeing with *S. bilens* in the bidentate lateral margins of the carapace, and in having two small oblique pectinated ridges on the upper surface of the palm. Of these, I regard *S. lividum* and *S. guttatum*, A. M.-Edwards \*, as very doubtfully distinct.

*S. dussumieri*, M.-Edwards †, from Bombay, is very briefly characterized; but as the words "pouce subcrénelé" occur in the description, it may be that our specimens belong to it.

There are specimens that I refer, at least provisionally, to this species in the collection of the Museum from the Philippine Islands (*Cuming, Veitch*), Koo-Kcang-San (*H.M.S. 'Samarang'*), Malaysian Seas without locality (*Dr. P. Bleeker*), and New Hebrides (*J. Macgillivray*). This latter example does not differ appreciably from the figure of *S. lividum*, A. M.-Edw., founded on a New-Caledonian example (*vide* N. Arch. Mus. H. N. ix. p. 303, pl. xvi. fig 2, 1873). This, as M. de Man has shown, is a species ranging throughout the Oriental region.

There are, besides, in the collection two very small specimens of a species of this genus belonging to the section having a carapace with entire lateral margins, which I will not venture to determine. The larger, a female, is from Port Jackson (0-5 fms.), the smaller, a male, from Port Curtis. It cannot, I think, be identified with *Sesarma erythrodactyla*, Hess, from Sydney ‡, in which the outer border of the mobile finger is ribbed, and the inner provided with two larger and several smaller teeth, &c.

## 92. *Pinnotheres villosulus*.

? *Pinnotheres villosulus*, Guérin-Ménéville, *Cr. in Voyage de la Coquille*, Zool. ii. p. 13 (1830); *Icon. Règne Animal*, Cr. p. 7, pl. iv. fig. 6 (1829-44).

? *Pinnotheres villosus*, M.-Edwards, *Ann. Sci. Nat. sér. 3, Zool. xx.* p. 218, pl. xi. fig. 8 (1853).

A female in Dr. Coppinger's collection, obtained at Warrior Reef, Torres Straits, agrees in nearly all particulars with M. Guérin's description based on specimens from Timor, and the maxillipede is almost exactly of the form delineated by Milne-Edwards. Guérin, however, describes the front as emarginate, whereas in the specimen I have before me it is triangulate and deflexed. In the slight outline sketch of the front and antennæ in his 'Iconographie' the rostrum appears, however, to be triangulate and bent down between the oblique antennules just as in Dr. Coppinger's specimen. I prefer, therefore, to refer the latter provisionally to Guérin-Ménéville's species rather than to incur the risk of adding needlessly to the

\* N. Arch. Mus. Hist. Nat. v. Bulletin, pp. 25, 26 (1869).

† Ann. Sci. Nat. sér. 3, Zool. xx. p. 185 (1853).

‡ Archiv. Mus. Hist. Nat. p. 151, pl. vi. fig. 10 (1865).



synonyms by giving a new designation to a female example and one so doubtfully distinct. I should add, however, that in Dr. Copping's specimen there is scarcely any trace of pubescence on the middle part of the dorsal surface of the carapace, which is probably worn smooth by abrasion.

Two females received in the second collection from the same locality, 16 fms. (No. 137), are of larger size, uniformly tomentose, and the maxillipede (in one specimen examined) is less distinctly truncated at its distal end; they cannot, however, be regarded as belonging to a distinct species.

### 93. *Mycteris longicarpus*, Latr.

Port Molle; four specimens (two males and two females) were obtained on the beach (No. 95).

Specimens are in the British-Museum collection from Port Essington (*J. Gould*); Nicot Bay, N.W. Australia (*M. du Boulay*); Sydney; Port Jackson (*Antarctic Expedition*); Swan River (*Dring*); Tasmania (*R. Gunn*); and others without special locality. Also from New Guinea (*Rev. W. F. Turner*); Billiton Island (*Marquis of Tweeddale*); Timor Laut (*H. O. Forbes*); Philippines, Negros (*Cuming*); and China seas (*Swinhoe*).

It is recorded by M. A. Milne-Edwards from New Caledonia.

I think it is very doubtful whether *Mycteris brevidactylus*, Stimpson\*, from the Loo-choo Islands, can be regarded as distinct from this species.

Of the closely allied *Mycteris platycheles*, M.-Edwards, there are specimens in the British-Museum collection from Broken Bay (*J. Macgillivray*, H.M.S. 'Rattlesnake'), Tasmania (*Dring*, *Lieut. A. Smith*), and others without special indication of locality. With this latter species, *Mycteris subverrucatus* of White† and Kinahan‡ is identical.

### 94. *Halicarcinus ovatus*, Stimpson.

Port Jackson, 0-7 fms. (No. 104). Four specimens, two males and two females.

In the 'Catalogue of New-Zealand Crustacea,' p. 49 (1876), I united this form with *Halicarcinus planatus* (Fabr.); but after a closer examination of a larger series of Australian specimens, I was inclined to think that it might after all be distinctly characterized by relatively larger and more closely approximated frontal lobes which are less hairy above. Accordingly the citation of this species was not included among the synonymical references to *H. planatus* in my notice of that species in the Report on the Crustacea of Ker-guelen Island §.

\* Proc. Acad. Nat. Sci. Philad. p. 99 (1858).

† List Crust. Brit. Mus. p. 34 (1847).

‡ Journ. Roy. Dublin Soc. i. p. 123 (1858).

§ Phil. Trans. clxviii. p. 201 (1879).

The differences in the form of the frontal lobes between the two species are, I may add, well shown in Targioni-Tozzetti's figures (*vide* 'Crostacei della Magenta,' pp. 173, 176, pl. x. figs. 4 & 5, 1877).

All the specimens of this genus from the Magellan Straits, Falkland, Kerguelen, and Auckland Islands, and New Zealand in the collection of the Museum belong to *H. planatus*.

Of *H. ovatus* there are specimens in the collection of the British Museum from reefs on the N.E. coast of Australia (*Saumarez*) and Port Jackson (*Cuning*). I believe a very small specimen from King George's Sound, S.W. Australia (*F. M. Rayner*, H.M.S. 'Herald'), also belongs here. Mr. Haswell (Cat. p. 114) mentions the occurrence of *Halicarcinus planatus*, which he refers to the genus *Hymenosoma*, at Port Western; but as he merely quotes the description and synonyms as given in my New-Zealand Catalogue, I cannot be certain whether his specimens belong to *H. planatus* or *H. ovatus*.

#### 95. *Leucosia ocellata*, Bell.

A female example was obtained in the Arafura Sea at 32-36 fms. (No. 160).

There are besides in the Museum collection only the specimen referred to by Bell as from "Eastern Australia," which was obtained at Cape Capricorn, on the Queensland coast (*J. Macgillivray*, H.M.S. 'Rattlesnake'), and one without special locality collected by F. M. Rayner (H.M.S. 'Herald').

Mr. Haswell records this species from Keppel Bay, Queensland.

#### 96. *Leucosia whitei*.

*Leucosia whitei*, Bell, *Trans. Linn. Soc.* xxi. p. 289, pl. xxxi. fig. 2 (1855); *Cat. Leucosiidae Brit. Mus.* p. 9 (1855); *Haswell, Proc. Linn. Soc. N. S. Wales*, p. 45 (1880); *Cat. Austr. Crust.* p. 118 (1882).

? *Leucosia cheverti*, *Haswell, t. c.* p. 47, pl. v. fig. 2 (1880); *Catalogue*, p. 120 (1882), var.

A specimen from Flinders, Clairmont, N.E. Australia, dredged in 11 fms. (No. 108), in the first collection, belongs here, and one from Prince of Wales Channel, 9 fms. (No. 157), second collection. Mr. Haswell records it from Princess Charlotte Bay, Cape Grenville, and Brook Island.

I think that *L. cheverti*, Haswell, can scarcely be regarded as more than a variety of *L. whitei*; it is distinguished, according to its author, by the form of the front, which is obscurely (not distinctly) tridentate, and by the absence of granules on the hepatic regions. The hepatic granules, however, vary in number in the specimens (four in number) in the Museum collection, and in one are very obscurely marked. In two specimens from Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'), which I think

must be referred to the variety *cheverti*, not only are the hepatic granules entirely absent, but also the front has not the faintest trace of trilobation.

97. *Leucosia craniolaris*, var. *lævimana*. (PLATE XXVI. fig. A.)

I propose thus to designate, at least provisionally, a female specimen obtained in 10 fms. at Friday Island, Torres Straits (No. 153), which is distinguished from the very numerous examples of *L. craniolaris* in the Museum collection by the absence of a series of granules on the inner margin of the palms of the chelipedes. The carapace is narrower than is usual in *L. craniolaris*, very polished and shining, and has two white spots on either side of the gastric region. The notch in the anterior margin of the thoracic sinus is less distinct than is usual in *L. craniolaris*. A second specimen from Torres Straits, in the Museum collection, resembles Dr. Coppinger's example in its narrow rhomboidal carapace, but the inner margins of the chelipedes are distinctly granulated.

Specimens of *Leucosia craniolaris* are in the British Museum from Tranquebar (*Old Collection*); Ceylon (*E. W. H. Holdsworth*); Penang (*Dr. Cantor*); Borneo and Chinese seas (*coll. H.M.S. 'Samarang'*); Formosa (*Matthew Dickson*); Hong-Kong (*Dr. W. A. Harland* and *W. Stimpson*).

98. *Myra carinata*, *Bell*.

Flinders, Clairmont, N.E. Australia. A fine male dredged in 11 fms. (No. 108) seems to be referable to this species, which has been recorded by Mr. Haswell \* from Cape Grenville.

Specimens are in the British-Museum collection from the Celebes, Macassar (*coll. Dr. Bleeker*), Philippines (*Cuming*), and Hong-Kong (*Dr. W. A. Harland*).

These differ slightly among themselves in certain points, as *e. g.* the relative narrowness of the carapace, prominence of the inner and upper orbital angles, and length of the posterior spines, characters that may be of some importance; but large series are needed to determine with certainty the distinctions between the very variable species of this genus.

99. *Myra affinis*, *Bell*.

Four specimens are referred here from Port Denison, 4 fms. (Nos. 111, 122), first collection, and a larger female from Thursday Island, 3-4 fms., second collection (No. 177), which, like the examples mentioned by Mr. Haswell from Cape Grenville and New South Wales, have a more or less distinct median longitudinal carina on the carapace.

Of *M. affinis* there are specimens in the British-Museum collection from the Philippine Islands, Masbate, Zebu (*Cuming*), and from the Eastern seas (*H.M.S. 'Samarang'*) without special locality.

\* 'Catalogue,' p. 121 (1882).

The larger specimen closely resembles the specimens referred to *M. affinis* in the Museum collection, and scarcely differs from *M. mammillaris* except in the (relatively) somewhat longer, more acute median spine of the posterior margin, and shorter chelipedes; and I think it probable that a larger series would demonstrate the necessity of uniting the two species. The younger examples may be distinguished from those referred to *M. australis* by their narrower carapace, and the longer, more acute, and non-recurved posterior marginal spines.

#### 100. *Myra mammillaris*, Bell.

An adult male is in the collection from Port Denison, 4 fms. (No. 111).

There are in the Museum collection specimens from Adelaide, S. Australia (purchased), and others without special locality.

#### 101. *Myra australis*, Haswell?

*Myra mammillaris* (young), Miers, *Trans. Linn. Soc.* ser 2, Zool. i. p. 239, pl. xxxviii. figs. 25-27 (1877).

? *Myra australis*, Haswell, *Proc. Linn. Soc. N. S. W.* iv. p. 50, pl. v. fig. 3 (1880); *Catalogue*, p. 122 (1882).

Three specimens are referred doubtfully to this form from Port Molle, 14 fms. (No. 93), and one from Port Denison, 4 fms. (No. 122) (first collection); also a male from Thursday Island, 3-4 fms. (No. 177), two females from the same locality, 4-5 fms. (No. 165), (to the back of one of which is attached a fine specimen of a species of *Acetabularia*), and two males from Prince of Wales Channel, obtained at 7 fms. (No. 142) and 9 fms. (No. 157).

In some of the specimens I have examined the carapace is much more evenly granulated than in others, and they also differ in the more or less recurved posterior median spine and the greater or lesser dilatation of the intestinal region; in some females the post-abdomen is comparatively narrow, whereas in others it covers the whole of the sternal surface. Although some of the larger specimens approach nearly in their characters to *M. mammillaris*, yet, as all may be distinguished by their more orbiculate carapace, more acutely-angulated pterygostomian regions, the more or less recurved posterior median spine, and relatively shorter chelipedes, I prefer to adopt for them, at least provisionally, Mr. Haswell's specific name. I should add, however, that in Mr. Haswell's figure the male post-abdomen is represented as shorter than in our specimens, with the sides somewhat constricted at base of the terminal segment.

There are specimens from Shark Bay, West Australia, in the Museum collection (*H.M.S. 'Herald'*) which probably belong here, but in one (a female) the granulations of the carapace are very indistinct.

102. *Phlyxia crassipes*, Bell.

Of this species, which is said by Mr. Haswell to be extremely common at Port Jackson, a very small male was dredged at that locality in 5-7 fms. (No. 104), and another, larger, male in 0-5 fms. (second collection).

Besides the specimens from Port Jackson (*Cuming* and *J. Macgillivray*) mentioned by Bell, the Museum possesses one from Flinders Island, Bass Straits (*F. M. Rayner*, H.M.S. 'Herald'), and others, without special locality, from Dr. Bowerbank and W. A. Miles, Esq.

It is of interest to note that there are two other species of this genus recorded from Port Jackson, and agreeing with *Phlyxia crassipes* in possessing a 4-lobed front, which yet appear to be distinct; they are *Phlyxia quadridentata*\*, a species recorded from Port Jackson by Stimpson, and *Phlyxia ramsayi*, Haswell (*t. c.* p. 127).

103. *Phlyxia lambriformis*.

*Phlyxia lambriformis*, Bell, *Trans. Linn. Soc.* xxi. p. 304, pl. xxxiv. fig. 2 (1855); *Cat. Leucos. Brit. Mus.* p. 17 (1855); *Haswell, Cat. Austr. Crust.* p. 124 (1882).

*Phlyxia petleyi*, *Haswell, t. c.* p. 125, pl. iii. fig. 3 (1882).

A female was received with Dr. Coppinger's second collection from Prince of Wales Channel, 9 fms. (No. 157), and four males and a female from Port Darwin, 7-12 fms. (mostly No. 173).

There are, besides, two specimens in the British Museum from the 'Rattlesnake' collection, obtained at Bass Straits, and one from the same collection without special locality.

It is recorded by Mr. Haswell from Princess Charlotte Bay and Holborn Island near Port Denison, and also from Port Molle, Whitsunday Passage (as *P. petleyi*).

After a careful comparison of Mr. Haswell's description and figure of *P. petleyi* in the Catalogue of Australian Stalk- and Sessile-eyed Crustacea with Prof. Bell's types of *P. lambriformis* in the Museum collection, I am unable to regard the two as distinct species. Prof. Bell's figure is from an adult male in which the rostrum, tubercles of the carapace, and teeth of the antero-lateral margins are all very prominent, whereas Mr. Haswell's description was based upon a female and smaller male. Moreover, Bell's short description is misleading in one or two particulars—*e. g.* he describes the carapace as carinated, whereas the keel in question extends only over the depressed postfrontal portion of the carapace, from the back of the rostrum to the gastric region.

104. *Nursia sinuata*, Miers.

Of this species three specimens, a male and two females, are in the collection (No. 123), but, unfortunately, the exact locality is not

\* *Ebalia quadridentata*, Gray, *Zool. Miscell.* ii. p. 40 (1831).



known. In the smallest (immature) female the postabdomen is relatively narrow, and does not, as in the adult, cover the whole of the sternal surface.

*Nursia abbreviata*, Bell, must be added to the list of the Australian species of this family, since the specimens in the British-Museum collection are from Moreton Bay, and were purchased with the types of *N. sinuata* from the same locality.

#### 105. *Nursilia dentata*, Bell.

In the first collection is a female from Flinders, Clairmont, N.E. Australia, 11 fms. (No. 108), and in the second an adult female and two smaller males from the Arafura Sea, 32-36 fms. (No. 160). These do not differ from the type (a female, without special indication of locality, from the 'Samarang' collection) in the British Museum, except in the somewhat more prominent spines and marginal teeth of the carapace.

Mr. Haswell mentions the occurrence of this species at the Fitzroy Islands.

There is in the collection of the British Museum a female from the Fiji Islands, Matuka (*H.M.S. 'Herald'*), in which the small spines or tubercles of the gastric, hepatic, and branchial regions are nearly obliterated, as are also the lobes or teeth of the lateral margins.

In the final consignment of the collections of *H.M.S. 'Alert'* is a specimen from the Seychelles. Hence this species is evidently distributed throughout the Oriental region.

#### 106. *Iphiculus spongiosus*, Adams & White.

A small male was dredged in the Arafura Sea, 32-36 fms. (No. 160), which agrees with the larger specimens from the Philippine Islands, Corregidor (*Cuming*), and another specimen without definite locality, from the 'Samarang' collection, in the British Museum.

Prof. Bell is certainly right in classing this genus with the Leucosiidæ, and in stating that it has no near affinities with the Parthenopidæ, as supposed by Adams and White.

#### 107. *Arcania pulcherrima*, Haswell.

*Arcania septemspinosa*, Bell, *Trans. Linn. Soc.* xxi. p. 310, pl. xxxiv. fig. 7 (1855); *Cat. Leucos. Brit. Mus.* p. 21 (1855).

*Arcania pulcherrima*, Haswell, *Proc. Linn. Soc. N. S. Wales*, iv. p. 58, pl. vi. fig. 4 (1880); *Cat. Austr. Crust.* p. 131 (1882).

An adult female from Prince of Wales Channel. 9 fms. (No. 157), and a smaller male from the Arafura Sea, 32-36 fms. (No. 160), are referred here.

A comparison of Mr. Haswell's description and figure of *A. pul-*

*cherrima*, from Darnley Island, with Bell's type of *A. septemspinosa* (which is registered as from Borneo, and is not, as Bell states, of unknown locality) in the Museum collection establishes the identity of the two species. There is in reality no median posterior marginal spine in *A. septemspinosa*, the one shown in the figure (and made much too prominent) being the posterior spine or tubercle of the median longitudinal dorsal series, which is situated above the posterior margin. Hence the name *septemspinosa* is inappropriate for this species; and as, moreover, the same specific description is used in the genus *Iphis*, which, as I have already noticed\*, is scarcely distinct from *Arcania*, I prefer to retain Mr. Haswell's specific name.

108. *Lithadia? sculpta*, Haswell.

A male of this very interesting little species was dredged in the Arafura Sea at 32-36 fms. (No. 160), where so many other remarkable species were obtained. A dried female is in the British Museum, from the collection of H.M.S. 'Samarang,' but without any special indication of locality. Mr. Haswell's types were from the Fitzroy Islands.

109. *Oreophorus reticulatus*, Adams & White.

An adult female from Thursday Island, 4-5 fms. (No. 165), and a smaller specimen of the same sex from Friday Island, 10 fms. (No. 153), seem to belong to this species.

The specimens in the British-Museum collection are from the Straits of Sunda (H.M.S. 'Samarang') and Philippines (*Cuming*).

From *O. frontalis* this variable species may, it would appear, always be distinguished by its very much less prominent and non-emarginate front.

110. *Oreophorus frontalis*. (PLATE XXVI. fig. B.)

The carapace is transverse and laterally produced at the branchial regions over the bases of the ambulatory legs; the margins of the carapace at this part form a distinct angle with the antero-lateral margins. The front is very prominent, and divided by a very shallow median notch into two rounded lobes; it is uniformly granulated above. The surface of the carapace (seen under a sufficient magnifying-power) is granulated, the granules most numerous towards the posterior and postero-lateral margins, and, where not granulated, it is closely and finely punctulated; the hepatic regions are separated from the adjoining parts by a well-defined semicircular suture, the branchial regions near to the middle line are strongly convex. There is a prominent triangular acute lobe on the pterygostomial regions. All the postabdominal segments appear to be distinct, the postabdomen, sternal surface, and inferior parts of the carapace generally being granulated; a more prominent tubercle

\* *Vide* Ann. & Mag. Nat. Hist. ser. 5, v. p. 317 (1880).

exists on the fifth segment; the terminal segment is much narrower than the preceding, acute and constricted at base. The eyes are placed in very small orbits; the antennules lie in oblique fossettes; the bases of the antennæ are almost completely fused with the surrounding parts of the carapace (in the single specimen examined), and scarcely any trace remains of a flagellum. The merus-joint of the outer maxillipedes is triangulate, and shorter than the preceding; the exognath has its outer margin straight, and, although robust, is narrower than the ischium of the endognath, it does not reach to the extremity of the merus-joint. The chelipedes are subequal and of moderate length, with the joints granulated, but otherwise unarmed; merus trigonous; carpus very short; palm externally rather convex, with an angulated prominence on its inner surface, shorter than the fingers, which externally are longitudinally sulcated, meet along their inner margins when closed (these margins being minutely denticulated), and are concave internally toward and somewhat incurved at the tips. The ambulatory legs (which are partially concealed beneath the carapace) have all the joints strongly granulated; the dactyle slender, and longer than the preceding joints. The colour (in spirit) of the single specimen is nearly white. Length not quite 3 lines (6 millim.), breadth nearly 4 lines (8 millim.).

The single specimen was collected at Port Molloe, 5-12 fms. (No. 118), and is a male, the first, I believe, recorded of this genus.

The very prominent front seems to distinguish this species from all hitherto recorded, except *Oreophorus petraeus*\*, from New Caledonia, which is only distinguished by the much shorter, more dilated immobile fingers of the chelipedes, and by having the lateral margins of the carapace marked by three closed fissures, whereas in *O. frontalis* there are but two, which meet behind and circumscribe the hepatic region. There are two specimens that probably belong to *O. petraeus* in the collection of the Museum, from Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'). These forms are certainly intermediate between *Oreophorus* and *Tlos*, but seem to me to have more affinity with the former genus, since in *Tlos muriger*. Ad. & White (the typical species), the front is not at all prominent, and its margin, with the antero-lateral margins of the carapace, is dorsally reflexed.

In the elongated fingers it resembles *O. rugosus*, Stimpson, as figured by A. Milne-Edwards†, from the Loochoo Islands and Cochin China, which, however, has a much less prominent front and the carapace more coarsely punctulated, and is without the hepatic sulcus. Mr. Haswell (Cat. p. 130) records *O. rugosus* from Port Denison; but as his description is merely abbreviated from that of Milne-Edwards, I am unable to say whether the specimens there collected afford any basis for uniting *O. rugosus* and *O. frontalis*.

\* *Tlos petraeus*, A. M.-Edwards, Nouv. Arch. Mus. Hist. Nat. x. p. 51, pl. iii. fig. 1 (1874).

† Ann. Soc. Entom. France, sér. 4, v. p. 152, pl. vi. fig. 3 (1865).

111. *Matuta victrix* (Fabr.).

Two males are in the collection from the Percy Islands, Queensland, 0-5 fms. (No. 91).

Of this common species specimens are in the British-Museum collection from Torres Straits (*J. B. Jukes*), and Shark Bay (*F. M. Rayner*, H.M.S. 'Herald'). Also from the Red Sea, Zanzibar (*Dr. Kirk*); Pondicherry, Indian Ocean (*Gen. Hardwicke*); Madras (*India Mus. coll.*); Ceylon (*E. W. H. Holdsworth*); Penang (*India Mus. coll.*); Celebes, Macassar, Bali, and Batjan (*coll. Dr. Bleeker*); Borneo (*Admiralty*).

Of the very distinct variety *crebrepunctata*, Miers, there are specimens from Japan (*Leyden coll.*), Fiji Islands, Vanua Levu (*F. M. Rayner*), and Mallicollo, New Hebrides (*W. Wykeham Perry*).

112. *Matuta inermis*. (PLATE XXVI. fig. C.)

I must, at least provisionally, thus designate a female from Albany Island, 3-4 fms., two small males from Thursday Island, 3-4 fms. (No. 177), three from Prince of Wales Channel, 7 fms. (No. 169), and four collected in Torres Straits at 10 fms. (No. 158), also four specimens (of which three are very small, and the fourth, a male, but little larger) from the 'Herald' collection (*F. M. Rayner*), without definite locality, in the British-Museum collection. In all of these specimens the carapace is rather longer than broad, proportionately longer and narrower than in other species of the genus; the tubercles of the carapace are arranged nearly as in *M. banksii*, which this species further resembles in having the anterior half of the carapace coarsely and distinctly granulated. The long lateral marginal spines, however, which exist in every other species of *Matuta* are in *M. inermis* obsolete and represented merely by a small tubercle. The interrupted ridge on the middle of the outer surface of the palm is parallel with the inferior margin, and the outer surface of the mobile finger presents scarcely any trace of a longitudinal ridge (fig. c). Hence this species is to be referred to my second section (B) of the genus. The chelipedes differ, however, from those of *M. banksii* and other species in having the carpus distinctly granulated, and in having no spine, but only a tubercle, at the proximal end of the ridge on the exterior surface of the palm, &c. (see the figure). Length of the specimen from Albany Island about 10 lines (21 millim.), breadth about  $9\frac{1}{2}$  (20 millim.). The male above referred to is somewhat smaller. In only a few of the specimens is any trace of coloration to be seen; and in these examples the markings are in the form of largish patches or blotches, sometimes defined by darker marginal lines, and in some of the spirit-specimens there are longitudinal waved lines on the posterior regions.

No reference was made to this species in my "Monograph of the genus *Matuta*,"\* because the few specimens then before me were

\* Trans. Linn. Soc. ser. 2, Zool. i. p. 243 (1877).

without locality, and being also of very small size, I was uncertain whether to regard them as belonging at all to this genus, and if so, whether they might not represent an immature condition of one of the known species. This, I am inclined to think, cannot be possible, since there are one or two *Matutæ* in the collection no larger than *M. inermis*, in which nevertheless the lateral spines are distinctly developed and the carapace of the normal width. In the obsolescence of the lateral spines *M. inermis* resembles the genus *Cryptosoma*; but in the form of the chelipedes and of the dactyli of the swimming-legs and in the mouth-organs it is altogether a *Matuta*.

### 113. *Calappa hepatica* (Linn.).

An adult male was obtained near Clairmont on a coral-reef (No. 151).

Specimens are in the British-Museum collection from the following Australian localities:—Trinity Bay, N.E. Australia (*J. Macgillivray*, H.M.S. 'Rattlesnake'), also from Bramble Key and West Hill (*J. B. Jukes*). Hess records it from Sydney.

I have already\* referred to the extended geographical range of this common species, which is more generally known by Fabricius's designation *C. tuberculata*.

### 114. *Dorippe dorsipes*.

*Cancer dorsipes*, Linn. Mus. Lud. Ulricæ, p. 452 (1764); *Syst. Nat.* ed. xii. p. 1053 (1766), not of Rumphius, Fabricius, or Herbst.

*Cancer frascione*, Herbst, *Naturg. Krabben etc.* i. p. 192, pl. xi. fig. 70 (1790).

? *Cancer quadridens*, Fabricius, *Ent. Syst.* ii. p. 464 (1793).

*Dorippe quadridens*, Fabr. *Ent. Syst. Suppl.* p. 361 (1798); *De Haan*, *Faun. Japon., Crust.* p. 121, pl. xxxi. fig. 3 (1841); *White*, *List Cr. Brit. Mus.* p. 54 (1847); *Stimpson*, *Pr. Ac. Nat. Sci. Phil.* p. 163 (1858).

*Dorippe atropos* and *D. nodulosa*, Lamarch, *Syst. Anim. sans Vert.* v. p. 245 (1818).

*Dorippe quadridentata*, M.-Edw. *Hist. Nat. Crust.* ii. p. 157 (1837); *Hilgendorf*, *Monatsb. Akad. Wissensch. Berlin*, p. 812 (1878); *Haswell*, *Cat. Austr. Crust.* p. 137 (1882).

To this species are referred a male from Port Molle, 14 fms. (No. 93); another from Port Denison, 4 fms.; a female from Flinders, Clairmont, N.E. Australia, 11 fms.; and a small male in very imperfect condition from Thursday Island, 4–6 fms. (No. 130), in which the carapace is narrower than usual. All of the above from the first collection. In the second collection, three small specimens from the Arafura Sea, 32–36 fms. (No. 160), probably belong here. Another very small example from Friday Island, 10 fms. (No. 153), which has the carapace glabrous, but tuberculated nearly as in *D. dorsipes*, I cannot assign with certainty to any species.

\* Phil. Trans. clxviii. p. 491 (1879).



I designate this common species (which is usually referred to under the Fabrician name *quadridens* or *quadridentata*) *D. dorsipes*, because Linnæus's somewhat detailed description in the 'Museum Ludovicæ Ultricæ' agrees with it excellently in almost every particular, and more especially as regards the disposition of the spines on the postabdominal segments of the male, where, however, it must be noted that there is usually a tubercle on the first postabdominal segment, which is described by Linnæus as "*inermis*." In the female there are between the larger spines or tubercles of the postabdominal segments several smaller spinules. If this species be not truly *D. dorsipes* of Linnæus, it would appear (as Hilgendorf notes) that Herbst's name of *D. frascone* has still priority over the Fabrician designation.

Of this species there are specimens in the British-Museum collection from several localities on the North-eastern coast of Australia, e. g., Torres Straits (*J. B. Jukes*), Dunk Island (*J. Macgillivray*, H.M.S. 'Rattlesnake'), and near Cumberland Island (*J. Macgillivray*); also a small specimen from Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'), in which the eye-peduncles are relatively much longer, probably belongs here. There are, besides, specimens in the Museum collection from the Indian Ocean (*Hardwicke*); Ceylon (*E. W. H. Holdsworth*); Philippine Islands (*Cuming*); Japan (*Leyden collection*); and China seas (*R. Swinhoe*).

There are in the Museum collection two specimens from Shanghai, which have the carapace and ambulatory legs much more tomentose, the median spines of the front less prominent, and the right-hand chela (in the male) considerably developed, with the palm swollen and vertically very deep; they are probably only old and large specimens of this species.

Three female specimens from China only differ in the remarkable breadth of the carapace at the branchial regions, and the larger size of some of the wart-like tubercles of the dorsal surface, and are probably not distinct. A specimen from Canton Province (*Dr. Cantor*) approaches in the lesser width of the carapace ordinary females of *D. dorsipes*. In all of these the postabdomen is deficient.

Finally, two specimens from Zebu, Philippines (*Cuming*), which White has referred to *D. callida*, Fabr., only differ in the slender legs and in the obsolescence of the tubercles of the carapace, whose surface, however, is uneven and elevated where these tubercles ordinarily exist. They may be distinct or only a variety of *D. dorsipes*.

#### 115. *Dorippe australiensis*. (PLATE XXVI. fig. D.)

I thus designate a small example obtained at Port Denison, 4 fms.; also two specimens from Moreton Bay (*purchased*), and four from the Australian coast (*Dr. Bowerbank*), but without any special indication of locality, in the British-Museum collection.

This form is evidently very nearly allied to *D. granulata*, De

Haan, from the Japanese seas\*, but differs from his description and figure, and from a Japanese specimen in the Museum collection, in the following characters:—The carapace is somewhat more depressed, and granulated only toward the sides, the gastric and cardiac regions being smooth; the second and third legs are naked, the merus-joints much slenderer and less compressed than in *D. granulata*, and smooth, not granulated; the following joint is bicarinated as in *D. granulata*, but the carinae are not granulated. In the single male example of *D. granulata* I have seen, the palm of the larger (right) chelipede is granulated on its outer surface, in *D. australiensis* it is smooth. These observations and the figure (*d*) of the chela are based on adult examples received from Dr. Bowerbank, as the specimen received from Dr. Coppinger is very small and is, moreover, a female. This species is also very nearly allied to *D. astuta*, Fabricius; but in specimens referred to the latter from the Indian Ocean and the Philippines, in the Museum collection, the carapace is smooth and narrower, the legs slender, and the carpus-joint in the second and third pairs not longitudinally bicarinated. In *D. sima*, M.-Edw., on the contrary, the second and third legs are much more robust, and there is a strong spine at the inner suborbital angle, which is wanting in the three species above mentioned.

## ANOMURA.

### 1. *Cryptodromia lateralis*.

? *Dromia lateralis*, Gray, *Zool. Miscell.* p. 40 (1831).

*Dromia verrucosipes*, White, *List Crust. Brit. Mus.* p. 55 (1847).

*Cryptodromia lateralis*, Stimpson, *Proc. Ac. Nat. Sci. Philad.* p. 239 (1858); Heller, *Reise der Novara, Crust.* p. 71 (1865); Miers, *Cat. New-Zeal. Crust.* p. 57 (1876); Haswell, *Cat. Austr. Crust.* p. 139 (1882).

A male from Port Jackson, 5–7 fms. (No. 104), is referred to this species. Specimens from the same locality are in the British-Museum collection (*Antarctic Expedition* and *J. Brazier*). Other Australian localities indicated by specimens in the British Museum are:—Nicol Bay (*M. du Boulay*); Brisbane (*Cuming*); Tasmania (*Cuming*, *Ronald Gunn*); Bass Straits (*J. Macgillivray*, H.M.S. 'Rattlesnake'); Fremantle (*Dr. Bowerbank*); King George's Sound, West Australia (*F. M. Rayner*, H.M.S. 'Herald'); also from Japan, Madjica-Sima (*H.M.S. 'Samarang'*), Philippine Islands, Bohol (*Cuming*), and New Zealand.

This species is without doubt the *Cryptodromia lateralis* of Heller; and Dr. Gray's short diagnosis also agrees with our specimens so far as it serves; but he does not mention one of the most salient characteristics of the species—the nodosities of the chelipedes and ambulatory legs. In certain of the specimens, however, these prominences are much less apparent, and the longitudinal carinae of

\* In Siebold, *Fauna Japonica, Crust.* p. 122, pl. xxxi. fig. 2 (*sima*), 1841.

the penultimate and antepenultimate joints of the ambulatory legs are more distinct.

## 2. *Petalomera pulchra*. (PLATE XXVII. fig. A.)

Carapace somewhat oblong-oval, and a little longer than broad, moderately convex and granulated; its anterior parts are rather thinly pubescent, the front in its median portion is nearly vertically deflexed (see fig. *a*); the lateral frontal lobes are prominent, in a dorsal view triangulate, and are separated from one another by a deeply concave interspace. The upper orbital margin is thin, prominent, and entire; there is a small notch at the outer angle; the sides of the carapace are armed with three small teeth placed in an oblique series, the anterior of which is situated upon the subhepatic region; the carapace in front of these teeth is somewhat coarsely granulated. Distinct longitudinal ridges exist on the endostome or palate. The sternal *sulci* in the female are remote from one another, and terminate in tubercles which are situated a little behind the bases of the second pair of legs (see fig. *a'*). The eyes are of moderate length, corneæ distinct; the peduncles of the antennæ are rather robust; the second joint somewhat longer than the first or the third. The merus-joint of the outer maxillipedes is about as long as the ischium, truncated at its distal end, and without any notch at its antero-external angle where the next joint articulates with it. The chelipedes are subequal; the merus has its upper margin produced into a high arched crest, its inner surface is smooth and polished, its outer pubescent, the inner and lower margin is sharp-edged and entire; the wrist and palm are also slightly cristated above, and have their outer surfaces granulated and pubescent; the wrist has two larger tubercles or prominences at its distal end; the granules on the palm disposed in six longitudinal series; fingers somewhat shorter than the palm and meeting along their regularly serrated inner edges when closed, excavate and naked at the apices. The ambulatory legs are pubescent and moderately robust; the merus-joint of the first pair has its upper margin produced (as in the chelipedes) into a high arched crest, in the next pair this joint is not specially dilated and its upper margin is straight; the last two legs terminate in a small curved claw, but the penultimate joint has no terminal spiniform process. Colour (in spirit) greyish or cinereous. Length of carapace nearly  $\frac{3}{4}$  inch (19 millim.), breadth  $8\frac{1}{2}$  lines (18 millim.).

The females were obtained in Prince of Wales Channel, 7-9 fms.

This species is distinguished from *P. granulata*, Stimpson, the type of the genus, from Kajosima, Japan, by the absence of a distinct supraocular tooth, and by the non-cristated merus-joint of the third pair of legs, &c. It cannot be confounded with any of the Australian *Dromice* described by Mr. Haswell (Catal. pp. 139-141).

### PARATYMOLUS, *Miers*.

The affinity of *Paratymolus*, and particularly of the later described species *P. latipes*, Haswell, and *P. sexspinosus*, Miers, with *Telmessus* is pointed out by Mr. Haswell, and is undeniable, notwithstanding the very differently shaped carapace of *Telmessus*, and the fact that in that genus the basal antennal joint has its outer margin produced into a broad triangulate lobe which enters the inner orbital hiatus. The affinities of *Paratymolus* with *Homola* are also very evident, and I have already referred to them. In *P. pubescens* and *P. bituberculatus* the distal margin of the merus-joint of the outer maxillipedes is somewhat rounded as in certain Inachidæ, to which family this genus further approximates in its slender basal antennal joint. Whether the genus *Paratymolus* be associated with *Telmessus* or not, its affinities are, I think, with the Maioid Anomura, to which also *Homola* belongs, rather than with the Corystidæ. I retain this genus therefore for the present near the Dromiidæ, where also Haswell keeps it.

#### 3. *Paratymolus bituberculatus*, *Haswell*, var. *gracilis*.

A male is in the collection, from Prince of Wales Channel, 7-9 fms., which is thus designated with some hesitation. The principal character distinguishing *P. bituberculatus* from *P. pubescens* is to be found in the subtriangulate chela, the upper distal end of which is produced into a more or less prominent tooth; the teeth on the posterior margins of the merus and palm, which are very distinctly indicated in Mr. Haswell's figure, exist in Dr. Coppinger's specimen only as small tuberculiform setigerous prominences; and, moreover, the spine in front of the principal hepatic spine, which exists in the type specimens of *P. pubescens* and of *P. bituberculatus*, is wanting in the example from Prince of Wales Channel, which should not improbably be separated as a distinct species.

A mutilated female, in which both chelipedes are deficient, from Thursday Island, 3-4 fms. (No. 177), greatly resembles the type of *P. pubescens*, Miers\*, from Matoya, in the form of the carapace and number and disposition of its spines and tubercles, differing only in the somewhat less prominent rostrum, and may perhaps belong to that species.

#### 4. *Paratymolus sexspinosus*. (PLATE XXVII. fig. B.)

This form is a near ally of the *Paratymolus latipes* described by Mr. Haswell, but differs in the following particulars:—The lobes of the rostrum are blunter, and the median notch much smaller; the antero-lateral margins of the carapace are armed with only three spines or teeth, including the præocular spine, the postocular being deficient; the chelipedes and ambulatory legs in the specimens examined (which, however, are females) are slenderer; the merus-

\* Proc. Zool. Soc. p. 45, pl. ii. fig. 6 (1879).



joints of the chelipedes have three or four granules or spinules on the posterior, but none on the anterior margin, and the palm is without either granules or spinules; the ambulatory legs are much less dilated and compressed than in Mr. Haswell's figure\*.

From *Paratymolus pubescens* and *P. bituberculatus* this form is distinguished not merely by the different shape and tuberculation of the carapace, but also by the shorter eye-peduncles and second antennal joint, and by the more dilated last joint of the peduncle of the antennæ, and the more distinctly operculiform maxillipedes, which are altogether of the Maoid type, with nearly quadrate merus-joints (see fig. *b*). The legs also are more robust. Colour (in spirit) light yellowish brown. Length of carapace of an adult female with ova nearly  $3\frac{1}{2}$  lines (7 millim.), greatest breadth nearly 3 lines (6 millim.); length of chelipede about  $3\frac{1}{2}$  lines (7 millim.), of second ambulatory leg about 5 lines (11 millim.).

Three specimens (females) are in the collection from Friday Island, 10 fms. (No. 153). The distinctions between the two forms above enumerated are, I think, too marked to be due to sex. The sex of Mr. Haswell's types from Port Denison and Port Jackson is not stated, but the figure of the postabdomen nearly resembles that of our adult female *P. scarpinosus*.

### 5. *Diogenes rectimanus*. (PLATE XXVII. fig. C.)

The carapace is depressed, with the sides in front of the branchial regions uneven and with a few hairs; the lateral margins armed with three or four spinules: the frontal margin broadly sinuated, with scarcely any trace of a median prominence, but with distinct lateral spinules, situated between the bases of the eye-peduncles and antennæ: the branchial regions are but little dilated; the rostral scale is linear, acute, and reaches nearly to the apices of the ophthalmic scales, which are broadly ovate, with three or four minute denticles at their distal ends. The postabdomen is clothed with longish hairs, and has four filamentous appendages on its left side, its fifth and sixth segments are protected by dorsal calcareous plates; the terminal segment is slightly transverse, divided by a median notch into two rounded lobes, which are ciliated and spinulose on the margins. The eye-peduncles are nearly as long as the transverse width of the frontal margin of the carapace, much shorter than the antennal peduncles, with the corneæ not dilated. The penultimate joint of the peduncle of the slender antennules reaches just beyond the apex of the eye-peduncles; the antepenultimate joint of the peduncle of the antennæ is prolonged into a spine, which reaches nearly to the apex of the following joint; this spine is armed on its inner margin with a series of smaller spinules, and there is a smaller spine on its outer side at base: the terminal peduncular joint reaches beyond the eye-peduncles; the joints of the flagella are fringed below with long flexible hairs. The outer and lower margin of the

\* Ann. & Mag. Nat. Hist. ser. 5, v. p. 303, pl. xvi. figs. 3-5 (1880).



trigonus merus-joint of the larger (left) chelipede is armed with three or four spinules at its distal extremity: the carpus is but little shorter than the palm and granulated externally, the granules on the upper margin increasing in size to the distal end, where they are spinuliform: the palm also is externally granulated and pubescent; the lower margin is in a straight line with the lower margin of the immobile finger, and is armed with several much larger acute spinules; a few somewhat large granules exist also at the base of the palm, and others are arranged in a longitudinal series along the outer surface parallel to the upper margin, and also along the upper margin of the palm and of the dactyl, which is about as long as the palm, flattened externally, and fitting closely against the lower finger, having on its inner margin near the base a rounded lobe, which is received into a corresponding cavity in the inner margin of the lower finger. The smaller chelipede has the slender wrist and hand clothed with yellowish hairs: the wrist armed above with small spinules arranged in two longitudinal series. The second and third ambulatory legs are slender and thinly pubescent, with the dactyli arcuated and rather longer than the foregoing joints. The fourth and fifth legs are subchelate, the small dactyl impinging against the broad spongy pad which terminates the penultimate joint. The filamentary appendages of the postabdomen are clothed with long hairs. The left uropod only is perfect; it has the inner ramus larger than the outer. The colour is whitish, with faint indications of pink upon the legs. Length of the carapace about 4 lines (nearly 9 millim.), of the left chelipede about 9 lines (19 millim.), of the third ambulatory leg about 11 lines (23 millim.).

The single example in Dr. Coppinger's collection is from Prince of Wales Channel, 7 fms. (No. 169).

This species scarcely differs from *D. spinulimanus*, Miers, except in the longer slenderer rostrum, denticulated ophthalmic scales, and in having the lower margin of the immobile finger in a straight line with the lower margin of the palm (fig. c), whereas in the typical *D. spinulimanus* the lower finger is bent downward and the ophthalmic scales subentire. In *D. penicillatus* the eyes are much shorter, there is a median rostral spine, and the left chela has a double series of spinules above.

It may be distinguished from the species of *Diogenes* included in Mr. Haswell's Australian Catalogue (pp. 156, 157) as follows:—From *D. miles*, Fabr., by the much less spinulose chelipedes and shorter tarsi of the ambulatory legs; from *D. custos*, Fabr., by the narrower, non-denticulated, rostriform appendage; from *D. granulatus*, Miers, by the very different form and armature of the larger (left) chelipede, &c.; and from *D. senex*, Heller, by the shorter rostrum and eye-peduncles, which latter do not reach to the end of the peduncles of the antennæ, the different spinulation of the palms of the chelipedes, &c.

6. *Pagurus imbricatus*, *M.-Edw.*

A specimen which I believe to be an adult male is referred here from Thursday Island, 3-4 fms. (No. 145), an adult female from the same locality and depth (No. 175), and a smaller male from Prince of Wales Channel, 9 fms. (No. 157).

Specimens also are in the British-Museum collection from Shark Bay, W. Australia (*Rayner*, H.M.S. 'Herald').

The smaller examples agree very well with Milne-Edwards's brief description\*. As, however, the animal increases in size, small granules or prominences are developed upon the anterior margins of the flattened tubercles or scales of the outer surface of the left chelipede, which in the male from Thursday Island are large enough to give it a uniformly granulated appearance.

7. *Pagurus hessii*. (PLATE XXVIII. fig. A.)

Carapace depressed, with a few hairs on the sides near the front, the cervical suture distinctly defined; the branchial regions but moderately dilated on the sides; with no median rostral tooth, but with the lateral frontal teeth (situated just outside of the bases of the eye-peduncles) triangulate and subacute; lateral margins without spines. Ophthalmic segment, between the eyes, completely uncovered. Terminal postabdominal segment divided by a median notch into two unequal rounded lobes. Eye-peduncles robust, in the adult shorter than the width of the front, with the corneæ considerably dilated; their basal scales with a rounded lobe on their outer margins, and with their apices subtruncated and armed with two or three spinules. The peduncles of the antennules in the adult scarcely reach to the end of the eye-peduncles; the antepenultimate and penultimate joints of the peduncles of the antennæ each bear a small spinule above, besides the longer *aciculum* which projects from the dorsal surface of the penultimate joint, which has one or two smaller spinules on its inner margin; the joints of the antennal flagella are almost naked. The coxæ of the outer maxillipedes and chelipedes are almost contiguous. The chelipedes are nearly equal and of moderate size; the merus-joints trigonous, the margins (in the adult) armed with a few spinules toward the distal extremity; upper and outer surface of the wrists scantily hairy and spinulose, the spinules arranged in three longitudinal series; palms rather turgid, about as long as the fingers, spinulose and hairy, the spinules smaller and more crowded below, larger and more distinctly longitudinally seriate on the upper and outer margins; fingers spinulose and hairy, with subexcavate dark corneous tips, and opening somewhat obliquely. The last three joints of the first and second ambulatory legs are hairy and spinulose above; the terminal joints slender, longer than the preceding, and externally longitudinally canaliculated on the inner surface, bearing a series of oblique *sulci* which are bordered with hairs. Both the fourth and fifth legs are chelate;

\* Ann. Sci. Nat. sér. 3, Zool. x. p. 61 (1848).

the dactyli well developed and impinging against the produced scabrous infero-distal lobe of the preceding joint. The postabdomen (in the female) has on its left side three appendages, articulated with as many membranaceous dorsal plates, and each terminating in four filaments or flagella, which are clothed with long hairs. The uropods on one side are imperfect, their rami ~~are~~ margined with rather long hairs; the segment with which they are articulated has a longitudinal groove on its dorsal surface. The coloration (which is probably faded in both the specimens examined) is yellowish or whitish, with very faint pink reticulations in the larger specimen; the chelæ are pink, the eye-peduncles bordered on the sides with broad longitudinal bands of brownish pink; the under and inner surfaces of the last two joints of the second and third legs are of the same colour. The length of the carapace (in the larger specimen) is about 1 inch 5 lines (37 millim.), the length of the third (right) leg exceeds  $3\frac{1}{2}$  inches (90 millim.); but the specimen being dried, its exact dimensions cannot be given.

Of this species a rather small adult female was taken in the Arafura Sea, 32–36 fms. (No. 160). A much larger female, in mutilated condition, wanting the postabdomen, is among the Banksian specimens in the British-Museum collection, from which the description is mainly taken.

This species resembles *Clibanarius*, and differs from most species of *Pagurus* in the subequal spinulose chelipedes; in the structure of the ophthalmic segment of the eyes, the absence of a rostrum, and in other points it is a true *Pagurus*. In *P. platythorax*, Stm., a species with equal chelipedes, the chelæ and legs are not spinulose.

The *Pagurus minutus*, Hess (*vide* Haswell, Cat. p. 156), from Sydney, is too briefly described for certain identification, but seems to be distinguished from *P. rubrovittatus* by the shorter antennal appendages and tuberculated non-spinuliferous chelipedes.

### 8. *Clibanarius tæniatus*.

*Pagurus clibanarius*, Quoy & Gaimard in *Voy. de l'Uranie*, Zoologie, Crust. p. 529, pl. lxxviii. fig. 1 (1824).

*Pagurus tæniatus*, M.-Edwards, *Ann. Sci. Nat. sér. 3, Zool. x.* p. 62 (1848).

*Clibanarius tæniatus*, Stimpson, *Proc. Acad. Nat. Sci. Philad.* p. 235 (1858).

A single male was obtained at Port Molle, inhabiting a shell of a species of *Purpura*. Another specimen, presenting a precisely similar system of coloration, is in the British-Museum collection from Shark Bay (*F. M. Rayner*, H.M.S. 'Herald').

These specimens agree with the figure of Quoy and Gaimard, and differ from the specimens referred to *C. vulgaris* in the collection of the British Museum, in having the carapace (as well as the ambulatory legs) marked with longitudinal pale lines bordered with red: in the specimens referred to *P. vulgaris* this coloration does not exist upon the carapace; the eye-peduncles are somewhat longer and

slenderer, the chelæ less swollen toward the base, and armed above with stronger spinules, which are white, and contrast strongly with the red ground-colour of the palms. It is possible, but I do not think it probable, that this species is a variety of *C. vulgaris*; the figure of Quoy and Gaimard was originally cited by M.-Edwards as synonymous with that species; nor can I be certain that the distinctions mentioned exist in M.-Edwards's *C. vulgaris*, not having seen the types.

Another very small specimen of this genus is in the collection from Port Molle (No. 118), which can scarcely be referred with certainty to any species.

### 9. *Eupagurus compressipes*. (PLATE XXVIII. fig. B.)

The carapace is nearly smooth, moderately dilated at the branchial regions, with the cervical suture very distinctly defined; the frontal margin between the eyes is very little prominent, and there is no median rostriform projection, and but two small triangular teeth on the frontal margin, situate one on the outer side of each eye-peduncle. The eye-peduncles are shorter than the carapace is wide in front, robust, and have the corneæ somewhat dilated; their basal scales are dilated at base, narrow, subacute, and entire at apex, with the margins ciliated but not denticulated. Antennular flagella very short. The bases of the antennæ bear a short spine on their outer margins, which does not reach halfway to the apex of the eye-peduncles; articulated with the dilated base of this is a longer spine, which is serrated on its inner margin, and prolonged above the bases of the antennæ nearly to the end of the eye-peduncles, on the inner side and at the base of which is a small spinule. The joints of the flagella of the antennæ are setose. The outer maxillipedes are remote from one another at their bases, and the inner margins of the ischium-joints are denticulated. The legs are pubescent; the right chelipede is more robust, but little longer than the left; the outer margins of the merus-joints in both chelipedes are spinulose toward the distal extremities, the carpus spinulose on its inner margin and on its upper surface; the hand in the larger chelipede is narrow-ovate, and very obscurely spinulose on the margins and in the middle of its outer surface, the spinules or granules nearly concealed by the pubescence; the fingers are rather shorter than the palm, denticulated on their inner margins, acute at their apices, and have between them no hiatus when closed; the smaller (left) hand is similar, but slenderer. The first and second ambulatory legs have the joints, except the dactyli, somewhat dilated and compressed, the merus-joints with a series of spinules on their anterior margins; the dactyli longer than the preceding joints, slender, somewhat compressed and curved, but not contorted. The acute infero-distal angle of the penultimate joint of the fourth legs is produced halfway along the inferior margin of the dactylus. The fifth legs are subchelate, and the chelæ densely hairy. The male postabdomen (as well as the female) bears several pairs of filiform



appendages; the uropoda are asymmetrical; the terminal segment is rather deeply notched at its distal end, the lobes denticulated. Colour (in spirit) a very light orange-pink. Length of carapace of male about  $3\frac{1}{2}$  lines (nearly 8 millim.), of right chelipede about  $6\frac{1}{2}$  lines (14 millim.), of second ambulatory leg about 10 lines (21 millim.).

Two specimens were collected at Port Denison, 4 fms. (No. 111). The larger is a male, the smaller a female with ova.

*E. compressipes* resembles *E. tricarinatus*, Stimpson, from Japan, and *E. acantholepis*, Stm., from Port Jackson\*, in the absence of a rostrum, but is distinguished from both by the nearly smooth chelæ and the more dilated joints of the first and second ambulatory legs, and from the latter also by the somewhat dilated cornæ of the eyes, the non-canaliculate carpi of the chelipedes, &c.

#### 10. *Eupagurus kirkii*. (PLATE XXVIII. fig. C.)

In this little species the carapace is scantily hairy, with the branchial regions moderately dilated, without any indication of a rostrum, and without lateral teeth, and rounded off at the antero-lateral angles. The terminal postabdominal segment has its margins minutely spinulose, is rounded on the sides, and without a median notch. The eye-peduncles are slender, and about as long as the width of the frontal margin; cornæ small and not dilated; ophthalmic scales small, entire, with subacute apices. The basal antennal joint is very short, and has a very small spinule on its outer margin: the dorsal aciculum of the following joint is very slender, and reaches very nearly to the apex of the eye-peduncles; the flagella nearly naked. The merus-joints of the chelipedes have a small spinule at the distal ends of their upper margins; the wrists are hairy, and spinulose above, with a series of more prominent spinules along the inner and upper margins; the larger (right) chela is ovate, scantily hairy, rather swollen within, externally nearly flat, with a series of small spinules along its upper and lower margins, and with some obscurely indicated granules on its outer surface: the fingers are shorter than the palm, and have between them a small hiatus at base when closed; the lower is granulated externally; both are spinulose on their outer, and toothed on their inner margins. The second and third legs are of moderate length, hairy and smooth, without spines or tubercles; the dactyli a trifle shorter than the preceding joints; the fourth legs are short and imperfectly subchelate (the infero-distal lobe of the penultimate joint being but little developed); the fifth legs apparently not subchelate, the dactyli clothed with long hairs. The uropoda are, as usual, asymmetrical; the rami with a scabrous pad on their outer surfaces. Colour (in spirit) pinkish white. Length of carapace about  $3\frac{1}{2}$  lines (about 7.5 millim.), of larger chelipede about  $6\frac{1}{2}$  lines ( $13\frac{1}{2}$  millim.), of left ambulatory leg of first pair about 7 lines (15 millim.).

A single male was obtained in the Arafura Sea (32-36 fms.).

\* Proc. Acad. Nat. Sci. Philad. p. 251 (1858).



From most of its congeners this species is distinguished by the absence of a distinct rostrum, and the form and armature of the larger chelipede; the latter character will distinguish it from *E. tricarinatus* and *E. acantholepis*, Stimpson, from Japan and Port Jackson, species in which the rostrum is absent. From the foregoing species it is at once distinguished by the longer, slenderer eye-peduncles with shorter basal scales, the form of the chelæ, slenderer ambulatory legs, &c.

11. *Petrolisthes japonicus* (*De Haan*), var. *inermis*, *Haswell*.

Port Mollo (No. 103), several specimens obtained on the beach between tide-marks; Port Curtis, 7-11 fms. (No. 85), several specimens.

Other specimens are in the collection of the British Museum from Facing Island, Port Curtis (*J. Macgillivray*, H.M.S. 'Rattlesnake'); and a small example from Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'), probably belongs here.

This species is closely allied to the well-known New-Zealand *P. elongatus*, M.-Edwards, but the chelipedes have a longer, slenderer wrist, and the palm is slenderer and its outer margin is straight, not arcuated. The variety *inermis* is distinguished by Mr. Haswell by having two spines near the distal end of the posterior margin of the wrist, not three as in *P. elongatus*. De Haan in his description of *P. japonicus* mentions three, but figures two only. The wrist is even longer and the palm more roughened above than in the Australian specimens: and the second pair of legs only has the merus-joint bispinulose at apex.

The Japanese species *Petrolisthes pulchripes*, designated by White *Porcellana pulchripes* (List Cr. Brit. Mus. p. 129, 1847), of which the type, from the Madjica-Sima group, is in the collection of the British Museum, is closely allied to the foregoing; but the chelipedes have a short thick carpus, which is much shorter than the cephalothorax, and has three teeth on its posterior margin; the distal end of the merus-joints of both second and third ambulatory legs is unarmed.

12. *Petrolisthes lamarckii* (*Leach*).

Here are referred several specimens found on the beach at Flinders Island, and one obtained between tide-marks at Port Mollo (No. 103). These examples are of small size; the front is triangulate, somewhat deflexed, sinuated on the margins, concave in the middle line above, narrowed to the apex, which is rounded; there is a very distinct postocular spine on the lateral margins of the carapace; the chelipedes are closely granulated above; the arm has a blunt tooth at the distal end of its inner margin; the inner margin of the wrist has three triangular, not very distant teeth, which decrease in size from the first to the last; at the distal end of the posterior margin are three small spines. Colour reddish or yellowish; the first and second ambulatory legs (where the coloration is best preserved) have the

carpus and penultimate joints alternately banded with yellow and red.

The type of Leach's *P. lamarchii* (from Australia) in the Museum collection has lost its chelipedes; hence the identification is not certain; but the carapace in all respects agrees with the specimens described above, and there exists a distinct postocular spine on the lateral margins.

The type specimens of *P. asiaticus*, from the Mauritius, are of larger size, but scarcely differ except in having the anterior margins of the wrists armed with more distant, but relatively smaller teeth, and in having the distal ends of the merus-joints of the first and second ambulatory legs more distinctly denticulated. Specimens apparently belonging to this form are in the Museum collection from various islands of the Pacific and Malaysian seas; and I think it very probable that it should be united with *P. lamarchii*. I may note here that the specimen recently figured by Richters\* as *P. asiaticus*, Leach (and by him retained in the genus *Porcellana*), has a more distinctly truncated median frontal lobe, and only two teeth on the posterior margin of the arm of the chelipede, and may perhaps belong to a distinct species.

### 13. *Petrolisthes haswelli*. (PLATE XXIX. fig. A.)

Carapace flattened, longer than broad, and marked with faint transverse striæ, which are bordered with short hairs; the lateral margins are cristated, the carinæ extending from the outer orbital angles to about the middle of the branchial regions; the front is subtriangulate, with the apex rounded and concave above, the margins somewhat sinuated: the outer orbital angle is not very prominent, behind it there is a spine on the hepatic region; the upper orbital margins are entire. The eyes are short and thick. There is a prominent tooth or lobe upon the antepenultimate joint of the peduncle of the antennæ, whose flagella are very long and naked. The chelipedes are moderately robust, the merus or arm very short, with a prominent lobe at the distal end of its inner margin: the carpus is flattened above, its upper surface tuberculated, the tubercles, which in the middle line are generally larger, are flattened and bordered with short hairs; its anterior margin armed with four or five unequal teeth, whose margins are themselves generally denticulated; the posterior margin armed with three spines at its distal end; palm and fingers closely tuberculated on their outer surface, the tubercles bordered with short hairs, and merging toward the upper margin into longitudinal striæ; the lower margin of the palm is straight and suberistated; fingers shorter than the palm, meeting along their inner edges, and incurved at the tips. Ambulatory legs slightly hairy, with the merus-joint moderately dilated and compressed, without spinules or teeth, except one or two small denticles at the distal end of the lower margin; the following joints

\* In Möbius, Beitr. zur Meeresfauna der Insel Mauritius &c., Decapoda, p. 159, pl. xvii. fig. 13 (1880).

are slender; dactyli short, terminating in a small claw. Colour (in the spirit-specimen) pale reddish yellow, punctulated with darker red. Length nearly 7 lines (14 millim.), breadth a little over 6 lines (13 millim.); length of chelipede about  $1\frac{1}{3}$  inch (34 millim.).

An adult female is in the collection from Thursday Island, obtained on the beach (No. 167).

There is also in the Museum collection a female from Port Curtis, Facing Island, two examples from Torres Straits (*J. B. Jukes*), and two from the 'Samarang' collection, of which one is from Koo-Keang-San.

The three distinct spines on the posterior margin of the arm seem to distinguish this form from the *P. bellis* of Heller, from the Nicobars—a species, however, which is only briefly characterized.

It is evidently very nearly allied to *Petrolisthes rugosus* (M.-Edwards), to which are referred specimens in the British-Museum collection from Karachi (*Karachi Museum*) and North Australia (*Dr. J. R. Elsey*), which species, however, has the carapace and chelipedes covered with well-defined piliferous crests, and the teeth of the anterior margins of the wrists much more regular in form and disposition.

#### 14. *Petrolisthes annulipes*. (PLATE XXIX. fig. B.)

*Petrolisthes annulipes*, *White, List Crust. Brit. Mus.* p. 63 (1847), *descript. nulla*.

Carapace moderately convex, scarcely longer than broad, its upper surface and also that of the chelipedes transversely striated; the striæ imbricated and fringed on the anterior margins with close-set short setæ; the front is subtriangulate, moderately prominent, slightly concave above, with the apex rounded or subtruncated, and the margins usually minutely spinulose; there is a spine on the upper margin of the orbit just in front of the eye-peduncles; the sides of the carapace are armed with about six spines, the first of which (when present) is situated just posterior to the outer orbital angle, the second a little behind it, the third a little within the margin on the front of the branchial region, and the other three on the sides of the branchial region and close to one another. The first exposed joint of the antennæ is armed with a spine (see fig. *b*). The ischium- and merus-joints of the outer maxillipedes are transversely striated and setose, like the carapace; the last three joints fringed on their inner margins with very long hairs. The merus-joint of the chelipedes is armed with a denticulated lobe at the distal end of its inner margin; the carpus or wrist has five denticulated teeth on its anterior margin, and three or four spines on its posterior margin; the palm is armed with a series of minute spinules on its outer or posterior margin; the fingers meet along their inner edges, and have their tips incurved and acute. The ambulatory legs are somewhat hairy, the merus-joints in the first three pairs transversely striated and setose, and armed with spinules on their

anterior margins; in the first two pairs there is also a small spinule at the distal end of the posterior margin. Ground-colour yellowish; the transverse imbrications of the carapace and legs are red; the carpus- and merus-joints of the ambulatory legs are also banded with red. Length and breadth of the carapace of the largest specimen (a female with ova) a little over 4 lines (9 millim.), of chelipede, when extended,  $9\frac{1}{2}$  lines (20 millim.).

Two adult females and three males (one very small) are in the first collection from Port Denison, 4 fms. (Nos. 111, 122), and a small male from Port Molle, 5-12 fms. (No. 118); in the second collection is an adult female from Prince of Wales Channel, 7 fms. (No. 169), and two small specimens from Thursday Island, 4-5 fms. (No. 165).

The description is taken from the largest female: in the smallest specimen the anterior margin of the front is minutely denticulated.

There are in the British-Museum collection three specimens obtained off Cape Capricorn (15 fms.). White's typical specimen is from the Philippine Islands, Corregidor (*Cuming*).

In the last consignment received from H.M.S. 'Alert' are specimens from the Seychelles.

This species cannot, I think, be confounded with any of the numerous Oriental forms described by Milne-Edwards, Dana, Stimpson, and Heller.

It is evidently nearly allied to *P. scabricula*, Dana\*, from the Sooloo Sea, and to *P. militaris*, Heller†, from the Nicobars, in both of which the spinulation of the carapace is different and the palms of the chelipedes externally pubescent. In *P. scabricula* the series of spines along the posterior margin of the wrist seem to extend along its whole length; and Heller makes no mention of the prominent spine on the upper margin of the orbit in his description of *P. militaris*, which in *P. annulipes* seems to occupy the position of the obtuse-lateral frontal lobes mentioned in his description.

Mr. Haswell (Catalogue, p. 146) refers certain specimens collected at Port Denison to the *Petrolisthes dentatus* of M.-Edwards‡; but as he only cites M.-Edwards's very short diagnosis and adds nothing respecting the Australian specimens, I am unable to say whether they are distinguishable from the species I have designated *P. haswelli* or from *P. annulipes*. M.-Edwards's types were from Java, and seem to be distinguished from the Australian species by having the posterior margin of the carpus of the chelipedes "dentelé en scie."

# 15. *Petrolisthes* ? *corallicola* (Haswell)? (PLATE XXIX. fig. C.)

? Porcellana corallicola, Haswell, *Proc. Linn. Soc. N. S. Wales*, vi. p. 759 (1881); *Cat. Austr. Crust.* p. 150 (1882).

Carapace much longer than broad, the gastric and hepatic regions

\* U.S. Expl. Exp. xiii. Crust. i. p. 424, pl. xxvi. fig. 13 (1852).

† Crust. in *Reise der Novara*, p. 75 (1865).

‡ Hist. Nat. Crust. ii. p. 251 (1837).



defined by very distinct *sulci*, and the whole of its upper surface, except near the posterior margin, very uneven; the front is deeply concave in the middle line, and its median interantennular portion much deflexed, spinulose, the spinules of unequal length; its lateral margin armed with about seven spinules, and the protogastric lobes also spinulose; the peduncles of the antennæ are without spinules. The merus-joint of the outer maxillipedes fits into a deep notch in the anterior margin of the preceding joint, and is itself excavated at its distal end. The single chelipede present in the unique example before me has a spinulose lobe or tooth at the distal end of the inner margin of the arm; the wrist and palm are flattened on the upper surface, which is armed with tubercles arranged in longitudinal series, the tubercles themselves for the most part minutely spinulose; the inner margin of the wrist is armed with three or four spines at its base, and beyond with smaller spinules; the posterior margin is armed with about seven spines; there are two spines at the distal end of the inner margin of the palm, and its outer margin is spinulose and pubescent; the fingers meet closely along their inner margins, which are entire, and their outer margins are spinulose. The first pair of ambulatory legs have the anterior margins of the merus, carpus, and propus armed with a few distant spinules, which are almost wholly absent from the same joints in the following legs. Colour whitish. The single specimen examined is a female: the carapace measures nearly 3 lines (6 millim.) in length and  $2\frac{1}{2}$  (5 millim.) in breadth; the chelipede, when extended as far as its conformation will allow, about 5 lines (11 millim.).

The single specimen was obtained at Port Molle, between tide-marks (No. 103), with *Petrolisthes japonicus*. The description given above will show that our specimen differs from Mr. Haswell's type in the more uneven carapace with more numerous lateral marginal spinules, non-pubescent posterior margin of the wrist of the chelipede, and in having two spines (not mentioned by Mr. Haswell) at the distal end of the anterior margin of the palm (see fig. c). If distinct, I would propose to designate this species *P. dorsalis*. It seems, upon the whole, to have more affinity with the genus *Petrolisthes* than with *Porcellana*, on which account I refer it, although with some hesitation, to that genus.

#### 16. *Polyonyx obesulus*. (PLATE XXIX. fig. D.)

*Porcellana obesula*, White, *List Crust. Brit. Mus.* p. 130 (1847), *descript. nulla*.

I refer to this species, though somewhat doubtfully, a female obtained from Port Denison, 4 fms. (No. 122), also one from Prince of Wales Channel, 7 fms. (No. 169), one from West Island, 7 fms., and one from Port Darwin, 12 fms. These examples resemble the three specimens in the British-Museum collection, and differ from



Dana's description of his *P. biunguiculatus*\*, in having a distinctly trilobate front, the middle lobe of which is broad, subacute, or rounded, and not much more prominent than the lateral lobes; whereas in *P. biunguiculatus*, to which species specimens from the Gulf of Suez (*R. MacAndrew*) appear to belong, the median lobe is very prominent and acute and the lateral lobes obsolete. The specimens referred to *P. biunguiculatus* also differ from *P. obesulus* in having the outer surface of the palms of the chelipedes much more closely punctulated. The cephalothorax is narrowest in the smallest-sized specimens; and in the female from Port Denison (which is one of the largest examples I have seen) is much broader than in the others; but I cannot regard this character by itself as of specific importance.

I am inclined to doubt whether the genus *Polyonyx* is distinct from *Megalobrachium*. Stimpson merely distinguishes the latter on account of the absence of the prominent accessory claw, which gives to the dactyli of the species of *Polyonyx* a biunguiculate appearance. The type of *Megalobrachium* (*M. granuliferum*, Stm.) is from the West Indies; but Stimpson refers the *P. macrochelis*, Gibbes, from Carolina, to the genus *Polyonyx*. The other species of the latter genus are Oriental in habitat.

Specimens are referred to *P. biunguiculatus* by Mr. Haswell from Holborn Island, Port Denison, by whom also this species is retained in the genus *Porcellana* (*vide* Cat. p. 147).

### 17. *Pachycheles pulchellus* (Haswell). (PLATE XXX. fig. A.)

*Porcellana pulchella*, *Haswell, Proc. Linn. Soc. N. S. Wales*, vi. p. 758 (1881); *Cat. Austr. Crust.* p. 148 (1882).

As Mr. Haswell's description is very brief, I append the following from specimens received from Dr. Coppinger:—

The carapace is smooth, rather convex, rounded on the sides, and hence somewhat orbiculate in outline, faintly striated on the sides at the back of the branchial regions. The front is rather broad, and in a dorsal view its margin appears straight; in an anterior view it is seen to be bisinuated, with a broadly rounded but very slightly prominent median lobe. The orbital and lateral margins of the carapace are entire. The first exposed joint of the peduncle of the antennæ is shorter than the following joint, and has sometimes a small blunt prominence on its inner margin; the third joint is short; the flagellum somewhat elongated, with the joints almost naked. The ischium of the outer maxillipedes has a spine at its outer distal angle; the next joint has a prominent lobe on its inner margin; the three following joints are robust. The chelipedes are robust, but not so broadly dilated as in most species of this genus; the merus or arm is very short; wrist with broad low prominences disposed in longitudinal series on its upper surface, and

\* *Vide* U.S. Explor. Exped. xiii., Crust. i. p. 411, pl. xxvi. fig. 1 (1852).

with two or three strong triangular teeth on its inner margin; palm about as long as the wrist, and with the lower finger almost triangular in shape; the outer surface of the palm is divided by four sulci into five longitudinal, smooth, rounded ridges, including the rather less prominent line or ridge along the lower margin of the palm; the fingers are smooth, scarcely denticulated on their inner margins, incurved at the tips, and have between them (when closed) a more or less distinct hiatus; the first to third ambulatory legs have the joints (except the last) armed with small tubercles or prominences on their upper margins; the dactyli have several spinules on their lower margins. The colour (of spirit-specimens) is white, faintly tinged or spotted with pink. Length  $2\frac{1}{2}$  lines (5 millim.); breadth a little over  $2\frac{1}{2}$  lines (nearly 6 millim.).

Two specimens (male and female) are in the first collection—one obtained at Port Molle, 5–12 fms. (No. 118), and the other at Albany Island, 3–4 fms. In the second collection are eight specimens (male and female) obtained at Thursday Island in 3–4 fms. (No. 177), 4–5 fms. (No. 165). Mr. Haswell records it also from Holborn Island.

This species cannot be confounded with any of the species of *Pachycheles* mentioned by Dr. Stimpson in his very useful Synopsis of the Anomura\*; and in its slenderer chelipedes approaches *Porcellana*, to which genus Mr. Haswell refers it.

In two specimens from Prince of Wales Channel, 7 fms. (Nos. 142, 169), which are probably not distinct, the chelipedes are more unequal and smoother. One example has the left chelipede much enlarged, the ridges on the palm separated by wide interspaces, and the fingers strongly arcuated.

### 18. *Porcellana nitida*, Haswell, var. *rotundifrons*.

(PLATE XXX. fig. B.)

Carapace smooth, shining, everywhere striated; the striae short and interrupted. The front is rather prominent, transverse, and very obscurely 3-lobed; the median lobe very broad and rounded; the lateral lobes (or inner orbital angles) also rounded and small. Behind the outer orbital angle, which is dentiform, is a second acute tooth, and behind this a rounded prominence; there is a small tooth on the subhepatic region. The basal joint of the antennae is very short, the second and third longer, and the fourth very short; the flagellum naked; the ischium-joint of the outer maxillipedes has a spine on its outer margin; the inner margin of the merus is produced into a thin lobe at base, the following joint is robust. The chelipedes are robust and elongated, the joints are smooth; the arm and wrist have their inner margins cristiform and acute and entire; the arm is very short, the wrist somewhat longer; the larger palm (in an adult male) is robust and considerably elongated, its upper margin rounded; the fingers are shorter than the palm,

\* Proc. Acad. Nat. Sci. Philad. p. 225 (1858).

curved at tips, and having between them a small hiatus when closed; the upper or mobile finger is strongly arcuated, sometimes with a strong blunt tooth at base; the lower has its inner margin obscurely crenulated and sometimes toothed. The first three pairs of ambulatory legs are robust, the joints nearly naked and without denticles or spinules, except on the inferior margins of the penultimate joints, which have two or three spinules at or near the distal extremity; the dactyli are short, robust, and appear biunguiculate on account of the considerable development of the accessory spine on the inferior margin, behind which is another small denticle. The ground-colour (in spirit) is yellowish; the carapace and chelipedes are blotched with pink or marked with irregular lines of the same colour. Length of carapace of an adult male about 4 lines ( $8\frac{1}{2}$  millim.), breadth about  $3\frac{1}{2}$  lines (8 millim.); length of chelipede, when fully extended, about  $8\frac{1}{2}$  lines (20 millim.).

Port Denison, 4 fms. (No. 122): a considerable number of specimens were obtained. Specimens were also received with the second collection from Friday Island, 10 fms. (No. 153), Dundas Straits, 17 fms. (No. 161), Port Darwin, 12 fms., and others dredged in the Arafura Sea at 32–36 fms. (No. 160).

The description, except as regards coloration, is taken from an adult male: the coloration is perfectly preserved in one specimen only, a female with ova. The larger specimens possessing both chelipedes are mostly of the female sex. In the females and smaller-sized specimens the lateral lobes of the front are often more acute, the palms of the chelipedes relatively shorter, the fingers meet along their inner edges when closed, and the upper finger has not the strong tooth at base, &c.

In the robust and biunguiculate dactyli of the ambulatory legs this form resembles the species of *Polyonyx*, but differs in the relatively longer carapace, which resembles that of other species of *Porcellana*.

I refer it doubtfully to *P. nitida*\*, which is very briefly described, and differs apparently in the triangulate form of the median frontal lobe, and in having an additional lateral marginal spine behind the outer angle of the orbit; but as Haswell's types were from Port Denison, at which locality specimens of the form now described were taken by Dr. Coppinger, I distinguish it merely as a variety.

#### 19. *Porcellana dispar*, Stimpson. (PLATE XXX. fig. C.)

Four males and two females from Port Jackson, 5–7 fms. (No. 104), are referred to this species, which Mr. Haswell (Cat. p. 149) observes is very common at this locality. He also records it from Port Stephens.

Stimpson's description agrees very well with the adult males, but

\* *Vide* Haswell, Catalogue, p. 148 (1882).

he does not notice that the outer margin of the smaller chelipede is armed with a series of minute spinules, which are often concealed by the pubescence. The smaller chelipede in the adult male and both chelipedes in the smaller specimens have the anterior margin of the wrist armed with two teeth, and in the smaller specimens (which yet I cannot think belong to a distinct species) the frontal and upper orbital margins are very minutely spinulose. There is developed in both chelipedes a more or less distinct longitudinal median ridge on the upper surface of the wrist and palm, and the outer margin of the hand in both is armed with a series of small spinules, so that these specimens in many points resemble *Porcellana ornata*, Stimpson, from Hong Kong.

## 20. *Porcellana quadrilobata*. (PLATE XXX. fig. D.)

In the single male from Port Denison, 4 fms., thus designated, the carapace is shaped nearly as in *Porcellanella triloba*, that is, it is much longer than broad, with the sides very slightly arcuated. The upper surface, when viewed under a lens of sufficient power, is seen to be marked with numerous rather closely-set transverse striæ. The inter-antennular portion of the front, which in *P. triloba* is entire, is in *P. quadrilobata* divided by a median triangular notch (which, however, is not so deep as the lateral notches), hence the front appears 4-lobed. The lobes are triangular and acute; on the inner margin of each of the outer lobes is a small spinule, and the inner margins of each of the inner lobes is minutely serrated. There is a very small tooth or spine at the outer orbital angle, and posterior to this the sides of the carapace are armed with five spines, the three posterior of which are placed near to one another and separated by a somewhat wider interval from the preceding tooth. On the inferior surface of the carapace, below the inferior orbital margin, there is a strong spine. The eyes are set on very short pedicels, and are nearly concealed within the orbits. The joints of the peduncles of the antennæ are short (the flagella wanting in the single specimen examined). There is a spine at the distal end of the basus-joint of the outer maxillipedes; the ischium-joint is somewhat dilated, scarcely at all emarginate at its distal end, where it is articulated with the merus, which is excavated at its distal extremity; the three following joints are moderately robust. The chelipedes are proportionately rather slender and elongated; the merus or arm is short, its inner margin somewhat cristiform, and terminating in a thin subacute lobe; there is a spine also on the under surface of the merus; the wrist is about as long as the palm, and is armed with three spines or teeth on its inner margin; the hand is slightly contorted: the surface both of hand and wrist finely striated; the fingers are rather shorter than the palm, meet along their inner edges when closed and cross at the tips, which are incurved; at the bases of the inner margins of the fingers is a patch of hair; the lower margin of the lower finger is armed with a series of small spinules. The ambulatory legs are rather slender; there are a few short stiff *setæ*, or mobile spines, at the distal end of the



slender penultimate joint of the first to third ambulatory legs; the short, curved dactyli are armed on their lower margins with a strong accessory claw, posterior to which are one or two more small teeth. Colour (in spirit) yellowish. Length of carapace about  $2\frac{1}{2}$  lines ( $5\frac{1}{2}$  millim.), breadth nearly 2 lines (4 millim.).

This species is scarcely distinguished from the typical *Porcellana latifrons*, Stimpson, except by the somewhat different denticulation of the lobes of the front, and in the latter having, as it would seem, the posterior margin of the wrist armed, as well as the anterior, with three spines. The specimens described by Stimpson were from Hong Kong. *Porcellana armata*, Dana, has a much less prominent front.

*Porcellana streptochirus* of White\*, from the Philippines, is, I think, a mere variety of this species. It differs only in the somewhat broader carapace, in having the frontal lobes armed with more numerous spinules, and in having the under surface of the merus of the chelipedes armed with three or four spines in place of the single spine in *P. quadrilobata*; and these characters are possibly due to the greater age of the specimens.

In one of White's specimens the wrist is tridentate, in the other it is subentire.

This species, in its elongated carapace and slender chelipedes, establishes a transition to the genus (or subgenus) *Porcellanella*, the species of which have a prominent and tridentate front. The genera of the Porcellanidea stand much in need of revision; and I may add that I doubt the constancy of the characters derived by Stimpson from the size and number of the denticulations of the dactyli of the ambulatory legs as generic distinctions.

There are in the collection three small specimens from Thursday Island, 4-5 fms. (No. 165), which in many of their characters are closely allied to *P. serratifrons*, Stimpson, yet are probably distinct, but to which, on account of their very imperfect condition, I will not apply a specific designation. In one specimen the chelipede is probably aborted, having the palm narrow and twisted and the fingers abnormally developed. These specimens are further distinguished from *P. serratifrons* by having three (not 1 or 2) spinules on the sides of the branchial regions, six to eight spines on the anterior, and two on the posterior margin of the carpus of the chelipede, &c. In the single specimen (a young one) possessing both chelipedes the lower margins of both right and left palms are spinulose.

## 21. *Galathea australiensis*, Stimpson. (PLATE XXXI. fig. A.)

Here are referred a male from Port Denison, 4 fms. (No. 111), and another from Port Molle, 14 fms. (No. 93), in the first collection; also a series of seven specimens from the Arafura Sea, 32-36 fms. (No. 160), in the second collection, among which are both males and females. Stimpson's description was from a female. In the adult males I have examined the palms are broader and the fingers have between them a hiatus when closed, and are strongly toothed on their

\* List Crust. Brit. Mus. p. 64 (1847), *descript. nullā*.



inner margins near the base (the teeth themselves generally appearing erenulated when viewed with a lens of sufficient power), and there are usually one or two spinules discernible on the hepatic region.

There are specimens in the British-Museum collection obtained between Cumberland Island and Slade Point, and from Port Jackson (*J. Macgillivray*, H.M.S. 'Rattlesnake'), and others from Flinders Island and Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'). The specimens from Flinders Island and Shark Bay have, however, the upper surface of the wrist and palm of the chelipedes much more strongly and distinctly spinulose, and may possibly prove to be distinct.

Mr. Haswell (Cat. p. 162) notes the possible identity of *G. australiensis* with *G. spinosorostris*, Dana, from the Sandwich Islands, a species somewhat insufficiently described. He has himself briefly characterized a form, the distinctive characters of which may perhaps not be sufficient to separate it from *G. australiensis*. *G. corallicola*, from Port Molle, scarcely differs from *G. australiensis*, except in the absence of the gastric spinules, for the form of the chelæ and fingers is evidently a character liable to variation, according to the sex and age of the individual.

I may note here that there is in the Museum collection a specimen from the Philippines perhaps belonging to the species briefly characterized by Haswell under the designation *G. aculeata*.

## 22. *Galathea elegans*.

*Galathea elegans*, White, *List Crust. Brit. Mus.* p. 66 (1847), *descript. nullâ*; *Crust. in Voy. H.M.S. 'Samarang'*, pl. xii. fig. 7 (1848); *Haswell, Cat. Austr. Crust.* p. 163 (1882).

Here is referred, although with some hesitation, a specimen from Albany Island, 3-4 fms., first collection, and one from Port Molle, 14 fms., second collection. They differ from White's types of this species in the British-Museum collection, from the Philippines, Corregidor (*Cuming*), and Borneo, Unsang (*H.M.S. 'Samarang'*), in the smaller, more inconspicuous spinules of the lateral margins of the rostrum. The chelipedes are somewhat more elongated and slender than in a dried specimen which I take to be a female of White's species, the fingers relatively shorter, and the spinules of the carpus and penultimate joint smaller and well nigh concealed by the pubescence. The coloration, as depicted in the figure cited, is of no value as a specific distinction, since not any two specimens agree exactly in their markings. In the Bornean examples they are much broader than in the Philippine specimens, from one of which they are wholly absent. In the specimen from Albany Island they are distinguishable only on the anterior part of the post-abdomen. The ground-colour in nearly all is dull red.

In the adult males of *G. elegans* (the type specimens of which have never been described) the carapace is strigose, the strigæ ciliated, its lateral margins armed with 8 or 9 prominent spinules; the rostrum is elongated, narrow-triangular, as long, or nearly as long, as the cara-

pace; its lateral margin armed with about 8 spinules; the joints of the chelipedes also spinulose and hairy; fingers rather shorter than the palm, minutely denticulated on their inner margins, not gaping when closed, with the tips incurved; the merus- and carpus-joints of the first and second ambulatory legs are spinulose on their anterior margins; and one of the denticules of the inferior margin of the terminal joint is more prominent than the others.

If the Australian specimen does not belong to *G. elegans*, it may be referable to *G. longirostris*, Dana\*, from the Fijis, which is very incompletely known, which it resembles in the minute serrulation of the carapace and rostrum and the shorter fingers of the chelipedes, which are not, however, less than half the length of the palms, as in Dana's description.

In more than one of the specimens in the Museum collection the rostrum is slightly deflexed, and I think it probable that *G. deflexifrons*, Haswell (Cat. p. 163), from Albany Passage (*H.M.S. 'Alert'*), should be regarded merely as a marked variety of *G. elegans*.

### 23. *Munida spinulifera*. (PLATE XXXI. fig. B.)

This species is evidently nearly allied to *Munida japonica*, Stimpson; and it will suffice here to allude to the distinctive characters and some other points not mentioned in Stimpson's description. As in *M. japonica*, the anterior part of the gastric region is armed with a transverse series of thirteen spinules. On the sides of the carapace, at a short distance behind the spine at the outer orbital angle, is usually a single small spinule (whereas Stimpson, in his description of *M. japonica*, says, "Regio gastrica superficie utrinque tri-spinulosa"). On the front of the branchial regions, just behind the cervical suture, is another small spinule not mentioned by Mr. Stimpson. The lateral margins of the carapace have about seven spinules, inclusive of the outer orbital spine, which is rather long.

The median spine of the rostrum (in the specimens I have examined) is considerably more than twice the length of the lateral spines, and is arcuated, with scarcely any trace of lateral denticulations. The second postabdominal segment has several spinules on its upper surface on the anterior margin. The merus, carpus, and penultimate joints of the ambulatory legs are spinulose; the spinules on the penultimate joints usually developed only on the posterior (or inferior) margins.

Three specimens, of which one (the only one having a chelipede) is a male, the two others females with ova, were obtained in the Arafura Sea, 32-36 fms. (No. 160).

In the specimen of *M. japonica* from the Korean Straits, referred to in my Report on Capt. St. John's collection†, not only are the lateral frontal spines relatively much longer (half the length of the

\* Crust. in U.S. Explor. Exped. xiii. p. 482, pl. xxx. fig. 11 (1852).

† Proc. Zool. Soc. p. 51 (1879).

median spines, as in Stimpson's description), but the median spine is itself arcuated and very distinctly denticulated on the lateral margins as well as on the dorsal surface, and there are two spines on the front of the branchial regions. Nevertheless a sufficient series of specimens might perhaps hereafter show the Australian to be a mere variety of the Japanese form.

In the absence of the supraocular spines these species resemble the American genus (or subgenus) *Galathodes*, A. M.-Edwards\*, but the corneæ of the eyes are considerably dilated, and the dactyli of the ambulatory legs (in *M. spinulifera*) are not strongly spinulose. Of all the numerous American species of *Munida* described by A. M.-Edwards (*t. c.* pp. 47-52) the nearest allies to *M. spinulifera* are apparently *M. iris* and *M. irasa*, from which *M. spinulifera* is distinguished by having the first two segments of the postabdomen armed with several spinules &c.

#### 24. *Mastigochirus quadrilobatus*, Miers.

Seven specimens were collected in Prince of Wales Channel, 5-7 fms. (No. 150), which scarcely differ from the type from the Philippines in the British-Museum collection except in having the median frontal lobes generally somewhat more acute. A careful comparison of these specimens with the (previously) unique dried type example shows that the number of joints in the terminal flagelliform portion of the anterior limbs (which are imperfectly seen on account of the hairs with which they are thickly clothed) was understated in the original description; instead of being ten or twelve, they are usually twice as numerous.

### MACRURA.

#### 1. *Gebia carinicauda*, Stimpson.

Two females are in the collection from the beach at Thursday Island (No. 167). Another in the British Museum was collected by Mr. MacFarlane on the shores of one of the islands in Torres Straits. Stimpson's types were from Hong Kong. These specimens agree very well with Stimpson's description, except that the upper margins of the dactyli of the anterior legs can scarcely be described as carinated. The spinules of the front are almost completely concealed by the pubescence, but are distinctly visible in a lateral view.

In a smaller specimen, also a female and from the same locality, the spinules mentioned by Stimpson as existing above the genital apertures in the third pair of legs (and which are very distinct in the larger examples in the 'Alert' collection) are not developed.

\* Bull. Mus. Comp. Zool. viii. p. 53 (1880).

*G. carinicauda* is nearly allied to, and may prove to be identical with, *G. hirtifrons*, White, which Mr. Haswell (Cat. p. 164) mentions as commonly occurring in sponges at Port Jackson; but in the latter species the spine of the lower margin of the hand (which exists in adult examples of *G. carinicauda*) is absent. I may add that in the type specimen of *G. hirtifrons* the bases of the second, as well as of the third, pair of legs bear a spinule.

## 2. *Gebiopsis darwinii*. (PLATE XXXII. fig. A.)

The carapace is vertically deep and laterally compressed (as in *Gebiopsis nitidus*, A. M.-Edw.); its sides converge very slightly to the front, which has four median spines on its anterior margin, arranged nearly in a semicircle, and are equidistant, and behind this the lateral margins are denticulated. The carapace is densely pubescent above in front, and its dorsal surface is bordered anteriorly by a suture, which is continued backward nearly as far as the cervical suture, which is deep and well defined. The segments of the postabdomen are nearly smooth, but clothed with a few hairs; the terminal segment slightly transverse, with the posterior margin straight and unarmed. The eyes, which have very short and thick peduncles, are well nigh concealed beneath the front in a dorsal view. The antennules are short, the peduncles scarcely reaching beyond the front, and each bearing two subequal flagella. The antennæ are little longer than the carapace; the slender peduncles reach somewhat beyond the front; the penultimate and terminal joints are short, and clothed above with long hairs; the flagella of the antennæ terminate in a pencil of hairs, and the several joints also bear a few setæ. The chelipedes are subequal and moderately robust; the merus-joints unarmed and somewhat hairy; the hairs longest and most abundant along the inferior margins; the wrists are short, thinly clothed with hair, and having a few minute spinules along their upper margins, of which the anterior one is the most prominent; the palms longer than broad, somewhat turgid, rounded above and below, and thinly clothed with hair, which is arranged in distant longitudinal lines; the fingers are hairy, much shorter than the palms, thickened at base, dentated on their inner margins, with their apices slightly crossed when closed, the upper much curved. The second legs have the under margins of the merus-joints densely fringed with hair, and the last three joints are also hairy; the penultimate joint longer than the preceding, moderately dilated and compressed; dactyli shorter than the preceding joint; the third legs are similar to the second, but the merus is less hairy below, and the propus is shorter; the fourth and fifth legs are much shorter and slenderer than the foregoing, and the last three joints are more or less hairy, the hairs thickest along the inferior margins of the propus. The rami of the uropoda are broad, with the distal margins straight; they about reach to the distal end of the terminal segment of the postabdomen. Colour (in spirit) yellowish white. The length of the largest specimen does not exceed 9 lines (19 millim.).



Seven specimens were collected at Port Darwin at 12 fms (including both sexes); two or three are females with ova. In the last collection from H.M.S. 'Alert' specimens from Singapore are apparently not specifically distinguishable, although presenting some slight distinctions.

From *Gebiopsis nitidus*, A. M.-Edwards\*, from the Cape Verdes (the type of the genus), this species is distinguished by the somewhat different form of the rostrum, the existence of a spine on the carpus of the chelipedes, the much shorter antennular and antennal peduncles, &c.

A male from Fremantle, S.W. Australia (*Dr. J. S. Bowerbank*), differs in the form of the rostrum, which is anteriorly deflexed; its margins armed with ten spines in front of the first of the denticles of the sides of the head; of these, four (of which two are longer) are arranged in a semicircle in front, and three, posterior to them, on each side. I would propose to designate this, if specifically distinct, *G. bowerbankii*.

The genus *Gebiopsis* scarcely differs from *Gebia*, except in the greater development of the lower finger of the chelipedes (which thus are perfectly chelate), and is probably to be regarded as a sub-genus.

### 3. *Axius plectrorhynchus*, *Strahl*.

I am somewhat uncertain of the identity of the specimen in the 'Alert' collection with *Strahl's* type from Luzon, and therefore subjoin the following description:—

The carapace and postabdomen are somewhat membranaceous in texture, as in most species of the genus. The cephalothorax is vertically deep and laterally compressed; the carapace is smooth, without spines, and has the cervical suture distinctly marked. The rostrum is prominent and narrow, concave above between the eyes; it is produced somewhat behind them, and is armed on the lateral margins with five or six teeth; at the base of the rostrum, in the median dorsal line, the carapace rises into an abrupt prominence; both the gastric and cardiac regions are distinctly defined. The postabdominal segments are smooth, the first very small, the rest nearly of equal length; the lateral margins of the second to sixth segments are nearly straight, entire, and are not produced into spines at either the antero-lateral or postero-lateral angles; the terminal segment is quadrate, very little broader than long, a little broader in its proximal than in its distal half, and has its posterior margin straight. The eyes are of moderate length and thickness, and have distinct black corneae; the antennules are of moderate length, their antepenultimate joints longer than the two following, which are subequal; the two flagella are of equal thickness, with naked joints. The antennae are shorter than the animal, the antepenultimate joint of the peduncle shorter than the following, and armed beneath with a small spinule; the penultimate joint longer than the last joint; the

\* *Nouv. Archiv. Mus. Hist. Nat.* iv. p. 63, pl. xviii. figs. 4-7 (1868).



joints of the flagella almost naked. The scale at base of the antennæ is acuminate at its distal end, and between it and the peduncle is a strong spine, which is apparently articulated with the antepenultimate peduncular joint. The outer maxillipedes are subpediform, and the joints are hairy on their inner margins. The anterior legs are wanting in the single specimen I have seen; the three following legs have the joints somewhat compressed; the merus and carpus in the second legs are somewhat dilated and fringed below with long hairs, the palm forming with the dactyl a perfect chela, the fingers of which are acute and meet along the inner edges; the following legs are not subchelate; the palm in the third pair is ovate, fringed with short stiff hairs below and on the sides, dactyl very short; in the fourth pair the palm is somewhat slender and more elongated, more thickly clothed towards its distal end with plumose hairs; the fifth legs are shorter and comparatively slender and feeble. The postabdominal appendages are biramose, the inner larger than the outer branch. The rami of the uropoda are somewhat indurated and considerably dilated; their distal margins are straight, ciliated, and minutely spinulose, and they reach to the end of the terminal segment of the postabdomen. Colour (in spirit) whitish. Length about 1 inch  $4\frac{1}{2}$  lines (35 millim.).

The single example collected, which is, I think, a male, was obtained on the beach between tide-marks at Port Molle (No. 103), and is in very imperfect condition.

Although the anterior legs are wanting in this specimen, there can, I think, be no doubt of its generic position.

#### 4. *Thalassina anomala* (Herbst).

To this species probably belongs a female of rather small size from Thursday Island, obtained in the mangrove-swamps (No. 124).

In this specimen the chelipedes are of nearly equal size, and both chelæ are as slender and as much elongated as is the smaller chela in the adult *T. anomala*, and are strongly spinulose on their upper margins.

The examination of this specimen induces me to regard certain small examples (of both sexes) from Borneo, Singapore, and the Indian Ocean which I formerly \* referred to *T. anomala*, and which have a more broadly triangulate rostrum, and the upper margins of the wrists and hands of the chelipedes armed with much smaller spinules along their upper margins, as probably referable to a distinct species. White's *T. talpa*, however, is, as I have already stated, probably a young *T. anomala*.

To the localities mentioned in my paper referred to above is to be added Nicol Bay, N.W. Australia, whence the Museum possesses a small mutilated example (*M. du Boulay*).

Perhaps the species described by Hess† from Sydney as *T. maxima* is to be regarded merely as a variety of *T. anomala*.

\* Ann. & Mag. Nat. Hist. ser. 5, v. p. 377 (1880).

† Archiv f. Naturgeschichte, xxxi. p. 163, pl. vii. fig. 18 (1865).

5. *Alpheus edwardsii*.

- Athanasus edwardsii*, Audouin, *Explic. planches de Savigny, Descript. de l'Egypte, Atlas*, pl. x. fig. 1 (1809).
- Alpheus heterochelis*, Say, *Journ. Acad. Nat. Sci. Philad.* i. p. 243 (1818); *M.-Edw. Hist. Nat. Crust.* ii. p. 356 (1837); *De Kay, Crustacea in Zool. New York Fauna*, p. 26 (1844); *Gibbes, Proc. Amer. Assoc. Advanc. Sci.* p. 196 (1850); *Kingsley, Bull. U.S. Geol. and Geogr. Survey*, iv. (No. 1) p. 194 (1877); *Smith, Trans. Conn. Acad. Sci.* ii. pp. 23, 39 (1869); *Lockington, Ann. & Mag. Nat. Hist.* ser. 5, i. p. 475 (1878).
- ? *Alpheus armillatus*, *M.-Edw. Hist. Nat. Crust.* ii. p. 475 (1837).
- Alpheus neptunus*, triton, rhode, and amphitrite, *White, List Crust. Brit. Mus.* p. 74 (1847), descr. nullâ.
- Alpheus doris*, *White, t. c.* p. 75 (1847), descr. nullâ.
- Alpheus ararus*, *De Haan (nec Fabricius), Crust. in Fauna Japonica*, p. 179, pl. xlv. fig. 3 (1849), *Alpheus bisincisus* on plate.
- Alpheus edwardsii*, *Dana (nec Milne-Edwards), Crust. in U.S. Explor. Exped.* xiii. p. 342, pl. xxxiv. fig. 2 (1852)?; *Heller, Sitzungsber. der Akad. Wissensch. Wien, math.-nat. Klasse*, xlv. (i.) p. 267 (1862); *Norman, Ann. & Mag. Nat. Hist.* ser. 4, ii. p. 174 (1868); *Miers, Cr. in Zool. 'Erebus' and 'Terror'*, p. 4, pl. iv. fig. 3 (1874), *A. neptunus* on plate; *Hilgendorf, Monatsb. Akad. Berlin*, p. 830 (1878).
- Alpheus edwardsii*, var. *leviusculus*, *Dana, t. c.* p. 543, pl. xxxiv. fig. 3 (1852).
- Alpheus strenuus*, *Dana, t. c.* p. 545, pl. xxxiv. fig. 2 (1852); *Miers, t. c.* p. 5, pl. iv. fig. 2 (1874), *A. doris* on plate; *Monatsb. Akad. Berlin*, p. 831 (1878).
- ? *Alpheus pacificus*, *Dana, t. c.* p. 544, pl. xxxiv. fig. 5 (1852), var. ?
- Halopsyche lutaria*, *Saussure, Rev. Zool.* p. 100 (1857).
- Alpheus lutarius*, *Saussure, Mém. Soc. Phys. et Hist. Nat. Genève*, xiv. p. 461, pl. iii. fig. 24 (1858); *von Martens, Arch. f. Naturg.* xxxviii. p. 139 (1872).
- Alpheus bisincisus* (*De Haan*), *Stimpson, Proc. Acad. Nat. Sci. Philad.* p. 30 (1860); *Miers, Proc. Zool. Soc.* p. 53 (1879).
- Alpheus crassimanus*, *Heller, Reise der Novara, Crust.* p. 107, pl. x. fig. 2 (1865), var. ?
- ? *Alpheus bispinosus*, *Streets, Proc. Acad. Nat. Sci. Philad.* p. 242 (1878).
- Alpheus edwardsii* and *A. strenuus*, *De Man, Notes from the Leyden Museum*, xxi. p. 105 (1881).

As the very common and widely distributed species which is here referred to the *Alpheus edwardsii* of Audouin has been designated by many different specific names, it may be useful to point out its most salient characters, more especially as Savigny's excellent figure, by which alone the species may be easily identified, is not accompanied by any description. The rostrum is short, acute, and arises from the front margin of the carapace; on either side of it, between the front and supraocular arches, a longitudinal depression extends back on the dorsal surface of the carapace for a short distance, so that the dorsal surface is slightly carinated. The second (exposed) joint of the antennules is longer than the first. The basal scale of the outer antennæ scarcely reaches beyond the peduncle, and is

without or has only a rudimentary spine at base; it narrows somewhat to its apex, which has a small spinule at its outer angle. The larger chelipede (which may be either the right or left) has a massive hand, which is rounded at its proximal end, notched above and toothed below, just behind the bases of the fingers; on the outer and inner surface of the palm, just below the incision in the upper margin, is an irregular shallow depression, that on the inner surface being somewhat of a triangulate and that on the outer surface of a quadrangulate shape: an impressed line, which forms the posterior margin of the depression of the inner surface, passes obliquely downward to the lower and proximal margin, and upward over the rounded superior margin, whence it is prolonged in a nearly straight line along the upper and outer surface to the rounded base of the upper margin: this line is sometimes nearly obsolete; the mobile finger is rounded and subcarinated above, and is armed on its inner margin near the base with a very prominent rounded tooth or lobe, which fits into a deep pit in the lower (immobile) finger; the smaller chela is slender (in the typical form), without notches, teeth, or sulci; the second joint of the carpus of the second leg is usually a little shorter than the first, the three last joints short, the fifth a little longer than the fourth.

In some specimens the lobe or tooth immediately behind the notch on the upper and lower margins of the large chela is rounded or subacute, in others it is acute.

Eight specimens (males and females) are in the first collection from Port Curtis, 0-11 fms. (No. 92), one (male) from Port Molle beach (No. 95), and two females from Port Denison, 4 fms. (No. 111); a small specimen (No. 123) is without special indication of locality. In the second collection are two small specimens from Thursday Island, 4-5 fms., a female from Dundas Straits, 17 fms. (No. 161), and an adult female from the beach at Port Darwin (No. 176).

There are, besides, specimens in the British-Museum collection from other localities as follows:—North Australia (*Dr. J. R. Elsey*), Port Essington and Rockhampton (*Godeffroy Museum* as *A. brevirostris*, M.-E.). Also from the Red Sea (*Dr. C. Heller*); Gulf of Suez (*R. MacAndrew*); Egypt (*J. Burton*); Zanzibar (*Dr. Kirk*); Seychelles (*Dr. E. P. Wright*); Karachi (*Karachi Museum*); Ceylon (*E. W. H. Holdsworth*); Indian Ocean, Philippine Islands, Bohol (*Cuming*); Japan, Katsura (*Capt. H. C. St. John, R.N.*, the specimens I formerly designated *A. bisincisus*, De Haan); New Hebrides (*J. Macgillivray*); Fiji Islands, Nairai (*H.M.S. 'Herald'*); Samoa Islands, Upolu (*Rev. S. J. Whitmee*); Tahiti (*Mus. Godeffroy*, as *A. pacificus*, Dana); Sandwich Islands (*W. H. Pease*). Specimens from the island of Trinidad (*R. J. Lechmere Guppy*) and the west coast of Central America (*Capt. Dow*) seem to be scarcely specifically distinguishable\*.

The males may be distinguished from the females by the form of

\* The series of specimens in the British-Museum collection, extensive though it be, does not fully exhibit the ascertained range of this species. According to

the smaller chela of the first pair of legs. In the females the fingers are slender, straight, and acute, and scantily pubescent; in the males the dactyl is relatively broader, subspatulate in form; toward the distal extremity the lateral margins are closely and densely fringed with hairs, which pass in an oblique line over the sides of this joint, and meet on its dorsal surface immediately behind its acute apex. Among the males the form of this (the smaller) chela is subject to considerable variation; sometimes (as in Dr. Heller's Red-Sea specimen in the Museum collection) it is, as stated above, smooth and entire, without notches or *sulci*, but it often exhibits a gradual approach in form to the larger chela in having the upper margins more or less distinctly notched, and even occasionally in exhibiting traces of distinct depressions on the outer and inner surface. As the two varieties appear to pass into one another by almost insensible gradations, I have not ventured to distinguish them by name. Of this latter form there are specimens from the Gulf of Snez, Karachi, Samoa, and Shark Bay, West Australia (*F. M. Rayner*, H.M.S. 'Herald'), in the Museum collection. Among the Shark-Bay specimens (preserved dry) in the Museum collection one, which is apparently a female, has a slight indentation on the lower margin of the smaller chela.

Specimens from China (*Gen. Hardwicke*) in the Museum collection are further distinguished by having a small spinule on either side of the mobile finger at the distal end of the upper margin of each chela. These have been designated by White *A. chivagricus*, M.-Edw., whether rightly or not I cannot determine.

In certain specimens I have observed that the interocular portion of the rostrum is somewhat elevated and subcarinated, as in the form from the Nicobars designated *A. crassimanus* by Heller\*, which may perhaps be a mere variety of *A. edwardsii*. Dr. Heller notes a difference in the form of the smaller chelipede in *A. crassimanus* exactly resembling that I have described above as occurring in *A. edwardsii*. This character, I may add, seems to be alluded to by Hilgendorf † in his remarks upon *A. strenuus*; but if so, that author was not aware of its being a mere sexual distinction, but apparently supposed it to be a good specific character. It is also mentioned by De Man, who, although regarding *A. strenuus* and *A. crassimanus* as distinct species, regards the difference in the form of the smaller hand as probably sexual ‡.

In the British-Museum collection are specimens of what appears to be a distinct but closely-allied species from the Fiji Islands, Totoya (*H.M.S. 'Herald'*), and Sandwich Islands (*W. H. Pease*),

S. I. Smith (*t. c.*) it ranges from N. Carolina southward to the Abrolhos (Brazil), and Lockington mentions its occurrence on the Lower Californian coast and at Realejo on the west coast of Nicaragua (as *A. heterochelis*); Dr. F. Richters records it from the Mauritius.

\* Reise der Novara, Crustacea, p. 107, pl. x. fig. 2 (1865).

† Monatsber. der Akad. Wissensch. Berlin, p. 831 (1878).

‡ 'Notes from the Leyden Museum,' xxv. p. 105 (1881).



which is distinguished by having a small but well-developed spinule on the outer side of the antennal scale at base, and the fingers of the smaller chelipede slender, arcuated, considerably longer than the palm, thickly clothed with long hair on their inner margins, and having between them an interspace when closed. In the adult the fingers are sometimes elongated to a remarkable degree, three times as long as the palm in one specimen. This form I propose to designate *Alpheus gracilidigitus*.

*Crangon monopodium*, Bosc \*, is very possibly this or an allied species. As, however, it is impossible to identify that author's brief description and rude figure as given in his second edition (1830) with any species with certainty, and as his designation has never been adopted by any subsequent writer, I prefer to retain Andouin's name *A. edwardsii*, about which there is no uncertainty and which has been used by several authors of repute. I have never seen the first edition of Bosc's work.

Both the *Alpheus edwardsii*, as described by Dana from Cape-Verd specimens, and the *A. pacificus*, Dana, from the Sandwich Islands, differ in having the second joint of the carpus of the second pair of legs much shorter than the first joint, but are probably mere varieties of the typical *A. edwardsii*.

The species I described from the Samoa Islands as *A. lineifer* † is allied to *A. edwardsii*, but may be distinguished by the smoother chelipede and the existence of a well-developed spine on the outer side of the peduncles of the antennæ. It may perhaps be the young of *Alpheus parvirostris*, Dana, from the Balabac Straits; but the first joint of the carpus of the second pair of legs is relatively shorter, and the large chela of the first pair relatively narrower and more elongated than in Dana's figure.

#### 6. *Alpheus obesomanus*, Dana.

A small example from Port Molle, 5-12 fms. (No. 118), is referred to this species.

Several small specimens are in the British-Museum collection from Ovalau, Fijis (*H.M.S. 'Herald'*). Dana's types were also from the Fiji Islands. Dr. F. Richters has recently recorded this species from the Mauritius (Isle des Fouquets).

This species is remarkable on account of the turgid form of the larger chelipede and the great elongation of the second carpal joint of the second pair of legs.

#### 7. *Alpheus gracilipes*, Stimpson.

I thus designate a specimen from Port Molle, obtained on the beach (No. 95), and another small example from Flinders Island,

\* Hist. Nat. Crust. ii. p. 96, pl. xiii. fig. 2 (1802).

† Ann. & Mag. Nat. Hist. ser. 4, xvi. p. 343 (1875).



which differ from the specimen doubtfully referred to *A. gracilipes*, from Capt. St. John's Corcan collection, in the British Museum\* only in having the inferior margins of the merus-joint of the larger chelipede distinctly serrated and its upper margin bluntly angulated at the distal end, whereas in the Corcan specimen the inferior margins are nearly smooth and the upper margin ends in a distinct spine. A specimen from Ceylon (*E. W. H. Holdsworth*) is somewhat intermediate in these characters. Nothing is said regarding the form of this joint by Stimpson in his original description. I may add that both the Japanese and Australian specimens differ from Stimpson's description, founded on examples from Tahiti, in having the first joint of the carpus a little shorter than the second.

### 8. *Alpheus minor*, var. *neptunus*.

*Alpheus minus*, Say, *Journ. Acad. Nat. Sc. Philad.* i. p. 245 (1818); *M.-Edwards*, *Hist. Nat. Crust.* ii. p. 356 (1834); *De Kay*, *Zool. New York Fauna*, *Crust.* p. 26 (1844); *White*, *List Crust. Brit. Mus.* p. 75 (1847); *Gibbes*, *Proc. Amer. Assoc. Advanc. Sci.* p. 196 (1851); *Kingsley*, *Bull. U.S. Geol. Survey*, p. 190 (1878).

? *Alpheus formosus*, *Gibbes*, *l.c.* p. 196 (1851).

*Alpheus neptunus*, *Dana*, *U.S. Expl. Exp.* xiii. Cr. i. p. 553, pl. xxxv. fig. 5 (1852); *Stimpson*, *Proc. Acad. Nat. Sci. Philad.* p. 31 (1860), var.

*Alpheus charon*, *Heller*, *Sitz. Akad. Wissensch. Wien*, xlv. i. p. 272, pl. iii. figs. 21, 22 (1862); *Crust. in Reise der Novara*, p. 107 (1865), var.

*Alpheus minor*, *Lockington*, *Ann. & Mag. Nat. Hist.* ser. 5, i. p. 472 (1878).

Three specimens, of which two are females with ova, were obtained at Thursday Island, 4–5 fms. (No. 165).

A small specimen is in the British-Museum collection from Port Jackson, between Bell's Head and Goat Island (*J. Brazier*).

To this species also are referred specimens from the Gulf of Suez (*R. MacAndrew*), Karachi (*Karachi Museum*), and Ceylon (*E. W. H. Holdsworth*), besides three specimens presented by T. Say, and therefore of typical value, from East Florida.

Dana's types were from the Sooloo Sea, and Stimpson records it from Ousima and Hong Kong.

I can find nothing, either in the descriptions of authors or in the specimens I have examined, to warrant the specific separation of the Oriental from the American species. The ocular spines and rostrum are, however, somewhat shorter and more triangulate in the Floridan examples than in the Oriental form; and as Kingsley notes a similar distinction between specimens occurring on the Eastern and Western American coasts, I retain Dana's name for the Oriental variety. On the American coasts it is recorded by Kingsley from North Carolina to the Bermudas on the east, and at Pearl Islands Bay, off Panama, on the west.

\* *Vide* Proc. Zool. Soc. p. 55 (1879).

### 9. *Alpheus comatularum*, *Haswell*.

Since Mr. Haswell's description of this species is brief, it may be of service to subjoin the following, which was drawn up before his Catalogue came to hand:—

The body is smooth; carapace with the sides nearly straight and the antero-lateral angles appearing right angles in a dorsal view. The rostrum is very long, reaching nearly to the end of the peduncles of the antennules, vertically compressed and acute; it has a dorsal keel, which is prolonged backward to the gastric region of the carapace, which is rather convex; the supraocular spines are long and acute, but not half as long as the rostrum. The lateral margins of the second to sixth segments of the postabdomen terminate in small spines in the males; in the females the third to sixth segments are laterally acute; in the males the first, and in the females the first and second segments have their lateral margins broadly rounded. The terminal segment is about twice as long as broad, with four spines on its upper surface (two on either side of the middle line) and four at its distal end (two on either side of a slightly prominent median lobe). The eyes are completely concealed beneath the carapace; the penultimate and antepenultimate joints of the antennular peduncles are of about equal length, the last joint a little shorter; the longer of the two flagella is about as long as the carapace, with ciliated joints; outside of the peduncles is a flattened spine, which reaches to the middle of the penultimate peduncular joint. The terminal joint of the peduncle of the antennæ is much elongated, the preceding joint very short; the flagella robust and hardly as long as the body; the basal scale is shorter than the peduncle, bipartite at its distal end, the outer lobe spiniform and acute; there is a small external basal spine, below which is another larger spine. The larger chelipede (either the right or left) has a slender merus-joint, which is armed with a small spinule at the distal end of its upper margin; the carpus (in both) is extremely short, armed above and below with a strong spine; palm subcylindrical, elongated, smooth, without notches, rounded above and below, with a small spinule at the distal end of its upper margin; fingers each with a blunt rounded tooth on its inner margin, the upper dilated laterally, compressed and carinated above. In the smaller chelipede the palm is slender, the fingers incurved at the tips, the dactyl much longer than the lower finger and strongly arcuated. In the second legs the last joint of the carpus is slightly longer than the three preceding joints (which are very short); the following legs are moderately robust, and terminate in small curved claws. The rami of the uropoda are rounded, ciliated, and very minutely granulated at the distal ends, the outer somewhat the larger; their basal portions are armed with a spine above. Colour (in spirit) yellowish or pinkish; an adult female with ova is a deep brown-pink. Length of an adult female nearly 1 inch 2 lines (30 millim.), of its large chelipede about  $9\frac{1}{2}$  lines (20 millim.); the males are somewhat smaller.

Two females were obtained at Albany Island, 3-4 fms., whence also it is recorded by Mr. Haswell, and a small male at Warrior Reef (first collection); also an adult male from Prince of Wales Channel, 7-9 fms., and three from Thursday Island, 4-5 fms. (No. 165), from the second collection.

Specimens are in the British-Museum collection from Ceylon (*E. W. H. Holdsworth*), and I have also seen examples from Singapore (in the collection of A. O. Walker, Esq.).

The remarkable development of the rostrum and orbital spines and the form of the antennal scale serve to distinguish this species.

According to Mr. Haswell (Cat. p. 189), whose description of this and several other of his new species was based on specimens obtained by H.M.S. 'Alert,' it is invariably found clinging to the arms of a species of Comatulid, to which its markings give it a general resemblance. The carapace is marked with longitudinal stripes of brownish purple, with a narrow median white line, which is continued on the first two postabdominal segments; at the sides are three short white markings, the abdomen has broad brownish-purple and narrow white lines, bases of antennæ purple, longitudinal stripes of purple on the ambulatory legs; large hand marked with longitudinal lines of light brown, bordered by narrow darker bands.

#### 10. *Alpheus villosus*, *M.-Edw.*

An adult example is in the collection from Warrior Reef (first collection), and two specimens (one of small size) from Thursday Island, 3-4 fms. (No. 177), in the second collection.

A female with ova from the Australian coast (without special indication of locality) is in the Museum from the collection of Dr. J. S. Bowerbank.

To the characters given by Milne-Edwards I may add that there exists a small spinule on the outer margin of the first exposed joint of the antennular peduncles. The larger chela is vertically very deep at its base, but narrows towards the fingers; the smaller one is pubescent, but without *sulci* or spinules; the fingers quite as long as the palm.

#### 11. *Pontonia (Conchodytes) tridacnæ*, *Peters.*

A large series of specimens was obtained at Warrior Reef, at from 10-16 fms. (No. 137), together with specimens of *Pinnotheres villosulus*, which inhabited "pearl-shells:" whether the *Pontonia tridacnæ* had the same habitat is stated to be uncertain. By far the greater number of the specimens collected were females with ova. In the full-sized examples the second pair of legs are very much larger and more robust than in the specimen figured by Dana (the only one he had seen), having the palm robust and elongated, rounded above and below, and the fingers less than half the length of the palm, the mobile finger strongly carinated above, with a tooth

or lobe on its inner margin, which fits into a cavity between two smaller teeth on the inner margin of the lower finger. These characters are, however, less marked in specimens in which the second legs are less developed, and there are one or two examples in which the chelæ scarcely differ in form and proportions from Dana's figure; hence I have not ventured to regard the species as distinct.

A specimen, dried and very imperfect, which probably belongs to this species, is in the British-Museum collection from Keppel Island, Port Curtis, obtained within the shell of a live *Pinna* (*J. Macgillivray*, H.M.S. 'Rattlesnake'), others from the collection of H.M.S. 'Herald,' from the interior of *Tridacna* (without indication of locality), and others from Matuka and Ngau (*H.M.S.* 'Herald'). In all the specimens from the 'Herald' collection the second pair of chelipedes are less developed, as in Dana's figure of this species, which was based on a specimen from Tutuila, in the Samoan or Navigator group (*Crust. U.S. Expl. Exp. xiii. p. 571, pl. xxxvii. fig. 1, 1852*).

It appears very doubtful whether the *P. maculata*, Stimpson\*, from *Tridacna* obtained at Bonin, can be regarded as distinct from *P. tridacna*, from which it is only distinguished by Stimpson by its elongated form and slenderer rostrum; the rostrum is, however, described as reaching only to the penultimate joint of the antennular peduncles (and hence shorter than is usual in *P. tridacna*) and truncated at apex.

The genus *Conchodytes*, established for this species by Dr. Peters, can, I think, scarcely be regarded as generically distinct from *Pontonia*; but the name may perhaps be conveniently retained as a subgeneric designation for *P. tridacna* and the allied species. Dr. Hilgendorf, who had the opportunity of examining Dr. Peters's type, distinguishes it from *Pontonia* merely by the shorter antennal flagellum†; but the flagellum in *P. macrophthalmia* (which Dr. Peters himself supposes to belong to *Conchodytes*) is represented as being much longer. (See M.-Edwards, *Atlas in Cuvier's 'Règne Animal,' Crustacés, pl. lii. fig. 3.*)

## 12. *Harpilius inermis*. (PLATE XXXII. fig. B.)

Body not compressed, smooth, and dorsally rounded, and without spines either on the carapace or postabdomen. Rostrum spiniform, rounded and smooth above, longer than the eye-peduncles, rather broad at base, appearing acute at apex in a dorsal view, without spinules or teeth on its upper or lower margins; it is laterally somewhat compressed, and in a lateral view its apex is rounded. The terminal postabdominal segment is rounded above, but narrows considerably towards its distal end, which bears several setæ; the lateral margins are unarmed. The eye-peduncles project laterally and are of moderate size; the antennular peduncles project slightly

\* *Proc. Acad. Nat. Sci. Philad. p. 38 (1860).*

† *Sitzungsber. der Akad. Wissensch. Berlin, p. 835 (1878).*



beyond the rostrum and bear two flagella, whereof one is considerably thickened and is bipartite at its extremity; the antennal peduncles are short, with the last joint longer than the preceding; their basal scales ovate, much longer than the peduncles, and without spinules; rounded and ciliated at the distal ends; the flagella are shorter than the animal, with the joints nearly naked; the two last joints of the outer maxillipedes are slender, setose, and together little longer than the antepenultimate joint, which, like the preceding, is moderately dilated. The anterior legs are slender, with the wrist elongated and about twice as long as the palm and fingers taken together; the second chelipedes, although larger than the preceding, are yet slenderer than in many allied forms; the joints are without spines; the right leg a very little more robust than the left; the merus or arm about as long as the ischium and little longer than the carpus, which is rounded above and below and not half as long as the palm; the palm is smooth, rounded above and below, very slightly compressed; the fingers rather more than half the length of the palm, with thin inner edges, incurved and acute at the tips, and each armed with a tooth near the base on the inner margin, that of the dactyl being the larger; in the left chelipede the teeth are not developed. The three following legs are slender, unarmed, and terminate in a small simple curved claw. The uropoda reach a little beyond the distal end of the terminal postabdominal segment; their bases are armed above with a spine; the rami are ovate and ciliated, the outer a little broader than the inner. Colour (in spirit) light yellowish. Length of the single specimen (a female) about 10 lines (21 millim.), of second chelipede about 7 lines (15 millim.).

*Single* The second specimen was found in the interior of a shell of a species of *Pinna*, obtained on the coral-reefs at Port Molle, and bears ova.

This species in its general appearance and in many details, as in the edentulous rostrum, ovate antennal scales, and the form of the chelipedes, bears a striking resemblance to *Anchistia aurantiaca*, Dana\*, from the Fijis, but differs in the form of the outer maxillipedes and of the dactyli of the ambulatory legs, in which it rather resembles *Harpilius*. As this is the only spirit-specimen, I have not ventured to dissect the buccal organs to ascertain the absence of a mandibular palpus; but there can, I think, be little doubt that this species is rightly placed with *Harpilius* and *Anchistia*.

There is in the British-Museum collection a dried example from Shark Bay, W. Australia (*F. M. Rayner*, H.M.S. 'Herald'), which probably belongs here. This specimen also was found in the interior of a *Pinna*-shell.

Another closely allied species exists in the Museum collection, represented by a single dried specimen from the interior of *Tridacna* (H.M.S. 'Herald'), without precise indication of locality, which differs in the form of the rostrum (which appears acute in a lateral view), and in having a spine on the anterior margin of the carapace

\* U.S. Expl. Exp. xiii. Cr. i. p. 581, pl. xxxviii. fig. 2 (1852).



above the scale of the external antennæ, which is armed with a spinule at its antero-external angle. This I propose to designate *H. spinuliferus*.

### 13. *Anchistia petitthouarsi*, Audouin?

The carapace, with its rostrum, is shaped nearly as in *Palæmon*; the terminal postabdominal segment is narrow, with four spines on its upper surface, placed close to the lateral margins, and terminates in two long mobile spines and three smaller spines. There is a supraorbital spinule situated on each side of the rostrum, between it and the eyes and just behind the anterior margin of the carapace, also an antennal spine outside of the eyes, and one (the branchio-stegal?) placed below the eyes and behind the anterior margin. The rostrum is longer than the peduncles of the antennæ, nearly straight, has six teeth on its upper and four on its lower margin, and is bidentate at apex; the last tooth of the series is situated in the median dorsal line of the carapace behind the anterior margin. The eyes are, as in *Leander*, of moderate size and project laterally. The antennules have the antepenultimate (?) joint of the peduncles dilated, laminate, and vertically compressed, with a small spinule at its antero-external angle; the two following joints are short and slender and terminate in two flagella, of which the thicker is shortly bifid at its apex, the other is broken. The antennal scale is much elongated, narrow, nearly reaching to the apex of the thicker antennulary flagellum, and completely concealing (in a dorsal view) the peduncles of the antennæ; it is ciliated on its inner margin and at its apex, and has a spinule at its antero-internal angle; the antennal flagellum is about as long as the animal. The outer maxillipedes are subpediform, with the antepenultimate but little thicker than the last two joints, the penultimate longer than the last joint. The anterior legs (or chelipedes) are very slender, with the wrist as long as the palm and fingers together; the second legs are slender, but thicker than the preceding; merus-joint with a small spine at the distal end of its inferior margin; the wrist, which is little longer than the palm, is also armed with a spine at its distal extremity; the palm is very slender, nearly terete, and about as long as the fingers; these latter are without teeth on the inner margins, and have the tips slightly incurved. The ambulatory legs are slender and clothed with a few distant hairs; the penultimate joints very long; the dactyli slender, styliiform, nearly straight, and not half as long as the preceding joints. The bases of the uropoda have a small spinule at the distal end of the outer margin, and there are two subterminal spinules on the outer margin of each outer ramus; the rami are subovate (as usual) and ciliated at the distal extremity and along the inner margins; the outer somewhat broader than the inner ramus. Colour (in spirit) whitish. Length nearly 10 lines (21 millim.).

The unique specimen (a female with ova) was obtained at Port Mollo on the beach (No. 98).

I regard the *Anchistia grandis* of Stimpson, from Ousima\*, as synonymous with *Anchistia pettitthouarsi*.

The differences in the proportions of the second legs in our specimen and that described by Mr. Stimpson may perhaps be due to sex. Stimpson does not mention the number of the teeth (if any) on the inferior margin of the rostrum in his example; but as he says "*A. ensifronti* affinis," it may be presumed that, as in Dana's species, there are three teeth on the inferior margin of the rostrum, and also that there is, as in that species, a supraocular spine.

*Anchistia inaquimana* of Heller is, according to Kossmann†, also synonymous with *A. pettitthouarsi*. It is remarkable that neither in the figure of Savigny, nor in Heller's long description of *A. inaequimana* in the 'Beiträge zur Crustaceen-Fauna des rothen Meeres,' can I find any indication of the supraocular spine; so that our specimen may after all belong to a distinct species.

#### 14. *Coralliocaris? tridentata*. (PLATE XXXII. fig. C.)

The body is rounded above and not compressed; the anterior margin of the carapace bears a strong spine outside of the eye-peduncles and above the basal antennal scale. The rostrum is short, not reaching to the end of the peduncles, and has three spiniform teeth on its upper margin; its lower margin is entire; the apex curves gently upward and is acute. The segments of the postabdomen are without spinules; the terminal segment has four small mobile spinules on its upper surface near the lateral margins, and the somewhat rounded apex is tipped with a few short setæ. The eyes are rather short, robust, and reach about halfway to the apex of the rostrum. The antepenultimate joint of the peduncles of the antennules is about as long as the two following taken together; these are short and of equal length; the longer flagellum is broken in the single specimen examined, the shorter is slightly bipartite at its distal end. The basal antennal scales are shorter than the peduncles of the antennules, rounded and ciliated at the distal ends, and with a very small spinule on the outer margin. The antepenultimate joint of the outer maxillipedes is very little longer and broader than the penultimate joint, which about equals the terminal joint in length. The anterior legs (the left only is perfect) are very slender; the wrist much exceeds the hand in length, the slender palm about equals the fingers. Of the second legs also only the left is perfect; this limb has the joints smooth and unarmed, the merus longer than the carpus, which is less than half the length of the palm, which is much shrivelled, but its lower margin appears to have been carinated; the fingers are less than half the length of the palm, acute at their apices, and without teeth on their inner margins. The third legs are robust, with the merus and penultimate joints compressed; the dactyl minute, curved, and with a minute tooth on the lower margin. The following legs are imperfect.

\* Proc. Acad. Nat. Sci. Philad. p. 39 (1860).

† Zool. Ergebn. Reis. roth. Meer. ii. p. 83 (1880).

The rami of the uropoda are somewhat longer than the terminal segment, ovate, the outer somewhat broader than the inner. Colour (in spirit) purplish brown. Length about  $7\frac{1}{2}$  lines (16 millim.).

The single specimen, a female with ova, was obtained at Thursday Island, 4-6 fms. (No. 130), and is in very imperfect condition, the right chelipede of the first and second pair and most of the ambulatory legs being deficient. Nevertheless the species may be distinguished from all described by Dana, Heller, or Stimpson by the different dentition of the rostrum. On account of the minute dactyl with its inferior tooth I refer this species to *Coralliocaris*; but it differs from the typical species in the slenderer maxillipedes and shorter antennal scales.

### 15. *Palæmon (Leander) intermedius*, Stimpson.

Three specimens, two of which are females with ova, were obtained at Port Jackson, 0-5 fms. (first collection). Stimpson's specimens were also from Port Jackson.

Specimens are in the British-Museum collection from King George's Sound, S.W. Australia, and from Ovalau, Fiji group (*F. M. Rayner*, H.M.S. 'Herald'), and also from Tasmania.

This species usually has eight teeth above and five below, exclusive of the subapical tooth on the rostrum, and more rarely seven above and four below, as stated by Stimpson. The apex is usually, but not invariably, bidentate; in one of the specimens from Port Moller the subapical tooth is placed further back on the dorsal surface of the rostrum, which thus appears simple at its apex. There is a small spine at the base of the antennal peduncles outside of the antennal scale.

I regard the *Palæmon (Leander) serenus* of Heller\*, from Sydney, as very probably a mere variety of *P. intermedius*. Mr. Haswell (Cat. p. 195) retains the two species as distinct; but he appears to have seen no specimens, and his translated descriptions are inaccurate as regards the second pair of legs in both species.

### 16. *Sicyonia ocellata*, Stimpson.

A small specimen is in the second collection, from Thursday Island, 4-5 fms. (No. 165), which agrees with Stimpson's description and the specimens in the British-Museum collection from Ceylon and Hong Kong. To this species also belongs, I think, the *Sicyonia* briefly characterized by Mr. Haswell, but without specific name, from Port Jackson (*vide* Cat. p. 205).

### 17. *Penæus granulosus*, Haswell.

A small male from Port Darwin, 12 fms. (first collection), belongs here, and also, I think, a male specimen from Thursday Island,

\* 'Reise der Novara,' Crust. p. 110, pl. x. fig. 5 (1865).

4-6 fms., in Dr. Coppinger's second collection (No. 130), which has the terminal postabdominal segment broken.

These specimens, although males, have a distinct dorsal carina on the carapace, in this particular agreeing with Mr. Haswell's description of the female and differing from the specimens he regards as the males of this species.

*P. granulosus* comes very near to *P. monoceros*, Fabricius, which species, however, has no lateral spines on the margins of the terminal segment.

#### 18. *Penæus velutinus*, Dana.

Here are referred two specimens (one of which is an adult male) from Port Darwin, 12 fms.; a specimen from Albany Island, 3-4 fms.; and a small example from Thursday Island, 4-5 fms.

For remarks upon the specific characters and geographical range of this widely-distributed species, I may refer to my paper on Crustacea from the coast of Senegambia\* and memoir on the Penæidea†.

I may add that in *P. velutinus* there are present an antennal and hepatic spine, and a third spine (the branchiostegal?) situated on the anterior margin of the carapace below the eye-peduncles; also usually a minute supraorbital spinule or denticle, or a notch indicative of its position, in the anterior margin.

#### 19. *Penæus batei*. (PLATE XXXII. fig. D.)

The carapace and postabdomen are covered with a very short close pubescence as in *P. velutinus*. The carapace has scarcely any traces of *sulci*, and has a well-developed antennal and a small hepatic spine; also a very small pterygostomial spine or spinule. The rostrum scarcely reaches beyond the ends of the peduncles of the antennules; it is scarcely prolonged at all backward as a median longitudinal dorsal crest; its distal extremity curves slightly upward and is acute; its lower margin is entire; its upper margin is armed with two teeth placed just in front of the anterior margin of the carapace; behind these, on the gastric region of the carapace, is a rudimentary tooth. The third to sixth segments of the postabdomen are carinated in the dorsal median line; the carina on the sixth segment ends in a small spinule on the posterior margin of this segment. The terminal segment is slightly longer than the preceding, narrow, longitudinally carinated above, and terminates in a strong spine, on either side of which are three lateral spines, of which those nearest to the distal extremity are smaller and placed immediately above the preceding. The eyes are large, much more dilated than their short peduncles. The terminal joint of the peduncles of the antennules is shorter than the preceding; the flagella subequal and very short, not so long as the peduncles. The

\* Ann. & Mag. Nat. Hist. ser. 5, viii. p. 367 (1881).

† Proc. Zool. Soc. p. 304 (1878).



peduncles of the antennæ are very short, completely concealed beneath the large basal scales, which reach slightly beyond the antennal peduncles, narrow to their apices, and have a small spinule at the distal ends of their outer margins. The outer maxillipedes are rather robust and elongated, reaching, when thrown forward, almost to the apices of the antennal scales. The first legs are much shorter than the following, with the joints compressed, the dactyli acute, and the basus and ischium-joints have each a small spine at the distal ends of their inner margins; the second and third chelipedes are slender (the basus-joint of the second legs bears a small spine); the third are longer than the second; the fourth legs are slender and rarely as long as the third; the fifth are imperfect. The rami of the uropoda are narrow, and reach about to the end of the terminal segment; the outer has the lateral margins nearly parallel; in the inner ramus they converge very slightly to the rounded extremity. Colour (in spirit) purplish beneath the cinereous pubescence. Length about 2 inches 10 lines (72 millim.).

The unique example (a female) was obtained at Albany Island in 3-4 fms.

The palpi of the mandibles are two-jointed; the joints flattened, dilated, and ciliated, as in *Penæus*.

As the specimen is unique, I have not been able to make a complete examination of the branchiæ; but I think (as in the true *Penæi* as restricted by Mr. Spence Bate) no true podobranchiæ are present, but merely the epipoditic appendages or "mastibranchiæ" as he denominates them\*.

There are, besides, in the collection from Port Denison a specimen closely allied to *Pasiphæa* and to *Leptochela*, Stimpson; and another crustacean, perhaps belonging to the Penæidea, which, being in very mutilated condition, cannot be described in detail, and which I leave for the present undetermined.

\* *Vide* Spence Bate "On the Penæidea," Ann. & Mag. Nat. Hist. ser. 5, viii. p. 174 (1881).

In this recent memoir on the Penæidea several new genera and not a few new species have been very briefly characterized, to none of which, I believe, can our new form be referred. The descriptions, however, are insufficient. From *Hemipenæus*, which this species resembles in its short and few-toothed rostrum, it differs in the structure of the flagella of the antennules.

Mr. Spence Bate includes in the very insufficiently defined genus *Penæopsis* the *P. styliiferus*, M.-Edwards, with which he apparently considers *P. dobsoni*, Miers, to be identical. He has strangely overlooked an important distinction, twice mentioned by me in my paper (*vide* Proc. Zool. Soc. 1878, pp. 305, 307), namely the absence of lateral marginal spinules on the terminal postabdominal segment. They are absent, I may add, alike in the female and in Prof. Wood-Mason's small male. The existence of these in *P. styliiferus* is mentioned by Milne-Edwards in his original description of that species, and they are present also in a specimen referred to *P. styliiferus* in the British-Museum collection.



## STOMATOPODA.

1. *Squilla nepa*, *Latr.*

A small male is in the collection from Port Darwin, 7-12 fms. (No. 173).

For remarks on the geographical distribution, and an enumeration of localities whence the British-Museum collection possesses examples of this common and widely-distributed species, I may refer to my revision of the group\*.

Since its publication specimens have been added to the National Collection from W. Borneo †.

2. *Gonodactylus chiragra* (*Fabr.*).

Two small males are in the collection from Port Molle (beach, No. 98) in the first collection, and one from the beach at Thursday Island (No. 167) in the second collection, of larger size.

Since I referred to the distribution of *G. chiragra* in 1880, specimens both of this species and of *G. graphurus* have been added to the collection from various Malayasian localities ‡; and of *G. chiragra* also from Ceylon (*Dr. W. Ondaatje*).

*Dr. Kossmann* § confidently identifies this very common species with the *Cancer falcatus* of *Forskål* ||, whose name, having priority over that of *Fabricius*, would displace the almost universally adopted designation *G. chiragra*, if the identification be correct. But I am inclined to think that *Forskål*'s description may not improbably have been based upon a specimen of the almost equally common *G. graphurus*; the words (used of the terminal segment) "in medio scuti gibbus, elatus, hemisphæricus, carinis longitudinalibus, convexis, pone mucronatis numero quinque" will apply better to the latter form, on the supposition that *Forskål* overlooked the small outermost pair of lateral prominences; in *G. chiragra* but three dorsal carinæ are distinctly developed, and these, in the adult at least, are not mucronate. Under these circumstances it will be better, perhaps, to retain the accepted designations than to run the risk of further unnecessarily complicating the synonyms by applying *Forskål*'s doubtful name to either species.

3. *Gonodactylus graphurus*, *White* (ined.), *Miers*.

Specimens of this widely distributed species, which appears to be very abundant on the N.E. Australian coasts, are in the collection

\* *Ann. & Mag. Nat. Hist.* ser. 5, v. pp. 25, 118, 120 (1880).

† *Vide* 'Annals,' t. c. pp. 458, 459.

‡ *Vide* 'Annals,' t. c. p. 459.

§ *Malacostraca*, in 'Zool. Ergebn. einer Reise in Küstengeb. des roth. Meeres,' p. 100 (1880).

|| 'Descriptiones Animalium,' &c. p. 96 (1775).

from Port Molle, obtained on the beach (No. 92), at 5-15 fms. (No. 118), and 14 fms. (No. 93). Some of these (No. 95) are adult males of large size. Also a small female from Port Denison, 4 fms. (No. 111). All of the above are from Dr. Coppinger's first collection. Also a small male from Clairmont Island (No. 151), and two specimens from Thursday Island—a female from the beach (No. 167) and a male from a depth of 4-5 fms. (No. 165)—in the second collection.

## ISOPODA.

### 1. *Ligia gaudichaudii*, var. *australiensis*, Dana?

Here are somewhat doubtfully referred several specimens obtained on the beach above high-water mark at Port Molle. Dana's brief diagnosis was based on imperfect specimens in which both the antennæ and uropoda are wanting; and as Mr. Haswell had seen no specimens of this species, and therefore adds nothing to our knowledge about it in his Catalogue, the following description may be useful:—

The body is oblong-oval, moderately convex, but little laterally dilated. The head is transverse, with its anterior margin convexly rounded, without any median rostriform point, its upper surface granulated and transversely sulcated, one of the *sulci* running parallel to the posterior margin, and others bordering the posterior margin of the eyes. The segments of the thorax are rather indistinctly granulated above; the postero-lateral angles of the first segment are nearly right angles, those of the second and third slightly more acute, those of the fourth to seventh segments acute and posteriorly prolonged, yet not to so great a degree as in some species of the genus. The segments of the postabdomen are nearly smooth above in the middle line, but granulated on the sides, and have as usual the postero-lateral angles acute and produced; the postero-lateral angles of the penultimate segment scarcely reach more than halfway to the apex of the corresponding angle of the terminal segment. The terminal segment is longer than the preceding; the posterior margin has a very slight median prominence, and a rather deep notch close to the postero-lateral spine; the margin of the notch, although sometimes slightly sinuated, is not dentated as in *L. gaudichaudii*; the postero-lateral spine is short and scarcely reaches beyond the level of the posterior margin. The eyes are very large, black. The minute antennules are not visible in a dorsal view. The antennæ are shorter than the animal, and have the penultimate and terminal joints of the antennæ slender and elongated, the terminal longer than the preceding joint; the three preceding joints are robust and much shorter; the flagellum composed of 26-30 joints; the joints of the legs are clothed with short stiff *setæ*, which are most abundant on the inferior margins of the four last joints; below the terminal claw is a second small subterminal one on all the legs. The terminal joint of the stem of the uropoda

is somewhat elongated, trigonous, and has a small spinule at its distal end; the rami are subequal and longer than the base, yet not greatly elongated as in some species. The colour (in spirit) is yellowish, usually closely and somewhat irregularly punctulated with black. Length of the largest example about 8 lines (17 millim.); breadth nearly  $3\frac{1}{2}$  lines (7 millim.).

These specimens very nearly resemble examples referred to *L. gaudichaudii* from Madjica-Sima in the Museum collection; but the body is less distinctly granulated, and the granulations do not generally extend over the median dorsal line of the postabdominal segments, and the notches of the terminal segment are not distinctly toothed. In one specimen, however, I have observed a continuous line of granules bordering the posterior margins of the postabdominal segments.

In the uncertainty that exists regarding the true nomenclature of not a few species of this genus, I prefer to retain the name of *australiensis* as a designation for this variety. Mr. Thomson\* has described a species from Dunedin, New Zealand (*L. quadrata*), which is evidently nearly allied to the *L. australiensis*, but may, perhaps, be distinguished by the less prominent postero-lateral angles of the last postabdominal segment, which is described as "subquadrate, with the angles hardly projecting."

## 2. *Ceratothoa imbricata*.

*Oniscus imbricatus*, *Fabr. Mantissa Insect.* i. p. 241 (1787).

*Cymothoa imbricata*, *Fabr. Ent. Syst.* ii. p. 503 (1793); *Suppl.* p. 304 (1798).

*Cymothoa banksii*, *Leach, Dict. Sci. Nat.* xii. p. 353 (1818); *Desmarest, Consid. Crust.* p. 309 (1825); *M.-Edwards, Hist. Nat. Crust.* iii. p. 273 (1840); *Heller, Reise der Novara, Crust.* p. 148 (1865).

*Cymothoa trigonocephala*, *M.-Edwards (nec Leach?)*, *Ann. Sci. Nat.* sér. 2, iii. pl. xiv. figs. 1, 2 (1835); *Crust. in Cuv. Règne Animal*, pl. lxxv. fig. 2; *Hist. Nat. Crust.* iii. p. 272 (1840), var.; *Guérin, Icon. Crust. Règne Animal*, pl. xxix. fig. 2 (after *Milne-Edwards*).

*Ceratothoa trigonocephala*, *Heller, Novara Crust.* p. 148 (1865); *Thomson, Trans. New-Zeal. Inst.* xi. p. 233 (1879), var.; *Haswell, Cat. Austr. Crust.* p. 282 (1882), after *M.-Edwards*.

? *Cymothoa approximans*, *White, t. c.* p. 110 (1847).

*Ceratothoa banksii*, *Miers, Cat. New-Zeal. Crust.* p. 135 (1876).

A small specimen, presenting no distinctive external sexual characters, is in the collection from Port Jackson, 0-5 fms. It is undoubtedly identical with a somewhat larger specimen from the same locality in the British-Museum collection, taken "from the mouth of a bream." The type example of *C. banksii* (thus designated in the handwriting of Dr. Leach) is of larger size, and is said to have been obtained in the New-Zealand seas; it presents no distinctions which can be regarded as of specific importance, and the description which I have

\* *Trans. New-Zeal. Inst.* xi. p. 232 (1879).

already given of it in the 'Catalogue of New-Zealand Crustacea' will apply equally well to the smaller Australian examples, except that in these latter the eyes are distinct and dark-coloured, the antero-lateral prolongations of the first thoracic segment (in the smallest specimen especially) somewhat narrower at base, and the posterior margin of the terminal postabdominal segment somewhat arcuated\*.

The type of Fabricius's *Cymothoa imbricata* is also in the British-Museum collection (from the collection of Sir J. Banks), and I am enabled to identify Leach's species with it with tolerable certainty. The slight notch in the terminal segment mentioned by Fabricius is, I think, merely due to an accident. As White referred Fabricius's *Cymothoa imbricata* to the genus *Nerocila*, and the type, when my New-Zealand Catalogue was published, had not been placed in the general collection of the Museum, I did not then suspect its identity with *C. banksii*. The species in the New-Zealand Catalogue (p. 107) which I designated, after White, *Nerocila imbricata* must be called *Nerocila macleayi*, White having previously used this name for it (*vide* Dieffenb. Voy. New Zealand, ii. p. 268, 1843).

It is not improbable that the original *C. trigonocephala*, Leach, must also be regarded as synonymous with this species; nevertheless, as the type specimens (which are dried and without definite locality) present certain slight distinctive characters, as (*e. g.*) the head is narrower, more distinctly triangulate, with straight sides, and the anterior thoracic segment proportionately longer than is usual in *C. imbricata*, I keep them provisionally distinct (*cf.* Ann. & Mag. Nat. Hist. ser. 5, v. p. 463, 1880). To ascertain the true distinctive characters of the species of this difficult group, a careful revision of the whole subject is needed. Milne-Edwards's description of *C. trigonocephala* in the 'Histoire naturelle des Crustacés' seems to have been drawn up from specimens of a variety having a more obtuse front, and the anterior margin of the first thoracic segment armed with a median lobe or tooth. Specimens presenting these characters are in the British-Museum collection from Shark Bay. Mr. Haswell, in his Catalogue, and Thomson (*t. c.*) merely copy M.-Edwards's description.

I refer specimens in the Museum collection to *Ceratothoa imbricata* from Port Essington (*Haslar Hospital*); Sydney, Murray River (*A. E. Craven*, from the mouth of a salmon-trout); Shark Bay, W. Australia (from a species of *Monacanthus*); Calcutta (designated by White *C. approximans*); and various other specimens without special indication of locality.

### 3. *Cirolana multidigitata*, Dana.

A small female from Albany Island belongs, I think, to this species.

\* The posterior margin in Leach's type is slightly rolled in through the desiccation of the specimen; it should not have been described as "nearly straight."



The inner ramus of the uropoda is less distinctly triangulate than in the specimens in the British-Museum collection from the Philippines and Swan River\*. The median lobe of the front is not at all prominent.

Reference to this species is omitted in Mr. Haswell's Catalogue.

#### 4. *Cirolana schiödtei*. (PLATE XXXIII. fig. A.)

Body narrow-oblong, microscopically punctulated, convex and smooth, as in *C. rossii*. Head closely encased in the first segment of the body, transverse, with scarcely any indication of a median inter-antennular rostral point, anteriorly bordered with a transverse groove running parallel to and just behind the anterior margin; there is a similar groove bordering the posterior margin of the eyes. The first segment of the body is longer than the following; the postero-lateral angles of the first four segments are rounded, those of the fifth to seventh segments are right angles. Five or six postabdominal segments are visible in a dorsal view; the first five are very short, the lateral angles of the second to fourth curve backward and are much prolonged and acute or subacute; the terminal segment is widest at base, and beyond this subtriangulate, with the lateral margins converging in a gentle curve to the distal extremity, which is acute or subacute; the margins in their distal half are ciliated and minutely serrated. The eyes, seen laterally, are oblong (as in *C. rossii*); they each occupy rather less than one third of the total length of the front margin of the head, and extend but a short distance over its inferior surface. The antennules reach nearly to, or even a little beyond, the posterior margin of the head; the joints of the peduncle are short, the first two slightly more dilated than the third, the flagellum composed of a great number of very short joints. The interantennal plate ("*lamina frontalis*") lies between the bases of the antennæ, its sides diverge slightly from the base to a point situate between the antennules and antennæ, where it bears a strong tooth; beyond this its distal extremity is acute, and lies between but does not completely separate the antennules. The antennæ about reach to the posterior margins of the fifth body-segment. The first two joints of the peduncles are very short, the third and fourth somewhat longer and robust, the fifth yet longer, but slenderer than the preceding; the flagellum is composed of a great number of joints (50-65). The three posterior epimera have their postero-lateral angles prolonged and acute. None of the legs of the body are ancoral. The ischium- and merus-joints in the first three pairs are dilated and dorsally produced. The margins of the third to fifth joints in all the legs are clothed with stiff setæ; the dactyli in all are but slightly curved. The basæ of the uropoda are prolonged at their inner and distal angles into a strong spine; the rami are ciliated on the margins and acute at their apices, the outer much narrower and a little shorter than the inner, which reach a little

\* *Vide* Journ. Linn. Soc. xiii. p. 511, pl. xxiv. figs. 6-11 (1878).



beyond the distal extremity of the terminal segment. Colour (in spirit) yellowish white. The length of Dr. Coppinger's largest specimen is little over  $8\frac{1}{2}$  lines (18 millim.); but the largest example in the British-Museum collection is of much greater size, measuring not less than 1 inch  $2\frac{1}{2}$  lines (31 millim.).

Two specimens were dredged in the Arafura Sea, 32-36 fms. (No. 160).

There are in the British-Museum collection several specimens collected in Torres Straits (*J. B. Jukes*). All of these appear to be of the male sex. The terminal segment (only) is slightly pubescent above.

The mandible closely resembles that of *C. hirtipes* as figured by Milne-Edwards\*, in its truncated and strongly dentated apex, sensorial appendage, and triarticulate palpus; the maxillipede is also formed on a precisely similar type to that of *C. hirtipes*.

The form of the interantennal plate, which somewhat resembles that of certain *Ega* (e. g. *Ega spongiophila*), and of the lateral prolongations of the second to fourth segments of the postabdomen at once distinguish this species from *Cirolana hirtipes*, M.-Edw., and *C. rossii*, Miers, and from *Cirolana (Eurydice) swainsonii*, Leach, a Mediterranean and West-African form, to which *C. schiödtei* is very nearly allied. *Ega novizealandia*, Dana, and *Cirolana latistylis* and *orientalis*, all of them forms somewhat insufficiently described, appear to be distinguished by the much more rounded and less triangulate terminal segment, &c. *C. arabica*, Kossmann, to judge from his figures†, is distinguished by the form of the rostrum, terminal segment, and interantennal plate both from this and the following species.

##### 5. *Cirolana tenuistylis*. (PLATE XXXIII. fig. B.)

As this species in many particulars nearly resembles the foregoing, it may suffice here to point out its chief distinctive characters. The interantennal process is narrow-linear, as in *C. rossii* or *C. hirtipes*, but the eyes are subquadrate or somewhat rounded, with very large ocelli, and each occupy less than one fourth of the total length of the front and lateral margins of the head, which has a more prominent median frontal process. The antennules have the first two joints of the peduncle more dilated, the second very short, the third robust, but less dilated than the preceding; the last two joints of the peduncle of the antennæ are shorter than in *C. schiödtei*. The third and fourth joints of the ambulatory legs are considerably dilated and margined with stiff setæ. The inner ramus of the uropoda is much narrower than in *C. schiödtei*, with the sides parallel to near the extremity, which is subacute. The length of the largest specimen is about 7 lines (15 millim.).

A single specimen, I think a male, is in the collection from Prince

\* Atlas in Règne Animal de Cuvier, Crust. pl. lxxvii. fig. 8.

† Zool. Ergebn. Reis. roth. Meer. ii. p. 114, pl. viii. figs. 7, 11 (1880).

of Wales Channel (7-9 fms.). The antennæ are imperfect. Two specimens, of unknown locality, are in the British Museum from the collection of H.M.S. 'Herald.'

The mandible, in its broad and strongly dentated apex, closely resembles that of *C. schiödtei*.

*Cirolana latistylis*, Dana, from the Balabac Straits, is very imperfectly described, but appears to be distinguished from this species by the much broader inner ramus of the uropoda.

#### 6. *Cirolana lata*, Haswell, var. *integra*.

Three small specimens from Albany Island, 3-4 fms., are referred with much hesitation to this species. In the broadly ovoid form of the body, with its longer first thoracic segment and short post-abdomen, they resemble Mr. Haswell's figure and description\*; but the terminal postabdominal segment is less acute than in the figure, and there is no tooth upon the inner edge of the inner ramus of the uropoda. I may add, in reference to some points that are not mentioned in Mr. Haswell's description, that the eyes are black and subquadrate, the median rostral point prominent and prolonged between the bases of the antennules to or nearly to the apex of the interantennal plate, which is nearly of the same form as in *C. schiödtei*, but is without a superficial tooth; the apex of the mandible is broad and dentated as in other species of the genus; the basal joint of the antennules is large and considerably dilated; the flagellum of the antennæ (which is short and scarcely reaches beyond the posterior margin of the first body-segment, as in Haswell's figure) is 13-15-jointed.

#### 7. *Rocinela orientalis*, Schiödte & Meinert.

A single female is referred here in Dr. Coppinger's collection from Prince of Wales Channel, 7-9 fms., which has lost the inner ramus of both uropoda.

Specimens are in the British-Museum collection from Moreton Bay.

If a male and female from Ceylon (*E. W. H. Holdsworth*) and a male from the Gulf of Suez are correctly regarded as identical with this species (and they do not seem to differ markedly from the Australian examples), this must be a widely distributed Oriental form. A large specimen from the West-African coast (without special indication of locality) comes very near to this species, but has a more acute and prolonged front and posterior epimera, and differs slightly in the proportionate length of the joints of the antennæ and antennules, and may be distinct. Messrs. Schiödte and Meinert's types were from the Philippines and Calcutta.

Mr. Haswell has described a species, *Rocinela vigilans*, from Holborn Island, near Port Denison (*vide* Cat. p. 285), which seems

\* Proc. Linn. Soc. N. S. Wales, vi. p. 192, pl. iv. fig. 1 (1881); Cat. p. 286 (1882).

in some of its characters to connect this genus with *Cirolana*; it is at once distinguished from *R. orientalis* by the form of the eyes, which are confluent in the middle line of the head. Specimens are in the British-Museum collection from the north-eastern coast of Australia, but no special indication of locality remains, nor any record as to how they were obtained.

In Dr. Coppinger's specimen, and in that from the Gulf of Suez, the front is somewhat more broadly rounded than in the figure of Schiödte and Meinert (Nat. Tidsskr. p. 395, pl. xiii. figs. 1-2, 1879). In the smaller specimens from Ceylon the antennæ have a fewer (10-12) jointed flagellum. I doubt therefore the constancy of the number of the joints of the antennal flagellum as a character for separating the species; but not having examined specimens of several of the new forms described by Schiödte and Meinert, I will not express myself upon this point with certainty.

There is in the British-Museum collection a species of *Ega* very nearly allied to *Ega cyclops*, Haswell, from Port Jackson, but which seems to be sufficiently distinguished by having the body very coarsely punctulated, the epimera of the fourth to seventh segments only subacute and (the last excepted) scarcely prolonged beyond the posterior margin of the segments; and particularly by the form of the terminal postabdominal segment, which is truncated, not rounded, at its distal extremity; the outer ramus of the uropoda is ovate but not acute, the inner squarely truncated at its distal extremity; the distal process of the peduncle extends considerably beyond the middle of the inner ramus. This species, of which a single male is in the collection from King George's Sound (*F. M. Rayner*, H.M.S. 'Herald'), I propose to designate *Ega meinerti*. In the confluent eyes and the form of the terminal segment it somewhat resembles the North-European and Arctic *Ega crenulata*, Lütken, but the posterior prehensile limbs are without the cultriform process characteristic of that species and *Ega webbi*.

### 8. *Cymodocea longistylis*. (PLATE XXXIII. fig. C.)

Convex oblong-ovate, as usual in the genus. Head and first three segments of the body indistinctly punctulated; the fourth to seventh segments granulated, the granules arranged in two transverse series, and most distinct on the two posterior segments. First segment of the postabdomen with a transverse line of granules (like those of the thoracic segments, but larger) and with other granules posterior to it, and with a prominence on either side of the middle line on its posterior margin; terminal segment also very distinctly granulated and somewhat hairy, and with two elevated prominences on its upper surface, behind which, and near to the distal extremity, is a much less elevated and more rounded prominence; terminal notch quadrangular, and with an oblong distally truncated median lobe. The median frontal process is subtriangulate; the postero-lateral angles of all the segments of the body are acute, except those of the

last segment, which are broadly rounded. The eyes are borne on the broadly rounded postero-lateral lobes of the head. The first segment of the peduncle of the antennules is about twice as long as broad and considerably dilated; the second joint, which is small but moderately dilated, is received into a cavity at the distal end of the first joint; the flagella about 14-jointed. The peduncular joints of the antennæ are slender; the flagella about 20-jointed. The ambulatory legs are very slender; the merus, carpus, and propus or penultimate joints margined inferiorly with short stiff hairs, and, as in other species of the genus, the dactyli bear a small subterminal accessory claw. The rami of the uropoda are narrow, entire, nearly straight, and rather densely hairy; the outer rather shorter than the inner ramus, and more acute at its distal extremity; the inner long, projecting by about half its length beyond the terminal segment. Colour (in spirit) yellowish white. Length a little over 4 lines (9 millim.).

A single mutilated specimen was obtained on the beach at Thursday Island, Torres Straits, and is evidently a male, the ventral genital stylets being very distinctly developed. Two males are in the Museum collection without special locality (*J. B. Jukes*), and some specimens from Singapore received in the final consignment of H.M.S. 'Alert.'

I cannot identify it with any of the Australian species of this genus recently described by Mr. Haswell. In the granulated segments of the body it resembles *C. bidentata* and *C. coronata*, Haswell, both obtained at Griffith's Point, Victoria, but differs in the armature of the terminal postabdominal segment. There are specimens in the British-Museum collection from Bass Straits (*J. Macgillivray*, H.M.S. 'Rattlesnake') which I refer to *C. coronata*, having the tubercles on the dorsal surface of the postabdomen disposed as in Mr. Haswell's diagnosis, but differing in the acute inner ramus of the uropoda.

*C. longistylis* is also very nearly allied to the European *C. truncata*, Leach, but is distinguished by the much longer and slenderer inner ramus of the uropoda. However, I am not sure that the examination of a sufficient series would not necessitate uniting the two species.

#### 9. *Cerceis bidentata*, *M.-Edw.*, var. *aspericaudata*.

(PLATE XXXIII. fig. D.)

Thus is designated with much hesitation a specimen (male) from Prince of Wales Channel, 7 fms. (No. 169). As Milne-Edwards's diagnosis is very brief, I subjoin the following description of the principal distinctive characters presented by the specimen before me:—

The body is convex with the sides straight, and widens gradually to the tail. Head subtriangulate, but with the anterior margin rounded; the rostral lobe is inflexed, and lies between the bases of the antennules; the postero-lateral lobes, which bear the small black



eyes, are but little produced and rounded, and are received into rounded notches in the first segment of the body. The first body-segment is longer than the following; its antero-lateral processes narrow, acute, and prolonged forward along the sides of the head beyond the eyes; the postero-lateral angles of all the segments (the last excepted) are acute, those of the last body-segment are rounded. The postabdomen is divided into two portions, the anterior of which is minutely punctulated and bears on each side two lateral sutures, indicative of coalescent segments; the posterior (or terminal segment) is granulated, subtriangulate, with two low rounded elevations on its upper surface; its distal extremity has a rather deep and narrow and somewhat triangulate notch. The basal joint of the peduncle of the antennules is much enlarged, longer than broad, its distal extremity is excavated, and its distal and inferior angle is prolonged into a spine which reaches nearly to the extremity of the following joint, which is also dilated, but shorter than the preceding; the very slender flagellum is 12-14-jointed; the four exposed joints of the peduncle of the antennæ are slender, but little more dilated than the joints of the flagellum, which are 14-16 in number. The fourth to sixth joints of the ambulatory legs are slender and margined with very short hairs. The rami of the uropoda are rather large and dilated, reaching beyond the distal end of the terminal segment, and with the exterior and distal angles acute and somewhat produced (especially in the outer ramus, which is rather the larger). Colour (in spirit) yellowish white, minutely speckled with black. Length nearly 6 lines (12 millim.).

Our specimen differs from Milne-Edwards's diagnosis in its punctulated and granulated postabdomen and the narrower notch of the terminal segment; the first-mentioned is a character which might possibly be overlooked on an examination with a lens of low power; nevertheless this variety will perhaps prove a distinct species.

The remarkable structure of the antennules serves, I think, to distinguish it generically from the typical species of *Dynamene*, which it resembles in the simply emarginate tail-segment; but it may be found convenient hereafter to separate generically the species with a tridentate terminal postabdominal segment from those in which this segment is simply notched, as has been done in the analogous case of *Cymodocea*; the examination, however, of further material is required to determine this question. Certain species with a tridentate segment closely connect this genus with *Cymodocea*. I may take this opportunity of noting that the *Cymodocea granulata* described by me in 1876\* is probably not specifically distinguishable from *Cerceis tridentata*, Milne-Edwards, which species, however, is but very briefly characterized.

\* *Vide* 'Catalogue New-Zealand Crustacea,' p. 114, pl. iii. fig. 5 (1876).



10. *Cilicæa latreillei*.

*Cilicæa latreillei*, *Leach, Dict. Sci. Nat.* xii. p. 342 (1818); *Desmarest, Consid. Crust.* p. 296, pl. xlviii. fig. 3 (1825).

*Næsea bidentata*, *Guérin, Icon. Crust. Règne Animal, Atlas*, pl. xxx. fig. 2 (1829-44).

*Sphæroma pubescens*, *M.-Edwards, Hist. Nat. Crust.* iii. p. 209 (1840), ♀ ?

*Næsea latreillei*, *M.-Edwards, Hist. Nat. Crust.* iii. p. 218 (1840).

*Cymodocea pubescens*, *Haswell, Proc. Linn. Soc. N. S. Wales*, v. p. 473, pl. xvii. fig. 1 (1881); *Cat. Austr. Crust.* p. 290 (1882).

The following is a description of the principal distinctive characters of this species, taken from male examples bearing Leach's label in the British-Museum collection :—

The segments of the body and uropoda are covered with a very short stiff pubescence. The head is transverse; the eyes are borne on the rounded postero-lateral lobes, which are encased in notches in the anterior margin of the first thoracic segment; the median frontal lobe is subacute and projects between the bases of the antennules. The first thoracic segment is slightly longer than the following; its antero-lateral processes are acute: the postero-lateral rather blunt, with the posterior margins slightly hollowed out; the second thoracic segment is rounded, but narrowed on the sides; the third and fourth subacute, the fifth less acute, and the sixth and seventh broader and rounded or subtruncated. The dorsal process of the penultimate postabdominal segment is simple, straight, its apex scarcely acute; it does not project far beyond the distal end of the terminal segment, which is rather more distinctly granulated and has on its upper surface two prominences, situated one on each side of the dorsal process of the penultimate segment; the notch in the middle of the posterior margin is rather deep and as broad as deep, and is divided by a median subtriangulate lobe. The basal joint of the antennules is considerably dilated, longer than broad, and is slightly excavated at its distal extremity, where it is articulated with the next joint. The ambulatory legs are slender; and the dactyli are armed below with a small accessory claw. The inner ramus of the uropoda is represented by a blunt lobe or process of the base: the outer ramus is straight, not greatly longer than the base, and usually bears a small tooth on its outer margin. Length 5 lines (nearly 11 millim.).

The female scarcely differs, except in wanting the posterior dorsal process of the penultimate postabdominal segment, and in the subequal rami of the uropoda, the inner or immobile ramus being more developed, and the outer shorter in the adult, usually more acute at its distal extremity, and bearing, as in the male, a tooth on the outer margin. It presents all the appearance of a *Cymodocea*.

I have scarcely any doubt that the *Cymodocea* (or *Sphæroma*) *pubescens* of Milne-Edwards and Haswell are the female of this species. All the specimens in the considerable series before me, with the dorsal process of the postabdomen and rudimentary

inner ramus of the uropoda, have the external genital appendages proper to the male sex, which are not to be found on any of the specimens I regard as the females of this species, several of which, on the contrary, carry ova. In several instances I have found the two forms associated in the same phial in the Museum collection.

I refer to this species the following females in the 'Alert' collection, which may, however, belong to the variety *crassicaudata*, Haswell:—

An adult example from Port Jackson, 5–7 fms. (No. 104), whence also Mr. Haswell records it as *Cymodocea pubescens*; also one from Thursday Island, 4–5 fms. (No. 165). These specimens have the outer ramus of the uropoda acute, with a strong tooth on its outer margin, and closely resemble *S. pubescens* as described by Milne-Edwards.

Smaller specimens are in the collection from Port Curtis, 7 fms., and Albany Island, 3–4 fms., which have the body less pubescent and the postabdomen more distinctly granulated, the rami of the uropoda somewhat shorter, the outer ramus subacute or even obtuse, with the tooth on its outer margin very faintly defined or obsolete.

The rounded elevations on the upper surface of the terminal segment vary much in prominence in this species. In two females from King George's Sound, West Australia, which may belong to a distinct species, they are very prominent, conical, and subacute. An approach to this form is, however, exhibited in one of Leach's types (a male).

A good series of both sexes of *Cilicæa latreillei* from the Australian seas is in the British Museum from the collection of the late Dr. J. S. Bowerbank. Unfortunately the exact locality has not been preserved.

Mr. Thomson\* has described a species of this genus (as I think) from Dunedin, New Zealand, under the name of *Nasea caniculata*, which is allied to *C. latreillei*, but distinguished by the broadly truncated process of the first postabdominal segment.

### 11. *Cilicæa latreillei*, var. *crassicaudata* (Haswell).

A male and female are in the collection from the Arafura Sea, 32–36 fms. (No. 160), and also a male and two females without special indication of locality (No. 123).

This form comes extremely near to *Cilicæa latreillei*, Leach, and must, I think, be considered a mere variety of it. It is distinguished by the longer, less conical median process of the penultimate postabdominal segment, and the much longer outer ramus of the uropoda, which is not toothed on its outer margin.

I have observed males of the typical form in which the tooth on the outer margin of the outer uropod is obsolete.

There is in the British-Museum collection a specimen from Bass

\* Trans. New-Zeal. Inst. xi. p. 234, pl. x. fig. A 7 (1879).

Straits which appears to merit separation at least as a variety, which has the segments of the body, the postabdominal process, and the uropoda covered with a dense golden-brown pubescence; the process of the penultimate postabdominal segment very long, reaching nearly to the extremity of the outer ramus of the uropoda, and obscurely emarginate at its distal extremity; the outer ramus straight, subacute, and entire, the inner represented by a short but distinct process of the base; the notch in the terminal segment deep, with a prominent triangulate median process. This I will designate *C. latreillei*, var. *longispina*. I have observed specimens of the preceding variety which nearly resemble this in the form of the terminal notch with its median lobe. From *Cilicæa tenuicaudata* and *C. crassa*, Haswell, which this form resembles in the greatly elongated postabdominal process, it is distinguished by wanting the two prominences of the terminal segment, and by the entire longer ramus of the uropoda.

*Cilicæa antennalis*\*, from Swan River, is nearly allied to *Cilicæa latreillei*, but may be distinguished by the nearly smooth body, the form of the thoracic segments, which are subtruncated on the sides, the much wider, shallower, transverse notch of the terminal segment, which has a very small median prominence, and the form of the process of the penultimate segment, which projects far beyond the distal end of the last segment, is vertically compressed, rounded at the distal end, and marked with a longitudinal median groove; the median frontal process, which is inflexed and lies between the bases of the antennules, is truncated at its distal end, where it is applied to the anterior margin of the labrum; the basal joint of the antennules is considerably enlarged, more than twice as long as broad, with a small tubercle at the distal end of its upper margin; the next joint, which is about half as long, terminates in two spines below the point of articulation with the slender third joint: ambulatory legs very slender; apices of the uropoda subtruncated and recurved. The type (a male) measures 10 lines (21 millim.) from the front of the head to the end of the postabdominal process.

The genus (or subgenus) *Cilicæa*, I may note in conclusion, is nearly allied to *Næsa*, Leach, and *Campecopea*, Leach; but the typical species of *Næsa* have the last segment of the postabdomen simply notched (without a median process), and the penultimate segment armed with two or three dorsal processes or spines, and in the typical species of *Campecopea* the terminal segment is entire. The distinctions between the sexes in this group are so marked that a considerable series is necessary and a careful examination, or distinctions which are merely sexual may easily be taken to be indicative of distinct species or even genera.

\* *Næsa antennalis*, White, List Crust. Brit. Mus. p. 105 (1847) (*ined.*).

12. *Haswellia carnea* (*Haswell*).

*Calyptura carnea*, *Haswell, Proc. Linn. Soc. N. S. Wales*, v. p. 476, pl. xvii. fig. 4 (1881); *Cat. Austr. Crust.* p. 302 (1882), *nomen genericum præoccupatum*.

A single specimen of this remarkable genus and species is in the collection from Port Jackson.

The name *Calyptura* having been preoccupied in 1843 by Swainson (in the Class Aves), I am obliged to adopt a new generic designation for this species, and would propose to associate Mr. Haswell's name with a type which is certainly one of the most interesting of the many new forms described by him.

The coloration, which is described as crimson by Mr. Haswell, has completely disappeared in the specimen in the 'Alert' collection\*.

## ANISOPODA.

1. *Paranthura australis*, *Haswell*.

A single specimen, I think a male, is in the collection from Dundas Straits (17 fms.).

I may add the following to Mr. Haswell's brief description:—The anterior margin of the front is bisinuated on either side of the median lobe. The terminal segment is longer than broad, and narrows to its rounded apex. Of the antennules four, and of the antennæ five, joints are visible, besides the rudimentary flagellum. The carpus in all (?) the legs is produced below the inferior margin of the propus or penultimate joint in the form of a blunt lobe or tooth. These characters, which are not indicated in Mr. Haswell's description and figure, render it possible that this specimen may belong to a distinct species.

## AMPHIPODA.

In the determination of the Amphipoda of the 'Alert' collection I have generally followed Mr. Haswell in using Mr. Spence Bate's classification †, rather than that more recently proposed by the late Axel Boeck ‡, since the latter author was concerned exclusively with north-temperate and Arctic species, and the characters of the

\* In passing from this notice of the Australian Isopods, I may observe that the *Idotea caudacuta*, Haswell, and *I. excavata*, Haswell (Cat. pp. 276, 277), are probably identical, the former with *Idotea peronii*, Milne-Edwards, and the latter with *I. unguolata*, Pallas, as characterized in my recent revision of the group (Journ. Linn. Soc., Zool. xvi. p. 1, 1881).

† *Vide* 'Catalogue of Amphipodous Crustacea in the British Museum,' 8vo (1862).

‡ 'De Skandinaviske og Arktiske Amphipoder' (Christiania, 1872).

numerous generic divisions proposed by him would doubtless require considerable modification in any general systematic arrangement of the group. Of the numerous Australian additions to this Order described by Haswell, but few are in the collections received from Dr. Coppinger.

### 1. *Ephippiphora kröyeri*, White.

Several small specimens from Dundas Straits, 17 fms. (No. 161), one from Prince of Wales Channel, 7-9 fms., and one from Port Denison, 4 fms. (No. 122), are referred to this species. They agree with White's much larger types in the form of the body, the coxæ of the thoracic legs, and particularly in the great development of the postero-lateral lobes of the fourth coxæ, in the broadly rounded basus-joints and somewhat dilated ischia of the three posterior legs, and in other points. White's examples (from Tasmania) are dried, and the first and second legs are now broken, as also the terminal segment in both specimens. In the specimens from the 'Alert' collection the terminal segment is elongated, narrowing slightly to the distal extremity, with the sides straight, and is divided by a narrow median fissure; the imperfect terminal segments in White's types seem to show a similar structure; in this particular they differ from *L. nitens*, Haswell, from Port Jackson. *L. australiensis*, Haswell, has a very close resemblance to *L. kröyeri*, and I should have considered it identical with it, were it not for the probable difference in the form of the terminal segment, since *L. australensis* is only distinguished by Haswell from *L. nitens* by the form of the eyes and the palms and fingers of the second legs.

In the present uncertainty as to the true limits of the genera of this group, I refer to this species under White's original designation *Ephippiphora*. By Boeck this genus is doubtfully considered to be identical with his *Socarnes*, first described in 1870.

Mr. Thomson\* records the species from Dunedin, New Zealand (as *Lysianassa kröyeri*); but as he says nothing of the form of the telson or terminal segment, I am not sure of the identity of his specimens with the true *kröyeri*.

### 2. *Leucothoë spinicarpa*, var. *commensalis*.

*Gammarus spinicarpus*, *Abildgaard, Zool. Danica*, iii. p. 66, pl. cxix. figs. 1-4 (1789).

*Cancer (Gammarus) articulatus*, *Montagu, Trans. Linn. Soc.* vii. p. 70, pl. iv. fig. 6 (1804).

*Leucothoë articulosa*, *Leach, Trans. Linn. Soc.* xi. p. 358 (1815), *et auctorum*.

*Leucothoë spinicarpa*, *A. Boeck, Skandinaviske og Arktiske Amphipoder*, p. 507, pl. xvi. fig. 5 (1876), *ubi synonym.*

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\* *Trans. New-Zealand Institute*, xi. p. 237 (1879).



*Leucothoë ? crassimana*, Kossmann, *Zool. Ergebn. einer Reise rothen Meeres, Malacostruca*, p. 131, pl. xiii. figs. 9, 10 (1880).

*Leucothoë commensalis*, Haswell, *Proc. Linn. Soc. N. S. Wales*, iv. p. 261, pl. x. fig. 3 (1880); *Cat. Austr. Crust.* p. 248 (1882), var.

I refer to this species a single specimen from Port Jackson, 0-5 fms. It differs only in the greater length of the superior antennæ from Mr. Haswell's description of *L. commensalis*, these exceeding in length the head and first four segments of the body. It ranges along the whole eastern coast of Australia, from Thursday Island in the north to Western Port in the south.

Mr. Haswell describes this as being one of the commonest Amphipoda of Port Jackson, where it is found within the pharynx of a common large tunicate, in the cavities of large sponges, and in other similar situations. A mutilated specimen is in the Museum collection from this locality, received from J. Brazier, Esq.

It is not without much hesitation that I unite *L. commensalis* with the European *L. articulosa*, yet upon comparison of the Australian specimens of *L. commensalis* with the specimens from Great Britain and Norway in the British-Museum collection I can detect no difference of specific importance. In one English specimen the eyes are reddish, in another Australian example reddish black, and in others scarcely any trace of the pigment remains. There are variations in the length of the antennæ and in the form of the antero-lateral processes of the first segment of the body, and also in the degree of acuteness of the apex of the carpal process of the second pair of legs, which, however, I cannot connect with the geographical habitat of the individuals examined. As, however, the series the Museum possesses is but small, and there are in the national collection no specimens from localities intermediate between Great Britain and Australia, it may be well to consider Mr. Haswell's species as a variety, since there may be distinctive characters discoverable in the colour of the eyes, or in other minor particulars. The eyes in Abildgaard's original description are described as black.

Kossmann's species (*L. crassimana*), from the Red Sea, is only briefly characterized, but the details figured would seem to show that this species is also identical with or very nearly allied to *L. articulosa*.

### 3. *Leucothoë brevidigitata*. (PLATE XXXIV. fig. A.)

The body is smooth, dorsally rounded and laterally compressed; the coxæ of the first four legs deep, as in allied forms. Head small, with a very small median rostral lobe, its antero-lateral angles rounded and not much produced. The coxæ of the fourth legs are but little longer than the preceding, without any distinct postero-lateral lobe; they are slightly overlapped by the much shorter coxæ of the fifth legs. There is a very small acute tooth at the postero-lateral angles of the first tail-segment; these angles in the second

segment are slightly acute, and in the third segment nearly a right angle; the terminal segment or telson is subtriangulate, entire, longer than broad, with the apex subacute. The eyes are black, somewhat ovate in shape. The antennules scarcely equal in length the head and first two segments of the pereon; they have three joints of the peduncle exposed, the first and second subequal in length, but the first somewhat thicker; the third joint slenderer than the second and about half its length; flagellum 13- or 14-jointed. The antennæ have the first joint (which is only partially visible in a lateral view) short, subspherical, the second very short and not more dilated than the third and fourth, which are elongated; the fourth a little shorter than the second; flagellum about 8-jointed. The first pair of legs (gnathopoda) have their basus-joints moderately dilated, with the posterior margins thin-edged and hairy; ischium and merus very short; carpus considerably dilated, and produced at its posterior and distal angle into a spine, which extends along the posterior margin of the propus and reaches to its distal extremity. The propus or penultimate joint is ovate, the dactyl minute and articulated with it at its distal extremity. In the second legs the carpus is very short, and produced along the posterior margin of the propus for less than half its length: the propus is subovate and large; its posterior margin is armed in its distal half with a series of small granuliform teeth, against which the well-developed dactyl impinges. The third and fourth legs are small and present nothing remarkable; the fifth to seventh have the coxæ small, the basus-joint moderately enlarged and rounded posteriorly; the following joints slender and nearly naked; the fourth and fifth slightly produced at the posterior and distal angles. The three posterior pairs of tail-appendages are biramose, the rami lanceolate and acute; in the posterior pair the outer is a little shorter than the inner ramus. Colour (in spirit) whitish. Length about  $7\frac{1}{2}$  lines (16 millim.).

A single specimen was obtained at Thursday Island, 4-5 fms. (No. 165).

This species is distinguished from *L. spinicarpa*, var. *commensalis*, Haswell, and the closely allied species or varieties *L. diemenensis* and *L. gracilis*, Haswell, by the broader, more ovate propus or palm and shorter dactyl of the first legs, and the more regularly and evenly toothed palm of the legs of the second pair. The terminal segment is shorter, less acute, and broader-triangulate than in the specimen I refer to *L. commensalis*.

*L. novæ-hollandiæ*, Haswell, from Port Jackson, is at once distinguished by the broad truncated palm and the absence of a dactyl to the anterior legs, by the shorter carpal process of the second legs, and by other characters. Our species may be regarded as in some sense intermediate between the first three and the last-mentioned species.

There are mutilated specimens both of *L. novæ-hollandiæ* and *L. brevidigitata* in the Museum collection from Vacluse Point, Port Jackson (*J. Brazier*).

#### 4. *Melita australis*, Haswell.

A male is in the collection from Port Jackson, 0-5 fms., a locality where, according to Mr. Haswell, it is very common.

In this specimen the three anterior postabdominal segments have their posterior dorsal margin armed with six spines; the fourth with two spines, outside of which on each side is a small spinule; the fifth is armed as the fourth, but the median spines are smaller; the telson is divided nearly to its base, with the lobes acute.

The species is very nearly allied to the *Melita setipes*, Dana, from Singapore; but in the absence of specimens for comparison, I do not venture to unite the two forms. *M. setipes* has, according to Dana, but two teeth or lobes on the distal margin of the larger hand of the second legs; *M. australis* has three, but the one nearest the dactylus is very small in the specimen I have examined.

#### 5. *Mœra ramsayi*, Haswell.

A male specimen is referred to this species from Port Jackson, 0-5 fms., whence also Mr. Haswell records it: and also one from Prince of Wales Channel, 7 fms. (No. 169). The minute teeth or spines on the posterior margins of the first and second segments of the postabdomen do not extend to the postero-lateral lobes; in the third segment the posterior margins are armed with spinules to or even beyond the postero-lateral angles. There are several small spinules on each side of the median dorsal spine on the posterior margin of the fourth and fifth segments. There is a small notch in the anterior margin of the palm of the smaller leg of the second pair, besides the small defining tooth at the postero-distal angle. These points, which are not mentioned in Mr. Haswell's description, render it possible that this specimen should be regarded as belonging to a distinct variety or species.

#### 6. *Mœra rubromaculata* (Stimpson).

To this species are referred two imperfect specimens obtained at Port Molle, 5-12 fms. (No. 118), and one from Dundas Straits, 17 fms. Mr. Haswell also records it from Ports Denison, Stephens, and Jackson. As in these specimens the superior antennæ are imperfect and the posterior uropoda are wanting, their identification with Stimpson's species must remain somewhat uncertain. Accordingly it may be useful to append a description of the specimens, with special reference to some points which are not mentioned in the descriptions already given of this species.

The body is slender; the head not produced at its antero-lateral angles; the coxæ of the first segment of the body have their antero-lateral angles acute and produced somewhat beneath the head. The posterior margins of the five anterior postabdominal segments are armed with a series of minute spinules, which in the first and second

segments and fourth and fifth segments exist only on the dorsal surface, but on the third extend down to the rounded postero-lateral angles; in the second segment the posterior margin above the rounded postero-lateral angles is obscurely dentated. The lobes of the terminal segment are subconical and tipped with one or two setæ. The eyes are oval, but very obscurely seen. The penultimate joint of the peduncles of the superior antennæ is slightly longer and slenderer than the preceding; the third joint, with which the short accessory flagellum is articulated, is very short; the flagella are themselves imperfect; the accessory flagella about 6-jointed. The inferior antennæ are much shorter than the superior; the first peduncular joint little more than half as long as the second, which is about as long as the third; the flagella 12-14-jointed. The first legs are slender and feeble; the merus-joints very small, with posterior acute lobe and tooth; the carpus resembles the propus or palm, having the posterior margin convex, rounded, and hairy; the dactyl is a little more than half as long as the palm. The second legs have the carpus very short, propus considerably enlarged, longer than broad, its distal margin oblique, slightly arcuated, and defined by a small tooth; dactyl slightly arcuated, and closing against the distal margin of the propus. The three posterior legs are slender; the margins of the fourth to sixth joints with a few stiff hairs. The uropoda are biramose, the rami in the penultimate and antepenultimate pairs subequal; the last pair are wanting in the three specimens I have examined.

Another specimen from Port Jackson, 0-5 fms., which I refer doubtfully to this genus (it having lost the head), and which I cannot identify with any known species, has the body smooth and unarmed, the first three postabdominal segments with a small spinule at their postero-lateral angles; the terminal segment has the lobes flattened and subacute distally. The first legs are small, with the carpus and propus posteriorly arcuated, the carpus little shorter than the propus. The second legs have the merus-joint short, but little produced at its postero-distal angle; carpus transverse, dilated in its distal half, which equals the width of the palm at base; palm longer than broad, narrower distally, with the distal margin very oblique, not acute, but presenting a broad surface, against which the strong arcuate dactyl closes, and armed with four spines or lobes as follows—one defining the postero-distal angle, a pair of small spines in front of this, and a rounded lobe below the articulation of the palm with the dactyl. The three posterior legs are rather robust, with the basus-joints not serrated; the merus produced at its anterior and distal angle. The outer ramus of the penultimate and antepenultimate uropoda is slightly shorter than the inner ramus; the rami of the last pair subequal, broader and slightly shorter than the preceding.

This species, which may be designated provisionally *M. crassimana*, is apparently well distinguished by the form and dentition of the palms of the second pair of legs.

There is also in the collection a specimen which may belong to



this genus or to *Megamœra*, from Port Jackson, 5-7 fms. (No. 104), but which, having lost both pairs of antennæ and the terminal segment, cannot be referred to any genus with certainty. It is distinguished from the various species described by Mr. Haswell by the great length of the first legs, which exceed the legs of the second pair in length, and have the merus considerably produced at the postero-distal angle, the carpus about twice as long as the propus and truncated at its distal end, propus posteriorly arcuated, dactyl about half as long as the propus: the legs of the second pair have the merus short, carpus more than half as long as the palm and truncated at its distal extremity; palm or propus considerably enlarged, its distal margin oblique and nearly straight, defined at the postero-distal angle by a small spine, and with a truncated lobe or tooth nearer the base of the dactylus, which is strongly arcuated and does not reach quite to the postero-distal angle of the palm. The coxæ of the four anterior legs are deeper than the segments with which they are articulated. The three posterior legs slender, with the basus-joints little dilated and posteriorly entire, the merus-joints not distally produced into lobes or teeth. The uropoda are biramose, the rami subequal, those of the posterior pair very small, not foliaceous. The segments of the body are without teeth, spines, or spinules. The coloration (in spirit) whitish, the body covered with numerous small black dots.

In the form of the anterior legs and in the coloration it resembles *Amphithoë setosa*, Haswell, from Botany Bay, but differs in the form of the palm of the second leg, and, I suppose, of the posterior uropoda.

#### 7. *Megamœra suensis*, Haswell?

As Mr. Haswell's description is very short and our specimens differ slightly from his figure in the form of the second legs, I append the following description:—Body rather robust; head with a small lateral tooth behind the antero-lateral angles. Coxæ of the first four thoracic limbs deeper than their respective body-segments, the first pair not much prolonged at the antero-lateral angles, which are rounded or subacute. The last thoracic segment and the first and second postabdominal segments have their posterior margins armed with two small dorsal spines: the third is dorsally emarginate but without spines; the fourth has its posterior and dorsal margins armed with two strong triangulate acute lobes or teeth. The first and second postabdominal segments have a small spinule at their postero-lateral angles; the third segment has its postero-lateral angles truncated and armed with three to five teeth; the lobes of the terminal segment, which are subcylindrical, are tipped with a few setæ. The eyes are oval, black. The antennæ are somewhat hairy; the superior antennæ are broken, but exceed the head and thoracic segments in length; the basal peduncular joints are thicker and somewhat shorter than the second joints; the third joints very short; the slender accessory flagellum is composed of three rather



long joints, and is tipped with a pencil of hairs. The inferior antennæ slightly exceed in length the head and first five segments of the body; the basal peduncular joint is very short, the second is slightly longer than the third joint. The first legs (gnathopoda) are very slender and feeble; the merus short, unarmed; the carpus, like the propus, convexly arcuated posteriorly and fringed with hairs; dactyl rather less than half the length of the propus. The second legs have the small and slender merus armed with a posterior spine; the carpus very short, transverse, and equalling the proximal end of the propus or palm in width; the palms, in three specimens examined, are large, similar, and subequal, longer than broad, rounded at base, very slightly broader at the distal extremity; the distal margin, against which the strong arcuate dactyl closes, has a wide shallow notch above the postero-distal angle of the palm, and above this three or four very obscure indications of teeth; the infero-distal angle is not defined by a tooth or spine. The third and fourth legs are very slender, with the dactyli about as long as the preceding joints; the three posterior legs are robust, with the basus-joints posteriorly serrated; the fourth to sixth joints margined with long hairs; the merus-joints widening to the distal margin, which is prolonged into an anterior and posterior spine, the posterior spine being very large; dactyli less than half the length of the preceding joints. The fourth and fifth pairs of uropoda have the slender rami margined with short stiff hairs; the sixth pair have the rami sub-foliaceous, rather narrow-ovate and not greatly elongated. Colour (in spirit) light brownish pink. Length (without antennæ) a little over 4 lines (9 millim.).

Two specimens are in the collection from Albany Island, 3-4 fms., and two from Port Denison, 4 fms. (No. 122).

In the dorsally bispinose postabdominal segments this species resembles *Megamœra diemenensis*, Haswell, from Tasmania, but differs from this and all of the other Australian species of *Mœra* and *Megamœra* described by that author (as it appears) in the form of the palms of the second legs, not to speak of other characters. If our specimens should prove to be distinct from *Megamœra suensis*, which is only known to me by Mr. Haswell's very short diagnosis, I would propose to designate them *M. haswelli*.

Mr. Thomson\* has recently described a species, *Megamœra fasciculata*, from Dunedin Harbour and Christchurch, New Zealand, which is distinguished from both this and the following species by the non-emarginate unarmed palms of the first and second legs, the first pair being "quite transverse," &c.

### 8. *Megamœra thomsoni*. (PLATE XXXIV. fig. B.)

This species is allied to the foregoing; but the body is somewhat slenderer; the posterior and dorsal margins of the thoracic and postabdominal segments are all of them entire, without spines or

\* Ann. & Mag. Nat. Hist. ser. 5, vi. p. 5, pl. i. fig. 5 (1880).

notches, but the posterior and lateral margins of the third segment of the postabdomen are armed with a series of small spinules which do not extend over the dorsal surface, but reach downward to the postero-lateral angles: there are also one or two small spinules or teeth at and near the postero-lateral angles of the first and second postabdominal segments; the eyes are much narrower and (transversely) longer than in *M. suensis*, the first peduncular joint of the inferior antennæ is somewhat longer and slenderer; the wrist and palm of the first legs (gnathopoda) are much more hairy; the spine on the posterior surface of the merus-joint of the second legs is much shorter, the wrist longer, and the palm perhaps rather more slender and hairy, with a less distinctly defined distal notch, behind as well as in front of which are one or two small teeth; the three posterior legs are slenderer, with the distal angles of the merus-joints acute but not prolonged into spines; the rami of the posterior uropoda are subequal, but much longer than in *Megamæra suensis* and less acute. Colour (in spirit) light yellowish brown. Length about 5 lines (11 millim.).

A single specimen was obtained at Albany Island, 4-5 fms., with the preceding species; also two from Prince of Wales Channel, 7-9 fms.; and one from Thursday Island, 4-5 fms. (No. 165).

In the long rami of the posterior uropoda this species somewhat resembles *M. mastersii*, Haswell, from Port Jackson; from which, however, it is distinguished by the larger narrow eyes and the somewhat excavated and less distinctly toothed distal margins of the palms of the second legs; nor does Mr. Haswell mention the spinules of the third postabdominal segment, &c.

From *Mæra rubromaculata*, Stimpson, it is distinguished by the entire non-pectinated postero-dorsal margins of the postabdominal segments, the narrow eyes, and the non-defined distal margin of the palms of the second legs.

It is also apparently very nearly allied to the British *Megamæra semiserrata* and *M. brevicaudata*, Spence Bate, and may be only a variety of one of these species; but in *M. semiserrata* the eyes are represented as less narrow and elongated, and the dactyli of the legs of the second pair are serrated upon the inner distal half, and in *M. brevicaudata* the palm has the inferior margin less distinctly defined and more convex in its distal portion\*.

I may note, in conclusion, that Kossmann has described† two species, *Mæra erythra* and *M. massavensis*, from the Red Sea, which appear to be distinguished from all the foregoing species of *Mæra* and *Megamæra* by the form of the palms of the second legs.

#### 9. *Podocerus australis*, Haswell.

Five male specimens were obtained at Port Jackson from weed on the ship's bottom.

\* *M. semiserrata* is one of several Amphipoda which it would seem are inaccurately marked in Mr. Spence Bate's Catalogue as represented in the Museum.

† Zool. Ergebn. einer Reise im roth. Meeres, pp. 132, 133, pl. xiv. figs. 1-11 (1880).

This species is very nearly allied to the British *Podocerus falcatus*, Montagu (of which the male is figured by Sp. Bate and Westwood as *P. pulchellus*), and also to *P. validus* (Dana), from Rio de Janeiro, in the form of the legs of the second pair. I have not been able to compare it with specimens of the last-mentioned species. From *P. falcatus* it is apparently distinguished by the inferior antennæ, whose flagellum (in the specimens of *P. australis* I have examined) has a very long stout basal joint which much exceeds the united length of the remaining joints of the flagellum; these are two or three in number, very short, and diminish successively in length.

#### 10. *Caprella æquilibra* (Say).

A good series of specimens were obtained from weed on the ship's bottom at Port Jackson with *Podocerus australis*.

Mr. Haswell's examples (designated *C. obesa*) were from Clark Island in the same harbour.

All appear to be males. A conical spine, not mentioned by Mr. Haswell, exists on the ventral surface of the body, between the second pair of legs (gnathopoda).

A female obtained with the foregoing, and which probably belongs to the same species, has the joints of the peduncle of the superior antennæ less dilated and the flagellum more elongated; the basus-joints of the second gnathopoda are less dilated; but one of the distal teeth of the inferior margin of the palm is developed, and this is very indistinct.

I may refer to Dr. Paul Mayer's recently published fine monograph of the Caprellidæ\* for the synonyms of this very widely distributed species. There can be no doubt of the correctness of his identification of *C. obesa*, Haswell, with *C. æquilibra* (Say). Say's specimen in the British-Museum collection, although dried and in a somewhat shrivelled condition, does not differ appreciably from our Australian examples, nor from a specimen from the Mediterranean (*Hennah*), and the dried one from Hong Kong (*Harrington*) in the Museum collection, which was identified with *C. æquilibra* by Mr. Spence Bate. Out of three (presumably) British examples in spirit in the Museum collection, designated *C. æquilibra* by Mr. Sp. Bate, one only belongs to this species, and this also does not differ from the Australian examples.

#### 11. *Caprella attenuata*, Dana? (PLATE XXXIV. fig. C.)

I refer here with much hesitation a male obtained at Port Jackson with *Caprella æquilibra*. It differs from *C. attenuata* as figured by Dana and by Dr. Mayer (*t. c.* p. 67) in the much more robust

\* In 'Fauna und Flora des Golfes von Neapel,' vi. p. 45, pl. i. fig. 7, pl. ii. figs. 1-11, pl. iv. figs. 20-25, pl. v. figs. 16-18 (1882).

and shorter segments of the body and peduncular joints of the superior antennæ, relatively longer inferior antennæ, &c., as a comparison of the figures will show; but as Mayer refers to this species (founded upon types from Rio de Janeiro) specimens sent to him by Mr. Haswell from Port Jackson, and our specimen agrees with Dana's figures of the male in the denticulation of the palms of the second legs and in other characteristic points, I do not venture to regard it as distinct.

*Caprella novæ-zealandiæ* of Kirk \* comes very near this species, but differs in the form of the non-ciliated joints of the flagellum of the superior antennæ, and the penultimate joint of the second legs is armed (apparently) with but two teeth. Both *C. novæ-zealandiæ* and *Protella australis*, which greatly resemble this species, have a spine or tooth on the penultimate joint of the three posterior legs, of which scarcely any indications exist in the specimens I refer to *C. attenuata*.

Two other very small *Caprellæ*, also obtained at Port Jackson, are in the collection, which I am unable to identify with certainty, but do not think it desirable to designate by a distinct specific name.

## OSTRACODA.

The few Ostracoda collected were submitted to Dr. G. S. Brady for determination, who referred them to the following species:—

### 1. *Cypridina albo-maculata*, *Baird*.

The specimens collected were from Port Darwin, 12 fms., and Dundas Straits, 17 fms. (No. 161). The original types were from Western Australia, Swan River.

## CIRRIPEDIA.

### 1. *Balanus trigonus*, *Darwin*.

Numerous specimens (mostly small) were obtained at Port Jackson, 0–5 fms. (No. 90). Darwin records it from Sydney, and mentions its distribution through the Malaysian seas and its occurrence at New Zealand and also on the W. coast of the American continent.

### 2. *Balanus amaryllis*, *Darwin*.

A specimen from the beach at Port Darwin (No. 176), and several small specimens from Albany Island, 3–4 fms., attached to a shell, appear to belong to this species. In the two largest specimens, however, whose opercula I have examined, the scuta

\* Trans. New-Zeal. Inst. xii. p. 393 (1879).

have the articular ridges somewhat reflexed. For its distribution see Darwin's monograph (p. 279), by whom it is recorded from Moreton Bay.

### 3. *Acasta sulcata*, *Lamarch*, var.

A single specimen in the collection from Albany Island, 3-4 fms., is very doubtfully referred to this species. It agrees generally in its external characters with Mr. Darwin's description, and also in the broader spur of the tergum of the operculum. In the remarkable reduction of the width of the parietes of the carino-lateral compartments it altogether resembles a specimen from Sydney in Mr. Cuming's collection (now in the British Museum) specially referred to by Mr. Darwin\*; but it differs very remarkably in the external armature of the parietes of the other compartments, which are armed with strong, outwardly-projecting, bluntly-triangular lobes or teeth, one such tooth being situate on each compartment, not very far below the apex, except on the carina, where there are two teeth; thus there are five in all. The cup-shaped basis of the shell is pinkish; the epidermis, which remains upon the basal half of the compartments, bright yellow.

Mr. Darwin (*t. c.* p. 311) mentions some remarkable variations in the external armature of this species, but none which at all resemble the specimen now described. In the very closely allied *A. spongites* the calcareous projections of the shell are often of considerable size, yet not nearly so large as the teeth in the specimen from Albany Island, and much more numerous and irregularly distributed. In the specimen of *A. sulcata* from Sydney, with narrow-linear carino-lateral compartments, the walls of the shell are externally smooth.

\* Monograph of Cirripedia, Balanidae, p. 310 (1854).



## PYCNOGONIDA.

BY

E. J. MIERS.

1. *Achelia lævis*, var. *australiensis*. (PLATE XXXV. fig. A.)

Body and legs moderately robust, the body disciform, the leg-bearing processes being closely approximated. Proboscis stout, sub-cylindrical, tapering toward its distal extremity, slightly deflexed. Mandibles rudimentary, 2-jointed, the terminal joint very small. Palpi 8-jointed?; ovigerous legs 10-jointed. Legs without spines, but with a short, blunt, conical process at the distal end of the fourth joint, and with two auxiliary claws beside the normal claw.

As Mr. Hodge's description of *Achelia lævis* (from Polperro, Cornwall) is very insufficient, I append the following from the single Australian example I have examined:—

The body is robust and disciform, with the leg-bearing processes enlarging distally and closely approximated. The cephalothoracic segment (viewed from above) is as long as the three following and is elevated on its dorsal surface, which bears the rounded oculiferous tubercle; the three following segments (in a dorsal view) short and transverse; the first the shortest, almost transversely linear. The proboscis is about as long as the body without the abdomen, obliquely deflexed, and is of a narrow ovoid shape, tapering to the distal extremity. The abdomen about as long as the three preceding segments of the body, and very slender. The mandibles are rudimentary, 2-jointed, the terminal joint about half the length of the preceding. The palpi are apparently 8-jointed (on one side evidently broken); the second and fourth joints subequal and rather long; the first and third and the four last very short. The ovigerous legs 10-jointed; the first joint very short, the second and third longer and subequal, the fourth and fifth yet longer and of about equal length, the sixth to ninth very short, and the terminal joint minute. The first to third joints of the legs are short, the second a very little longer than the first or third; the fourth, fifth, and sixth joints longer and of about equal length; the fourth joint somewhat more dilated than either of the following, and with a slight blunt process at the distal end of its upper margin; the upper surface of the fifth and sixth joints is slightly uneven, but can scarcely be

described as tuberculated; the seventh joint is very short; the eighth slightly curved and nearly as long as the sixth, the terminal claw about half as long as the eighth joint; the two auxiliary claws placed, as usual, above the base of the principal claw. The body and limbs are clothed with a very short, close pubescence, and the joints of the limbs with scattered longer hairs; the last three joints of the ovigerous legs have some rather stronger simple setæ, and the eighth joints of the legs have each a series of three or four spine-like bristles on the under surface near the base.

The single specimen, which is in very imperfect condition, is from Port Jackson. As no traces of the ovary could be seen, I think it is a male.

This specimen resembles the British form designated *A. hispida* by Hodge \* (which is probably a mere variety of *A. lavis*) rather than the typical *A. lavis*, as represented in that author's figures, in the form of the rostrum and abdomen, but the leg-bearing processes of the segments of the body are more closely approximated and the animal more densely pubescent than in either form. I do not observe the "circlet of little spines" at the extremity of the first joint of the mandibles mentioned by Hodge in his diagnosis of *A. hispida*. Böhm † refers specimens from Kerguelen Island to this species; but his figure of the palpus differs markedly from the same limb as figured by Hodge in *A. lavis*.

There are in the British-Museum collection two specimens of uncertain British locality, probably referable to *A. lavis*; but they are in a very bad state of preservation, being gummed upon cardboard, and can scarcely be identified with certainty.

It is to be regretted that during the transference of the specimen from spirit to the slide on which it is mounted for the microscope, the eighth joint of the only perfect leg was lost; but the figure, which was outlined while the specimen was yet in spirit, represents with sufficient accuracy the form of this joint.

This species is referable to the genus *Achelua* as limited by Dr. Hoek in his recent Classification of the Pycnogonida ‡.

Dr. Anton Dohrn § has united this genus (with several others) with *Ammonothea*, and the distinctions separating these genera are certainly very slight. I think it better, however, having only two species under consideration, to refer them to the genera as characterized by Hoek, his being a complete synopsis of the known genera and species of the group.

## 2. *Phoxichilidium hoekii*. (PLATE XXXV. fig. B.)

Body robust, with narrow intervals between the leg-bearing processes at base. Proboscis cylindrical, increasing slightly in thickness to its distal extremity, inserted ventrally between the bases of

\* Ann. & Mag. Nat. Hist. ser. 3, xiii, p. 115, pl. xiii. fig. 11 (1864).

† Monatsb. der Akad. Wissenschaft. Berlin, p. 186, pl. i. fig. 5 (1879).

‡ Report on the Pycnogonida of H.M.S. 'Challenger,' p. 26 (1881).

§ 'Die Pantopoden des Golfes von Neapel,' p. 134 (1881).

the ovigerous legs. Mandibles 2-jointed, the chelate terminal joint inserted not laterally, but at the distal extremity of the preceding joint. Ovigerous legs 10-jointed. The legs (but not the mandibles) are armed with strong conical spines, and bear two long auxiliary claws besides the normal claw.

Length of the rostrum, a little over . . . . .	2 millim.
Length of the body (without rostrum and abdomen) nearly . . . . .	3 „
Length of the abdomen about . . . . .	1.5 „
Length of leg of the first pair about . . . . .	21 „

The body is moderately robust (as in *P. fluminense*), with the leg-bearing processes nearly in contact at their bases; the articulations of the segments of the body are discernible only on the ventral surface. The cephalothoracic segment is about as long as the three following segments taken together, and of these latter the first is a little shorter than the second or third. The proboscis, as in *P. insigne*, is inserted ventrally, far back between the bases of the two ovigerous legs, and, as in that species, is very slightly swollen at the base, in the middle, and at the distal extremity; the mouth is small and triangulate, and is margined by three slight protuberances. The abdomen is slender, longer than in *P. insigne*, and directed upwards.

The oculiferous tubercle is conical, subacute, with four dark eyes. Immediately *behind* it the cephalothoracic segment is marked by a median longitudinal depression, extending along nearly its whole length. The basal joints of the mandibles are but slightly divergent and extend considerably beyond the front of the proboscis; they have no indication of the acute process characteristic of *P. insigne* and bear the second joints, which are about half as long as the first, at their distal extremities; the pincers are smooth on their inner surfaces. The basal joints are nearly glabrous. The second joints and the pincers at base are clothed with fine hairs, which are most abundant on the under surface of the second joint.

The ovigerous legs are inserted on either side of the base of the proboscis and are 10-jointed; the first and third joints are short, the second a little longer, the fourth and fifth still longer and of nearly equal length, but the fourth is somewhat thickened, the sixth about as long as the second, the seventh to tenth small, the tenth minute; the last five joints are clothed with fine hairs.

The first joint of the legs is small, nearly as long as the lateral process, the second more than twice as long as the first, the third about half as long as the second; the fourth is about as long as the three preceding joints taken together; the fifth slenderer and a little longer than the fourth; the sixth also slenderer and about as long as the fourth; the seventh is very short; the eighth slightly curved and longer than the first, but not as long as the second joint. The first joint of the leg bears, at the distal extremity of its upper surface, one or two small conical spinules or protuberances, and at the

distal extremity of its fourth and fifth joints five protuberances, of which the two outermost are small, and the three inner longer, strong and subacute; near the middle of the ventral surface of the fourth joint is a small process (as in *P. fluminense*), and a series of minute spinules or protuberances along the upper margin of the fifth joint; the joints also, except perhaps the eighth, are marked with longitudinal impressed lines; the eighth has a series of spinules on its inferior surface; besides the terminal claw there are, as already noted, two strong accessory claws. The first to third joints of the legs are scantily clothed with very short hair; the distal protuberances of the fourth joint and the fifth joints are more thickly clothed with longer hair, and the sixth to eighth joints again with a much finer, more scanty pubescence.

Three specimens are in the collection, obtained respectively at Dundas Straits, 17 fms. (No. 161), Thursday Island, 4-5 fms. (No. 165), and in Prince of Wales Channel, 7 fms. (No. 169). As in these specimens the thigh-joints are not specially dilated and the genital pores are small, I believe them to be males.

This species resembles *Phoxichilidium insigne*, Hoek (*t. c.* p. 82, pl. xiv. figs. 5-7), from Bahia, in the curious distal protuberances of the fourth and fifth joints of the legs, but these are absent from the second and third joints in *P. hoekii*, and our species differs in many other most important points, as (*e. g.*) in the closely approximated leg-bearing processes of the body, the terminally-placed second joints of the mandibles, and the more robust body and appendages. The first-mentioned of these characters will also separate this species from *P. fluminense*, Kröyer (see Hoek, *t. c.* p. 81, pl. xiv. figs. 1-4), from which it is also distinguished by the distal protuberances of the leg-joints &c. The existence of these protuberances separates this species from those other species of *Phoxichilidium* described by Dr. Hoek in which the leg-bearing processes are more or less approximated, and from the two Austral species described by White\* as *Nymphon phasma* and *N. johnstonianum*, which Dr. Hoek has shown belong to *Phoxichilidium*. The "points" mentioned by White as occurring at the end of the joints in *N. johnstonianum* are, I may add, only short stiff setæ.

\* Proc. Zool. Soc. xv. p. 125 (1847).

## ALCYONARIA.

BY

STUART O. RIDLEY.

CONSIDERABLE light has already been thrown from four sources upon the zoology of the Aleyonaria of the northern and eastern parts of Australia—the districts which receive illustration from the present fine collection. I refer to the collection made by Mr. F. M. Rayner in the ‘Herald,’ that made by Mr. J. B. Jukes in the ‘Fly,’ in those of the Antarctic Expedition under Sir James Ross and the present Sir J. Hooker, and that by the German circumnavigatory expedition of the ‘Gazelle.’ In the case of the three British expeditions, the Aleyonaria of chief interest were described by Dr. J. E. Gray in the ‘Proceedings of the Zoological Society of London’\*, in the ‘Annals and Magazine of Natural History’†, and in his ‘Catalogue of the Lithophytes or Stony Corals in the collection of the British Museum’ (London, 8vo, 1870). The specimens collected by the ‘Gazelle’ were described by Prof. T. Studer in the ‘Monatsbericht der Akademie der Wissenschaften zu Berlin’‡. Studer’s is the largest single contribution to the subject, and describes twenty-four species from Australia, but only from western and north-western localities. The information given by the older writers Lamarck, Lamouroux, Milne-Edwards and Haime is almost all open to the great objection of indefiniteness as to locality; the single species definitely described by MM. Quoy and Gaimard as collected by the ‘Astrolabe’ in Australia is from the south.

The present collection contains thirty-eight species, and may be regarded as giving a good general insight into the character of the Aleyonarian fauna of the shallow waters of the north-east coast of Australia (coast of Queensland, up to and including Torres Straits), and as adding in a most important manner to our knowledge of the same fauna in the north-western part of this continent. I have inserted notes on specimens already in the collection where the localities were known with certainty; in particular a series recently obtained by exchange from the Australian Museum, Sydney, and collected near Port Jackson and on the Queensland coast, has been of service.

*Distribution.*—The number of localities investigated, and the

\* 1862, pp. 27, 31, 34; 1872, p. 744.

† Ser. 3, vol. v. p. 20; ser. 4, vol. ii. p. 441, iii. p. 21.

‡ 1878, p. 633.



number of stations dredged and searched in the north-eastern district, together with the known ability of the distinguished collector, Dr. R. W. Coppinger, give an assurance that from shallow water in this quarter but few novelties are likely to be received in future. The results obtained from the northern region (from Torres Straits westward as far as the 130th parallel of E. longitude) are the most interesting, but the number of localities and stations searched here is relatively smaller than on the eastern side. The small number of Pennatulidæ is partly explained by the fact that the depths reached by the dredge did not exceed 30 fms. in any locality but one, viz. Arafura Sea, where 32–36 fms. are recorded. One of the most important results is the acquisition of definite localities for some interesting forms whose exact origin was hitherto unknown (see *Leucoella cervicornis*, *Mopsella textiformis*). Several, however, described by Lamarck, Lamouroux, and Gray, probably coming from this region, still remain undetermined as to exact locality. The known range of some species has been greatly extended by this Expedition, e. g. *Nephthya jukesi*, *Muricea umbraticoides*, *Siphonogorgia mirabilis*, *Acabaria japonica*, whose previously known habitats were respectively—i. Philippine Islands; ii. N.W. Australia; iii. Red Sea; iv. Japan.

In all, excluding the two Pennatulids as visitors from the deeper water, the shallow waters in the districts examined yielded altogether 36 species, of which 12, or one third, appear to be new to science, and are, with one exception (*Echinomuricea indo-malaccensis*), according to present knowledge, peculiar to these districts. Of the remaining species, two (*Ellisella calamus* and *Leucoella cervicornis*) are not known out of Australian (N.W., N., or N.E.) seas; while *Muricea umbraticoides* and *Mopsella textiformis* are known only from N.E. Australia and Dirk Hartog Island (W. Australia). Studer gives 22 other species from West and N.W. Australia (Dampier Island and Dirk Hartog Island), and Gray 2 other species from localities within these limits. Of these 24, 12 are not known elsewhere; so we have a total of 23 species not as yet certainly known outside Australia north of the 30th parallel of latitude.

Of the species not confined to Australia, *Spongodes florula*, *Echinogorgia flabellum*, *Otenocella pectinata*, *Juncella elongata*, and *Suberogorgia suberosa* are generally distributed in the Indian Ocean; *Spongodes spinosa* and *Solenocaulum tortuosum* extend, as at present determined, only to New Guinea; *Telesto smithi* to the sea off Timor; *Nephthya jukesi* goes further, to the Philippine Islands. One species, *Acabaria japonica*, extends to Japan; two, *Siphonogorgia mirabilis* and *Juncella gemmacea*, to the Red Sea; and two, those termed provisionally *Leptogorgia flexilis* and *Plexaura miniacea*, possibly to the Western American coast.

The systematic list which follows will show sufficiently the distribution of the species within Australian waters. I have adopted the same classification of the localities as in the case of the Sponges.

The list shows that the greater number of species (23) were obtained on the Queensland coast to the south-east of Torres Straits,

while that more tropical locality only furnishes 11 species, of which 4 occur also in the former district.

*Australian Distribution of Alcyonaria collected by H.M.S. 'Alert' on the Australian Coasts.*

	South-east Australia (New South Wales).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea, off Northern Australia.	Western North Australia (Port Darwin and Dundas Straits).	Western Australia (lat. 20°–35° S.). <sup>1</sup>
Family ALCYONIIDÆ.						
Subfamily ALCYONINÆ.						
1. <i>Nephthya jukesi</i> , Gray, var. ....	...	*				
2. <i>Spongodes florida</i> , Esper .....	*	...	...	...	..	*
3. — <i>hemprichi</i> ?, Klunzinger.....	...	...	*			
4. — <i>spinosa</i> , Gray, var. ....	...	*				
5. — <i>studer</i> , n. sp. ....	...	*	...	...	*	
— —, var. <i>levior</i> .....	...	...	...	*	*	
Subfamily TELESTINÆ.						
6. <i>Telesto smithi</i> , Gray .....	*	*	...	*		
Family PENNATULIDÆ.						
7. <i>Pteroides javanica</i> , Bleeker .....	...	...	...	*		
8. <i>Virgularia</i> , sp. ....	...	...	...	*		
Family GORGONIIDÆ.						
Group PRIMNOACEÆ.						
9. <i>Muricella tenera</i> , n. sp. ....	...	*				
10. <i>Muricea umbraticoides</i> , Studer .....	...	*				
11. <i>Echinomuricea indo-malaccensis</i> , n. sp. ....	...	*	*			
12. <i>Echinogorgia flabellum</i> , Esper .....	...	*	...	...	...	* ?
Group EUNICEACEÆ.						
13. <i>Plexaura prælonga</i> , n. sp. ....	...	*				
— —, var. <i>cinerea</i> , nov. ....	...	*				
14. — <i>miniacea</i> ?, Ehrenberg .....	...	...	*	...	*	
Group GORGONIACEÆ.						
15. <i>Leptogorgia flexilis</i> ?, Verrill .....	...	*				

<sup>1</sup> NOTE.—This locality is given *vide* Studer, *l. c.*

*Australian Distribution of Aleyonaria (continued).*

	South-east Australia (New South Wales).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea, off Northern Australia.	Western North Australia (Port Darwin and Dundas Straits).	Western Australia (lat. 20°-35° S.). <sup>1</sup>
16. <i>Leptogorgia australiensis</i> , n. sp. } ... ..						
— — —, var. <i>flavotincta</i> ..... } ... ..			*			
— — —, var. <i>perflava</i> ..... } ... ..						
17. <i>Psammogorgia rectangularis</i> , n. sp. ... ..					*	
Group GORGONELLACEÆ.						
18. <i>Juncella juncea</i> , <i>Pallas</i> ..... ..		*				*
19. — — — <i>gemmacea</i> , <i>M.-Edw. &amp; Haime</i> ... ..		*				*
20. — — — <i>elongata</i> , <i>Pallas</i> , var. .... ..		*				
21. — — — <i>fragilis</i> , n. sp. .... ..		*				
22. <i>Ellisella calamus</i> , <i>Studer</i> ..... ..		*				*
23. <i>Ctenocella pectinata</i> , <i>Pallas</i> ..... ..			*			*
Group SCLEROGORGIACEÆ.						
24. <i>Suberogorgia suberosa</i> , <i>Pallas</i> ..... ..		*	*			*
Family BRIAREIDÆ.						
25. <i>Briareum</i> , ? sp. .... ..			*			
26. <i>Callipodium australiense</i> , n. sp. .... ..			*			
27. <i>Solanderia</i> sp. .... ..			*			
28. <i>Iciligorgia orientalis</i> , n. sp. .... ..			*			
29. <i>Siphonogorgia mirabilis</i> , <i>Klunzinger</i> , } ... ..				*		
var. <i>flava</i> , nov. .... ..						
30. <i>Solenocaulum tortuosum</i> , <i>Gray</i> ..... ..		*		*		
31. <i>Leucoella cervicornis</i> , <i>Gray</i> ..... ..		*				
Family MELITHÆIDÆ.						
32. <i>Melitodes albitincta</i> , n. sp. .... ..		*				
33. <i>Mopsella textiformis</i> , <i>Lamarek</i> ..... ..		*	*			*?
34. — — — <i>clavigera</i> , n. sp. .... ..		*	*			
35. <i>Acabaria japonica</i> , <i>Verrill</i> ..... ..					*	
36. — — — <i>serrata</i> , n. sp. .... ..					*	
37. <i>Psilacabaria gracillima</i> , n. sp. .... ..	?*	*			*	
Family TUBIPORIDÆ.						
38. <i>Tubipora hemprichi</i> , <i>Ehrenberg</i> ..... ..		*				

<sup>1</sup> NOTE.—This locality is given *vide* Studer, *l. c.*

*Taxonomy.*—The results of the collection in this respect are not less interesting than are those of the distribution. In the case of one family (the Melithæidæ), a structural character has for the first time come to light, which illustrates the existence of a similar character in other families of this natural but very manifold Order: I refer to the occurrence of two kinds of zooids. In one case (in the same family) it has been found desirable to establish a new genus, and the number of new species is relatively large. The Melithæidæ show a remarkable development here. A remarkable member of the usually rare family Briareidæ has been assigned by me to the genus *Iciligorgia*, hitherto known only from the West Indies. The number of species of this family found here is relatively large, and includes some rare and very strange forms (*Solenocaulum*, *Leucoella*). Two points of general importance for the family Gorgoniidæ may be considered to have been decided by a study of the series which represents the new species, *Leptogorgia australiensis*, in this collection—1. That colour alone cannot be taken as a character of specific importance. 2. That characters derived from the shape, depth, partial presence or absence of superficial grooves in the cortex, or their partial replacement by raised lines, as seen in dry specimens, are not of specific, much less of family value, as held by Dr. Gray for some Gorgoniidæ (see Catalogue Lithoph. Brit. Mus., p. 24, *Elliselladæ*).

*Measurements and Terms employed.*—The measurements of spicules are those of *average greatest* specimens of each form of spicule. I have adopted Verrill's term *verruca* to signify that specialized part of the cortex which contains the retracted zooid. When describing them I have applied the term *longitudinal* to the radiating spicules of the verruca, and *horizontal* to those which are circularly arranged with regard to its centre.

*Classification.*—I have followed in the main the arrangement adopted by Kölliker in his 'Icones Histilogicæ.'

## ALCYONIIDÆ.

### ALCYONIINÆ.

The absence of both *Sarcophytum* and *Alcyonium* from the collection is perhaps due to the absence of in-shore reefs in the area examined. An *Alcyonium* was described from Port King George in Southern Australia by Quoy and Gaimard from the 'Astrolabe' voyage; but Lamarek's *A. putridosum*, from that locality, I have ascertained to be a siliceous Sponge.

**NEPHTHYA**, *Audouin ap. Savigny.**Ammonothea*, *Lamarck.***1. Nephthya (Ammonothea) jukesii**, var.*Lemnalia jukesii*, *Gray, Ann. & Mag. N. II.* (4) ii. p. 442, fig. 1.

The two specimens in this collection differ from the type specimen of the species in having the spicules about one sixth as large again in all dimensions, and in the infundibular, and not merely irregularly ramose arrangement of the crown of lobes. It is apparently not generically distinct from *Ammonothea* (this generic name is forestalled by Leach in *Pycnogonida*), but nearly related to *A. imbricata* (M.-Edwards and Haime) and *A. ramosa* (iid.). The spicules have never been figured, and Dr. Gray's description seems, perhaps unintentionally, to suggest that none are likely to be found in the superficial parts of the animal.

*Hab.* Port Molle, Queensland, between tide-marks.**2. Spongodes florida.***Alcyonium floridum*, *Esper, Pflanzenthier*, iii. p. 49, pl. xvi.*Spogodes florida*, *Gray, P. Z. S.* 1862, p. 27, pl. ix. figs. 1-4.

Two young specimens. Shark Bay, S.W. Australia, is apparently the only other Australian locality recorded. It also extends to the Philippine Islands (*Gray*).

*Hab.* Port Jackson, 0-5 fms.**3. Spongodes hemprichi.***? Klunzinger, Kor. roth. Meer.* p. 36, pl. iii. fig. 1.

A young dry specimen, which does not show its characters with sufficient distinctness to justify a positive decision as to its identity. It has, however, the general external aspect of the above species; the stem and main axis are white, the zooids clustered on the surface-lobules crimson; the spicules are fusiform, and thickly covered with coarse, prominent tubercles.

*Hab.* Thursday Island, Torres Straits, 4-5 fms.**4. Spongodes spinosa**, var.*Spogodes spinosa*, *Gray, P. Z. S.* 1862, p. 27, pl. iv. figs. 5-7.

A small portion of a colony, in spirit, possibly specifically distinct from Gray's species. The stem and branches have a dull purple-grey colour, which belongs almost solely to the soft parts, affecting the spicules but slightly. The spicules reach a length of



3 to 4 millim., those of the type specimen of the species 5 millim. Studer (*l. c.* p. 636) assigns to this form a species from New Guinea with orange-red polype-heads and spicules 2·5 millim. in maximum length, which appears to be specifically distinct from it. The dark colour of the stem of the present specimen is perhaps simply a case of local variation, but may perhaps be the normal condition, lost in the original spirit-specimen. Another point of divergence is the usually single spicule projecting above the polype-cell at one side; in the type specimen there are usually two spicules here.

*Hab.* Port Denison, Queensland, 3–4 fms.; bottom, sand and rock.

### 5. *Spongodes studeri*. (PLATE XXXVII. figs. A, A', a-a'').)

*Spongodes spinosa*, Studer, *MB. Ak. Berlin*, 1878, p. 636; *nec*  
*Spoggodes spinosa*, Gray.

Head relatively large, laterally compressed, sharply demarcated from the pedicle. Greatest diameter of head at least three times that of pedicle. Pedicle cylindrical, weak to moderately strong. Common axis of head dividing into from 6 to 12 strong lobes, of varying distinctness in different specimens; lobes dividing almost immediately into a large number of lobules, slightly horizontally expanded at their free end. Terminal lobules each presenting a mass of from 4 to 9 small round polype-heads, closely aggregated. Each polype usually accompanied by one stout projecting spicule on its external aspect, but the lobule usually has but two or three really prominent spicules, which form a kind of calyx to the lobule; the remaining ones, being shorter, are inconspicuous, as a rule. The largest spicules project from 1 to 2 millim. beyond their polypes. Colour of stem dirty white, sometimes crimson, that of surface of axis of the head and its subdivisions white or pale pinkish, of polypes (where not removed by the action of the spirit) either claret-colour or deep fiery orange-red (in one case the polypes are white, but the lobules are tipped with orange-red).

Spicules of general axis of head mostly more or less longitudinally arranged:—(i.) Fusiform, undulating, rather bluntly terminated, beset with monticular tubercles, usually terminally roughened or divided, about ·02 to ·035 millim. in height, often arranged in approximately annular series round the spicule, about 5 in number in the semidiameter of the middle of the spicule; size about 3 by ·3 millim. Also (ii.), as (i.) but smaller, with tubercles crowded towards ends and usually smaller than in (i.), simple (not rough) or almost so; size about 1·5 by ·15 millim. Spicules of lobules:—(iii.) Large “main” spicule fusiform, almost straight, fairly sharp at each end, covered with low tubercles (not exceeding ·18 millim. in height), about 4 to a semidiameter in the middle of the spicule; tubercles simple and monticular towards the middle, sharp and directed forward near the external end, where they gradually diminish in size, becoming usually very scanty in numbers, or reduced to mere

linear ridges, at the very point; size about 2·6 by ·21 millim. (iv.) Smaller spicules, as (iii.), but generally more curved; the tubercles at the outer end are strongly developed and project forward, often giving quite a feathered appearance to the point; size about ·64 by ·053 to ·07 millim. A variety, which may be distinguished as var. *lavior*, represented by two young specimens, has the tubercles on the larger spicules smaller, usually simple, and fewer in number.

*Hab.* (Typical form) Port Darwin, Percy Island, and Port Molle, Queensland, depths 0–14 fms., bottom various; also McClure Gulf, New Guinea (*Studer*). Var. *lavior* occurs in the Arafura Sea, off N.W. coast of Australia, 32–36 fms., and Dundas Straits, 17 fms., bottom various.

*Obs.* The aggregation of lobules at the surface, though close, is not so close as in the type specimen of *S. spinosa*, Gray, in which, moreover, the spicules are much larger and the shape of the colony as a whole more horizontal than here; the two species, however, are closely allied. Several specimens occur in the collection. Of those species which are the best known and described hitherto, viz. the Red-Sea forms described by Klunzinger, *S. henprichi* appears to be the most nearly allied; it has, however, the spicule-tubercles considerably larger in proportion, and the spicules of the stem tend to be blunt instead of fusiform, and instead of being longitudinally, they are more or less transversely arranged.

#### TELESTINÆ.

##### 6. *Telesto smithi*.

*Telesco smithii*, Gray, *Ann. & Mag. N. H.* (4) iii. p. 21, fig.  
*Alexella smithii*, *id. ibid.* p. 22.

A considerable quantity, in masses, in conjunction with Sponges and articulate Polyzoa, from the Arafura Sea. It was originally described from Sydney, New South Wales.

*Hab.* Arafura Sea, 32–36 fms.; Port Molle, Queensland, 12–20 fms.

#### PENNATULIDÆ.

##### 7. *Pteroides javanica*.

*Bleeker*, *Natuurkund. Tijdsch. Batav.* xx. p. 402; *Kölliker*, *Anat.-syst. Beschreib. Alcyon.*, *Pennat.* p. 104.

A very young specimen in spirit. It agrees in its chief characters and general facies with this species, though it has only 10–12 leaves on each side, and the largest leaves have only 4–6 chief rays; these low proportions, however, are perhaps due to youth. The stem is surrounded by a dark band opposite the lowest leaves, and by another about halfway up that part of the axis on which the

leaves are inserted. Total length 26 millim., length of leaf-bearing portion 12 millim., greatest diameter 8 millim. Bleeker's specimens were collected at Java.

*Hab.* Arafura Sea off N.W. coast of Australia, 32-36 fms.

### 8. *Virgularia*, sp.

A specimen in a very imperfect condition, but evidently representing a delicate species with large, partially separate zooids, whose centre is occupied by a broad dark-purple band, the proximal and distal ends being pale yellowish (in spirit). The leaves have a very oblique direction on the stem, and leave bare a wide dorsal area: they are subalternate and just overlap each other in front.

The axis is only about .9 millim. in diameter.

*Hab.* Arafura Sea, N.W. coast of Australia, 32-36 fms.

## GORGONIIDÆ.

### PRIMNOACEÆ.

### 9. *Muricella tenera*. (PLATE XXXVI. figs. E, E', e, e'.)

Corallum erect, branching approximately in a plane; after one or two, or without any, dichotomous divisions the branching becomes pinnate, the pinnæ approximately alternate, the ultimate pinnæ varying from 15 to 45 millim. in length. Stem and branches somewhat flattened from front to back, the stem about 1.5 millim., the tips of the branches about 1 millim. thick in the broadest place (excluding verruæ). Cortex thin, paper-like, level but slightly rough, owing to the large size of the spicules which lie in it, side by side, without projecting: colour in dry state white, in spirit semitransparent, appearing dirty white, owing to the axis, which is black, being partially seen through it. Verruæ in two lateral series, alternate, and alternately directed more or less towards the front and the back (this latter character most strongly marked towards the ends of the branches). In the closed state the verruæ are conical, prominent (about 1 millim. high); in the expanded state the cone is truncate and not so high. Colour of polypes in dry state a pale brown. Cortical spicules fusiform, generally slightly curved, tapering gradually from centre to moderately sharp ends, covered with mostly distinct, but closely-set, prominent, cylindrical tubercles, the ends of which are blunt (occasionally rather pointed) and strongly roughened; average size about 1 millim. by .177 millim. Verruca-spicules of same characters, but either about 1.5 millim. long by .28 millim., or .9 by .14 millim. Spicules of polype itself with smaller tubercles, but of same general characters; size about .35 by .07 millim.

*Hab.* Port Molle, Queensland, 14-20 fms.; bottom rock or coral.

*Obs.* This species belongs to the section of *Muricea*, s. lat., which Verrill has named *Muricella* (Trans. Conn. Acad. i. p. 450). It appears to be most nearly related to *Muricella flexuosa*, Verrill, of described species, but the verrucæ appear to be larger than in any species yet known: perhaps the systematic position of the species is not far from *Nicella*, Gray.

#### 10. *Muricea umbraticoides*.

*Studer, MB. Ak. Berlin, 1878, p. 650, pl. iii. fig. 16.*

Studer's description and figures of his species (obtained from Dirk Hartog Island, on the west coast of Australia, about 26° S. lat., in 45 fms.) are most characteristic, with the exception that the "halbseitig warzig" character of the spicules appears hardly to exist, and the tubercles should be rough and more distinct from each other than his otherwise good figure 16*b* would signify. Two dry and several spirit specimens are in the collection, 185 millim. ( $7\frac{1}{2}$  inches) in height.

*Hab.* Port Curtis, Queensland, 5–11 fms., bottom sand and shells; also Port Molle, 14 fms. (from Australian Museum).

#### ECHINOMURICEA, Verrill.

*Acanthogorgia, Johnston, pars, nec Gray.*

The type species of the genus is *E. (Nephthya, Stimpson) coccinea*, Stimpson, which I have wrongly retained in *Nephthya* (Ann. and Mag. N. H. (5) ix. p. 184), having overlooked Verrill's later remarks upon the species. The type species of *Acanthogorgia* (*A. hirsuta*, Gray) appears to me quite distinct generically from the two (*A. grayi* and *A. atlantica*) assigned to it by Johnston. The latter agree with *Echinomuricea*. A new species of the genus occurs in the collection.

#### 11. *Echinomuricea indo-malaccensis*.

(PLATE XXXVI. figs. B, B'; PLATE XXXVIII. figs. *d*–*d'''*.)

Corallum erect, branching almost exclusively in one plane at angles of about 75°. Branching fundamentally dichotomous, accompanied by unilateral pinnation. Branches given off at intervals of not more than 20 or less than 6 millim., as a rule. Branches near middle of colony comparatively short, viz. 15 to 40 millim., those near the periphery tend to become very long (*e.g.* up to 160 millim.); cylindrical, slightly clavate, being about 2 to 3 millim. in diameter at their commencement, and about 3 to 4 millim. at apex in large specimens, 1.5 to 2 in small ones. Axis very tough and flexible, very dark brown at base, paler at ends of branches. Cortex thin, arenaceous in appearance, red. Verrucæ crowded over all parts of cortex, leaving but small intervals, prominent but truncate, resembling low turrets; in expanded condition about .3 millim. high and 1 millim.

broad; the rim is beset with scattered spine-like spicula with branched bases, about two deep; the points project directly upwards in the expanded state.

Spicules of general cortex :—(i.) Conical, with rounded broad end tapering to moderately sharp smaller end, the whole thickly covered with very coarse blunt tubercles; size  $\cdot 32$  to  $\cdot 35$  by  $\cdot 123$  to  $\cdot 177$  millim. (ii.) Conical to fusiform, with prominent proliferating tubercles; size about  $\cdot 38$  by  $\cdot 1$  to  $\cdot 14$  millim. (iii.) Tri- to quadri-radiate, the arms stout or slender, pointed, covered with rough tubercles like those of (ii.); about  $\cdot 53$  millim. in maximum length and  $\cdot 07$  to  $\cdot 14$  millim. in maximum diameter of the arms. (iv.) Verruca-spicules with expanded ramifying basal portion, whose branches are lobose and marginally denticulate and bear low scattered spines; the upright projecting portion or spine which helps to form the fringe on the rim of the verrucæ is smooth, approximately straight, and tapers from its base to a sharp point; total length of spicule  $\cdot 035$  to  $\cdot 65$  millim., total breadth  $\cdot 177$  to  $\cdot 46$  millim.; projecting spine alone  $\cdot 25$  to  $\cdot 37$  by  $\cdot 053$  to  $\cdot 087$  millim. (basal diameter). Also less developed forms of the same type as (iv.). The zooids themselves contain long curved fusiform spicules with smooth ends.

*Hab.* Port Curtis, Queensland, 5–11 fms., bottom sand and shells; Port Molle, Queensland, 12–20 fms., bottom rock and coral; Warrior Reef, Torres Straits, bottom pearl-shells.

*Obs.* This species is perhaps more nearly allied to *E. atlantica* and *E. gragi* than to *E. coccinea*, Stimpson, from which it differs in the non-tuberculation of the spine of the large verruca-spicule. Verrill's specimens were unbranched, but this may have been due to youth. The long-spined marginal spicule of the verruca of *Acanthogorgia atlantica* is exactly like that of this species; but that species differs from the present in having the verrucæ less distinctly marked out by a spicular crown and by the dark brown colour. The new species is represented in the present collection by three dry specimens and one in spirit; the largest measures 230 millim. (9 inches) in maximum height, and 130 millim. (5 inches) in maximum breadth. Specimens occur in the British Museum from Hongkong (*coll. Dr. Harlan*).

## ECHINOORGIA, Kölliker.

In the following descriptions I have not thought it necessary to describe the spicules of the verrucæ in all cases, as they appear to exhibit the same main characters throughout these species of *Echinogorgia* and *Plexaura*.

### 12. *Echinogorgia flabellum*.

*Antipathes flabellum*, *Esper*, *Pflanzenreich*, ii. p. 137, *Antipath.* pl. i.

*Gorgonia pseudo-antipathes*, *id. op. cit. Fortsetz.* ii. p. 32, pl. liv. (*nec Gorgonella pseudo-antipathes*, Kölliker, *Icon. Histiol.* p. 140, pl. xviii. fig. 42).

? *Gorgonia cancellata*, *Dana*, *Zooph. U. S. Expl. Exp.* p. 658.



? *Rhipidogorgia cancellata*, *M.-Edw. & Haime, Hist. Cor.* i. p. 179.

? *Paramuricea cancellata*, *Studer, MB. Ak. Berlin*, 1878, p. 653.

*Echinogorgia*, sp., *Ferrill, American Journ. Sci.* (2) xlv. p. 143.

The affinities of this long-known species have been so frequently misunderstood that I fully describe its spicules to justify the course I have taken in placing it in the genus *Echinogorgia*. The spicules of the general cortex, which is thick, are:—(i.) Fusiform, pointed at each end and generally curved, with scattered prominent, usually simple, tubercles, often of large size; length about  $\cdot 21$  to  $\cdot 42$  millim. by  $\cdot 053$  to  $\cdot 087$  millim. broad (including tubercles). (ii.) Larger fusiform, thickly covered with blunt, simple or compound tubercles on one side; on the other bearing a few large, prominent, moderately sharp dog-tooth-like tubercles,  $\cdot 035$  to  $\cdot 07$  millim. long. The spicule itself has blunt ends and is usually but slightly curved; it measures about  $\cdot 56$  by  $\cdot 177$  to  $\cdot 25$  millim. (iii.) Irregular tri- to sexradiate, with low, blunt, generally rough tubercles; maximum diameter of spicule  $\cdot 177$  to  $\cdot 25$  millim., of single arms  $\cdot 035$  to  $\cdot 053$ . (iv.) A form of "Blattkeule" with very variously developed shaft, generally consisting of several arms, covered with low, blunt, rough tubercles. The foliar portion consists of two to four angular dog-tooth-like projections, arranged in one plane, more or less flattened in this plane (as are the arms of the shaft), and their bases covered with similar but less prominent tubercles; length of teeth  $\cdot 053$  to  $\cdot 14$  millim., basal diameter about  $\cdot 07$  millim.; size of spicule variable, from  $\cdot 25$  to  $\cdot 35$  millim. in length and breadth. The spicules of the verrucæ are simple, fusiform, slightly tuberculate.

The tooth-like spines of spicules (ii.) and (iv.) are directed outwards in the natural position of the parts and produce the minute roughening of the surface of the cœnenchyma, which may be felt, and is to be seen under a lens; the small fusiform (i.) and the form (iii.) lie beneath, next to the horny axis.

A large series of dry specimens occurs in this collection; they are usually more extended laterally than the specimen figured by Esper. Most of them have a smaller general habit, the branches having a mean diameter of  $\cdot 1$  to  $1\cdot 5$  millim. in all specimens but one (from Port Curtis), which has the 2 millim. characteristic of Esper's specimens and of examples from Torres Straits &c. already in the Museum. The fundamental colour appears to be always a light yellowish brown; but many of the specimens have acquired a dusky coloration, apparently subsequent to death. In some young specimens from the Straits of Malacca (*Bowerbank coll.*) and Queensland anastomosis is wholly wanting.

*Hab.* Port Molle, Queensland, 12–20 fms.; Port Curtis, ditto, 5–11 fms.

*Obs.* *Echinogorgia* of Kölliker is nearly allied to *Plexaura*\*, and is perhaps connected with it by *E. cerea* and *furfuracea* and the

\* I regret having placed Klunzinger's species *P. torta* (from the Red Sea) in the widely distinct genus *Villogorgia*, in a communication to the 'Annals and Magazine of Natural History' (ser. 5, vol. ix. p. 191); its thick cortex separates it from that genus, at any rate, though whether it can be maintained in

present species. In habit these three species are closely similar. A specimen in the Museum, which is apparently the type of *Bovella ramulosa*, Gray (Ann. & Mag. Nat. Hist. (4) v. p. 407), is closely allied to *E. flabellum*, and should stand as *Echinogorgia ramulosa*.

## EUNICEACEÆ.

13. *Plexaura prælonga*, sp. n., var. *typica*. (PLATE XXXVI. fig. F, and PLATE XXXVIII. figs. *g*, *g'*.)

Growth upright, approximately in one plane. Common stem extremely short. Branching dichotomous; branches few, almost straight; terminal branches 150 millim. (6 inches) and upwards in length in adult specimens. Stem and branches cylindrical, either nearly of the same diameter throughout in both cases, viz. about 2·5 millim., or ranging from 6 millim. at base to 3 millim. at end of branches in adult specimens. Cortex approximately smooth, even, rather friable. Colour in dry state pale red-brown or dark tawny brown. Verrucæ small, not projecting from surface, equally distributed over all parts, 5 to 1 millim. apart. Axis tough, flexible, black. Cortical spicules:—(i.) Long fusiform, approximately straight, tapering to sharp points, with few, scattered, tapering, sharp, simple tubercles; size about ·35 by ·07 millim. (ii.) Stout fusiform-cylindrical, covered with low, blunt, compound tubercles; size about ·3 by 1 millim. (iii.) Irregular tri- to sexradiate, arms cylindrical, tapering to sharp points, with numerous but distinct, prominent, simple or compound, pointed tubercles; maximum diameter of spicule ·25 to ·52 millim., thickness of arms ·042 to ·1 millim. (iv.) Blattkeule; shaft with one or two distinct arms uniting in a moderately stout neck, often themselves bearing secondary arms; the whole shaft is covered densely with very prominent, tapering, compound tubercles. Foliar portion flattened in one plane, variable, either approximately oblong with rounded angles, or much drawn out laterally, forming angles at this point, and with a point below, or with the lower edge broken up into small lobes; edges sharp, minutely scalloped. From the shaft descend on to the foliar portion, sometimes more than halfway down its face, one or more narrow, more or less prominent ridges, tapering so as gradually to disappear; or the place of each ridge is taken by one or more rounded prominences; both ridges and prominences are smooth; length of spicule about ·5 millim., breadth of Blatt ·3 millim.

*Hab.* Port Curtis, 5–11 fms., bottom sand and shells; Port Denison, 4 fms., bottom rock.

*Obs.* Two dry specimens, the one from which the larger external measurements were taken being largely decorticated, occur, also

*Plexaura* may be open to doubt; in its spiculation it agrees with *Plexaurella* as limited by Verrill (Proc. Ess. Inst. vi. p. 42); but Dr. Klunzinger does not state explicitly whether the axis is simply horny or whether it contains the carbonate of lime, by the presence of which Kelliker distinguishes the genus from *Plexaura*.

some small bad specimens; they are respectively 200 and 220 millim. (8 and 9 inches) long, extreme lateral extension in the natural state probably about 70 millim. (3 inches). This variety is remarkable for its variability in external characters, for the great relative length of the terminal branches, and the early stage at which branching commences, and by the ridged character of the face of the Blattkeule spicule; in most other respects it closely approaches the following variety.

**Plexaura prælonga, var. cinerea.** (PLATE XXXVIII. fig. *h*.)

Growth upright, in one plane. Stem long. Branching approximately dichotomous; branches few, flexuous; terminal branches 100 to 150 millim. (4 to 6 inches) long; stem and branches cylindrical, approximately of one diameter, viz. about 2·3 millim., throughout. Cortex minutely rough, even, fairly tenacious. Colour in dry state dark dirty grey. Verrucae small, slightly projecting from the surface as low mounds, their openings extended in direction of length of branch; about 1 millim. distant from each other, equally distributed all over cortex. Axis tough, flexible, glossy dark brown. Cortical spicules:—(i.) Long fusiform, approximately straight, tapering to sharp points, with scattered, tapering, sharp, simple tubercles; size 21 to 35 by 7 millim. (ii.) Stout fusiform-cylindrical, curved, rather thickly covered with low compound tubercles, often extended in direction of circumference of spicule, with pointed ends; size about 3 by 12 millim. (iii.) Irregular tri- to sex-radiate, the arms cylindrical, blunt, covered with few and scattered, mostly low and blunt tubercles; maximum diameter of spicule 18 to 21 millim., thickness of arms 42 to 53 millim. (iv.) Blattkeule, extremely variable in form; shaft provided with very stout neck, generally branching into two (occasionally three) stout arms; the latter are well covered with compound, rather angular tubercles, the neck and proximal part of foliar portion bearing broader, more fungiform tubercles; the foliar portion is flattened in one plane, and either transversely oblong with four rounded angles, or cordate with sharp lancet-like extremity, or with the lower extremity prolonged into several long teeth; the edges are thin and always more or less dentate, at any rate at the outer extremity, with small teeth; the proximal part of the face carries, as already mentioned, a few large, fungoid, compound tubercles; one variety which has the edges much dentate has also a number of small tubercles extended almost as far outwards as the edges. Size of spicule about 35 long by 35 millim. broad.

*Hab.* Port Curtis, Queensland, 5–10 fms.; bottom sand and shells.

This variety is represented by a single dry specimen, measuring 230 and 180 millim. (9 and 7 inches) in extreme height and diameter respectively. It differs from var. *typica* chiefly in the tuberculate rather than ridged character of the faces of the “Blatt” of the Blattkeule spicule.

With regard to the relation of this to other species, perhaps the Chilean forms described by Philippi (Arch. für Naturg. 1866, p. 116) are the closest allies; their growth is similar to that of *P. prælonga*; their spiculation is not, however, described.

#### 14. *Plexaura miniacea*.

? *Plexaura miniacea*, *Ehrenberg, Cor. roth. Meer.* p. 141.

I assign to this species with great doubt a very small Gorgoniid of bright crimson colour, branching frequently and dichotomously in one plane, and thus forming what in an older specimen would probably be a reticulate corallum. The branches are slightly flattened from front to back; the terminal ones are short (not exceeding 10 millim.); maximum diameter of stem about 2.5 millim., of tips of branches (which are somewhat clavate) 1.25 to 1.75 millim. Cortex compact, minutely rough. Verruæ slightly prominent, orbicular. Axis flexible, glabrous, greenish to amber-brown. Blattkeule spicule of cortex very like that of *Echinogorgia cerea*, Esper, as figured by Kùlliker\*, with shaft composed of one median, slender pointed, and two shorter alar rays with scattered, rounded, simple or compound tubercles; foliar portion consisting of wedge-shaped processes, the middle one the longest, edges minutely scalloped, faces rendered uneven by longitudinal striae or angular ridges; size about .35 by .14 millim. The cortical radiate and slender fusiform spicules resemble in character those of *P. cinerea* (*suprà*), but they are only about half the maximum size of those of that species. I have not observed a stout cylindro-fusiform. Ehrenberg does not assign any locality to his species.

*Hab.* Port Darwin, north coast of Australia, 8-12 fms., bottom mud and sand; also Hammond Island, Torres Straits (*coll. by P. M. Rayner*, in Brit. Mus.).

*Obs.* The specimen last referred to shows decided anastomosis of the branches.

#### GORGONIACEÆ.

#### 15. *Leptogorgia flexilis*.

? *Litigorgia flexilis*, *Verrill, Trans. Conn. Acad.* iv. p. 400 (edition 1); and *Amer. Journ. Sci.* (2) xlviii. p. 42.

? *Leptogorgia flexilis*, *id. l. c.* edit. 2.

I refer to this species with some doubt a single dry specimen, broken off below, consisting of a cylindrical main axis, 10 inches (250 millim.) long, and diminishing in diameter from 2.25 millim. at base to 1.25 in greatest diameter of the somewhat flattened apex, bent over (perhaps accidentally), so that the apex points downwards; two branches, 36 and 32 millim. respectively in length, decidedly flattened, and having an apical diameter of 1.25 and 2.0 millim. respectively, are given off at angles of about 45° and at an

\* Icon. Histiol. pl. xvii. fig. 17.

interval of 145 millim., in planes which are at right angles with one another. The hard axis is tough and flexible; its colour is that of whalebone at the basal end, where it is 1.5 millim. in diameter; it is about .6 millim. thick at the apex of the stouter branch. The cortex is firm, roughened by the slight projection of the verrucæ, which usually form three alternating rows on each side of a slight median bare space. The verrucæ, which are open, are oval elevations, just sufficiently raised to render the surface of the cortex uneven; their long axis follows that of the stem or branch, and is about .6 millim. long; they are not swollen wart-like, but rather resemble the reverse side of holes made in paper by thrusts with a sharp point, whereby a thin rim of broken paper is made to extrude at the opposite side to that from which the hole is made. Between the verrucæ the cortex is smooth or even glabrous. Colour dull crimson. Cortical spicules fusiform, with two main whorls, distinct from each other, of distinct, low, rough tubercles; a few larger ones have two smaller subterminal whorls, distinct from the median ones, of similar character, and beyond them the apex is formed by a pointed or irregular, more or less tuberculate end; but in most cases the outer pair of whorls practically terminate the spicule; size .087 to .106 by .053 millim.; colour deep crimson.

*Hab.* Port Denison, Queensland, 4 fms.; bottom rock.

*Obs.* The only points in which I find this species to differ from Verrill's description are the slightly inferior diameter of the spicules, the absence of longitudinal grooves to the stem &c., the crimson-red colour, the branching not being confined to one plane.

If this species should prove to be identical with Verrill's it will be a remarkable case of distribution, as the latter was obtained from the Bay of Panama; but it must be remembered that the specimen is single and imperfect.

#### 16. *Leptogorgia australiensis*. (PLATE XXXVI. figs. C, C', c, c'.)

Corallum flabelliform, branching in one plane. A small number (two or three) of main branches are given off by the short common stem, and are pinnate at short intervals with long simple pinnae or branchlets, generally alternate, diminishing in length towards the ends of the branches; a few pinnae may be themselves pinnate. Base thin, small. Main stem cylindrical. The main branches are almost straight, the pinnae curve upwards; both branches and pinnae are much flattened out laterally, tapering to slender, slightly hastate apices. Main stem in large adult specimens about 6 millim. in diameter, main branches 5 millim. at base; pinnae ranging in size from 15 centim. in length by  $2\frac{1}{2}$  millim. in greatest diameter to 6 centim. by 1 millim., in exceptional cases 20 centim. (8 inches) long. Surface almost smooth, but for the polype-cells and some grooves and raised lines. The main stem is marked by a few shallow longitudinal furrows; the branches are provided on both the anterior and posterior faces with a more or less distinct furrow, slightly undulating (sometimes very tortuous, much inter-



rupted, and accompanied by raised margins); near their origin some of the chief pinnæ show similar furrows at their bases, extending some distance upwards in those which have themselves become pinnate. These grooves may be replaced in parts of the specimen\* by irregular raised lines. Verrucæ distributed with more or less regularity in two alternating rows down each lateral face of the branches and the pinnæ (often uniserial in young specimens), in number from 18 to 36 to an inch on each side; they appear as low, gradually elevated prominences, often barely elevated, but most so near the tips of the pinnæ; the mouth is formed by a longitudinal slit extended in the direction of the long axis of the branch. Cortex about .6 millim. thick on main stem. Axis black in stem, filiform, transparent, and pale brown at tips of pinnæ. Spicules fusiform, long or short, beset with prominent tubercles arranged in whorls in the median portion of the spicule, massed together at the ends; whorls separated by more or less distinct bare spaces; about 8 whorls in long fusiform spicules, 4 in stout ones; tubercles fungiform, consisting of a cylindrical base with an expanded and roughened apex. Spicules either lemon-yellow, chrome-yellow, deep crimson, or (rarely) partly crimson and partly yellow or colourless. Dimensions (average maximum †):—

- |                                 | millim.                      | millim.          |
|---------------------------------|------------------------------|------------------|
| i. Long fusiform spicules . .   | .152 by .038 to .177 by .038 | to .044.         |
| ii. Stout fusiform spicules . . | .108 by .05                  | to .127 by .041. |
| iii. Verruca-spicules(fusiform) | .139 by .031 to .146         | by .032.         |

No other forms of spicule observed.

Two forms of this species may be distinguished:—

(1) Var. *flavotincta*. Stem, main branches, and bases of pinnæ of pale brownish-yellow colour, inclining to crimson-red in the neighbourhood of the cells; the latter colour characterizes the remaining parts of the pinnæ and becomes deeper towards their apices; the paler tints are due to the intermixture of crimson and yellow spicules; the ends of the pinnæ possess crimson spicules only. The spicules measure—(i.) long fusiforms .177 by .038; (ii.) stout fusiforms .127 by .041; (iii.) verruca-spicules .142 by .038 millim.

(2) Var. *perflava*. Whole corallum bright yellow, being lemon-yellow in one specimen and chrome-yellow in another. The spicules are almost all of a bright yellow colour, some of a darker tint than others; a crimson one is occasionally to be found. Dimensions (average greatest):—

	Chrome-yellow specimen. millim.	Lemon-yellow specimen. millim.
i. Long fusiform . . . .	.165 by .044.	.152 by .038.
ii. Stout fusiform . . . .	.12 by .05.	.108 by .05.
iii. Verruca-spicule . .	.146 by .032.	.139 by .031.

\* Perhaps due, as also the variations in the grooves, to wrinkling of the cortex during the process of drying.

† The endeavour has been to arrive at the size of the adult spicule in each case, by a series of comparative measurements; the variations here given are those occurring in different specimens.

*Hab.* Warrior Reef and Prince of Wales Channel, Torres Straits ; in the latter case from 7 to 9 fms., bottom sand (actually attached to a stone).

This is a very beautiful and attractive species, the mode of branching and the proportions of the branches being graceful and the colours very vivid.

Of the three dry specimens obtained (i.) deep yellow, is 550 millim. (22 inches) high by 325 millim. (13 inches) in extreme diameter ; (ii.) lemon-yellow specimen, 475 by 275 millim. (19 by 11 inches) ; (iii.) reddish specimen, 475 by 387 millim. (19 by 15½ inches). A young specimen preserved in spirit of the same colour as (i.), and measuring 145 millim. high by 30 millim. maximum lateral expanse, is distinguished by slenderer habit.

Of the double-headed spicules which Verrill has found in many *Leptogorgia* I have seen none here, though sometimes almost deceived by pieces of broken fusiform spicules, consisting of a smooth median portion and a whorl of tubercles left at each end of it. I have no doubt as to the specific identity of the above specimens. In the main external features of the corallum, and the forms and proportions of the different kinds of spicules, they agree substantially with one another, as may be seen by the few differences by which it has been found possible to distinguish the two varieties : the colour is the only serious difficulty in the way of uniting these two varieties, and is shown not to be of specific importance in this case by the fact that red spicules do occur in the cortex of both specimens of the yellow variety, and that in that of the main branches of the red form there are almost, if not quite, as many yellow as there are red spicules, some individual spicules being transitional in colour.

In its manner of branching the species belongs to one of the less common types of this large genus. Of other Australian species *L. divergens*, Studer (MB. Ak. Berlin, 1878, p. 655, pl. iv. fig. 21), from N.W. Australia, is a very different form, if it be a *Leptogorgia* at all ; its polype-spicules are very large and the mode of branching dichotomous. *Sydella australis*, Gray (P. Z. S. 1872, p. 747, pl. lxiii. figs. 8, 9), from Sydney, only known from a drawing, is perhaps another Australian *Leptogorgia* distinguished by a long termination to the branchlets bare of cells.

*Psammogorgia* ? **PSAMMOGORGIA**, Verrill.

**17. *Psammogorgia rectangularis*.** (PLATE XXXVI. figs. A, a, a'').

Corallum erect, branching in one plane ; the main branches pinnate on one side with short claviform twigs, projected almost at right angles to branches, at intervals of 8 to 20 millim.

Stem cylindrical, about 1.25 millim. in diameter. Branches rather compressed from front to back ; average diameter from side to side 2 millim. ; diameter of small branches at origin 1 millim., at

clavate apex 2 millim. Axis flexible—at base black, 1 millim. in diameter; near apices dark brown, filiform. Cortex compact, about .3 millim. thick on branches, dirty white in colour, finely granulated by the surface-spicules. Verrucæ equally scattered over all sides of the stem and branches, though absent at the lower end of the stem, about .5 millim. high; monticular, with small apical opening.

Cortical spicules:—(i.) Fusiform, with moderately sharp ends, and covered with large, transversely extended, rough, blunt tubercles, with distinct spaces between them, irregularly scattered or sometimes approaching a whorled arrangement; size .24 by .087 millim. (ii.) Cylindro-fusiform, with less pointed ends, and covered with small, low, cylindrical tubercles of approximately uniform size, except at the end, where they become smaller and almost disappear; size .38 by .14 millim. (iii.) Pegtop-shaped, with the broader end slightly pointed itself; tuberculated in same way as (i.); size .28 by .14 millim.

*Hab.* Port Darwin, 8–12 fms.; bottom mud and sand (growing on a Gorgonellid stem).

The height of the single dry specimen is 76 millim. (3 inches), the extreme width .23 millim.

The spicules of this species have tubercles of a somewhat different character from those figured by Verrill for most of his species, being low and rough, like those of the fusiforms of *Leptogorgia*; but in general shape the spicules appear to agree with those of the species on which he forms the genus. In external appearance the species very closely resembles *P. arbuscula*, var. *pallida*, but is paler even than that form; the cortical spiculation of that form differs from that of our species in having the spicules more acutely tuberculate, *i. e.* with the tubercles longer in proportion to the diameter of the shaft and more pointed; the spicules are also, as a rule, far smaller all over, the largest sizes given by Verrill for either the variety or the typical form being .264 millim. length and .108 millim. breadth.

#### GORGONELLACEÆ.

##### 18. *Juncella juncea*, Pallas.

*Gorgonia juncea*, Pallas, *Elench. Zooph.* p. 180; *Esper, Pflanzenzth. Fortsetz.* ii. p. 26, pl. lii.

*Juncella juncea*, Kölliker, *Icon. Histiol.* p. 140, pl. xviii. figs. 45, 46; ? *Valenciennes, Comptes Rendus*, xli. p. 14; ? *M.-Edw. & Haime, Hist. Cor.* i. p. 186; *Gray, Cat. Lithoph.* p. 25; *Studer, MB. Ak. Berlin*, 1878, p. 659.

A single fine specimen of typical characters. Neither Milne-Edwards and Haime nor Valenciennes give details full enough to enable the student to identify their species satisfactorily with that of Pallas and Esper. In the 'Alert' specimen and that figured by Esper (referred to by M.-Edwards and Haime) the verrucæ are closely

packed over the cortex. In our specimen, which is about 46 inches (1150 millim.) long by 6 millim. thick at the present (broken) base, and  $3\frac{1}{2}$  millim. thick at tip, the basal end is almost smooth, the verrucæ being either level with the surface or depressed below it; towards the middle of the length they gradually become projecting, until they reach a height of about 1.25 millim.; they are then appressed against the surface of the cortex. A distinct median groove is to be traced along most of the stem. Studer has already recorded it from Australia (north and north-west), 45–50 fms.

*Hab.* Port Denison, Queensland, 4 fms.

### 19. *Juncella gemmacea*.

*Verrucella gemmacea*, *M.-Edwards & Haime, Hist. Cor.* p. 185, pl. B 2. fig. 7.

*Juncella gemmacea*, *Kölliker, Icon. Histiol.* p. 141, woodcut 19, fig. 1.  
? *Juncella flexilis*, *Studer, MB. Ak. Berlin*, 1878, p. 659.

The spicules of this species appear to be hardly distinguishable from those of *J. juncea*, Pallas, judging by a comparison of those obtained from the present Australian specimen with those figured by Kölliker (*l. c.*). The present collection contains (partly dry, partly in spirit) five specimens, besides fragments; they exhibit precisely the range of variation in colour which is described by Studer (*MB. Ak. Berlin*, 1878, p. 659) in his specimens from 80 fms. off North-west Australia. They are mostly flexible and somewhat slender as compared with *M.-Edwards* and *Haime's* figure, for the maximum diameter of the stem in most is not more than (including the verrucæ) 2.5 millim., only in one case attaining 3 millim.

*Hab.* Percy Island, 0–5 fms.; Port Moller, 12–20 fms. and between tide-marks; Port Denison, 4 fms.; Fitzroy Island, 11 fms. (all in Queensland).

*Obs.* The absence of this wide-ranging species from the Torres Straits captures seems to be accidental. Studer's species, *J. flexilis*, seems hardly distinct from it.

### 20. *Juncella elongata*, var.

*Gorgonia elongata*, *Pallas, Elench. Zooph.* p. 179.

*Juncella elongata*, *Kölliker, Icon. Histiol.* p. 138.

A spirit-specimen measuring 125 millim. (5 inches) in height and 90 millim. ( $3\frac{1}{2}$  inches) in extreme present diameter; it differs from the typical form of this species mainly in its slender habit, indistinct indication of posterior bare space and depressed line, and pale pinkish-yellow colour. The spicules agree perfectly with those of the species. The branching is dichotomous. The largest perfect terminal branch measures 63 millim. in length; some other very short ones appear to have been broken during life, the cortex

having covered the ends again; the same thing, curiously enough, appears to have occurred with the base itself, so that the specimen must have been living unattached at the time of capture. The stem and branches are slightly flattened from front to back, and the greatest diameter of the proximal end of the base is 3 millim., of the tips of the branches 1 to 1.25 millim. The verrucae are very prominent (about .6 millim. long), and appressed against the branch itself at ends of branches, less prominent towards the base. The stem and branches are but slightly flexible, and could not be bent at an angle of more than 45° without risk of breakage.

*Hab.* N.E. coast of Australia (exact locality unfortunately lost).

*Obs.* If the spicular characters of this genus are to be considered, as seems almost necessary, as often (from their very slight tendency to variation) insufficient to distinguish species, this form might be separated from the species to which I have doubtfully assigned it on the score of the external points of difference which I have indicated. These may, however, be considered insufficient for this purpose, a conclusion which has in its favour the consideration that this is evidently a young and somewhat imperfect specimen, and, having been kept in spirit, may have lost much of its original colour. The species has hitherto been recorded only from the West Indies and Mediterranean. That this is not an impossible case for an Alcyonarian appears from the analogous instance of the (nearly allied) *Ctenocella pectinata*, Pallas, which I record from Cuba in this Report, its only other recorded habitat being the Indo-Pacific area. Indeed this identification receives further confirmation from the presence in the Museum of a specimen labelled as from Formosa, which differs from the typical *J. elongata* only in the less distinct and more appressed character of its verrucae, a point which may be largely due to some peculiarity in the manner in which the specimen has been dried.

In some points (as the colour and prominence of the verrucae) our Australian species approaches *J. gemmacea*; but I have identified with that species a form which is in this district more deeply coloured and has a very flexible stem.

## 21. *Juncella fragilis*. (PLATE XXXVI. fig. D.)

Stem long (unbranched?), diminishing very slowly in diameter towards apex, which may be either clavate or sharp-pointed; flexible, easily broken; diameter at base about 5 millim., at apex 3 to 4 millim., except when the apex consists of a sharp point. Cortex thick, cream-white in dried state, soft, but not very friable; no trace of lateral naked line in the upper three fourths of length. Verrucae small, viz. about 1 millim. high, clavate, closely appressed against cortex; crowded over all parts of the latter. Axis very slender, viz. about 1 millim. in diameter near base and hair-like at apex; near base hard, pale olive-brown, and beset with regular longitudinal striae.



Cortical spicules:—(i.) Clubs almost exactly as in *Juncella gemmacea*, M.-Edwards and Haime (see Kölliker, Leon. Histiol. p. 122, woodcut 19, 1); length .087 millim. (ii.) Double stars, with short median bare shaft, and swollen but rather unequal heads, covered with three or four series of moderately sharp tubercles, closely aggregated; length of spicule .087 millim.

*Hab.* Port Denison, Queensland, 4 fms.; bottom rock.

*Obs.* The two dry specimens which represent this species have, unfortunately, neither of them retained their original base, but the larger one was broken off at a point probably not far above it. The length of the specimens respectively is  $13\frac{1}{2}$  inches (330 millim.) and  $8\frac{3}{4}$  inches (170 millim.). They are more or less bent irregularly and are very flexible.

In its small crowded verrucæ, in the absence of lateral lines, in its pale colour, and in the abundant tuberculation of the heads of the double-stellate spicule this species differs from *J. gemmacea*, M.-Edw. and Haime, which seems to be the nearest described species.

### ELLISELLA.

*Ellisella*, Gray, P. Z. S. 1857, p. 287; Studer, MB. Ak. Berlin, 1878, p. 659.

*Juncella* (pars), Kölliker, Leon. Histiol. p. 140; (pars) Klunzinger, Kor. roth. Meer. p. 55.

*Verrucella* (pars), Kölliker, l. c.

### 22. *Ellisella calamus*.

*Studer*, l. c. p. 660, pl. v. fig. 28.

A specimen 9 inches (225 millim.) long in its present imperfect condition appears to represent this species; but the fusiform spicules are from .07 to .1 millim. long, and the colour is dark brick-red. Studer gives .06 as the length of these spicules, and does not mention the colour. His specimens were from N.W. Australia.

*Hab.* Port Denison, Queensland, 4 fms.

### 23. *Ctenocella pectinata*.

*Gorgonia pectinata*, Pallas, Elench. Zooph. p. 179.

A fine and extremely well-preserved specimen of unusual symmetry; it has the form of the conventional lyre, being V-shaped, with the upper lateral branches curved inwards. Colour pale salmon.

The front and back faces of the two main (outer) branches are bare of polyps for from one third to half their length from their origin; the verrucæ are but slightly prominent on the outer branches; the

spicules agree with those of specimens already in the National collection.

*Hub.* Warrior Reef, Torres Straits, 12 fms. ; off North-west Cape, W. Australia, 3-4 fms. (*Stuler*).

The known distribution is:—Indian Ocean (*Pallas*), Seas of the Moluccas (*Lamarck*), India and China (*Gray*), Cuba (*Mus. Brit.*, coll. H. Christy).

The occurrence of this species off Cuba is a remarkable case of distribution, but must be taken to be correct, as I can, after careful examination, find no grounds for separating the specimen from the above and other undoubted specimens of *pectinata*. Indeed it agrees with the Torres-Straits specimen more closely than with other, probably Indian Ocean, examples; the verruca-spicules, which are neither figured nor fully described by Kölliker ('*Icones Histologicæ*'), show a modification of the same type as those of the general cortex, being only more elongated than those, and bearing two and sometimes three distinct whorls of tubercles, besides a few median terminal ones on each half of the spicule; the two inner whorls almost meet in the middle, so as to obliterate the median bare zone which is characteristic of the cortical spicules.

#### SCLEROGORGIAEÆ.

##### SUBEROGORGIA.

*Suberogorgia*, *Gray*, *P. Z. S.* 1857, p. 159.

*Pterogorgia* (pars), *Dana*, *Zooph.* p. 647; *M.-Edwards & Haime*,

*Hist. Cor.* p. 167 (1857).

*Sclerogorgia*, *Kölliker*, *Icon. Histiol.* ii. Abth. pp. 142, 144 (1865).

##### 24. *Suberogorgia suberosa*.

*Gorgonia suberosa*, *Pallas*, *Elench. Zooph.* p. 191; *Esper*, *Pflanzenh. Fortsetz.* i. p. 170, pl. xlix.

One magnificent specimen, attaining a height of 87·5 centim. (35 inches) and a maximum lateral expansion of 50 centim. (20 inches), also several smaller ones, all dry, and two small examples in spirit. *Pallas* says that it often reaches the height of 3 feet.

*Studer* records it from the north-west coast of Australia at 50 fms. It appears not to have been recorded until now from Torres Straits or any locality in the Pacific Ocean.

*Hub.* Port Denison, Queensland, 4 fms. ; Alert Island and West Island, Torres Straits, 7 fms.

#### BRIAREIDÆ.

##### 25. *Briareum*, ? sp.

A crumbling spirit-specimen of what is, perhaps, a species of this

genus. It has a strong broad base, and tapers rapidly to a point; in view, however, of its bad condition, I reserve further details until better specimens are obtained.

*Hab.* Torres Straits, 10 fms.

## 26. *Callipodium australiense*.

Incrustation very thin, viz. .25 to .5 millim., smooth, varying from dark flesh-colour to dull crimson. Forming either elongated flattened stolons, 3 to 6 millim. broad, or more concentrated in form. Verrucae 2 to 3 millim. apart; they may be contracted so much as to present mere monticular swellings .5 millim. high, showing no trace of octoradial segmentation, or they may form subcylindrical columns 1 to 1.5 millim. high, the octoradial star occupying their extremities, the walls of the columns being decidedly grooved longitudinally along the lines of the segments. Basal diameter of fully contracted verrucae .6 to 1.0 millim., of the more expanded forms just described 1.0 to 1.25 millim.; apical diameter of the latter about 1 millim. Spicules of stolon:—(i.) Fusiform, generally tapering to somewhat slender ends, beset with numerous (about ten) whorls of prominent tubercles with rounded and minutely tuberculate extremities, the maximum height of the tubercles being about .03 millim., diameter .018 millim.; five to six tubercles in each of the central whorls; average maximum size of spicules .42 by .1 millim. (including tubercles). (ii.) Fusiform, tuberculate, the tubercles placed mainly on two opposite sides (*i. e.* in one plane); the ends of the spicules are blunt and strongly tuberculate; the tubercles are about ten in number down each side of the spicule (some much smaller ones on the other faces completing the whorls), but are .042 by .035 to .042 millim. in average maximum height and breadth respectively; rough and often branched; average maximum size of spicule .52 by .14 millim. (including tubercles). (iii.) Branched spicules, quadri- to multiradial, the rays either pointed and smooth at ends, or expanding into fungiform terminations: a few small tubercles on sides of arms; average maximum extension of arms about .35 millim., diameter of thickest arms or shaft (where present) .04 to .06 millim.

[The larger of these last forms (iii.) are evidently merely exaggerated forms of (ii.), and these are but unequally developed representatives of (i.).]

*Hab.* Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand.

*Obs.* This species occurs incrusting a sponge. It differs from Verrill's species *C. pacificum* and *aureum* in the superior size and more elongate form of the fusiform spicules and the smaller relative size of their tubercles. No "club" or slender "head" spicules observed, as in those species.

27. *Solanderia*, ? sp.

An apparently dead and bleached specimen of considerable size seems to belong to this genus, and is decidedly distinct from the South-African species called by Gray *Homophyton gattyæ*; but I prefer to await better specimens before describing it, as members of this family appear to rapidly lose their natural characters when dying in the sea.

*Hab.* Thursday Island, Torres Straits, 4–5 fms.

## ICILIGORGIA.

*Duchassaing de Fonbressin, Revue des Zoophytes et des Spongiaires des Antilles* (Paris, 1870), p. 12.

Central spicular axis dense, imperforate. Longitudinal canals forming a circumaxial zone. Erect, branched; stem and branches antero-laterally compressed, with knife-like lateral edges. Zooids wholly retractile, arranged in single series along each edge of the branches; no external verrucae.

To this hitherto exclusively West-Indian genus appears to belong the following species:—

28. *ICiligorgia orientalis*. (PLATE XXXVII. figs. F–F'', and PLATE XXXVIII. fig. e.)

Stem long, slender, transversely expanded, with a median rounded ridge running down each of the anterior and posterior faces; the lateral margins forming two even knife-like edges, in grooves in which the zooids lie. Branching apparently normally dichotomous, in same plane as the long diameter of the stem. Branches oval, transversely expanded, like the stem, but without the median rounded ridge possessed by the stem, except near the origins of the main branches. The transverse diameter of both stem and branches is to the antero-posterior as 2 : 1. Surface even, feeling slightly rough to the finger. Zooids uniserially arranged, about .5 millim. in diameter, .5 millim. apart, set in a narrow continuous lateral groove of the stem and branches. Colour of stem in spirit pinkish yellow, of branches cream-colour.

In transverse section the stem and branches are seen to consist of a cylindrical central ("medullary") spicular axis of closely aggregated but distinct spicula, occupying from four fifths (at the base of the stem) to one half (at the apex of the branches) of the entire thickness. The cortical layer is similarly constituted; it is separated from the medulla by a single annular series of four to six circular or oval longitudinal canals, varying in diameter from about .15 millim. near the terminations of the branches to .3 millim. at the base of the stem. Spicules of medulla, chief forms:—(i.) Roughly fusiform, with few irregularly scattered, mostly fungiform, compound tubercles; size about .23 to .45 by .087 millim., the largest tubercles about .024 millim. in height. (ii.) Elongated, cylindrical, rounded

at the ends; a few small low tubercles at the ends and here and there on the body of the spicule; size  $\cdot 18$  by  $\cdot 03$  millim. (near apex of branches only about  $\cdot 018$  millim. broad and with longer sharp tubercles). Spicules of cortex (iii.) short, fusiform, with ridge-like, transversely elongated tubercles, much roughened; ends of spicules irregular in shape; size about  $\cdot 018$  to  $\cdot 022$  by  $\cdot 1$  millim.

*Hab.* Torres Straits, 10 fms.; bottom sand.

*Obs.* This species appears to belong to the genus established by Duchassaing de Foubressin (*l. c.*), but differs from the description of the single species, *I. schrammi*, there described (from Guadaloupe) in the verrucae not projecting from the general level of the cortex. The height of the single specimen is 250 millim. (10 inches), greatest diameter at basal end 9 millim., least diameter at same place  $4\frac{1}{2}$  millim.; greatest diameter at apex of branches  $4\frac{1}{2}$  millim.; common stem 100 millim. long; longest branch 150 millim.; it branches only once, but one other (aborted) branch is indicated on one edge of the stem of another of the branches.

### SIPHONOGORGIA.

*Kölliker, Festschrift phys.-med. Ges. Würzburg, 1874, p. 18.*

Three species of this highly interesting and but recently discovered type are already known, viz. *S. godeffroyi*, Kölliker (*l. c.*), from the Pelew Islands; *S. mirabilis*, Klunzinger, from the Red Sea; and *S. squarrosa*, Studer, from N.W. Australia. A species occurs in the present collection which though differing more or less from all these either in its spicules or external characters, yet agrees sufficiently closely in its spicular characters and general form with Klunzinger's species for me to record it under the name

#### 29. *Siphonogorgia mirabilis*, var. *flava*.

*Siphonogorgia mirabilis*, *Klunzinger, Kor. roth. Meer. i. p. 49, pl. iii. fig. 9.*

Two groups growing on tubular masses of sponge or worm-tube, and consisting of a creeping, thin, adherent stolon, 1.0 to 5 millim. broad, bearing the monticular closed verrucae, 1 to 1.5 millim. in diameter, and sending up vertical shoots at intervals of from 6 to 10 millim.; these are unbranched, from 9 to 34 millim. in height and from 1.5 to 2.5 millim. in their greatest by 1 millim. in their least diameter, being somewhat flattened, knife-like; they have slightly swollen but pointed apices. The colour in spirit is a light yellowish brown throughout. The verrucae are closed, but the polypes are seen by sections to have a yellow colour.

The parenchyma-spicules agree in their general characters with those described by Klunzinger; but I find (i.) those of the cortical layer having either the characters exhibited in the lowest of the figures marked *d* in his fig. 9. pl. iii (*l. c.*), viz. stout fusiform with rather distinct broad minutely tuberculate tubercles, size  $\cdot 21$  by  $\cdot 085$  millim. to



·4 by ·1 millim., or else longer and proportionally more slender, with more distant and simple tubercles, ·4 by ·08 millim. Those (ii.) of the denser axial substance are short, very boldly tuberculate forms, very irregularly modified from the fusiform types, but with the tubercles somewhat scattered; size ·14 by ·042 to ·18 by ·07 millim.; intermixed with these are some of the stouter and longer forms which compose the outer layer. The spicules are either devoid of any colour or very faintly yellow.

*Hab.* Arafura Sea. off N.W. coast of Australia, 32–36 fms.; bottom—sand, mud, and shell.

*Obs.* The only differences which distinguish these specimens from Klunzinger's are the pale brown instead of red colour of the corallum as a whole, its unbranched condition, and the want of a decided coloration of the spicules themselves.

A specimen of this species also occurs, in an exclusively reptent form, upon an elongated sponge in the dry state; it extends 120 millim. (5 inches) horizontally, exclusive of branches. It exactly resembles the horizontal parts of the specimen just described, but sends up no vertical axes, and might thus have been taken for a *Callipodium* had the radiate spicules assigned to this type by Kölliker and Verrill been present. This resemblance of the young stage of a typical Briareacean to that genus perhaps supports Kölliker's views as to the genus properly finding its place among the Briareaceæ.

### SOLENOCAULUM.

*Solenocaulon*, Gray, *P. Z. S.* 1862, p. 34, figs. p. 36; *Ann. & Mag. N.*

*H.* (3) x. p. 147 (1862).

? *Cœlogorgia*, M.-Edwards and Haime, *Hist. Corall.* i. p. 191 (1857).

*Solenogorgia*, Genth, *Zeitsch. wiss. Zool.* xvii. p. 429 (1867).

#### 30. *Solenocaulum tortuosum*.

*Solenocaulon tortuosum*, Gray, *ll. cc.*

A single (dry) specimen of this very remarkable form came up with the tangles from a dredging of from 12 to 20 fms. off Port Molle, Queensland; it is about 5 inches long, or rather less than half the length of the type specimen. It is of a pale orange colour, in which, as in its other external as well as in its microscopic characters, it agrees with the original type of the species. The stem is solid, as is that of a spirit-specimen already in the collection, and as (so far as I have been able to ascertain with safety) that of the type specimen, and affords another point of agreement between this genus and *Solenogorgia* of Genth, and adds one more reason to those given by Studer (MB. Ak. Berlin, 1878, p. 669) for uniting the two genera under the older name conferred by Gray, a proceeding which is obviously necessary.

Another specimen, from the Arafura Sea, fortunately preserved in spirit and practically complete, although two apical portions are detached, differs somewhat from the typical form. It has a stem 55 millim. long, of which the lower end, to the length of about

32 millim., consists of a strongly flattened, rather undulating portion, with a midrib 1 to 2 millim. thick running longitudinally down its middle, on each side of which the edges are drawn out so as to form a double-edged knife-like ending, with a maximum breadth of 7 millim.; above, this is united to the hollowed, zooid-bearing part by a cylindrical portion, 20 millim. long and 3 millim. in maximum thickness, apparently solid. Only 10 millim. from the commencement of the zooid-bearing part, a strong tubular branch is given off, and another on the same side only 4 millim. further up the terminal tube, which is considerably bent to one side, and constitutes with the last mentioned branch a true bifurcation, which thus takes place at only 14 millim. from the commencement of the functionally active section of the colony.

The colony is thus manifestly young, for the stem is 65 millim. long, while the zooid-bearing part is only 40 millim. long and carries near the end of each of its branches one or more narrow spatular or grooved processes from 8 to 15 millim. in length, recalling those which attain so great a development (up to 10 centim. long, Studer) in *S. grayi*, Studer, and in *S. (Solenogorgia) tubulosa*, Genth. The maximum antero-posterior diameter of the tubular part of the colony is only 8 millim. The verrucæ form a single row on each side of the tubes and spatulate processes. The colour differs from that of the type specimen of the species in being a dull pale orange, with dark purplish verrucæ, whereas in that specimen it is for the most part (in its present dry condition) a dull umber-brown with a tint of red, with a reddish lateral band including the verrucæ. The length of the spatulate processes does not appear to me sufficient to show any close connection with *S. grayi*; and as the spicules agree essentially with those of the type of *S. tortuosum*, I retain that name for this specimen as well.

As Studer's account of the spiculation of the species appears erroneous in some points, I give herewith the results of an examination of the type specimen. Cortical spicules:—(i.) Clavate or excentrically fusiform, covered with coarse, prominent, cylindrical tubercles, often roughened terminally; size of spicule .21 to .39 by .06 to .12. (ii.) Superficial, short, broad, cylindrical, with about 3 rude whorls of very prominent ragged tubercles; size of spicule about .14 by .07 millim. [this spicule is not figured by Studer for the species, but a very similar form is given by him as the axial spicule of *S. grayi*, under which species is also figured one which differs from (ii.) mainly in having simpler tubercles]. The white chalky axial mass consists mainly, if not exclusively, of (iii.) long cylindricals with rounded ends, bearing sharp-pointed tubercles at considerable intervals; size of spicule about .38 by .035 millim. The external longitudinal verrucæ-spicules (iv.) are irregularly fusiform or cylindrical, strongly roughened by prominent closely-set tubercles, and measure about .18 by .07 millim.; towards the mouth of the verruca these pass into irregular flattened or styliiform bodies about .14 millim. long by .017 millim. broad. (v.) The horizontal spicules of the verrucæ are fusiform, tapering gracefully to rounded points, more or less curved; they bear numerous small, smooth, and rounded tubercles

and measure  $\cdot 4$  to  $\cdot 6$  by  $\cdot 035$  to  $\cdot 06$  millim. [Comparing Studer's species *S. grayi* with this species, it appears to correspond closely with it, but is perhaps distinct by virtue of the smaller size of the spicules and the simple character of their tubercles, as stated above.]

*Hab.* Port Molle, Queensland, 12–20 fms., bottom rocks and coral; Arafura Sea, off N.W. coast of Australia, 32–36 fms., bottom sand, mud, and shells. Also Mermaid Strait, N.W. Australia (*Studer*).

*Obs.* It is interesting to note that it is the specimen which comes from a rocky bottom which has the simple, moderately long, cylindrical stem resembling that of the type specimen, while that which came from a loose bottom (sand &c.) has a long spatulate termination, well adapted for maintaining the colony in an upright position in this less stable material.

It seems extremely probable from the account given by Messrs. Milne-Edwards and Haime (*l. c.*) of the external characters of their *Cologorgia palmosa*, that it is generically identical with *Solenocaulum*; but finding a very different spiculation indicated in a Paris slide in this Museum, which professes to belong to the species, I prefer to follow Studer in leaving the question for future investigation.

### 31. *Leucoella cervicornis*.

*Leucoella cervicornis*, Gray, *Ann. & Mag. N. H.* (4) v. p. 403.

A Briareacean intermediate in its characters between *Suberia*, Studer (MB. Ak. Berlin, 1878, p. 666), and *Solenocaulum*, Gray. Its most striking external feature is the broad posterior space devoid of polypes and (in the dry state, at any rate) indented by a wide groove. In the type specimens in the British Museum the verrucæ mostly have rounded blunt terminations, about 1 millim. in maximum height; in a specimen, however, contained in the present collection they are mostly pointed and very prominent, viz. 2 millim. high in some cases. Whereas also in the type specimen the colour is somewhat pale umber-brown, in the present specimen the colour is very dark umber-brown, becoming almost black at the tips of the verrucæ; in this specimen the anterior aspects of the tips of the branches are almost devoid of verrucæ and usually much flattened, while the verrucæ on the anterior and lateral faces of the other parts are placed at distinct intervals; the latter are closely set in about equal proportions over all parts of the anterior and lateral surfaces of the stem and branches. The axial spicules (i.) in both specimens are cylindrical, pointed at the ends, and covered with small sharp tubercles; size  $\cdot 35$  to  $\cdot 42$  by  $\cdot 024$  to  $\cdot 027$  millim. The cortical spicules are either (ii.) fine, long, fusiform, tapering to points at both ends, provided with numerous, but distinct prominent tubercles,  $\cdot 28$  to  $\cdot 42$  millim. by  $\cdot 053$  to  $\cdot 08$  millim., or (iii.) squat fusiform, with the ends more rounded than in (ii.), with the tubercles stouter and blunter but crowded together; size  $\cdot 14$  to  $\cdot 28$  by  $\cdot 053$  to  $\cdot 07$  millim. This specimen furnishes us with a locality for the species, that of the original specimen not being known.

*Hab.* Port Denison, Queensland, 4 fms.; bottom rock.

*Obs.* The differences between this specimen and the types in the form of the verrucæ appear to be due to their more expanded condition at time of death in this than in the type specimens. Unfortunately no spirit-specimens have as yet reached the Museum.

### MELITHÆIDÆ.

Melithæaceæ, *Kölliker, Icones Histiol.* p. 142.

Melithæadæ, Mopselladæ, and Elliselladæ, *Gray, Cat. Lithoph. Brit. Mus.* (1870) pp. 3, 5, 24.

The two first-named of Dr. Gray's families cannot possibly be maintained distinct from each other, as of the genera which he has placed in the first, *Melithæa* (*Melitodes*) includes, as is shown by a careful study of the spicular characters, *Anicella*, which he has placed in the second; the only distinctive character by which the Melithæadæ are alleged to be separated from the Mopsellidæ, viz. the perforation by the longitudinal cœnenchymal canals of the lower joints of the hard axis, is exhibited also by four out of the five genera which make up the latter family; this may readily be ascertained by examination of adult specimens representing these genera. For this reason I have been obliged to relinquish this character in the separation of the genera, except in the case of *Clathraria* and the new genus *Psilacabaria*, and have in this Report reconsidered the genera and species involved, and after comparing them with the rich collection already in the national museum, embracing almost every known species, arranged them mainly according to spicular characters, thus following the plan which has been adopted with such success in other groups of the Aleyonaria by Kölliker and Verrill. The Elliselladæ, Gray, include a Melithæid (*Wrightella*).

The family thus constituted is represented in the present collection by the proportionally large number of six species, of which four are new, one appearing to be generically distinct from all other known forms, and remarkable further for its pure white colour and slight habit, unexampled in the family. The existence of a *dimorphism* of the zooids, long known to obtain in the Pennatulida, and treated of in the Aleyoniidæ (*Heteroxenia*, Kölliker; *Sarcophytum*, Moseley, Report etc. 'Challenger,' vol. i. p. 118), and by Prof. Moseley in the Coralliidæ (Quart. Journ. Micr. Science, n. s. vol. xxii. p. 396), and stated by Hickson (Quart. Journ. Sci. 1883, Oct., p. 574) to occur in the Briareidæ (*Paragorgia*), a fact which I am able to confirm from specimens in the British Museum, was also pointed out for the first time in the present family by Mr. Hickson, from information with which I furnished him, viz. in a new species (*M. albitincta*) of the genus *Melitodes*. In this species, the only one of between 20 and 30 species of the family in which I have observed it, this phenomenon occurs in a somewhat remarkable manner, partly owing to which I had at first overlooked it; but on my attention being called by the artist, Mr. Highley, to certain projections on some of the branches, larger than the ordinary verrucæ, I examined the corallum more



carefully and found that, in the proportion of about 1 to 30 of the ordinary verrucæ, or about one to each internode, some large verrucæ occurred, about twice the diameter of the usual forms; this was the case only on the medium-sized and larger branches. Unfortunately no spirit-specimens of the species were obtained; but the examination of the open verrucæ shows 8 short spiculate tentacle-lobes, converging like the segments of an orange, within both the smaller and larger verrucæ. This is therefore a case of dimorphism much less strongly marked than and of a different character from that of the Pennatulida, and of *Corallium* and *Sarcophytum*, where the asexual zooids have no tentacles. Possibly, when spirit-specimens are examined, it will be found that these two kinds of tentaculate individuals represent the two kinds of "polypes" (viz. rudimentary sexual and perfect asexual) which occur in *Halisceptrum* (Kölliker, 'Pennatuliden,' p. 161) in addition to the sexual "zooids."

In my descriptions I have employed the term "internode" for the hard joints, and "soft joints" for the intermediate ones, as being more appropriate and more conformable to the botanical usage than the "joint" and "internode" employed by Gray (*l.c.*) to designate these parts respectively.

The new genus *Psilacabaria* presents an exception to the usually strongly marked bilateral symmetry in the arrangement of the external parts of the corallum in this family.

### MELITODES.

Melitæa, *Lamarck, Mém. du Mus. d'Hist. Nat.* i. p. 410 (1815).

Melitodes, *Verrill, Bull. Mus. Comp. Zool.* i. p. 38 (1863).

Axis, both hard and soft joints, traversed by longitudinal canals; cortical spicules of two kinds, viz. larger, fusiform, verrucose, and smaller, nodular. As above stated, the first of these characters only distinguishes *Melitodes* from *Olathraria* and *Psilacabaria* among Melithæidæ.

#### 32. *Melitodes albitincta*.

(PLATE XXXVII. figs. C-C'''; PLATE XXXVIII. figs. b, b'.)

Corallum slight, branching in one plane. Stem slender, internodes circular in section; joints oval, little thicker than the internodes and about half their length. Branchlets slender, undulating, almost all anastomosing, forming chiefly elongate meshes. Diameter of internodes of the larger main branches 3 millim., of terminal branchlets 1 millim. Colour of general cortex in dry state white, beautifully speckled with vermilion, that of verrucæ and the contained polypes orange-yellow. Cortex very smooth, thin on stem, on terminal branchlets forming about two thirds of the thickness of the branch. Verrucæ broad, slightly prominent, arranged in two alternating rows on each side of the branches, but generally absent from the anterior and posterior faces; they are of two sizes, viz.:—(i.) abundant, low, about .4 millim. in diameter at their base; (ii.) about one to each internode on an average, more prominent than (i.), measuring about



1 millim. in diameter at its base, placed on the larger and medium-sized branches. Axis of soft joints firm, brick-red in colour; that of internodes crimson, traversed by numerous longitudinal canals in the stem and larger branches, in the small branches deeply channelled by longitudinal furrows.

Spicules of general cortex:—(i.) Larger, fusiform, the ends rather blunt, the shaft stout, beset with numerous strong and prominent tubercles, their ends strongly microtuberculate, irregularly distributed over the spicule; size  $\cdot 21$  by  $\cdot 062$  millim. (ii.) Smaller, sub-cubical, looking as if formed by an aggregation of tubercles like those of (i.); diameter  $\cdot 07$  millim. Spicules of verrucæ:—(iii.) Longitudinal, fusiform, with blunt ends, provided with numerous and strong tubercles of a length equal to half the diameter of the shaft of the spicule: size  $\cdot 21$  by  $\cdot 035$  millim. (iv.) Horizontal, fusiform, tapering to sharp points, tubercles numerous but small and sharp; size as (iii.).

*Hab.* Port Moller, Queensland, 12–20 fms.

Two dry specimens represent this beautiful species. The common stem of the largest is 31 millim. long, its total height 130 millim. (5 inches), its maximum width 76 millim. (3 inches). The species differs from *M. ochracea* externally by the presence of two kinds of zooids, by the slenderness of the stem, and the slight difference in thickness between the main and the lesser branches, by the greater relative length of the internodes and the rounded outline of the joints, the almost complete anastomosis of the branches, and the whitish ground-colour of the cortex; in its minute characters it is distinguished by the long cortical spicules being stouter and about half as long again as in *M. ochracea*, and by the stronger tuberculation of those of the verrucæ. Although, as in the cases of *Acyonium* and *Sarcophytum*, *Xenia* and *Heteroxenia*, two otherwise nearly related genera have been shown to be distinguished by the character of dimorphism in the polypes of one of the pair, I do not know any other case in which, as here, a species is referable on all other grounds but this one character to the same genus as other species which do not exhibit it.

### MOPSELLA.

*Mopsella*, Gray, *P. Z. S.* 1857, p. 284.

*Melitella*, Gray, *P. Z. S.* 1859, p. 485.

Both hard and soft axis perforated by longitudinal canals wherever stout enough to carry them. Cortical spicules of two kinds, fusiform and foliated ("Blattkeule," Kölliker). The presence of this foliated spicule distinguishes the genus from *Melitodes* and *Acabaria*; this, in conjunction with the perforation of the hard axis, from *Clathraria*.

### 33. *Mopsella textiformis*.

*Melithæa textiformis*, Lamarck, *Mém. Mus. Hist. Nat.* i. p. 412

*Lamouroux*, *Polyp. flexibles*, p. 464, pl. xix. fig. 1.

*Melithæa textiformis*, M.-Edwards & Haime, *Hist. Cor.* i. p. 201.

? *Mélitée ochracée*, *De Blainville, Man. Actinol.* p. 504, pl. lxxxvi. fig. 3.

? *Mopsella retifera*, *Studer, MB. Ak. Berlin*, 1878, p. 666.

Lamarck's species seems not to have been clearly identified by modern writers, with, perhaps, the exception of Verrill (*Bull. Mus. Comp. Zool. Camb.* i. p. 38); I have, however, little doubt of its identity with a form which occurs somewhat abundantly in this collection from Port Molle, Queensland, &c. I have thought it well to describe this form fully, in order to clear up the uncertainty which has hitherto prevailed as to the correct name of the species.

It branches strictly in one plane and has elongated meshes; the stem and main branches are slight and *break up almost immediately* into a reticulum of undulating thin branchlets, which almost all anastomose; the terminal branchlets are only about 1 millim. in diameter. The internodes are long; the joints are small, short, and squarish. The cortex is rough, rather dull scarlet; the zooid-verrucae of the same colour; the expanded zooids, scarlet in one specimen, yellow in another, are equal and small, but distinctly prominent, abundant over the front and sides of the branches. Axis of joints firm, bright red, that of basal internodes longitudinally channelled, deep red; of distal internodes faintly striated, but of the same tint, and penetrated by the longitudinal canals.

Spicules of general cortex:—(i.) Fusiform, sharply pointed at both ends, as a rule, and covered with irregularly scattered tubercles, which are large and blunt at the middle of the spicule, minute at the ends; dimensions .18 by .035 millim. (ii.) “*Blattkeulen*,” large, either with long cylindrical shaft, strongly tuberculate, with large compound tubercles and two “leaves” which are broad, rounded, the edges divided into blunt teeth, or with the shaft more or less aborted; dimensions of spicule .21 by .105 millim., length of cylindrical shaft alone about .1 millim. Spicules of verrucae:—(iii.) Longitudinal, curved, fusiform, tapering gracefully to sharp points, with rather few tubercles, prominent and sharp at middle, disappearing towards ends; dimensions .24 by .035 millim. (iv.) Horizontal, very regularly fusiform, curved, pointed rather bluntly, covered with very closely set, low, blunt tubercles; dimensions .28 by .041 millim.

*Hab.* Port Curtis, 5–7 fms.; Port Molle, 12–20 fms.; Thursday Island and Prince of Wales Channel, Torres Straits, 4–7 fms. Also, perhaps, Dirk Hartog Island, W. Australia, and N.W. Australia (*Studer*).

This is a delicate and graceful species; it is represented in this collection by two nearly perfect specimens and a number of fragments in the dry state, and by a specimen and fragments in spirit. The largest specimen measures 193 millim. (nearly 8 inches) in height, by 146 millim. (6 inches) in maximum breadth; the thickness of the base is—joints 6 millim., internodes 4 millim. Lamarck's and Lamouroux's descriptions suit the species very well, and the remark of the latter to the effect that it is “*peu rameuse; se divisant subitement en ramuscules très-menus, filiformes, verruqueux, anastomosés*,”

may be considered characteristic of its habit; his figure, though taken apparently from a rather stunted specimen, is fair, but the joints are too long. Lamarck, too, notices the short stem and its sudden division into slender branches, which are its best external distinguishing characters. In its minute structure it is characterized by its fine Blattkeule with dentate edges and graceful longitudinal verruca-spicule. Dry specimens are apt to turn white; perhaps the white variety mentioned by Lamarck (*l. c.*) is an instance of this phenomenon. A variety occurs from Torres Straits with grey cortex, black verrucæ, white internodes, red joints.

The species figured by De Blainville (*l. c.*) differs from ordinary specimens of *M. textiformis* in its yellow soft joints. It is possibly a variety of *M. coccinea*.

### 34. *Mopsella clavigera*.

(PLATE XXXVII. fig. B; PLATE XXXVIII. figs. *a-a'''*.)

? *Mopsella elongata*, Studer, *MB. Ak. Berlin*, 1878, p. 666.

Corallum branching strictly in one plane: branches almost invariably anastomosing in adult at the soft joints, proportionately less, according to age, in the younger specimens; the meshes thus formed are either longitudinally elongated or irregularly polygonal; the frond may be either about as broad as it is high, or the height may be double the breadth. Stem short, moderately developed or weak. Internodes undulating or seldom straight, compressed, the antero-posterior diameter having the proportion with regard to the side diameter of about 3:2; penetrated towards base by longitudinal canals. Soft joints distinct, but not large, elongated near base of main branches, only just perceptible in younger parts. Verrucæ numerous, scattered over sides and back (or front) of corallum, but leaving a bare space down the middle of its posterior aspect; tubercular in shape, slightly prominent. Cortex thin, white and almost colourless. Axis of internodes rough, white or pale pink (generally only so in young specimens). Soft joints bright red, pink, or almost colourless. Verrucæ dirty brownish to white in colour.

Spicules of general cortex:—(i.) Coarsely tuberculated, rather bluntly pointed, fusiform, of various sizes, the larger ones somewhat swollen, tapering and sometimes terminated by a small "Blatt" at the other extremity; average maximum dimensions .17 to .21 by .07 millim. (ii.) Blattkeule, compound, with about two lancet-shaped laminæ, as a rule, and these mainly flattened in one plane, with a short conical to almost obsolete shaft, covered with smallish tubercles often deeply dentate; average maximum dimensions .14 by .07 millim. Spicules of verruca long, slender, curved and pointed, fusiform, with tubercles fewer and less prominent than those of the cortical spicules and less numerous near the ends: average maximum dimensions .25 by .026 to .285 by .044 millim.

*Hab.* Port Curtis, Queensland, 5–11 fms., bottom sand and shells; Port Molle, 14 fms., bottom rock; Thursday Island, Torres Straits,

4-6 fms., bottom rock and sand. Studer's species was obtained at Dirk Hartog Island, West Australia.

*Obs.* Three young, one older fresh specimen in spirit, one large adult dry, and one large adult dead and blackened specimen, and numerous fresh fragments dry and in spirit represent the species. The largest specimen, which has lost its terminal twigs, measures 400 millim. in height by 275 in maximum breadth.

This well-marked species is very well represented in the collection by specimens showing differences due to age and other causes, constituting variations of no inconsiderable extent. The internodes of none of the branches, except the few primary divisions of the base, attain a greater lateral diameter than  $2\frac{1}{4}$  millim. or a greater antero-posterior one than  $3\frac{1}{2}$  millim.; it is further distinguished by the constant club-shaped character of the stouter fusiform tuberculate spicules of the general cortex and by the oblong transverse section of the internodes.

The tendency to vary in colour is very remarkable; the axis of the joints ranges from white to brick-red, that of the internodes from white to crimson. The pink colour of the internode-axes is exhibited by all the young specimens and lost externally in most of the adult colonies; but these generally exhibit a trace of their earlier condition by the pink tint of the centre of the hard joint, as may be seen by breaking it across; on the other hand, the colour *may* persist in its fullest intensity in the adult, as is shown by a fragment of a good-sized specimen which occurs with crimson internodes. The dependence of the amount of anastomosis on the age of the specimen is another very interesting feature of the species. Of the two youngest complete specimens (one 40 millim., the other upwards of 50 millim. long), one has but one case of anastomosis among its numerous branches, while the other has seven such cases.

### ACABARIA.

*Gray, Ann. & Mag. N. H.* (4) ii. p. 444.

This genus has the general habit of *Mopsella* (viz. slender stem and branches, the latter given off at acute angles), but has fusiform instead of Blattkeule spicules in the cortex, replacing the small nodular spicules of *Melitodes*.

#### 35. *Acabaria japonica*.

*Mopsella japonica*, *Verrill, Proc. Ess. Inst.* iv. p. 199, vi. p. 80.  
? *Melitæa tenella*, *Dana, U. S. Expl. Exp. Zooph.* p. 683.

A fine dry specimen which I cannot distinguish specifically from the above species; it measures about 110 millim. in extreme vertical and 30 millim. in extreme lateral extent.

The terminal branches have the extremely slight thickness of .5 millim. (excluding verrucæ); the colour of the general cortex is pale scarlet, that of the verrucæ, which are prominent and rounded,



lemon-yellow. The species has to be referred to *Acabaria*, as it wants the foliated spicules (Blattkeulen) characteristic of *Mopsella*.

*Hab.* Port Darwin, Australia, 8-15 fms.; bottom mud.

*Obs.* The distribution of this species, hitherto known only from Japan, is not by any means unparalleled (cf. *Echinomuricea indomalaccensis*, p. 336, extending from China to N.E. Australia); the species has not hitherto been recorded from any point between Australia and Japan.

Dana's species (*v. supra*), from the Sandwich Islands, is probably nearly allied if not identical with this, but the original description is insufficient to decide the point.

### 36. *Acabaria serrata*.

(PLATE XXXVII. figs. E, E'; PLATE XXXVIII. figs. c-c''.)

Corallum erect, branching dichotomously at angles of  $30^{\circ}$  to  $40^{\circ}$ , strictly in one plane; anastomosis absent or rare. Base? Main stem slender, not exceeding 2.5 millim. in diameter. Internodes slender, slightly flexuous, 8-10 millim. long as a rule, compressed from front to back, decreasing slightly in diameter towards periphery, viz. from about 1.5 millim. lateral diameter near base to .75 millim. at tips of branches (exclusive of tubercles); antero-posterior diameter only about half as great as the lateral diameter. Internodes compact, apparently imperforate throughout; axis deep crimson-red. Soft joints distinct, spherical, nearly twice the diameter (taken laterally) of the adjacent internodes, except near periphery, where they are no thicker than the internodes; substance compact, deep crimson.

Cortex very thin, but compact, smooth, deep crimson (in spirit) in adult, white to pale scarlet in young specimens. Verruæ usually forming a strictly single row down each lateral margin of the branches; in closed state rounded and but slightly prominent; in open state truncate-conical, about .5 millim. in height, serrating the edges of the branches in a manner peculiar to this species in its genus; their bases are just free from each other; colour (in spirit) pale yellow. Spicules of cortex:—(i.) Fusiform or subclavate, curved, tuberculate, one end usually well pointed, the other more or less obscured at one side by projection of large tubercles; tubercles distinct from each other, but not arranged in whorls, long, pointed, rather ragged; those of the convex side very prominent towards the larger end and inclined towards this end; size .21 by .062 millim. (ii.) Smaller, shorter, blunt or almost so, with thick shaft and two median whorls of tubercles, low, rough, transversely elongated, forming almost continuous ridges round the spicule, and a whorl of incipient tubercles surrounding each blunt end; size .088 to .12 by .053 millim. Spicules of verruæ:—(iii.) Horizontal, fusiform, curved, tapering more or less, the middle beset with few, low, and rounded tubercles, more or less roughened towards the ends; size .21 to .25 by .024 to .035 millim. (iv.) Longitudinal spicules, apparently almost the



same as (i.), but with the tubercles fewer and smaller at large end.

*Hab.* Port Darwin, N. coast of Australia, 7-12 fms.; bottom sand and mud.

*Obs.* A young specimen of what appears to be this species is almost white (in spirit). Several specimens preserved in spirit and one dry (the latter *probably* from the same locality as the rest). The serrated appearance imparted to the branches by the regularly uniserial and rigidly lateral arrangement and the prominence of the verrucæ is the most striking external point distinguishing this from other species of the genus. In spiculation, as in the external characters of most young specimens, it approaches *A. (Mopsella) japonica*, but has the tubercles of the large ends of the cortical fusiform spicules much less prominent, the spicules on the whole smaller than in that species, in which, moreover, the small cortical spicule is elongate, and has the whorls of tubercles at some distance apart. Older specimens much resemble *Mopsella textiformis* in the proportions and arrangement of the branches: but the tint inclining to crimson rather than to scarlet and the strictly marginal position on them of most of the verrucæ serve to distinguish *A. serrata* superficially. The specimens are mostly more or less imperfect; the tallest measures 80 millim. in height.

### PSILACABARIA \*, g. n.

Melithæidæ without foliate spicules (Blattkenlen); branches given off from soft joints at approximately right angles; spicules fusiform, the tubercles of the large cortical spicules tending to coalesce into ring-like ridges; verrucæ spirally arranged.

This genus is at once distinguished by the wide angles formed by the branches; those of other species of Melithæidæ rarely, if ever, exceed 45°. The arrangement of the branches and of the verrucæ upon them is less bilaterally symmetrical than in any other Melithæid except *Clathraria rubrinodis*, Gray (*Mopsella bicolor*, Kölliker); hence, perhaps, this is an older form, allied to the Coralliidæ or to other Alcyonaria with imperfect bilateral symmetry. The ridge-like tuberculation of the larger cortical spicule is not elsewhere found, though the *smaller* cortical spicule of *Melitodes ochracea* has two similar but usually continuous ring-like ridges. These spicules are unusually large in the single species assigned to this genus; in it, too, the branches are remarkably slender and the internodes relatively very long; their pure white colour is a unique character among normal adult specimens of known Melithæaceæ; although in the rare genera *Trinella* and *Parisia*, which appear to me to be best ranked in this family, as representing a distinct subfamily, the white colour reappears. This, however, is perhaps of superficial importance. In all other respects it agrees with *Acabaria*, Gray.

\* From ψιλός, slender, and *Acabaria* a genus of Melithæidæ (derivation "Accabaar," Malay name of *Melitodes ochracea*).

37. *Psilacabaria gracillima*.

(PLATE XXXVII. figs. D-D'' ; PLATE XXXVIII. figs. f-f'')

Corallum extremely delicate, erect, branching dichotomously, approximately in one plane, and at approximately right angles. Apparently no anastomosis. Internodes 12-16 millim. long, diameter  $\cdot 3$  to  $\cdot 7$  millim., cylindrical, slightly flexuous. Soft joints inconspicuous, not broader than the adjacent internodes. Axis of internodes hard, white, not striated.

Cortex about one quarter the thickness of the whole branch, roughened by the large spicules. Verrucae arranged in spiral series, with bases almost in contact on larger branches, rather distant and on opposite sides on the smaller ones; triangular and flattened in the former, low, rounded, and tubercular in the latter; basal diameter and height 1 millim. in the large to  $\cdot 5$  millim. in the small branches. Colour of cortex white, of tips of verrucae pale yellow.

Spicules of general cortex:—(i.) Large cylindro-fusiform to subclavate, with thick axis, slightly tapering to round-pointed ends, well provided with strong tubercles about  $\cdot 03$  millim. high, either sub-spherical or forming low roughened ridges often extending round as much as one quarter of the circumference of the spicule (apparently representing tubercular whorls of those spicules of other *Melithæidæ* which possess them); size  $\cdot 28$  to  $\cdot 31$  by  $\cdot 087$  millim.; tubercles commonly more abundant and larger near one end than the other. (ii.) Smaller, fusiform, with sharply pointed ends and prominent pointed and roughened tubercles, more or less curved, scattered abundantly all over; size  $\cdot 21$  to  $\cdot 25$  by  $\cdot 053$  to  $\cdot 071$  millim. (also at base of verrucae) [probably young forms of (i.)]. Spicules of verrucae:—(iii.) Similar to (i.), but with less broad and ridge-like tubercles, measuring as much as  $\cdot 3$  by  $\cdot 087$  millim.; on exterior of the verrucae, except just at the apex. (iv.) Subclavate, tapering from a broad to a sharp-pointed end, well covered with irregularly scattered, prominent, pointed tubercles, which become larger towards the broad end, where they project forwards beyond and in the direction of the axis of the spicule; on the inner wall of the verrucae, thus resembling the subapical verruca-spicules of *Acabaria divaricata*. (v.) Smaller, fusiform, with fewer tubercles, pointed, scattered equally all over, two or three terminal ones at one end prolonged much as in (iv.); size  $\cdot 21$  to  $\cdot 25$  by  $\cdot 035$  to  $\cdot 044$  millim.; on apex of verrucae [probably young forms of (iv.)]. (vi.) Intermediate forms between (i.) and (ii.), with tubercles more distinct and smaller than in (i.); size  $\cdot 31$  by  $\cdot 07$  millim.; on general body of zooid.

Of all these six forms I only distinguish 3 distinct types, viz.:—(i.) [including iii. and vi.] representing the large cortical fusiform of other *Melithæidæ*, but found also on the verruca, from the fact of the latter being covered more or less with what represents the general cortex; (ii.) representing the smaller cortical fusiform and perhaps also the horizontal verruca-spicule of other *Melithæidæ*; (iii.) [including v.] representing the longitudinal verruca-spicule,

and approaching the forms of this which are found in *Acabaria japonica* and *australis*.

*Hab.* Port Molle, Queensland, 12–20 fms.; bottom consisting of rock and coral. Port Darwin, 8–12 fms.; bottom sand, mud, and shells. Also East Australia, 42 fms. (*coll. F. M. Rayner in Mus. Brit.*).

*Obs.* This is the most delicate of all known Melithæidæ. From their extreme fragility, the specimens, which are all dry, are all imperfect; the longest piece is 40 millim. high; but probably none of the specimens exceeded 60 millim. in height and greatest width respectively. Perhaps half a dozen original specimens are represented. It is remarkable that the length of the internodes and the size of the large cortical spicule vary inversely to the stoutness of the internodes.

### TUBIPORIDÆ.

#### 38. *Tubipora hemprichi*.

*Ehrenberg, Cor. roth. Meer.* p. 55.

A single dry mass.

*Hab.* North-east coast of Australia.

*Obs.* Klunzinger identifies a species from near Timor as *T. rubeola*, Quoy and Gaimard, and it does not appear that he met with this species on the coast of Australia. *T. rubeola*, however, resembles *T. hemprichi* considerably in the rather widely separated tubes and the length of tube between the horizontal (external) diaphragms; but in the latter point it exceeds *T. hemprichi*, and must be regarded as quite distinct from it, owing to the red colour assigned to its polypes, those of *T. hemprichi* being grey.

## SPONGIIDA.

BY

STUART O. RIDLEY.

THE published information relating to the marine Sponges of Australia is very limited, both as compared with that relating to other groups of the Animal Kingdom, and as compared with the attention which has been paid to them by collectors. Large quantities of Sponges have been sent to England from this coast, and the national collection of France possesses a large number evidently of similar origin: but notwithstanding this fact, the number of intelligibly described species is surprisingly small. Dr. Bowerbank, who obtained very large supplies of material, chiefly from S.W. Australia, only described\* 14 species which may be said to have probably come from this continent; these are chiefly Silicea. Mr. Carter has described† 8 species from Bass's Straits, and some 25 from other localities (almost entirely southern and south-western); of these 33, about one half are Silicea, and most of the remainder are Ceratosa. Prof. Hæckel‡ describes 16 species of Calcarea from the south and east coasts; A. Hyatt§ records 8 Ceratosa from South and East Australia; Prof. Sclenka|| shortly describes and figures 5 Sponges from Melbourne and Bass's Straits; and W. Marshall¶, Gray\*\*, and some other writers add a few species to the list; Poléjaeff†† adds 11 Calcarea to the fauna. Dr. Gray describes a remarkable form, *Xenospongia*, from Torres Straits, the only Siliceous species which I can find hitherto described as definitely obtained from North Australia.

The older writers by no means neglected the Sponges of Australia; and in particular Lamarck‡‡ described 53 species from "Mers Australes," collected by Messrs. Péron and Lesueur, of which, as we shall see below, there is considerable reason to believe that many were obtained off the more northern parts of the continent; a few are certainly from the south (King Island and Francis and Kangaroo Islands). There is, however, the very serious difficulty connected with these descriptions of Lamarck that they are ex-

\* Chiefly in Proc. Zool. Soc. 1872-76.

† In Ann. & Mag. Nat. Hist. 1873-84.

§ Mem. Bost. Soc. ii.

¶ Zeitsch. wiss. Zool. xxxv.

\*\* Ann. & Mag. Nat. Hist. (4) vi.; Proc. Zool. Soc. 1869.

†† Zoology H.M.S. 'Challenger,' part xxiv.

‡‡ Ann. Mus. Hist. Nat. xx. (besides an uncertain number, as *Alcyonia*, in Mém. Mus. Nat. Hist. i.).

‡ Die Kalkschwämme.

|| Zeitsch. wiss. Zool. xvii.

tremely short, and deal almost invariably with the mere external characters of the forms to which they refer, and thus, owing to the well-known variability and comparatively slight diagnostic importance of these characters in the Spongiida, are almost useless, *per se*, even for the identification of species.

Thus we have in all some 90 species (allowing for synonyms), more or less fully described, of Sponges chiefly from the southern, south-eastern, and south-western coasts of Australia, and some 60 species described in the barest manner, probably (but not certainly) in most cases from the northern coasts, and a few from the south.

The present collection comprises upwards of 300 specimens, representing 110 species, besides 7 distinct varieties, of which more than half are well preserved in spirit and the remainder are dry. The districts searched consist of:—1. Port Jackson, N. S. Wales; 2. Several points on the north-east coast of Queensland; 3. Various islands and spots in Torres Straits; 4. The Arafura Sea, between Cape York and Port Darwin; 5. Port Darwin, N.W. Australia. The depths range from between tide-marks to 36 fms. (Arafura Sea), but most dredgings did not exceed 20 fms. in depth.

It is perhaps not surprising, after what has been stated as to the previous work which has been done among the Australian Sponges, to find that a large proportion (42 out of 110, or 38 per cent.) of the species are certainly new to science, and that a considerable number more may possibly prove to be so, having been assigned only doubtfully to described species. However, the distribution of the littoral species (when these are properly defined and limited) of Sponges appears usually to be but moderately wide, and perhaps less so than the shallow-water Alcyonaria; both this and another fact must be adduced to account for this large number of new species, viz. that the sponge-faunas of the neighbouring and moderately distant seas are even less known than that of Australia itself; this will be seen clearly from a statement of what has been done to elucidate the fauna of the Indian Ocean which I have made under the heading Geographical Distribution. I have in this dearth of information taken pains to describe every form which warranted description. I have been careful not to assign a new name where the sponge might possibly have been already described, in order not to run the risk of adding to the overburdened synonymy, but have generally given a full description in such cases, so that no doubt might remain as to the characters of that species, at any rate, with which I have had to deal.

*Taxonomy of the Collection.*—Of the 110 species obtained, 20 (or more than one sixth) are Ceratosa, a number which is illustrative of the largely tropical character of the localities from which they are drawn; the Dysideidæ include two new species and a most interesting variety of a most important form, *Psammopemma densum*, Marshall, whose nature receives hereby confirmation and elucidation; the number of new Ceratosa (4) is not great, as most of the species seem to have a wide range.

The Silicea, as usual, far outnumber the other groups; the



Chalinidæ are especially abundant (16 species, 5 new). No essentially new types occur; but of two new genera, one (*Toxochalina*) is formed in recognition of a character, hitherto overlooked, connecting this family with the Desmacidinidæ. Seventeen Renieridæ (5 new) occur, which are chiefly remarkable for their close resemblance to European forms, all the genera and three species being already known from Europe. The Desmacidinidæ have 19 species, and include 9 new forms, and a species for which I have established a new genus, *Gelliodes*, which appears to be an extreme development of the well-known European *Gellius* (*Desmacodes*, Schmidt), also two species for which a genus (*Iotrochota*) is formed, in tardy recognition of their great distinctness; it is probably related rather to the deep-sea genera *Chondrocladia* and *Cladorrhiza* than to any littoral genera, except *Monanchora*, Carter, and is remarkable as being a persistent littoral representative of what was probably one of the earliest types of Desmacidines, viz. that in which the anchorate spicule was symmetrical. Such old types usually survive only in the deep sea or fresh water: we have already seen that the deep sea produces examples of it, and probably the Spongillidæ with birotulate spicules are also modern representatives of this type, which (or whose ancestors) have taken refuge in fresh water. Remarkable as are the outward forms assumed by the species of *Rhizochalina* here described, they will not surprise those who have studied the paper in which Mr. Carter recently described (under the name *Phleodictyon*) a number of species belonging to this genus from various parts of the world; perhaps, however, Torres Straits will prove to be more prolific in this respect than any other locality. The Ectyonidæ are remarkably rich in new forms (10 species out of 17). *Clathria*, which is small in growth and not very rich in species even in the Mediterranean, here assumes a great development in size and number of species. The distribution of the Axinellidæ is as much bathybial as littoral, in accordance with which fact we only have three species here. Of the 8 species of Suberitidæ, 4 are new.

The suborder Tetractinellida is, in conformity with the fondness for greater depths and the relative scarcity of individuals which its members commonly exhibit, represented by only 7 species, of which four are new, and all belong to the Choristidæ (*Sollas*).

The Calcareæ are poorly represented (3 species), and afford nothing of great interest from a taxonomic point of view.

I have given further details, where necessary, of the more remarkable systematic points under the different groups themselves, and a classified list of the species is inserted in the account of the Geographical Distribution.

*Anatomy and Histology of Soft Parts.*—Want of time has prevented me from thoroughly investigating these subjects at present, interesting and important in the extreme as they are, and favourable in many cases for the purpose as is the material contained in the collection. A few notes relating specially to the histology will be found scattered throughout the Report (see especially *Aplysina*,

*Dysidea*, *Iotrochota*, *Rhaphidophlus*, *Acanthella*). In the systematic descriptions of the genera and species I have employed the old expression "sarcode" for the soft tissues generally, as being intelligible, comprehensive, and as having the advantage of involving no special theory or view with regard to the homologies of the parts referred to; the greater part of the tissues included under the term are, however, the "mesoderm" of F. E. Schulze, together with the ciliated chambers and the walls of the canal-system which it encloses.

*Individual Variation.*—A few remarks on this subject are suggested by the study of this large collection. First, variation in the size of *spicules* is an almost invariable occurrence in different specimens of the same species, as it is in individual spicules in the same specimen; in the one case, however, it rightly falls under the head of variation, in the latter chiefly under that of *growth*. In the descriptions below will be found statements which show the range of this form of variation within the limits of a species to be frequently wide, see especially *Leucophloeus fenestratus*, *Echinodictyum* (the spined spicule), and *Stelletta purpurea*. The Ectyonidæ exhibit, as a rule, surprisingly little variation of this kind, and little use is to be made of characters based on size in distinguishing even *species* in this group. Chalinidæ and Desmacidinidæ are also very fairly constant as a rule. Secondly, variation in the *form of spicules* is less common. The Suberitidæ exhibit variation of the head of the skeleton-spicule from sub-acuate to spinulate (*Suberites*). Modifications of the form of the ends of acerate spicules are certainly not often to be noticed; but this collection shows that in *Pellina muricata* the ends of the acerate vary from being gradually sharply pointed to being rounded off almost as thoroughly as in the usual "cylindrical;" and in *Cladochalina nuda* the ends may taper gradually from about four diameters from end of spicule, or else from within about  $1\frac{1}{2}$  diameters (var. *abruptispicula*, mihi), producing a very different appearance. Thirdly, as to variation in the *external form* of the Sponge within the limits of the same species, striking examples are afforded by the series of *Iotrochota purpurea* and *Clathria reinwardti* (where a multi-personal origin appears to explain the most remarkable case). The *number of vents* present has been used as a generic character in the Tetractinellida by Prof. Sollas (*Geodia*, *Isops*). In one of the species of *Stelletta* here described this seems to be constant, in the other not; in the species of *Geodia* described below it is doubtful whether absence of vents ("lipostomy," Hückel) is constant.

*"Person"-theory.*—The individuality of those parts of a Sponge which enclose a single cloacal cavity seems to be regarded as a fact by Marshall, who speaks (Zeitschr. wiss. Zool. xxxv. p. 98 &c.) of species of Dysideidæ as being "monozöisch" or "polyzöisch." It is difficult to see how the different cloacal tubes which are formed during adult life by folding-over of a flat wall, as appears to be the case in the species named below, *Siphonochalina bullata* and *Dysidea semicanalis*, can be said to constitute individuals. It seems possible

that in other species as well the distinct cloacal systems may prove to be formed in the same manner. In his latest work (Spong. Meerbus. Mexico) Schmidt says (p. 16):—"Individuell beginnend übernehmen in vielen Spongien die anfänglich neutralen oder gemeinschaftlichen Gebiete die Rolle der Individuen, aber *der sich nährende und fortpflanzende Körper ist weder Individuum noch ein Stock*, auch der blosse Vergleich mit Individuum und Stock passt nicht auf ihn." (The italics are Prof. Schmidt's.) This view would seem to hold well, at any rate in the cases I have referred to.

*Parasitism*.—An instance of an Oscillatorian Alga parasitic within the tissues of a Sponge is described under *Stelletta clavosa*; a similar circumstance has been recorded in *Halisarea* and *Spongelia* (Schulze) and in a Suberite (Carter). Two examples are to be noted of the converse case, viz. that of a Sponge constantly employing an Alga for support by mingling with its structures, as already noticed by Semper in *Spongia cartilaginea*, Esper. These cases are—(1) *Gellius cymiformis* (v. infra), where the Sponge, though probably less in bulk than the Alga, seems to draw the latter into its own form; and (2) a Renierid (probably *Reniera* s. str.) from Port Moller, Queensland, which coats and penetrates between the superficial fibres of two specimens of a species of erect arborescent Alga, giving it the appearance of the British Sponge *Halichondria albescentis*.

A few examples of *Spongiophaga* (Carter) were noticed in the basal part of a spirit-specimen of a *Rhaphidophylus* (*R. procera*) from Port Darwin: the heads measured .005 to .01 millim., the fibre about .001 millim. in diameter. This parasite has already been recorded from the Siliceous genera *Axinella*, *Gellius*, *Esperia*, *Vioa* (Carter, Ann. & Mag. N. H. (5) ii. p. 167). It also occurs in the Ceratosa of the collection; the skeleton of a *Hircinia* from Torres Straits is almost replaced by it.

#### GEOGRAPHICAL DISTRIBUTION.

##### 1. *Relations of Australia to other Districts.*

In attempting to compare the Australian Sponge-fauna with the faunas of other districts, we are met by a great difficulty, caused by the very imperfect manner in which the Ceratose and Siliceous Sponges of any given marine region, except the Northern and Equatorial Atlantic and Mediterranean, are as yet known. A paper by Prof. Selenka (Zeitsch. wiss. Zool. xxxii. p. 467) and one by myself (Proc. Zool. Soc. 1881, p. 107) give accounts of about 30 species from the South Atlantic: Esper, Carter, and Vosmaer describe species from the Cape. The Sponges of the Pacific are almost wholly unknown\*. Thanks almost exclusively to Mr. Carter's and Dr. Bowerbank's exertions, we have a better knowledge of the Indian-Ocean fauna; but even this is extremely imperfect. Our more exact knowledge of this area (excluding Australia, for which see above, p. 366) is based chiefly on:—

\* But see Carter's (Ann. & Mag. Nat. Hist.) and Bowerbank's (Proc. Zool. Soc.) writings for sundry species from the "South Seas;" and Döderlein (Zeitsch. wiss. Zool. xl. p. 62) for four new Lithistidæ from Japan.

a. Papers, describing about 70 species from Ceylon, by Carter ('Annals and Magazine of Natural History,' ser. 5, vol. vi. pp. 35, 129, viii. p. 361, xi. p. 353); one by Ehlers (Die Esperschen Spongien &c.), redescribing 4 species from Ceylon and South India; and one by Bowerbank, describing a few from Ceylon (Proceedings of the Zoological Society of London, 1873, p. 25).

b. A paper, describing 4 or 5 species from Mauritius, by Carter (Ann. & Mag. Nat. Hist. ser. 5, vol. iii. pp. 284, 343).

c. Descriptions of 3 species from the Red Sea, by Carter (*tom. cit.* p. 298) and Bowerbank (Proc. Zool. Soc. 1872, p. 630).

d. Papers by Bowerbank, describing 17 species from the Straits of Malacca (Proc. Zool. Soc. 1869, p. 325; 1875, p. 281).

e. A paper by the same author, describing 3 species from the north of New Guinea (*op. cit.* 1877, p. 456).

f. A paper by Carter (Philosoph. Transactions Royal Society, vol. 168. p. 286), describing 8 species from Kerguelen Island.

The Calcarea of this region have received considerable attention from Prof. Hæckel in his famous monograph; and a pupil of his (Schuffner) has described (Jenaische Zeitsch. 1878) some species collected at Mauritius. The 'Challenger' collection (*l. c.* p. 366) produced 6 species from the Indian Ocean.

I propose here only to notice some of the most salient facts of the distribution, the known distribution of the species being given below under each.

Of the 110 species described below, only 27 species (25 per cent.) are known with certainty to occur outside the Australian seas. Of these:—

a. One, *Leucetta primigenia*, is almost cosmopolitan.

b. Four, viz. *Reniera indistincta*, *Gellius couchi*, *Suberites carnosus*, *Hymeniacidon caruncula*, occur in the British seas.

c. Five, viz. *Euspongia officinalis*, *Cacospongia mollior*, *Reniera aqueductus*, *Tedania digitata*, *Gellius fibulatus*, occur in the Mediterranean, the last also on the Portuguese coast.

d. Three, viz. *Cladochalina armigera*, *Acervochalina finitima*, *Tedania digitata*, in the West Indies.

e. One, viz. *Cladochalina pergamentacea*, near the Brazilian coast.

f. One, viz. *Siphonochalina tubulosa*, is known from the Cape of Good Hope.

g. Three, viz. *Tubulodigitus communis*, *Spirastrella vagabunda*, *Geodia globostellifera*, from Ceylon; the first also from Kurrachee.

h. Fourteen (comprising 4 Ceratosa, 1 or 2 each of Calcarea, Tetractinellida, and of each family of the Monactinellida except the Suberitidæ) from the tropical parts of the Western Indian Ocean (see Part II. of this Report).

i. Six, viz. *Toxochalina folioides*, *Gellius couchi*, *G. varius*, *Rhizochalina singaporensis*, *Iotrochota purpurea*, *Clathria frondifera*, from the Straits of Malacca.

j. One, viz. *Toxochalina folioides*, from New Guinea.

It should be noticed that the most widely ranging forms belong in most cases to very generalized types, such as might be expected to possess considerable antiquity, and hence a wide distribution. Another



explanation seems, however, to suggest itself as possibly applicable to some cases of extremely generalized and indefinite types (e. g. *Reniera indistincta* and *Hymeniacion caruncula*, which are common to the British and Australian seas), viz. an independent origin of the same species, or of what to a zoologist's eye is the same species, at two different localities. The number of points by which it is possible to distinguish species of (e. g.) *Reniera*, *Hymeniacion*, *Amorphina*, and *Suberites* from one another is so small, and these points are so variable and so *relative* in their character, that it is quite possible that the same end (*i. e.* the same specific characters) may be attained by development in the same direction of two distinct species, the result being a *zoological* but not a *natural* species, or, in other words, of species which are distinct from each other but which cannot be shown to be so.

## 2. Distribution of 'Alert' Species within Australian Seas.

List of the Species collected on the Australian coasts, or in the Arafura Sea, by H.M.S. 'Alert,' 1881, with their known distribution in those waters. [The localities for Southern and Western Australia, and in one or two cases for Port Jackson, are given from previous writings; the rest are those due to the 'Alert' investigations.]

*Note.*—Where the distribution of a *variety* of a species is given, the distribution of the typical form is also given (when Australian) opposite the name of the *species*. The stars opposite the name of the variety refer exclusively to the variety.

	South-eastern Australia (Port Jackson).	North-east. Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°–35° S.).	Southern Australia (long. 100°–150° E.).
Order <b>CARNOSA</b> (not represented).							
Order <b>CERATOSA</b> .							
Family SPONGIIDÆ.							
1. <i>Cacospongia mollior</i> , <i>Schmidt</i> .....			*				
2. <i>Euspongia foliacea</i> ( <i>Esper</i> ?) .....			*				
3. — <i>officinalis</i> , <i>Linné</i> , var. <i>cavernosa</i> , nov. ....			*				
4. — <i>septosa</i> ( <i>Lamarck</i> ?) .....			*				
5. <i>Hippospongia derasa</i> , n. sp. ....			*				
6. <i>Stelospongius excavatus</i> , n. sp.....		*		*			
7. — <i>implexus</i> , n. sp. ....		*					
8. — <i>intertextus</i> ( <i>Hyatt</i> ?) .....	*						*



	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20° - 35° S.).	Southern Australia (long. 100° - 150° E.).
9. <i>Carterispongia otahitica</i> , <i>Esper</i> .....		*					*?
10. — <i>lamellosa</i> , <i>Esper</i> .....		*					
11. — <i>fissurata</i> , <i>Lamarck</i> .....			*				*
Family HIRCINIIDÆ.							
12. <i>Hircinia horrens</i> , <i>Selenka</i> .....			*				*
13. —, sp. ....	*		*				
Family DYSIDEIDÆ.							
14. <i>Dysidea favosa</i> , <i>Marshall</i> .....					*		*
15. — <i>fusca</i> ( <i>Carter</i> ?) .....			*				
16. — <i>digitifera</i> , n. sp. ....			*				
17. — <i>semicanalis</i> , n. sp. ....		*					
18. <i>Psammopemma densum</i> , <i>Marshall</i> ..							*†
— —, var. <i>subfibrosa</i> , nov. ....			*				
Family APLYSINIDÆ.							
19. <i>Aplysina membranosa</i> , <i>Pallas</i> .....			*				
20. <i>Lanthella flabelliformis</i> , <i>Pallas</i> .....					*		
Order SILICEA.							
Suborder MONACTINELLIDA.							
Family CHALINIDÆ.							
21. <i>Chalina monilata</i> , n. sp. ....	*						
22. <i>Cladochalina armigera</i> , <i>Duck. &amp; Mich.</i> .....		*	*				
23. —, sp. ....			*				
24. — <i>nuda</i> , n. sp. ....			*				
— —, var. <i>abruptispicula</i> .....			*				
25. — <i>subarmigera</i> , n. sp. ....			*				
26. — <i>pergamentacea</i> , <i>Ridley</i> .....			*				
27. <i>Acervochalina finitima</i> , <i>Schmidt</i> .....	*	*	*				
28. <i>Tuba bullata</i> ( <i>Lamarck</i> ?) .....		*					
29. — <i>confederata</i> ( <i>Lamarck</i> ?) .....			*				
30. <i>Siphonochalina tubulosa</i> , <i>Esper</i> , var. ...		*	*				
31. <i>Tubulodigitus communis</i> , <i>Carter</i> .....	*						
32. <i>Toxochalina folioides</i> , <i>Bowerbank</i> .....			*		*		
33. — <i>robusta</i> , n. sp. ....	*						

† Tasmania.

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20° -35° S.).	Southern Australia (long. 100°-150° E.).
Family CHALINIDÆ ( <i>continued</i> ).							
34. <i>Toxochalina murata</i> , n. sp. ....		*					
35. <i>Pachychalina lobata</i> ( <i>Esper</i> ?) ....					*		
36. — <i>macrodactyla</i> , <i>Lamarek</i> .....			*				
Family RENIERIDÆ.							
37. <i>Reniera indistincta</i> , <i>Bowerbank</i> , var. ....			*				
38. — <i>scyphonoides</i> , <i>Lamarek</i> .....			*				*
39. — <i>ferula</i> , <i>Bowerbank</i> .....					*		
40. — <i>aqueductus</i> , <i>Schmidt</i> .....					*		
41. — <i>testudinaria</i> , <i>Lamarek</i> .....		*					
42. —, sp., wall-like .....					*		
43. —, sp., laminar .....			*				
44. —, sp., honeycombed .....					*		
45. <i>Pellina muricata</i> , n. sp. ....					*		
46. — <i>alifornis</i> , n. sp. ....					*		
47. —, sp., tubular .....		*					
48. —, sp., massive .....		*			*		
49. — <i>eusiphonia</i> , n. sp. ....					*		
50. <i>Protoschmidtia hispidula</i> , n. sp. ....			*				
51. <i>Schmidtia variabilis</i> , n. sp. ....					*		
52. <i>Amorphina megalorrhaphis</i> , <i>Carter</i> .....			*				
53. <i>Tedania digitata</i> , <i>Schmidt</i> , varr. ....			*		*		
Family DESMACIDINIDÆ.							
54. <i>Rhizochalina fistulosa</i> , <i>Bowerbank</i> ...						*	
— —, var. <i>infradensata</i> , nov. ....				*			
55. — <i>singaporensis</i> , <i>Carter</i> , var. ....			*				
56. — <i>spathulifera</i> , n. sp. ....				*			
57. — <i>canalis</i> , n. sp. ....			*	*	*		
58. <i>Gellius couchi</i> , <i>Bowerbank</i> .							
— —, var. <i>ceratina</i> , nov. ....				*			
59. — <i>varius</i> , <i>Bowerbank</i> .....					*		
60. — <i>fibulatus</i> , <i>Schmidt</i> .....	*		*				
61. — <i>eymiformis</i> , <i>Esper</i> .....		*	*				
62. <i>Gelliodes fibulata</i> ( <i>Carter</i> ?) .....			*				
63. <i>Amphilectus tibiellifer</i> , n. sp. ....			*				
64. — <i>hispidulus</i> , n. sp. ....			*				
65. <i>Myxilla arborescens</i> , n. sp. ....	*						
66. <i>Crella schmidtii</i> , n. sp. ....	*						
67. <i>Iotrochota purpurea</i> , <i>Bowerbank</i> .....		*	*				
68. — <i>baculifera</i> , n. sp. ....				/	*		
69. <i>Esperia parishi</i> , <i>Bowerbank</i> .....					*		

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°-35° S.).	Southern Australia (long. 100°-150° E.).
70. <i>Esperia pellucida</i> , n. sp. ....	.....	.....	*				
71. — <i>obscura</i> ( <i>Carter?</i> ) .....	.....	.....	*				
72. <i>Phoriospongia fibrosa</i> , n. sp. ....	*	.....	*				
Family ECTYONIDÆ.							
73. <i>Ophlitispongia australiensis</i> , n. sp. ..	.....	*					
74. <i>Clathria aculeata</i> , n. sp. ....	.....		*				
75. — <i>tuberosa</i> , <i>Bowerbank</i> .....	.....		*				
76. — <i>coppingeri</i> , n. sp. ....	.....		*				
77. — <i>reinwardti</i> , <i>Fosmaer</i> . — —, var. <i>subcylindrica</i> , nov. ....	.....		*				
— —, var. <i>palmata</i> , nov. ....	.....	*					
78. — <i>frondifera</i> , <i>Bowerbank</i> .....	.....	*	*				
79. <i>Rhaphidophlus arborescens</i> , n. sp. ...	.....		*				
80. — <i>procerus</i> , n. sp. ....	.....				*		
81. —, sp. ....	.....		*				
82. <i>Aearnus ternatus</i> , n. sp. ....	.....		*				
83. <i>Echinodictyum bilamellatum</i> , <i>Lmk.</i> ...	.....	*				*	
84. — <i>costiferum</i> ( <i>Lamarck?</i> ) .....	.....	*					
85. — <i>glomeratum</i> , n. sp. ....	.....		*				
— —, var. <i>subglobosum</i> .....	.....		*				
86. — <i>cancellatum</i> ( <i>Lamarck?</i> ) .....	.....		*				
87. <i>Raspailia bifurcata</i> , n. sp. ....	.....		*				
88. — <i>australiensis</i> , n. sp. ....	.....				*		
89. — <i>clathrata</i> , n. sp. ....	.....		*				
Family AXINELLIDÆ.							
90. <i>Axinella echidnæa</i> ( <i>Lamarck?</i> ) .....	.....		*				
91. <i>Acanthella</i> , sp. (resembling <i>carduus</i> , <i>Lamarck</i> ) .....	.....		*				
92. <i>Leucophleus fenestratus</i> , n. sp. ....	.....				*		
— —, var. ....	.....			*			
Family SUBERITIDÆ.							
93. <i>Suberites carnosus</i> , <i>Johnston</i> .....	*						
94. — <i>epiphytum</i> , <i>Lamarck</i> .....	.....	*					
95. <i>Hymeniacidon caruncula</i> , <i>Bowerbank</i>	*						
96. — <i>agminata</i> , n. sp. ....	*						
97. —, sp. ....	.....		*				
98. <i>Spirastrella vagabunda</i> , n. sp. ....	.....		*				
99. — <i>congenera</i> , n. sp. ....	.....		*				
100. — <i>decumbens</i> , n. sp. ....	.....		*				

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°-35° S.).	Southern Australia (long. 100°-150° E.).
Suborder TETRACTINELLIDA.							
Family CHORISTIDÆ.							
101. <i>Stelletta purpurea</i> , n. sp. ....			*	*	*		
— — —, var. <i>retroflexa</i> .....			*				
102. — — <i>clavosa</i> , n. sp. ....			*	*			
103. — —, sp. ....			*				
104. <i>Stellettinopsis carteri</i> , n. sp. ....			*				
105. <i>Tethyopsis dissimilis</i> , n. sp. ....			*		*		
106. <i>Geodia globostellifera</i> , <i>Carter</i> .....					*		
107. <i>Placospongia carinata</i> , <i>Bowerbank</i> ...			*				
Family LITHISTIDÆ (not represented).							
Suborder HEXACTINELLIDA (not represented).							
Order CALCAREA.							
Family ASCONIDÆ (not represented).							
Family LEUCONIDÆ.							
108. <i>Leucetta primigenia</i> , <i>Häckel</i> .....							*†
— — —, var. <i>microrrhaphis</i> , <i>Häckel</i> .....			*				
109. <i>Leucaltis bathybia</i> , <i>Häckel</i> .							
— — —, var. <i>australiensis</i> , nov. ...	*						
110. <i>Leuconia saccharata</i> , <i>Häckel</i> .....	*						*
Family SYCONIDÆ (not represented).							
Family TICHONIDÆ (not represented).							

It is at once apparent from this Table that by far the largest number of species (64 in all) have been obtained from Torres Straits; that is, no doubt, partly due to the large number of dredgings taken and the number of minor localities investigated here. The Renieridæ are the only family of Silicea or Ceratosa which are not strongly represented. The forms most abundant here are *Iotrochota purpurea*,

† It is uncertain to which *variety* the locality given by Häckel refers.

*Gelliodes fibulata*, *Rhizochalina singaporensis*, var., and *Clathria reinwardti*, var. *subcylindrica*. Ectyonidæ and Tetractinellida are relatively the most rich in species in this subequatorial region, 12 out of the 17 species collected of the first and 7 out of the 8 of the latter group being obtained here. It is remarkable that the only Siliceous species hitherto recorded with certainty from the locality, so far as I am aware (*Xenospongia patelliformis*, Gray, P. Z. S. 1858, p. 229, pl. 12), has not appeared on this occasion; it was, however, perhaps obtained from deep water, as its apparent affinity to *Halicnemis*, Bowerbank, of the British seas would suggest, and no specimens were obtained on this occasion from deep water (if such exists) in Torres Straits.

Of the other localities, Port Darwin on the north-west and the eastern Queensland coast on the east have been the most productive. As might have been expected from the wide extent of moderately deep sea which separates Port Darwin from Torres Straits, there are very considerable differences between their Sponge-faunas, although a larger number of dredgings made at the former would probably have reduced these differences. We find, however, the *Iotrochota* (*purpurea*) so common at Torres Straits replaced by another species, *I. baculifera*; *Gelliodes fibulata* and *Rhizochalina singaporensis* do not even appear; the Ectyonidæ, so far from being common, have but a single species here; and the Renieridæ, so poorly represented at Torres Straits, have here 10 species. Only a few species are here shown to extend across the Gulf of Carpentaria (*Toxochalina folioides*, *Rhizochalina canalis*, *Stelletta purpurea*).

The Arafura Sea represents a somewhat deeper area, but, as might have been expected, shows affinities with Torres Straits on the one hand and Port Darwin on the other; 3 species of *Rhizochalina* and 2 *Stelletta* are its chief representatives in the collection.

The Queensland coast does not appear to be so rich in Sponges as in Alecyonaria; in particular, the absence of Tetractinellida and almost total absence of Suberitidæ characterizes the collections obtained from this region. The occurrence either here or in Torres Straits of the whole of the 12 species assigned to species described by Lamarck is evidence in favour of the view that it was here that a considerable proportion of the Sponges described by him as collected by MM. Péron and Lesueur in the 'Mers Australes' were obtained.

Port Jackson shows peculiarities connected with its southern latitude, producing two British Suberitidæ besides South-Australian species of *Leuconia* and *Hircinia*; still, it has some species in common with Torres Straits. Six species range from the south to the north of Australia.

*Classification*.—I have followed no one author in this matter. The subject is in a state of transition, and I have adopted those divisions which seemed most in accordance with the present state of our knowledge. Remarks on the characters of the different groups will be found under their names; in some cases (especially *Chalinidæ*, *Desmacidiniidæ*) important modifications in scope or characters seem required by the results of the present collection.



*Terms employed.*—These are essentially those used by Mr. Carter, as in my Report on the ‘Alert’ collections from the South-American coast (Proc. Zool. Soc. 1881). The measurements given for spicules are the *average maximum* measurements; the diameter of a spicule is its *greatest* diameter; *spines* are not included in spicule-measurements.

## CERATOSA.

Ceraospongiæ, *Schmidt, Spong. Adr. Meer. and Atl. Geb.*

## SPONGIIDÆ.

Bibulida, and Hircinida, pars, *Carter, Ann. & Mag. N. H.* (4) xvi. p. 132.

### 1. *Cacospongia mollior.*

*Schmidt, Adr. Meer.* p. 27.

A specimen in spirit, pedicellate, consisting of one prominent lobe and a lower broader portion, and a fragmentary skeleton. The apices of the conuli are about 2 millim. apart; the consistence is firm but compressible and elastic, the dermis black and glabrous, the sarcode rather opaque yellowish brown; the primary fibres long, straight, and with very rare foreign bodies, diameter 1 millim.; the secondaries making very various angles with the primaries, and forming numerous irregular meshes of variable size and angular shape; diameter of fibre  $\cdot 035$  to  $\cdot 07$  millim.; fibre of both kinds coarsely laminated.

The specimen is 68 millim. ( $2\frac{3}{4}$  inches) high, 25 millim. in greatest breadth, 12 millim. in greatest thickness, and seems to agree in the main with Schmidt’s species, although the network of the fibre is less regular and close.

*Hab.* Prince of Wales Channel, Torres Straits, 5–7 fms.

*Distribution.* Adriatic (*Schmidt*).

### 2. *Euspongia foliacea.*

? *Spongia foliacea*, *Esper, Pflanzenthiere, Fortsetz.* i. p. 201, pl. lvi.

? *Platychalina foliacea*, *Ehlers, Die Espersch. Spong.* p. 21.

It is with much regret that I have to express a doubt whether the sponge for which that careful observer, Prof. Ehlers, established the above genus is, as he asserts, a Chalinid. My reasons are as follows:—From H.M.S. ‘Alert’ there has been obtained a sponge, in fine preservation although dry, agreeing minutely with Esper’s figure and description, except that the “pores” are smaller and more scattered and numerous, and not placed on the back, but on the front. With the exception of a very few fragments of spicules of different thicknesses, found singly and rarely in a few fibres, there are no spicules at all, and the sponge is evidently a Ceratose species, differing from the common species of *Euspongia* only in its flattened form. The fibres of the main skeleton agree in their consistency

and non-rectangular arrangement with those of *Euspongia*, and, as stated already, foreign bodies are the exception even in the surface-tufts; the diameter of the fibres is  $\cdot 4$  to  $\cdot 7$  millim. (Ehlers gives  $\cdot 5$  to  $\cdot 8$ ), except in the delicate *Ditela*-network of the surface and interstices, where it is  $\cdot 0085$  to  $\cdot 022$  millim. Ehlers says that the fibres contain "in der Axe vereinzelte sehr dünne spitz-spitze Nadeln (0.1 mm. lang,  $\cdot 006$  mm. breit) welche nur in den kegelförmigen Zuspitzungen an der Oberfläche des Schwammes etwas dichter gehäuft sind." Their occurrence singly ("vereinzelte") and not in longitudinal series, if that is what is implied, is not the usual mode of occurrence of spicules in the fibres of Chalinidæ (though it occurs occasionally in some fibres of *Cladochalina*), nor is their greater abundance in the surface-tufts, so far as I know, usual in this family. These statements appear to me to point towards the true explanation of the nature of these spicules, viz. that they are foreign, and taken in (as is usually the case in *Euspongia*) as foreign bodies in small quantities into the surface-tufts. A re-examination of the original specimen is desirable. If Esper's species is a Chalinid, then the present species is a *Euspongia*-isomorph of a Chalinid form, like the Chalinopsid representatives of *Siphonochalina* and *Pachychalina* which Schmidt (Spong. Meerbusen Mexico, p. 80) has described as *Siphonochalinopsis* and *Pachychalinopsis*.

I have satisfied myself that another explanation which might be suggested, viz. the dissolution of the spicules from the fibre of the Sponge (as in Carter's *Aplysina chalinoides*, afterwards found to be a true Chalinid), cannot apply to this case. I have studied the fibre very carefully, with and without the aid of potash, and can assert that it never possessed "proper" spicules.

The respective localities (Cape and Torres Straits) perhaps constitute relative objections to the specific identity of the present with Esper's species.

*Hab.* West Island, Torres Straits.

*Distribution.* Esper's species is from the Cape of Good Hope.

### 3. *Euspongia officinalis*, Linné, var. *cavernosa*. (PLATE XLI. fig. g.)

From a depth of 10 fathoms in Torres Straits we have a small turnip-like sponge, unfortunately preserved only in the dry state, which to the unaided eye presents the general appearance of a *Rhizochalina fistulosa*, with several tubular processes, 10 to 35 millim. long and 8 to 10 millim. in greatest median diameter, on its upper surface; these processes are, however, ragged in outline at their distal ends, and evidently in life opened through the fringed aperture, now obscured by the falling together of the sides; their sides are in some cases fenestrate. The body of the sponge is rudely globular, and is drawn up above into monticular elevations, which are terminated by the tubes just described; the base is somewhat flattened, and has apparently been attached at three points to rock or gravel at the sea-bottom, portions of which are still left imbedded in the sponge. The chief horizontal diameters of the sponge-body are 45 and 55

millim. respectively; the vertical height, viz. to base of uppermost tube, is 30 millim. The surface is darkish umber-brown in colour, that of the body has a slightly irregularly wrinkled parchment-like appearance, that of the tubes is somewhat wrinkled in the direction of their length, and one of them presents further a somewhat shagreen-like surface, as if beset with very short conuli (scarcely 1 millim. high). On dissection it is found that whereas the tubes are chiefly (in the dry state) composed of a horny skeleton, 1-2 millim. thick, the body is a very cavernous mass whose bulk is largely occupied by large canals or chambers, 7-10 millim. wide, opening directly into the bases of the similarly wide tubes, the skeleton of the body thus consisting of trabeculae with smooth, rounded surfaces; the subglobular appearance of the body is produced by the bridging over of the spaces between these trabeculae by a brown paper-like membrane, which is found on microscopic examination to contain no horny elements, but may or may not enclose a certain quantity of minute foreign bodies (sponge-spicules, &c.).

Examining the skeleton of the body with the microscope, I find from vertical sections that it consists of a close reticulation of solid cylindrical horny fibres, distinguishable as:—(1) primary, stouter, approximately straight and parallel to each other, about  $\cdot07$ – $\cdot04$  millim. apart, more or less vertical to the surface, according to position, thickness about  $\cdot03$ – $\cdot04$  millim.; and (2) secondary, similar to primary, and more or less vertical to them, but often very obliquely placed, thickness about  $\cdot013$ – $\cdot03$  millim.; distance apart very variable, from  $\cdot14$  millim. upwards. Colour of fibre, pale to medium amber-colour. Although single primary fibres do not appear to project in the way strikingly exhibited in the more typical forms of *Euspongia officinalis*, where they project well above the general surface, and where distinct “conuli” are formed by the dermis around their bases, yet the sections show an aggregation and projection of the general skeleton at certain points, apparently representing conuli, but not (in the present state of the sponge) finding expression on the outer surface in the conical eminences which usually occur here in *Euspongia*. On the tubes the dermis (immediately below a membranous substance containing a few foreign bodies) is formed by a very close and regular horny network, composed of primary and secondary fibres, like the main skeleton, but arranged parallel, instead of vertically, to the surface. The proportions of the fibres are about the same, respectively, as those of the main skeleton, but the primaries are only  $\cdot03$ – $\cdot1$  millim. apart. All the skeleton-fibres are devoid of sand-core, but are coated (in parts strongly) by the minute strongly refractive brown globules which Prof. F. E. Schulze has considered to be probably of Cryptogamous affinities.

In two points is this sponge of especial interest, viz. (1) in the almost complete subordination of the general arrangement of the skeletal framework to the largely developed excretory canals; (2) in the almost total suppression of the “conuli.” A further point is the absence of sand-cored fibres. I was at first inclined to separate it generically from *Euspongia*, as having the large mæandrine

excretory chambers, separated by comparatively narrow and sheet-like skeletal trabeculae, with even surfaces, which distinguish *Hippospongia*; but on looking at the brief description given by Prof. F. E. Schulze (Zeitsch. wiss. Zool. xxxii. p. 620) of the Adriatic form which he has placed under *Euspongia officinalis*, as var. *tubulosa*, I saw that he had had a closely similar form before him. It agrees with our specimen in the long tubes (of much less diameter, however, in the Adriatic *tubulosa* than here) and in the absence of sand-cored fibres; but it appears to want the following striking peculiarities of our form:—(1) subglobular form (incrusting in Schulze's specimens); (2) trabecular structure of main body; (3) absence of conuli (they are stated by Schulze to occur on the general body of the sponge, but in a very well-preserved specimen in absolute alcohol which he has liberally presented to the National Collection, I find them only on some small digitate lobes which spring from the body; those possibly occurring upon one of the tubes in var. *cavernosa* are evidently only exceptional); (4) approximate equality in stoutness of fibres throughout (in var. *tubulosa* those near the surface are said to be thinner than elsewhere).

In a preparation made from Prof. Schulze's specimen I do not notice a special thinness of the fibres at the surface, but they seem to have a slightly greater diameter throughout than in our form.

Considering the dry state of this single specimen and the evident plasticity of form in *E. officinalis*, I think it best to associate this form provisionally with that termed by Prof. Schulze var. *tubulosa*, feeling that it may be only a mere extreme variation of the species in the same direction as that variety, deferring (as I feel bound to do on a question which Prof. Schulze has made so eminently his own) to Prof. Schulze's judgment in specifically uniting aberrant forms like these with those familiarly known as *E. officinalis*; I am, however, induced, from the points of divergence from *tubulosa* noted above, to assign to it a distinct varietal designation.

*Hab.* Torres Straits, 10 fms.

*Distribution* (of species). Mediterranean (Schulze, &c.).

#### 4. *Euspongia septosa*.

? *Spongia septosa*, Lamarch, *Ann. Mus. Hist. Nat.* xx. p. 373.

It is possible that Lamarch's species, of which I have access to the description only, is a *Dendrospongia* (Hyatt), as its somewhat honeycomb-like surface renders not impossible; but it seems to resemble a species in this collection, represented by two small specimens in spirit, of a dark grey colour, each attached to two or more stones, over which they form horizontally expanded laminae which rise into subcylindrical lobes 5 to 7 millim. in diameter. The surface is broken up by a number of sharp prominent ridges and points 1 to 3 millim. high; the intermediate surface is rough. Primary skeleton-fibres set approximately at right angles to surface, thickness about .06 millim.; secondaries approximately vertical to primaries, about .035 to .053 millim. in thickness, forming with some connecting



fibres rounded-angled meshes, .14 to .21 millim. in diameter, between the primaries, which are about .42 millim. apart. Skeleton-fibres amber-yellow in colour, usually homogeneous in appearance throughout. Primaries cored to some little distance from surface by a usually single series of small foreign bodies; secondaries uncored. Sarcode dull pale brown, subtransparent. Texture of sponge in spirit very tough and elastic.

*Hab.* Alert Island, Torres Straits, 7 fms.

[*Distribution.* "Australian Seas" (*Lamarek*)?]

## HIPPOSPONGIA.

*Schulze, Zeitsch. wiss. Zool.* xxxii. p. 614.

Under this head, owing to the sheet-like aggregation of the skeleton-fibres on the different surfaces, and the large tubular cavities formed by the excretory canals, I am for the present including those Spongiidæ with mæandrine main excretory canals, as *Cacospongia cavernosa*, Esper, and *Spongia intestinalis*, Lamarek, as a subdivision of the genus. Characters may, perhaps, in the future be discovered in their soft parts to justify their separation from that genus. The following is a third species referable to this section of *Hippospongia*.

### 5. *Hippospongia derasa* \*. (PLATE XLI. fig. A.)

Sponge subglobose; surface and interior of skeleton honeycombed by mæandering and branching excretory canals 2 to 3 millim. in diameter at the surface, opening into larger spaces at a short distance within the sponge. Texture of sponge firm, but elastic, in dry state; colour buff, becoming ochreous in parts.

Skeleton at surface between openings of canals smooth and compact, as if pared by a knife; walls of canals smooth. Primary fibres simple, straight, either (1) cored and set at right angles to surface, but not projecting beyond it, diameter, where not distended by foreign bodies, .05 millim.; or (2) not cored by foreign bodies, set approximately at right angles to cored primaries, diameter about .035 millim. Secondaries forming either subrectangular or irregular meshes between the primaries; diameter .018 to .022 millim. Diameter of the ultimate meshes .07 to .14 millim.; distance between primary fibres .18 millim. Fibre dense, homogeneous, elastic; colour pale amber-yellow.

*Hab.* West Island, Torres Straits (washed up).

The single dry specimen is subhemispherical, and measures 60 millim. ( $2\frac{2}{5}$  inches) in length by 35 millim. ( $1\frac{1}{2}$  inch) in height. The species is most nearly allied to *H. (Spongia) intestinalis*, Lamarek, but has the fibres only about two thirds the stoutness of those of that species, and it is subglobose instead of being elongated and tubular. The texture of *intestinalis* is coarser and harsher than that of this species, partly owing to the thickness of the fibres

\* *Derado*, to rub down, in allusion to the smoothness and compact texture of the surface.



and the greater number of cored primaries. *Spongia cavernosa*, Esper, differs from both in having the surface between the canals echinated with tufts.

The peculiarly smooth and unbroken character of the surface of the skeleton between the openings of the excretory canals appears to be due mainly to the remarkable modification of the usual position of the uncored primary fibres, by which, instead of running parallel to the cored primaries, and so meeting the general surface at right angles and (as is usually the case) by a superficial projection, they run approximately at right angles to the very scanty cored fibres, and so *parallel* to the general surface of the sponge; the very close *interstitial* network further adds to its density and evenness of the texture.

### STELOSPONGUS.

Stelospongos, *Schmidt, Atl. Geb.* p. 29; *Hyatt, Mem. Bost. Soc.* ii. pt. 3, p. 528.

Polyfibrospongia, *Bowerbank, P. Z. S.* 1877, p. 459.

Stelospongia, *F. E. Schulze, Zeitsch. wiss. Zool.* xxxii. p. 613.

Stelospongia, *Marshall, Zeitsch. wiss. Zool.* xxxv. pp. 90, 118.

I cannot see any sufficient reason for Marshall's mode of writing the name of this genus. The first part of the word appears to be based on *στήλη*, a column, from the frequency with which Schmidt alludes to the columns ("Säulen") formed by the main fibres of the skeleton.

#### 6. *Stelospongos excavatus*. (PLATE XXXIX. fig. A.)

A small spirit-specimen, obtained at Port Molle, Queensland, has a head which arises from a short pedicel, is broad and semitruncate above, and cup-like, being excavated on its upper surface by four pits, the deepest occupying a great part of the thickness of the sponge; each pit contains a vent; the vents vary in size from about .25 to 3 millim. The colour in spirit is greyish white (putty colour); the dermis conceals all the skeleton but the ends of the primary fibres, which appear as low points over the whole of the outer surface and just inside the margins of the pits.

The skeleton-lines measure about .38 millim. in diameter, the individual fibres of primary lines from .018 to .028 millim. in diameter, those of the large secondary lines .07 millim. Both the secondary and primary fibres enclose more or less foreign matter, which also occurs on the outside of the primary fibres and dermis, forming a kind of mosaic. Greatest height and breadth of the single specimen 31 and 25 millim. respectively. Several large nucleated and unsegmented ova are discernible in the tissues, scattered or aggregated in groups of two or three; the diameter of the largest is about .06 millim.; one was also observed which had apparently divided into four segments.

A fine dry specimen, 300 millim. in gross height by 95 in the maximum diameter of the cup, provided with a slender pedicel 150 millim. long, breaking up below into a number of long stringy rooting

fibres, was also obtained. So far as the vents can be made out, they are numerous, and occur in a zone just inside the margin of the cup. The primary fibres are very stout at the margin of cup, viz. about .5 to .7 millim. in diameter, exclusive of their sandy coating.

*Hab.* Port Molle, Queensland, between tide-marks; Arafura Sea, off north coast of Australia, 32-36 fms. (the larger specimen).

The external position of the sand on the fibres recalls *Mauricea*, Carter (Ann. & Mag. N. H. (4) xx. p. 174), for which see below (*Carterispongia*). In this point, and in the arrangement, proportions, and other characters of the skeleton-fibres, the species strongly resembles Bowerbank's *Polyfibrospongia flabellifera* (Proc. Zool. Soc. 1877, p. 459), from the north of New Guinea: but the shape of that species is entirely different, being fan-shaped and quite thin, and the vents are described as inconspicuous.

### 7. *Stelospongius implexus*. (PLATE XXXIX. fig. B.)

Stipitate, with short, usually flattened or compound pedicel; sub-turbinate, the wall usually proliferating inwards, and then anastomosing, forming a chambered cup, with thin walls (2 to 4 millim. thick). Outer and inner surfaces even, the outer marked strongly, in the dry state, by longitudinal projecting skeleton-ridges, the inner slightly so by the subrectangular superficial skeleton-network. Vents? Texture in dry state harsh, but yielding and rather brittle. Colour pale greyish brown.

Main skeleton at some distance below surface consisting of stout fascicles of primary fibres, vertical to the surface, about .17 millim. in diameter (the individual fibrils about .025 millim.), densely coated by a mosaic of small sand-grains, connected towards the surface by secondary lines of similar structure, about .07 millim. in diameter; the primaries, when near the surface, become cored with foreign bodies, and become more condensed, sometimes forming but a single fibre, .1 millim. thick. Dermal skeleton on exterior of cup consisting of parallel single fibres .1 to .17 millim. in diameter, coated, and to some extent cored, by small foreign bodies; intermediate membrane sparsely strewn with similar foreign bodies. Sarcode pale amber-yellow, transparent. Skeleton-fibre very pale yellow in the small, deep amber in the large fibres.

*Hab.* Port Molle, Queensland, coral-reef.

This species differs in external form from all those described by Hyatt (Mem. Bost. Soc. ii.). In the only cup-shaped form alluded to by Schmidt (Atl. Geb. p. 29) the walls would appear to be relatively much thicker, as is the case in *S. excavatus*, mihi (*suprà*). This form approaches that species closely, the skeleton- and surface-structure being almost identical in the two cases; but the well-marked tendency to proliferation and formation of secondary cavities in the cup and the shortness of the pedicel further distinguish *S. implexus*. This is a small species: all four specimens obtained (which were dry) were in their natural state between 40 and 60 millim. high, and between 40 and 60 millim. in greatest diameter at the top.

8. *Stelospongius intertextus*.

? *Hyatt, Mem. Bost. Soc.* ii. p. 532.

A fragment of what was probably either a cup-shaped or flabellate specimen is, perhaps, referable to this species: the structure of the skeleton agrees fairly with Hyatt's description; at some little distance below the surface the primary skeleton-lines are very stout, viz. .14 millim. and upwards in diameter, and mostly *cored*, not *coated*, by foreign material; the skeleton is elastic and very compressible.

*Hab.* Port Jackson, 0-5 fms.

*Distribution.* Mauritius? (*Hyatt*)?

## CARTERISPONGIA.

*Halispongia*, *Bowerbank, Mon. Brit. Spong.* i. p. 207 (*nec De Blainville*).

*Carteriospongia*, *Hyatt, Mem. Bost. Soc.* ii. p. 540.

*Mauricea*, *Carter, Ann. & Mag. N. H.* (4) xx. p. 174.

De Blainville founded the genus *Halispongia* (*Man. Actinol.* p. 532) to contain a number of sponges, of which the first is *Spongia papillaris*. Grant (= *Halichondria panicea*, Johnston), and which are stated in the generic diagnosis to contain siliceous spicules; therefore Bowerbank is clearly wrong when he describes and figures (*Mon. Brit. Spong.* i. pp. 207, 278) an obviously horny sponge as typical of the genus. The sponges which he has referred by name to this genus (*H. choanoides*, *mantelli*, *ventriculoides*, *stellifera*) appear to be all in accordance with his, but not with De Blainville's idea of the genus. Hyatt formed the genus *Carteriospongia* nominally for a species called by him *otahitica*, Esper, which is, however, apparently *lamellosa*, Esper, to the plate of which he refers. This species differs in outward form from the cup-shaped or palmate *Halispongiae* of Bowerbank, but agrees with them in the skeleton-structure, while some *Halispongiae* agree in possessing the cabbage-like growth which characterizes Hyatt's typical *Carteriospongiae*. So many species (*Halispongia ventriculoides*, *Spongia fissurata*, Lamk., &c.), which appear to agree in all other points with Hyatt's conception of the genus, have, nevertheless, the secondary fibres sand-cored, that I venture to omit the character "absence of foreign matter from the secondary or connecting fibres," which he attributes not only to the genus, but to the entire family Phyllospongiadae in which he places it. Schulze (*Z. wiss. Zool.* xxxii. p. 613) upholds this genus as a true member of the family Spongiidae as revised by himself. In the second part of this work I shall explain the reasons why I cannot admit *Mauricea* as a distinct genus.

9. *Carteriospongia otahitica*.

*Spongia otahitica*, *Esper, Pflanzenz. Fortsetz.* i. p. 209, pl. lxi. figs. 7, 8.

*Halispongia ventriculoides*, *Bowerbank, P. Z. S.* 1874, p. 301, pl. xlvii. figs. 1, 2.

? *Cacospongia poculum*, *Selenka*, *Z. wiss. Zool.* xvii. p. 567, pl. xxxv. fig. 7.

The specimens agree well with Esper's figure 7 and Bowerbank's specimens.

*Hab.* Bird Island, N.E. Australia (from coral-reef).

*Distribution.* N.E. Australia (*B.M. coll.*); [Melbourne (*Selenka*)?]; Otaheite (*Ellis*).

#### 10. *Carterispongia lamellosa*.

*Spongia lamellosa*, *Esper*, *Pflanzenh.* ii. p. 270, pl. xlv.

*Cacospongia lamellosa*, *Ehlers*, *Espersch. Spong.* p. 15.

? *Carterispongia otahitica*, *Hyatt*, *Mem. Bost. Soc.* ii. p. 541.

Fine dry examples showing the cabbage-like growth characteristic of Hyatt's genus. Also specimens with single stem (showing, however, traces of being composed of two or more united axes) and simply flabellar, with more or less prominent longitudinal ridges on one side, sometimes forming secondary flabellate expansions. The specimens, being still invested with dried sarcode, have an umber-brown colour and a stiffness, which contrasts strongly with the very pale colour and the flexibility of washed-out specimens.

I cannot agree with Prof. Ehlers in placing this sponge, with its close network, under *Cacospongia*, which is distinguished by the loose wide meshes formed by the fibres.

*Hab.* Port Molle, Queensland, and "North-east coast of Australia."

*Distribution.* Uncertain.

#### 11. *Carterispongia fissurata*.

*Spongia fissurata*, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 382.

*Carterispongia vermifera*, *Hyatt*, *Mem. Bost. Soc.* p. 543.

Cabbage-like heads formed of flabelliform expansions, which fold round at their lateral extremities, which then may, or may not, unite with similar fronds which arise parallel to each other from the multiple-stalked base or from the surfaces of other fronds. The surface of the skeleton is even, without projecting ridges, but honeycombed with small longitudinal, connected by short horizontal, demi-canals, between which intervene small, usually longitudinally elongate ridges, which all lie on one level. The fibres show very distinct lamination of the ceratinous material; both primary and secondary fibres are sand-cored, but the sand is often wanting over certain areas of the skeleton. Represented by dry specimens.

*Hab.* Thursday Island and Channel Rock, Torres Straits.

*Distribution.* "Australian seas" (*Lamarck*); Phillip's Island, probably near Melbourne (*Hyatt*).

## HIRCINIIDÆ.

*Schulze, Zeitsch. wiss. Zool.* xxxii. p. 594.

12. *Hircinia horrens*.

? *Spongelia horrens*, *Selenka, Zeitsch. wiss. Zool.* xvii. p. 566.

Differs from *Selenka's* description in the pale colour (dull yellow or putty-colour) of the sponge as a whole and the pale brownish colour of the sarcode; the former is perhaps due to the absence from the dermis of the dark bodies described as nuclei. The fibres are closely reticulate in the conuli and in parts of the dermis; in other parts the latter is homogeneous, but of a ceratinous appearance; the diameter of the fibres is  $\cdot 042$  to  $\cdot 088$  millim. (*Selenka* gives  $\cdot 07$  to  $\cdot 15$ ). The conuli are, as in *Selenka's* specimen, about 5 to 10 millim. apart, but not so prominent as most of those in that specimen. The specimen is an irregular lobate mass growing over some bottom material, and is itself much overgrown by a sponge (*Iotrochota*), a Didemnid Ascidian, and a creeping Alcyonarian (*Callipodium*). This latter fact may account for the pale colour, which is perhaps owing to a sickly condition produced by the growth of other animals obscuring the pores; and indeed an orange colour in one part of the sponge itself seems likely to be due to local death. It is possible that *Selenka's* species may prove to be an *Aplysina*. The specimen is preserved in spirit.

*Hab.* Prince of Wales Channel, Torres Straits, 7 fms.

*Distribution.* Bass's Strait (*Selenka*)?

13. *Hircinia*, sp.

Three specimens in spirit, incrusting in growth; colour flesh-tint. The primary fibres are almost full of foreign bodies in the Torres-Straits specimen, less often so in the Port-Jackson one, and are about  $\cdot 18$  millim. in diameter; the secondaries at acute angles to the primaries, generally free from foreign bodies, and about  $\cdot 06$  millim. in diameter.

I had referred this to a species of *Selenka's* which I now see has been referred to *Aplysilla* by Prof. F. E. Schulze. I hope to describe it more fully at a future time.

*Hab.* West Island, Torres Straits, 7 fms.; Port Jackson, 0-5 fms.

## DYSIDEIDÆ.

*Gray, P. Z. S.* 1867, p. 511.

*Gray* appears to have been the first to give a distinctive name to this family, although *Bowerbank* (*Mon. Brit. Spong.* i. p. 211), in 1864, makes *Dysidea* the type of a distinct suborder, to which he gives no name. *Marshall* ("Ueber Dysideiden und Phoriospongien," *Zeitsch. wiss. Zool.* xxxv. p. 92) employs the same name; and as his arguments for the retention of the generic term *Dysidea* instead of *Spongelia* appear to me to be valid, it seems desirable to retain the old family name, which is derived from it, in preference to *Spon-*



gelidæ, which Vosmaer has recently (Mitth. Zool. Stat. Neapel, iv. pp. 444, 445) employed. On the geographical distribution of the members of the Family see the subsequent Report on the Collections made in the Western Indian Ocean.

#### 14. *Dysidea favosa*.

*Marshall, Zeitsch. wiss. Zool.* xxxv. p. 98, pl. vi. figs. 6-11.

Fragments; exhibiting, however, the secondary pouches in the wall of the tube, into which the excretory canals open, as described by Marshall. Here also, as in Marshall's specimens, the foreign contents of the fibres are chiefly sponge-spicules, but linear siliceous forms seem to prevail.

*Hab.* Port Darwin, between tide-marks.

*Distribution.* Bass's Strait (*Marshall*).

#### 15. *Dysidea fusca*.

? *Hircinia fusca*, *Carter, Ann. & Mag. N. H.* (5) vi. p. 36.

One specimen is composed of two anastomosing lobes, somewhat compressed, 9-17 millim. in diameter, one being pointed and 45 millim. high, the other shorter and blunt. Vents few, scattered between conuli; tubercular, about 1 millim. across. Conuli 2-3 millim. apart, about 1 millim. high, apex often ridge-like; intermediate surfaces concave, depressed, glabrous. Texture in spirit fairly tough; colour dark reddish brown. Mr. Carter speaks of the fibre being "covered" with foreign material. In this specimen it is very coarse, viz. .07 to .25 millim. thick, and has the structure of that of *Dysidea* (i.e. is filled with coarse foreign bodies). Sarcodæ dense, reddish brown, granular. Main skeleton somewhat irregular, primary fibres plainly distinguishable only near surface; secondary fibres stout, irregular in direction. Dermal skeleton chiefly composed of coarse fibres, .25 millim. broad, radiating from conuli. The fibres of the main skeleton contain a distinct yellow horny substance, and are occasionally devoid of foreign bodies for a short distance.

It seems possible that this may be Mr. Carter's species, but his description is too short to decide the matter. In a second specimen, which covers the upper surfaces of the body and limbs of a crab, throwing up short lobose projections at intervals, the conuli are smaller, pointed, and only 1 millim. apart, and the colour is a dull reddish brown.

*Hab.* Prince of Wales Channel, Thursday Island, Torres Straits, 3-4 and 7 or 9 fms.

*Distribution.* Ceylon (*Carter*)?

*Histology.* The cortex and subjacent tissues contain large quantities of granular reddish-brown cells, with circular outline, apparently those of the ectoderm (*Schulze*) lining the excretory cavities, which give the sponge its peculiar colour. In some parts of the paler-coloured sponge they are still distinguishable, but in others they are scarcely demarcated from the general transparent sur-

rounding tissues. The paler colour, to the natural eye, of the latter sponge appears to be due to the greater concentration of the pigment within the cells: a similar effect is produced by a similar cause in some Cephalopoda (*Loligo*).

### 16. *Dysidea digitifera*. (PLATE XLI. fig. C.)

Curved and anastomosing cylindrical digitations, about 3 millim. in diameter, arising from the upper aspect of an erect, compressed, irregular basal mass, and tapering gradually to pointed ends. Surface even, minutely roughened by the presence in the dermis of a coarse, reticulate, horizontal skeleton. Vents few, scattered on main mass of sponge, subcircular, leading deeply into sponge. Texture (in spirit) very friable; colour pale greyish brown. Main skeleton composed of large foreign bodies, united by a thin, almost colourless membrane (not visible unless the fibre is broken); primary\* fibres running approximately at right angles to surface; secondaries (*tertiary* of Marshall) approximately parallel to surface, very short; meshes narrow, about .07 to .09 millim. broad, rounded; fibres .019 to .05 millim. thick. Dermal skeleton formed of fibre similar to that of the main skeleton, about .025 to .055 millim. thick, forming circular or oval meshes, .032 to .09 millim. broad. Sarcodae pale greyish brown, rather granular.

*Hab.* Albany Island, Torres Straits, 8 fms.

This is a delicate species, distinguished from all other described species by its closed digitate processes (those of *D. callosa*, Marshall, bear vents); in being devoid of conuli it differs from most species, but seems to agree with *Dysidea kirkii*, Carter (Ann. & Mag. N. H. (5) vii. p. 374), ? Bowerbank.

Height of sponge 40 millim. ( $1\frac{3}{5}$  inch); greatest lateral extension 25 millim. (1 inch); longest individual digitation, 20 millim. ( $\frac{4}{5}$  inch). The sponge has grown up amongst and over some specimens of *Eudendrium*.

### 17. *Dysidea semicanalis*. (PLATE XLI. fig. B.)

A hollow flattened vertical common stem, giving rise to several vertical cloacal tubes, some of which are open on one side (evidently formed in some cases by the folding over of surface-ridges), united more or less by their projecting knife-like adjacent edges. Tubes about 60 millim. ( $2\frac{1}{3}$  inches) in greatest length; mean internal diameter about 6 millim.; contracted at mouth, their walls 3 to 4 millim. in greatest thickness; inner surface provided with a few shallow pits. Outer surface bearing a few long, but not prominent, ridges running from near base to near the upper end; surface between ridges even, minutely honeycombed in dry state by small, longitudinally elongated spaces, separated by fibres of dermal skeleton, and about .5 millim. in their smaller diameter. Texture, in dry state, rather harsh to the touch, firm but elastic, compressible and somewhat tough. Colour pale yellowish brown.

\* *Secondary* of Marshall, *primary* of Hyatt, *vertical* of Carter.

Main skeleton forming rectangular meshes; primary fibres strong, running at right angles to surface, exhibiting horny margins (which may form as much as one third of total thickness of fibre), about .28 to .35 millim. apart, .1 to .18 millim. thick. Secondary fibres vertical to primaries, at about the same intervals, either without foreign bodies or with only about half to two thirds of the thickness occupied by them; in the former case .035 to .043 millim. thick, in the latter .053 to .1 millim. thick. Longitudinal fibres (*primary* of Marshall) of same structure as primaries, but less horny, .18 to .28 millim. apart, .14 to .21 millim. thick, running upwards and spreading out somewhat from each other. Dermal skeleton composed of long compound fibres, the primaries running parallel to each other and to the long axis of the sponge, .35 to .43 millim. apart; the secondaries extended between them at considerable intervals; primaries .14 to .28 millim. broad, secondaries .1 to .14 millim., the horny matter of the former usually, of the latter often, obscured by the foreign bodies, which often project much from the fibre. Horny substance amber-yellow. Sarcodermis amber-yellow, transparent. Foreign bodies of fibres small, chiefly sand.

*Hab.* North-east coast of Australia.

The single specimen is 105 millim. ( $4\frac{1}{5}$  inches) high by 65 millim. greatest width. In its even compact surface it differs from all other *Dysidea* except *D. favosa*, Marshall, with which it also agrees in the large development of the tubular form which it exhibits. The strongly horny character of the secondary fibre, however, distinguishes it from this (as from most, if not all other) species, and allies it to *Hircinia*. These striking characters, and the good preservation of the specimen, seem to warrant its description.

# 18. *Psammopemma densum*, Marshall, var. *subfibrosa*.

(PLATE XLI. fig. h.)

*Psammopemma densum*, Marshall, *Zeitsch. wiss. Zool.* xxxv. p. 113.

Agreeing closely in size and external characters with Marshall's account of this strange form is a specimen in spirit in the present collection. It has the size and almost the shape of a horse-bean, and is of a grey colour. The dermal membrane contains numerous foreign bodies, but is in parts transparent, though fibrillated. Owing to an inferior amount of contained sand, a distinct network of wholly sandy fibres is to be made out, which Marshall did not find in his specimens; the meshes are round, about .3 millim. in diameter, in the natural state almost filled up with sarcodermis containing foreign bodies. Sarcodermis very pale brown, subtransparent. The radiating tubes indicated in Marshall's figure (6) appear to me possibly to represent spaces between primary fibres; but those fibres in the present specimen are not straight, but bend right and left to meet the short secondary lines; thus a vertical section of the sponge exhibits a somewhat honeycomb-like appearance. No trace of horny matter was observed.

*Hab.* Thursday Island, Torres Straits, 3-4 fms.

*Distribution.* Tasmania (Marshall).

## APLYSINIDÆ.

Aplysinida, *Carter, Ann. & Mag. N. H.* (5) xvi. p. 132.

This name is used in a wider sense than that to which Vosmaer (*Mitth. Zool. Neapel*, iv. p. 444) limits it.

19. *Aplysina membranosa*.

*Spongia membranosa*, *Pallas, Elench. Zooph.* p. 398.

*Spongia membranacea*, *Esper, Pflanzenth.* ii. p. 256, pl. xxxiv.

? *Ianthella concentrica*, *Hyatt, Mem. Bost. Soc.* ii. p. 407.

? *Aplysina purpurea*, *Carter, Ann. & Mag. N. H.* (5) vi. p. 36.

A very fine species, fortunately preserved in spirit as well as in the dry state. It forms a cylindrical mass, which has the same general form as that given in Esper's figure (*l. c.*); the base of the wet specimen is about 40 millim. ( $1\frac{2}{5}$  inch) in diameter. The dry specimen, which is much the largest of the two, is 580 millim. ( $22\frac{1}{2}$  inches) high, and the maximum diameter, which is at about 5 inches above the base, is about 40 millim. ( $1\frac{3}{5}$  inch). At 77 millim. (3 inches) above the base a branch is given off, 22 millim. ( $\frac{7}{8}$  inch) in maximum diameter and 145 millim. ( $9\frac{1}{2}$  inches) in length, and on the same side, about 30 millim. higher up, a smaller branch, 12 millim. ( $\frac{1}{2}$  inch) in maximum diameter and 75 millim. (3 inches) in height. The skeleton consists of a very open and irregular network of fibres, 1.5 to 2 millim. in thickness, which arise at the base of the sponge, and take a longitudinal but somewhat sinuous course along the interior of the cylindrical column of which the sponge consists. They throw out branches somewhat freely from their sides, and subdivide terminally into ramifying branches; the resulting twigs anastomose freely, the superficial ones end in outwardly and upwardly directed points, usually bi- or tri-furcate, which are just covered by the tough dermis; the apices are .18 to .28 millim. in diameter. The dermis and the internal membranes consist of a tough membrane of a puce or dull purple colour in spirit, almost black in the dry state. The membrane is seen with the naked eye to be marked with numerous raised thickened lines, which radiate from the projecting apices of the dermal conuli (formed by the tension of the dermis over the points of the skeleton, as mentioned above), and branch and anastomose on the membranes. Under the microscope they are seen not to be special fibre-structures, but to consist simply of thickened membrane. The membrane is coloured by purplish cells, which are about .03 millim. in diameter, and are crowded with semiopaque granules, to which they owe their colour. The fibres of the skeleton have a wide central cavity, occupying about half their diameter, and filled, or almost so, with a transparent substance coloured diffusely of a purplish-red colour. The walls of the fibre are composed of laminae which separate readily, and may then be seen to consist of a dark substance, rather readily torn, thickly set with fine dark purple-red

granules, lying in a diffusely stained subtransparent matrix of the same colour, but paler. A transparent membrane, consisting of an almost colourless matrix, containing few purple granules, appears to invest the fibre.

*Hab.* Thursday Island, Torres Straits, 4-5 fms.; bottom sand, or sand and rock.

*Distribution.* "Indian Ocean" (*Pallas*).

*Obs.* In many particulars this species recalls *Aplysina purpurea* of Carter, but appears to differ fundamentally in the distinctness, large size, and non-multiplicity of the fibres; whereas in that species the axes of the conuli and the skeleton generally consist of aggregated masses of fine fibrils. If Hyatt's species is really like *Ianthella homei*, with which he compares it, it cannot be this sponge, as it would be of flattened growth; but he appears to be uncertain on the point.

If one of the dermal cones, with the surrounding membranes, is treated with a strong solution of caustic potash, a dark brownish-yellow colouring-matter is dissolved out, thereby differing from that of *Ianthella*, which is said to be violet under similar circumstances (Gray, Proc. Zool. Soc. 1869, p. 50); nothing of the tissues is left but a branched fibre or two and some flocculent matter; therefore the only truly fibrous structures here are the terminal twigs of the skeleton.

The wall of the main skeleton-fibre of this species is much thicker than in most *Aplysinæ*, and its axial substance is not granular.

## 20. *Ianthella flabelliformis*.

*Spongia flabelliformis*, *Pallas*, *Elench. Zooph.* p. 380.

*Ianthella flabelliformis*, *Gray*, *P. Z. S.* 1869, p. 50.

A specimen in spirit, somewhat imperfect, and not showing any of those exfoliations of the lateral surfaces which specimens commonly exhibit.

*Hab.* Port Darwin, 7-12 fms.; bottom sand.

*Distribution.* Indian Ocean (*Pallas*); "Australia" (*Gray*).

## CHALINIDÆ.

In this family must now be included some forms with minute flesh-spicules. *Homæodictya*, Ehlers, is the earliest discovered case of this combination; and I am able to add another, in a new genus, *Toxochalina*, which possesses fine tricurvates scattered in the sarcode. I have relegated *Rhizochalina* to the Desmacidinidæ for reasons given below (family Desmacidinidæ). I have also given reasons for a belief that *Platychalina*, Ehlers, is a Ceratose sponge (see *Euspongia*, *suprà*).

The fact cannot be ignored that the genus *Toxochalina*, characterized below, runs counter to the plan of classification hitherto



usually adopted in the family Chalinidæ, viz. that by the external form, in which both Carter and Schmidt agree. So long as, in the remaining features of their organization, the different members of the family did not present any sufficiently distinctive characters, it was impossible to do otherwise than arrange them by this character, which, indeed, appears to possess, from its approximate constancy in the species, more importance than in some other families of Monactinellida. Now, however, that two markedly distinct types of flesh-spicules have been found to occur (*cf.* the anchorate in *Homorodictya* (*Chalina*, Carter) *palmata*, Johnston), in addition to the normal acerate or fine subcylindrical, it seems necessary to apply the same rule as in other families, and allow the spicular characters, where they are well marked, precedence over those derived from the general form. Thus I have thought it right to unite here species which would, *ceteris paribus*, be classed in groups *Reptata* and *Aculeata* of two distinct families (Chalinida and Cavochalinida) of Mr. Carter's classification. This single spicular character is supported in this case by the coexistence of a firm texture and a rectangular arrangement of the skeleton-fibre.

On the comparatively slight value of aculeation of the surface and of erect or decumbent growth, see below under *Cladochalina subarmigera*.

In the present collection the family is represented by no less than 7 genera (8, if *Siphonochalina* is to be regarded as distinct from *Tuba*) and 15 species, of which 1 genus and 5 species are described as new. The latter are probably not forms of any great rarity, but owe their novelty to the very slight attention which has hitherto been paid to the Chalinidæ of the Indo-Pacific region; the chief contributors to the fauna hitherto being Mr. Carter, who has described or re-identified some 8 or 9 forms from this region, and Dr. Bowerbank, with 3 or 4 species. The identification of two of the species is unfortunately somewhat uncertain, from the very scanty descriptions given by Lamarek, their original describer.

With the exception of *Toxochalina*, the species have a strong resemblance to Atlantic forms, and in three cases (*Cladochalina armigera*, *C. pergamentacea* and *Acervochalina finitima*) have been satisfactorily determined as identical with species found near the eastern coast of America (West Indies and Brazil).

### CHALINA, Bowerbank.

This genus was merely mentioned by name in Grant's 'Tabular View of the Animal Kingdom' (1861). In 1864 Dr. Bowerbank\* (first) defined correctly the genus, assigning to it *Spongia oculata*, Pallas, as its type species. Schmidt therefore appears to me to be in the wrong when he (Atl. Geb. p. 32) removes this species to his genus *Chalinula*, of 1868, and restricts *Chalina* to species which have the habitus of *Euspongia* and *Cacospongia*.

\* Mon. Brit. Spong. i. p. 208.

21. *Chalina monilata* \*. (PLATE XLI. fig. k.)

Erect, dichotomously branched; branches circular in transverse section, round at the ends, solid, 4 to 6 millim. in diameter, swelling out gently, necklace-like, about every 8 or 10 millim. of their length; terminal ones 35 to 85 millim. long, generally broad and compressed at point of bifurcation. Stem short, no stouter than most of the branches. Surface smooth, glabrous. Vents circular, edges flush with the surface, diameter about 2 millim., few, scattered irregularly on surface. Texture in spirit compressible, elastic, moderately tough; dermis tough, parchment-like; colour opaque yellowish brown.

Main skeleton irregularly rectangular, fibres very flexible, pale amber-yellow: primaries about .042 millim. in diameter, spicules 3- to 4-serial; secondaries about .035 millim. in diameter, spicules 1- to 3-serial: primaries .35 to .53 millim. apart at surface, secondaries .14 to .35 millim. Dermal skeleton—a wide-meshed, irregular polygonal network of strong fibre, .035 to .07 millim. thick; spicules numerous, 3- to 8-serial; within its meshes a dense and regular, usually rectangular, network of very pale horny fibre, .006 to .042 millim. in diameter; meshes .05 to .1 millim. in diameter; spicules of fibre usually 1-serial: fibres of characters transitional between these two kinds also occur. Sarcode very pale brown, slightly granular. Spicules smooth, acerate, usually tapering gradually to fine points, size .1 by .0017 millim.; more rarely tapering slightly from centre to about two diameters from ends, and then suddenly to sharp points; size .085 by .0021 millim.

*Hab.* Port Jackson, 0–5 fms.

Several specimens in spirit, the largest 175 millim. (7 inches) in height. This species has the general habit of *Chalina oculata*, Pallas; but the vents are less numerous and regular, the dermis is tough, instead of being soft and velvet-like, and the branches are moniliform, not strictly cylindrical, and the slender acerate spicules are very different from the stout fusiform ones of *C. oculata*. I am unable to assign this species to any of the numerous probable Chalinidæ which Lamarck has described under his section “Masses rameuses,” &c.† The tough outer layer, the spiculation, or the habit distinguish it alike from these and all other *Chalines* with which I am acquainted.

22. *Cladochalina armigera*.

*Tuba armigera*, *Duch. de Fonbressin & Michelotti*.

Two dry specimens and one in spirit. Agree well in external characters with the original figure (Spong. Mer Caraïb. pl. viii. fig. 3) and in the characters of the fibre, except that the spicules are far more abundant (6 to 8 series in the primary and proportionally

\* From Lat. *monile* necklace.

† Ann. Mus. Hist. Nat. xx. p. 446.

more in the secondary fibres) than is the case with the mounting which the Museum possesses from Prof. Schmidt. The spicules are chiefly acerate, tapering gradually to sharp points, characters which I have already described in those of Schmidt's specimen (P. Z. S. 1881, p. 114); but here I find also a considerable number of cylindricals in some places with well-rounded extremities; the size of both kinds is  $\cdot 08$  by  $\cdot 0025$  millim., which is almost exactly the size I gave for those of Schmidt's slide (*l. c.* p. 114). On re-examination of the latter, I find a few of the cylindricals present there also, and the position of the spicules in the fibre is normally axial on the whole, and not superficial only, as I stated in the paper referred to: I was misled as to these points by the scantiness and badly preserved condition of the small mounting which represents the species. Thus, with the exception of the more strongly spicular character of the fibre, the present specimens do not differ essentially from West Indian specimens of the species. The diameter of the stem varies from 5 to 9 millim. (exclusive of the spines), and the spines are strong, viz. 2 to 3 millim. high. Vents at intervals of 6 to 12 millim. along the stem.

*Hab.* Thursday and Alert Islands, Torres Straits, 3-7 fms.; Port Denison, Queensland, 4 fms.

*Distribution.* Caribbean Sea (*Duch. & Mich.*); Florida, 9 fms. (*Schmidt*).

It is interesting to have such a well authenticated case of identity of a West-Indian and an Australian sponge.

### 23. *Cladochalina*, sp.

A spirit-specimen, of sub-erect habit, with stout amber-yellow horny fibre and fusiform acerates, uni- or biserial, measuring  $\cdot 28$  by  $\cdot 016$  millim. Stem subcylindrical, about 12 millim. thick, without surface aculeations. I prefer to await more perfect specimens rather than risk an incorrect determination and description.

*Hab.* Prince of Wales Channel, Torres Straits, 5-7 fms.; bottom sand and shells.

### 24. *Cladochalina nuda*. (PLATE XLI. fig. i.)

Decumbent. Stems solid, slender, tortuous (branches?; none occur in the specimens), irregularly cylindrical, more or less compressed from above in places, especially at points at which large vents occur; generally bullately swollen out laterally at the same points; diameter irregular, 2 to 7, or 5 to 9 millim. in different specimens. Surface even, minutely rough to the touch, with occasional low pointed projections. Vents uniserial, approximately confined to upper surface, 6 to 12 millim. apart, circular, opening level with the surface, or occasionally with edges drawn up, 1 to 3 millim. in diameter, 1 to 3 millim. deep; walls cavernous, perforated by numerous excretory canal-openings. Texture in spirit compressible, but resistant, very elastic; outer wall parchment-like, tough; colour pale umber-brown.

Main skeleton strictly rectangular; primary fibres  $\cdot 28$  to  $\cdot 35$  millim. apart at surface, secondaries  $\cdot 24$  to  $\cdot 28$  millim.; primaries  $\cdot 053$  to  $\cdot 07$  millim. in diameter, spicules 2- or 3-serial; secondaries  $\cdot 035$  to  $\cdot 07$  millim. in diameter, spicules uniserial; horny matter strong, pale amber-yellow, composing two thirds of the fibre in the primary, and five sixths in the secondary fibres. Dermal skeleton a strong, usually quadrangular network, tending to be rectangular, of similar composition to the main skeleton; between its meshes is intercalated a close angular network of finer and paler uniserially spiculate fibre,  $\cdot 018$  to  $\cdot 024$  millim. in diameter, the meshes  $\cdot 053$  to  $\cdot 14$  millim. in diameter. Sarcod pale umber-brown, granular. Spicule slightly bent, smooth acerate, tapering gradually to sharp points from three or four diameters from ends; size  $\cdot 115$  by  $\cdot 007$  millim.

*Hab.* Alert and West Islands, Torres Straits, 7 fms.; bottom sand.

Three good and some more or less fragmentary specimens in spirit. The two largest are 120 and 115 millim. ( $4\frac{1}{5}$  and  $4\frac{3}{5}$  inches) in length. The largest is composed of two stems, apparently of independent origin, but one of them attached to and united with the other at two points by broad masses of common substance. The species is nearly allied to *C. subarmigera*, and hardly differs at all exteriorly from the smooth form of that species except in its apparently slight tendency to form branches, but has the spicules of about twice the diameter, and much fewer in number in proportion to the horny matter, and the network of the main skeleton closer.

It resembles *Chalina montagui*, Bowerbank (? Fleming) (Great Britain), in the general form and the size and shape of the spicules; but the fibre in that species is less horny and stout, and has but one or two series of spicules.

It is a curious fact that at one of the points of union between the two stems, as above described, a vent, originally belonging to one of the stems, seems to have come into communication with the canal-system of the other stem.

**Cladochalina nuda, var. abruptispicula.** (PLATE XLI. fig. j.)

Repent?, with single series of vents on one surface about 2 millim. in diameter, from 15 millim. and upwards apart, margins level with surface. Stem 8 to 12 millim. in diameter, slightly compressed, unbranched; surface even. Colour, in dry state, brown. Texture tough, elastic. Main skeleton rectangular. Fibre strong, pale amber-yellow; primary fibres about  $\cdot 088$  millim. thick, spicules axial, about 3-serial,  $\cdot 35$  to  $\cdot 5$  millim. apart, with a margin of horny matter; secondary fibres, as primaries, but  $\cdot 044$  to  $\cdot 088$  millim. thick, spicules somewhat loosely aggregated, 1- to 3-serial. Dermal skeleton as in the typical form, but with stouter main fibres. Sarcod pale yellow-brown, transparent. Spicules smooth acerate, straight or almost so, coming abruptly to sharp points within  $1\frac{1}{2}$  diameter from ends; size  $\cdot 107$  by  $\cdot 0063$  millim.

*Hab.* Thursday Island, Torres Straits.

The abrupt termination of the spicules and the stouter fibre distinguish this form of *C. nuda*. A single dry specimen, 105 millim. ( $4\frac{1}{5}$  inches) long.

### 25. *Cladochalina subarmigera*.

(PLATE XXXIX. fig. H; PLATE XLI. figs. *l*, *l'*.)

Repent, tortuous, solid, subcylindrical; stems 4 to 8 millim. in diameter (2 to 4 in a dwarf form), branching dichotomously at rather long intervals, somewhat flattened above. Branches of same general character as stems, often increasing somewhat in diameter towards apices, maximum length about 45 millim., attached at various points of lower surface. A few sharp points 1 to 2 millim. long project from sides of stem and branches here and there, especially in the neighbourhood of the larger vents; absent in some specimens; surface otherwise even. Vents numerous, in a single series, 2 to 6 millim. apart, along upper surfaces of stem and branches, circular, 1 to 2 millim. deep, 1 to 2.5 millim. in diameter; lumen cylindrical; margins level with the flattened upper surface of the sponge. Texture in spirit compressible, elastic, tough; surface somewhat harsh to the touch; colour umber-brown.

Main skeleton strictly rectangular in arrangement, rather variable in size of meshes and diameter of fibres in different specimens; thus the distance between primaries is .28 to .77 millim., between secondaries .042 to .28 millim.; diameter of primaries .053 to .09 millim., of secondaries .035 to .053 millim. (in dwarf form, primaries .035 to .053, secondaries .023 to .035 millim.); fibre almost entirely spicular, a very narrow horny margin alone being usually discernible (rarely in the dwarf specimen); spicules 6- to polyserial in primaries, 3- to 5-serial in secondaries (in the dwarf form, 4- to 8-serial in the former, 2- to 4- in the latter). Dermal skeleton of irregular wide meshes, composed of fibres of the same structure as those of the main skeleton; between these a close angular network of fine unispicular fibre, meshes .053 to .08 millim. in diameter. Horny matter of fibres amber-yellow. Sarcoderm rich yellowish brown, finely granular. Spicules smooth acerate, slender, almost cylindrical to within three diameters of ends, whence they taper to sharp points; size .08 by .0032 millim., .09 by .0032, .095 by .002, to .12 by .002 (in different specimens).

*Hab.* Warrior Reef, Alert Island, Thursday Island, Prince of Wales Channel, Torres Straits, 4-7 fms., &c.; bottom pearl-shells or sand, &c. Albany Island, N. coast of Australia, 3-4 fms.; bottom mud (dwarf form).

A few spirit-specimens represent the larger form of the species, one of them is 105 millim. ( $4\frac{1}{5}$  inches) in maximum extent. A small specimen, 25 millim. long, is the dwarf form above mentioned.

The species is perhaps most closely allied to *Cladochalina armigera*, Duch. & Mich., of described species; the surface-spines, however, which are the most striking external feature of *C. armigera*, are



here few in number and reduced in dimensions; the primary fibres are more slender and much more strongly spicular, and I have not observed here the cylindrical form of spicule which accompanies the acerate in *C. armigera*; the vents are more abundant and the growth is repent, instead of suberect. Still I believe the species to be not remotely allied; and this near relation between two species, one of which has an aculeated surface and an erect growth, while the other is decumbent and scarcely at all aculeated, shows how little value for the group-distinction of the Chalinidæ such characters may possess. The variation shown by different specimens (see description) is somewhat wide.

## 26. *Cladochalina* *pergamentacea*.

*Cladochalina armigera*, var. *pergamentacea* \*, *Ridley*, *P. Z. S.* 1881, p. 112, pl. x. fig. 4.

A young specimen of compressed form, smooth surface, and with a row of vents along each margin, with the fibre as in *C. armigera*, and spicules measuring .09 by .0016 millim. and shaped like those of *C. armigera*, seems to belong to the above form.

*Hab.* Thursday Island, Torres Straits, 3-4 fms. (on *Retepora*).

*Distribution.* Hotspur Bank, off S.E. Brazil (*Ridley*).

## ACERVOCHALINA, g. n.

*Chalina*, *Schmidt*, *Suppl.* ii. *Adr. Meer.* p. 10 (*nec Bowerbank*).

Massive, sessile Chalinidæ. Fibre strongly ceratinous, containing axially or diffusely arranged slender acerate spicules, which do not exceed in bulk the horny material of the fibre which contains them. Vents distinct, ranged along upper surface.

Type *Chalina limbata*, *Bowerbank* (*Mon. Brit. Spong.* ii. p. 373; ? *Montagu*).

This genus appears to be most closely allied to *Cladochalina*, by its strong relative development of keratose, its fine acerate spicules, and its serial vents. Mr. Carter indicated the distinctness of such forms as long ago as 1875, when (*Ann. & Mag. N. H.* (4) xvi. pp. 142, 162) he established the family *Acervochalinida*, making his first group of the family *Solida*, in which *Acervochalina* would come. He himself suggested the name which I have adopted, and has sent me a specimen illustrating his view of the species which should be assigned to the genus. The constancy in form of both this and the following species, and their agreement in other points, show them to be no mere dwarfed forms of erect Chalinidæ.

*Schmidt* has on reconsideration (*Atl. Geb.* p. 38) referred *Chalina limbata* to *Chalinula*; but that genus is equivalent to *Chalina*,

\* This so-called variety seems, by the constancy of the peculiarities of its external form, viz. knife-like shape, two marginal rows of vents, and smooth surface, to differ specifically from *C. armigera*, and may therefore stand as *Cladochalina pergamentacea*.

and besides being primarily based on an *erect* species, requires the spicules to form the greater part of the skeleton-fibre, which he reconciles with the structure of *C. limbata* by stating that the horny matter in this species shrivels when dried.

### 27. *Acervochalina finitima*.

*Chalina finitima*, Schmidt, *Atl. Geb.* p. 33.

Several specimens agreeing with this Atlantic species. They have the general habit of *Clathria oroides*, Schmidt, which from a low massive body throws out blunt spurs. On the spurs are placed numerous small vents, 1-4 millim. in diameter, biserially or irregularly arranged. Texture in spirit very soft and elastic; colour pale yellowish brown. Skeleton network close, rectangular; fibres stout, pale yellow or colourless; spicules multiserial in primary, biserial or uniserial in secondary fibres. Spicules smooth, gradually and sharply pointed; size about .1 by .0018 millim. (*i. e.* a little thinner than in West-Indian specimens).

*Hab.* Port Jackson, 0-5 fms., Percy Island, Queensland, 0-5 fms.; Alert Island, Torres Straits, 7 fms.

*Distribution.* Florida, Antilles (*Schmidt*).

*A. finitima* differs from the British species *limbata* in its general shape, that of *limbata* being globular to lobate.

The specimens measure about 50 millim. (2 inches) in greatest diameter, and 25 millim. in height.

### 28. *Tuba bullata*.

? *Spongia bullata*, Lamarch, *Ann. Mus. Hist. Nat.* xx. p. 43 (*nec* var.  $\beta$ ); *nec* *Siphonochalina bullata*, Schmidt.

*Spongia aculeata*, Linné, pars, *Syst. Nat. ed.* 12, p. 1297.

Wide-mouthed tubes, 50 to 200 millim. high (2 to 8 inches), rising from a common horizontal lamina, from which they appear to be formed by the reversion and curling of its edges. Tubes irregular in lumen, 35 to 125 millim. ( $1\frac{1}{2}$  to 5 inches) in maximum diameter. Surface asperated by a network of low sharp ridges, beset with numerous sharp points, 1 to 3 millim. high. Mouth of tubes somewhat constricted, inner surface smooth. The surface-tufts are seen on examination generally to proceed from narrow superficial ridges which run over the surface in different directions. The prolongation of the margin spoken of by Lamarch is not to be made out distinctly.

Skeleton of narrow rectangular meshes. Primary fibres about .1 to .14 millim., secondary .42 to .7 millim. in diameter, both full (in most places) of the acerate spicules, though these are somewhat closely aggregated. Spicules (*i.*) fusiform, tapering to sharp points from within about two diameters of the apices, .18 by .0095 millim.; also (*ii.*), probably a variety of (*i.*), acute, about .14 by .0063 millim.

This species appears to be widely distributed between Japan and

Australia. I have, at any rate, seen pieces of a sponge closely allied to, if not identical with, this substituted for the original sponge of *Hyalonema sieboldi*, probably belonging to the species alluded to as occurring in this connexion in Japan by L. Döderlein (Arch. für Naturg. xlix. p. 104), under the name of *Siphonochalina papyracea*; it is in any case not referable to that species, but possibly to *Tuba megastoma*, Duch. & Mich., or *T. (Spongia) bursaria*, Lamarek. Linné seems to have confounded two or more species under the name *aculeata*.

*Hab.* Port Molle and Port Curtis, Queensland (from coral-reef, &c.).

*Distribution.* Australian seas (*Lamarek*).

## 29. *Tuba confœderata*.

? *Spongia confœderata*, *Lamarek, Ann. Mus. Hist. Nat.* xx. p. 438.

Groups of erect, straight, laterally united tubes, each about 25 millim. (1 inch) in greatest internal diameter in the present (dry and somewhat compressed) state, the surface covered with numerous sharp but low aculeations, about 2 to 3 millim. high and 3 to 5 millim. apart, seem to me to possibly represent this species. I am, however, doubtful whether Seba's figure to which Lamarek refers (viz. *Thesaurus*, iii. pl. xevii. fig. 2) professes to represent the surface aculeations which I have described; in that figure the tubes are shorter in proportion to their diameter than here. In this specimen the surface between the aculeations is smooth, and the tubes decrease but slightly in diameter towards the mouth, which is fringed with a row of small, flexible, tag-like aculeations 2 to 3 millim. long. The tubes are 95 to 120 millim. long, and have evidently been torn from a common hollow horizontal base (as is shown by another, very battered specimen, which also shows the real length of the tubes to be approximately as stated above for the detached tubes); they are united up to their summits or to within a very short distance of them. The walls are 1 to 3 millim. thick. Vents numerous, small, .5 to 1 millim. in diameter, on the inner (otherwise smooth) surface of the tubes. The colour is pale brown.

The main skeleton-fibre is tough, flexible, amber-yellow; the spicules of the primary fibres form about 3 or 4 series in axis of fibre, of which they occupy about one fourth of the total breadth, which is .07 to .1 millim.; the spicules of the secondary fibres are in two or three axial series, diameter of fibre about .07 millim. Secondary fibres generally long, not far apart, approximately vertical to the primaries. Dermal skeleton consisting of stout main fibres about .14 millim. in diameter, intermediate fibres .035 to .1 millim. broad; fibres usually spicular, with little or no visible horny matter. Sarcode wanting. Spicules smooth acerate, tapering to sharp points from about three diameters from ends; size .1 by .0063 to .0075 millim.

Represented by three more or less washed dry specimens.

*Hab.* West Island, Torres Straits (from beach).

This species has a great resemblance to the West-Indian *Tuba sororia* of Duchassaing de Fonbressin and Michelotti, but differs from the West-Indian species included by Schmidt in his *Siphonochalina papyracea*, of which *T. sororia* is one, in having the spicules .0063 millim. and upwards thick, instead of only .002 to .0042, as stated by Schmidt for those species.

### SIPHONOCHALINA, Schmidt.

Although apparently published (Spong. Küst. Alg. p. 7) as distinct from *Tuba* of Duch. de Fonbr. and Michelotti, it seems to be coextensive with that (older) genus. I have, however, provisionally retained the name for convenience, for a few forms with narrow, thick-walled tubes, like those of the type species *S. coriacea* (l. c.).

#### 30. *Siphonochalina tubulosa*, var.

*Spongia tubulosa*, Esper, *Pflanzenh. Fortsetz.* i. p. 196, pl. liv.

*Siphonochalina tubulosa*, Ehlers, *Die Eschersch. Spong.* p. 19.

? *Spongia bullata* var.  $\beta$ , Lamarck, *Ann. Mus. Hist. Nat.* xx. p. 437.

Small colonies, some agreeing well with Esper's figure, some with the tubes scarcely rising above the general surface. The skeleton-spicules are rather longer and more slender than is indicated by Ehlers's measurements, viz. .17 by .009 millim. (Ehlers gives .11 to .13 by .012 millim.); the smaller ones mentioned by him are obviously young.

Several specimens, dry and in spirit.

*Hab.* Thursday Island, Channel Rock, Torres Straits, depth?; Port Moller, Queensland, "beach."

*Distribution.* Cape of Good Hope (Esper).

#### 31. *Tubulodigitus communis*.

Carter, *Ann. & Mag. N. H.* (5) ix. p. 367.

The present specimens, preserved in spirit, agree sufficiently with Mr. Carter's description as regards external characters. The colour (in spirit) is chiefly a dark earthy brown, which may very probably have been altered from the purple described by Mr. Carter. The fibre is strongly horny, slender, and very flexible, .035 to .042 millim. in diameter in the case of the primaries, .028 to .035 in the secondaries; spicules 1- to 3- (rarely 4-) serial in the primaries, 1- or 2-serial in the secondaries. In Mr. Carter's specimens the spicules appear to be relatively somewhat more abundant. Colour pale amber-yellow. Although I have not observed in these specimens a constant difference in size between the axial and peripheral spicules of the fibre, such as that which Mr. Carter notices (l. c.), there is, nevertheless, a very marked dimorphism in the spicules. Between those of the commoner, slender acerate form, gradually sharp-pointed, size .1 by .005 millim., are intercalated in various places stouter ones of similar shape, but in size .14 by .0063 millim., and they sometimes occur by the side of the slenderer form. From the



resemblance in external characters and in this remarkable structural point between Mr. Carter's species and the present specimens, I assign the latter with little doubt to that species, although Mr. Carter has not given the measurements of the spicules.

*Hab.* Port Jackson, 0-5 fms.

*Distribution.* Ceylon (*Carter*); Kurrachee (*coll. Mus. Brit.*).

The absence of this species from the hauls made in the tropical waters of Northern Australia perhaps indicates that its natural habitat is in subtropical seas, like those of Northern India and Port Jackson.

### TOXOCHALINA\*, g. n.

Chalinidæ with well-developed horny fibre arranged rectangularly. Spicules, a skeleton acerate and a tricurvate acerate ("Bogen," German) flesh-spicule.

*Obs.* The tricurvate flesh-spicule distinguishes this genus from all other Chalinidæ; the only parallels for the occurrence of a flesh-spicule in this group with which I am acquainted are found in the species *Halichondria palmata* of Johnston, lately (*Ann. & Mag. Nat. Hist.* (5) x. p. 109) redescribed and assigned by Mr. Carter to the genus *Chalina*, and *Spongia (Desmacidon, Ehlers) compressa*, Esper, also referred (*l. c.* p. 112) by Mr. Carter to *Chalina*, and in a species described by O. Schmidt ('Meerbus. Mexico,' p. 76) as *Rhizochalina? fibulata*, which has bihamates. The fact of an intimate connexion, which seems to have been thus already discovered, between the Chalinidæ and Desmacidinidæ, appears to receive confirmation from the present cases of the occurrence of a *tricurvate* flesh-spicule in members of the former family.

### 32. *Toxochalina folioides*. (PLATE XLI. figs. *m-m''*.)

*Desmacidon folioides*, *Bowerbank*, *P. Z. S.* 1875, p. 295.

In one Bowerbankian specimen from New Guinea and one 'Alert' specimen from Australia the form is vallate, produced by the lateral union of a series of tubes; the other 'Alert' specimens agree with the type (see *Bowerbank, l. c.*) in its external form, and the former specimens may be termed var. *vallata*. This is a true Chalinid, although the amount of horny material in the fibre is no more than enough to unite the spicules into a tough and elastic mass, and is not visible outside the spicules. I have detected in the type specimens of this species small, smooth, finely-pointed, tricurvate acrates, about .04 by .001 millim. in size, in the dermal membrane; I have not yet detected them in the subjacent tissues, though this has been done for another specimen of the species in the Bowerbankian collection (from New Guinea). The skeleton-spicules vary from rather tapering cylindrical, with rounded ends, to tapering acerate, with sharp ends, size about .11 by .0042 millim. in the typical, and .16 by .0085 millim. in the Port Darwin specimens. The New-Guinea

\* From Gr. τόξον, a bow; and χαλινός, a thong.



and Australian specimens have rather thicker branches than those from the Straits of Malacca, viz. 12 to 25 millim. as against about 10 millim.

*Hab.* Prince of Wales Channel and Thursday Island, Torres Straits, beach and 7-9 fms. ; Port Darwin, 7-12 fms.

*Distribution.* Straits of Malacca (*Bowerbank*); New Guinea (*Bowerbank coll.*).

33. *Toxochalina robusta*. (PLATE XXXIX. fig. G ;  
PLATE XLI. figs. n, n'.)

Repent, branching, attached usually by the lower surface of the main stem or branches. Stem and branches subcylindrical, uneven in places, subnodular, varying in diameter within short distances; solid, not tubular. Branches given off at intervals of 1 to 2 inches, at angles of from about  $30^{\circ}$  to  $80^{\circ}$ , sometimes anastomosing. Stem and main branches usually 10 to 18 millim. in greatest diameter, some small branches descend to 4 and 5 millim. Vents few, approximately one to the space between each two branches, the margins usually sharp and projecting somewhat; diameter 3 to 6 millim.; excretory canals penetrating straight and deeply into the substance of the sponge. Sponge, in spirit, tough, but yielding and pliable (almost as much so as *Chalina oculata*, Pallas). Internal fibres soft and elastic, forming a close network. Dermal membrane firmer, parchment-like, even, glabrous, slightly marked by the apices of the primary skeleton-fibres and the dermal skeleton-network. Colour of sponge in spirit pale brown, inclined to yellow.

Main skeleton consisting of straight, stout, bright amber-yellow, horny primary fibres, .05 to .075 millim. thick, and about .5 to .7 millim. apart at surface, meeting the surface at right angles, and sometimes projecting slightly; their apices are, however, connected by a system of fine horizontal fibre-network; spicules closely aggregated, confined to the axis of fibre, forming a band there of about 6 to 8 spicules broad, and occupying, near the surface of the sponge, only about one third of the total thickness of the fibre. Secondary fibres at right angles to primaries, of paler yellow horny fibre, about .035 to .05 millim. in diameter and .28 to .35 millim. apart; spicules of axis in a unispicular series (occasionally two spicules broad), often interrupted altogether or wholly wanting. Dermal skeleton formed by a few very stout, dark yellow fibres, .05 to .1 millim. thick and 1 to 1.4 millim. apart, enclosing angular spaces filled by a close subrectangular network of paler, mostly non-spiculate fibres from .009 to .045 millim. in diameter. Sarcode very pale yellow, transparent, with numerous small dark granules.

Skeleton-spicule acerate, tapering abruptly from within about  $1\frac{1}{2}$  diameters of ends to very sharp points; size .1 by .0032 to .0042 millim. Flesh-spicule tricurvate acerate, curves moderately bold, tapering gradually to sharp points from centre; size .05 to .063 by .0017 to .0021 millim.; found in superficial and deeper parts of the sponge, fairly abundant.

*Hab.* Port Jackson, 0-5 fms.

The maximum lateral extent of the largest of the specimens appears to have been about 270 millim. ( $10\frac{3}{4}$  inches), another measures 250 millim. (10 inches) across the branches, while individual branches may attain a length of 90 millim. ( $3\frac{1}{2}$  inches). In *habitus* the species differs from *T. folioides* mainly in having the general surface approximately *even*, and not asperated by projecting points; in the structure of the fibre, the horny element shows a far greater development, and the tricurvate is much stouter than in that species.

### 34. *Toxochalina murata*\*.

Low, broad, wall-like masses, enclosing a series of vertical tubes, 5 to 8 millim. in diameter, which rise straight from near the base of the mass, and are separated by 8 to 10 millim. of sponge-substance; the mouths of the tubes may project slightly, but are rather contracted. General surface of sponge asperated with low, sharp, monticulated elevations 3 to 7 millim. apart, 1 to 2 millim. high, often connected by low ridges; surface between ridges and elevations smooth in dry state. Texture in dry state elastic but firm; colour pale yellowish brown. Fibre very tough.

Main skeleton—meshes chiefly very wide, rectangular, formed by primary and secondary fibres of approximately equal diameter; at intervals a less regular network of smaller secondary fibres combined with the straight primaries; larger fibres .022 millim. broad, smaller .0095 to .016 millim.; primaries cored by 1 to 4 series of axially placed acerate spicules, sometimes wanting; secondaries by 1 to 2 series, often wanting altogether. Colour of fibre pale yellow-brown.

Spicules—(1) skeleton acerate, straight, smooth, tapering to very sharp points from about two diameters from ends, size .1 by .005 millim.; (2) tricurvate acerate of sarcod, smooth, curves gentle, tapering gradually to fine points, size .063 by .0016 millim.

*Hab.* Port Moller, Queensland, 12–20 fms.

The average greatest height of the single (dry) specimen is 30 millim. ( $1\frac{1}{4}$  inch), the total length (from side to side) 140 millim. ( $5\frac{1}{2}$  inches).

This species has very much the external habit of *T. folioides*, var. *vallata*, but the points on the surface are less prominent than in that species; the very strongly horny character of the fibre separates it more decidedly, so that it is impossible to confound the two species under the microscope. In the case of *T. robusta*, mihi, the repent habit, the solid and smooth branches, and the slighter and more strongly spiculate fibre constitute ample means of differentiation.

### 35. *Pachychalina lobata*, var.

? *Spongia lobata*, *Esper*, *Pflanzenzth.* ii. p. 273, pl. xlv.

I have thought it best to assign, with doubt, to the above species (as a variety) a form with strong, rudely cylindrical main axis and branches, which was apparently semidecumbent in life, and which

\* From *Lat. muratus*, walled.

has a slightly but regularly uneven surface, the tissue covering it being, however, almost smooth. Vents with thin everted margins about .5 millim. high, abundant, irregularly uniserial, 1 to 3 millim. in diameter on one (presumably the upper) side of the stem and branches, less abundant and generally smaller on the opposite side. Branching dichotomous, at angles of  $50^{\circ}$  to  $60^{\circ}$ ; the branches rather flexuous; branches and stem 8 to 18 millim. in diameter. Texture in spirit firm, but flexible, tough; colour dark dull grey. Main skeleton composed of tough, flexible primary fibres of closely packed spicules, about 6- to 12-serial, running approximately at right angles to surface (no horny uniting-matter visible), the fibres nearly approximated to each other; and of irregular and often loose crossing secondary tracts of spicules 2 to 4 spicules broad, not strictly at right angles to primaries. Dermal skeleton a closely-set coat of subparallel spiculo-fibres about 8 spicules broad. Sarcode dark brownish, granular. Spicules acerate, slightly but sharply bent, tapering slightly from middle, and rather suddenly from within about two diameters of ends, to moderately sharp points; size .2 by .0128 millim.

*Hab.* Port Darwin, 7-12 fms.; bottom mud and sand.

*Distribution.* East-Indian seas (*Esper*)?

The only specimen measures 150 millim. (6 inches) in extreme length. The species is at any rate distinct from *Spongia arborescens* of Lamarck, who gives *S. lobata*, *Esper*, as a synonym of his species. It stands on the borderland between *Pachychalina* and the branched and large-vented *Renieridae*. I assign it to the former, as its fibres are evidently formed in part by a flexible horny material. It differs from the described specimens of *S. lobata* in having approximately cylindrical branches and bearing some vents on both sides.

36. *Pachychalina macrodactyla*. (PLATE XL. figs. B, B';  
PLATE XLI. fig. c.)

*Spongia macrodactyla*, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 457.

Guided only by the short and superficial description given by Lamarck, and by the locality ("probably Indian Ocean") assigned by him, I refer to his species some dry fragments of an exquisite *Pachychalina*, possibly originally belonging to one specimen. It has some external resemblance to *Spongia asparagus*, Lamarck, of which I have seen a specimen; but the branches in the latter are cylindrical, the vents open on the level of the general surface, and the fibre-structure is that of *Chalina* rather than *Pachychalina*. I will proceed to supplement the original incomplete description by a fuller one.

The stem and branches are flattened out, somewhat knife-like, in most places, the edges being sometimes quite sharp; the lateral diameter is here about twice the antero-posterior one (viz. about 13 millim. at largest part of stem, 9 millim. just below apex of branches); the stem near the base appears to be normally cylindrical, about 6 millim. in diameter. Branches (in present specimens) given off pin-

nately from one side of the main stem at very acute angles, soon becoming almost parallel with the stem itself; their length varies from 60 to 120 millim. ( $2\frac{1}{3}$  to  $4\frac{3}{4}$  inches). The vents are numerous,  $\cdot 5$  to 1 millim. in diameter, circular, with sharp, prominent margins, about  $\cdot 5$  to 1 millim. above the general surface; ranged in a single row down each margin of the stem and branches, and also scattered (more sparsely) on their anterior and posterior faces; they are 2 to 5 millim. apart on the margins. General surface of sponge level, only rendered a little uneven by the slight elevations which carry the vents, composed of a close meshwork; meshes  $\cdot 25$  wide,  $\cdot 25$  to  $\cdot 5$  millim. apart. Texture firm, incompressible in stem, elastic, somewhat compressible towards ends of branches, brittle; the surface and internal fibre soft, like leather. Colour in dry state—surface pale grey; interior brownish yellow in present specimens, owing to a parasitic microphyte of some kind. Sarcode apparently transparent, almost colourless.

Main skeleton—meshes strictly rectangular, very close; primary fibres about  $\cdot 11$  millim., secondaries about  $\cdot 14$  millim. apart near surface; horny material uniting fibres only visible distinctly at some depth in the sponge; primary fibres 3 or 4 spicules broad, secondaries 2 or 3 spicules broad. Dermal skeleton composed of meshes of various sizes and a varying number of angles, formed by the projecting ends of the primary main-skeleton fibres and the uppermost secondary fibres. Horny matter almost colourless. Spicules—(1) skeleton acerate, smooth, slightly curved, tapering to sharp points from near middle; size  $\cdot 16$  by  $\cdot 0063$  millim.

*Hab.* Friday Island, Torres Straits.

*Distribution.* "Probably Indian Ocean" (*Lamarek*).

*Parasite.* The horny matter of the fibres is covered with immense numbers of a small, strongly refractive globular body about  $\cdot 0015$  millim. in diameter, similar to that which gives a rust-brown colour to the fibres of many *Euspongiae*, recently stated by Prof. F. E. Schulze ("Der Badeschwamm," Westermann's Illustr. Deutsch. Monatshefte, 1882, pp. 188–210) to be probably of parasitic nature. Certainly, judging by the friable character of these and other similarly affected specimens, these bodies would appear to have exercised some distinctly deteriorating influence.

## RENIERIDÆ.

*Renierida*, *Carter*, *Ann. & Mag. N. H.* (4) xvi. p. 133.

Under this heading I include only those Monactinellida which have merely acerate spicules not enclosed in a distinct horny fibre. The genus *Reniera* very commonly has strong indications of a horny material uniting the ends of the spicules, and thus approaches *Chalina* and *Pachychalina*, where, however, the horny element is distinct enough to bear the name of a fibre; but there is no sharp line between the Renieridæ and Chalinidæ. In several cases, where the specimens have been imperfect, I have preferred to give no specific



name, for want of characters by which to identify species with others which I know merely by descriptions; I have, however, given descriptions in these cases, in order that the species may be identified (if possible) by future comparisons with *specimens* of species to which I have not access at present.

### RENIERA, *Nardo*.

This genus is distinguished by the regularity of its main skeleton, the small size of its spicules, and the want of an evident distinct dermal skeleton. The latter point, however, is not very satisfactorily indicated in all the species which seem otherwise referable to the genus.

#### 37. *Reniera indistincta*, var.

*Isodictya indistincta*, *Bowerbank, Mon. Brit. Spong.* ii. p. 290, iii. pl. li. figs. 1-4, iv. p. 119.

A small specimen in spirit, incrusting stones. The surface is smooth, formed of a thin but strong membrane, of grey colour (in spirit), penetrated by moderately numerous round perforations, .5 millim. across. Vents few, occasionally slightly elevated, 2 to 3 millim. in diameter. Main skeleton agreeing fairly with the typical specimen of the species; a dermal network, uni- to bispicular (in the type specimen it appears to exist, although Bowerbank denies it, but it is somewhat irregular there). Sarcode yellowish brown, slightly granular (it is more yellow in the type). Spicules: shape as in type; size .16 by .0063 millim., the same as in the type. The vents are rather smaller in the type, and the colour in the dry state is reddish brown; but the agreement in the characters on the whole is so close that I have little hesitation in making this identification.

*Hab.* Prince of Wales Channel, Torres Straits, 7-9 fms.

*Distribution.* British Islands and Guernsey (*Bowerbank*).

A specimen without distinct vents, but with a curious system of branching grooves on the surface, and of a dark greenish colour, appears to be also referable to this form.

*Hab.* Alert Island, Torres Straits, 7 fms.

#### 38. *Reniera scyphonoides*.

*Spongia scyphonoides*, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 437.

An elegant, slightly tortuous, tubular *Reniera*, 45 millim. high, tapering from its subcylindrical basal portion, which is 3-4 millim. thick, to an elliptical, slightly bullate summit, preceded immediately by a more decidedly flattened portion, the two diameters of which are respectively 4 and 8 millim. Long and short diameters of mouth of tube  $2\frac{1}{2}$  and 4 millim. respectively. Two small vents, 1 millim. in diameter, open on one margin of the compressed part of the sponge, and one of about .4 millim. diameter on the opposite margin.



Surface even, very slightly roughened by the projecting primary skeleton-lines, which form a fine velvet-like pile. Texture in spirit soft, compressible, elastic; colour pale brown, with a slight (possibly accidental) tinge of purple. Main skeleton—network rectangular; fibre to the eye wholly composed of spicules loosely aggregated, especially in the secondary fibres; primary fibres running at right angles to surface, spicules 3- to 5-serial; secondary fibres, spicules 1- to 3-serial; intervals between primaries about .17 millim., and the same between secondaries. No special dermal skeleton. Sarcode dark umber-brown. Spicules smooth acerate, slightly and gradually curved, tapering gradually to sharp points from near centre; size .21 by .011 millim.

*Hab.* West Island, Torres Straits, 7 fms.; bottom mud and coral.

*Distribution.* St. Peter and St. Francis Islands, Australia (*Lamarck*).

The "leviter incrustæ fibræ" and the "2- seu 3-fidi tubuli" of Lamarck's description are the only points not quite in agreement with our specimen; but it is evidently young, and might have branched when older; and the "incrustæ" apparently alludes to the sarcode, which here, as in Lamarck's var. *fidis subnudis*, has not all been retained; his specimens were 18-25 centimetres (7-10 inches) in length. Schmidt's *Reniera alba* (Adr. Meer. p. 73), from the Adriatic, seems to resemble the species, but a *uniserial* network is figured for its skeleton.

### 39. *Reniera ferula*.

*Isodictya ferula*, *Bowerbank*, *Mon. Brit. Spong.* iv. p. 116, pl. viii. figs. 1-3.

A small specimen of the size and shape of a hazel-nut, with few vents about .8 millim. in diameter; colour (in spirit) dull brown. It does not bear the interesting handle-like process on which Dr. Bowerbank lays so much weight as a "caudal appendage," which is (as the type specimens appear to have been young) perhaps a form of a *stolon*, like that described by Mereschkowsky in an *Esperia* from the White Sea (Mém. Acad. Pétersb. xxvi. no. 7, p. 22, pls. i. & iii. figs.), but which, as being apparently sessile by its whole length, as a stolon would normally be, Dr. Bowerbank cannot be right in comparing (*l. c.* p. 117) with the *erect* digitate processes which distinguish the genus *Polymastia*. The absence of this lobe does not appear to be of sufficient importance to separate this species from Bowerbank's. The spicules measure .21 by .0079 millim., whereas those of Bowerbank's type specimen are .19 by .01 millim., and are thus decidedly stouter; the arrangement of the skeleton is essentially the same in both species. The specimen is attached to what seems to be a Hydroid stem.

*Hab.* Port Darwin, 7-12 fms.; bottom sand and mud.

*Distribution.* Ireland (*Bowerbank*).

40. *Reniera aquæductus*.

*Reniera aquæductus*, *Schmidt, Spong. Adr. Meer.* p. 73, pl. vii. figs. 6, 6a, 6b.

Two specimens, 65 and 70 millim. ( $2\frac{2}{3}$  and  $2\frac{3}{4}$  inches) long, branched, forming very thick-walled tubes which open at the extremities of the branches, appear to represent this species. The branches and stem are somewhat irregular in outline, and decidedly compressed antero-posteriorly; their surface is rendered uneven by very low, almost obsolete ridges or eminences, though it is smooth between these; maximum diameter of stem and branches 7 to 12 millim., that of lumen of tube 3 to 4 millim. Texture in spirit firm, slightly compressible, moderately tough; normal colour apparently a pale brownish grey. Main skeleton—a rather irregular network of primary and secondary spiculo-fibres, about 4 to 6 spicules broad, with much interstitial 1- or 2-serial spicular network; dermal skeleton composed of long compact spiculo-fibres, 6 to 12 spicules broad. Sarcode pale yellowish, slightly granular. Spicules chiefly smooth acerate, curved, tapering gradually to sharp points from about four diameters from ends, or subacuate, tapering somewhat to the rounded end, or strictly acuate with well-rounded head; size .17 to .19 by .011 millim.

*Hab.* Port Darwin, between tide-marks.

*Distribution.* Adriatic (*Schmidt*); Black Sea (*Czerniavsky*).

The Adriatic form has a decided tough uniting material between the ends of the spicules, and the tube is relatively wider in the specimen figured by Schmidt, otherwise the two forms appear to agree. I find the spicules in a slide obtained from Prof. Schmidt to measure .19 by .0095 millim. in average maximum dimensions; he himself gives (*Atl. Geb.* p. 40) .16852 millim. for the length.

"*Reniera*, yellow" of Carter (*Ann. N. H.* (5) vi. p. 48, pl. v. fig. 17), from Ceylon, is probably not far from this species, but the spicule appears to be about half as stout again as here.

41. *Reniera testudinaria*. (PLATE XXXIX. fig. D:

PLATE XLI. figs. u, u'.)

*Aleyonium testudinarium*, *Lamarck, Mém. Mus. Hist. Nat.* i. p. 167.

One of the present specimens originally formed part of a much larger one, probably as much as 6 inches long by 6 broad by  $2\frac{1}{2}$  thick, covered with prominent jagged ridges; the other is a fine cup-shaped form, with wide mouth, thin edges, the ridges only appearing near the base. The skeleton-fibre is stout, strong, polyspicular, and of the Renierid type; it is composed of stout, smooth, cylindrical spicules, rounded at each end, sometimes tapering somewhat to the ends, and of a small number of smaller acerate forms, tapering suddenly to their points; average maximum size about .32 by .016 millim.

The species belongs to that group of Renieridae which Mr. Carter, in his "Notes Introductory to the Study and Classification of the

Spongida" (Ann. & Mag. N. H. (4) xvi. p. 178) calls *Crassa*; in its cup-shaped form and cylindrical spicules it is evidently nearly allied to *R. cratera*, Schmidt (Adr. Meer. p. 73). It was described by Lamarek in 1815, and has not been since identified as a sponge or redescribed. The present specimen agrees well with the description, and with the specimen which represents the species in the Museum, in both the larger and the minuter characters. It is certainly not, as Lamarek suggests (*l. c.*), the *Spongia cristata* of Ellis and Solander.

*Hab.* Port Denison, Queensland, 4 fms.

*Distribution.* Lamarek's conjecture as to the locality, viz. "Seas of Enrope," can hardly be correct.

#### 42. *Reniera*, sp.

Wall-like. A small specimen attached to a filamentous Alga. It is erect, broad, laterally compressed; maximum thickness 6 millim., length 25 millim., height 19 millim. On the sloping and narrow upper margin is placed one blind rounded eminence and the suborbicular opening, 4-5 millim. wide, of a deep cloacal cavity, which rises from near the base of the sponge. The skeleton-fibres have 1- or 2-serially arranged spicules; the latter are short, smooth, curved acerates, tapering to sharp points from within about three diameters of ends, size .11 by .006 millim. Texture of sponge in spirit soft, brittle; colour dull pinkish grey. Surface even, glabrous.

*Hab.* Port Darwin, between tide-marks; bottom mud and rock.

#### 43. *Reniera*, sp.

Laminar. Some fragments of a laminar *Reniera* (s. str.) of erect habit occur in the collection. The lamina is 1 to 2 millim. thick, and exhibits curves in some pieces, perhaps indicating that the original form was cup-shaped; its free edge is quite thin; both surfaces are quite even and of a texture resembling fine cloth, exhibiting very minute apertures, closely set, all over. Texture of sponge in spirit very soft and compressible, subelastic, but very readily torn; colour dull pale yellowish brown. Main skeleton very regular; primary lines biserial, running parallel or obliquely to lateral surfaces in centre of lamina, but curving out towards the surface of the sponge, which they meet at right angles; these lines scarcely one spicule's length apart; secondary lines uniserial, the single spicules usually crossing obliquely the spaces between the primaries. Sarcode dull brown, rather granular. Spicules smooth acerate, very slightly curved, tapering gradually to sharp points from about five diameters from ends; size .175 by .0079 millim.

The specimen when entire must have been two or three inches high and as many wide. It strongly resembles *Isodictya infundibuliformis*, Bowerbank, in growth, texture, and surface-characters, but its spicules are less stout and do not include acuate forms. It is a striking species, and should be recognized from the above description when met with in a perfect state; until that

time I forbear to assign a specific name; it appears not to have been described before. It also resembles *Spongia plancella*, Lamarck (a Chalinid with strong fibre and smaller spicules), externally. Future researches will, no doubt, prove this to be a distinct species, to which the name *Reniera infundibularis* may be given.

*Hab.* Thursday Island, Torres Straits, 4-6 fms.; bottom sand and rock.

#### 44. *Reniera*, sp.

Honeycombed. An imperfect specimen. From an incrusting base arise narrow trabeculae, which meet above and enclose meandering channels, 3 to 5 millim. in diameter. The aspect of the mass is that of a piece of wood almost reduced to fragments by some boring animal, or of a much folded piece of chamois-leather. Texture of sponge in spirit compact, brittle; colour very pale buff. Surface (apart from the large ridges and canals) even, smooth. Main skeleton—general arrangement rectangular near surface, irregular near base; spicules of fibre very loosely aggregated; both primary and secondary fibres bi- to multispicular, primary fibres .14 to .18 millim. apart. Lines of growth very apparent. Dermal skeleton a 1- to 2-serial network of spicules, with triangular polygonal meshes. Sarcode very pale buff, opaque. Spicules smooth acerate, slightly curved, tapering to sharp points from about three diameters from ends; size .2 by .0085 millim.

I can find no such species described from Australia, and I know of no European form like it.

*Hab.* Port Darwin, 8-12 fms.

### PELLINA.

*Schmidt, Spong. Atl. Geb.* p. 41.

The want of regularity and definiteness in the structure and arrangement of the fibres, and the large size of the spicules, appear to me to be more distinctive attributes of *Pellina* than Schmidt's character, viz. the possession of a distinct dermis; but it is to species combining a reticular dermis with these two characters that I here apply the name.

#### 45. *Pellina muricata*. (PLATE XXXIX. fig. J; PLATE XLI. fig. v'.)

Aggregations of irregularly united short parallel tubes, 6 to 10 millim. in diameter, lumen 3 to 7 millim. across; tubes cylindrical, summit usually widely open. Surface asperated with sharp monticular points, 1 to 2 millim. high; glabrous between and over bases of points. Texture in spirit firm, slightly compressible, but somewhat brittle. Surface harsh to touch; normal colour apparently pale brown. Main skeleton composed of compact spiculo-fibre, the spicules united by a colourless transparent substance: the primary fibres

wide apart, vertical to surface, 3 to 8 spicules broad; secondaries at less intervals, 3 to 6 spicules broad; the interstices occupied by much irregular 1- or 2-serial network. Dermal skeleton of stout spiculo-fibre, similar to that of main skeleton; the spicules 3- to 8-serial, forming a network of subrectangular meshes, .4 to .7 millim. wide, enclosing detached or loosely aggregated spicules. Sarcode very pale yellowish brown, slightly granular. Spicules smooth acerate, slightly and gradually curved, tapering to sharp points from about three diameters from ends (varieties occur having one end tapering more or less to a blunt rounded extremity, or with one end rounded and as stout as the middle of the spicule, thus becoming truly acuate); size .2 by .0127 millim.

*Hab.* Port Darwin, 7 fms.; bottom sand.

This species is perhaps allied to *Reniera aqueductus*. It differs from that species in the anastomosing and externally spinous tubes and in the superior diameter of the spicule, which does not exceed .0095 millim. in that species. The specimen forms a low hedge-like series of anastomosing tubes, which are almost horizontal at their lower ends; maximum height of colony 55 millim. ( $2\frac{1}{5}$  inches), maximum lateral extent 100 millim. (4 inches). It has a remarkable external resemblance to a form of the Chalinid, *Tuba acapulcensis*, Carter.

46. *Pellina aliformis*. (PLATE XXXIX. fig. O;  
PLATE XLI. fig. w.)

Erect, with slender pedicle; expanding into one or more wing-like lobes, 4 to 6 millim. thick, 14 to 20 millim. in greatest width; the free edges looking upwards and downwards respectively and the apex directed horizontally. Surface more or less roughened (especially on the flat surface of the lobes) by the conuli, about .6 millim. apart, which enclose the ends of the primary skeleton-fibres; the margins of the lobes, and sometimes their sides, are covered by a glabrous semitransparent membrane. Vents few, suboval, 2 millim. in greatest diameter, with thin membranous margins, generally placed on the edges of the lobes; their cavity oblique, entered by numerous excretory canals. Texture in spirit brittle, slightly elastic; colour very pale brown.

Main skeleton—spiculo-fibres loose, no perceptible horny uniting substance; primary fibres approximately vertical to surface, .6 to .85 millim. apart, 8 to 10 spicules broad; secondary fibres at various angles to primaries, at some distance apart, about 5 spicules broad. Dermal skeleton thick, formed of very loose spicular tracts of various sizes, crossing each other at various angles, leaving small spaces between them. Sarcode rather granular, pale brown. Spicules smooth acerate, slightly curved, tapering to sharp points from near centre; size .5 by .025 millim.

*Hab.* Port Darwin, 8–12 fms.; bottom sand and mud.

Represented by one whole specimen and one fragment, in spirit. The former 33 millim. high by about the same wide, and formed



by a short narrow pedicle, which rises broadening and flattening, and producing two broad expansions, about 25 millim. long, which bend to one side, where they meet and unite by their apices. The fragment consists of a similar wing-like expansion; so that this character is probably more or less constant in the species. The large size of the spicules and the coarse, though vague, dermal skeleton seem to justify the generic position I have assigned to the sponge. *Pellina bibula*, Schmidt (Baltic), resembles it in form, but has no apparent vents, and the spicules measure only .13 to .24 millim. in length.

#### 47. *Pellina*, sp.

Tubular. Part of a specimen, consisting of a detached subcylindrical tube, 30 millim. long, 10 millim. in extreme diameter, wall 2.5 millim. in greatest thickness; tube contracted towards mouth, which is 4 millim. across and has a thin margin. Consistence firm, brittle; colour dull brown. Skeleton irregular; tracts loose. Spicules smooth acerate, slightly curved, tapering very gradually to sharp points; size .6 by .02 millim.

The spicules are larger than in the European species of the genus; but I do not assign a specific name, as the specimen is imperfect.

*Hab.* Port Curtis, Queensland, 11 fms.

Some very small, massive, rounded specimens from Port Darwin, between tide-marks, with spicules measuring .8 by .02 millim., are perhaps young forms of a variety of this species.

#### 48. *Pellina*, sp.

Massive. Nearly allied to "*Reniera*, yellow" of Carter (Ann. & Mag. N. H. (5) vi. p. 48), from the Gulf of Manaar, and possibly identical with it, although that form seems to be paler in colour, and its spicule as described would be about .24 by .02 millim. in size. It seems to consist normally of a massive base, which sends up digitate processes, suboval in transverse section and about 15 millim. in greatest basal and 5 millim. in greatest apical diameter respectively. Consistence in spirit firm, brittle; colour dull brown. Surface even, covered by thin glabrous dermal membrane. Vents few, scattered usually on the narrow margin of the sponge, receiving the larger excretory canals at a slight distance below surface, oblong, maximum greater and less diameters usually 3 and 1.5 to 2 millim. respectively. Main skeleton composed of loose spiculo-fibre 1 to 2 spicules broad; the primaries only approximately vertical to surface; the secondaries irregular in direction. Dermal skeleton reticulate; fibre usually 2-3-serial, very loose. Sarcoderm reddish brown, somewhat granular. Spicules smooth acerate, tapering to sharp points from about four diameters from ends; size .38 by .0127 millim. Specimens fragmentary.

Another compressed specimen, terminating in an angle above, and with a single orbicular vent about 3 millim. wide, leading deeply

into the sponge, agrees fairly with this species. Sponge 30 millim. long, 20 millim. high, 10 millim. in greatest thickness. The main-skeleton lines are somewhat more abundantly spicular.

*Hab.* The first specimen, Port Curtis, Queensland, 11 fms.; the latter specimen, Port Darwin.

#### 49. *Pellina eusiphonia*. (PLATE XLI. fig. *x*.)

Massive, sessile, horizontal in growth. Surface even, smooth. Vents formed by prominent thin-walled tubes, 3 to 4 millim. in diameter, ranging in length up to 12 millim., numerous, aggregated on upper surface of sponge, anastomosing with each other; thickness of wall about .2 millim. Texture in spirit—basal portion firm, rather brittle; of vents soft, very yielding; colour in spirit dull pinkish brown. Main skeleton—no visible horny matter, spicules loosely aggregated in fibres; primary fibres vertical to surface, .28 to .42 millim. apart, 3 to 5 spicules broad; secondary fibres approximately vertical to primaries, about .28 to .42 millim. apart, 2 to 5 spicules broad. Dermal skeleton composed of long subparallel spiculo-fibres, rather compact, without visible horny material, 3 to 10 spicules broad, .53 to .7 millim. apart; the intermediate spaces are occupied by an irregular 1-2-spicular network. Subjacent sarcode transparent, pale brown; that of dermis almost colourless, pinkish. Spicules smooth acerate, tapering to moderately sharp points from within about two diameters of ends; size .33 by .0125 to .019 millim.

*Hab.* Port Darwin, between tide-marks; bottom rock and sand.

The specimen is an irregularly flattened mass, 75 millim. (3 inches) long, 35 millim. broad, 20 millim. in greatest thickness, and involves several stones in its substance. The peculiar arrangement of the excretory tubes distinguishes it from any species which I can find described. In the allied form *Pellina semitubulosa*, Lieberkühn (Schmidt, *Adr. Meer.* p. 75; *Atl. Geb.* p. 41), perhaps the most nearly related described species, the spicules taper very gradually to sharp points, as in *Amorphina panicea*, Johnston, and measure .38 to .44 by .01 millim., and no true vent-tubes seem to be formed either in this or in the other species referred to *Pellina* by Schmidt.

#### 50. *Protoschmidtia hispidula*. (PLATE XLI. figs. *p*, *p'*.)

Erect, lobose, nodular, the subcylindrical lobes have a slight tendency to branch sideways and a strong tendency to anastomose; lobes about 4 to 6 millim. in diameter. Growth bushy (*i.e.* in more than one plane). Surface beset with a velvet-like pile of fine hair-like points, .5 to 1 millim. apart and about .25 to .75 millim. high; between points, leathery and glabrous. Vents? Texture in spirit elastic and fairly compressible, tough; colour dark reddish brown. Main skeleton consisting of spiculo-fibre 4 to 6 spicules broad, closely but not firmly united; numerous short parallel

primary fibres run vertically to surface, mostly into the surface-points; these are connected below by long secondary fibres, approximately at right angles to them; internal skeleton consisting chiefly of long more or less curved spiculo-fibres and membranous expansions, containing non-aggregated spicules, surrounding rounded spaces. Dermal skeleton formed by the projection of the ends of the primary main-skeleton lines; the spaces between these are occupied by numerous spicules irregularly scattered over the membrane which covers the surface, occasionally aggregated into irregular loose paucispicular tracts. Sarcod of interior reddish brown (darkest around the fibres), rather granular, of conuli very dark opaque red-brown. Spicules smooth acerate, very slightly curved, tapering to sharp points from about three diameters from ends; size .14 by .0063 millim.

*Hab.* Albany Island, Northern Australia, 3-4 fms.; bottom mud.

A specimen and a fragment, both in spirit, the former 45 millim. ( $1\frac{4}{5}$  inch) high by 40 millim. across; a *Serpula* is imbedded in the lower part, which forms (from anastomosis) almost one continuous mass, and small specimens of *Serialaria* are growing on it. The tenacity of the internal fibres and membranes shows the presence of a stronger element than ordinary sarcod; but horny outlines are not to be distinguished on the fibres, although the sarcod is darker here.

It is nearly allied to *Hymeniacidon bretti* and *thomasi*, Bowerbank (British seas); but the spicules of these species are far longer than those here, and the surface-roughness does not extend to the production of the characteristic hair-like points found here, which resemble those of *Euspongia*. Dr. Gray (P. Z. S. 1867, p. 518) retains these species in *Reniera*, with most of the acerate-spiculed species of *Hymeniacidon* described by Bowerbank; Schmidt (Atl. Geb. p. 76) assigns them to *Amorphina*. *Protoschmidtia foraminosa*, Czerniavsky (Bull. Soc. Mosc. 1879, p. 98), Black Sea, agrees in the proportions and forms of its spicules, in colour, &c., differing mainly in its much less rough surface and distinct vents; so I place this species in the same genus in preference to *Amorphina*, which, if *Halichondria panicea* is to be regarded as typical of its structure, should include forms with a distinctly reticulate dermal skeleton and absence of tough and deeply coloured sarcod from the fibres.

51. *Schmidtia variabilis*. (PLATE XXXIX. fig. N;  
PLATE XLI. fig. t.)

Decumbent; consisting of elongated horizontal (sometimes vertically flattened-out) lobes of very irregular, more or less angular outline, sometimes branching and anastomosing; the upper margin rises at intervals into low elevations, which consist of thick-walled, wide, rounded tubes, 3 to 7 millim. in diameter at the mouth, within which the true vents unite at about 6 millim. below mouth;

or the tubes are almost level with the edge of a wall-like ridge which terminates the sponge above; margin of tubes simple. Surface of sponge between the coarse inequalities smooth, imperforate to naked eye. Texture in spirit firm but brittle; colour dull and pale umber-brown.

Main skeleton—very loose primary lines of spicules, about three spicules broad, running irregularly towards surface, crossed by secondary tracts of similar character, 2 or 3 spicules broad, at right angles to the primaries and about  $\cdot 4$  millim. apart. Dermal skeleton—extremely loose tracts of irregularly parallel spicules, 3 or 4 spicules broad, surrounding roundish or polygonal areas from  $\cdot 18$  to  $\cdot 28$  millim. in diameter. Sarcoderm dense, granular, yellowish brown, containing much foreign material. Spicules smooth acerate, slightly curved, tapering to fairly sharp points from centre, more rapidly towards the ends than near the centre; size  $\cdot 4$  by  $\cdot 019$  millim.

*Hab.* Port Darwin, N. coast of Australia, 7–12 fms.; bottom sand and mud.

The vertical and horizontal dimensions of the irregular lobes both vary from about 12 to 22 millim. The specimens are all broken; the greatest length represented among the pieces is 60 millim. ( $2\frac{1}{3}$  inches). By the very slight extent to which the tubes which chiefly characterize the genus are developed, the species is distinguished from *S. dura*, Schmidt; by the large size of the skeleton-spicules, from *S. aulopora*. It has somewhat the general habit of the specimen figured by Schmidt (Atl. Geb. pl. v. fig. 8) for the latter species, and of *Thalysias subtriangularis*, Duch. de Fonbressin and Michelotti; but has a more contort character than the latter, and the spicules are far larger than those of the former. It is also quite distinct in habit and spiculation from the form termed *Thalysias triangularis* by Carter (Phil. Trans. clxviii. p. 287), from Kerguelen Island, the spicules in this being (as I have ascertained from the original specimens, now in the Museum) only  $\cdot 19$  to  $\cdot 2$  by  $\cdot 014$  to  $\cdot 016$  millim. in dimensions. In *Schmidtia* (*Isodictya*, Bowerbank) *mirabilis*, Bowerbank, another Indo-Pacific species, the spicules are only about half the size of the present species, although the habit is similar. It is perhaps nearly allied to *S. clavata* (Balsamo-Crivelli), Esper, by its general habit and large strong spicules; but those of that species, as figured by Balsamo-Crivelli (Atti Soc. Ital. v. pl. iv. fig. 12), are considerably stouter than those of *S. variabilis*.

## 52. *Amorphina megalorrhaphis*.

*Carter, Ann. & Mag. N. H.* (5) vii. p. 368.

A remarkable small specimen, which at first sight appears to be pedicellate, with a fusiform head, but is in reality horizontal in growth. It is a subfusiform mass, which tapers rapidly to a blunt point at one end, runs out as a long narrow cylindrical lobe at the other, and is attached by one side of its thickest part, so that the two ends mentioned project horizontally outwards to right and left of the



point of attachment; the length (horizontal) is 39 millim. ( $1\frac{1}{2}$  inch), greatest (vertical) thickness 8 millim., average thickness of narrow lobe 2 millim. Colour (in spirit) white; texture rather firm, harsh (Carter says "tender"). A small aperture, about .3 millim. in diameter, at the end of the shorter lobe is the only perceptible vent. Surface obscurely wrinkled. Spicules as in *A. panicea*, measuring .8 to 1 millim. by .012 to .018 millim.

This specimen agrees well in size and in its general and spicular characters with those described by Mr. Carter from Ceylon.

*Hab.* Prince of Wales Channel, Torres Straits, 5-7 fms.

*Distribution.* Basse Rocks, Ceylon, Kerguelen Island (*Carter*), (Atlantic?, *Carter, l. c.*).

### 53. *Tedania digitata*, varr.

*Reniera digitata*, *Schmidt, Adr. Meer.* p. 75, pl. vii. fig. 11.

*Reniera ambigua*, *id. Adr. Meer. Suppl.* p. 39, pl. iv. fig. 8.

*Reniera muggiana*, *id. Spong. Alg.* p. 28.

*Tedania digitata et muggiana*, *Gray, P. Z. S.* 1867, p. 520.

*Tedania nigrescens*, *Schmidt, Adr. Meer.* p. 74, is probably not distinct from the above species; but, as it was not intelligibly described until after *T. digitata*, the latter name in any case takes precedence.

From a comparison of the specimens and slides of these different species in the Museum *inter se* and with Schmidt's descriptions, I come to very much the same conclusion as Schmidt (*Atl. Geb.* p. 43), viz. that they are all mere varieties. Schmidt's expression is that it is merely a matter of taste whether they are called species or varieties. The differences in outward form have caused him his greatest doubts as to their identity; and it is true that, while some specimens bear large lobate elevations, others are massive, and that whereas some have large vents, in others they are all small and scattered. But I find that all agree in a more or less massive habit, cavernous structure, and strongly ridged or papillose surface; whereas the Atlantic form, *T. suctoria*, *Schmidt*, and the Chilean *T. tenuicapitata*, *mihi*, have an almost even surface.

The forms of the spicules are practically the same in all cases, and the micro-spination of the heads of the cylindrical "tibiella" is undoubted throughout, whereas in the two specified species the heads are quite smooth.

The Port-Darwin specimens differ decidedly in the proportions of the acuate spicule, as will be seen below, from the rest. None of the varieties pointed out seem to stand out with sufficient distinctness from the rest to receive distinct varietal names. A specimen lately received from Kurrachee agrees essentially with all the above specimens, the spicules being only rather small; the surface is broken up into a dense mass of slender, almost filiform processes and lamellar ridges, from 1 to 5 or 6 millim. high.



I append a Table showing the chief variations in the proportions of the spicules:—

*Proportions of Spicules (in millim.).*

	Smooth Acuate.	Tibiella (in- cluding heads and their diameter).	Fine Acerate.
Mediterranean specimens of <i>T. digitata, nigrescens, am- bigua, muggiana</i> .....	.29 by .011 to .012	.23 to .25 by .0063	.18 to .2 by .0016 to .0017
<i>T. digitata</i> , var., Kurrachee specimen .....	.21 by .007	.16 by .0042	.14 by .002
Do., Thursday and Alert Is- lands, Torres Straits, speci- mens (2) ..	.19 by .0063	{ about .228 by .006	about .18 by .0015
Do., Prince of Wales Channel, Torres Straits, specimen ...	.25 by .0063	.22 by .0042	.22 by .002
Do., Port Darwin (Australia) specimens (2) .....	.3 by .0095	{ .2 to .25 by .006 to .0063	.18 to .19 by .0021 to .0032

In the present collection are some more or less fragmentary specimens, and two which incrust crabs, all well preserved in spirit; they are either broad, massive, about 25 millim. (1 inch) thick, or incrusting, 1 to about 6 millim. thick. The surface is covered with more or less closely-set ridges or monticular elevations, from 1 to 3 millim. high. The colour is pale grey of different shades (a purple colour in one case being apparently derived from a purple sponge which arrived in the same bottle of spirit). The spicules agree closely in form with those of Mediterranean specimens; and the only notable difference in proportion is that the diameter of the acuate is from  $\frac{1}{2}$  to  $\frac{1}{4}$  less than that of those specimens. The colour is paler than in the Mediterranean forms; but these exhibit a wider range of variation in this respect than is shown by a comparison of the darkest Australian and palest Mediterranean specimen. Therefore I feel fully justified in uniting the two groups of forms as one species, remarkable for its wide geographical distribution, polymorphic external habit, and great range of spicular variation.

*Hab.* Alert and Thursday Islands, and Prince of Wales Channel, Torres Straits, 3–9 fms.; Port Darwin, between tide-marks.

*Distribution.* Mediterranean (*Schmidt*); Atlantic (*Schmidt*); Antigua (*Carter*); Kurrachee (*coll. Brit. Mus.*).

*T. increscens*, Schmidt, JB. Comm. Unters. deutsch. Meer. ii.–iii. p. 115 (off S.W. Norway), differs from these and all described species in having a spinulate head to most of the smooth acuates.

DESMACIDINIDÆ (*Schmidt*, 1870).

If all those sponges which contain hooked or bow-like flesh-spicules were, in accordance with Vosmaer's views, as expressed in his very useful Revision (*Notes Roy. Mus. Netherl.* ii. p. 99), included in this family, it would not only be the largest, in all probability, of the families of Siliceous Sponges, but it would leave some of the remaining ones mere skeletons. Judged by the facts now known, the boundary region between the Desmacidinidæ and Chalinidæ is now narrow, but not in reality so narrow as it would be if the above definition is insisted on. Whatever may be the affinities of *Homœodictya*, with its anchorate flesh-spicules (referred by Mr. Carter to the Chalinidæ), those of *Toxochalina*, mihi (see Chalinidæ, *suprà*), are undoubtedly with that group; yet it has a bow-like flesh-spicule in conjunction with a Chalinid acerate skeleton-spicule, horny fibre, and digitate habit. Until the homologies of the flesh-spicules are better understood than they are at present, I believe that cases such as those just mentioned will have to be considered separately on their individual merits as they arise, having special regard to the direction in which the greater assemblage of affinities point. It seems probable that this family will only prove a fresh illustration of the maxim "*Natura non facit saltum.*" Besides *Toxochalina* I here exclude from the family those genera (e. g. *Cluthria*, *Acarus*, *Echinonema*) in which any of the spicules project laterally from the fibre; such forms as these seem to pass by gradations (*Echinodictyum*, *Raspailia*) almost into *Axinella* and *Phacellia*, by losing, in the first case, the flesh-spicules, and in the second (*Axinella* &c.) the spined echinating cylindricals. *Rhizochalina*, on the other hand, seems linked to the family by its occasionally horny fibres, and by its ally *Oceanapia* with its bihamate flesh-spicule; and I have ranged it (although only provisionally) here as a degraded Desmacidine. It probably owes its peculiar form to its mud-loving habits. Two new generic types, *Gelliodes* and *Iotrochota*, are described below.

## RHIZOCHALINA.

*Schmidt*, *Atl. Geb.* p. 35.

*Phleodictyon*, *Carter*, *Ann. & Mag. Nat. Hist.* 1882, x. p. 122.

This form is so aberrant in its coarser anatomy that I think there can be little doubt that Carter has done right (*l. c.*) in making it the type of a distinct group, although we have as yet no satisfactory information about the arrangement and structure of the soft parts. Although I can see no sufficient reason why the name *Oceanapia*, Norman, should give way to the above names for such species as *Desmacidon jeffreysi*, Bowerbank, whose spiculation includes a bihamate, yet it seems not undesirable to retain the older of the two for those which have simply an acerate spicule. With regard to the question of syste-

matic position, which Carter (*l. c.*) is inclined to regard as among the Renieridæ, I notice that *Rhizochalina oleracea*, at any rate, has a true Chalimid fibre; but Bowerbank's and Carter's species never approach this condition more closely than by producing a few scattered compact fibres, wholly composed of spicules, like those of some *Pachychalinae*: but the greater part of the organization is Renierid, and it appears to approach *Schmidtia*, Balsamo-Crevelli. On the other hand, *Oceanapia*, which seems to be nearly allied, has the bihamate spicule. Taking this fact in conjunction with the horny fibre of *Rh. oleracea*, it seems to me best to place the two genera in the Desmacidinidæ.

54. *Rhizochalina fistulosa*, Bowerbank, var. *infradensata*, nov.

? Aleyonium putridosum, Lamarch, *Mém. Mus. Hist. Nat.* i. p. 168.

Desmacidon fistulosa, Bowerbank, *P. Z. S.* 1873, p. 19, pl. iv. figs. 7, 8.

Two more or less imperfect specimens in spirit, the largest about 25 millim. (1 inch) across the body, and some detached dry tubes. An arrangement here found, which I have not seen described in this species, is that of a dense layer of the skeleton-spicules, packed side by side, at right angles to and about .25 to .8 millim. below the surface of the sponge—below, that is to say, the superficial Isodictyal, or rather Halichondrioid (in Bowerbank's sense) network containing the subcortical crypts and other cavities. This layer recalls the vertical layer of small subspinulates of *Rinalda uberrima*, Schmidt, only that it is not, as there, placed at the surface. It is represented in the type specimen of the species by a layer in which the spicules are set obliquely to the surface at various angles. As both the present specimens present this peculiarity, I think it well to establish for them a distinct variety.

One of the specimens exhibits the small crateriform eminences figured on the outside of Bowerbank's specimen, but the other does not; hence they probably have no systematic, and but little physiological importance. The spicules agree closely in proportions with those of the type.

	Type specimen.	Arafura Sea, Spec. no. 1.	Arafura Sea, Spec. no. 2.
Acerate spicule.	.27 by .011 to .0127	.25 by .011	.25 by .012 mm.

*Hab.* Arafura Sea, N.W. coast of Australia, 32–36 fms.; bottom mud, sand, and shells.

*Distribution.* Fremantle, W. Australia (*Bowerbank*) (the typical form).

The dermal membrane of one of the specimens contains a large number of smooth acerate spicules of about half the length and breadth of the proper spicules; they do not occur below the membrane, nor, apparently, in the other specimen. A similar circumstance occurs in *R. singaporensis* described below; in that case a number of short blunt cylindrical spicules occur of the normal, or almost the normal thickness, but only one half to two thirds the length of the adult form.

55. *Rhizochalina singaporensis*, Carter, var. (PLATE XLI. fig. s.)

*Phloeodietyon singaporense*, Carter, *Ann. & Mag. N. H.* (1883) xii. p. 326, pl. xiii. fig. 17.

With this species I identify a series of specimens which usually have the outward habit of *R. fistulosa*, but in which a large proportion of the (usually acerate) spicules have both ends more or less rounded. In the most perfect specimen the cortex is glabrous, chestnut to purplish-brown in colour, thin; the fistulæ are wanting on one, presumably the lower, surface. A smaller specimen consists of a barrel-shaped mass adherent by its lower surface to two other sponges, and giving off from one lateral extremity one, from the other two fistulæ and no others. A detached fistula exhibits furcation, dividing into two unequal branches at an angle of about  $30^\circ$  to each other. In one remarkable specimen the central part of the body is elongate, slightly compressed, and measures 110 millim. ( $4\frac{2}{3}$  inches) in its present length, while its diameter does not exceed 12 millim. anywhere; in its other characters it agrees well with the above specimens. A fragment of the bulbous part of a large specimen shows that part of this specimen, when perfect, to have possessed a diameter of about 75 millim. (3 inches).

The ends of the spicules show almost every stage between a merely blunted point and a rounded end like that of the base of an ordinary acute spicule: some thin, completely acerate forms, which occur mixed with the blunt forms in the subcortical tissues, are perhaps the young of the latter, indicating the typical shape from which the adult spicules have diverged. The largest adult spicules have nearly the same size as the acerates of the typical form of *R. fistulosa*, viz.  $\cdot 3$  by  $\cdot 0127$  millim., but they vary immensely in length; the thin acerates measure  $\cdot 28$  by  $\cdot 004$  millim. In Carter's specimen the acerates measure  $\cdot 3$  by  $\cdot 017$ , the blunt forms  $\cdot 04$ – $\cdot 08$  by  $\cdot 004$  millim.

Three fistulæ retain their ends, and these are finger-like and closed.

*Hab.* Prince of Wales Channel, West and Alert Islands, Torres Straits, 7 fms.

*Distribution.* Singapore (Carter).

I may explain that I had at first distinguished this form as a variety of *R. fistulosa*; but as Mr. Carter has, since then, published a description of it as a distinct species, and as I had already felt that it should perhaps be so described, I assign the name proposed by him to the Australian specimens.

56. *Rhizochalina spathulifera*.

(PLATE XXXIX. fig. E; PLATE XLI. fig. q.)

Main body elongated, flexuous, cylindrical or somewhat compressed, 12–17 millim. in greatest diameter. External portion (cortex) in dry state even, hard and dense on the stem, where it is about  $\cdot 7$  millim. thick; rather uneven, porous and compressible on the branches:

rather brittle, white, marked (at any rate on the stem) on its inner surface by closely-set elongate or reticulate ridges; covered by a thin, wrinkled, paper-like, pale yellow-brown membrane. Branches given off towards end of stem, in succession, in one plane; 7-8 millim. in diameter at bases, slightly less towards apices, 25 to 60 millim. (1 to  $2\frac{1}{2}$  inches) long; cylindrical at base, becoming compressed at apex into flattened subcircular or knife-like expansions, about 10 to 12 millim. in width and 1.5 millim. in thickness; the free ends often (if not always) imperforate. Skeleton of cortex a rather close Halichondrioid network, with meshes .07-.14 millim. wide, fibre 3 to 6 or 7 spicules broad. Main skeleton below cortex coarsely reticulate with immense aggregations of spicules into coarse spiculo-fibre. Sarcoderm in axial tissues brown, transparent, in cortex almost colourless. Spicules smooth acerate, tapering gradually to sharp points from about seven diameters from ends; size .22 by .0098 millim.

*Hab.* Thursday Island, Torres Straits, 4-5 fms.; bottom mud.

A single specimen, 175 millim. (7 inches) long, composed of two laterally fused specimens. One end is broken across, and shows the interior to be filled with flocculent spiculo-tissue; it is thus doubtful whether this end bore any tubes. This species differs, in its very drawn-out form, from all the described species except, perhaps, *Phlaeodictyon hondurasense*, which is known only from a tubular fragment; but the spicules of that species are considerably smaller than those of this form, viz. only .16 by .008 millim.

No Chalinoid or even *Esperia*-like fibre appears to occur in any part of the sponge.

### 57. *Rhizochalina canalis*.

(PLATE XXXIX. fig. F; PLATE XLI. fig. r.)

Simple, unbranched, cylindrical tubes, straight or slightly bent near middle. Diameter at middle about 10 millim. (in large specimens), gradually (sometimes very slightly) decreasing towards ends; ends finger-like, closed, 3 to 4 millim. broad. Surface somewhat uneven. Vents apparently represented by circular perforations of cortex, .5 to .8 millim. wide, few, scattered. Cortex in dry state hard, rather brittle, slightly compressible towards ends, dense; colour greyish; thickness about .7 millim.; outer layer hard, about .2 millim. thick; inner layer bast-like, closely reticulate, about .3 millim. thick. Axial substance? Skeleton of cortex composed of very strong vertical spiculo-fibres 5-12 spicules broad, interlacing closely at the surface to form the hard outer layer; they are about .14 to .18 millim. apart and about .7 millim. long at the thickest part of the cortex, being met at their inner extremities by a strong secondary fibre (parallel to the surface) about 10 spicules broad. Sarcoderm pale brown, transparent. Spicules smooth acerate, becoming rounded off (rather than tapering) to sharp points from about four diameters from ends; size .27 by .014 millim.



*Hab.* Port Darwin, 8-12 fms., bottom sand, mud, &c. ; Arafura Sea, 32-36 fms., bottom sand, mud, and shells ; Torres Straits.

Several dry, more or less imperfect specimens, all somewhat overgrown by Polyzoa, Hydroids, or other Sponges ; and one in spirit, showing the only at all complete extremity. The largest measures 155 millim. ( $6\frac{1}{4}$  inches) in present length, and was probably quite 250 millim. (12 inches) long when perfect. The species is an extreme form of the same elongate type as *R. spathulifera*, but does not branch, and there is no indication in the present specimens of flattened extremities like those of that species ; the spicule is stouter, longer, and more approaching a cylindrical form than in that species.

### GELLIUS.

*Gray, P. Z. S.* 1867, p. 538.

*Asychnis, id. l. c.* p. 539.

*Desmacodes, Schmidt, Spong. Atl. Geb.* p. 54 ; *Vosmaer, Notes Roy.*

*Mus. Netherl.* ii. p. 104.

*Fibularia, Carter, Ann. & Mag. N. H.* 1882, ix. p. 282.

The identity of Schmidt's genus with Gray's might appear to be questionable, as Schmidt, besides the acerate and bihamate spicules on which Gray bases his definition, describes also a spinulate and cylindrical one ("Stift") ; but I fail to find these forms on the slide of the type species which the Museum possesses from Prof. Schmidt. The genus, which may be defined as "consisting of massive or erect forms, with loose brittle texture, and a skeleton smooth acerate, and a flesh bihamate spicule," is widely distributed ; the proportions of the spicules vary little, and the external form has chiefly to be relied upon in distinguishing the species. It is unfortunate that Dr. Gray's genus, which, like many others made by him, is sufficiently characterized, and is prior to names assigned to the genus by other authors, has not come into general use, since many synonyms have been thereby created. Sollas (*Ann. & Mag. N. H.* 1882, ix. p. 427) upholds Gray's genus *Thenaea* against all comers in a similar way, and is supported by Norman (*apud* Bowerbank, *Monograph Brit. Sponges*, iv. p. 29).

Horny matter is not usually to be detected in the skeleton.

#### 58. *Gellius couchi*, Bowerbank, var. *ceratina*, nov.

*Halichondria couchi*, Bowerbank, *Mon. Brit. Spong.* iii. p. 203, pl. lxxxi. figs. 12-15.

*Halichondria elegantia*, *id. P. Z. S.* 1875, p. 286.

As Vosmaer (*l. c.*) has suspected, the above two species are both congeneric with *Desmacodes fibulatus* (Schmidt, sp.) and agree with it in having a spiculation composed of an acerate and bihamate.

Bowerbank's type specimen of *H. couchi*, which I have examined, contains plenty of the latter spicule ; and his own statement to the contrary (*P. Z. S.* 1875, p. 286) is obviously an error, as he himself describes and figures these spicules from this species (*Mon.*

Brit. Spong. iii. p. 204, pl. lxxiii. fig. 15); Vosmaer notes this discrepancy.

The British form of *Gellius couchi* has external characters similar to those of *Halichondria elegantia*, and differs from it but slightly in the spiculation. In the present collection occurs a specimen with very similar spiculation, but the acerate is thinner and the fibre is very distinct, the spicules being united by a yellow substance which appears beyond the spicules on each side of the fibre. It has grown over a Sertularian Hydroid, to which circumstance it probably owes its elongate cylindrical form (that of *G. couchi* is usually massive, compact, and the spiculo-fibre is loose). The vents are scattered on the surface, and measure only about 2 millim. in diameter. It may be distinguished as var. *ceratina*. The following table gives the proportions of the spicules in the type specimens of each of the three forms here united:—

	Acerate. millim.	Bihamate. millim.
<i>Hal. couchi</i> , Bowerbank . .	·24 by ·011	·02 by ·0016
<i>Hal. elegantia</i> , id. . . . .	·2 by ·01	·025 by ·016
<i>G. couchi</i> , var. <i>ceratina</i> . . .	·23 by ·0063–0079	·025 by ·0016

*Hab.* Arafura Sea, 32–36 fms.

*Distribution.* Straits of Malacca (*Bowerbank*); Cornwall (*Bowerbank*).

### 59. *Gellius varius*.

*Halichondria varia*, *Bowerbank*, *P. Z. S.* 1875, p. 292.

*Isodictya virgata*, *id. l. c.* p. 294.

The above two species must be united. The erect cylindrical form of well-grown specimens forms a good external distinctive specific character, while the superior diameter (see below) of the skeleton-spicule readily distinguishes it under the microscope. Two fragments, exhibiting a cylindrical erect habit, occur; the skeleton-fibre is rigid and brittle, even in spirit-specimens, and agrees sufficiently with that of the typical specimens; the proportions of the spicules are as follows:—

	Acerate. millim.	Bihamate. millim.
<i>Hal. varia</i> (type) . . . . .	·22 by ·016	·025 to ·032 by ·0016
<i>Isodictya virgata</i> (type) . .	·22 by ·014	·025 by ·0021
<i>G. varia</i> (from Pt. Darwin)	·25 by ·015	·019 by 0015

*Hab.* Port Darwin, 8–12 fms.

*Distribution.* Straits of Malacca (*Bowerbank*).

### 60. *Gellius fibulatus*.

*Reniera fibulata*, *Schmidt*, *Adr. Meer.* (1862), p. 73; *Atl. Geb.* (1870), p. 40.

? *Isodictya jugosa*, *Bowerbank*, *Mon. Brit. Spong.* ii. p. 296, iii. pl. 2. figs. 11–14.

Schmidt's Portuguese specimen differs from the specimen which was originally described by him (and which was from Trieste) in its more massive habit and in the much larger size of its bihamate, which (as I find in the slide in the British Museum) measures  $\cdot 04$  to  $\cdot 07$  millim. in length, or  $\cdot 0337$  ( $\cdot 337$  millim. seems to be a misprint), as he himself states at p. 40 of the 'Spong. Atl. Geb.' *Isodictya jugosa* agrees closely with this form in the proportions of its spicules, but was based on a very young specimen, so that its external characters can hardly be appealed to; it differs from the specimens described below in its rough surface.

Several specimens have lately been added to the National collection from the neighbourhood of Kurrachee (Hindustan), which consist usually of stout, horizontally spreading and anastomosing lobes, with a row of vents of various sizes, about 10 millim. or less in diameter, ranged along their upper margins. The surface of the sponge is quite smooth in most places, and the texture soft and brittle. The spiculation closely resembles that of *Reniera fibulata*.

Lastly, in the present collection occur:—(i.) a small but massive soft specimen from Torres Straits, with a few oscula on its summit; it has a somewhat pyriform shape, apparently owing to its having grown upon the stem of what seems to be a filamentous Hydroid; (ii.) a fragmentary specimen, which apparently had when perfect the same general habit as the Kurrachee specimens just referred to; the spiculation is similar. I propose to unite all these forms except *I. jugosa* under the name *fibulata*; I give the spiculations of all for comparison:—

	<i>R. fibulata</i> .		<i>I. jugosa</i> .	Kurrachee specimens.	Torres-Straits specimen.	Port-Jackson specimen.
	Triest.	Portugal.				
	millim.	millim.	millim.	millim.	millim.	millim.
1. Acerate ... {	?	$\cdot 22$ by $\cdot 0095$	$\cdot 27$ by $\cdot 0095$	$\cdot 16$ – $\cdot 19$ by $\cdot 0079$ – $\cdot 0084$	$\cdot 19$ by $\cdot 0079$	$\cdot 19$ by $\cdot 0063$
2. Bihamate (length). }	$\cdot 023$	$\cdot 038$ – $\cdot 07$	$\cdot 025$ – $\cdot 038$	$\cdot 019$ – $\cdot 025$	$\cdot 019$ – $\cdot 038$	$\cdot 036$ – $\cdot 042$

The slender proportions of the acerate and the soft texture of the sponge distinguish the species from *G. varia*, Bowk., and its distinct vents from *G. couchi*, Bowk.

*Hab.* Torres Straits, 10 fms.; Port Jackson, 0–5 fms.

*Distribution.* Adriatic, coast of Portugal (*Schmidt*); coast near Kurrachee (*coll. Mus. Brit.*).

#### 61. *Gellius cymiformis*. (PLATE XLI. fig. z.)

*Spongia cymæformis*, *Esper*, *Pflanzeneth. Fortsetz.* i. p. 43, *Spong.* pl. lxxix.

*Isodictya cymæformis*, *Ehlers*, *Espersch. Spong.* p. 24.

The external characters agree well with those of *Esper's* species,

and the fibre appears to agree with Ehlers's account of the species, but I do not find the acute spicules mentioned by him as occurring less abundantly than the acerates; the size of the latter in the present specimens is  $\cdot 15$  to  $\cdot 16$  by  $\cdot 0055$  to  $\cdot 007$  millim. (Ehlers gives  $\cdot 17$  millim. for the length); and I find (what Ehlers does not mention) fine bihamates measuring  $\cdot 02$  by  $\cdot 001$  to  $\cdot 0016$  millim. But a more extraordinary fact connected with the species is that the sponge-tissue is almost entirely replaced (this seems to be the true explanation of the facts) by a ramifying and anastomosing algal fibre,  $\cdot 1$  to  $\cdot 18$  millim in diameter, of a semitransparent appearance and tough elastic texture in the dry state, like that of dry isinglass; the component cells are about  $\cdot 007$  millim. in their smallest diameter. It appears to be the same species as that which forms the substratum of the mass described by Bowerbank (P. Z. S. 1876, p. 771, pl. lxxx.) as *Ophlitaspongia fucoides*, which is nothing more than a coating Suberitid Sponge running over the fibrous filaments of this same alga, which Bowerbank has taken, though not without hesitation (see p. 772, l. c.) for the horny fibre of an *Ophlitispongia*, although he has identified isolated portions as alga. In this case also it is not until examined with the microscope that the algal nature of most of the structure is identified with certainty. This form of *symbiosis* has been lately noticed by Prof. K. Semper in 'Die natürlichen Existenz-Bedingungen' ('Animal Life,' International Scientific Series), where *Spongia cartilaginea*, Esper, is used in illustration; it is probably of not uncommon occurrence in the Spongida. A Formosa specimen agrees closely in the characters both of the sponge and alga with those from Australia. Mr. Carter (Ann. & Mag. Nat. Hist. 1878, ii. p. 163) describes exactly the same circumstance in an allied species from Hong Kong, and adds other similar instances. Several specimens, dry and in spirit.

*Hab.* Thursday Island, Prince of Wales Channel, Torres Straits, 7-9 fms.; Port Molle, Queensland, coral-reef.

*Distribution.* Ceylon (*Esper*); Formosa (*coll. Brit. Mus.*).

This species has a similar habit to *G. varius*, if the form may be regarded as that of the sponge and not of the alga; but its acerate spicules are not so long and scarcely half as thick as those of that species.

### GELLIODES, g. n.

Desmacidinidae of erect habit and well-defined form, fibre distinct and compact; outer surface of sponge beset with pointed eminences. Spicules smooth skeleton acerate and bihamate.

This genus unites the habit of Echinonemata with the fibre of Desmacidinidae and the spiculation of *Gellius* (*Desmacodes*). Mr. Carter (Ann. & Mag. N. H. 1882, ix. p. 288) has referred his species *Aeos fibulata* to the genus *Phorbas*, Duch. and Mich., together with his *Aeos anchorata*, which can hardly be generically identical with it, as its spiculation is an acerate and an anchorate, while *Phorbas amaranthus*, the second species of the genus, has only an

acerate. Judging by the present specimens, *A. fibulata* wants also the purple colour of *Phorbas*, on which Mr. Carter lays so much weight; so that I see nothing but the general external form by which to connect this species with *Phorbas*, and this cannot suffice for a point of affinity in the Spongiida.

## 62. *Gelliodes fibulata*.

(PLATE XXXIX. fig. I; PLATE XLI. figs. *bb-bb''*.)

? *Spongia rubispina*, Lamarck, *Ann. Mus. Hist. Nat.* xx. p. 450.

? *Axos fibulata*, Carter, *Ann. & Mag. N. H.* 1881, vii. p. 383, pl. xviii. fig. 4.

Long cylindrical stems, given off from a common base, but not in a plane, irregularly curved, anastomosing at points of contact, aculeated at intervals of about 2 to 5 millim. by strong but slender sharp spines 2 to 3 millim. long; intermediate surface more or less cavernous, the spaces more or less tympanized by membrane which is semitransparent in spirit, transparent in the dried state. Skeleton-fibre very compact, but exhibiting no horny material; main fibres going direct to surface, .18 to .28 millim. thick; secondaries given off at various angles from primaries and at intervals of .43 millim. and upwards, .088 to .18 millim. thick. Sarcode transparent, with only the faintest tint of yellow. Spicules:—(1) Acerate, smooth, tapering gradually to sharp points from near middle, slightly and gradually curved; size .25 by .0063 millim.; forming the fibres. (2) Bihamate, smooth, slender, with fine points, well curved; size .016 by .001 millim. Texture of sponge in dry state firm, very harsh to touch, slightly flexible: colour pale or darkish brown.

*Hab.* Prince of Wales Channel and Thursday Island, Torres Straits, 3–10 fms. Abundant.

*Distribution.* Bass's Straits (Carter)?

Single branches attain a length of about 100 millim. (4 inches), and the largest colony is 160 millim. ( $6\frac{2}{5}$  inches) high. The species differs from Lamarck's description of *S. rubispina* in wanting the white incrustation, and in not being branched in a fan-like manner; it is doubtful what he means by an "encroûtement coriacé." A specimen in the Lamarckian collection named *Spongia licheniformis* having apparently formed part of a turbinate or flattened mass, even on one side and beset with low but sharp distant monticular eminences on the other, has an almost identical spiculation, but the fibres are less stout and are decidedly loose in their structure. It seems to me that we have here a small natural assemblage of forms representing a more primitive type of Desmacidinidæ than the forms with anchorate spicules.

## AMPHILECTUS.

Vosmaer, *Family Desmacidinidæ*, *Notes Roy. Mus. Netherl.* ii. p. 109.

Although this genus as defined by Vosmaer appears to have



somewhat too wide a scope, it is at the same time true that a resting place or places must be found for those numerous and varied species which are intermediate between the more plainly marked genera *Desmacidon*, *Esperia*, and *Myxilla*. For some of these forms older genera may be employed, e.g. *Dirrhopalum* (*Plocamia*) for *A. coriaceus* and *microcionides* (as I have endeavoured to show in a paper "On the Genus *Plocamia* &c.," Journ. Linn. Soc., Zool. xv. pp. 481, 482). For some such species (*abyssi*, *phlyctenoides*) Mr. Carter employs the old term *Halichondria*; but the type of Fleming's genus *Halichondria* is *Spongia papillaris*, Pallas, which appears to be a synonym of *Halichondria* (*Amorphina*, Schmidt) *panicea*, viz. a Renierid and not a Desmacidine, and so the genus *Halichondria*, if maintained, should be restricted to Renieridæ.

*Amphilectus*, it seems to me, may be kept with advantage for forms with dentate or navicular equianchorate flesh-spicules, with smooth skeleton-spicules and absence of any echinating spicules: the type of the genus is *Isodictya gracilis* of Bowerbank. It may be perhaps necessary to admit forms in which the tibiella (when present) is slightly spined, as in *Desmacidon anceps*, Schmidt. Vosmaer's limitation of *Desmacidon* to species with horny fibre is not justified by the species he has assigned to it.

### 63. *Amphilectus tibiellifer*. (PLATE XLII. figs. *t-t'*.)

Erect, massive, sessile by broad base; sponge broader than high and higher than it is thick, decreasing in thickness towards upper margin, which presents a narrow edge. Sponge-mass honeycombed by a system of tortuous, anastomosing spaces, 3 millim. and upwards in diameter, separated in most cases merely by trabeculæ of substance. Surface perforated by the closely-set openings of the above-mentioned spaces: surface of sponge and of the trabeculæ between openings even, slightly villous in spirit. Texture of sponge in spirit firm, subelastic, tough; colour dark reddish umber-brown. Sarcode pale reddish brown, rather soft. Main skeleton consisting of compact spiculo-fibre formed of spicule no. 1, showing no horny uniting substance, about 3 to 6 spicules broad, irregular; some only of the primary fibres go straight to surface, the secondary fibres usually meet the primaries at acute angles; primaries about .5 millim. apart. Dermal skeleton consisting of a network of spiculo-fibre 2 to 4 spicules broad, the spicules mostly loosely aggregated; meshes of network about .35 millim. apart.

Spicules:—(1) Skeleton acuate, strong, smooth, straight or slightly curved; base rather squarely rounded, shaft cylindrical, tapering to point from about three diameters from end; size .38 by .014 millim. (2) Tibiella, slender, almost straight; shaft smooth, of same diameter throughout, passing gradually into an oval smooth head about half as thick again as shaft; size .25 by .0042 millim. (thickness of head): abundant in dermal membrane and interior. (3) Equianchorate, navicular or shuttle-shaped, with palms rather

longer than broad, inner margins truncate, as seen from front, tubercle distinct; shaft slightly and gradually curved; size .016 millim. long: abundant, especially in dermal membrane. (4) Tricurvedate, smooth, strong, the curves bold, the points sharp; size .15 by .006 millim.

*Hab.* Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand.

A specimen and a fragment in spirit, the former 80 millim. broad by 75 high by 40 thick at present base; it is almost semi-circular in outline, the round margin uppermost; it appears to have been torn from a rather larger specimen.

The presence of a tibiella with smooth ends distinguishes it from all allied species of *Desmacidon* (Schmidt) but *D. emphysema*, Schmidt (JB. Comm. Unters. deutsch. Meer. ii.-iii. p. 118), and *D. physa* (id. l. c.), the latter of which, however, has the surface of the sponge even and the sponge itself flask-shaped; in the former the sponge is covered with bubble-like elevations. *Desmacidon arciferum*, Schmidt, which has a similar tibiella, appears to be an *Ophlitispongia*, from the strong horny fibre and the echinating arrangement of some of its acuates. *D. diane*, id., has, besides, the tridentate anchorates of *Myxilla* and a strongly horny fibre; and both it and *D. anceps*, id., possess the forcipiform spicules which occur in *Halichondria forcipis*, Bk.

#### 64. *Amphilectus hispidulus*.

(PLATE XL. fig. C: PLATE XLI. figs. *y-y'*.)

Erect, clathrous; formed of a number of irregularly branching and anastomosing masses, their surface more or less covered with low cylindrical or ridge-like elevations. Vents? Surface hispid with closely set, hair-like terminations of the primary skeleton-fibres. Texture of sponge in dry state firm, elastic, but readily torn, in spirit soft, elastic; colour dull pale brown in dry state, in spirit pale pinkish brown.

Main skeleton of the type known as "isodictyal," viz. consisting of primary lines running straight to the surface, at right angles to it, connected by numerous transverse secondary lines set at right angles to the primaries; distance between primaries at surface about .25 millim., between secondaries .17 millim., length of the surface processes of primaries about .3 millim. Fibres formed of pale yellow horny material, cored by the axial spicules (no. 1) to the extent of about one third of their total thickness in the case of the secondary fibres, about three quarters in the primaries; margins of horny material clearly seen outside the spicules, except in the surface-tufts of the primaries, which are opaque and dark-coloured; spicules in series of 3 or 4 in the primary, of 2 in the secondary fibres, of about 6 in the dermal tufts of the primaries. Dermal skeleton consisting of an irregular reticulation with polygonal meshes made up of fibres, some of which resemble the primaries,

others the secondaries of the main skeleton. Sarcode very pale brownish yellow, thin and transparent.

Spicules:—(1) Skeleton acuate, smooth, straight or slightly curved, with rounded base slightly smaller than the middle of the shaft, which tapers gradually to a fine point from near the middle of the spicule; size of spicule  $\cdot 18$  to  $\cdot 2$  by  $\cdot 046$  to  $\cdot 0063$  millim.: in middle of fibre. (2) Flesh-spicule, equianchorate, navicular, shaft gradually curved, slender; length of spicule  $\cdot 013$  to  $\cdot 016$  millim.

*Hab.* Thursday Island, Torres Straits, 3–6 fms. (on bivalve shell and Hydroid).

Represented by a dry specimen and by one in spirit: the larger one is 50 millim. high by 55 in extreme diameter. The species is distinguished by its regularly rectangular main skeleton and well-developed horny fibre.

### 65. *Myxilla arborescens*.

(PLATE XL. fig. G; PLATE XLII. figs. *a*–*d*’.)

? *Halichondria plumosa*, Carter, *Phil. Trans.* vol. 168, p. 287 (*nec* *Spongia plumosa*, Montagu, *Wern. Mem.* ii. p. 116).

Ercet, pedicellate, branched, branching not confined to one plane, forming “heads” by the aggregation and partial anastomosis of many different pedicellate branched growths arising from one or more common stems; mode of branching dichoto- to pollicitomous\*. Stems, both primary and secondary, slender, of angulated outline, owing to the lateral projection from them of a number of prominent, jagged, longitudinal ridges. Branches palmate, the edges sharp, the flat surfaces covered with longitudinal, very prominent ridges and upwardly projecting points, the tips of the branches subtruncate. Thickness of secondary stems, exclusive of surface-projections, about 1.5 millim., of palmate parts of branches  $\cdot 25$  to  $\cdot 5$  millim. Minute appearance of surface in spirit granulated (*i. e.* covered with minute rounded elevations, which are smooth and glabrous in spirit). Texture in spirit tough, very pliable, of very imperfect elasticity. Vents apparently represented by round or oblong apertures,  $\cdot 25$  to 1 millim. in maximum diameter, numerous, placed between prominences of surface of branches. Colour in spirit dull pale brown. Sarcode rather granular, pale yellow-brown, soft. Skeleton consisting of longitudinal lines of loosely aggregated spicules (nos. 1 and 2), about 8 to 10 spicules broad, surrounded by some loose spicules of the same kind and ciliated by spicule no. 1; the lines run approximately parallel with each other, occasionally branching and anastomosing at acute angles; at the surface these primary lines either become loose and form loose tracts of skeleton-spicules running along the surface, or they remain compact and project as surface-tufts.

Skeleton-spicules:—(1) Spined acuate, tapering gradually from rounded head to sharp point, generally somewhat curved; spines

\* *i. e.* dividing many times at one point; from *πολλάκις*.

straight, sharp, slender, about .002 millim. long at head, where they are closely aggregated, gradually decreasing in size and numbers towards point, where they cease entirely; size of spicule .1 to .17 by .0063 to .0079 millim. (2) Hastate cylindrical or subacerate, smooth, of almost uniform diameter from centre to within two diameters of ends, whence it tapers to a sharp point; size .2 by .0042 millim. Flesh-spicule, (3) Equianchorate; tridentate, with stout, strongly backwardly curved shaft .0026 millim. in diameter; lateral arms of heads subtriangular, about .0063 millim. long, the middle of the margin of the arm conspicuously folded inwards; the middle arm narrow, oblong, about .0032 millim. long; length of spicule .025 millim.

*Hab.* Port Jackson, 0 to 5 fms.

The entire "stock" or head, of which the single well-preserved spirit-specimen consists, is .42 millim. ( $1\frac{1}{2}$  inch) in height by 40 in greatest diameter; the individual branches may be as much as 9 millim. in diameter at their broadest palmate part. I am under the impression that this is the species alluded to by Mr. Carter (*l. c.*) as *Halichondria plumosa*, from Kerguelen Island. It differs, however, in spiculation from the typical form of that British species in having the shaft of the anchorate about twice as thick and in the longer and slenderer hastate spicule; the difference between the anchorates is perceptible even under a low magnifying-power. It is, however, nearly allied to both it and *Myxilla fictitia* of Bowerbank, and to some Mediterranean *Myxilla* of Schmidt.

I add the measurements of the spicules of what is probably the typespecimen of *Halichondria* (*Microciona*, Bk.) *plumosa*, Mont., for comparison:—

1. Spined acute, .16 by .0063 millim.
2. Hastate acerate (hastate only at *one* end), .17 by .0063 millim.
3. Equianchorate, .016 millim. long, shaft .0013 millim. in diameter.

Mr. Carter places species of this nature in a new Group, called *Plumohalichondrina* (Ann. & Mag. Nat. Hist. 1875, xvi. p. 144, and 1880, vi. p. 39), as being distinguished by their habit and their angulated, not "naviculiform" anchorate; but his genus *Plumohalichondria* (*op. cit.* 1876, xviii. p. 236) must be carefully distinguished from this similarly named Group, for it is described as possessing a naviculiform anchorate.

### CRELLA.

*Crella*, Gray, *P. Z. S.* 1867, p. 521.

*Cribrella*, Schmidt, *Adr. Meer.* p. 69.

Schmidt's generic name was already in use for a genus of Asteridean Echinodermata (L. Agassiz, 1835, Mém. Soc. Sci. Neufchâtel, i. p. 191). Dr. Gray therefore very properly altered it.

The present species, although the first assigned to the genus from



the Indo-Pacific region, agrees well with the typical form of the genus, only presenting its peculiarities, both external and internal, under a decidedly more striking form than in the Atlantic and Mediterranean species. *Halichondria infrequens*, Carter, differs from it in having the spined acerate skeleton-spicule which occurs in some of the Atlantic species, but agrees with it in having a bihamate; its external characters are unknown, but it will almost certainly prove to be a *Crella*.

66. *Crella schmidti*. (PLATE XLI. fig. *a a*.)

Massive, sending up moderately thick lobes pierced by passages 1 to 4 millim. in diameter, lined by smooth surfaces bearing the pores. General surface covered with narrow longitudinal ridges about 1 millim. broad, 5 millim. high, and 1 millim. apart, rough; dermal membrane between ridges smooth, transparent. Vents few, in depressions 1 to 3 millim. deep. Texture in spirit like crumb of bread; colour dirty yellowish white. Main skeleton somewhat irregular, spiculo-fibre devoid of horny matter; in deep parts spicules 1- or 2-serial, fibres very irregular in direction; towards the periphery primary fibres, with spicules 2- to 4-serial, run towards the surface, generally at an obtuse angle to it; they terminate between the intermarginal chambers in tufts of the tibiella spicule, 12 to 15 spicules broad, the distal ends of the tibiellæ spreading out upon the dermal membrane and forming its only skeleton. Sarcodæ pale brown, rather granular. Spicules:—(1) Skeleton acerate, smooth, straight or slightly curved, tapering to sharp points from near centre; size .22 by .0063 millim. (2) Tibiella of dermal tufts, straight, smooth, heads of same thickness as centre of shaft; shaft tapering to necks below heads, necks tapering gradually to the oval heads; size .22 by .0063 millim. (3) Equianchorate of flesh, tridentate, the shaft stout, strongly curved; the teeth strong, well curved inwards, sharp, the two lateral ones united to shaft by falcate expansions; length of spicule .037 millim., that of each head .013 millim., thickness of shaft .0044 millim. [(4) Bihamate of flesh, contort, curve moderate, ends bent sharply inwards; size .037 by .0021 millim. Possibly foreign to the sponge, but not uncommon in both the deeper and superficial parts of the sarcodæ.]

*Hab.* Port Jackson, 0–5 fms.

The only specimen is in spirit and well preserved, but small; the external characters peculiar to the genus are, however, well marked. Whereas the head of the tibiella is scarcely defined as such in any of Schmidt's species (of which two are from the Adriatic and two from the West-Indian seas), here it is quite a striking feature of the dermal membrane when seen in section; in *Halichondria infrequens*, Carter, above referred to, the head of the tibiella is similarly well defined. The spicules are generally stouter than those of Schmidt's species, and none of the skeleton forms are spined, as appears to be the case in *C. elegans* and *papillosa*, if not in *hospitalis*. I associate this species with the name of the distinguished



spongologist to whose keen eye for generic characters we owe this very distinct and constant genus.

### IOTROCHOTA\*, g. n.

*Halichondria*, pars, *Higgin*, *Bowerbank*, *Carter*.

Desmacidinidæ with smooth linear skeleton-spicules and minute birotulate flesh-spicules with straight shafts, both the heads being of the same size, circular, and symmetrical; sarcode purple.

This genus is formed to include *Halichondria birotulata*, Higgin (Ann. & Mag. Nat. Hist. 1877, xix. p. 296) and *Halichondria purpurea*, Bowerbank (P. Z. S. 1875, p. 293). *Halichondria* s. str. is based on a Renierid. The peculiar flesh-spicule of this genus is one form of the flesh-spicule which usually appears in the Desmacidinidæ under the form of an "anchorate," equi- or inequi-anchorate. The latter forms apparently originate by excentric flexion of the shaft of a birotulate form like the present, and suppression of the rays which lie on that side towards which the shaft is bent; the thin expansions uniting the arms in the birotulate apparently become the "falces" which unite the arms of the anchorate (see Carter, Ann. & Mag. Nat. Hist. 1874, xiv. p. 207). An intermediate stage is seen in *Chondrocladia*—viz. *C. virgata*, Wyville Thomson, and *C. (Halichondria) abyssi*, Carter (Vosmaer),—the shaft of the birotulate being bent and the arm of that side almost aborted as in a normal anchorate (see Carter, *tom. cit.* p. 218). *Chondrocladia* differs further from *Iotrochota* in being accompanied by a bihamate or tricurvate flesh-spicule. *Cladorrhiza*, Sars (*C. abyssicola*, id. Somo Remark. Forms &c. i. p. 65, pl. vi. figs. 16-34), is an allied form, but not only has the shaft of the birotulate bent, and the symmetry of the head impaired by the almost total reduction of that arm of the head which thus comes into contact with the curve of the shaft, but it is *inequi-birotulate*, and corresponds in the birotulate series to the inequi-anchorate form of the anchorates of the common types of Desmacidinidæ; it differs from *Iotrochota* in the possession of a bihamate flesh-spicule in addition to the birotulate.

It is noteworthy that those species of this genus hitherto known are from shallow water (littoral, see below), while all other known allied forms except *Axos anchorata*, Carter, for which the depth is not given, are from the deep sea.

From an unusually well-preserved specimen of the green variety of *I. purpurea* from the Amirante Islands (see Pt. II. of this Report), I am able to make out that the ciliated chambers are oval, the ends being well rounded, and measure .032 by .025 millim. They are crowded along the sides and in the parenchyma, lying between what appear to be secondary and tertiary canals of the excretory system, and also (though this may perhaps be merely apparent) upon the

\* From *ἰον*, a violet, and *τροχός*, a wheel, in allusion to the purple colour and the birotulate flesh-spicules.

primary skeleton-fibres; the canals I have mentioned range in diameter from about  $\cdot 07$  to  $\cdot 14$  millim. This opening of a considerable proportion of the ciliated chambers directly into moderately wide canals agrees with what Vosmaer finds to be the arrangement in many forms of the other Monactinellid families Renieridae and Suberitidae, as well as in a few other forms, viz. his third type ('Anteekeningen over *Leucandra aspera*, H.,' Leyden, 1880, and Tijdschrift Nederl. Dierk. Vereen. v. p. 144 *et seq.*).

### 67. *Iotrochota purpurea*.

(PLATE XXXIX. fig. L; PLATE XLII. figs. e-e''').

*Halichondria purpurea*, Bowerbank, P. Z. S. 1875, p. 293.

Dr. Bowerbank's specimen (from the Straits of Malacca) is evidently quite young; the present fine series of specimens, both dry and in spirit (numbering upwards of twenty), gives a better idea of the characters of the species.

The external form is usually that of a cylindrical column, narrow, diminishing gradually in thickness towards apex, viz. from about 15 millim. at base to 4 millim. at apex in adult specimens, dividing towards the apex into two or three subequal branches; it is sometimes flattened irregularly near the base; it occasionally forms a broad palmate frond or irregular erect expansion, or an irregularly honeycombed horizontal mass which may attain a diameter of 65 millim. ( $2\frac{1}{2}$  inches). The surface is broken up into a forest of pointed or ridge-like monticular elevations, 1-3 millim. apart, 1-3 millim. high. In the typical specimen (dry) the surface aculeations are only  $\cdot 5$  to 1 millim. apart and the same in height. Texture in spirit rather firm, but soft on surface, tough and flexible; in dry state harsh on surface, rather brittle: colour in spirit very deep purple, in dry state dark green or pale purple. Skeleton rectangular, consisting of stout compact primary spiculo-fibres devoid of visible horny material, 10 to 20 spicules broad, and of similar secondary fibres 1 to 3 spicules broad. Skeleton-spicules smooth, acuminate, rather squarely rounded at base, tapering to a sharp point from about five diameters from end; size chiefly  $\cdot 26$  by  $\cdot 0063$  millim., a few in the interior of the primary fibres  $\cdot 18$  by  $\cdot 005$  to  $\cdot 0095$  millim. (in the type the prevailing size is  $\cdot 16$  by  $\cdot 0127$  millim. and the spicule frequently increases in diameter from the base towards the centre). Flesh-spicule birotulate (not *equiunchorate*, as stated by Bowerbank), shaft very slender; rotulae small, umbrella-shaped, with four equal curved teeth; length of spicule  $\cdot 016$  to  $\cdot 019$  millim. Sarcode in spirit dark purple, granular; in dry state either dark purple or dark greenish. Large specimens attain a height of about 150 millim. (6 inches).

*Hab.* Torres Straits, various localities down to 10 fms.; Albany Island, 3-4 fms.; Port Molle, coral-reef.

*Distribution.* Straits of Malacca (*Bowerbank*).

The specimens referred to as being greenish in colour are all dry,

and four of the five agree further in being the only ones of the series which present an irregular erect expansion or horizontal mass; a specimen of the erect slender type also shows this colour; neither do I find any thing peculiar in the spiculation of greenish specimens. Two of them are the only specimens received from Port Molle, the rest are from Torres Straits. But as two flattened specimens from the Amirante Islands, in spirit, also possess a decided olivaceous green coloration, I conclude it to represent a variety, uniting green colour with expanded habit of growth. Possibly the colours may depend on sexual characters, or reproductive condition, as noted by Keller in *Chalinula fertilis*.

The general form and surface characters resemble strongly those of the species named by Mr. Carter *Axos anchorata*, from Bass's Straits, except that this is not branched; in this the colour is given as brown; the equianchorate appears to be a modified birotulate, but the skeleton-spicule is acerate. It is perhaps referable to *Chondrocladia*, Wyville Thomson, although, unlike the hitherto described species of that genus, it has no second form of flesh-spicule.

#### 68. *Iotrochota baculifera*.

(PLATE XXXIX. fig. M; PLATE XLII. fig. f.)

Erect, formed of subcylindrical lobes, terminating bluntly; diameter of lobes about 12 millim. Surface chiefly rough, owing to the projection from it, at intervals of .5 to 1 millim., of blunt meandering ridges or conical blunt processes, .5 to 1 millim. high; dermis between eminences smooth, glabrous (in parts smooth patches of some extent). Texture in spirit soft to touch, but very slightly compressible and elastic; colour very dark crimson (almost black).

Main skeleton forming somewhat irregular and wide meshes (.4 to .6 millim. across); consisting of stout compact primary spicular fibres running approximately at right angles to the surface, about 12 to 15 spicules broad, and of similar secondary fibres, vertical to the former in general direction, often meeting them in curves, about 10 spicules broad. Sarcode purple, stained diffusely and also coloured by the presence of very abundant dark purple cells. Dermal skeleton formed by summits of primary and by uppermost secondary fibres, and by long compact tracts of cylindrical spicules which traverse the intervening spaces.

Spicules:—(1) Smooth acuate, rather suddenly curved, base well rounded, tapering to a sharp point from about four diameters from apex, or to blunt point from about  $1\frac{1}{2}$  diameters from the apex; size .2 by .0095 to .0127 millim.: forms the main skeleton-fibre. (2) Smooth, cylindrical, straight, ends well rounded; size .22 to .28 by .0063 millim.: lies loose in dermis. (3) Birotulate, shaft slender, heads about .003 millim. across; teeth four in number, bent inwards, umbrella-like; length .016 millim.

*Hab.* Port Darwin, between tide-marks; bottom mud and rock.

The specimen consists of an irregular horizontal mass about 40 by

15 millim. in greatest and least thicknesses respectively, spreading over and uniting three detached stones, from which arise two chief and a few incipient lobes, the largest respectively 12 and 25 millim. in height. The species differs from the Torres-Straits and Malacca species (*I. purpurea*) in the presence of the cylindrical dermal spicule, in the stouter stem, and the much more finely roughened surface; it is more nearly allied to *D. (Halichondria) birotulifera*, Higgin (from the West Indies), which it resembles in stoutness of habit; but the cylindrical and acuate spicules are both twice the diameter of the corresponding spicules of that form.

#### 69. *Esperia parishi*.

*Raphiodesma parishii*, *Bowerbank*, *P. Z. S.* 1875, p. 283.

*Amphilectus parishii*, *Vosmaer*, *Notes Roy. Mus. Netherl.* ii. p. 119.

An indubitable *Esperia*. Dr. Bowerbank's description of the spiculation of this species is defective and misleading; he omits to notice the sheaves of "trichites" which I find in his preparations; they are, as usual, local in their occurrence, and, from their delicate proportions, not easy to find; the slender bihamates described may be traced by intermediate stages up to the large bihamates, which are perhaps the most striking feature of the spiculation; they are thus merely the young of these latter forms: the alleged spined acuates and tricurvates obviously belong to a *Myxilla* over which the *Esperia* has grown, as they occur in abundance together, but not all over the "basal membrane." (Some navicular *equi-anchorates* which occur seem to be also foreign, being found only detached and in small numbers, and but local in their distribution.) I am inclined to consider the small "palmato-inequianchorates" as young forms of the normal large one.

The following are the proportions of the different spicules proper to the sponge; they agree fairly in both the Malacca and Australian specimens:—

1. Smooth, subspinulate acuate, with slight elongate head; basal end slenderer than middle of shaft:  $\cdot 33$  by  $\cdot 013$  millim.
2. Large inequianchorate; large end comparatively short, its tubercle long and narrow:  $\cdot 057$  millim. long.
3. Navicular equianchorate:  $\cdot 013$  millim. long.
4. Bihamate, smooth, contort:  $\cdot 095$  by  $\cdot 008$  millim.
5. Trichite spicules in bunches of two to four or five:  $\cdot 032$  to  $\cdot 16$  by  $\cdot 0018$  millim.

Some thin fragments agreeing well in all respects with the typical specimen occur in the present collection.

*Hab.* Port Darwin, between tide-marks.

*Distribution.* Straits of Malacca (*Bowerbank*).

This species appears to be absent from Torres Straits, judging from the results of the numerous dredgings taken there; its presence at Port Darwin is therefore probably to be accounted for by direct transit across the western end of the Arafura Sea by way of Timor and the neighbouring islands.



70. *Esperia pellucida*.

(PLATE XL. fig. K; PLATE XLII. fig. h.)

Growth horizontal, spreading over and between stones &c., rising at certain points into slender lobes. Surface even, glabrous. Consistence rather firm and brittle. Vents? Colour in spirit pale pink or dirty white, subtransparent. Dermal membrane gelatinous, transparent, subelastic, firm; internal structures soft. Main skeleton formed of delicate, widely inosculating fibres 4 to 6 spicules broad, soft, branching at obtuse angles. Dermal skeleton consisting of angular meshes formed by distinct straight tracts of spicules, 2 to 4 spicules broad.

Spicules:—(1) Skeleton subspinulate; straight or slightly curved; head marked by a slight and gradual enlargement a little below base; head round and blunt, diameter less than maximum diameter of shaft; shaft tapering gradually to sharp point from within about 2 to 6 diameters of apex; size  $\cdot 42$  by  $\cdot 0095$  millim. (2) Large inequianchorate; shaft strong, slightly bent, of same diameter throughout except near the two ends. Large end forming about one third of total length of spicule, diameter about the same as its length. Lateral palms, as seen from front, broad, truncate below, inferior angle projecting slightly; outer margin slightly reverted throughout; median palm oval, small; tubercle distinct, small, pear-shaped; small end almost truncate above as seen from front, but with the supero-lateral angles sharp, slightly produced upwards, outer margins reverted throughout; tubercle relatively large, anvil-shaped; the small end of the spicule is truncate below and about half the diameter of the large end; length of spicule  $\cdot 1$  millim. (3) Small inequianchorate; shaft slender, gradually curved; large end forming about two fifths of total length of spicule; lateral palms with sharp inferior angles, being excavated on inner side, outer margin reverted throughout; tubercle narrow, elongate; smaller end about half the length of upper (larger) end; outer margin reverted throughout; tubercle subterminal, squarish; end truncate below: length of spicule  $\cdot 032$  millim. (4) Bihamate, contort, slender, with wide curve, size  $\cdot 057$  by  $\cdot 0032$  millim. (5) Trichites, in bundles of from 20 to 30, with fine points; size of individual spicules  $\cdot 06$  by  $\cdot 0015$  millim.

*Hab.* Alert Island, Torres Straits, 7 fms.; bottom sand.

The anchorate of this spicule belongs to the more common of the types occurring in Atlantic and Mediterranean *Esperiae*; it is, however, larger than most, if not all, and the presence of a second form of inequianchorate is another unusual point. The single specimen is in spirit and runs over and between a number of loose and attached calcareous fragments, *i. e.* shells &c. The upright lobes are about 16 millim. long and somewhat flattened.



71. *Esperia obscura*.

? Carter, *Ann. & Mag. Nat. Hist.* 1882, ix. p. 299, pl. xi. fig. 18.

? Mycale grandis, Gray, *P. Z. S.* 1867, p. 533 = "Eine indische Espene," Schmidt, *Suppl. Spong. Adr. Meer.* p. 34, pl. iii. fig. 11.

Mr. Carter assigned the above name to a massive specimen from Freemantle, S.W. Australia, of which he says (*l. c.*) it has "all the characters of *Esperia*, viz. lace-like dermal layer, rigid interior fibre, and acute (sub-pinlike) form of skeletal spicule, but with an inequianchorate about 5-6000ths" (of an inch) "long so transparent in its detail that all I can give of it are the representations (pl. xi. fig. 18), in the hope that it might be thus recognized and finally illustrated." In the present collection made by H.M.S. 'Alert' occur two small imperfect specimens of an *Esperia* which has (besides a larger one) a small inequianchorate spicule which strongly resembles Mr. Carter's figures above referred to, and does not contradict in any point the other parts of the short description which was all that Mr. Carter was able to give of his species. I therefore propose to refer the present specimens to that species provisionally until other specimens are obtained from Freemantle or its neighbourhood which may clear up the question of identity. The following is a description of the 'Alert' species; it may be taken as characteristic, so far as the more minute characters go, the tissues being in a good state of preservation:—

Sponge massive, enclosing detached (and perhaps fixed) foreign bodies. Texture firm, rather brittle. Surface gently undulating, glabrous. Vents numerous, oval, 1 to 2.5 millim. in greatest diameter, scattered on general surface; margins thin, sometimes projecting somewhat; main excretory canals rising from a distance below the surface. Dermal membrane thin, glabrous, semitransparent, firm. Colour in spirit pale dull brown.

Main skeleton—spiculo-fibre moderately well defined, delicate, branching at various angles, from 5 to 10 spicules broad. Dermal skeleton diffuse, the spicules scarcely ever arranged into definite tracts, but loosely matted. Sarcodine thin, very pale yellow-brown, slightly granular.

Spicules:—(1) Skeleton subspinulate, straight or slightly curved, head elongate, subterminal, slight, gradually passing into a bluntly-rounded narrower extremity on the one hand, and into the shaft on the other; diameter of head decidedly less than that of shaft; shaft tapering gradually to within about three diameters of apex and then rapidly to a sharp point; size .8 by .014 millim. (2) Large inequianchorate; shaft slightly curved, stout; larger end of spicule of same longitudinal and horizontal diameter, viz. one third as much as total length of spicule; lateral palms finely curved, ending below in sharp inwardly-curved points and reduced to narrow falciform processes with a narrow reverted rim as seen from front; anterior palm oblong, with rounded angles as seen from front; tubercle distinct, oval; smaller end of spicule with abrupt square upper margin;

lateral margins reverted at upper end; tubercle strong, oval; breadth and length of small end about half those of larger end; length of spicule .12 millim. (3) Small inequianchorate; shaft slender, sharply bent at about middle; larger end about three fourths of total length of spicule in length and about half that amount in breadth; the lateral arms as seen from front finely curved and forming long wing-like processes, pointed below and excavated on their inferior and inner aspects, reaching almost to the upper edge of the smaller end of the spicule; their curve coincides with that of the lower end; smaller end like that of the large inequianchorate, but truncate at its distal extremity; length of spicule .032 millim. (4) Bihamate, contort, slender, curve wide, points sharp; size .057 by .0032 millim. (5) Trichites, in sheaves of 10 to 20 or 30; finely pointed, apparently straight, each about .032 long by .0016 millim. thick; very abundant in some parts of dermal membrane.

*Hab.* Thursday Island, Torres Straits, 4-6 fms.; bottom rock and sand.

*Distribution.* Freemantle, S.W. Australia (*Carter*)?; Indian Ocean (*Schmidt*)?

The larger piece is 43 millim. ( $1\frac{3}{4}$  inch) long, by 20 millim. ( $\frac{3}{4}$  inch) broad, by 10 millim. thick; it is uncertain whether it ever had an independent stem or whether it depended for attachment on the fragments of shells &c. which it involves in its substance, or on fixed foreign bodies; the smaller piece is similar in its relations, and perhaps both originally formed part of one specimen.

The large anchorate strongly resembles that figured by Schmidt (*l. c. supra*) as belonging to "eine indische Esperie," named *Mycale grandis* by Gray (*l. c.*), in the form of its larger end, although the anterior palm is relatively larger than in that form, while the middle palm of the lower end is far smaller relatively to the spicule and to the lateral palms than in Schmidt's anchorate; but it seems likely from its appearance that the lower end of the spicule was imperfectly developed in the example figured by Schmidt. The spicule was even larger than that of our species, viz. .145 millim. long, according to Schmidt's measurement. Gray's species is based simply on that author's description of the spicule.

## PHORIOSPONGIA.

*Marshall, Zeitschr. wiss. Zool.* xxxv. p. 122.

The striking structural character on which this genus was founded receives confirmation and illustration from the following species: I have referred to it as occurring in *Clathria* (*Microciona*) *tuberosa*, Bowerbank (see p. 444). *Fibularia anchorata*, Carter, from Antigua (Ann. & Mag. N. H. 1882, ix. p. 283), is perhaps a *Phoriospongia*.

### 72. *Phoriospongia fibrosa*. (PLATE XLII. fig. g.)

Massive, sessile, irregularly shaped; surface uneven, with irregular

shallow depressions, covered by a glabrous semitransparent membrane, rendered rough by the projection of the low ends of the primary fibres, .25 to .5 millim. apart (many smooth patches occur); texture in spirit brittle, compressible (specimen No. 1), rather tough, elastic (specimen No. 2); colour pale greyish (specimen No. 1) or reddish brown (specimen No. 2). Internal structure cavernous, loose. Vents numerous, scattered, circular or oval, leading deeply into sponge; diameter 1.5 to 3 millim.

Main skeleton regular, rectangular in arrangement; primary fibres set at right angles to surface, .18 to .35 millim. apart, .013 to .03 millim. thick; secondary fibres at right angles to primaries, .18 to .35 millim. or upwards apart, similar to primaries in proportions; fibres wholly composed of foreign bodies united by an almost colourless, not dense, substance. Dermal skeleton formed by small foreign bodies scattered abundantly over the dermis, tending to aggregate into slightly denser anastomosing tracts about .14 millim. broad, enclosing rounded meshes about .18 to .53 millim. in diameter, and by the cylindrical spicules of the sponge, which by loose aggregation form tracts, about 4 to 6 spicules broad, below the skeleton of foreign bodies, the tracts branching and anastomosing not unfrequently, and ending freely on the surface in slightly expanding tufts; sarcodæ subtransparent, granular, colour a warm brown (slightly in specimen No. 1, strongly in specimen No. 2, in which it is more dense. Spicules:—(1) Slender acerate, smooth, with very slightly enlarged subpyriform basal end, the other end rather bluntly pointed; size about .16 to .19 by .0021 by .0032 millim.: forming part of dermal skeleton and scattered over main skeleton-fibres. (2) Contort bihamate, smooth, curve moderately strong, points sharp, suddenly and sharply bent inwards; size .032 by .002 millim.: abundant in subjacent tissues. (3) Tridentate equianchorate, shaft well curved, about .0016 millim. thick; teeth slender, sharp, curved inwards, about .008 millim. long; spicule .022 millim. long. Foreign bodies small in specimen No. 1; large, for the most part, in specimen No. 2.

*Hab.* Specimen No. 1: Prince of Wales Channel, Torres Straits, 7–9 fms.; bottom sand. Specimen No. 2: Port Jackson, 0–5 fms.

Two specimens in spirit. No. 1 has apparently been torn from a larger mass; it is much penetrated by some thin Algæ, on which it seems to have grown much as *Amorphina panicea* grows over weed; it measures 60 millim. by 22 millim. in its two chief dimensions. No. 2 is somewhat compressed on one side, and measures 36 by 19 by 12 millim. The anchorate spicule is scarce in one of the specimens (that from Port Jackson), while it is abundant in the other.

The variability in colour and texture, and perhaps in the secondary fibres, is considerable, but not surprising, considering the distance between the stations at which the specimens were obtained; in other points the agreement is close. The species is a very distinct one, differing from both Marshall's species in the presence of a well-defined reticulate skeleton and of an anchorate flesh-spicule,

in the slenderness of the bihamate spicules, and the almost absolute absence of a head to the very slender linear spicule; the resemblance in spiculation seems conclusive as to the generic identity of the three forms, in spite of the remarkable differences in the skeleton. The mulberry-like bodies described by Marshall in *P. solida* I cannot see in the present species; when treated with hydrochloric acid the superficial layer of the dermis parts with all hard elements except the spicules and some amorphous transparent fragments. Marshall himself does not mention these bodies in *P. reticulum*, so that they cannot be of more than specific or individual importance.

The spiculation of *Phoriospongia* is perhaps nearer to that of *Amphilectus* than of any other genus. Thus, besides *Clathria* (see *C. tuberosa*, p. 444), we have a second genus of Siliceous Sponges which may normally exhibit the phenomenon of intussusception of sand into the fibre. It seems to me that intussusception is the most probable hypothesis on which to account for the presence of the sand in this genus, although Marshall, whom I understand to describe *Phoriospongia* as penetrating and spinning up masses of sand ("durchziehen und umspinnen Sandmassen, sie zu Klumpen vereinigend"), may be right in this interpretation of the origin of the sand in the genus *Phoriospongia*; however, in *P. fibrosa* we find a real system of fibres which does not appear to occur in *P. solida* and *reticulum*; and although I have not been able to detect a horny material, like that of *Dysidea*, uniting the sand grains, which might, as held by Bowerbank and Marshall, pick them up, it seems to me that, remembering the readiness with which Siliceous Sponges, whether possessing a horny fibre or not, take up foreign bodies, there is no reason why the sand of *Phoriospongia* should not be taken up, and not be due to the penetration of masses of sand by the sponge. This view is supported by the spiculation, which is not Suberitid like that of *Vioa*, but, as above remarked, Desmacidine; the presence of the spinulate spicule is common to it and many Desmacidines; while the absence of the remarkable eversible funnel which distinguishes the termination of the excretory canal-system in *Vioa* seems to indicate a different affinity. *Reniera fibulata*, Schmidt, to which Marshall refers in support of his view that bihamates occur in sponges other than Desmacidinidæ, has been placed by Vosmaer in that group under the genus *Desmacodes*, Schmidt, apparently not without reason; and Schmidt (Spong. Atl. Geb. p. 40) himself inclines to the view of its Desmacidine affinities; but the presence of bihamates in Suberitidæ is hitherto unknown.

## ECTYONIDÆ.

Ectyonida, Carter, *Ann. & Mag. N. H.* 1875, xvi. p. 133.

Schmidt (Spong. Atl. Geb. 1870, p. 133) grouped *Chalinopsis* (= *Ectyon*) and its allies, with *Axinella*, *Phacellia*, &c., under the heading Chalinopsidinæ (= Echinonemata, Carter, *l. c.*). Mr. Carter



has, however, done good service in pointing out an essential difference between the two groups into which he divides the Chalinosidinae, viz. in the way in which their echinating spicules are attached. It must, however, be remarked that *Echinodictyum*, mihi, as now understood, approaches *Axinella* decidedly in this point.

The presence of spined echinating spicules is not (see *Ruspailia*, infra) distinctive of the family as here constituted.

The absence or slightly pronounced tendency to difference in size and form between the corresponding spicules of allied species, when the outward form of the sponge differs unmistakably, is a most characteristic feature of this family, and is especially well exhibited in the genera *Echinonema*, *Clathria*, *Echinodictyum*, and *Ruspailia* (s. str.), whereas in Axinellidae the relative thickness of the spicules usually gives good characters (see *Acanthella*, sp., p. 463, where the external form differs little from *A. obtusum*).

### OPHLITISPONGIA.

*Ophlitaspongia*, Bowerbank, *Mon. Brit. Spong.* ii. p. 14.

Vosmaer (Family Desmacid. p. 107) places *O. seriata*, Bowerbank, the typical species of this genus, under *Desmacodes*, and says (*l. c.* p. 155) of *O. papilla*, id., which seems to me not to be specifically distinct from it, that it is probably a *Clathria*, but that no anchorate spicules have been described in it; I have examined the original slides (Bowerbankian) without finding anchors. The sponge which I am about to describe from the present collection agrees with these British *Ophlitispongiae* (but not with the foreign ones) of Bowerbank in their fibre and spiculation, except that the fibre is cored by a cylindrical spicule which is wanting in *O. seriata* and *papilla*. I am inclined to believe that we have here a natural genus, differing from *Clathria* mainly in the absence of anchorate spicules. I do not see how these species can be placed under *Desmacodes*, when they have echinating spicules, but no skeleton acerates (except tricurvates) and no bihamates.

#### 73. *Ophlitispongia australiensis*. (PLATE XLII. figs. c, c'.)

Habit of *Clathria frondifera*; spiculation of *C. coralloides* and allied species. Massive; structure cellular, *i. e.* interior and surface broken up into angular cells by walls of tough denser sponge-substance, projecting at surface in low ridges and slight points; between them are extended thin membranous expansions. Texture in dry state firm, tough, subelastic; colour pale dirty brown.

Main skeleton—meshes rounded, narrow; primary fibres stout, amber-yellow, cored with about one third their thickness of spicules, proceeding straight to surface, diameter about .1 to .14 millim.; secondary fibres abundant, irregular in direction, amber-yellow,



diameter about .07 millim.; one or two axial series of spicules; both sets of fibres echinated sparsely with the echinating spicule. Dermal skeleton formed by undulating, very pale yellow horny fibres containing two or three series of spicules, about .053 millim. broad, and of loose tracts of spicules. Sarcode pale amber-yellow, transparent.

Spicules:—(1) Skeleton cylindrical, smooth, straight, tapering slightly from middle towards well-rounded ends; size about .2 by .0042 millim. (2) Echinating acerate, smooth, straight, tapering decidedly from middle towards the base, which is thus thinner than the middle of the shaft, but is well rounded, and tapering from middle to sharp point at apex; size about .13 by .0095. (3) Tricurvate acerate, smooth, curves slight, ends finely pointed; size about .042 by .0021; in sarcode.

*Hab.* Port Moller, Queensland, 12 fms.; bottom rock and coral.

In general appearance this sponge resembles *Clathria frondifera*, but has the intervals between the trabeculae of the clathrous structure more or less filled with membranous expansions. The spiculation is not quite so simple as that of the British species, but has, in addition to their echinating acerate and tricurvate, a cylindrical skeleton form. I know of no other near allies. A small but well-preserved dry specimen represents this species.

#### 74. *Clathria aculeata*.

(PLATE XL. fig. I; PLATE XLII. fig. k.)

Erect, with single, slender stem, dividing into branches at some distance from base; branches given off in various planes and at acute angles, occasionally connected by bars of sponge-substance; secondary branches occur, formed in the same manner as the primary branches. Stem cylindrical, 4-5 millim. in diameter in present specimens; surface even, with the exception of a few prominent but blunt aculeations shortly below the commencement of the branches; branches well covered by long, more or less pointed aculeations, 2 to 5 millim. high. Texture of stem, both in spirit and in the dry state, woody, incompressible; that of the branches elastic, but more or less incompressible until near the apices, which are firm but compressible. Colour, in spirit, dark amber-brown; in dry state pale brown, the branches having a whitish incrustated appearance. Surface of branches, in spirit, minutely uneven, that of stem glabrous.

Main skeleton composed of very strong amber-yellow horny fibre, tortuous and anastomosing, not showing distinct separation into primary and secondary fibres, but forming oval meshes: diameter of fibre at base of branches varying from .05 to .2 millim., the short diameter of the meshes formed by it at the same spot from .18 to .8 millim.: fibre cored by a tract of slender spinulate spicules, 3 or 4 spicules broad, and echinated everywhere abundantly by the spined acerate spicule. Dermal skeleton similar to main skeleton,

but fibre more constantly stout; thickness from .07 to 2 millim.; meshes narrower, viz. .09 to .7 millim. in smaller diameter, and bearing short blunt processes at intervals, echinated by thick tufts of the smooth subspinulate spicule on its upper surface. Sarcode very dark yellowish brown, granular and opaque.

Spicules:—(1) Stouter, smooth, subspinulate acuate, straight, with very slight constriction marking off a short head, which is less in diameter than the middle of the shaft; shaft tapering gradually to sharp point from about centre; size .23 by .0127 millim.: in tufts on dermal skeleton. (2) Slender, smooth, spinulate, with slight oval head, nearly straight; tapering to sharp point from near centre; size .35 by .0085 millim.: forming axis of skeleton-fibres. (3) Subspinulate spined acuate, with small globular head, and tapering to a fine point from about centre; spines numerous, sharp, projecting at right angles to long axis of spicule, prominent on middle of spicule and sometimes on head, becoming obsolescent in the other parts; size .09 by .0079 millim.: echinating the skeleton-fibres. (4) Tricurvate acerate of sarcode, smooth, sharp-pointed; curves gentle; size about .063 by .0015 millim. (5) Navicular equianchorate; shaft slender, slightly curved; length about .0127 millim.

*Hab.* Thursday Island, Torres Straits, 3–4 fms., bottom sand; also same locality, probably from beach.

Two specimens, agreeing closely in their characters, represent the species; heights 70 and 85 millim. ( $2\frac{4}{5}$  and  $3\frac{2}{5}$  inches) respectively; expanse of branches 30 and 20 millim. respectively. It agrees closely in character of spiculation with *C. ulmus*, Vosmaer (Notes Roy. Mus. Netherl. ii. p. 151), of which the locality is not stated; but the stem is single and not ramified as stated by Vosmaer, who does not mention the most striking external characteristic of this species, viz. its strong aculeation by long pointed processes. I know of no other species which approaches it at all closely.

### 75. *Clathria tuberosa*. (PLATE XLIII. fig. d.)

*Microciona tuberosa*, Bowerbank, P. Z. S. 1875, p. 281.

The specimens are finer than those in the Bowerbankian collection; the largest measures 70 millim. ( $2\frac{3}{4}$  inches) in greatest diameter, and 50 millim. (2 inches) in greatest height; the individual lobes may measure as much as 14 millim. in greatest diameter. The "skeleton columns" (Bowerbank) are even more strongly arenated than in the type specimen, and resemble those of a *Dysidea*, the projecting ends of the spined and fine smooth acuate being the only point of difference which appears at first sight. The proportions of the spicules differ slightly from those of the Malacca specimens as given by me (P. Z. S. 1881, p. 121)\*, viz. :—

\* The length of the equianchorate should have been stated there as .016 millim., and the base of the slender smooth acuate described as slightly inflated.



branches, and the entire surface of smaller branches uneven and covered with small deep vents, about .5 millim. in diameter and .5 to 1 millim. apart. Texture of sponge in dry state and in spirit firm, the peripheral portions and the reticulation generally elastic, somewhat compressible and flexible, like cork; the main stems in dry state hard, woody; reticulation and lesser branches rather brittle. Surface between pits composed of an incrustation, which is whitish when dry, dull umber to pinkish in spirit; colour of subjacent tissue pale brown in dry state, pinkish and subtransparent in spirit.

Main skeleton irregular, consisting of a close reticulation of primary and secondary fibres, which are curved, and form rounded meshes from .18 to .25 millim. wide; primaries .044 to .07 millim., secondaries about .035 millim. in diameter. Dermal skeleton formed of similar, rather narrower meshes; fibres .053 to .07 millim. in diameter.

Spicules:—(1) Smooth acute, tapering gradually to sharp points and also to base, which is slightly narrower than middle of shaft; size .2 by .015 millim.: in axis of fibres and projecting from ends of primaries. (2) Subspinulate acute, slightly curved, tapering gradually to sharp point; head formed by a slight constriction just above base, which is microspined; size .34 by .015 millim.: in axis of and projecting from ends of primary fibres. (3) Smooth, straight, slender spinulate, with oval head slightly stouter than shaft, tapering gradually to sharp point; size .25 by .005 millim. to .15 by .0063 millim.: in the sarcode, especially at the surface (probably young forms of No. 2). (4) Spined acute, with slight constriction just above base, spined all over with small, sharp, straight spines; size .011 by .0063: scattered, echinating the different fibres at right or acute angles. (5) Equianchorate, navicular, with slender shaft and slightly elongate palms with truncate proximal margins, as seen from in front; .017 millim. long: abundant in sarcode.

*Hab.* Albany Island, north coast of Australia, 3 to 8 fms.; bottom sand and mud.

A very fine dry specimen, 455 millim. ( $18\frac{1}{4}$  inches) by 450 millim. (18 inches) in extreme height and diameter respectively, together with a portion in spirit of what must have been also a large specimen, represent this species. The remarkable external characters are not accompanied by any thing striking in the spiculation; indeed this is remarkable, if for any thing, for its simplicity, the equianchorate being the only flesh-spicule present. I have great pleasure in associating with what is perhaps the finest new sponge of this collection, and the finest known species of its genus, the name of the indefatigable and successful collector who obtained it.

#### 77. *Clathria reinwardti*, var. *subcylindrica*.

*Clathria reinwardti*, Vosm., *Notes Roy. Mus. Netherl.* ii. p. 152.

I have little doubt of the identity with Vosmaer's species of a sponge which occurs abundantly in Torres Straits. The general external resemblance to *Axinella cannabina* is very striking and the



specimens recall strongly, from their habit and size, the figure of this species given by Esper (Pflanzenh. ii. pl. xlv.), with which Vosmaer's specimen was at first erroneously identified.

The following are the leading points in the external characters:—The specimens are abundantly branched, the stems and branches are either roughly cylindrical below (usually flattened at the ends), greatest diameter about 9 millim. in the cylindrical, 12 to 14 millim. in the compressed parts. Anastomosis frequent, produced by lateral adhesion of branches, sometimes forming broad expansions of sponge-substance. Surface entirely broken up by a system of anastomosing, more or less sharp, usually jagged ridges, 2 to 3 millim. high, often drawn up into prominent detached points. Texture in dry state subelastic, firm, harsh to touch. Maximum extent of largest specimen 180 millim. ( $7\frac{1}{2}$  inches). Skeleton: indications of horny matter in fibres slight and infrequent; fibres usually wholly composed of the smooth skeleton-spicule, about 8 spicules broad, and sparingly echinated by the spined cylindrical form. Spicules: I cannot find any spinulates, those which Vosmaer describes are perhaps young forms of the smooth acuate; nor do I find the smooth cylindrical which he places within brackets.

(1) The skeleton smooth acuate, has a well-rounded head and tapers gradually to a sharp point; size  $\cdot 25$  by  $\cdot 0127$  to  $\cdot 28$  by  $\cdot 0095$  millim.

(2) Smooth acuate, occasionally echinating, measures  $\cdot 22$  by  $\cdot 0127$  millim.

(3) The spined echinating cylindrical tapers to the smaller blunt end; the spines project directly outwards from the shaft and are about equally distributed over the whole spicules; size  $\cdot 076$  by  $\cdot 0063$  millim.

(4) Equianchorate,  $\cdot 019$  millim. long.

Colour, in dry state, grey or very pale brown.

Vosmaer's description being short and merely preliminary, I have thought it well to give the chief details (although I hope he will himself figure or further describe his species) to obviate any future uncertainty as to the identity of the present form.

*Hab.* Thursday Island, Prince of Wales Channel, Torres Straits, 3–7 fms.; common.

*Distribution.* Moluccas (*Vosmaer*).

Vosmaer states that his specimen is unbranched.

### *Clathria reinwardti*, *Vosmaer*, var. *palmata*.

It is not surprising to find *Clathria* exhibiting individual variation in its external form of a character similar to that which occurs in the nearly allied genus *Echinonema*. As in that genus the same species may be either cylindrical or semipalmate, so here. In this collection occur two specimens from one locality, which, though differing greatly in form from each other, have the same colour, a surface of similar character, and agree closely in spiculation.

The one arises from a stout, laterally compressed, short pedicle, and expands rapidly into a fan-shaped but rather thick expansion,



apparently partly formed by upgrowths from short stems placed beside it, which, though now single, appears to have been originally compound also; one surface of this expansion is almost level, but honeycombed densely with openings with rounded edges, varying from 1 to 4 millim. in diameter; the other surface is broken up into seven more or less pronounced vertical ridges, irregular and frequently interrupted, 3 to 10 millim. in height; this surface and its ridges are also strongly honeycombed, and between the openings usually project points and ridges of sponge-tissue. It measures 130 millim. ( $5\frac{1}{3}$  inches) in breadth, 120 millim. ( $4\frac{3}{4}$  inches) in height. The second specimen is strap-shaped, 24 to 30 millim. across, somewhat abruptly bent at one point, and terminated by two small lobes; like the other specimen, one surface is comparatively level and is honeycombed rather minutely (openings .3 to .5 millim. in diameter), while the other is rugose, from the presence of several demi-canals, about 2 to 4 millim. across, which run from the middle to the margin of the frond; the surface between them is minutely honeycombed and drawn up into a few sharp points and ridges. The colour is darkish grey, varying to greenish in both specimens. The spiculation is essentially that of the above-mentioned form of *C. reinwardti*, but the skeleton smooth acute is only .0063 to .0079 millim. in diameter, and the short, stouter, smooth acute is wanting; this slight difference in spiculation appears to justify the separation of this form under a distinct varietal name. It is perhaps as nearly related to the original form as the first-mentioned specimens. The remarkable fan-shaped specimen appears (having regard to the multiple character of its base) to be made up of several "persons" which have united to form a single symmetrical-frond.

*Hab.* Bird Island, N.E. Australia, coral-reef.

### 78. *Clathria frondifera*.

(PLATE XLII. fig. *i*; and Part II. of this Report, PLATE LIII. fig. J.)

*Halichondria frondifera*, Bowerbank, *Proc. Zool. Soc.* 1875, p. 288.

*Amphilectus frondifer*, Vosmaer, *Notes Roy. Mus. Netherl.* ii. p. 115.

A very common species, especially in Torres Straits. At first I was inclined to separate the specimens from Bowerbank's species on account of the greater development of ceratinous substance investing the lines of skeleton-spicules. In the Australian specimens this occupies from half to two thirds of the diameter of the fibres, while in the type specimen from the Straits of Malacca its place is often almost entirely taken by spicules, and extends to half the diameter of the fibre only in some cases. The consistency of the sponge is hence much tougher and more elastic in the Australian specimens. The main skeleton-spicules are much stouter in the Malacca specimens.

Dr. Bowerbank has omitted to describe a very fine tricurvate flesh-spicule which occurs both in his specimens and in the present ones. His description is also misleading in not stating, what his own type specimen satisfactorily exhibits, and what the Australian examples

show to greater advantage, that the stag's-horn-like branches anastomose and inosculate very freely with each other, forming a number of deep angular cells, open above and below, and more or less at the sides also, owing to the fenestræ left between the branches. The Australian specimens mostly exceed Bowerbank's type in their dimensions: the largest measures 110 millim. ( $4\frac{2}{5}$  inches) by 115 millim. ( $4\frac{1}{2}$  inches) in extreme height and breadth respectively; it is formed of three main lobes which arise from a common base and unite towards the summit of the sponge.

The measurements of the spicules are given, as Bowerbank has not figured them:—

	Smooth skeleton Acuate.	Smooth surface Acuate.	Spined echinating Acuate.	Equi- anchorate.	Tricurvate.
	millim.	millim.	millim.	millim.	millim.
Gaspar-Strait spec. } (Bowerbank Coll.)	·22 by ·0127	·28 by ·0063	·08 by ·0095	·019 long	·042 by ·001
Typical specimen, } thickness. ....	·0127-·0158				
Queensland spec. } ( 'Alert' Coll.), A	·2 by ·0112	·28 by ·0063 to ·0078	·07 by ·0095	·019 long	·042 by ·001
Ditto, B ....	·21 by ·008	·28 by ·004	·09 by ·016	about ·017	about the [same.]

*Hab.* Thursday Island, 4-5 fms.; Prince of Wales Channel, 5-7 fms.; Percy Island and Fitzroy Island, Queensland, 7-11 fms.; bottom—combinations of sand, mud, or shells.

*Distribution.* Straits of Malacca, Gaspar Strait (*Bowerbank*).

The presence of spined echinating spicules removes the species from *Amphilectus*, where it had been placed by Vosmaer, who had only an imperfect description to guide him. It must be referred to *Clathria* as emended by him; and it is interesting to find here a variability in the development of the horny fibre in different specimens which is similar to what he has described (*l. c.* p. 150) in *C. coralloides*.

The second Queensland specimen ("B"), from Percy Island, differs decidedly from the rest in the greater slenderness of its skeleton-spicules; it is, however, a young specimen, and the differences may be due to this circumstance.

## RHAPHIDOPHLUS.

*Ehlers, Die Espersch. Spong.* pp. 19, 31.

This genus differs from *Clathria* only by its spicular crust, and from *Echinonema*, Carter, only by the absence of tricurvate spicules.

79. *Rhaphidophlus arborescens*. (PLATE XL. fig. L;  
PLATE XLII. figs. n, n'.)

Sponge stipitate, much branched, bush-like: branches angular rather than cylindrical; surface nodular, connected by frequent horizontal trabeculae at right angles to the erect branches. The average diameter of the stem and its branches is 4-5 millim. The cortical incrustation of spicules consists of a layer about .5 millim. thick, the outer part of which consists of loose fascicles of the smooth spinulate spicule, with the pointed ends placed outermost; the spicules are closely approximated to each other below the surface, between the intermarginal canals, but their distal ends diverge and spread out somewhat at the surface, and between them appear to be placed the pores; the intermarginal canals, as stated, lie between the bases of these fascicles. The deeper part of this layer consists of Halichondrioid spiculo-fibre, about 6-8 spicules broad, with small roundish or polygonal meshes, which seem to have enclosed small canals (probably the afferent canals leading from the intermarginal cavities to the ciliated chambers). No horny matter is to be seen in this part of the skeleton, the extreme fragility of which forbids the idea that any such occurs here [on the contrary, the compressibility and readiness with which the spicules and fibres must be able to move upon each other in life, owing to the manner of their aggregation, point to a probable great power of contractility and expansion in the dermal membrane, with important consequences to the pores, intermarginal cavities, and inhalent canals which it contains; and I should anticipate that good spirit-specimens would show the strong development here of muscle-cells, such as has been shown by Prof. Sollas in *Tetilla* (Ann. & Mag. N. H. 1882, ix. p. 155)]. The fibres of the skeleton are irregular; their course is winding, and the distinction between primary and secondary fibres not clear, except at the surface; here the ends of the primary fibres, which stand out for some distance beyond the general reticulum and support the dermal crust, are absolutely concealed by the enormous abundance of points of the spined spicules which project from them.

Spicules:—(1) Slightly spinulate, smooth acuminate, .34 by .0063; (2) Spined acuminate, slightly constricted basally, .08 by .0044; (3) Delicate equianchorate, palms proximally square, .012 millim. long.

*Hab.* Friday Island, Torres Straits.

The specimen, which is dry, measures 125 millim. (5 inches) in height and 60 millim. ( $2\frac{1}{3}$  inches) in maximum diameter.

Vosmaer's *Clathria ulmus* (Notes Roy. Mus. Netherl. ii. p. 151) resembles this species, but is stated to have a bihamate flesh-spicule, and no dermal crust is described. The species differs from *R. cratitius*, Esper, in the well-branched habit and in minor points in

the proportions of the spicule. Ehlers (Espersch. Spong.) assigns a bihamate to that species\*.

80. *Rhaphidophlus procerus*. (PLATE XXXIX. fig. K ;  
PLATE XLII. figs. o-o".)

Erect, cylindrical, or very slightly compressed. Stem tapering to a point above, commencing with a cylindrical approximately smooth basal portion, about 6 millim. in diameter; it gradually increases in diameter towards the middle, where the antero-posterior diameter is 7, the lateral diameter 8 millim.; the lateral surfaces show a tendency to develop a succession of low upwardly-projecting eminences; the anterior and posterior surfaces of this (middle) division of the sponge are covered with closely-set rounded papillæ, 1-2 millim. apart, 1 millim. broad by .5 to 1 millim. high; the upper fourth tapers gradually to the apex and is approximately smooth, the papillæ of the median part becoming gradually obsolete here. No true branches (only two small cylindrical processes on one side close together, near the middle). Base formed by several branched roots, 3 to 5 millim. in diameter. Surface smooth between and over eminences, compact, soft and velvet-like to the touch; no vents visible to the naked eye. Texture in spirit firm, very slightly compressible, flexible, very tough; colour pale grey.

Main skeleton consisting of a close network of amber-coloured horny or dull subopaque yellow horny sarcodic fibre, the primary lines of which are about .2 millim. apart and are placed vertically to the surface, the secondaries also about .2 millim. apart, crossing the intervals between the primaries at approximately right angles; to the fibres are attached by their bases large numbers of the larger smooth spinulate spicule, whose points project outwards and upwards at acute angles to the fibre. Dermal skeleton formed of a single thickness of distinct, but overlapping, dense tufts of the smaller smooth spinulate spicule, one or more of the spined acute spicules occupying the centre of each tuft; the spicules are attached by their blunt ends, and the points radiate outwards over the dermis. Sarcode pale yellowish brown, somewhat granular.

Spicules:—(1) Smooth spinulate; head distinct, suboval, rather narrower than middle of shaft; shaft tapering gradually to sharp point from about middle; size .36 by .0127 millim.: in fibre of main skeleton. (2) As (1), but measuring .28 by .0079 millim.; forming tufts in dermis. (3) Spined acute, with well-rounded, undilated base, tapering to sharp point from base; spines usually absent from the apex and just above base, stout, sharp, those of median portion of spicule more or less recurvate towards base; size .11 by .0127: in centre of dermal tufts and sparingly in main-skeleton

\* *Spongia cactiformis*, Lamarek (Ann. Mus. Hist. Nat. xx. p. 440), is also a *Rhaphidophlus*, differing from *R. arborescens*, so far as the material at my disposal shows, mainly in the non-spinulation of the smooth acute.



fibre. (4) Equianchorate; navicular, shaft almost straight, pointed at each end; length .016-.018 millim.

*Hab.* Port Darwin, 7-12 fms.; bottom sand, mud, and shells.

The above diagnosis is based on a large specimen. A small specimen (which is perhaps the apex of a larger one), 36 millim. high, also occurs from the same place and same depth, differing from it in having no perceptible horny fibre, in being, in consequence, soft and flaccid, and in having the spined acuate confined to a central axis which contains a large quantity of sand; it is probably identical with the large specimen, its differences being partly individual, partly due to youth; it contains the parasite *Spongiphagus*, Carter. This very fine species appears to be referable to *Rhaphidophlus* by possessing a distinct dermal crust composed mainly of smooth spinulate spicules with their points projected outwards, but adds to this the presence in this crust of the spined echinating spicules, a feature in which it resembles *Dirrhopalum*. The crust is thin, but appears to represent the correspondingly situated structure in *R. cratitius*, Esper (Ehlers). Its root-like base recalls the horizontal meshwork figured by Esper, and here, as there, the erect portion appears to have no real tendency to form branches; but, besides the differences in the dermis, the skeleton and echinating spicules are both much longer than in the type and hitherto only recognized species of the genus. The height of the perfect and well-preserved spirit-specimen is 470 millim. ( $18\frac{3}{4}$  inches). The arboresecent form, the strongly horny fibre, the slenderness of the skeletal and echinating spicules, the replacement of the spinulate for the most part by the spined acuate in the main-skeleton fibre, and the thickness of the dermal crust, distinguish *R. arboresecent* from *R. procerus*.

### 81. *Rhaphidophlus*, sp.

The following appears to be distinct from all known species of the genus, but more material is necessary for full description:—

A small dry specimen of subramose cylindrical growth, 45 millim. long by 12 millim. in greatest diameter, the surface proliferating into ridges and processes 2-3 millim. high, giving it a flocculent appearance. Colour pale dusky brown. Skeleton irregularly rectangular in arrangement; spicules united in the fibre by a small amount of very pale horny substance, which is only occasionally seen outside the spicules; primary fibres about 8 to 10, secondary 6 to 8 spicules broad. Dermal skeleton a single layer of smooth subspinulates in tufts radiating outwards.

Spicules:—(1) Smooth acuate, tapering gradually to sharp point; size .23 by .0095 to .0127 millim.: in fibre. (2) Smooth subspinulate, forming dermal layer; head very slight, larger than shaft; tapering gradually to sharp point; size .25 by .0095 to .0127 millim. (3) Spined cylindrical, tapering gradually from well-rounded, very slightly dilated base to rounded apex, which is about one third the diameter of the base; spines prominent, sharp, distal ones



strongly recurvate; size of spicule  $\cdot 07$  by  $\cdot 0095$  millim.: very abundant on the fibre. (4) Navicular equianchorate of sarcode, shaft slender, almost straight; length of spicule  $\cdot 018$  millim.

*Hab.* Prince of Wales Channel, Torres Straits, 5-7 fms.

## ACARNUS.

*Gray, P. Z. S.* 1867, p. 544.

*Acaruia* is used as a generic name in an earlier part (*tom. cit.* p. 515) of the same paper as that in which Dr. Gray described *Acarnus*; but it has not come into general use, otherwise the essential agreement in form between the two words would necessitate the suppression, on that ground, of the later one. A careful comparison of the grapnel-spicule, which characterizes the genus, with the spined cylindricals of *Clathria* and *Echinodictyum* shows that the affinity of the sponge is with these genera rather than with the "Tethyadæ" of Dr. Gray, as held by him, or with the "Esperiadæ," as supposed by Mr. Carter (*Ann. & Mag. Nat. Hist.* 1871, vii. p. 274).

*A. innominatus*, Gray\* (*l. c.*), besides the remarkable 4-hooked grapnel-like spicule and the acuate (not cylindrical, as stated by Gray, *l. c.*) form which characterize the main skeleton, possesses—as I have been able to ascertain by an examination of a mounting made by Dr. Bowerbank, who was the first to figure and describe these spicules (*Mon. Brit. Spong.* i. figs. 73-76, 292), which Dr. Gray afterwards embodied in his description of the species—also a tricurvate (figured by Bowerbank) and an equianchorate flesh-spicule; the former about  $\cdot 13$  by  $\cdot 0042$  millim. in dimensions, the latter  $\cdot 016$  to  $\cdot 024$  millim. long; also a tibiella, measuring about  $\cdot 28$  by  $\cdot 0045$  (shaft) or  $\cdot 0063$  (head) millim.

### 82. *Acarnus ternatus*. (PLATE XLII. figs. *b*, *b'*.)

From a mounting which the Museum owes to the liberality of Dr. John Millar, and from the spirit-specimen in the present collection, we learn that in this new species the acuate spicules are imbedded in a reticulate horny skeleton of a pale salmon-red colour, and not, as usual, yellow. The grapnel has but *three* hooks, and the tibiella has the shaft only  $\cdot 003$  millim. thick. The other spicules agree with those of *A. innominatus*. The largest of the present specimens is about 65 by 25 millim. ( $2\frac{1}{2}$  inches by 1 inch), and forms a clathrous structure of round soft anastomosing trabeculæ which are about 3 millim. in diameter. Colour in spirit reddish brown. Several specimens occur in the present collection.

*Hab.* West Island and Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand and coral.

*Distribution.* Bombay? (*coll. Brit. Mus.*).

\* Mr. Carter gives reasons (*l. c.*) for his supposition that the West Indies are the home of this species; the specimen, however, to which he appeals in support of this view, viz. that attached to the base of a specimen of the West-

## ECHINODICTYUM.

Echinodictyum, *Ridley, Journ. Linn. Soc., Zool.* xv. p. 493.

Dictyocylinndrus, *Carter, pars, nec Bowerbank.*

There can be no doubt that Schmidt is right in identifying his (Nardo's) genus *Raspailia* with *Dictyocylinndrus* of Bowerbank, and in superseding the latter name on grounds of priority (the dates are, Nardo, 1833, Schmidt, 1862, Bowerbank, 1864). The spiculation, outward form, and skeleton-arrangement of the type species of the two genera (*R. viminalis*, Schmidt, and *D. hispidus*, Montagu) agree essentially. Bowerbank has placed in his genus, besides typical *Raspailie*, species of *Axos* (*D. dentatus*) and *Axinella* (*D. setosus*). Carter has placed in the genus species (*D. laciniatus* and *pykei*) of an erect branching habit, somewhat like some *Raspailie*, but with a spined cylindrical instead of a spined acuate echinating spicule, as in *Echinodictyum*, which is thus further approximated to *Raspailia*. A slight enlargement of this genus, by admitting species which have the setaceous acuate, will, I believe, meet the requirements: it will then be distinguished from *Raspailia* only by a more robust habit and by having the fibre exclusively composed of acerate spicules:—

ECHINODICTYUM, *diag. emend.* Sponges erect, cup-shaped or ramose. Skeleton formed of spicules united into distinct fibres. From the fibres project at right angles short, strongly spined, cylindrical spicules, tapering from their attached ends; long, slender, smooth acuate (single-pointed) spicules may also be inserted upon the fibre, projecting from it at acute angles. Spicules composing fibre exclusively smooth, acerate (doubly pointed). No special flesh-spicules.

*Distribution.* Indo-Pacific region.

*Echinonema vasiculatum*, Carter, *Ann. & Mag. Nat. Hist.* 1882, ix. p. 114, S.W. Australia, and *Dictyocylinndrus laciniatus* and *pykei*, id., must be referred to this genus.

83. *Echinodictyum bilamellatum*.

*Spongia bilamellata*, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 434.

*Echinodictyum bilamellatum*, *Ridley, Journ. Linn. Soc., Zool.* xv. p. 493, pl. xxviii. figs. 1-6.

A dry specimen, very closely resembling in its external characters the one which I described (*l. c.*) from N.W. Australia, but not so well preserved. It differs somewhat from previously known specimens in the proportions, though not in the form, of its spicules, viz.:—Larger acerate, about  $\cdot 35$  by  $\cdot 018$  millim.; smaller acerate, about  $\cdot 17$  to  $\cdot 24$  by  $\cdot 0095$  millim.; spined echinating cylindrical,  $\cdot 099$  to

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Indian species *Ectyon sparsus*, appears to me to be specifically distinct both from Dr. Gray's and the present species for two reasons, viz. (1) the presence in it of a smaller grapple-spicule with *spined* shaft; and (2) the apparent absence of the tibiella. I propose the name *Aearnus carteri* for the West-Indian form.

·11 by ·0095 millim.; and thus gives a wider range to the possible variation in the sizes of spicules within the limits of a species.

The only locality hitherto known with certainty was N.W. Australia.

*Hab.* Port Curtis, Queensland (apparently from beach).

*Distribution.* N.W. Australia (*Ridley*).

*Obs.* This specimen most forcibly illustrates some remarks which I published in the 'Journal of the Linnean Society' (Zool. xv. p. 149), on the possible intrusion of extraneous spicules into sponges. The dermis contains, in fascicles and scattered, large numbers of a slender acuate form, which is wholly alien to the sponge, but whose appearance and position are so natural that I found it difficult to establish this fact. Re-examination of the slide referred to by me (*l.c. supra*, p. 495) as representing a specimen of this species, probably from Freemantle, S.W. Australia, has satisfied me that it is not referable to the species, but to one of those *Echinodictya* which possess fine acuate spicules in addition to the skeleton acerate (see above); the fine acuates were at first regarded by me as adventitious.

#### 84. *Echinodictyum costiferum*. (PLATE XLII. fig. *r*.)

? *Spongia costifera*, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 432.

Normally probably turbinate, forming an open cup; wall about 3 to 8 millim. thick, undulating. Inner surface uneven, beset at intervals of about 5 millim. with pointed monticular eminences, about 3 millim. high; outer surface proliferating into subdivided ridge-like or monticular eminences, each beset with several sharp points; these eminences are about 5 to 8 millim. high. Surface between eminences on both sides cancellated and more or less cavernous in dry state. Texture in dry state very harsh to touch, hard, brittle; colour pale buff-yellow. Main skeleton:—spiculo-fibre compact, no horny matter apparent, but surrounded by yellow sarcode; all fibres echinated by the spined spicules; consists of (i.) a longitudinal series of stout branching fibres, ·032 to ·095 millim. thick, running towards the free edge of the sponge, and outwards into its surface-eminences, where they form the sharp points referred to above, and (ii.) an intermediate network composed of meshes varying in shape from subrectangular (square or oblong) to oval and round, the angles always more or less rounded off, greatest diameter from ·06 to ·15 millim.; the deeper fibres bear the slender acuate spicule (No. 2) laid along the surface or projecting at very acute angles from it, sparingly. Dermal skeleton as main skeleton, but spicule No. 2 apparently absent.

Spicules:—(1) Smooth acerate, slightly bent, tapering to more or less sharp points from about 3 to 5 diameters from ends; size ·22 to ·28 by ·0079 to ·0095 millim.: forms the skeleton-fibre. (2) Smooth acuate, with well-rounded base, tapering gradually to fine point; size ·44 by ·005 millim.: on surface of deeper skeleton-fibres. (3) Spined cylindrical, tapering gradually from rounded base to the rather coarsely spined free end; spines distributed all over spicule,

numerous, low, sharp, those of distal half recurvate towards base; size of spicule  $\cdot 1$  to  $\cdot 14$  by  $\cdot 0079$  millim.

*Hab.* Port Molle, Queensland, from coral-reef.

Both in its external form and in the structure of its fibre this species much resembles *E. bilamellatum*; the form, however, is less definite here, and the presence of the fine acute effectually distinguishes this species. Its turbinate form separates it from *E. pykei* and *laciniatum*, and its rough outer and inner surface from *E. vasipliatum*, although it agrees with these three in possessing the fine acute spicule.

The dry specimen which represents it is not completely turbinate, but forms about three fifths of an open cup, not stipitate, at any rate in its present condition. There is little doubt that when fully grown it would be turbinate, as *E. bilamellatum* shows traces of an originally non-cup-shaped condition (and cf. varieties of *Phacellia ventilabrum*). The height is 50 millim. (2 inches), the extreme breadth of the cup 70 millim. ( $2\frac{3}{4}$  inches).

85. *Echinodictyum glomeratum*. (PLATE XL. fig. A;  
PLATE XLII. fig. p.)

Erect, stipitate; base spreading; stem short, branching frequently at acute angles and in an arborescent manner. Branches angular, more or less flattened, showing strong tendency to unite by their edges, forming a dense head, from which the rounded ends of the branches project to a short distance; maximum diameter of primary branches 7 to 10 millim., of terminal twigs 3 to 6 millim. Surface (in present dry state) even, but honeycombed by the spaces between the superficial skeleton-fibres; these bear small inconspicuous sharp points,  $\cdot 25$  to  $1\cdot 0$  millim. high, at intervals of about  $1\cdot 5$  millim. Vents? Texture in dry state harsh to touch, hard, incompressible, and almost inflexible; colour probably dull purple in natural state.

Main skeleton composed of compact spiculo-fibre; no horny matter apparent outside the spicules; spicules about 10- to 12-serial; arrangement non-rectangular, the meshes rounded, and the primary and secondary fibres not traceable as distinct fibres beyond one or two consecutive junction-nodes; meshes  $\cdot 28$  to  $\cdot 5$  millim. in greatest width; both primary and secondary fibres echinated at right angles by an abundance of the echinating spicule. Dermal skeleton composed of fibre similar in structure to that of skeleton, but ranging from 5 to about 20 spicules broad; meshes rounded, from  $\cdot 25$  to about  $\cdot 7$  millim. in width, echinated in same way as the primaries; the fibre composing the projecting vertical lines is similar in constitution to that of the main skeleton. Sarcode pale yellow, transparent or purplish brown, subopaque.

Spicules:—(1) Long setaceous acerate, sparse, echinating; smooth, tapering to sharp points; size about  $2\cdot 0$  by  $\cdot 0127$  millim. (2) Skeleton acerate smooth, slightly but rather suddenly bent in the middle, tapering to sharp points from about two diameters from



each end; size  $\cdot 19$  by  $\cdot 0079$  to  $\cdot 25$  by  $\cdot 0095$  millim. (3) Echinating spined cylindrical; base with slight globular inflation; tapering gradually to blunt distal end; spines short (the longest about  $\cdot 0016$  millim. long), thorn-like, sharp, shortest at apex, those of distal half more or less recurvate towards base, distributed equally over whole of spicule; size of spicule  $\cdot 095$  to  $\cdot 106$  by  $\cdot 01$  millim. (apex of spicule about  $\cdot 005$  millim. thick).

*Hab.* Thursday Island, Torres Straits, 4–5 fms.; bottom sand.

A single dry specimen, 70 millim. ( $2\frac{3}{4}$  inches) high by 60 millim. ( $2\frac{2}{5}$  inches) in greatest width. The arborescent growth distinguishes it at once from the turbinate *E. bilamellatum*, *vasiplicatum*, and *costiferum*, and the palmate, branched *E. nervosum*, mihi (Lamarck), the only species hitherto recognized; in fibre-structure it closely resembles *E. bilamellatum*, although the spicules are somewhat smaller. The much smaller smooth acute and acerate distinguishes it from *E. laciniatum* and *pykei*.

### *Echinodictyum glomeratum*, var. *subglobosum*.

Two dry specimens, consisting of an obsolescent stem, rising at once into a globular clathrous or honeycombed head, formed by rapid branching at subacute angles and free anastomosis; the branches appear to end bluntly on the surface in rough points, at about the same level (this, however, is perhaps partly due to abrasion on the shore). Texture rigid, harsh; colour pale brown in macerated, dark purplish in non-macerated specimen. Spicules:—(1) Long setaceous acuate, with well-rounded head, tapering to sharp point; size about  $2\cdot 0$  by  $\cdot 00127$  millim.: apparently echinating the bases of the primary fibres. (2) Smooth acerate of fibre, slightly curved, tapering gradually to sharp points; size  $\cdot 25$  by  $\cdot 0085$  millim. to  $\cdot 33$  by  $\cdot 0127$  millim. (3) Spined echinating cylindrical, with slightly indicated head and apex almost coming to a point; spines numerous, fine, sharp, straight at middle, recurvate at distal end of spicule; size  $\cdot 106$  to  $\cdot 16$  by  $\cdot 0085$  to  $\cdot 0095$  millim. Skeleton-fibres stout, compact, almost straight, sometimes with yellow transparent margins; secondary fibres given off at right, or more usually acute, angles from primaries.

*Hab.* Torres Straits, 5–10 fms.; bottom sand and coral.

A well-marked variety. The outward form and the almost pointed spined spicule distinguish this from the typical form. One specimen measures 40 millim., the other 75 millim. (3 inches) in both greatest height and diameter.

### 86. *Echinodictyum cancellatum*. (PLATE XL. fig. D; PLATE XLII. fig. q.)

? *Spongia cancellata*, Lamarck, *Ann. Mus. Hist. Nat.* xx. p. 456.

The short description of Lamarck agrees so closely, so far as it goes, with the external character of this sponge, that in default of information as to the minute characters of the old species, I assign



the present form provisionally to that species, with which it agrees much better than the form which I named *E. nervosum* (Journ. Linn. Soc., Zool. xv. p. 496). As to the locality at which *S. cancellata* was obtained, we have no more particular knowledge than that it was obtained by MM. Péron and Lesueur. As these travellers seem to have collected, among other places, on the north coast of Australia, this fact supports, if any thing, the above view as to its identity with the present species. In any case it will be best to describe the latter fully:—Erect, flabellate, clathrous. A short main stem gives rise to a clathrous reticulation lying in one plane, in which the original branches are only distinguishable near the base. Reticulation close, regular; meshes oval, the longest diameter lying in direction of long axis of sponge, about 10 by 5 millim. in average dimensions; the meshes form deep cells, occasionally closed by a septum of sponge-substance. The stem, branches, and the bars which complete the reticulation are oblong in transverse section, with rounded margins; hence the lateral surfaces are flat and the antero-posterior ones are rounded. Antero-posterior diameter of stem 32 millim., lateral diameter 18 millim.; antero-posterior diameter of the bars which form the ultimate reticulation about 10 millim., lateral diameter about 6 millim. A slight tendency to proliferation so as to form expansions parallel to the main plane of the sponge is shown by formation of a few meshes on the surfaces of the frond. Terminations of branches either united by connecting bars or projecting slightly as rounded lobose ends. Surface in dry (macerated) state quite even, appearing minutely reticulate. Texture firm, that of stem woody; substance of branches and reticulation rather brittle, slightly compressible; colour, in macerated condition, very pale yellow-brown.

Main skeleton rectangular in arrangement; primary fibres only projecting from surface by the tuft of echinating spicules which terminates them, compact, about 8 to 10 spicules broad; distance between them at surface about .4 millim.; echinated sparsely in interior, abundantly near surface of sponge, with the echinating spicule: secondary fibres compact, about 3 to 6 spicules broad, about .3 millim. apart, echinated abundantly with the echinating spicule. Dermal skeleton consisting of an irregular network with rectangular meshes, the meshes generally not exceeding .55 millim. in diameter; fibre compact, about 10 spicules broad, well echinated with the echinating spicule. Horny uniting material occasionally distinguishable outside fibre as a pale yellow transparent substance. Sarcodæ? (absent). Spicules:—(1) Skeleton acerate, smooth, slightly curved, tapering to sharp points from within about four diameters of the ends; size .22 by .0127 millim. (2) Echinating cylindrical, spined; both ends well rounded; spicule tapering slightly from base to apex; the apex about half the diameter of the base; spines distributed all over the spicule, rather more abundantly at base and near apex than elsewhere; those of the proximal half or one third of the spicule rather small, straight, sharp, the remainder longer, curved towards base; size of spicule .15 by .01 millim.: seat-

tered over surface of fibres, and aggregated into tufts at the ends of the primary fibres.

*Hab.* Warrior Reef, Torres Straits (apparently from beach).

A single dry specimen: extreme height 410 millim. ( $16\frac{2}{5}$  inches), extreme diameter 480 millim. ( $19\frac{1}{5}$  inches). This species resembles *E. bilamellatum* in the regularity of its skeleton and the compactness of its fibre. In outward appearance in the macerated condition, however, it has more the aspect of the Arabian form *nervosum*; but in this species the frond is only incipiently reticulate and the branches are much stouter. It differs markedly from both in the great length of the echinating spicule, almost half as long again as in those species.

87. *Raspailia bifurcata*. (PLATE XL. fig. J;

PLATE XLIII. figs. l, l'.)

Erect, arborescent; stem short, 3–4 millim. thick, branching dichotomously and frequently, in planes usually at right angles to each other and at angles of  $30^{\circ}$  to  $40^{\circ}$ ; terminal branches pointed, tapering to points from a thickness at origin of 1 to 1.25 millim. Stem and branches approximately cylindrical. Surface minutely hispid with sharp filiform points, about .3 millim. high and the same distance apart. Texture (in spirit) of stem and branches hard, woody, that of the tips of terminal branches soft and flexible; colour of stem and lower branches purple, of terminal branches white. Main skeleton composed of longitudinally arranged, sub-parallel loose bundles of the long acuates, accompanied by about the same amount of the acerate, covered and united by a considerable amount of pale purple tenacious material; the bundles anastomose freely by convergence at small angles; diameter ranging from about .28 millim. in stem to .05 millim. in tips of branches; surface sparsely covered by the spined acuate scattered over it. No distinct dermis; the surface is echinated at right angles by tufts, each composed of one or more long acuates; spicules projecting from a conical mass of purple tenacious substance. Sarcode very pale purplish, transparent. Spicules:—(1) Skeleton acuate, smooth, base well rounded, tapering gradually to sharp points (more rapidly near end); size about 1.2 by .0127 millim. (2) Skeleton acerate, smooth, slightly curved, tapering to sharp points from about six diameters from ends; size about .5 to .7 by .0095 millim. (3) Echinating acuate of dermal tufts, as (1), but measuring .022 millim. in thickness. (4) Spined cylindrical, tapering gradually from well-rounded base to blunt distal end, thickly and equably spined; spines fine, sharp, those of distal part of spicule recurvate; size .09 by .0079.

*Hab.* Prince of Wales Channel, Torres Straits, 5–7 fms.; bottom, shells and sand.

The specimen on which the species is based is 53 millim. (2 inches) high and 24 millim. across. The species much resembles *Dictyocylindrus pikei*, Carter, from Mauritius, in form, but, as we have seen, that species is referable to *Echinodictyum*.

The general form, the large development of acuate spicules, and the echination by the long acuate spicules ally the species more closely to *Raspailia* (*Dictyocylindrus*) than to *Echinodictyum*; the cylindrical form of the spined spicule agrees with the latter genus; but the share taken by the acuate spicule in the formation of the fibre is conclusive as to its belonging to *Raspailia*.

Subgenus SYRINGELLA, Schmidt.

In the description, in the Spong. Küste Algier., at p. 10, of a species from Algiers, named by him *Raspailia syringella*, Prof. Schmidt says that it diverges remarkably from the type of *Raspailia*, having but one form of spicule (spinulate) and (in the case of one specimen) a well-marked vent; he does not definitely form a new genus to contain it, but suggests that if the two characters referred to should, with further material, prove constant, a genus should be formed for the species, and named *Syringella*. Fresh material has now appeared, from which I describe the two following species. Although the spicular character of Schmidt's species is (essentially) reproduced in them, that of the presence of a vent is not; therefore, although I consider the group for which Prof. Schmidt provisionally proposed the name *Syringella* to be of subgeneric value, I do not feel justified in separating it generically from *Raspailia*. The group may be defined as differing from *Raspailia* in the absence of the spined acuate spicule. In the following species the skeleton-spicule has usually lost the head, which *R. syringella* retains well developed. It is interesting to find this subgeneric type so widely distributed.

88. *Raspailia* (*Syringella*) *australiensis*.

(PLATE XLII. figs. m, m'.)

Erect, unbranched, consisting of a single, slender, cylindrical column, tapering very gradually from about two thirds of the height to the base on the one hand and to the rounded free extremity on the other; diameter at base and summit about half that of the thickest portion of the stem. Surface in spirit semi-gelatinous in appearance under lens, and minutely pilose and velvet-like; it is corrugated by closely set, irregularly interrupted, longitudinal ridges. The sponge is, as a whole, tough and elastic; the corrugated superficial layer loose and fragile, its greatest thickness about 1 millim. Colour in spirit dirty white. The stem is formed by a dense flexible rod of a dull yellow colour and smooth surface. Vents not perceptible to naked eye or lens. Skeleton of axis consisting of a close network of tracts of skeleton-spicules, the tracts mostly arranged longitudinally, and connected by smaller tracts set at oblique angles to them (as in *Axinella*, Schmidt, but much closer together); tracts often confluent, at most only .15 millim. apart; no soft substance is apparent uniting the spicules. Skeleton of cortical soft layer consisting of fascicles of skeleton-spicules, radiating

horizontally from the axis, about .4 millim. apart, each about 10 to 20 spicules broad; the spicules appear to be simply imbedded in the dense, dull yellow sarcode which forms the chief part of the cortex, and they project about .4 millim., diverging somewhat, from its surface. Sarcode dull yellow, subtransparent, no distinct granules visible. Spicules:—(1) Skeleton acuate, long and slender, tapering gradually to basal rounded end from about ten diameters from base, and very gradually to the sharp point (the basal portion is thus little more than half the maximum diameter of the spicule); size about .7 by .013 millim. (2) Smaller acuate; as (1), but size about .5 by .004 millim.

*Hab.* Port Darwin, 7–12 fms.; bottom sand and mud.

This fine species is represented by two good specimens in spirit, of which the largest measures 160 millim. ( $6\frac{2}{5}$  inches) in height by 4 millim. in greatest thickness. Near the base the axis is very tough, and consists almost entirely of continuous colourless or pale amber horny matter and of the imbedded spicules. As the skeleton-spicules are simply acuate, not spinulate, the distinction between this species and *R. syringella* is seen to be well marked.

### 89. *Raspailia* (*Syringella*) *clathrata*.

(PLATE XLI. fig. F.)

Erect, branched approximately in one plane; mode of branching essentially dichotomous, at angles of about  $45^\circ$ , anastomosis frequent. Stem rudely cylindrical, 5 millim. in greatest diameter; branches flattened out laterally, lateral margins sharp; lateral diameter of largest branches 5 millim., of terminal branches 1 to 1.5 millim. No vents observed. Surface, in spirit, covered with low obsolescent ridges, running into each other. Texture of branches in spirit tough, elastic; the terminal branches compressible, the larger ones hard, the stem almost rigid; colour pale dirty grey.

Skeleton consisting of the skeleton-spicule traversing longitudinally the branches and stem, about equally distributed throughout their thickness, and of horizontal bundles of the same radiating towards the surface, about 3 or 4 bundles in the circumference, about 10–12 spicules broad. No distinct dermis. Sarcode pale yellow, subtransparent. In the base the reticulum of spiculo-fibre is backed by some horizontal (circular) horny fibres, amber-yellow, .9 millim. and upwards in thickness; the bases of the radiating tufts and the general reticulum of spicules is more or less sheathed in horny fibre (which is quite pale in this place). Spicules smooth acuate, with well-rounded heads, tapering gradually to fine points; size about .6 by .011 millim. in the horizontal bundles, from .6 by .0032 to .6 by .0095 millim. in the longitudinal series.

*Hab.* Thursday Island, Torres Straits, 7–12 fms.; bottom sand.

The specimen which furnishes the above description is 105 millim. ( $4\frac{1}{5}$  inches) high and 80 millim. ( $3\frac{1}{5}$  inches) across the broadest part. It is remarkable for having several small stones and shells attached to some of the outer branches, which perhaps indicates that the



frond, though only curved somewhat to one side in the plane of expansion, was in life decumbent, so that the terminal branches were then in contact with the sea-bottom. The species differs from *R. australiensis* in the branching and anastomosing habit and the flattened knife-edged branches, and in having the longitudinally arranged spicules not confined to the axis, but extending to the cortex. From *R. syringella*, Schmidt, it also differs in its growth (though Schmidt mentions that the branches of *R. syringella* sometimes unite) and in the absence of heads to the acute spicules.

### AXINELLIDÆ.

Axinellida, Carter, *Ann. & Mag. N. II.* 1875, xvi. p. 133.

This family differs from the Ectyonidæ in the much greater importance of *size* of spicule as a factor of specific distinction. The relations of the two families, however, require readjustment on more satisfactory bases than at present.

#### 90. *Axinella echidnæa*. (PLATE XLIII. fig. a.)

? *Spongia echidnæa*, Lamarck, *Ann. Mus. Hist. Nat.* xx. p. 448.

It seems likely that this will prove to be Lamarck's species. That author refers (*l. c.*) to Seba (Thesaurus, iii. pl. xcix. fig. 7) in illustration of his sponge. This figure has a strong resemblance to the present species, but does not show the same tendency to lateral junction between the branches, and has most of the latter somewhat enlarged at the tips, whereas in these specimens they usually, though not invariably, are either of about the same diameter throughout or else taper to points. The dark reddish-brown colour of these specimens and the peculiar echination of their surface by angular wedge- or knife-shape processes about 2 to 4 millim. high, projecting outwards and somewhat upwards, are decidedly indicated in the figure. In texture the specimens are tough, elastic, harsh to the touch in the dry state; the surface-processes are flexible, almost soft, in spirit. In structure it is a true *Axinella*, and thus does not support Lamarck's surmise that it might be identical with *Spongia muricata* of Esper (Pallas, sp.), which is *Tricentrium muricatum* of Ehlers. The main skeleton exhibits the usual longitudinally elongated meshes of loose spiculo-fibre, which in the stem is composed in part of a transparent and almost colourless horny uniting material, which seems to be wanting in the surface-tufts; distance between longitudinal lines of axis .07 to .1 millim. Surface covered with a fuscous-brown subopaque pigment, which penetrates to a slight distance below. Sarcod transparent, almost colourless, very pale reddish brown. Spicules:—(1) Smooth, slightly curved acerate, tapering gradually to sharp points, or more or less blunted at one or both ends; size .3 by .0095 to .44 by .0127 millim.: these



forms compose the main bulk of the skeleton. (2) Long smooth acuminate, generally slightly curved, tapering gradually to a fine point; size about 1.1 by .0127 millim.: forming part of longitudinal skeleton-lines of surface-tufts.

*Hab.* Thursday Island and Prince of Wales Channel, Torres Straits, 4-7 fms.

*Distribution.* "African coasts?" (*Lamarek*).

As pointed out in speaking of the characters of the ends of the branches, this form shows considerable variability: as a rule the specimens are chiefly branched in one plane (fan-like), but in two specimens branches project from both faces, but they then tend to form fan-shaped fronds parallel to the main frond. The largest specimen measures 160 millim. ( $6\frac{1}{2}$  inches) high by 160 millim. wide; the average maximum diameter of the distinct branches (which are cylindrical or somewhat compressed), not that of the broadest but obviously compound branches (which occur commonly), is about 10-12 millim. Five specimens occurred.

### 91. *Acanthella*, sp.

Externally resembling *Spongia carduus*, Lamarek (Ann. Mus. Hist. Nat. xx. p. 381). When guided by the description alone, I had referred the present specimen to this species with more confidence than usual; but on mounting sections of the probable type specimen at Paris, I saw that it was a different species. The points in which the description does not quite suit this form are "pédicule cylindracé, très-dur," the stem having apparently been flattish, and, though stiff, not inflexible; and "couleur d'un blanc grisâtre," whereas this (in spirit) is flesh-colour. The ridges run longitudinally up and down the sponge, and are 1 to 3 millim. high, and their free edge is beset with sharp (in spirit flexible) points at intervals of one or two millimetres. Texture tough and flexible, substance compact, surface between inequalities glabrous. It is a true *Acanthella*. The spiculation is as follows:—(1) Smooth acuminate, slightly curved, tapering gradually to sharp point, about .4 to .6 millim. by .0095 millim. (2) Smooth undulating cylindrical with rounded ends, length about .7 millim., diameter just .0063 millim.

The species differs from the Adriatic forms *A. acuta* and *obtusa*, Schmidt, in the broad explanate form and in the smaller size of the spicules, the cylindrical being much shorter and thinner, the acuminate much shorter than in those species. The skeleton forms a loose-fibred *Axinella*-like network of spicules, imbedded in a dense, transparent, almost colourless mass of caoutchouc-like consistency, containing nucleoid bodies about .007 to .008 millim. in diameter.

*Hab.* Prince of Wales Channel, Torres Straits, 7 fms.

A single specimen in spirit, 35 millim. ( $1\frac{2}{5}$  inch) high by 29 millim. across.

## LEUCOPHLEUS.

Carter, *Ann. & Mag. N. H.* 1883, xii. p. 323.

92. *Leucophleus fenestratus*. (PLATE XLII. fig. s.)

Massive, suberect, terminating above in thin edges, on each side of which open wide pouch-like vent-cavities, which also open to the surface laterally by rounded apertures. Surface minutely undulating, but glabrous. Texture in spirit rather tough, compressible, soft; colour dull greyish brown. Main skeleton composed of irregular, very loose tracts of spicules, 3 to 10 spicules broad, extending in various directions and lying at various angles; the dermis is supported by some closely set subvertical tracts of similar character lying between the subcortical crypts. Dermal skeleton composed of very loose and irregular tracts or aggregated masses of spicules intercrossing so as to form an almost continuous sheet, in the intervals of which are placed the pores. Sarcode pale brown, subtransparent. Spicule smooth straight, or almost straight acuminate, tapering gradually from centre to moderately sharp point, and from centre gradually to well-rounded undilated base, which has, however, only about half the diameter of the centre of the shaft; size of spicule  $\cdot 5$  to  $\cdot 8$  by  $\cdot 019$  to  $\cdot 022$  millim.

*Hab.* Port Darwin, 8–12 fms.; bottom sand and mud.

The height of the single specimen is 38 millim., greatest diameter (at base) 20 millim.; it forms an irregular, elongated pyramid, with the apex flattened out and somewhat twisted. In size and shape of the spicules the species resembles *Hymeniacidon crustula*, Bowerbank (*Mon. Brit. Spong.* ii. p. 185), from the British Seas, which is, however, massive or mammillated and, owing to the inferior diameter ( $\cdot 012$  millim.) of the spicule, shows the slenderness of the basal end much less distinctly. It is nearly related to *L. massalis*, Carter (*l. c.*), from W. Australia, but is darker in colour, is less distinctly penicillate, and has the spicule rather larger.

*Leucophleus fenestratus*, var. (PLATE XLIII. fig. g.)

A dry, upright, flattened specimen, which has grown around a Hydroid bush, appears closely allied to the above species. It appears to have formed part of a long wall-like mass, 70 millim. ( $2\frac{1}{2}$  inches) high and 15–20 millim. thick. Like it, it is surmounted by pyramidal processes, and is traversed from the upper surface downwards by large cloacal spaces. Colour white, with a tinge of green. The spicules differ from those of the typical form in measuring  $\cdot 9$  by  $\cdot 032$  millim.: as, however, a small series of specimens of this species from the western part of the Indian Ocean (see Part II. of this work) includes within itself as great a variation in this respect as is shown by these two Australian specimens, I do not assign distinct varietal names to these two, at first sight, very distinct Australian specimens.

*Hab.* Arafura Sea, 32–36 fms.; bottom sand, mud, and shells.

## SUBERITIDÆ.

Suberitida, *Carter, Ann. & Mag. N. H.* 1875, xvi. p. 133.

No strikingly new form occurs in this group. It is remarkable that from so large an Australian collection *Tethya* is altogether absent, though Dr. Bowerbank long since showed that it is well established in these seas.

93. *Suberites carnosus*.

*Halichondria carnosa*, *Johnston, Brit. Spong.* p. 146, pl. xiii. figs. 7 & 8.

Two specimens undistinguishable from British specimens of this common species. Mr. Carter has recorded its occurrence at Kerguelen Island (*Phil. Trans.* clxviii. p. 287). The present specimens are greenish white in spirit and irregularly lobate in shape; one appears to have been attached by the base, the others to have been quite unattached. The spicules have a suboval head, the free end projecting slightly beyond the actual enlargement of the head, and measure  $\cdot 28$  to  $\cdot 57$  by  $\cdot 0063$  millim. (the spicules of the Johnstonian type measure  $\cdot 45$  by  $\cdot 0063$  millim., and have a similarly formed head). The arrangement of the skeleton-fascicles is also closely similar, the greater distance between them in the present specimens being probably due to the more natural conditions retained by preservation in spirit.

*Hab.* Port Jackson, 0–5 fms.

*Distribution.* British Islands (*Bowerbank*).

94. *Suberites epiphytum*.

*Alcyonium epiphytum*, *Lamarck, Mém. Mus. Hist. Nat.* i. p. 163.

Lamarck's species, as I have ascertained from the original specimens in the Museum at the Jardin des Plantes, is a *Suberites* coating a fucus with a thin lamina of sponge (in which are imbedded a number of spinulate spicules whose heads rest for the most part almost directly on the supporting fucus, while their points project freely to the exterior). There is no flesh-spicule. The spinulate skeleton-spicule is generally curved, and gradually tapers to a sharp point; the head is transversely elongated, the side at which it is attached to the shaft being flat, and the free end curved, but more gradually than the lateral parts (in fact the shape is nearly that of the head of the spicule of *Caulospongia*, Kent, which Mr. Carter has graphically compared to a door-handle); the head is not unfrequently surmounted by a slight prominence (marking the aborted second ray, if the spinulate spicule is to be regarded as a uniaxial, biradiate spicule, with one ray aborted). In the type specimen there is some dark granular matter between the spicules. The

spirit-specimen in the present collection is in reality entirely incrusting, though apparently in part erect and cylindrical, owing to its growing along the stem of a Tubularian Hydroid, which is planted on the back of the crab on which the sponge-growth commenced. In the thicker parts of the sponge the spicules form long tracts, about 6 spicules in breadth, connected by interdigitation, or by loose, irregularly crossing spicular tracts. The sarcode is subtransparent, somewhat granular, diffusely stained of a reddish-brown colour. The spicules in both the type and the present specimen measure about .25 millim. in length by .0063 millim. in the diameter of the shaft.

*Hab.* Port Curtis, Queensland, 7 fms.

*Distribution.* "Probably the seas of America" (*Lamarch*).

### HYMENIACIDON.

*Bowerbank, Mon. Brit. Spong. i. p. 191.*

It appears to me that Bowerbank's genus should be retained for those sponges with spiculo-fibrous skeleton without horny matter, but in which primary lines are distinguishable, breaking up at the surface and more or less within the sponge into tufts (thus forming tracts which represent the secondary fibres of *Renieridæ*), and in which there is but one form of spicule, a slender skeleton acuate with or without indications of incipient spinulation. Such are the characters derived from *H. caruncula*, Bowerbank, the species which that author (*l. c.*) has named as the type of his genus. It differs from *Suberites* in the absence of distinct spinulation of the skeleton-spicule. Schmidt refers this sponge to *Amorphina* (*Spong. Atl. Geb. p. 76*), although he assigns in his diagnosis (*op. cit. p. 40*) *acerate* spicules to that genus, which belongs to the family *Renieridæ*, whereas *Hymeniacidon* s. str. is decidedly a *Suberitid*, closely allied to *Suberites*.

#### 95. *Hymeniacidon caruncula*, Bowerbank.

A broad, horizontally extended specimen from a crab's back; it presents a few short mamillæ on its free surface. The form of the spicules and arrangement of the skeleton are fully in accordance with the type specimens of this British species. The spicules measure .23 to .29 by .0063 to .008 millim.; those of the type specimen from Tenby, .19 to .32 by .0063 to .008 millim.

*Hab.* Port Jackson, 5-7 fms.

*Distribution.* British seas (*Bowerbank*).

#### 96. *Hymeniacidon agminata*.

(PLATE XII. fig. E; PLATE XLIII. figs. *f, f'*.)

Aggregations of erect, flexuous, more or less compressed stems, 8 to 10 millim. in longest diameter, anastomosing; subdividing in a

cymose manner into branches. Branches in part subcylindrical, in part compressed like the stems, of same diameters as stems; they divide and subdivide and anastomose irregularly, and frequently terminate in short vermiform tips about 10 millim. long by 2 millim. thick. Surface of sponge even, smooth. Texture in spirit rather tough, but dough-like, somewhat elastic. Internal structure subcompact, excretory canals small. Vents small, few, oval, 1 millim. in greatest diameter, with thin collapsing margins; near ends of branches. Colour in spirit pale greenish white.

Main skeleton consisting, beneath surface, of very loose spicular tracts confusedly arranged; at the surface they are set regularly at right angles to it, and are about 8 to 10 spicules broad, with intervals of .07 to .14 millim. between the tracts. Dermal skeleton formed by the points of the vertical tracts just mentioned, which do not project from the surface, and by a single thin layer of spicules scattered horizontally on the surface. Sarcode very pale, transparent. Spicules smooth, subspinulate, straight or slightly curved; head merely a slight enlargement of shaft, only slightly larger than adjacent part; shaft tapering to sharp point from near base; size .28 by .0063 millim.

*Hab.* Port Jackson, 0-5 fms.

A single spirit-specimen, 90 millim. ( $3\frac{1}{2}$  inches) high, 55 millim. ( $2\frac{1}{4}$  inches) in diameter. This species recalls in colour and consistency *Suberites carnosus*, which, however, differs in its compact form and in the basal protuberance on the head of its spicule. The habit of growth is more that of *Suberites antarcticus*, Carter (Ann. & Mag. N. H. 1882, ix. p. 350); but in that species the colour is dark brown, and the spicule much larger and provided with a large spherical head. It is near *H. caruncula*, only the spicules are of a rather smaller average size, and the head is slightly more pronounced; but the chief differences are the erect branched growth as opposed to the horizontal, merely mammillated habit of *H. caruncula*, and the pale whitish, not brown or yellow, colour.

#### 97. *Hymeniacidon*, sp.

A small incrusting specimen of a dull dark crimson colour, in spirit; the margins glabrous, the centre of the surface roughened by small conuli about .5 millim. high and .5 to 1 millim. apart. Primary skeleton-lines compact, about 10 spicules broad. Spicules smooth acuate, tapering gradually to fine points; size .16 to .22 by .0042 millim.

*Hab.* West Island, Torres Straits, 7 fms.

#### SPIRASTRELLA, Schmidt.

In accordance with the rules of zoological nomenclature, the generic designation *Suberites* (Nardo) should be retained for those species only which are generically identical with the type of Nardo's



genus. The first species, *Suberites typus*, Nardo, does not appear to have been recognized by authors; the next is *Acyonium domuncula* of Olivi, the *Hymeniacidon suberea* of Bowerbank, the spiculation of which consists of a simple spinulate. Even if we include in the genus the third species, *Suberites ficus*, Nardo (probably the *Hymeniacidon ficus* of Bowerbank), which possesses, in addition to the spinulate, a cylindrical flesh-spicule with a central inflation, those free compact Suberitidæ, with skeleton spinulate, whose flesh-spicule is a modified stellate ("spinispirula," Carter), cannot be admitted to the same fellowship, and Schmidt's genus *Spirastrella* must receive all such. Besides *Spirastrella cunctatrix* and *vidua*, Schmidt, *Hymeniacidon angulata*, Bowerbank, *Acyonium purpureum*, Lamarek, and several other species enumerated by Mr. Carter in his valuable "List of Suberites" lately published (Ann. & Mag. N. H. 1882, ix. p. 349 and following pages) must be included in the genus. To any one who has noticed the practical identity in spiculation between typical *Spirastrella* and numerous species of *Vioa* (e. g. *johnstoni*, Schmidt, and several described by Hancock as *Clione*), it must be a matter for serious consideration whether the boring habit and that general arrangement of their tissues which is expressed by Mr. Carter by the term *Laxa*, which he has applied to the group in which he places *Clione* and *Vioa*, are of sufficient importance to justify their being kept distinct from their non-boring allies, the *Spirastrella*. To me it seems very possible that they may some day be demonstrated to possess a free state, corresponding to *Papillina suberea*, Schmidt (= *Rhaphyrus griffithsii*, Bowerbank), which Mr. Carter has found to be merely the free condition of *Vioa* (*Clione*) *celata*; such a free state should be carefully watched for.

98. *Spirastrella vagabunda*. (PLATE XLIII. figs. *e*, *e'*.)

"Suberites, ? sp. undescribed. Trincomalee."\* Carter, Ann. & Mag. N. H. 1882, ix. p. 352.

Massive, attached by broad base, tending to grow up into large nodular elevations, which may bear one or more vents. General surface slightly verrucose (in spirit), more so in large dry specimens, smooth over and between inequalities of surface. Colour (in dry state) pale to dark yellowish brown, in spirit olive greenish brown. Vents of two kinds:—(1) At summit of the large elevations of surface, one or more (sometimes 5 to 8) on each; opening level with surface; suboval in uncontracted state, 2 to 10 millim. in greatest diameter, leading into wide and deep excretory canals. (2) On general surface of sponge, usually between the lesser inequalities of the surface, subcircular, with thickened margins, about .8 millim. in average diameter.

\* In the Trincomalee specimen described by Mr. Carter the vents are not placed at the apices of the lobes of the sponge, the adult spicule is scarcely spinulate at all, and measures only .0127 millim. in diameter, and the spinispirulæ appear to be scarce. For these reasons it appears desirable to distinguish it under the name *S. vagabunda*, var. *trincomaliensis*.

Internal structure rendered cavernous by the wide canals of the excretory system; texture of internal structures moderately tough. Internal skeleton formed of trabeculae and sheet-like expansions some larger trabeculae formed of crossed skeleton-spicules strengthened by dense sarcoderm proceed from the interior and support the cortex; they are from  $\cdot4$  to  $\cdot8$  millim. in diameter. A strong cortex, about  $\cdot8$  millim. thick, tough, formed chiefly by the skeleton-spicules much intercrossed, and united by a somewhat dense, brownish, sub-transparent sarcoderm (becoming less visible when the specimen is dried). Spicules:—(1) Skeleton spinulate, strong, slightly curved; head oblong, almost oval; shaft gradually diminishing to about two thirds of its full diameter towards head, and tapering gradually to sharp distal point; average maximum size  $\cdot6$  by  $\cdot02$  millim. (2) Spinispirular, delicate, composed of about three rather sharp bends, with about 4 to 8 rather blunt spines,  $\cdot0021$  millim. long, to each bend; shaft of equal diameter in all parts; average maximum size  $\cdot032$  by  $\cdot0016$  millim. (exclusive of spines).

*Hab.* Thursday and West Islands, Torres Straits, 4–7 fms.; bottom sand or coral.

*Distribution.* Trincomalee (Carter); Galle coast, Ceylon (*coll. Mus. Brit., ex coll. Dr. Ondaatje*).

The external appearance of this fine species is more characteristic and constant than is usual in the Suberitidae. Mr. Carter has shortly described it, but without name. The largest specimen known to me is one brought by Dr. Ondaatje, Colonial Surgeon, from Ceylon, which measures 225 millim. by 130 millim. (9 by 5 inches), by 60 millim. ( $2\frac{1}{2}$  inches) in greatest thickness; it was obtained at or near low-water mark.

The species is nearly allied to *Hymeniacidon angulata* of Bowerbank (Madeira), but has a skeleton-spicule of twice the diameter of the spinulate found in that species.

The spicules show no striking variation in size; the length of the spinulate varies from  $\cdot55$  to  $\cdot63$  millim. in different specimens; its breadth and the size of the flesh-spicule are almost constant.

*Colour.* This is produced by a number of globular or suboval cells of olive-green colour throughout, provided with a large nucleus of a darker colour; they measure about  $\cdot0095$  millim. in diameter, and have a well-defined outline; they appear to be confined to the mesoderm.

### 99. *Spirastrella congenera.* (PLATE XLIII. figs. *d, d'*.)

Massive, attached by broad base, tending to rise into pyramidal or cylindrical lobes, each terminated by the vent. General surface even, smooth (in dry state). Colour (in dry state) pale fawn. Vent (in the single dry specimen) oval, 8 millim. in greatest diameter, leading deeply into the body of the sponge, the margin level with the general surface (in the single specimen a tongue-like process, 8 millim. high, stands at one side of it). Internal structure cavernous, with wide spaces; texture of internal structures moderately tough.

Internal skeleton formed by a coarse network of loose spiculo-fibre, the subcortical ends of the fibres rising up so as to support the cortex. A strong cortex composed of a zone of chiefly subhorizontal skeleton-spicules united by sarcodic substance, and about .45 millim. in thickness.

Spicules:—(1) Skeleton spinulate, very large, decidedly curved, tapering gradually to a sharp point; head oval, shaft tapering slightly towards it, forming a decided but slight neck; size .8 by .035 millim. (2) Spinispirular, either delicate, long, composed of about three bends, which are gradual, so that no part of the whole spicule lies much out of the straight line; size .05 to .056 by .0016 millim.; or, rather stouter and shorter, with only two bends, size .032 by .0022 millim.; in either case about 10 spines to a bend; spines slender, sharp-pointed, .0022 to .0032 millim. long.

*Hab.* Thursday Island, Torres Straits, 4–5 fms.

The, unfortunately, single and dry specimen measures 35 millim. ( $1\frac{1}{2}$  inch) high by 25 millim. (1 inch) in extreme breadth.

The species has in the dry state the colour and much of the appearance of *S. vagabunda*; both forms of spicule, however, are considerably larger than in that form and the angulation of the flesh-spicule is less abrupt. It is, however, undoubtedly nearly related to it.

#### 100. *Spirastrella decumbens*. (PLATE XLIII. fig. c.)

Incrusting, thin (.5 to 10 millim. thick). General surface level (except where affected by the inequalities of the substance to which it is attached), glabrous. Colour in spirit grey, slightly tinged with pink. Vents not made out with certainty. Texture tough and leathery. Internal structure very compact; no large spaces seen, as a rule, in vertical sections. Sarcode dull greenish, sub-transparent, coloured diffusely. Skeleton consisting of loose spicular tracts, about 6 to 10 spicules broad, running obliquely or at right angles to the surface, and occasionally forming slight prominences, protected by the cortex, and of loose skeleton-spicules lying in all directions between them. Cortex consisting of a layer, two or three spicules deep, of the flesh-spicule, lying in almost colourless sarcode.

Spicules:—(1) Skeleton spinulate, slender, tapering very gradually to a sharp point, and very gradually also to the head, below which the shaft forms a decided and well-defined neck; head oval, rather pointed at free end, of about the same diameter as the middle of the shaft, viz. .0095 millim.; length of spicule .35 millim. (2) Spinispirular, moderately stout to stout, consisting of two bends, about 12 spines to a bend; spines strong, tapering from broad bases to sharp points, length about .0045 millim.; length of spicule .025 millim., thickness (excluding spines) .0032 to .0063 millim.

*Hab.* Alert Island, Torres Straits, 7 fms. (growing over a tubular *Retepora*).

This species appears to be more nearly allied in its spiculation to *S. (Alcyonium) purpurea*, Lamarck, than to any other Indo-Pacific species, but it differs from it in wanting the magnificent crimson colour

of that form, in its incrusting habit (*purpurea* being massive), in the inferior diameter of the shaft of the spinulate and the superior length of the spinispirular spicule (in *purpurea* these dimensions are respectively .013 and .016 millim.), the latter usually consisting in *purpurea* of only one to one and a half bends.

The single spirit-specimen measures 32 millim. ( $1\frac{1}{4}$  inch) in height by 30 millim. in longest diameter, by 10 millim. ( $\frac{1}{3}$  inch) in greatest thickness.

### TETRACTINELLIDA.

The family *Lithistidae* is not represented. This is not surprising if it is remembered that the depths investigated did not exceed 40 fms. Mr. Carter's better fortune with collections from Ceylon is in part due to the greater depth at which the specimens were obtained.

### CHORISTIDÆ.

Sollas, *Ann. & Mag. N. H.* 1882, ix. p. 164.

Prof. Sollas has since proposed a different arrangement of the Tetractinellida, but the division into Choristidæ and Lithistidæ appears a natural and convenient one. The species obtained, though few in number, are of remarkable interest, and all new to the Australian seas.

### STELLETTA, Schmidt.

This genus, as at present constituted, is decidedly heterogeneous. Some of Schmidt's and Carter's species appear referable either to *Geodia*, or some genus intermediate between *Geodia* and *Stelletta* (by virtue of the transitional character of their ball-stellate spicule), while *S. euastrum* appears distinct by virtue of its *disks*. The more typical forms appear to be divisible into subgroups which coincide roughly with their geographical distribution. Thus the Atlantic species mostly have medium-sized stellates, with numerous rather coarse, pointed rays; the Indo-Pacific ones have few-rayed stellates, usually minute; of the latter, the Fijian and two of the Ceylon forms agree in having a small surface bacillate or acerate spicule, while one Ceylon form (*S. tethyopsis*) and all the Australian ones known at present agree in having only minute delicate rayed stellates.

The Indo-Pacific species of *Stelletta*, s. str., may be divided into two groups:—

#### Group 1. With bacillar or acerate flesh-spicule.

1. *S. (Ecionemia) acervus*, Bowerbank, P. Z. S. 1873, p. 322, pl. xxx. figs. 1-6. Fiji Islands.

2. *S. (Ecionemia) densa*, id. l. c. p. 322, pl. xxx. figs. 7-14. Fiji Islands.

3. *S. (Tisiphonia) nana*, Carter, Ann. & Mag. N. H. 1880, v. p. 138, pl. vii. fig. 43. Gulf of Manaar, Ceylon.



4. *S. crassicula*, id. ibid. p. 371. Basse Rocks, Ceylon.
5. *S. australiensis*, id. op. cit. 1883, xi. p. 350, pl. xiv. fig. 2. W. Australia.
6. *S. bacillifera*, var. *robusta*, id. loc. cit. p. 351, pl. xiv. fig. 3. S. Australia.

Group 2. Without bacillar or acerate flesh-spicule.

7. *S. tethyopsis*, Carter, Ann. & Mag. N. H. 1880, v. p. 137, pl. vi. figs. 39, 40. Gulf of Manaar, Ceylon.
8. *S. globostellata*, id. op. cit. 1883, xi. p. 353, pl. xiv. fig. 5. Galle, Ceylon.
9. *S. bacca*, Selenka, Zeitsch. wiss. Zool. xvii. p. 569, pl. xxxv. figs. 14, 15. Samoa Islands.
10. *S. purpurea*, sp. n. N. coast of Australia.
11. *S. clavosa*, sp. n. N. coast of Australia\*.

In no Atlantic *Stelletta* which I have seen do the minute or any stellates possess *capitate* rays, except in a MS. species of Schmidt's from Florida, which has minute drawn-out stellates (*i. e.* incipient spinispirular spicules) with very slight heads to the slender rays: a larger stellate is, however, present in addition to these, and has not heads to its rays; the large stellate of *S. intermedia*, Schmidt, from Algiers, has the ends of the rays roughly tuberculated by prominent groups of tubercles, but the spicule itself seems to be homologous with the "balls" of *Geodia*, and not with the small stars of *Stelletta*, which are present as well. The Indo-Pacific species more often have the head. In *Stelletta* (*Ecionemia*) *densa*, Bowk., from the Fiji Islands, the tuberculation of the rays is sometimes rather coarser at their apices than on the remaining part, and in *Ecionemia acervus* the rays of the delicate stellate are very fine and slightly capitate. Carter does not describe or figure any heads on the rays of the stellates of his species from this region except *S. globostellata*. Selenka's species has no heads.

The two species from Australia to be first described agree with each other and with *Ecionemia acervus* in having small heads to the stellates, although they differ from it, and agree with *Stelletta tethyopsis*, in the probably more important character of the absence of a flesh acerate or bacillar spicule; the character of the apex of the ray of the stellate in the latter species has not been described. The Samoa-Islands species has no surface linear spicule assigned to it by its describer, but it differs fundamentally from our species in its large, noncapitate-rayed stellate.

\* *S. cuastum* of Carter (? Schmidt) described (Ann. & Mag. Nat. Hist. 1882, v. pp. 135, 136, pl. vii. figs. 41, 42) from the Gulf of Manaar and Australia, includes two distinct species, of which the first at any rate is distinct from Schmidt's species; they belong to a remarkable group of forms which connect *Stelletta* with *Geodia*: the surface-disk forms a character of sufficient importance to distinguish the species which possess it from *Stelletta* s. str. *S. nux* of Selenka (Zeitsch. wiss. Zool. xvii. p. 569, pl. xxxv. figs. 11-13), from the Samoa Islands, is probably a *Tethya* s. str., as its stellate agrees with the large stellate of that genus, and its "forks" are rare and probably foreign to the sponge.



101. *Stelletta purpurea*.

(PLATE XL. fig. E; PLATE XLIII. figs. j, j'.)

Free, subspherical or suboval. A single circular vent (about 2 millim. in diameter in moderate-sized specimens) often present; it leads deeply into the sponge. Surface subpapillose, *i. e.* embossed with small semiglobular elevations, visible most readily under a lateral light. Colour purple in spirit, when well preserved. A distinct cortical layer with sarcode of the same consistency as that of the central part of the sponge, about .7 millim. broad, containing the subcortical crypts, and formed (in adult specimens) by the space intervening between the heads of the superficial zone-spicules; a subcortical zone of anchors and smaller zone-spicules. Deep sarcode transparent, brownish yellow; that of surface purplish red, rather granular.

Spicules:—(1) Zone-spicule; shaft stout, tapering gradually to sharp point, 1.4 to 1.6 by .045 to .06 millim.; arms strong, tapering gradually to sharp points, projecting somewhat forward at the commencement, and then curving backwards slightly, .27 by .043 to .06 millim. in length and breadth respectively. (2) Anchor, long, tapering to sharp point; head almost flat above; arms turning rather abruptly back to form an angle of about 45° with shaft, tapering to sharp points; expanse of arms at their points .1 millim.; diameter of shaft about .035 millim.; length of shaft about 2 millim., of arms about .07 millim. Head usually lying below the zone of "chones." (3) Body acerate, long, slender, tapering very gradually from centre to sharp points: size about 1.5 to 2 by .037 millim. (4) Minute stellate of flesh; about 7 to 10 arms; no perceptible body; arms straight, very slender, *viz.* about .0008 millim. in diameter, apparently smooth, terminated by minute head; diameter of spicule across arms .02 to .025 millim.: distributed throughout all parts of the sarcode.

*Hab.* Prince of Wales Channel, Thursday Island, and West Island, Torres Straits, 4–9 fms.; bottom sand or sand and coral. Port Darwin, 7–12 fms.; bottom sand and mud. Arafura Sea off N.W. coast of Australia, 32–36 fms.; sand, mud, and shells.

Specimens not abundant at any of the stations. The single specimen from West Island is remarkable for being half covered by specimens of *Iotrochota purpurea*, *Rhizochalina singaporensis*, *Cladochalina nuda*, and a coralline.

*Stelletta purpurea*, var. *retroflexa*. (PLATE XLIII. fig. k.)

This name may be applied to a specimen which has the expanse of the arms of the zone-spicule somewhat greater than in the typical form, while their diameter is less, and one or more of the arms generally has the point bent backwards abruptly, so as to form an angle of about 135° with the rest of the arm. The specimen is globular, and has a vent about 1.5 millim. in diameter. The bend

in the arm is not quite constant in its position. The rest of the characters agree with those of the typical form.

*Hab.* West Island, Torres Straits, 7 fms.; bottom sand.

*Variations.* This sponge varies, as has been seen, in shape (oval or subspherical) and in the presence or absence of a vent. A third variation may be noted, viz. in the length, stoutness, and amount of curve in the arms, and in stoutness of the shaft of the zone-spicule; thus in a specimen from the Arafura Sea the diameter of the shaft falls to .045 millim., that of the arms to .043 millim., the length of the arm remaining .25 millim., while the backward bend of the arm, though gradual, is very decided.

The variations in this spicule, which is the only one which seems to differ much in *different specimens*, are as follows:—

	Diam. of shaft.	Diam. of arm.	Length of arm.	Curve of arm
	millim.	millim.	millim.	
1. Port-Darwin specimen.....	.06	.06	.25	slight, gradual.
2. Thursday Island specimen.....	.05	.05	.27	" "
3. Arafura-Sea specimen.....	.045	.043	.26	decided, gradual.
4. Var. <i>retroflexa</i> (West Island, Torres Straits)	.04	.04	.33	sharp near end.

The stellate is only .013 to .017 millim. in diameter in specimen No. 3.

The species differs from *S. bacca*, Selenka, in the small size of the stellate spicule, viz. .02-.025 millim. instead of .2 to .4 millim. in diameter; from *S. tethyopsis*, Carter, in having no "forks," and simple, not trifid, arms to the "zone-spicule;" and from *S. globostellata*, id., in the absence of a globostellate spicule; for distinctions from other species see table of species above. The largest specimens measure about 25 millim. (1 inch) in greatest diameter; all the specimens are preserved in spirit.

## 102. *Stelletta clavosa* \*. (PLATE XLIII. figs. i, i".)

Free, subglobular (very occasionally suboval). A single circular vent is almost (if not quite) invariably present; it is situate either on a flattened or depressed area; its margin apparently forms a sphincter; diameter 2 millim. in the largest specimens received. The excretory canals unite at 1-2 millim. below surface. Colour, in well-preserved spirit-specimens, pale purplish grey to puce, in others

\* From *clavus*, a nail, in allusion to the fine nail-like zone-spicule.

simply grey. A distinct cortical layer, containing the subcortical crypts, and formed in adult specimens by the space between the heads of the zone-spicules and those of the anchors, diameter about .7 millim.; sarcode here of same consistency as in rest of sponge. Sponge-sarcode below surface rather dark yellow-brown, rather granular; that of surface (in well-preserved specimens) reddish brown, granular.

Spicules:—(1) Zone-spicule, with long shaft tapering gradually from head to sharp point; head composed of three bifid arms; the proximal third of each arm projects forward at an angle of about  $120^{\circ}$  to the shaft, and then bifurcates in a plane parallel to that of the surface of the sponge, so that the ultimate divisions are parallel with this surface; the ultimate divisions taper gradually to sharp points from the point of bifurcation; shaft about 3 millim. long by .035 millim. in diameter; total length of single arm .32 millim., of proximal (simple) part .1 millim.; diameter of proximal part throughout .028–.032 millim., of base of ultimate divisions about the same. (2) Anchor, with long shaft tapering gradually from head to sharp point, and head composed of three arms tapering gradually to sharp points, curved backwards to form angles of about  $45^{\circ}$  with shaft (the angles vary slightly in different specimens); shaft about 2.1 millim. by .022 to .024 millim.; expanse of arms .11 to .12 millim., diameter of arm at base about .02 millim. (3) Body acerate, long and slender, smooth, tapering gradually to sharp points from the centre; size about 3 by .025 millim. (4) Flesh-spicule, composed of about 7 to 12 straight arms, radiating from a centre which does not show any perceptible inflation; arms very slender (about .0008 millim. in diameter), terminated by heads of about twice their own diameter; spicule .01 to .013 millim. in diameter across the arms: distributed generally in sarcode.

*Hab.* Prince of Wales Channel and West Island, Torres Straits, 7–9 fms.; bottom sand and coral. Arafura Sea, off N.W. coast of Australia, 32–36 fms.; bottom sand, mud, and shells.

This appears to be a small species, none of the specimens exceeding 13 millim. in their longest diameter. It exhibits, as compared with *S. purpurea*, a remarkable constancy in its form and in the occurrence of a vent, and the spicules vary but slightly in form and dimensions (the only variations observed are incorporated with the description above). In Torres Straits very few specimens were obtained; but in the Arafura Sea a considerable number of small specimens occurred. *Stelletta clavosa* differs from all nearly allied forms except *S. tethyopsis*, Carter, in the bifurcation of the arms of the zone-spicule, and from the latter species by the absence of “anchors” and of an *external* as distinguished from an *internal* form of stellate. The arms of the zone-spicule are much longer in proportion to their thickness than in Carter’s species.

*Parasite.* In the superficial sarcode (probably just beneath the ectoderm) of one specimen occur a large number of a chain-like Alga, resembling *Nostoc*, usually coiled, with very distinct cells.

103. *Stelletta*, sp.

Some fragments of a large specimen which has grown over some coils of *Vermetus*, not sufficiently complete to be safely described in full. The stellates are minute, and resemble those of *S. purpurea* and *clavosa*, but the arms are somewhat stouter and are not provided with heads.

*Hab.* Torres Straits, 5-7 fms.

## STELLETTINOPSIS.

*Carter, Ann. & Mag. N. H.* 1879, iii. p. 348.

This genus resembles *Tethyopsis*, Stewart, in that the two typical species have a minute bacillar flesh-spicule just such as that of the new species of *Tethyopsis* described below; and if it be, as seems probable, a tetractinellid which has undergone abortion of two arms (as in *Placina monolopha*, Schulze) of the main spicule, it resembles *Tethyopsis* further in this tendency to lose the arms of its skeleton-spicule (see description of *Tethyopsis dissimilis*, *suprà*). Reduction of the triradiate of the latter species by loss of a single arm would make the spiculation (apart from the skeleton-arrangement) essentially that of *Stellettinopsis*, if the bacillar spicule is regarded as an elongate stellate. The new species is assigned here to *Stellettinopsis* because it differs only from the typical species in the absence of the bacillar,—not a point of great importance, if the variation in *Geodia* as to presence and absence of one or other of the minute spicules is considered.

I dedicate this new species to Mr. H. J. Carter, to whom is due the credit of establishing this genus, and to whom I owe a great debt in his constant and ready help.

104. *Stellettinopsis carteri*. (PLATE XLIII. figs. *n*, *n'*.)

Pedicellate, on a short cylindrical stalk, passing gradually into a massive, somewhat flattened upper portion, which shows semi-detached lobes. Surface of upper portion dimpled and corrugated (somewhat like the Mammalian cerebrum). No visible vents. Texture in spirit soft, but elastic; colour in spirit dirty white. Surface between the undulations even, but minutely rough. Sarcode continuous, without many cavities; soft, very pale yellow in colour. Main and dermal skeletons consisting of a confused interlacement of the skeleton acerate spicules, not aggregated into fibres or tracts.

Spicules:—(1) Skeleton acerate, tapering to sharp points from near the middle; size 1·0 by ·02 millim. (2) Stellate, with very slight body, and five to ten straight blunt arms of uniform diameter (about ·0017 millim.) throughout; microspined with fine sharp points, which are most prominent at the tips; size ·05 millim. across arms.

*Hab.* Prince of Wales Channel, Torres Straits, 5-7 fms.; bottom sand and shells.

Of the two species assigned by Mr. Carter (*l. c.*) to the genus, *S. simplex*, recorded from Freemantle, Australia, and Hayti, is the most closely allied to the present, but differs from it in the possession of the bacillar tuberculate flesh-spicule. Mr. Carter, however, described in the same paper as that in which he founded *Stellettinopsis* (*tom. cit.* p. 344), a species which even more nearly approaches the present: this is *Amorphina stellifera* from South Australia, which differs from the present form only in its amorphous, non-pedicellate growth and the proportions of its spicules, which I now give, reduced to metric measurements:—

1. Acerate,  $\cdot 7$  by  $\cdot 017$  millim.

2. Stellate (stated to have no central inflation; that in *S. carteri* is hardly worth the name),  $\cdot 017$  millim. in diameter.

Thus the acerate is one fourth and the stellate two thirds smaller than in our species, and hence the two species are, in my view, sufficiently distinct. *Amorphina stellifera* should, however, stand as *Stellettinopsis stellifera*.

### TETHYOPSIS.

*Stewart, Quart. Journ. Micr. Sci.* n. s. x. (1870) p. 281 (*nee Zittel, Abh. bayer. Ak.* xiii., ii. (1879) p. 9).

To this remarkable genus I propose to assign a species which has, as described recent allies, the species *T. columnifera*, from the Philippine Islands, on which the genus was based, and *Tribrachion (um) schmidti*, from the Gulf of Mexico. Like the latter, the present form exhibits a singular divergence from the more normal Tetractinellid types, in that its chief spicule has lost one of its arms, and is only triactinellid. The genus appears to be allied to *Stelletta*, the peculiar development of its large tetractinellid spicule being apparently caused by the erect growth and non-corticate character of the sponge.

#### 105. *Tethyopsis dissimilis*.

(PLATE XL. fig. H; PLATE XLIII. figs. *l-l'''''*.)

Sponge elongated, slender, cylindrical or suboblong, tapering to the free extremity, which is pointed; attached by a narrow base which throws out a thin horizontal expansion outside the sponge itself. Flexible: surface formed by a thin and delicate dermal membrane of a dark grey colour in spirit. Vent? Pores  $\cdot 04$ – $\cdot 08$  in diameter, crowded in the interfascicular spaces of the dermis. Skeleton formed by a number of narrow bands of aggregated spicule-shafts (spicule No. 1) running longitudinally down the interior of the sponge; the bands are united laterally (see fig. *l'''*) by means of the arms of the triradiate spicule, are clothed with the soft tissues, and serve to break up the space within the sponge into 8 or 9 elongated cavities running from the base towards the apex of the sponge, viz. (1) anterior, (2) posterior, (3 and 4) lateral, (5 and 6) antero-lateral, (7 and 8) postero-lateral, and in one case (9) axial (see figs. *l* and *l'*). Subdermal skeleton formed by similar longitudinal



fascicles of spicule-shafts, a ray proceeding from the head of each of the latter, extending along the membrane and supporting it (see fig. 1''); in some parts stout acerate spicules (No. 2) take part in the formation of the dermal skeleton. Sarcoderm transparent, of very pale brown colour; rendered subopaque, when seen in the mass, by immense numbers of small elongate stellate spicules.

Spicules:—(1) Triradiate of axis and dermal skeleton, consisting of a straight shaft and two arms, one tapering to a sharp point and boldly recurvate, the other ending abortively in a rounded extremity shortly after its origin; the arms are set at right angles to the shaft and at angles of about  $160^{\circ}$  to each other, but lie in different planes. Length of shaft and long arm probably variable, and depending on the position of the spicule; the former attains a length of 5.5 millim., the latter of 2 millim.; diameter about .05 millim. It is the shaft of this spicule which forms the longitudinal skeleton-bands. (2) Large acerate of dermal skeleton, slightly curved, tapering from centre to sharp points; size about 1.8 by .05–.075 millim. (3) Minute elongate stellate flesh-spicule, consisting of a straight or occasionally curved or sinuous cylindrical shaft, beset with numerous irregular blunt processes, about 20 to the spicule, varying in length from .001 to .002 millim., thickness about .001 millim.; length of spicule about .0095 millim., thickness of shaft alone .001 millim. Crowded over all parts of the soft tissues.

*Hab.* Port Darwin, 7–12 fms., bottom sand and mud; Torres Straits, 10 fms., bottom sand.

Of the two specimens from Port Darwin the larger is 7.4 millim. (3 inches) long in its present state, viz. without its original base and with the apex somewhat abraded: it probably did not much exceed this length when perfect; its longest diameter (it is sub-oblong in transverse section) is 8 millim., its shortest 5 millim., at the present base. The smaller specimen has the base attached, but has lost the apex; it is almost cylindrical, and has a diameter of about 3.5 millim. throughout. In the dermis of the larger specimen no acerates have been found, but in the smaller one they appear to replace the triradiates in this place; it is in this specimen that an axial canal traverses the sponge. The specimen from Torres Straits is a fragment, forming the base of a specimen almost certainly belonging to the same species, but very imperfect. Its acerate differs from that of the typical form by having a diameter of .075 instead of .05 millim.; the flesh-spicule shows no divergence.

The species differs very markedly from Stewart's—(1) outwardly, in having the surface level instead of bearing sharp points; (2) inwardly, in the presence of an *axial* cavity, in having tri- instead of quadriradiate body-spicules, and in having a dermal acerate; the stellates of *T. columnifera*, further, are normal globostellates and not elongate, as here; in the general arrangement of the skeleton this species differs by possessing a number of longitudinal lines, instead of the condensed central mass of that species.

The species is obviously nearly related to a form named *Tribrachion Schmidti*, well described and illustrated as the type of

a new genus by W. Weltner ('Beitr. zur Kenntniss d. Spongien,' Inaugural Dissertation, Freiburg-in-Breisgau, 8vo, 1882, p. 30, pl. iii. figs. 29-41, 43), from Prof. Agassiz's dredgings in 1879 off the Morro Light, Gulf of Mexico, in 250-500 fathoms. In point of fact Weltner's species, which differs from *T. dissimilis* principally in the possession of a fully developed triradiate "anchor," occupies a position almost exactly intermediate between *T. dissimilis* and Stewart's species. I gather from Weltner's paper that he has not seen Stewart's description; had he done so he would, I feel sure, have at any rate mentioned the close affinity of his species to that of Stewart, from which it differs chiefly by the elongate form of the flesh-stellate and by the suppression of the third lateral arm of the skeleton-spicule, a suppression already foreshadowed in Stewart's species by the great reduction of two out of the three lateral arms in some of these spicules (see fig. 75, *l. c.*). I do not think that *Tribrachium* can be upheld as distinct from *Tethyopsis*; the gradation of forms between *T. columnifera* and *T. dissimilis*, by which (1) the quadriradiate spicule of *T. columnifera* is reduced to a triradiate in *Tribrachium*, and to (a) a biradiate with aborted third ray and (b) an acerate in *T. dissimilis*, together with the general agreement between the minute spicules, the skeletal structure, and the general form of the sponge, appear to mark these three species out as belonging to a natural though highly plastic circle of forms comparable to the Tetractinellid genus *Placina*, Schulze, of which the species (*P. monolopha*, *dilopha*, and *trilopha*, Schulze) each include bi-, tri-, and quadriradiate forms of the fundamental quadriradiate type; they are comparable also to many genera of the Calcarea, where the fundamental (probably triradiate) type exhibits great modifications, even within the limits of a single species.

Besides possessing three complete arms and the large skeleton-spicule, *Tribrachium schmidtii* is distinguished from *Tethyopsis dissimilis* by:—(2) the exterior being unmarked by horizontal ridges; (3) the inferior length of the lateral arm of the triradiate spicule; (4) the apparent absence of the long acerate spicule; (5) the more generally elongate form of the flesh-spicule and the superior number of its lateral whorls of tubercles.

Weltner's comparison of the form of the minute flesh-spicules with the similarly dendritic skeleton-spicules of the Rhizomorine Lithistids is invalidated by the fact that the two classes of spicules are not homologous with each other, the flesh-spicules of *Tribrachium* being represented in the Lithistid series only by the minute bihamates and other flesh-spicules of *Corallistes* &c.

A striking analogy with the arrangement of the skeleton of the Lyssakine Hexactinellida is afforded by the manner in which the arms and shafts of the large skeleton-spicules are employed in *Tethyopsis* (incl. *Tribrachium*) to form coherent rectangular meshes.

Weltner's discovery is of great interest, apart from the peculiarities of the type described, in the fact that his species, though living in the West Indies, is clearly intermediate between two types found near the confines of the Indo-Australian region.

106. *Geodia globostellifera*. (PLATE XLIII. fig. b.)

*Carter, Ann. & Mag. N. H.* 1880, vi. p. 134, pl. vi. fig. 38.

I have been able conclusively to determine the true relations of the globostellate spicule to the sponge, which Mr. Carter appears not to have felt quite safe in regarding as really belonging to it. As, however, I find it to occur not only in the cortex of different parts of the same sponge and in different specimens, but sometimes also in the sarcode beneath the crust of balls, it must be regarded as truly a production of, and thus proper to, the sponge itself. I find, what Mr. Carter does not describe, a small acerate spicule which forms small tufts on the surface, generally accompanied by the globostellate, and probably related specially to the orifices of the canal-system. Like Mr. Carter, I have been unable to find any "anchors."

My measurements of the spicules do not quite correspond with those given by Mr. Carter; but as these do not quite agree with his figures, I do not attach much importance to the discrepancy. In his description the globostellate has the same diameter (viz.  $\frac{1\frac{1}{2}}{1800}$  inch) assigned to it as to the shafts of the zone-spicule and body acerate, whereas in the plate, where it is figured (at fig. *f*) as on the same scale ("scale D," magnified 32 diameters) as those spicules, it appears as only about one third of their diameter.

The following are the chief spicular measurements from the present specimens:—

1. Zone-spicule (the arms of which are *simple*, as in Mr. Carter's figure, not *trifid*): diameter of shaft .07 millim., of arm at base about .048 millim.; expanse of any two arms together about .58 millim.

2. Body acerate, 3.0 millim. long by .038 thick.

3. Fork (the only one seen): diameter of arms and shaft .016 millim.; length of arm 1 millim.

4. *Geodia*-ball, long diameter .09 millim.

5. Globostellate, diameter .028 millim.

6. "External" stellate (forming, with the globostellate, the outer pellicle, but, like it, also occurring sparingly in the subcortical sarcode), .0063 millim. in diameter. Its arms are numerous and appear to end bluntly.

7. "Internal" stellate (the arms are few in number and are usually curved), .038 millim. in diameter.

8. Surface acerate; about .16 millim. long by .005 millim. in diameter.

The largest specimen is about 80 millim. ( $3\frac{1}{5}$  inches) in its greatest diameter; and the two specimens (which are preserved in spirit) are tinged with crimson in places, as if this was their colour during life.

*Hab.* Port Darwin, north coast of Australia, near tide-marks; bottom sand and rock.

*Distribution.* Gulf of Manaar, Ceylon (*Carter*).

The great interest of this species has induced me to devote some

space to its description. The complexity of its spiculation and the curious occurrence of the globostellate and of the surface acerate all combine to render it remarkable. Possibly it may have in the future to be separated from *Geodia* s. str. It is noteworthy that, while one of the specimens (the larger) exhibits nothing like a vent, the other has a circular opening leading obliquely and deeply into the sponge, lined with a soft wall, and about 4 millim. in diameter; its margin is slightly raised at one point. It is possible that it is merely an opening formed by growth over some cylindrical foreign body which has since disappeared; if a vent, its absence in the other specimen is remarkable. Mr. Carter does not mention any vents in his specimens.

#### 107. *Placospongia carinata*.

*Geodia carinata*, *Bowerbank*, *P. Z. S.* 1874, p. 298, pl. xlv. figs. 1-5.

This species differs from *P. melobesioides*, Gray, the typical species of the genus, in having a spinispirular and a globostellate flesh-spicule, the latter with furcate rays. Taking this difference into consideration, it is impossible any longer to regard the two species as identical. Some fine specimens were most fortunately obtained in spirit.

*Hab.* Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand.

*Distribution.* Dr. Bowerbank's specimen is said to have been obtained in the "South Sea."

### CALCAREA.

As with the collections made by the 'Alert' on the Patagonian coasts, so with those from the north and north-east of Australia, a very small number of Calcisponges have to be recorded, and no species new to science. Perhaps this is in part to be connected with the fact that but few Algæ (which so commonly afford a resting-place to these Sponges) occurred among the collections sent to the British Museum. But Hæckel says ('Kalkschwämme,' i. p. 426) of Calcarea, "Auf sandigem oder schlammigem Grunde wachsen nur sehr wenige Arten;" hence, as the abundant details given by Dr. Coppinger of the nature of the bottom on the coasts more particularly investigated by the 'Alert' show that it is chiefly composed of sand or mud or loose shells, this group of Sponges was likely to be found to be but poorly represented on the actual coast-line of this district; the coral-reef might be expected to produce more.

Judging from the collections in the British Museum, from Hæckel's Tables of Distribution (*op. cit.* i. pp. 430-432), and from Dr. Poléjaeff's Report, the south coast of Australia appears to be considerably more productive, fifteen or sixteen species being known from this region. I know of only two species from the western coast of the continent; but that district has been but imperfectly investigated hitherto. From the east coast Hæckel records but six species, Poléjaeff adds eight, and the present collection two. None of the species now to



be mentioned appear to have occurred in the Australian collections of the 'Challenger,' the Report on which unfortunately only appeared while this Report was passing through the press.

108. *Leucetta primigenia*, *Häckel*, var. *microrrhaphis*, *id.*

*Kalkschwämme*, ii. p. 118, pl. xxi.

A small bean-shaped specimen, of the *Lipostomella* form.

*Hab.* Alert Island, Torres Straits, 7 fms.

*Distribution* (the species). Mediterranean, Atlantic, Cape of Good Hope, Red Sea, Indian Ocean, South Australia, Fiji Islands, Chili (*Häckel*); Kerguelen and Heard Islands (*Poléjaff*).

109. *Leucaltis bathybia*, *Häckel*, var. *australiensis*, nov.

(PLATE XLIII. fig. m.)

*Leucaltis bathybia*, *Häckel*, *Kalkschwämme*, ii. p. 156, pl. xxviii. fig. 2.

A small, low, massive specimen, with a small lateral unarmed vent and very reduced cloacal cavity. The quadri-radiates are sagittal, those of the outer surface very large; diameter of rays about .04 millim., the facial angle nearly  $180^\circ$ , the apical ray in the same plane as the laterals; the deep quadri-radiates have a somewhat smaller facial angle and more slender rays, and the apical ray often projects well forward; rays almost straight. The tri-radiates form a thin layer on the inner wall, where their rays measure only about .01 millim. in diameter; they have a facial angle of about  $160^\circ$ ; in the deep parts they are subregular, sparsely scattered amongst the quadri-radiates, and the rays measure about .02 (sometimes .025) millim. in diameter; rays approximately straight. Colour (in spirit) white.

This form differs from vars. *perimina* and *arabica* of *Häckel* (*l. c.*) in the massive shape of the sponge, and in the larger size, as compared with the quadri-radiates, of the deep tri-radiates. In the comparative straightness of the rays it agrees with var. *arabica* and var. *mascarenica*, mihi (see this Report, Western Indian Ocean district); but differs from the latter in the smaller diameter of the rays of the large quadri-radiates, in the apparent smoothness of the cloacal surface, and the massive form.

*Hab.* Port Jackson.

*Distribution of species.* Red Sea (*Häckel*).

110. *Leuconia saccharata*, *Häckel*.

*Leucandra saccharata*, *Häckel*, *Kalkschwämme*, ii. p. 228, pl. xxxiii. fig. 3, pl. xxxviii. figs. 7-14.

A fine specimen, 60 millim. across, of the *Amphoriscus* type, and fragments. One cloacal fistula measures upwards of 30 millim. in length.

*Hab.* Port Jackson, 0-5 fms.

*Distribution.* Bass Straits (*Häckel*).



## PART II.

## COLLECTIONS FROM THE WESTERN INDIAN OCEAN.

## B I R D S.

BY

R. BOWDLER SHARPE.

*From the Amirante Group.*1. *Foudia madagascariensis* (L.).*Hartl. Vög. Madag.* p. 212.

- a.* ♂ ad. Ile des Roches, Amirante group, March 1882. Iris dark; bill horn-colour; legs and feet reddish brown.

Identical with Madagascar specimens.

2. *Crithagra chrysopyga*, Swains.*Hartl. t. c.* p. 418.

- a.* ♂. Ile des Roches, Amirante group, March 1882. Iris dark; bill horn-colour; legs and feet brown.

Doubtless introduced. It is a common African species.

3. *Francolinus ponticerianus* (Gm.).*Hartl. t. c.* p. 282.

- a.* ♀. Eagle Island, Amirante group, March 17, 1882. Iris dark; bill horn-colour, black at tip; legs and feet red.

Also introduced.

4. *Sterna melanauchen*, *T.*

*Gould, B. Austr.* ii. p. 400.

- a. ♂. African Island, Amirante group, March 16, 1882. Iris dark; bill, legs, and feet black.

Writing on this species in the Fiji Islands, Mr. E. L. Layard observes that he procured *Anous cinereus* on the coral-reefs north-east of Madagascar twenty years ago. Dr. Hartlaub, in his 'Vögel Madagascars,' very properly remarks that this statement requires confirmation in the highest degree, an observation I thoroughly indorse. Can it have been the present species (*S. melanauchen*) which Mr. Layard intended to write about? Anyhow, the range of the latter species is now greatly extended.

*From the Glorioso Islands.*

5. *Zosterops madagascariensis* (*L.*).

*Hartl. t. c.* p. 102.

- a. ♀. Glorioso Islands, May 1882. Iris dark; bill black; legs and feet grey.

6. *Corvus scapulatus*, *Daud.*

*Hartl. t. c.* p. 201.

- a. ♂. Glorioso Islands, May 1882. Iris dark; bill, legs, and feet black.

7. *Turtur coppingeri*, sp. n.

*T. similis T. aldabrano*, sed tergo brunneo et pileo fusciscenti-brunneo, fronte tantum pallide vinacea, et subcaudalibus cinereo lavatis distinguendus. Long. tot. 12 poll., culm. 0·7, alæ 6·45, caudæ 4·15, tarsi 1·0.

- a. ♀. Glorioso Islands, May 1882. Iris orange-red; bill dark; legs and feet dark red.

This species appears to be allied to *T. aldabranus*, Selater (*P. Z. S.* 1871, p. 692, pl. lxxiii.); but the white on the belly, which is shown in the plate, and referred to in Dr. Selater's description, does not appear so prominently in the skins of the type specimens kindly lent to me by Prof. Newton. The Glorioso Turtle-Dove differs from *T. aldabranus* in its browner upper surface, by the bluish-grey wash on the under tail-coverts, and especially in the pale vinous forehead, which contrasts somewhat with the dusky ash-colour of the head.

8. *Strepsilas interpres* (*L.*).

*Hartl. t. c.* p. 293.

- a. ♀. Glorioso Islands, May 1882. Iris dark; bill horn-colour; legs and feet yellow.

Still in immature plumage, but showing a trace of the approaching rufous dress.

*From the Seychelles.*9. *Ardea atricapilla*, *Afzel.**Hartl. t. c. p.* 308.

- a. Seychelles, March 1882. Iris reddish brown; upper mandible black, lower one yellow; legs and feet yellow.

10. *Ardea bubulcus*, *Sav.**Hartl. t. c. p.* 302.

- a. ♂. Bird Island, Seychelles, March 4, 1882. Iris light yellow; bill reddish yellow; legs and feet greenish yellow.  
b. ♂. Bird Island. Legs and feet greenish grey.

11. *Streptopelia interpres* (*L.*).*Hartl. t. c. p.* 293.

- a. ♂. Bird Island, Seychelles, March 4, 1882. Iris dark; bill horn-colour; legs and feet orange

In interesting plumage. Evidently a young bird of the previous season, commencing to put on the rufous dress of the adult bird.

12. *Puffinus chlororhynchus*, *Less.**Hartl. t. c. p.* 369.

- a. ♂ juv. Bird Island, Seychelles, March 11, 1882. Iris dark; bill dark horn-colour; legs and feet fleshy grey.

13. *Sterna anæsthes* (*Scop.*).*Saunders, P. Z. S.* 1876, p. 664.*Haliplana panayensis* (*Gm.*), *Hartl. t. c. p.* 388.

- a. No particulars attached.

14. *Gygis alba* (*Sparrm.*).*Hartl. t. c. p.* 389.

- a. ♂. Seychelles, March 1882. Iris dark; bill, legs, and feet black.

15. *Anous stolidus* (*L.*).*Hartl. t. c. p.* 391.

- a. ♂. Bird Island, Seychelles, Feb. 4, 1882. Iris dark; bill, legs, and feet black.

## REPTILIA.

BY

ALBERT GÜNTHER.  

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TWO REPTILES only were obtained, viz. the widely-spread *Hemidactylus frenatus*, on Eagle Island, Amirantes; and *Gerrhonotus madagascariensis*, on Glorioso Island.

## MOLLUSCA.

BY

EDGAR A. SMITH.

THE following list may be regarded as an appendix to E. von Martens's work on the Mollusca of the Mauritius and the Seychelles, forming part of Möbius's 'Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen.'

Of the 121 species here recorded, between forty and fifty do not occur in the above work; and the majority of them, as might be expected, are well-known forms.

## I. GASTROPODA.

1. *Conus arenatus*, *Hwass.*

Ile des Roches, Amirantes; and Cerf Island, Mascarenes, 10 fms., sand.

2. *Conus hebræus*, *Linn.*

Darros Island, Amirantes, on the shore.

3. *Conus turriculatus*.

*Sowerby, Thesaurus*, f. 643-4; *Weinkauff, Conch.-Cab.* pl. 69. figs. 10, 11.

*Conus acutangulus*, *Kiener (non Chemnitz), Coq. Fiv.* pl. 72. fig. 1; *Sowerby, l. c.* fig. 356.

Juv. = *Conus gemmulatus*, *Sowerby, Proc. Zool. Soc.* 1870, pl. 22. fig. 8.

Providence Reef, Mascarenes, in 24 fms.; sand and coral bottom.

A single specimen from this locality is of the same pale colour, faintly tinged with yellow, as the type in the British Museum, purchased from the "Taylor Collection." The original example of *C. gemmulatus* is also in the national collection, and proves on comparison to be merely the young state of the same species.

Kiener and Sowerby are wrong apparently in their identification



of *C. acutangulus* of Chemnitz. The shell described and figured by that author (Conch.-Cab. vol. xi. p. 59, pl. 182. figs. 1772-3) is very much more slender than the form referred to it by the two above-mentioned writers, and has simple non-coronated margins to the whorls of the spire.

The *C. acutangulus* of Kiener differs from the typical form of *C. turriculatus* merely in being more brightly coloured.

The *C. acutangulus*, Reeve (Conch. Ieon. pl. 37. fig. 200), appears to be a third species, and although agreeing with Kiener's shell as regards form, differs in having a smooth non-tuberculated spire.

4. *Conus miliaris*, *Hwass.*

Mozambique, between tide-marks.

5. *Conus literatus*, *Linn.*

Mozambique, between tide-marks.

6. *Conus millepunctatus*, *Lamarck.*

Glorioso Islands, between tide-marks.

7. *Conus flavidus*, *Lamarck.*

Darros Island, Amirantes, and Mozambique.

8. *Conus tessellatus*, *Born.*

Providence Reef, Mascarenes, in 24 fms.; and African Island, Amirantes, beach.

9. *Conus striatus*, *Linn.*

Ile des Roches, Amirantes, beach.

*C. floridus*, Sowerby, Thesaurus, frontispiece, f. 558, is unquestionably merely a slight variety of this well-known species, and bears no relationship whatever to *C. tulipa*, with which it is erroneously united by Weinkauff (Conch.-Cab. p. 180, and Jahrbuch. deutsch. mal. Gesellsch. 1874, p. 285).

10. *Conus martensi*. (PLATE XLIV. fig. A.)

Shell small, turbate, much narrowed towards the base or front, of an orange colour, rather paler upon the spire. Whorls about 10, flat-topped and a little sloping, raised somewhat above one another, concentrically three-grooved, separated by a deepish suture. Last whorl subacutely angled above, then a trifle convex at the sides, and being much attenuated anteriorly has a somewhat pyriform appearance; it is sculptured with fine lines of growth and transverse indistinct striæ or shallow grooves, which around the

base are much deeper. The aperture is very narrow, the outer lip being thin and moderately sinuated above the angle. The spire is short, gradated, with rectilinear outlines. Length 24 millim., diameter  $12\frac{1}{2}$ .

Providence Reef, Mascarenes, in 24 fms.

I have named this species in honour of Prof. E. von Martens, from whose work on the Mollusca of the Mascarenes I have obtained much information and assistance. It is distinguished by the narrowness of the aperture, its somewhat pyriform shape, and the uniform orange tint of its colouring. The spire is paler, except at the deepish suture, which is likewise orange.

### 11. *Conus articulatus*. (PLATE XLIV. fig. B.)

Sowerby, *Proc. Zool. Soc.* 1873, p. 146, pl. xv. fig. 3.

Shell shortly fusiform, brownish pink, encircled near the middle of the body-whorl with a white zone interrupted with blotches of a deeper tint than the general ground-colour of the shell, everywhere ornamented with transverse rows of minute reddish dots, which are invisible to the naked eye. Spire white, terminating in a pink apex, dotted with reddish brown upon the angle of the whorls, and blotched with the same colour upon their upper surface. Volutions 9, slowly enlarging; three apical smooth, glossy, convex; the rest in steps one above the other, sloping above, faintly grooved immediately beneath the suture, the furrow being broad, occupying half the upper surface of the whorls, but very shallow, not spirally striated, exhibiting only fine arcuate lines of growth. The last whorl is acutely carinate above, very faintly convex at the sides, and contracted towards the front; it is smooth at the upper half, and rather coarsely sulcated across beneath, a few of the intervening ridges at the base and two passing through the subcentral white band being rather more distinctly dotted than the rest of the surface. Aperture narrow, and outer lip thin and slightly sinuated behind. Length 12 millim., diameter 6.

Providence Reef, Mascarenes, in 24 fms.

This species is represented in Weinkauff's monograph of this genus (*Conch.-Cab.* pl. 56. figs. 1 & 4) under the name of *C. unabathrum*. *C. unabathrum* of Crosse is, however, perfectly distinct from the species here described, but is regarded by myself as a variety of *C. japonicus*, Hwass.

The locality "Mauritius" quoted by Weinkauff is confirmatory of the conclusion arrived at that his shell belongs to the same species as that from Providence Reef, and the figure, although representing a larger specimen, is fairly characteristic.

### 12. *Pleurotoma* (Defrancia?) *grisea*. (PLATE XLIV. fig. C.)

Shell very small, subfusiformly ovate, grey or dirty white, sometimes spotted with brown below the suture, or exhibiting one or two pale or whitish spiral lines. Whorls 8; first  $4\frac{1}{2}$  white, smooth,

glossy, convex, non-perpendicular with the axis of the shell; the rest granosely finely costate and transversely lirata, slightly convex at the sides. Costae about eighteen in number on a whorl, hardly as broad as the interstices. Lirae finer than the ribs, six on the upper whorls and about twenty on the last. Aperture small, narrow, terminating anteriorly in a short, oblique, recurved canal. Columella covered with a callus bearing two small tubercles just below the middle. Labrum externally thickened with a broadish varix, faintly sinuated above near the suture, armed within with seven strongish lirae. Length 5 millim., diam.  $1\frac{3}{4}$ ; aperture  $1\frac{3}{4}$  long,  $\frac{3}{4}$  broad.

Etoile Island, Amirantes, in 13 fms.

There is a little group of species with which that now described should be placed, and which does not quite come under any one of the as yet named subgenera of *Pleurotoma*. They are small shells with cancellated sculpture, having smooth apical whorls, an indistinct labral sinus, and lirae or denticles within the outer lip. *Columbella monilifera*, Sowb. (= *Pleurot. fuscolincata*, C. B. Adams, = *P. scalpta*, Reeve), *P. pygmaea*, C. B. Ad., *P. maculata*, C. B. Ad., *P. minor*, C. B. Ad., *P. piperata*, Smith, and *P. trifilosa*, Smith, all belong to this section.

The present species is remarkable on account of the proportionally large size of the smooth nucleus, consisting of four and a half volutions.

### 13. *Terebra babylonica*, Lamarck.

Marie-Louise Island, Amirantes, 20 fms.

### 14. *Terebra cerithina*.

(*Lamarck*) *Kiener, Coq. Viv.* pl. 11. fig. 25; *Sowerby, Thesaurus*, vol. i. pl. 43. fig. 58; *Reeve, Conch. Icon.* vol. xii. figs. 38 a, b.

Var. ? = *Terebra eburnea*, *Hinds, Thesaurus*, vol. i. pl. 45. fig. 123.

Juv. = *Terebra pulehra*, *Hinds, l. c.* fig. 129; *Reeve, l. c.* sp. 155.

Providence Reef, Mascarenes, 24 fms.

In the Museum there are specimens from the Seychelles and Philippine Islands, N.E. Australia, Timor, Marquesas and Society Islands.

### 15. *Terebra dimidiata*, juv.

Cerf Island, Mascarenes, 10 fms.

### 16. *Terebra bruguieri*.

*Deshayes, Proc. Zool. Soc.* 1859, p. 297; *Reeve, Conch. Icon.* vol. xii. fig. 82.

*Terebra hindsi*, *Deshayes, Journ. de Conch.* vol. vi. pl. 5. fig. 5.

Ile des Roches, Amirantes, 13 fms.

Other localities for this species are China (*Deshayes*) and Seychelle Islands (*R. P. Wright*, in *Brit. Mus.*).

17. *Terebra* (*Hastula*) *casta*.

*Hinds*, *Sowerby's Thesaurus*, vol. i. pl. 44. fig. 84.

*Terebra hastata* (part.), *Reeve, Conch. Icon.* vol. xii. fig. 81 *b*.

Var. = *Terebra albula*, *Hinds (non Menke)*, *l. c.* pl. 45. fig. 126.

Var. = *Terebra incolor*, *Deshayes, Proc. Zool. Soc.* 1859, p. 283.

Var. = *Terebra bipartita*, *Desh.* *l. c.* p. 284.

Var. = *Terebra mera*, *Hinds, l. c.* pl. 45. fig. 103.

Cerf Island, Mascarenes, 10 fms., sand (*Coppinger*); Philippines, Lizard Island, Swan River, Seychelles, and Sandwich Islands (*Brit. Museum*).

Reeve is wrong in confusing the West-Indian *T. hastata* with this species. That is a more robust form, with much stouter riblets extending from suture to suture.

18. *Murex* (*Chicoreus*) *adustus*, *Lamarck*.

Seychelle Islands, 4-12 fms., sand and coral.

19. *Murex* (*Ocenebra*) *pumilus*. (PLATE XLIV. fig. D.)

*Murex pumilus*, *A. Adams, Proc. Zool. Soc.* 1853, p. 70; *Sowerby, Thesaurus*, vol. iv. pl. 400. fig. 200 (enlarged).

Darros Island, Amirantes, in 22 fms., on a broken-coral bottom; China Sea (*Adams*).

This charming little species consists of seven whorls, three apical smooth and convex, and four normal. It is of a pink or almost scarlet colour, has six rounded costæ on the body-whorl and seven on the upper volutions; these are crossed by scabrous spiral ridges, of which there are two to three principal ones on the upper whorls, more slender ones intervening between them and the suture, and about seven on the last. The entire surface is beautifully ornamented by raised lines of growth, so that the transverse ridges are very prettily squamose. The aperture is small, ovate, and contracted anteriorly into a narrow but not closed canal. The labrum is well thickened exteriorly by the last varix, crenulated at the thin margin, and finely lirate within. *Sowerby* mentions an orange-coloured variety of this species; but this is unknown to me. His figure is very coarsely executed, magnified to more than twice the actual length of the shell, and shows only four costæ on the whorls, whilst five are always visible from any point of view.

20. *Murex* (*Ocenebra*) *infans*. (PLATE XLIV. fig. E.)

Shell small, ovately fusiform, whitish, stained with brown behind the longitudinal ribs. Whorls 7, three apical smooth, convex; the rest obliquely sloping above, the slightest concave, then sharply angled, straight below the angle and sloping inwards a little to the suture beneath; they are strengthened with moderately strong longitudinal costæ, crossed by stout spiral ridges and finer liræ.

The costæ are seven in number on the last volution, and eight or nine on the upper ones. There are two principal transverse ridges on the latter, with a smaller one between them, the uppermost being situated at the angle about the middle of the whorls, and the lowermost at the suture below. The body-whorl has three stout ridges round the middle part, and two rather more slender ones below, in addition to the raised squamous ridge around the cauda or extremity. On crossing the costæ these ridges are considerably produced into prickly hollow scales, and are everywhere crossed by very fine elevated lines of growth. The aperture is lilac, not greatly contracted anteriorly, and, together with the canal, occupies about half the entire length of the shell. The outer lip is armed within with about six short liræ; and the columella exhibits a tubercle at the upper part and one or two below the middle. The canal is short, open, and recurved. Length 8 millim., greatest width  $4\frac{1}{3}$ .

Etoile Island, Amirantes, in 13 fms., coral.

21. *Murex (Ocinebra) darrosensis*. (PLATE XLIV. fig. F.)

Shell small, fusiformly ovate, white, spotted upon and between the ribs with pale and dark brown. Whorls 7, the apical smooth, convex; the rest subconcavely sloping above, angulated near the middle, straightish at the sides, longitudinally costate and spirally ridged. Costæ moderately strong, about nine on a whorl, produced into angular prominences where crossed by the chief transverse liræ; the latter are three in number on the upper volutions, all on their lower half, and five or six on the last. In addition to these, the surface is ornamented with several finer intervening liræ and very fine lines of growth. The aperture is rather open, ovate, contracted into a short, open, oblique, recurved canal, and somewhat stained with yellow. The labrum has a broad varix exteriorly, and about eight fine liræ within. The columella is arcuate above, yellowish, and bears a small tubercle or two below the middle. Length 11 millim., greatest width 6.

Darros Island, Amirantes, 22 fms.; broken-coral bottom.

This species closely resembles *M. nitens*, A. Adams, but is smaller, has the upper part of the whorls more concave, and more numerous longitudinal costæ.

22. *Pisania ignea*, Gmelin.

Darros Island, Amirantes.

23. *Pisania (Tritonidea) undosa*, Linné.

Darros Island, Amirantes.

24. *Columbella turturina*, Lamarck.

African and Eagle Islands, Amirantes, 10–12 fms.



25. *Columbella nympha*, Kiener.

Providence Reef, Mascarenes, 24 fms.

26. *Columbella seychellensis*. (PLATE XLIV. fig. G.)

Shell small, narrow, ovate-fusiform, opaque white, irregularly blotched with brown. Whorls 9, three apical smooth, concave; the rest only very slightly concave, separated by a linear suture, above which revolves a white line dotted with brown, which also passes round the middle of the last whorl; this is not much contracted at the lower part, around which there are about half-a-dozen oblique grooves. The aperture is long and narrow, together with the oblique basal canal occupying rather less than the whole length of the shell. The outer lip is thickened externally by a broadish white varix. The columella is nearly perpendicular at the middle, and covered with a thin callosity. Length 8 millim., greatest width 3.

Seychelle Islands, 4–12 fms.

This curious little species is somewhat chrysaloid in form. The outlines of the spire are just a little concave below the apex, and gradually become slightly convex lower down. The outer lip in the single specimen at hand is smooth within, having been inhabited by a minute *Pagurus*; but it is very probable that fine liræ will be met with in other specimens.

27. *Columbella moleculina*.

*Duclos, Monogr. Columbella*, pl. 9. figs. 1 & 2; *id. in Chené's Illustr. Conch.* pl. 9. figs. 1 & 2.

Etoile Island, Amirantes, 13 fms. (*Coppinger*); Marquesas (*Pease*, in *Brit. Mus.*); Makeira Harbour, San Christoval, Solomon Islands (*J. Brazier*, in *Brit. Mus.*).

This species, although characteristically figured in the above unfinished monographs, has not, I believe, been as yet described. It is small, ovately fusiform, glossy, white, covered with a network or connected circles of a yellowish-brown colour, varied with two interrupted dark-brown transverse lines, one at the upper part of the whorls a little below the suture, where the ground-colour is at times opaque snowy white, and the other, consisting of less elongate spots, round the base of the body-whorl. Volutions 8, smooth, three apical convex, the rest nearly flat at the sides, very faintly gradated; the last rounded at the middle, contracted beneath, and strongly transversely grooved at the extremity. Aperture small, contracted into a short oblique canal in front. Outer lip strengthened with a remarkably broad external varix, distinctly sinuated a little below the suture and armed within with six small denticles, of which the second and third below the sinus are usually the largest. Columella covered with a callus bearing three or four elongate transverse tubercles at the lower part. Length 6 millim., width  $2\frac{1}{3}$ .

This pretty little species must not be confounded with *C. galaxias*, Reeve (Conch. Icon. figs. 229 *a*, *b*). The latter has a similar interrupted line at the upper part of the whorls, and an indication of a second towards the base of the last, but is nevertheless quite distinct, being destitute of the roundly meshed network, and more elongate in form. It has an opaque-white dotted line immediately above the suture falling round the middle of the body-whorl, and consists of two more normal volutions than *C. moleculina*.

28. *Columbella cincinnata*. (PLATE XLIV. fig. H.)

*Martens, Moll. Mauritius*, p. 248, pl. 20. fig. 14.

Eagle Island, Amirantes, 12 fms. ('Alert'); Mauritius (*Martens*).

Of this little species I have several examples before me in adult condition. In these I count five normal whorls and three nuclear, the former being nearly straight at the sides and the latter convex. The labrum is but very little thickened, has a shallow sinuation above and a few denticles within. The columella is subperpendicular, covered with a thin callus, having a prominent free margin.

29. *Columbella rufopiperata*. (PLATE XLIV. fig. I.)

Shell minute, ovate-fusiform, flesh-coloured, everywhere minutely dotted with red and marked with an indistinct pale line around the middle of the body-whorl. Volutions 7, three apical smooth, convex; the rest somewhat gradated, flat at the sides, very strongly longitudinally costate. Ribs about twelve in number, continuous up the spire, rounded, thick, having the upper end crossed by a shallow groove, giving the whorls a margined appearance. The body-whorl is convex at the middle, somewhat contracted below, transversely grooved at the base, with the costæ less strongly developed as the labrum is approached. Aperture very small and narrow, only slightly contracted into a short oblique canal; the outer lip is distinctly sinuated below the suture and thickened within. The columella is rounded, prominent at the middle, and covered with a callus. Length 3 millim., width  $1\frac{1}{3}$ .

Etoile Island, Amirantes, 13 fms.

This minute species to the naked eye appears to be of a pinkish-brown colour, but on examination with a lens is seen to be minutely dotted with red upon a pale flesh-coloured ground. The ribs are very strong for so small a shell.

30. *Columbella amirantium*. (PLATE XLIV. fig. K.)

Shell small, broad, ovate-fusiform, subpellucid, with the upper part of the whorls whitish and pale pink beneath, ornamented with some opaque white spots below the suture and a band of small dots of the same colour round the middle of the body-whorl, the basal extremity of which is dark pink or black dotted with white.

Whorls 8; five nuclear convex, pink, finely longitudinally lirate; the rest strongly costate and rather convex at the sides. The ribs are thick, rounded, about sixteen in number on the penultimate whorl, subobsolete behind the labrum. The last volution is broad above, contracted inferiorly, the extremity being crossed by several coarsish grooves and ridges. Aperture narrow, only a little narrowed anteriorly into a slightly oblique open canal. Outer lip much thickened by a strong external white varix, marked with two brownish-pink spots, one above and the other below the middle; it is also internally thickened, armed with eight denticles, and sub-sinuated at the upper end. The columella is covered with a callus bearing about five small tubercles near the middle. Length  $5\frac{2}{3}$  millim., width 3.

Eagle Island, Amirantes, 12 fms.; sand and coral bottom.

This is a very pretty little species, having the same form as the typical group of the genus.

### 31. *Columbella conspersa*.

*Gaskoin; Reeve, Conch. Icon.* vol. xi. fig. 99.

Providence Reef, Mascarenes, 24 fms.; and Ile des Neufs, Amirantes, in 15 fms.

Reeve's figure is fairly good in respect of form but misleading as regards the colour of this species. It is a whitish or pinkish-white shell, having the upper and lower parts of the whorls edged with opaque white, and a narrow zone of the same colour round the middle of the body-whorl. It is also blotched with olive-yellow and dotted with that tint upon the opaque bands. The labrum and columella are tinged with lilac-pink, the former being armed with seven or eight denticles and the latter with about six transverse tubercles upon a prominent callosity.

### 32. *Columbella albocaudata*. (PLATE XLIV. fig. L.)

Shell small, ovate-fusiform, pale pink, paler at the apex and white at the extremity of the body-whorl, bordered above with a few spots of a reddish colour. Whorls 8; four apical glossy, excentric, convex: the rest less swollen, separated by a moderately deep suture; last whorl scarcely angled at the middle, contracted towards the anterior end, which is transversely grooved and ridged, the ridges being about twelve in number. Aperture small, contracted anteriorly into a short open oblique canal. Labrum thin at the edge, strengthened with a varix at a little distance from the margin, which is distinctly sinuated towards the upper part, and furnished within with about five denticles. Columella perpendicular, arcuate at the middle, covered with a thin callus supporting about four cross tubercles. Length 6 millim., width  $2\frac{1}{2}$ .

Providence Reef, Mascarenes, in 24 fms.; bottom sand and coral.

This species to the naked eye appears to be almost uniformly light pink; by the aid of a lens, however, it is seen to be coloured as described above, and in addition there are two or three white dots placed at distant intervals upon the upper margin of the whorls.

33. *Nassa arcularia*, Linné.

Mozambique, between tide-marks.

34. *Nassa granifera*, Kiener.

Cerf Island, Mascarenes, in 10 fms.

35. *Nassa gaudiosa*.

*Hinds*; Reeve, *Conch. Icon.* viii. fig. 48.

Mozambique, between tide-marks

The specimen from this locality is shorter than that figured by Reeve, and almost as stout as *N. mucronata*, A. Adams, which is very closely allied.

36. *Nassa stigmara*, var.

A. Adams, *Proc. Zool. Soc.* 1851, p. 96; Reeve, *Conch. Icon.* figs. 42 *a*, *b*.

Var. = *N. densigranata*, A. Adams; Reeve, *Conch. Icon.* fig. 181.

Marie-Louise Island, Amirantes, 16-17 fms. (*Coppinger*).

The little shell from the above island resembles in every particular *N. densigranata*, said to have been originally found at the Philippine Islands, and which I think should be regarded as a dwarf form of *N. stigmara*. This species I have elsewhere quoted from the Korean Straits.

37. *Phos nodicostatus*, var.

A. Adams; Sowerby's *Thesaurus*, vol. iii. p. 93, pl. 222. fig. 47.

Darros Island and Poivre Island, Amirantes, 20-22 fms.; also Cerf Island and Providence Reef, Mascarenes, in 10-24 fms.

The same shell, regarded by Martens as a variety (*rhodostoma*) of *P. textus* of Gmelin (*Moll. Mauritius*, p. 241, pl. 20. f. 7), was dredged by Prof. Möbius at five fathoms depth at the Seychelles. The sculpture is of a more delicate character than obtains in *P. textus*, and the spire is more graceful.

38. *Purpura hippocastanum*.

African Island, Amirantes.

39. *Purpura (Jopas) sertum*, Bruquière.

Darros Island, Amirantes.

40. *Sistrum ricinus*, Linné.

Darros Island, Amirantes.

41. *Coralliophila madreporarum*, Sowerby.

Etoile Island, Amirantes, and Seychelle Islands, in 4-13 fms.

42. *Coralliophila amirantium*. (PLATE XLIV. fig. M.)

Shell minute, pyramidally ovate-fusiform, pale pinkish yellow. Whorls 8; three apical convex, smooth, the rest also convex, divided by a deep suture, longitudinally ribbed and transversely ridged. Costæ somewhat oblique, rounded, broader than the interstices, about twelve in number on the penultimate volution, rather obsolete towards the lower part of the last. Spiral liræ well raised, squamose, generally four in number on the upper whorls, and about eleven on the last, alternating with more slender ones in the interstices. Last whorl rounded above, contracted below the middle, with a conspicuous scaled ridge around the cauda. Aperture light pink, ovate-subpyriform, contracted anteriorly into a narrow, oblique, short, recurved canal. Columella subperpendicular, very little arcuated, coated with a thin pinkish callus. Outer lip not much thickened, crenulated at the edge, and armed within with about ten fine liræ, which run far within the aperture, but do not reach the margin of the labrum. Length  $11\frac{1}{2}$  millim., greatest width  $6\frac{1}{2}$ .

Marie-Louise, African, and Eagle Islands, Amirantes, 10 to 17 fms.

This species belongs to the same genus as another form described by myself as *Fusus? abnormis*. On further consideration I am of opinion that they would be more correctly placed in the genus *Coralliophila*. The present species is smaller and more coarsely sculptured than *C. abnormis* from the Andamans.

43. *Leptoconchus rostratus*.

*Magilus rostratus*, A. Adams; Sowerby, *Conch. Icon.* vol. xviii. figs. 15 a, b.

Darros Island, Amirantes, in 22 fms.; bottom broken coral.

44. *Fasciolaria filamentosa*, Lamarck.

Darros Island, on the shore.

45. *Latirus (Peristernia) nassatula*, Lamarck.

Seychelles, 4-12 fms.

46. *Oliva episcopalis*, Lamarck.

Glorioso Islands.



47. *Harpa minor*, Lamarek.

Darros Island, on the shore.

48. *Mitra episcopalis*, Linné.

Mozambique.

49. *Mitra coronata*, Chemnitz.

Darros Island, in 22 fms.

50. *Mitra luctuosa*.

*A. Adams*; Sowerby, *Thesaurus Conch.* vol. iv. fig. 229.

Darros Island, in 22 fms.

This species is of a dark olive-brown colour, having a single yellow line around the upper part of the whorls. It is spirally punctate-striate throughout, consists of ten whorls, and has five plaits on the columella, of which the lowermost is insignificant.

51. *Mitra tenuis*. (PLATE XLIV. fig. N.)

Sowerby, *Thesaurus*, vol. iv. p. 6, fig. 327.

Seychelles, in 4-12 fms.

The locality of this species has hitherto been unrecorded. It is a thin, narrow shell, of a light yellowish-brown colour, having a pale zone at the upper part of the whorls, another around the middle of the last, and a third less distinct one towards the base. Whorls 10: five apical excentric, smooth, convex, pale, the rest normal, almost flat at the sides, separated by an oblique suture, sculptured throughout with spiral striæ and lines of growth. The aperture is very much narrowed above and widens considerably below. The columella is oblique and armed with four plaits. Length  $12\frac{1}{2}$  millim., diameter  $3\frac{1}{2}$ , aperture  $5\frac{1}{2}$  long.

Sowerby's figure of the type, now in the British Museum, is considerably enlarged, and represents the aperture a little too long in proportion to the spire, and only two plaits on the columella are indicated, whilst no mention whatever is made of this character in the text. The "light fulvous band" is not at the upper part of the whorls as stated, this portion being pale and the band falling lower down.

52. *Turricula (Callithea) exasperata*, Chemnitz.

Seychelles, 4-12 fms.

53. *Turricula (Callithea) mucronata*.

*Mitra mucronata*, Swainson; Reeve, *Conch. Icon.* fig. 125; Sowerby, *Thes. Conch.* fig. 379.

*Mitra echinata*, *A. Adams*, *Proc. Zool. Soc.* 1850, p. 138.

Cerf Island, Mascarenes, in 10 fms.

*M. concentrica*, Reeve, which is regarded by some authors as a variety of this species, is, I think, sufficiently distinct. The spire is rather more acuminate, the whorls are not angular, the costæ more numerous and not acutely noduled.

54. *Turricula (Callithea) modesta*, Reeve.

Darros Island, in 22 fms.; also Mauritius (*Sowerby & Liénard*); Philippines (*Cuming*).

55. *Turricula (Callithea) bipartita*. (PLATE XLIV. fig. O.)

Shell small, fusiformly ovate, having the spire and the upper half of the body-whorl white, and the lower half stained with a dirty pale flesh-coloured band beneath and pinkish white at the extremity. Whorls 8; three apical smooth, convex, the rest a little convex at the sides, longitudinally costate and spirally grooved. Costæ about 14 in number on the penultimate whorl, attenuated inferiorly on the last, and not quite cut across by the transverse sulci; these are deepish, not quite so broad as the interstices, numbering from 6 to 7 on the penultimate volution and about 16 on the last. The aperture is small, occupying less than half the length of the shell. The columella is pale pink, covered with a thin callus bearing four oblique plaits. The outer lip is thin, and armed within with about eight thread-like liræ. Length 6 millim., diam.  $2\frac{1}{3}$ .

Providence Reef and Cerf Island, Mascarenes, in 10–24 fms.

This is a very small species, but probably adult, as the more crowded character of the costæ behind the labrum indicates. The dirty fleshy zone around the middle of the body-whorl is sometimes slightly visible upon the spire just above the suture.

56. *Marginella picturata*. (PLATE XLIV. fig. P.)

*Marginella (Glabella) picturata*, G. & H. Nevill, *Journ. As. Soc. Bengal*, 1874, vol. xliii. pt. 2, p. 23, vol. xliv. pl. 8. f. 89; copied by Wein-kauff, *Conch.-Cab.* pl. 22. figs. 13, 14.

Poivre Island, Amirantes, in 20 fms.; Mauritius (*Nevill*).

A very pretty specimen from Poivre Island is somewhat differently painted, the spots upon the white zones being curved or almost arrowhead-shaped, and in four series upon the body-whorl; two of these, namely one a little below the suture and the other just beneath the middle, are less distinct than the others, which fall above and below the lower more indistinct one. The outer lip has a fourth red spot at the upper extremity, and the anterior end of the columella is tinged with the same colour.

57. *Dolium (Malea) pomum*, Linné.

Glorioso Islands, on reefs, dead.

58. *Ranella pusilla*, var.

Seychelles, 4-12 fms. ; also Darros Island, in 22 fms.

The variety from the Seychelles is white, stained with purple on the posterior side of the varices, and with pinkish brown at the top of the body-whorl at the suture. The last whorl has also a bright pink band low down on the dorsal side, a spot of the same colour on the middle of each lateral varix, and a black extremity. The mouth of the aperture is of a pretty purple-pink colour, armed with seven white tubercles on the outer lip, and four or five on the inner.

59. *Triton (Persona) cancellinus*, *Roissy*.

Var.=*Triton decipiens*, *Reeve, Conch. Icon.* fig. 102.

Providence Reef, Mascarenes, in 24 fms.

60. *Natica tessellata*.

*Philippi, Conch.-Cab.* ed. 2, p. 48, pl. 7. fig. 7.

Mozambique, between tide-marks.

The exact locality of this species has not, I believe, been hitherto known.

61. *Cypræa asellus*, *Linné*.

Seychelles, in 4-12 fms.

62. *Trivia scabriuscula*, *Gray*.

African Island, Amirantes.

63. *Erato corrugata*, *Hinds*.

Eagle Island, Amirantes, in 12 fms.

I fail to discover any distinction between this species and *E. nana*, *Duclos*. It is of a greenish-yellow colour, having the anterior extremity and sometimes the apex of the spire rose-tinted. The surface is granulated throughout, the granules being elongate, and down the dorsal surface there is a conspicuous deep groove. *Reeve's* figure (*Conch. Icon.* fig. 12) does not apparently represent this species.

64. *Littorina glabrata*, *Philippi*.

Eagle Island, Amirantes.

65. *Cerithium echinatum*, *Lamarck*.

African and Darros Islands, on the shore.

66. *Cerithium columna*, *Sowerby*.

African Island.

67. *Cerithium albovaricosum*. (PLATE XLIV. fig. Q.)

*Cerithium gracile*, Pease (*non Lamarck*), *Proc. Zool. Soc.* 1860, p. 432.

Shell thin, elongate-pyramidal, whitish or livid white, sparsely spotted between the costæ with small narrow lines. Whorls about 14, convex at the sides, separated by a deep, subcanaliculate suture, slowly increasing, longitudinally finely costate, and spirally liræ, exhibiting at irregular subdistant intervals larger snow-white varices. Costæ about ten to fifteen on the upper whorls, and somewhat nodulous through being crossed by the fine transverse liræ, of which there are about four principal ones, several finer intervening. Last whorl with a prominent varix at the left side opposite the labrum, which is thinnish and somewhat expanded and grooved within. Aperture roundish ovate, oblique, contracted anteriorly into a narrow also oblique canal, sometimes (not always) stained with black. Columella well incurved, covered with a thin callosity bearing an elongate transverse tubercle at the upper part. Length  $14\frac{1}{2}$  millim., diam.  $4\frac{1}{2}$ .

Providence Reef, Mascarenes, in 24 fms.; Sandwich Islands (*Pease*).

*C. rostratum* of Sowerby is allied to this species, but may be distinguished by its more angular whorls, different costæ, less deep suture, and the different and more regular dotting between the nodules round the middle of the whorls. Specimens from the Sandwich Islands of this species in the British Museum have not a black anterior canal, and the costæ are rather finer than in the Mascareno specimen.

68. *Cerithium amirantium*. (PLATE XLIV. fig. R.)

Shell small, elongate, light pink, faintly dotted with brown. Whorls about 12, slightly convex, nodulously costate, spirally liræ, exhibiting at distant intervals paler thickish varices. Costæ about 15 on the upper whorls, crossed by two principal transverse liræ, which are nodulous upon the ribs, giving the whorls a biangulate appearance at the sides. In addition to these two there are several (about seven) finer liræ, but which scarcely form nodules upon the costæ. The body-whorl has the usual varix on the left side well developed, swollen. The aperture is round-ovate, acuminate above and prolonged anteriorly into an oblique, short, recurved canal. Columella arcuate, coated with a rosy callus, bearing an elongate transverse tubercle above. Labrum thickened by a small external varix. Length 15 millim., diam.  $4\frac{1}{3}$ .

Darros Island, Amirantes, in 22 fms.

This pretty little species agrees with *C. tenellum*, Sowerby, in colour, but is narrower and differently sculptured.

69. *Cerithium (Rhinoclavis) acutinodosum*.

(PLATE XLIV. fig. S.)

Shell elongate-pyramidal, white, spotted with brown between

the nodules. Whorls 16, straight at the sides, encircled above at the suture with a prominent series of acute tubercles, and below these by two or three other rows, which are much less elevated and distinct; they are also spirally striate-sulcate. The body-whorl has a swelling (scarcely a varix) on the left side opposite the outer lip, terminates in a narrow and much recurved canal, and is sculptured with about ten narrow sulci. Columella bearing a conspicuous callus reflexed over the cauda, and armed within with a single sub-median plait. Aperture oblique, produced above into a short, narrow channel. Labrum only a very little thickened. Length 30 millim., diam. 9.

Seychelles, in 4-12 fms., and Cerf Island, Mascarenes, in 10 fms.

This species bears some resemblance to *C. articulatum*, Adams and Reeve, especially as regards the aperture. It may be distinguished by the prominent row of acute nodules just below the suture, the corresponding series in *C. articulatum* being smaller, so that the whorls at this part are narrower than below, whilst, on the contrary, in the present species they are widest.

70. *Cerithium (Rhinoelavis) kochi*, *Philippi*.

Poivre Island and Ile des Roches, Amirantes, in 13-20 fms.

71. *Triphoris mirificus*. (PLATE XLIV. figs. T-T<sup>1</sup>.)

*Deshayes, Moll. Réunion*, p. 104, pl. 11. figs. 32, 33.

Etoile Island, in 13 fms.

This is a most curious species, on account of the prominent canal behind the aperture. The apex of the spire in the single specimen at hand, consisting of four whorls, is yellowish brown and finely cancellated instead of noduled like the rest of the shell.

72. *Triphoris monilifer*.

*Hinds, Voy. 'Sulphur,'* p. 30, pl. 8. fig. 14.

Etoile Island, in 13 fms.; Straits of Malacca (*Hinds*).

73. *Triphoris elegans*.

*Hinds, Voy. 'Sulphur,'* p. 29, pl. 8. fig. 11.

Distribution the same as preceding species.

74. *Triphoris maxillaris*.

*Hinds, Voy. 'Sulphur,'* p. 29, pl. 8. fig. 8.

Darros Island, in 22 fms.; also Straits of Malacca (*Hinds*).

75. *Strombus mauritanus*, *Lamarch*.

Marie-Louise Island.



76. *Strombus gibberulus*, Linné.

Seychelles, 4-12 fms.; Ile des Roches, Amirantes; and Mozambique.

77. *Strombus floridus*, Lamarch.

African Island and Darros Island, on the shore.

78. *Strombus columba*, Lamarch.

Poivre Island, Amirantes.

79. *Pterocera aurantia*, Lamarch.

Providence Island, Mascarenes.

80. *Calypttræa cicatricosa*.

Reeve, *Conch. Icon.* figs. 3 a, 3 b.

Providence Reef, Mascarenes; Philippines (*Cuming*).

81. *Nerita plexa*, Chemnitz.

Eagle Island, Amirantes.

A specimen from this locality is of unusually large size, having an extreme diameter of 56 millim.

82. *Nerita plicata*, Chemnitz.

Eagle Island and Ile des Roches, Amirantes.

83. *Nerita polita*, Linné.

Ile des Roches.

84. *Nerita albicilla*, Linné.

Poivre and Darros Islands, Amirantes.

85. *Neritina (Smaragdia) rangiana*, Récluz.

Providence Reef, Mascarenes.

86. *Turbo histrio*.

Reeve, *Conch. Icon.* vol. iv. fig. 32; *Philippi, Conch.-Cab.* p. 78, pl. 18. fig. 6; ? *Kiener, Coq. Viv.* pl. 33. fig. 3.

African and Darros Islands.

The locality of this species has not, I believe, been previously recorded. The type is a white shell broadly rayed above with a

rust-brown colour, being spotted and more irregularly stained with the same tint below. The two Amirante specimens have the same style of markings, but of a greenish colour or green and brown mingled together. Both of these and one of the specimens in the Cumingian collection have a distinct zone composed of irregular dark-coloured spots round the middle of the base.

87. *Turbo tursicus*. (PLATE XLIV. figs. U-U<sup>2</sup>.)

*Reeve, Conch. Icon.* sp. 60; *Philippi, Conch.-Cab.* ed. 2, p. 83, pl. 19. fig. 5.

Daros Island; Philippine Islands (*Cuming*).

This beautiful species is well characterized by its style of painting. It is whitish with broad scarlet rays, particularly distinct on the sloping upper surfaces of the whorls; these are sometimes edged with black posteriorly, and the suture is more or less stained with that colour. The lower part of the body-whorl is for the most part scarlet with a few narrow white streaks (sometimes black-spotted) radiating from the umbilical region. The operculum is white, thick, convex, and granose externally.

88. *Turbo* (*Marmorostoma*) *coronatus*.

*Turbo coronatus*, *Gmelin, Philippi, Conch.-Cab.* ed. 2, p. 23, pl. 6. figs. 11-13.

Zanzibar.

This species has also been recorded from the Red Sea, the Seychelles, Madagascar, Natal, Malacca, Cochin China, and the Moluccas.

89. *Phasianella æthiopica*, *Philippi*.

Bird Island, Seychelles, on the beach.

90. *Trochus* (*Gibbula*)? *amirantium*. (PLATE XLIV. figs. V.-V<sup>1</sup>.)

Shell small, subglobose, perforate, spirally finely lirate and sulcate, white, the liræ being interruptedly pink. Whorls 4-5, convex, rapidly increasing; last whorl rounded at the periphery, lirate throughout, the liræ being rather narrower than the intervening grooves and crossed by the lines of growth. Aperture circular, occupying more than half the total height of the shell. Columella arcuate, white, covered with a callus, which is considerably reflexed especially at the lower part. Height 4 millim., greatest diameter  $4\frac{1}{3}$  millim.

Etoile Island, Amirantes, in 13 fms.

The distinguishing feature of this little species is the reflexed character of the columella. I have not the operculum, and consequently am in doubt respecting the true generic position.

91. *Trochus* (*Monodonta*) *australis*, *Lamarck*.

Glorioso Islands, on the reefs.

92. *Trochus* (*Monodonta*) *labio*, *Linné*.

Seychelles, on the beach.

93. *Cylichna protracta*.

*Gould, Proc. Bost. Soc. Nat. Hist.* 1859, vol. vii. p. 140; *Otia*, p. 113.

Cerf Island, Mascarenes, in 10 fms.; coast of China (*Gould*).

94. *Tornatina voluta*, *Quoy & Gaimard*.

Providence Reef, Mascarenes, in 24 fms.

95. *Pyramidella* (*Lonchæus*) *maculosa*, *Lamarck*.

Poivre Island, in 20 fms.

96. *Pyramidella* (*Obeliscus*) *terebellum*, *Müller*.

African Island.

97. *Pyramidella* (*Obeliscus*) *sulcatus*.

*Obeliscus sulcatus* (*Nuttall, MS.*), *A. Adams in Sowerby's Thesaurus*, vol. ii. p. 807, pl. 171. fig. 34; *Sowerby, Conch. Icon.* vol. xv. figs. 12 *a, b*.

Providence Reef, Mascarenes, in 24 fms.

This species was collected at the Sandwich Islands by Nuttall, and Tahiti is assigned to it as the locality by Mr. A. Adams.

98. *Chemnitzia coppingeri*. (PLATE XLIV. fig. W.)

Shell elongate, subulate, pink, with large distant white varices. Whorls 18?; the 12 remaining are convex at the sides, separated by a deepish, slightly oblique suture, longitudinally finely ribbed and spirally lirate. Ribs twice as broad as the grooves between them, about 26 on the penultimate whorl, subnodose where they meet the transverse liræ; these are about 11 in number on the penultimate and about 24 on the last whorl, those on the lower part rather finer than those above. Varices large, almost one on every volution, transversely sulcated. Aperture subquadrate, nearly as wide as long. Columella straight, subtruncate and uniplicate anteriorly. Labrum arcuate, externally variced. Length of twelve remaining whorls 18 millims., diameter  $4\frac{1}{3}$  millim.

Providence Reef, Mascarenes, in 24 fms.

99. *Phyllidia varicosa*, *Lamarck*.

Mozambique, between tide-marks.

For distribution of this species see Bergh in Semper's 'Reisen im Arch. Philippinen,' Theil 2, Band 2, Heft x. p. 381.

100. *Doris (Platydoris) coriacea*.

*Doris coriacea*, *Abraham*, *Proc. Zool. Soc.* 1877, p. 247, pl. 27. figs. 1-4.

*Platydoris coriacea*, *Bergh*, in *Semper's 'Reisen im Arch. Philippinen,'* Theil 2, Band 2, Suppl.-Heft i. p. 58.

Mozambique, between tide-marks (*Coppinger*); South Africa, Seychelles, and Sir C. Hardy's Island (*Abraham*).

101. *Doris (Asteronotus) mabilla*.

*Doris mabilla* (*Bergh*), *Abraham*, *Proc. Zool. Soc.* 1877, p. 249, pl. 28. figs. 1-4.

*Asteronotus mabilla*, *Bergh*, in *Semper's 'Reisen im Arch. Philippinen,'* Theil 2, Band 2, Suppl.-Heft i. p. 71, pl. xx. c. fig. 10.

Seychelles and Samoa Islands (*Abraham*); Glorioso Islands and Mozambique (*Coppinger*).

In the specimens from the two latter localities the pale spots upon the back with dark centres are symmetrically placed upon each side of the central line, which is pale and dark spotted at intervals.

## II. CONCHIFERA.

1. *Cytherea (Caryatis) obliquata*, *Hanley*.

Seychelles.

A single right valve from this locality is of a rich brown colour, whitish towards the umbones and ventral margin, radiately streaked with white across the brown portion of the surface, having the lunule and posterior dorsal surface lineated with dark brown. The inner surface is white, faintly tinted with pale rose towards the hinder extremity.

2. *Circe (Crista) pectinata*, *Linné*.

Poivre Island.

3. *Circe (Crista) gibbia*, var.

Seychelles.

This specimen belongs to the variety named *C. menkei*, Jonas.

4. *Tellina elegans*, Wood.

African Island, Amirantes.

5. *Tellina semilævis*.

*Martens; Römer, Conch.-Cab.* p. 63, pl. 18. figs. 1-4.

*Tellina tenuilirata, Sowerby, Conch. Icon.* vol. xvii. pl. 43. fig. 253.

Seychelles, in 4-12 fms.

Care must be taken not to confuse this with the second species described by Mr. Sowerby under the same name (*T. tenuilirata*), and figured on plate 39. figs. 219 *a-b* of the same monograph.

6. *Tellina staurella*, Lamarck.

Seychelles, in 4-12 fms.

This species, according to Mörch, is the *T. cruciata*, Spengler.

7. *Tellina rugosa*, Born.

Seychelles, on the beach.

8. *Tellina scobinata*, Linné.

Eagle Island and Darros Island, on the shore.

9. *Tellina gratiosa*.

*Römer, Conch.-Cab.* ed. 2, p. 170, pl. 34. figs. 10-12.

Ile des Roches, Amirantes, in 13 fms.; Indian Ocean (*Römer*).

10. *Cardium* (*Ctenocardia*) *fornicatum*.

*Cardium fornicatum, Sowerby, Conch. Ill.* fig. 50; *Reeve, Conch. Icon.* vol. ii. fig. 110.

Providence Island, Mascarenes, in 19 fms.

The locality of this very beautifully sculptured shell has not, I believe, hitherto been recorded.

11. *Cardium* (*Papyridea*) *pulchrum*, Reeve.

Eagle Island, 12 fms.

12. *Gastrochæna mytiloides*, Lamarck.

Seychelles, in 4-12 fms.

13. *Lucina* (*Codakia*) *exasperata*, Reeve.

Poivre Island and Darros Island.

This species was originally described from a specimen collected at



Honduras, according to Mr. Reeve. *L. tigrina*, Lamarck, has a similar remarkable distribution (*vide* Deshayes, Moll. de la Réunion, p. 19, and Martens, Moll. Mauritius, p. 321).

14. *Lucina* (*Codakia*) *punctata*, *Linné*.

African Island, Amirantes, on the beach.

15. *Lucina clausa*, *Philippi*.

Mozambique, on the beach.

16. *Lucina* (*Divaricella*) *cumingii*, var.

Glorioso Islands.

17. *Modiola auriculata*, *Krauss*.

Poivre Island, Amirantes.

18. *Modiola elegans*, *Gray*.

Seychelles, in 4–12 fms.

Reeve quotes West Africa as the locality of this species; and the British Museum received specimens from G. Clifton, Esq., found in deep water near Garden Island, West Australia.

19. *Arca* (*Acar*) *divaricata*, *Sowerby*.

Seychelles, in 4–12 fms., on a sand and coral bottom; also Ile des Neufs, Amirantes, in 15 fms.

20. *Cucullæa concamerata*, *Chemnitz*.

Seychelles, at a depth of 12 fms.

## ECHINODERMATA.

BY

F. JEFFREY BELL.

THE greater number of the rather less than fifty species collected belong, as will be seen, to forms that are so thoroughly well known to students of this group of animals, that it has not been thought necessary to burden the text with the ordinary bibliographical references. The only object of especial interest is the remarkable new Ophiurid.

## ECHINOIDEA.

1. *Cidaris metularia*.
2. *Phyllacanthus baculosa*.
3. *Diadema setosum*.
4. *Astropyga radiata*.
5. *Salmacis* (young).
6. *Toxopneustes pileolus*.
7. *Tripneustes angulosus*.
8. *Echinometra lucunter*.
9. *Clypeaster scutiformis*.
10. *Brissus unicolor*.
11. *Metalia sternalis*.

## ASTEROIDEA.

1. *Echinaster purpureus*.
2. *Linckia lævigata*.
3. — *multiforis*.
4. — *diplox*.
5. *Scytaster variolatus*.
6. *Oreaster linckii*.
7. *Culcita schmideliana*.
8. *Gymnasterias carinifera*.
9. *Archaster typicus*.
10. *Astropecten polyacanthus*.
11. — *hemprichii* (?).

## OPHIUROIDEA.

1. *Ophioplocus imbricatus*.
2. *Ophiarthrum elegans*.
3. *Ophiocoma brevipes*.
4. — *scolopendrina*.
5. — *erinaceus*.
6. — *pica*.
7. — *schœnleini*.
8. *Ophiarachna incrassata*.
9. *Ophionereis dubia*.
10. *Ophiothrix trilineata*.
11. — *propinqua*.
12. — *longipeda*.
13. *Ophiopsammium* (?) sp.
14. *Neoplax ophiodes*.

## HOLOTHIROIDEA.

1. *Chirodota violacea*.
2. *Stichopus chloronotus*.
3. *Muelleria mauritiana*.
4. — *varians* (?)
5. *Holothuria vagabunda*.
6. — *impatiens*.
7. — *atra*.
8. — *maxima*.
9. — *amboinensis*.
10. — *pardalis*.
11. — *pulla* (?)
12. — *lagœna*.

## From Mozambique :—

<i>Cidaris metularia</i> .	<i>Astropecten hemprichii</i> (?).
<i>Astropyga radiata</i> .	<i>Ophioplocus imbricatus</i> .
<i>Toxopneustes pileolus</i> .	<i>Ophiocoma scolopendrina</i> .
<i>Tripneustes angulosus</i> .	— <i>schoenleini</i> .
<i>Echinometra lucunter</i> .	<i>Muelleria mauritiana</i> .
<i>Linckia lævigata</i> .	<i>Holothuria impatiens</i> .
— <i>multiforis</i> .	— <i>maxima</i> .
— <i>diplex</i> .	— <i>amboinensis</i> .
<i>Scytaster variolatus</i> .	— <i>pulla</i> (?).
<i>Oreaster lincki</i> .	— <i>lagoena</i> .
<i>Culeita schmideliana</i> .	

## From the Seychelles\* :—

<i>Diadema setosum</i> .	<i>Astropecten hemprichii</i> (?).
<i>Astropyga radiata</i> .	<i>Archaster typicus</i> .
<i>Salmacis</i> (? <i>bicolor</i> : young).	<i>Ophiocoma erinaceus</i> .
<i>Toxopneustes pileolus</i> .	<i>Ophiothrix trilineata</i> .
<i>Clypeaster scutiformis</i> .	— <i>propinqua</i> .
<i>Astropecten polyacanthus</i> .	— <i>longipeda</i> .

## From Darros Island :—

<i>Cidaris metularia</i> .	<i>Ophiocoma erinaceus</i> .
<i>Echinometra lucunter</i> .	— <i>pica</i> .
<i>Echinaster purpureus</i> †.	<i>Ophiuraelma incrassata</i> .
<i>Gymnasterias carinifera</i> .	<i>Ophionereis dubia</i> .
<i>Astropecten polyacanthus</i> .	<i>Ophiothrix propinqua</i> .
<i>Ophioplocus imbricatus</i> .	<i>Stichopus chloronotus</i> .
<i>Ophiarthrum elegans</i> .	<i>Muelleria mauritiana</i> .
<i>Ophiocoma brevipes</i> .	<i>Holothuria vagabunda</i> .
— <i>scolopendrina</i> .	— <i>atra</i> .

From one or more of the other islands of the Amirante group (African Island, Des Neufs, Eagle, Etoile, Marie-Louise, or Poivre) :—

<i>Cidaris metularia</i> .	<i>Ophiocoma pica</i> .
<i>Brissus unicolor</i> .	<i>Ophiothrix propinqua</i> .
<i>Metalia sternalis</i> .	<i>Chirodota violacea</i> .
<i>Ophiarthrum elegans</i> .	<i>Muelleria varians</i> (?).
<i>Ophiocoma brevipes</i> .	

From Des Neufs and Marie Louise come a number of small immature specimens of an *Actinometra*, of the general formula

\* It is possible that some elegantly coloured forms from the Seychelles belong to an undescribed species of *Ophiopsammium*; it is, however, one of which I have not seen any examples, and, at present, I find it impossible to come to any final conclusion as to their generic position or the exact relations of the genus *Ophiopsammium*.

† The single specimen of *Echinaster purpureus* from Daros Island has a much stouter habit and stronger less numerous spines than examples from more eastern localities; but at the same time it is by the same points to be distinguished from Savigny's figure.

$3A' \frac{b}{a}$ , which seems to be new to science, but of which more mature specimens must be obtained before the species can be named and described.

From the Ile des Roches, which is on a separate coral-bank from the other islands, came :—

*Phyllacanthus baculosus* (13 fms.).

At Providence Island, which is 240 miles S.W. by S. of the Amirante group, the only Echinoderm obtained was

*Ophiothrix propinqua*.

This species seems to be somewhat variable in the details of its coloration ; originally described by Lyman as having a blue marking, some specimens collected by the 'Challenger' were reported by that eminent authority as "red varieties." Such are most of the specimens in the present collection.

From Glorioso Islands come :—

*Ophiocoma scolopendrina* and *Holothuria pardalis*.

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In addition to the more or less well-known species of Ophiurids the names of which have just been given, the collection contains examples of some very remarkable forms which, so far as I am able to tell, have not yet received description at the hands of any naturalist.

In one case I feel justified in establishing a new genus, for which, as the term *Hemiplax* is already in use, I propose that of *Neoplax*.

### NEOPLAX.

Disk covered with a rather thick skin, not richly granulated. No radial shields ; the dorsal arm-plates present, but incompletely developed and not touching one another. Arms long, slender, coiled on themselves, but not divided. A few mouth-papillæ and a few teeth, but no fringe of spines to either. A moderate number of short arm-spines, with their basal portions embedded in the skin. The tentacle-scale single and very small. The genital slits long and the scale large.

This interesting genus appears to belong to Mr. Lyman's third group of Ophiuridæ, or the *Astrophyton*-like Ophiurans. Notwithstanding the absence of radial shields, it does not seem to have any special affinity to *Ophiomyces* ; but, on the whole, to stand not very far from *Ophiomyxa*, from which, however, it is to be distinguished (1) by the complete absence of radial shields, (2) the great reduction of the plates at the margin of the disk, (3) the twisted arms, and (4) the absence of the modified spines on the oral processes.

**Neoplax ophiodes.** (PLATE XLV. figs. *a-c*.)

Disk pentagonal and small; arms narrow, elongated, having the general appearance of being somewhat constricted between each joint, owing, probably, to the mode of attachment of the spines to the edge of the side arm-plates. Granules on the disk rather large, sparse, scattered, sometimes almost glassy in appearance; at the edge of the disk they are more closely packed and form a pretty definite row of bounding granules. Very few granules on the actinal surface.

Mouth-plates oval, a good deal broader than long, the side mouth-shields lying across them, so as almost, or altogether, to meet in the middle line. Five mouth-papillæ, four close together, the fifth close to its fellow of the opposite side. Three or four pretty strong teeth.

Though the genital slits are ordinarily long, the bridge separating the fellows of a pair is of a fair breadth; genital scale prominent.

On the fourth or fifth joint from the disk there are six small but distinct lateral spines, attached to the edge of the lateral plate; and further out there may be seven spines. The lowest spine is the longest and the most distinct. The upper arm-plates are widest along their proximal edge, the sides slope inwards, and the distal edge is much narrower. The most distinctive character in the lower arm-plates appears to be the excavation on the distal edge. The tentacle-scale is single, small, and at times, indeed, appears to be absent.

Diam. of disk 11.5, 8. Length of arm (probable), 60, 40 millim.

Coloration: the three specimens exhibit some differences, but are all brownish above and of a lighter hue below; several arm-joints are, here and there, darker than those just in front of or behind them.

All the three specimens were found at Darros Island, Amirante group, at a depth of 22 fms.



## CRUSTACEA.

BY

E. J. MIERS.

THE collection of Crustacea made in the Indian Ocean, if less numerous in species and less interesting than those obtained on the Australian coasts, contains a larger number of rare or undescribed forms than might have been expected, when it is remembered that the localities are all included in a region whose Crustacean fauna has been repeatedly explored by the collector. Of the Islands, however, visited by Dr. Coppinger, the Amirante, Providence, and Glorioso groups have been hitherto *terre incognite* to the carcinologist, and but little has been hitherto recorded of the Crustacean fauna of the Seychelles.

It may be useful (as in the previous part of this Report) to mention here the principal memoirs which have appeared since the publication of Milne-Edwards's 'Histoire naturelle des Crustacés' (1834-40) which deal specially with the Crustacean fauna of the East-African coast from the Red Sea to the Cape of Good Hope, and of the Mascarene Islands and other islands belonging to the same geographical subregion.

In 1843 appeared Dr. F. Krauss's valuable account of the South-African Crustacea\*, containing a complete enumeration of the then known Podophthalmia and Edriophthalmia of the Cape Colony and Natal, a work which even now forms the standard of reference for all students of the South-African Crustacea. Since its publication few additions have, indeed, been made to our knowledge of the South-African marine and littoral Crustacea beyond the descriptions of certain new species by Dr. W. Stimpson†.

In 1861-62 appeared Dr. C. Heller's standard work, "Beiträge zur Crustaceen-Fauna des rothen Meeres"‡, which added largely to what was previously known from the writings of Milne-Edwards, Rüppell,

\* 'Die südafrikanischen Crustaceen,' Stuttgart (1843), 4to.

† Proc. Acad. Nat. Sci. Philadelphia, 1857-60.

‡ Sitzungsber. Akad. Wissenschaft. Wien, xliii. (1) p. 297, xliv. (1) p. 241 (1861-62).

and others concerning the Podophthalmia and Edriophthalmia of the Red-Sea coasts. In the latter year also was published M. A. Milne-Edwards's enumeration (with descriptions of a few new species) of the Crustacea of Réunion\*.

In 1868 M. A. Milne-Edwards published an account of the Crustacea collected by M. A. Grandidier at Zanzibar and Madagascar (Cape St. Mariet†); and in the following year, in the third volume of Baron C. von der Deeken's 'Travels in East Africa' appeared the careful account by Dr. F. Hilgendorf of the Crustacea collected in that Expedition, to which is appended a very useful and complete systematic list, by Dr. E. von Martens, of all the known Crustaceans of the East-African coasts and islands adjacent‡.

In 1874 a Report appeared by C. K. Hoffmann, entitled 'Sur les Crustacés et Echinodermes de Madagascar et de l'Ile de la Réunion'§, based upon the extensive collections made by the author himself and by MM. Pollen and van Dam, wherein also numerous species are enumerated from the Mauritius.

In 1878 the Crustacea of Mozambique were dealt with by Dr. F. Hilgendorf, in the very useful memoir entitled "Die von Hrn. W. Peters in Mosambique gesammelten Crustaceen"||; a few species from the same locality had been previously enumerated by Prof. J. Bianconi in 1869¶.

In 1879, in the "Report of the Naturalists of the British Transit-of-Venus Expedition," were enumerated the Crustaceans collected at the island of Rodriguez, all, except *Talitrus gulliveri*, Podophthalmia, and nearly all common and widely distributed species\*\*.

In 1880 was published the excellent account, by Dr. F. Richters, of the Decapoda in Prof. Möbius's work on the marine fauna of the Mauritius and Seychelles††, to which frequent reference is made in the following pages. Since the appearance of this work, I have given‡‡ an account of some new or remarkable species collected at the Mauritius by M. V. de Robillard.

In 1881 Drs. H. Lenz and F. Richters, in a memoir entitled "Beitrag zur Krustaceen-Fauna von Madagascar"§§, enumerated a

\* Annexe F, Crustacés, in Maillard's 'Notes sur l'Ile de la Réunion.' Paris, 8vo (1862).

† Nouvelles Archives du Muséum, iv. p. 69 (1868).

‡ Vide Hilgendorf, Crustaceen in V. der Deeken's Reisen in Ost-Afrika, iii. (1) p. 1, and von Martens, *l. c.* p. 104 (1869).

§ In F. Pollen & D. v. Dam, 'Recherches sur la Faune de Madagascar,' &c. (5<sup>e</sup> partie). Leyden (1874). 4to.

|| Monatsber. der Akad. Wissensch. Berlin, p. 782 (1878).

¶ "Specimina zoologica mosambicana," fasc. xvii., in Mem. dell' Accademia di Bologna, ser. 2, ix. p. 205 (1869).

\*\* Vide E. J. Miers, in Phil. Trans. Royal Society, clxviii. p. 485 (1879).

†† Richters, Decapoda in Möbius's 'Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen,' 4to, Berlin (1880).

‡‡ Proc. Zool. Soc. pp. 339, 538 (1882); p. 10 (1884).

§§ Vide Abhandl. Senckenberg. naturf. Gesellsch. Bd. xii. p. 421 (1881).

certain number of Decapoda from Madagascar; among them are certain species new to the Madagascar fauna.

I may refer, in conclusion, to Dr. R. Kossmann's elaborate account of the Malacostraca (*Brachyura* and *Anomura*) in the yet incomplete account of his Exploration of the coasts of the Red Sea\*, wherein the principle of uniting allied species is carried to a perhaps inconvenient degree, and some modifications in the classification of genera and species are proposed which are of doubtful value to the systematist, but which contains much important and useful matter relating to the Crustacean fauna of the Red Sea. In this work frequent reference is made to a publication (in Russian, and with Russian title) by Dr. Paulson, which appeared at Kiew in 1875, but which I have never seen†, and which I believe has been quoted by no other carcinologist.

### *List of the Localities.*

#### SEYCHELLES.

4-12 fms., coral and sand, March 1882 (No. 194).

Bird Island, December 1881 (No. 210).

Mahé Island, beach, March 1882 (No. 196).

#### AMIRANTE GROUP.

African Island. Beach, December 1881 (No. 210).

African or Eagle Islands. 10 fms., sand and coral, March 1882 (No. 184).

Eagle Island. Beach, December 1881 (No. 210).

Darros Island. Beach, March 1882 (Nos. 199, 200); 22 fms., sand and coral, March 1882 (Nos. 185, 233).

Poivre Island. Beach, March 1882 (No. 198).

Poivre Island and Ile des Roches. 13-20 fms., sand and mud, March 1882 (No. 183).

Ile des Roches. Beach, December 1881 (No. 210).

Etoile Island. 13 fms., coral, April 1882 (No. 191).

Marie-Louise Island. 17 fms., coral, April 1882 (Nos. 186, 190).

Ile des Neufs. 15 fms., dead coral, April 1882 (No. 187).

#### PROVIDENCE GROUP.

Providence Island. Beach, December 1881 (No. 210); 19 fms., coral, April 1882 (No. 217).

Providence Reef. 24 fms., sand and dead coral, April 1882 (No. 215).

Cerf Islands. 10 fms., sand, April 1882 (No. 232).

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\* 'Zoologische Ergebnisse einer . . . Reise in die Küstengebiete des rothen Meeres' (erste u. zweite Hälften), 4to, Leipzig (1877 and 1880).

† This title, as translated for me by Mr. H. B. Wilson, lately of the Department of Printed Books in the British Museum, signifies "Researches upon the Crustacea of the Red Sea."

Glorioso Islands. Beach and reef at low water, May 1882 (No. 220); 7-10 fms., sand and mud, May 1882 (No. 219).

Mozambique. Beach, between tide-marks, May 1882 (Nos. 224, 225, 227); specimens found in the interior of *Tridacna*-shells (No. 237).

In the systematic list of the species which follows, 104 species and varieties are enumerated from the African subregion, besides 13 which were collected at Singapore and are not included in this Report; of these, 16 species and 6 varieties are described as new to science. 38 species and varieties are indicated as new to the African subregion; but several of the new varieties may not improbably have been already recorded by previous writers under the typical designation of the species.

Little need be said with regard to the geographical distribution of the species, since the great majority, except in the groups Oxyrhyncha and Oxystomata (which are richest in undescribed forms), are common in the Indo-Pacific region\*, but confined, with few exceptions, to that area of distribution. Such exceptions are *Grapsus maculatus*, *Liolophus planissimus*, *Alpheus edwardsii*, and *Gonodactylus chiragra*, which extend into the Atlantic region; also *Thalamita integra* and *Calappa gallus*, var. *bicornis* (if the distribution of the variety be included in that of the typical form). It is not necessary to repeat here what has been already noted on the affinity of the Crustacean fauna of this subregion or district with that of the West Indies†.

### *List of the Species, showing their Geographical Range.*

[N.B. The species and varieties distinguished by an asterisk are those which I believe to be now recorded for the first time from the Mascarene subregion and the Eastern coast of Africa. The term "Oriental Region" denotes that the species ranges from the African coast or islands adjacent eastward at least to one of the island-groups of the Pacific Ocean. At the end of this Report a table is appended, showing the distribution of the species on the East-African coast and the islands belonging to the same geographical sub-region.]

## PODOPHTHALMIA.

### DECAPODA.

#### BRACHYURA.

\**Achæus leviculus*, sp. n. Seychelles.

*Camposcia retusa*, Latreille. Mozambique; Oriental Region.

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\* Prof. F. W. Hutton, in a recent article on Zoological Geography, adopts the terms Province and District for marine geographical divisions in contradistinction to the terms Region and Subregion, which he restricts to the land divisions (*vide* 'New Zealand Journal of Science,' i. p. 199, footnote, 1882).

† Proc. Zool. Soc. p. 539 (1882).

- \* *Huenia pacifica*, Miers. Seychelles; Fiji Islands.  
*Menæthus monoceros* (Latreille). Mozambique; Seychelles; Oriental Region.
- \* *Stilbognathus martensii*, sp. n. Marie-Louise Island; Providence Island.
- \* *Paramithrax* (*Chlorinoides*) *longispinus*, De Haan, var. *bituberculatus*, n. Darros Island; Providence Island.
- \* *Hyastenus* (*Chorilia*) *oryx*, A. M.-Edwards. Providence Island; Oriental Region.
- \* — ( — ) *oratus* (Dana). Poivre Island or Ile des Roches; Hawaiian Islands.
- \* — ( — ) —, var. *tenuirostris*, n. African or Eagle Islands.  
*Naxia* (*Naxioides*) *pecterii*, Hilgendorf. Marie-Louise Island; Mozambique.
- \* *Eurynome stimpsonii*, sp. n. Providence Reef.  
*Micippa thalia* (Herbst), var. *hauni*, Stimpson. Providence Island; Mozambique; Pa-tchu-san; seas of China and Japan.
- \* *Paramicippa asperimanus*, sp. n. Seychelles; Providence Island.
- \* *Eutomonyx spinosus*, gen. et sp. n. Providence Island and Providence Reef.
- \* *Lambrus* (*Parthenopoides*) *calappoides*, Ad. & White? Seychelles; "Oriental Seas."
- \* *Euxanthus exsculptus*, var. *rugosus*, n. Darros Island; Madagascar, Tamatave.  
*Lophactæa semigranosa* (Heller). Etoile Island; Red Sea.  
*Lophozozymus dodone* (Herbst)? Mozambique; Ibo, Mauritius; "East Indies" (Herbst).
- Lionera punctata* (M.-Edwards). Darros Island; Oriental Region.  
*Actæa rufopunctata*, M.-Edwards. Seychelles; Oriental Region.  
*Atergatopsis granulatus*, A. M.-Edwards. Marie-Louise Island; Zanzibar; "Eastern Seas"?
- Xanthodes lamarekii* (M.-Edwards). Seychelles; Oriental Region.  
*Carpilodes rugatus* (M.-Edwards). Seychelles; Oriental Region.  
*Actæodes tomentosus* (M.-Edwards). Darros Island; Oriental Region.  
*Leptodius exaratus* (M.-Edwards, var.). Darros Island; Mahé Island; Oriental Region.
- \* — —, var. *gracilis* (Dana). Mozambique; Poivre Island; Oriental Region?
- Phymodius rugipes* (Heller). Seychelles; Red Sea.  
*Chlorodius niger* (Forskål). Seychelles; Oriental Region.
- \* — *miliaris*, A. M.-Edwards. Seychelles; New Caledonia.
- \* *Chlorodopsis melanodactylus*, A. M.-Edwards. Seychelles; African or Eagle Islands; Etoile Island; New Caledonia; Samoa Islands.  
 — *areolatus* (M.-Edwards). Mozambique; Darros Island; Oriental Region.
- Etisodes electra*, Herbst. Seychelles, 4-12 fms.; Oriental Region.  
*Cymo andreossii* (Audouin). Seychelles; Oriental Region.  
*Actumnus setifer* (De Haan). Seychelles; Ile des Neufs; Providence Island; Oriental Region.
- Eurippellia annulipes* (Milne-Edwards). Poivre Island; Oriental Region.
- Ozius* (*Epixanthus*) *frontalis*, M.-Edwards. Mahé Island; Oriental Region.
- Eriphia lævimanus*, M.-Edwards. Darros Island; Glorioso Islands; Oriental Region.  
 — *lævimanus*, var. *smithii*, MacLeay. Mozambique; Glorioso Islands; Oriental Region.



- Eriphia scabricula*, Dana. Mozambique; Darros Island; Oriental Region.
- Trapezia cymodoce* (Herbst). Seychelles; African or Eagle, Darros, Etoile, Marie-Louise, des Neufs, and Glorioso Islands; Oriental Region.
- *ferruginea*, Latreille. Seychelles; Oriental Region.
- *rufopunctata* (Herbst). Etoile Island; Glorioso Islands; Oriental Region.
- Tetralia cavimanus*, Heller. Seychelles; Etoile Island; Oriental Region.
- \* *Xiphonectes vigilans* (Dana), var. *obtusidentatus*, n. Seychelles.
- Scylla serrata* (Forskål). Mozambique; Oriental Region.
- Achdous granulatus* (M.-Edwards). Seychelles; Oriental Region.
- Goniosoma nutator* (Herbst). Poivre Island or Ile des Roches; Oriental Region (eastward, at least, to the Moluccas).
- Thalamita sima*, M.-Edwards. Mozambique; Seychelles; Poivre Island or Ile des Roches; Glorioso Islands; Oriental Region.
- \* — *quadrilobata*, sp. n. Seychelles.
- *integra*, Dana. Oriental Region (Senegambia; Canaries, var.).
- *crenata*, Rüppell. Mozambique; Oriental Region.
- *picta*, Stimpson. Darros Island; Oriental Region.
- Lissocarcinus orbicularis*, Dana. Seychelles; Oriental Region.
- Gelasimus annulipes*, M.-Edwards. Mahé Island; Oriental Region.
- *dussumieri*, M.-Edwards. Mahé Island; Oriental Region.
- Ocypoda ceratophthulma* (Pallas). Ile des Roches; Oriental Region; St. Christopher (??)
- *cordimanus*, Desmarest. Seychelles; African Island; Ile des Roches; Providence Island; Oriental Region.
- Macrophthalmus parvimanus*, Latreille (ined.), M.-Edwards. Mahé Island; Mauritius (M.-E.); Réunion (A. M.-E.); Fonquets (Richters).
- Euplax* (*Chænostoma*) *boscii* (Audouin). Mozambique; Oriental Region.
- Dotilla fenestrata*, Hilgendorf. Mozambique; E. Africa (Ibo to Natal).
- Carcinoplax integra*, sp. n. Seychelles.
- Grapsus maculatus* (Catesby). African Island; Oriental and Atlantic Regions.
- *strigosus* (Herbst). Mozambique; Oriental Region.
- Geograpsus grayi* (M.-Edwards). Ile des Roches; Providence Island; Oriental Region.
- Metopograpsus messor* (Forskål). Mahé Island; Oriental Region.
- Liolophus planissimus* (Herbst). Darros and Etoile Islands; Oriental Region (to Cape St. Lucas); Atlantic Region (Madeira, Ascension Island, Jamaica, coast of Florida).
- \* *Xanthasia murigera*, White. Mozambique; Oriental Region.
- \* *Philyra rectangularis*, sp. n. Seychelles.
- (*Philyra rudis*, sp. n. Penang.)
- \* *Pseudophilyra polita*, sp. n. Poivre Island and Ile des Roches.
- \* *Nursilia dentata*, Bell. Seychelles; Oriental Region.
- \* *Arcania undecimspinosa*, De Haan. Seychelles; Oriental Region (Japanese and Australian seas).
- Ebalia granulata* (Rüppell). Providence Island; Red Sea.
- Calappa hepatica* (Linn.). Mozambique; Oriental Region.
- \* — *gallus* (Herbst), var. *bicornis*, n. Providence Island; Indian Ocean.
- \* *Cymopolia whitei*, sp. n. Seychelles.

## ANOMURA.

- \**Dromidia spongiosa*, Stimpson, var. *stimpsonii*, n. Mozambique.
- \**Dromia vulgaris*, M.-Edwards. Providence Island; European seas northward to the British Channel; Indian and Indo-Malayan seas?
- \**Homalodromia coppingeri*, gen. et sp. nov. Providence Reef.
- Birgus latro* (Linn.). Du Lise Island; Oriental Region.
- Cænobita perlata*, M.-Edwards. Eagle and African Islands; Oriental Region? (eastward to Japan).
- Pagurus punctulatus*, M.-Edwards. Darros Island; Oriental Region.
- *guttatus*, Olivier. Seychelles; Mascarenes; Madagascar.
- Calcinus tibicen* (Herbst). Mozambique; Oriental Region.
- \**Petrolisthes lamarckii* (Leach). Darros Island; Oriental Region (eastward to the Australian seas).
- —, var. *asiaticus* (Leach). Darros Island; Oriental Region.
- \*— *annulipes*, White (ined.), Miers. Seychelles; Oriental Region (to Philippines and Australia).
- \*— *maculatus*, M.-Edwards. Mozambique; New Ireland.
- *villosus* (Richters)? Darros Island; Mauritius.
- \**Polyonyx bimaculatus* (Dana). Seychelles; Etoile Island; Gulf of Suez; Oriental seas?
- Galathea spinosirostris*, Dana? Marie-Louise Island; Providence Island?; Oriental Region (Sandwich Islands).
- \**Munida edwardsii*, sp. n. Ile des Neufs.

## MACRURA.

- Alpheus obeso-manus*, Dana. Seychelles; Oriental Region.
- *edwardsii*, Audouin. Seychelles; Oriental Region to California; Atlantic Region (Cape Verdes; American coast from Carolina to Brazil).
- *levis*, Randall. Seychelles; African or Eagle Islands; Etoile Island; Oriental Region.
- \*— *collumianus*, Stimpson? African or Eagle Islands; Bonin Island.
- *minor*, Say, var. *neptunus*, Dana. Darros Island; Ile des Neufs; Glorioso Islands; Oriental Region (to Bay of Panama).
- \**Pontonia? brevisrostris*, sp. n. Seychelles.
- \**Coralliocaris graminea* (Dana). Seychelles; Oriental Region.
- Penæus canaliculatus*, Olivier. Poivre Island; Oriental Region (to Nicaragua).
- \*— *richtersii*, sp. n. Cerf Island.

## STOMATOPODA.

- Gonodactylus chiragra* (Fabr.). Mozambique; Seychelles; Darros Island; Etoile Island; Oriental Region (to American coast); Atlantic Region (Mediterranean; W. Indies; Brazil).
- *graphurus*, Miers. Seychelles; Oriental Region.
- \*— *elegans*, sp. n. Providence Island or Ile des Roches; Providence Reef.

## AMPHIPODA.

- \**Mæra diversimanus*, sp. n. Seychelles.

## DECAPODA.

## BRACHYURA.

1. *Achæus lævioculis*. (PLATE XLVI. fig. A.)

I thus doubtfully designate a male specimen from the Seychelles, 4–12 fms., which in many of its characters closely resembles *A. lorina* (Ad. & White\*), from Mindanao and Borneo, but is distinguished by the absence of the prominent spines or tubercles on the gastric and cardiac regions of the carapace (which are here replaced by very small tubercles), the nearly terete eye-peduncles (which in *A. lorina* are armed with a spine or tubercle), and the much shorter ambulatory legs, which are scarcely more than twice the length of the carapace, and have the dactyli, even of the fifth pair, very little falcated, whereby this species may be at once distinguished from *A. cranchii* and *A. lacertosus*. *A. tuberculatus*, Miers, has the carapace much less constricted behind the eyes, a prominent cardiac spine, &c. I should note that in specimens of *A. lorina* in the Museum collection the spines of the carapace are much less prominent than in the figure of Adams and White.

2. *Camposcia retusa*, Latr.

Two females of this common Oriental species were obtained on the beach between tide-marks at Mozambique (No. 224), a locality whence Dr. Hilgendorf has already recorded it. I have already referred to its distribution on p. 189.

3. *Huenia pacifica*, Miers.

A male from the Seychelles, 4–12 fms. (No. 194), closely resembles the type specimen of this species from the Fijis in the characteristically long and slender rostrum and in all other characters. The occurrence of *H. pacifica* at the Seychelles suggests the possibility of this form being identical with *H. grandidieri*, A. M.-Edwards, from Zanzibar, founded upon a female example only†. I have, however, already noted the distinctions which exist between M.-Edwards's figures of *H. grandidieri* and the female from the Fijis in the Museum collection which I refer to *H. pacifica*. With the limited material available for comparison, the two forms certainly cannot be united; but perhaps the examination of a sufficient series would demonstrate the necessity of regarding both as mere varieties of the long-known *H. proteus*, with which they may be linked through the form designated by White *H. heraldica*, which has been already cited in the first part of this Report as synonymous with *H. proteus*.

\* Zool. 'Samarang,' Crust. p. 3, pl. ii. fig. 2 (1848).

† Ann. Soc. Entom. France, sér. 4, v. p. 143, pl. iv. fig. 2 (1865).

#### 4. *Menæthius monoceros* (Latr.).

A series of specimens of both sexes and various ages are in the collection from the Seychelles, 4-12 fms. (No. 194); also a small female obtained on the beach at Mozambique (No. 224), which has the prominences or lobes of the antero-lateral margins spiniform and acute.

I have already referred to this widely distributed and variable species on p. 190.

A small female specimen, which has unfortunately lost all the legs, obtained at African or Eagle Islands, 10 fms. (No. 184), has the rostrum remarkably abbreviated, not equalling in length the interocular width of the frontal region of the carapace, the greatest width at the branchial regions little exceeding the width at the frontal region, and the basal antennal joint more dilated than in the typical *M. monoceros*. It appears to merit distinction at least as a variety, since I have seen no specimen in the extensive Museum series which closely resembles it, but I refrain for the present from designating it as such.

#### 5. *Stilbognathus martensii*. (PLATE XLVI. fig. B.)

I propose thus to designate two males obtained at Marie-Louise Island, 17 fms. (No. 186), and a male from Providence Island, 19 fms. (No. 217), which, although having the ischium-joint of the outer maxillipedes longitudinally sulcated (and hence certainly belonging to *Stilbognathus*), differ from *Stilbognathus erythraeus*, Von Martens\*, from the Red Sea, in the form of the merus-joint, which has its extero-distal angle produced and acute as in *Stenocionops cervicornis*, and which further differs from the known species both of *Stenocionops* and *Stilbognathus* in having the notch on the inner margin (where the fourth joint articulates with it) provided with a tooth or lobe (see fig. *b*).

The carapace is constricted behind the orbits (as in *S. cervicornis*); the gastric, cardiac, and front of the branchial regions are rather convex and more or less distinctly covered with small tubercles or granules; the posterior margin of the carapace is cristate and prolonged in the median line into a tooth or lobe. The spines of the rostrum are slender and curved at first outwards and then inwards so as to meet at the apices, which are vertically reflexed as in *Stenocionops curvirostris*, A. M.-Edwards. There is a rounded prominence upon each pterygostomial region. The supraocular spines of the carapace are very long and straight; the eye-peduncles even longer; the basal antennal joint is considerably dilated, and has a small spine on its outer side near the base and another at its distal extremity. The longitudinal pit on the outer surface of the ischium-joint of the outer maxillipedes is longer than in *Stilbognathus ery-*

\* Verhändl. zool.-bot. Gesellsch. Wien, xvi. p. 379, fig. (1866).

*thraeus* as figured by Von Martens, reaching to the distal end of the inner margin, which is toothed as in *S. erythraeus*; this joint has a convex shining prominence at its outer and distal angle. The merus-joint is less deeply excavated where it is articulated with the ischium than in *S. erythraeus*, and, as already stated, there is a tooth in the notch on the inner margin where the carpus-joint is articulated with it, and its extero-distal angle is produced and acute; the lobe on the inner margin of the exognath is acute. The chelipedes (in the male) are of moderate length; merus and carpus granulated; palm granulated above, and with a longitudinal series of granules on its outer and inner surface; fingers arcuated and meeting (in the adult) only toward the apices, where they are denticulated. The ambulatory legs are slender and decrease in length from the first to the last, the first pair being much elongated. Colour (in spirit) yellowish or purplish. Length of carapace (without rostrum) 9 lines (19 millim.).

6. *Paramithrax* (*Chlorinoides*) *longispinus*, De Haan,  
var. *bituberculatus*.

An adult but small male from Darros Island, 22 fms. (No. 185), and two small males and a female obtained at Providence Island, 19 fms. (No. 217), are referred to this species, which has evidently a wide Oriental distribution.

They are distinguished from *P. longispinus* as figured by De Haan merely by having the lower (immobile) finger as well as the dactylus armed with a tooth or tubercle on its inner margin in the males, and the upper margin of the palm straight and entire, not dentated; the spines of the carapace and legs are small. The anterior præ-orbital spine is more or less recurved, as in De Haan's figure of the Japanese type.

From *P. coppingeri*, Haswell, referred to in the first part of this Report, this species is distinguished not merely by the form of the chelipedes, but by the less elongated carapace and ambulatory legs.

7. *Hyastenus* (*Chorilia*) *oryx*, A. M.-Edw.

Two females and two small males are in the collection from Providence Island, 19 fms. (No. 217).

These specimens are of interest as showing the wide Oriental distribution of this species, which had not previously been recorded, I believe, from the Western division of the Indo-Pacific Region. It has already been noticed in the first part of this Report (p. 195).

8. *Hyastenus* (*Chorilia*) *ovatus*.

*Lahaina ovata*, Dana, *Amer. Journ. Sci. & Arts*, ser. 2, xi. p. 269 (1851); *U.S. Expl. Exped.*, *Crust.* i. p. 92, pl. iii. fig. 1 (1853).

A small but adult female is referred to this species from Poivre



Island, or Ile des Roches, 13-20 fms. (No. 183), and a small male from Darros Island, 22 fms. (No. 233).

Dana's types were from the Hawaiian Islands; hence this species, which was previously unrepresented in the Museum collection, is evidently distributed throughout the Oriental Region.

It appears to be very distinctly characterized by the slender and very divaricate rostral horns, and the strong spines of the pterygostomial regions and basal antennal joints. In the specimens before me, the carapace beneath the pubescence is obviously tuberculated, and it is not so broadly ovate as in Dana's figure; as in that figure, there are small lateral epibranchial and intestinal spines.

There is, I think, no sufficient reason for separating this form, even as a subgenus, from *Chorilia*.

In a female from African or Eagle Islands, 10 fms. (No. 184), the carapace is still narrower, less distinctly tuberculated, and has scarcely any trace of the epibranchial and no intestinal spine; the spines of the rostrum are longer, exceeding the carapace in length; the spines of the basal antennal joints and pterygostomial regions shorter (the latter subequal). This I will designate *L. ovata*, var. *tenuirostris*.

#### 9. *Naxia* (*Naxioides*) *petersii*, Hilgendorf.

A young specimen is in the collection, from Marie-Louise Island, 17 fms. (No. 186).

Two specimens of this species are in the British-Museum collection without special locality (*H.M.S. 'Samarang'*). Dr. Hilgendorf's specimen was from Mozambique.

As I have elsewhere noted\*, this species is very probably identical with the earlier described *N. hirta*, A. M.-Edwards, from Zanzibar.

#### 10. *Eurynome stimpsonii*. (PLATE XLVII. fig. A.)

The carapace is of a rather narrow-pyriform shape; the spines of the rostrum rather short, very slightly divergent, and shaped nearly as in *Eurynome aspera*; there are usually two small spinules on the front of the gastric region, and always a strong spine on each branchial region. The surface of the carapace has besides several broadly dilated, laminate, flattened expansions, which, when examined with a lens of sufficient power, are seen to be themselves granulated:—one (longitudinal) on the gastric, one (posteriorly emarginate, and bearing a strong dorsal spine) on the cardiac, one (transverse) on the intestinal, one on the hepatic, and four on the branchial region grouped around the branchial spine; also one on the posterior margin of the carapace; their form will be best understood by a reference to the figure. The postocular tooth or lobe is prominent and triangulate; there is a small ridge or prominence on

\* Proc. Zool. Soc. 1882, p. 341.

the pterygostomian region; the basal antennal joint is slender, but not, as in *E. aspera*, longitudinally sulcated. The chelipedes in the single male examined (which is, however, of very small size) are small and slender; the merus-joint armed with a longitudinal series of small spines and other spines irregularly disposed; wrist and palm also armed on the upper and outer surfaces with numerous irregular spines; palm slender, about twice as long as the fingers, which are straight, not denticulated, and meet along their inner margins. The merus-joints of the ambulatory legs are armed above with a double longitudinal series of small spines, and there are spines also on the two following joints. Colour (in spirit) rose-pink. Length of the body to the apex of one of the rostral horns in the largest specimen (a female) rather over 5 lines (11 millim.); breadth nearly 3 lines (6 millim.).

There are in the collection four females and a small male, from Providence Reef, 24 fms. (No. 215).

This species is evidently nearly allied to *E. longimanus*, Stimpson, dredged with *Gorgonie* at 10 fms. off the Cape of Good Hope\*, which is only known to me by the short Latin diagnosis of its author; but it is distinguished not merely by the much shorter rostral spines and chelipedes (which may vary with age), but also by the absence of teeth on the branchial regions and posterior margin of the carapace, and the non-carinated ambulatory legs. Nothing is said by Stimpson of the form of the flattened *papille* of the carapace, nor does he mention the existence of the cardiac spine or of the spines on the wrist and palm of the chelipedes, &c. As in his species, the upper orbital fissure is closed in *E. stimpsonii*.

*Eurynome erosa*, A. M.-Edwards†, from Samoa (Upolu), is a much broader species, with less distinctly spinose legs, and the flattened prominences of the carapace are smaller and very different in form and position.

### 11. *Micippa thalia*, Herbst, var. *haani*, Stimpson.

A small male collected at Providence Island, 19 fms. (No. 217), seems to belong here. An adult male, closely resembling De Haan's figure, is in the British-Museum collection from Mozambique (*Prof. Bianconi*), designated "*Micippa cornuta*, Bianconi," and a small male from Pa-tchu-San (*H.M.S. 'Samarang'*).

This variety (for I can scarcely regard it as specifically distinct) is mainly distinguished from the species designated *M. thalia* in the Museum collection by having a prominent supraocular spine, and by the much greater prominence of the spines on the gastric and branchial regions and of the lateral margins in the adult; in the younger specimens, however, all except the supraocular spines are very small. As the supraocular spines seem to be referred to in Herbst's original description of *M. thalia*, they cannot be cited as

\* Proc. Acad. Nat. Sci. Philad. p. 219 (1857).

† Journ. Mus. Godeffroy, i. p. 78, pl. xii. fig. 1 (1873).

distinctively characterizing the variety *haani*, which is connected with *M. thalia* by insensible gradations.

Specimens referred by Dr. F. Richters to *M. thalia*, De Haan, from Fouquets, may probably belong to this variety; but the length of the supraocular spines is not mentioned.

## 12. *Paramicippa asperimanus*.

I thus designate a series of specimens from Providence Island, 19 fms. (No. 217), and a small female from the Seychelles, 4–12 fms. (No. 194).

These specimens in all their characters so nearly approach the typical *Paramicippa platypes*, Rüppell, from the Red Sea, of which they may prove to be a variety, that a detailed description is scarcely needed. They scarcely differ except in the form of the rostrum, which is much less deeply emarginate at its distal extremity, with the terminal lobes less acute; in the slenderer chelipedes of the male, whose merus-joint is longer, wrist minutely granulated on its inner and outer surface, and palm more elongated, granulated on its inner surface and without the characteristic coloration of *M. platypes*: and in having the distal extremity of the dilated basal antennal joint armed with a series of spinules, which are visible from above between the rostrum and the orbital cavity. In this latter character this species approaches *Micippa philyra*, Herbst, from which it is distinguished by the dilated palms and arcuated fingers of the chelipedes in the male and much more deeply emarginate front. It seems, in fact, to occupy an intermediate position between the two forms—which, however, can hardly be conspecific, since an adult male in the Museum collection of *M. philyra*, with slender feeble chelipedes, is of larger size than the males with strong dilated chelipedes of *P. platypes* and *P. asperimanus*. The specimen figured by Richters\* as *M. philyra*, var. *latifrons*, seems to be an adult male *Paramicippa platypes*. I cannot identify *P. asperimanus* with any of the “varieties” recently figured by Kossmann†; the variety designated *Micippa philyra*, var. *mascarenica*, is distinguished by the much deeper notch of the anterior margin of the rostrum, and nothing is said of the form of the chelipedes in this form.

The British Museum, since the above was written, has received an adult male of very large size from the Mauritius (*M. V. de Robillard*), in which the rostrum is as deeply notched as in the typical *M. platypes*, and the palms of the chelipedes strongly granulated both on the inner and outer surfaces.

## ENTOMONYX, gen. nov.

Carapace subpyriform. Rostrum obliquely deflexed and com-

\* In Möbius's 'Beiträge zur Fauna der Insel Mauritius und der Seychellen,' Decapoda, p. 142, pl. xvi. figs. 1–5 (1880).

† 'Zool. Ergebnisse . . . rothen Meeres,' Brachyura, p. 6, pl. iii. figs. 1, 3, 4, 5 (1877).

posed of two moderately divergent spines. Orbits deep, tubular, with a lateral aspect, and with two nearly closed fissures above. Basal antennal joint very much dilated, with a small distal spine. Chelipedes (in the male) rather small and slender, fingers nearly straight. Ambulatory legs slender, not spinose or nodose.

This genus must, I think, be associated with *Pericera* in the family Periceridae, on account of the deep, well-defined, and tubular orbits, notwithstanding the two narrow fissures in their superior margin. It is further distinguished from *Pericera* by the deflexed rostrum and the absence of a series of lateral spines. In *Priororhynchus* the rostrum is deflexed, but lamellate and merely notched at its distal extremity.

### 13. *Entomonyx spinosus*. (PLATE XLVII. fig. B.)

The carapace is moderately convex, subpyriform; its surface uneven and granulated, with two spines in a longitudinal series on the gastric, two in a transverse series on the cardiac, and two on the branchial regions near the postero-lateral margins. The spines of the rostrum are rather short, moderately divergent, broadest at base, and distally acute. The orbits are deep, tubular, project somewhat laterally, and are bordered with short spiniform teeth; in the upper margin, near the postocular lobe or tooth, are two narrow fissures. The postabdomen (in the male) is narrow, with the segments all distinct, the first the shortest. The pterygostomian regions are granulated. The basal antennal joint is granulated and very much enlarged, and has a short spine at its distal extremity beneath the base of the next joint, besides two small spines which are situated on the inferior margin of the orbit. The anterior legs or chelipedes are of moderate length and rather slender; merus-joint or arm granulated, and with a series of spines on the upper and lower surfaces; the wrist and palm also very closely granulated, the wrist with some longer tubercles or short spines on its outer surface near base; the palm rather slender, nearly twice as long as the wrist; the fingers nearly straight, acute at their apices, and regularly denticulated along their inner margins. The ambulatory legs are very slender, and decrease regularly in length from the first to the last; their merus-joints are minutely spinulose above, and have a longer spine at the distal extremity. The carapace and ambulatory legs are clothed with short curled hairs, which are longest and most dense at the base of the rostrum. Colour (in spirit) pinkish. Length of carapace to base of rostrum nearly  $5\frac{1}{2}$  lines (11 millim.), greatest breadth  $4\frac{1}{2}$  lines (9.5 millim.); length of a chelipede about  $\frac{1}{2}$  inch (13 millim.).

An adult female and small male were collected at Providence Reef, 24 fms. (No. 215), and three males and a female at Providence Island, 19 fms. (No. 217).

The rostrum is more strongly deflexed in the females than in the males.

#### 14. *Lambrus* (*Parthenopoides*) *calappoides*, *Adams & White*?

Two small males are in the collection from the Seychelles, 4-12 fms. (No. 194).

They have the carapace relatively somewhat broader and flatter than in the typical *L. calappoides* from the Philippines and Eastern Seas, and are possibly distinct. The specimens of *L. calappoides* in the Museum collection are somewhat more strongly tuberculated, but vary between themselves as regards this character.

#### 15. *Euxanthus exsculptus*, var. *rugosus*.

This designation is proposed for a female specimen obtained on the beach at Darros Island (No. 200), which differs from all the specimens of *Euxanthus exsculptus* (*E. mammillatus*) in the Museum collection in having the elevations or bosses of the carapace very much more rugose and punctulated, so that it has something of the appearance of a specimen of *Hypocælus sculptus*. A larger female is in the Museum collection from Tamatave, Madagascar (*Rev. Deans Cowan*), from which the figure is taken. As in the specimens of the typical form of *E. exsculptus* in the Museum collection, from Australia and the Philippines, the bosses of the carapace, although distinctly punctulated, are never rugose, I think this form may prove to be specifically distinct. In *E. huonii* (referred to in the earlier part of this Report and in *E. sculptilis*) there is an additional antero-lateral marginal tooth developed between the penultimate and last tooth. *Euxanthus exsculptus* (Herbst) is referred to by Hoffmann (*t. c.* p. 38) as occurring at the Mauritius.

#### 16. *Lophactæa semigranosa* (*Heller*).

Etoile Island, 13 fms. (a small male).

This species, which is apparently well distinguished by the disposition of the granulations of the carapace, which are absent from the mesogastric and cardiac regions, has been hitherto a *desideratum* in the Museum collection. The outer surface of the chelipedes and the margins of the ambulatory legs are clothed with hairs, and a few similar hairs exist on the sides of the carapace near the antero-lateral margins. The coloration (in spirit) is pinkish or yellowish.

#### 17. *Lophozozymus dodone* (*Herbst*)?

An adult male, obtained on the beach at Mozambique (No. 224), is referred to this species.

In this specimen the front is rather narrow and prominent, with scarcely any trace of a median emargination; the teeth of the antero-lateral margins have some indications of having borne *setæ*, as described by Hilgendorf. The merus of the chelipedes is carinated above, the wrist has a cristated lobe on its inner surface; the



palm is keeled along the distal half of its upper margin, and, as well as the wrist, is very evenly punctulated.

Dr. Hilgendorf has already recorded this species from Mozambique and Ibo and from the Mauritius.

In two specimens in the British-Museum collection from the Sandwich Islands (*W. H. Pease*), referred to *L. intosus* (Randall), with which species *L. nitidus* (Heller) is very probably identical, the carapace is relatively broader, the front less prominent, and the palms of the chelipedes much more rugose above. It may be that a larger series would demonstrate the necessity of uniting these with *L. dodone*, when it would prove to be a widely distributed Indo-Pacific species.

### 18. *Liomera punctata* (*M.-Edw.*).

A small male from the beach at Darros Island (No. 200), in which, however, the red punctulation has completely disappeared, is referred here.

Specimens of the same species are in the British-Museum collection from the Seychelles (*Dr. E. P. Wright*); Madagascar, Tamatave (*Rev. Deans Cowan*); Red Sea, Dædalus Shoal (*Lt.-Col. Playfair*); Ceylon, Galle (*Dr. W. Ondaatje*).

The types were from the Mauritius, and A. Milne-Edwards records this species from New Caledonia; hence it has undoubtedly a wide Oriental distribution.

In the adult examples in the Museum collection the front is much more deeply incised than in the smaller ones.

By M. A. Milne-Edwards this species is retained in the genus *Xantho*; but it appears to me that it should be referred to the genus *Liomera*, which should include all those species in which the carapace is markedly transverse, as in *Carpilodes*, with the two anterior of the antero-lateral teeth obsolete and the two posterior rounded, the legs not cristated, the finger-tips not distinctly excavated, and the basal antennal joint reaching to the subfrontal process, but not included within the inner orbital hiatus.

### 19. *Actæa rufopunctata* (*M.-Edw.*).

Seychelles, 4-12 fms., a small female (No. 194).

Specimens of this widely distributed form are in the Museum collection from the Mauritius (*Old Collection*); Dædalus Shoal, Red Sea (*Lt.-Col. Playfair*); Ceylon, Galle (*Dr. W. Ondaatje*); Keeling or Cocos Island (*Lt. Burnaby*); Fijis (*H.M.S. 'Herald'*); and Samoa Islands (*Rev. S. J. Whitmee*); also probably from the Hotspur Bank, S. Atlantic (the specimen referred to in the Report on Dr. Copping's collections in the Magellan Straits and S. Atlantic), and Madeira (*Rev. R. Boog Watson*). The specimens from Madeira have lost the characteristic coloration, but otherwise closely resemble Oriental examples.

20. *Atergatopsis granulatus*, *A. M.-Edw.*

A small female from Marie-Louise Island, 17 fms. (No. 186), belongs, I think, to this species. It has the carapace uniformly granulated, as in *A. Milne-Edwards's* figure, based on specimens from Zanzibar.

The specimens in the British Museum (from the collection of H.M.S. 'Samarang') designated by *A. M.-Edwards* *A. granulatus* are without special indication of locality; they differ from his description, and resemble (as it would appear) *A. lucasii*, in having the carapace granulated only towards the antero-lateral margins; but they have the strong compressed tooth on the lower (immobile) finger, which is deficient in *A. lucasi*, but exists in *A. granulatus*. They seem therefore to be intermediate between the two species; but a larger series of the genus is needed to show whether or no they should be regarded as specifically distinct.

21. *Xanthodes lamareckii* (*M.-Edw.*).

Darros Island, beach (No. 200); a small male and two females.

Specimens are in the British-Museum collection from Madagascar, Tamatave (*Rev. Deans Cowan*); Ceylon, Galle (*Dr. W. Ondaatje*); Philippines (*Cuming*); and Eastern Seas, without special locality (*H.M.S.S. 'Samarang'* and '*Herald*'). It is distributed throughout the Oriental Region eastward to the Pacific islands, since *A. Milne-Edwards* records it from New Caledonia.

22. *Carpilodes rugatus* (*M.-Edw.*).

Seychelles, 4-12 fms. (No. 194); an adult female.

Specimens are in the British-Museum collection from the Red Sea, Dædalus Shoal (*Lt.-Col. Playfair*), and Galle, Ceylon (*Dr. W. Ondaatje*).

This species is widely distributed throughout the Oriental Region; it has been recorded from various localities eastward to New Caledonia.

Specimens which are referred doubtfully to the nearly allied, but, as I think, distinct, *C. vaillantianus* (*A. M.-Edwards\**), are in the British-Museum collection from the Seychelles (*Dr. E. P. Wright*). In these specimens the lobes of the carapace are less prominent than in *C. rugatus*, and the sulci of the branchial regions are shorter, not prolonged to those which define the cardiac region of the carapace.

\* Annexe F, Crustacés, p. 3, in Maillard, 'Ile Réunion' (1862).

23. *Actæodes tomentosus* (M.-Edw.).

Darros Island, beach, an adult female (No. 200).

Specimens of this very common Oriental species are in the British-Museum collection from the Mauritius (*Lady F. Cole*); Rodriguez (*Transit-of-Venus Exped.*); Seychelles (*Dr. E. P. Wright*); Red Sea, Dædalus Shoal (*Lt.-Col. Playfair*); Duke of York Island (*Rev. G. Brown*); Sulu Islands (*U.S. Exploring Exped.*); Philippines (*Cuming*); Goto Islands (*Capt. H. C. St. John*); Port Essington, Minerva Reef, and Fiji Islands (*H.M.S. 'Herald'*); Samoa Islands (*Rev. S. J. Whitmee*); and Sandwich Islands (*W. H. Pease*).

24. *Leptodius exaratus* (M.-Edw.).

A specimen from the beach at Darros Island (No. 200) and Mahé Island (No. 196) are referred to this species, and may perhaps be best regarded as belonging to the variety *sanguineus*, M.-Edwards, which is said to be common at the Mauritius, although they have not the additional tooth behind the last of the normal antero-lateral teeth which usually characterizes *sanguineus*. From the variety designated *distinguendus* by De Haan\* they are scarcely distinguishable, except by their somewhat less convex and rugose carapace. I have referred to the uncertainty of the specific distinctions in this genus on p. 214.

If, as Dr. Richter surmises, the *Xantho quinquedentatus* of Krauss is to be regarded as synonymous with this species, Natal must be added to the recorded localities where *L. exaratus* occurs on the African coast.

25. *Leptodius exaratus*, var. *gracilis* (Dana).

Mozambique, obtained between tide-marks (Nos. 225, 227), two males; Poivre Island, beach (No. 198), eight specimens, of both sexes and different ages.

In the typical condition of this form the carapace is depressed and nearly smooth in its median regions: there are four distinct antero-lateral teeth (the one at the exterior orbital angle being usually obsolete); the first of the four is the smallest, with its apex obscurely defined; the three posterior are broad, triangulate, and very distinct. The chelipedes are nearly smooth, and have their fingers strongly arcuated, the lower, and sometimes the upper, finger being strongly toothed on its inner margin. On p. 214 I have referred to the localities whence the Museum possesses specimens of this variety, and to its apparent connexion with the typical *L. exaratus*; nevertheless it is usually easily distinguishable by the characters mentioned above.

\* *Xantho distinguendus*, De Haan, Faun. Japon., Crust. p. 48, pl. xiii. fig. 7 (1835).

26. *Phymodius rugipes*.

*Actæodes rugipes*, Heller, *Sitzungsber. der Akad. Wissensch. Wien*, xliii. (1) p. 330, pl. i. fig. 20 (1861).

Seychelles, 4–12 fms. (No. 194), a small male.

This species, originally described from the Red Sea, has been hitherto a desideratum in the Museum collection. The coloration (in spirit) is a brilliant red, with whiter blotches, whereof the largest is in the middle line of the carapace. It is distinguished from the other species of *Phymodius*, to which genus I think it must be referred on account of its strongly-lobulated carapace, which is less transverse than in *Carpilodes*, where it is referred by A. Milne-Edwards (N. Arch. Mus. Hist. Nat. ix. p. 181, 1873), by the rugose ambulatory legs, whose merus-joints, in the specimen I have examined, are denticulated along their upper margins. The basal antennal joint enters slightly within the inner orbital hiatus, but not more so than is usual in *Phymodius* (*P. unguatus*, *P. monticulosus*).

27. *Chlorodius niger* (Forskål).

Seychelles, 4–12 fms. (No. 194), an adult female.

On p. 215 I have referred to the distribution of this species as exemplified in the series in the British-Museum collection.

28. *Chlorodius miliaris*, A. M.-Edw.

Two specimens, adult males, were collected at the Seychelles with the preceding (No. 194).

This fine species has been hitherto a desideratum in the British-Museum collection. The specimens before me merely differ from M.-Edwards's description, based on specimens from New Caledonia, in the less elevated protogastric lobes, and in having the somewhat rounded frontal lobes separated by a rather deep median notch; the three posterior antero-lateral teeth are spiniform. The black coloration of the chelæ covers the distal part of the outer surface of the palms, where it forms a rectangular black patch.

29. *Chlorodopsis melanodactylus*, A. M.-Edw.

Etoile Island, 13 fms. (No. 191), four specimens; African or Eagle Island, 10 fms. (No. 184), an adult male. Seychelles, 4–12 fms. (No. 194); several specimens of both sexes and different sizes.

They agree in all essential characters with the description and figure of A. M.-Edwards, based on New-Caledonian examples, and with a specimen from the Oriental seas, without special locality, in the Museum collection (H.M.S. 'Herald').

*Chlorodopsis pilumnoides* of Adams and White\* is a nearly

\* Crustacea of H.M.S. 'Samarang,' p. 41, pl. ix. fig. 3 (1848).  
2 M 2

allied species; but in the adult male from Singapore in the British-Museum collection both carapace and chelipedes are much more spinulose, and the black coloration of the fingers extends over the inner and outer surface of the hand.

### 30. *Chlorodopsis areolatus*.

*Chlorodius areolatus*, *M.-Edwards*, *Hist. Nat. Crust.* i. p. 400 (1834).  
*Xantho dehaanii*, *Krauss*, *Südafrik. Crustaceen*, p. 29, pl. i. fig. 2 (1843), *nec Savigny*.

? *Chlorodius perlatus*, *McLeay*, *Annulosa in Smith's Zool. S. Africa*, p. 59 (1849).

? *Etisodes celatus*, *Dana*, *Pr. Acad. Nat. Sci. Philad.* p. 77 (1852);  
*U.S. Expl. Exp., Crust.* xiii. p. 188, pl. ix. fig. 4 (1852).

*Chlorodopsis areolatus*, *A. M.-Edwards*, *Nouv. Archiv. Mus. Hist. Nat.* ix. p. 231, pl. viii. fig. 8 (1873); *Hilgendorf*, *Monatsb. Akad. Wissensch. Berlin*, p. 790 (1878); *Richters*, *Decapoda in Möbius's Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen*, p. 148 (1880).

A good series of specimens was obtained on the beach at Darros Island (No. 199); also a female at Mozambique (No. 224).

Specimens are in the British-Museum collection from Port Essington and Fiji Islands (*H.M.S. 'Herald'*), besides others without special locality.

In the lobulation of the carapace and the form of the teeth of the antero-lateral margins, this species has much the aspect of a *Phymodius*, from which genus it is distinguished by the exclusion of the flagellum of the antennæ from the inner orbital hiatus, the hiatus, however, usually remaining open.

The description and figure of *Xantho dehaanii*, *Krauss*, seem to apply very well to this species except in one particular only—the legs are not very long as stated by *Krauss*. The coloration of the chelipede, as he represents it, is exactly what is usual in males I refer to *C. areolatus*.

### 31. *Etisodes electra* (*Herbst*).

A good series of specimens was obtained at the Seychelles, 4–12 fms. (No. 194).

The synonyms of this variable and widely-distributed species have been given on p. 217.

### 32. *Cymo andreossii* (*Audouin*).

A good series of specimens was collected at the Seychelles, 4–12 fms. (No. 194). Two of these specimens only have the fingers nearly colourless, the remainder belonging to the variety *melanodactylus* of De Haan, with dark-coloured fingers.

In the Report on the Crustacea collected by the naturalists of the



Transit-of-Venus Expedition at Rodriguez, I have already alluded to the geographical distribution of this very variable species\*.

The specimens in the Museum collection are from Rodriguez (*H. H. Slater*); Red Sea, El Tor (*Major MacDonald*), and Gulf of Suez (*R. McAndrew* and *J. K. Lord*); Fiji Islands (*H.M.S. 'Herald'*); Samoa Islands (*Rev. S. J. Whitmee*).

The variety *melanodactylus* is usually less pubescent than the typical *C. andreossii*, and the lower part of the outer surface of the larger chelipede is usually, but not invariably, destitute of granules or tubercles.

A male and female, from the Dædalus Shoal, Red Sea (*Lt.-Col. Playfair*), which may be designated *C. andreossii*, var. *quadri-lobatus*, are distinguished from all other specimens of the genus I have seen by having the front armed with four very distinct equal and equidistant rounded lobes or teeth. In this variety the carapace is very distinctly granulated on the protogastric and hepatic regions, and the chelæ tuberculated on the whole of their outer surface, the tubercles being very large, rounded, and granulated on and near the upper margin; the fingers were dark-coloured.

In both specimens there is a red spot on the gastric, cardiac, and branchial regions of the carapace. It may perhaps prove to be specifically distinct.

### 33. *Actumnus setifer* (*De Haan*).

Of this species, upon whose synonymy and distribution I have remarked on p. 225, a male and three females were collected at the Seychelles, 4-12 fms. (No. 194), a small female at Ile des Neufs, 15 fms. (No. 187), and two males and a female at Providence Island, 17 fms. (No. 217).

The length of the carapace of the smallest ova-bearing female is less than 3 lines (6 millim.).

*Actumnus miliaris*, A. Milne-Edwards†, an allied species, also from the Seychelles, seems to be well distinguished by the much less prominent and acute lobes of the antero-lateral margins, and by the deflexed index or immobile finger of the larger chelipede.

### 34. *Eurüppellia annulipes*.

*Rüppellia annulipes*, *M.-Edwards, Hist. Nat. Crust.* i. p. 422 (1834); *Dana, U.S. Expl. Exped., Crust.* xiii. p. 246, pl. xiv. fig. 4 (1852); *Stimpson, Proc. Ac. Nat. Sci. Philad.* p. 37 (1858); *nom. genericum præoc.*

A male and female were obtained on the beach at Poivre Island (No. 198).

In the British-Museum collection is a male from the Fiji Islands, Totoya (*H.M.S. 'Herald'*). Specimens from the Keeling or Cocos Islands (*Lt.-Col. Burnaby*) possibly belong to a different species, as they have the antero-lateral margins of the carapace less distinctly

\* *Phil. Trans.* clxviii. p. 487 (1879).

† *Nouv. Archiv. Mus. Hist. Nat.* i. p. 288, pl. xviii. fig. 7 (1865).

dentated, and carapace and chelipedes less distinctly granulated; in other particulars, however, they closely resemble the other examples in the British-Museum collection. In all the specimens I have examined there is a very large subbasal tooth or lobe on the inner margin of the mobile finger of the hand of the larger chelipede.

Dana records this species from the Kingsmill and Society Islands, and Stimpson from Loo Choo. It is evidently a widely distributed Oriental form.

Since the designations *Rüppellia* and *Eudora* have both been pre-occupied in zoology (the former by Wiedemann, in 1830, for a genus of dipterous insects, and the latter by Péron and Lesueur, in 1809, for a genus of *Acalephæ*), I have slightly modified the former name, which has so long been used by carcinologists for this species of crab.

### 35. *Ozium* (*Epixanthus*) *frontalis*, M.-Edw.

Mahé Island, beach (No. 196); two males—one adult, the other very small.

Specimens are in the British-Museum collection from Madagascar, Tamatave (*Rev. Deans Cowan*); Nicol Bay, N.W. Australia (*M. du Boulay*); Fiji Islands, Ovalau (*H.M.S. 'Herald'*); Samoa Islands (*Rev. S. J. Whitmee*).

The genus *Epixanthus* can scarcely, I think, be regarded as generically distinct from *Ozium*; but the name may be conveniently used as a subgeneric designation for the species with broader, more depressed, and flattened carapace (*cf.* A. M.-Edwards, *Nouv. Archiv. Mus. Hist. Nat.* ix. p. 240, 1873).

Of the species designated by Adams and White *Panopeus formio*\*, there are two specimens in the Museum collection. The smaller, from Ligitan, is not to be distinguished from normal specimens of *O. frontalis*. The larger, which is an adult male, and is apparently the specimen figured, and therefore the type, has the carapace somewhat narrower and more convex, and the first tooth of the antero-lateral margin shorter and more distinctly separated by a notch from the outer margin of the orbit, which is also notched. On account of this latter character the species, as represented by this specimen, must, I think, be retained, together with *Epixanthus dentatus* (Ad. & White), in the genus (or subgenus) *Heteropanope*, in which Stimpson long ago included it (*Proc. Acad. Nat. Sci. Philad.* p. 35, 1858).

### 36. *Eriphia lævimanus* (M.-Edw.)

Two females from the beach at Darros Island (No. 200), and a small male from the Glorioso Islands (No. 220), have been retained for the Collection.

The series in the British Museum includes specimens from the Mauritius (*Lady F. Cole*); Madagascar (*Dr. J. E. Gray*) and Tama-

\* Zoology of 'Samarang,' Crustacea, p. 43, pl. ix. fig. 1 (1848).

tave (*Rev. Deans Cowan*); Seychelles (*Dr. E. P. Wright*); India, Bengal; Malaysia (*Dr. Bleeker*); Duke of York Island (*Rev. G. Brown*); Moreton Bay (*purchased*); West Hill, Queensland (*J. B. Jukes*); Canton River (*purchased*); Fiji Islands (*H.M.S. 'Herald'* and *U.S. Exploring Exped.*); Samoa Islands (*Rev. S. J. Whitmee*).

The carapace and chelipedes (in dried and spirit-specimens) are very prettily spotted with red; but the coloration is often entirely obliterated.

### 37. *Eriphia lævimanus*, var. *smithii*, *MacLeay*.

Glorioso Islands, from the beach and reef at low water, two females (No. 220); Mozambique, between tide-marks, a small female (No. 227).

I have already remarked upon the specimens of this variety in the Museum collection\*, which is found not only on the eastern coast of Africa and on the Mascarene Islands, but also in the Indian and Indo-Malaysian seas eastward, at least, to New Guinea, and, according to Hilgendorf, at the Tonga Islands.

### 38. *Eriphia scabricula*, *Dana*.

Mozambique, between tide-marks, a male (No. 225); Darros Island, beach, a male (No. 200).

Specimens of this species (which is always distinguishable from small examples of *E. lævimanus* by the narrower front and wider orbits, the triangulate and acute spines of the antero-lateral margins, and the pubescent and granulated chelipedes) are in the Museum collection from the Mauritius, and Fiji Islands, Ovalau, Totoya (*H.M.S. 'Herald'*), besides others without special locality. The ambulatory legs are transversely banded with spotted reddish markings, which are not discernible in *E. lævimanus*. The length of the carapace in the largest specimen examined is only about 8 lines (17 millim.). Besides several Polynesian localities, it has been recorded from the Mauritius (*A. M.-Edwards*), Fouquets (*Richters*), Madagascar (*Lenz & Richters*), the Sooloo Sea (*Dana*), and Ousima Island (*Stimpson*).

### 39. *Trapezia cymodoce* (*Herbst*).

Of this very common species a large series of specimens was collected at the following localities:—Seychelles, 4–12 fms. (No. 194); African or Eagle Islands, 10 fms. (No. 184); Darros, 22 fms. (Nos. 185, 233); Etoile, 13 fms. (No. 191); Marie-Louise, 17 fms. (No. 186); Des Neufs, 15 fms. (No. 187); and the Glorioso Islands, 7–10 fms. (No. 219).

In a former paper† I have remarked upon the synonymy and distribution of this species, and have pointed out the characters by

\* *Vide* Ann. & Mag. Nat. Hist. ser. 5, v. p. 227 (1880).

† Ann. & Mag. Nat. Hist. ser. 5, ii. p. 408 (1878).

which it may be distinguished from *T. ferruginea*, Latreille, *i. e.* by the more acute lateral spines of the carapace, and the suberistate and hairy palms of the chelipedes, and these characters are remarkably constant in adult examples; but young and half-grown specimens can scarcely be distinguished except by the suberistate hands. Since the publication of that paper, a specimen has been added to the Museum collection from Amboina (*Dr. P. Bleeker*).

#### 40. *Trapezia ferruginea*, Latreille.

A few specimens are in the collection from the Seychelles, 4–12 fms. (No. 194).

Since 1878 specimens from Ceylon, Galle (*Dr. W. Ondaatje*), and Honolulu (found among fishes of the collection of H.M.S. 'Challenger') have been added to the Museum collection.

#### 41. *Trapezia rufopunctata* (Herbst).

Etoile Island, 13 fms. (No. 191), ten specimens of varying ages and both sexes; Glorioso Islands, 7–10 fms. (No. 219), an adult male.

Specimens are in the British-Museum collection from the Mauritius; Madagascar, Tamatave (*Rev. Deans Cowan*); Rodriguez (*H. Slater*); Red Sea (*Col. J. Burton*); El Tor (*Major MacDonald*); Dædalus Shoal (*Lt.-Col. Playfair*); Gulf of Suez (*R. MacAndrew*); and Ceylon (*E. W. H. Holdsworth*). It is distributed, as I have already noted, throughout the Oriental Region.

This species, as has been repeatedly observed, varies much in the size and degree of acuteness of the frontal teeth, and in the size and number of the red spots with which the body is covered. The specimens from Etoile Island are mostly of the variety designated by Dana *T. maculata* of MacLeay\*, for which Rüppell's name *T. guttata* is an earlier and safer appellation†, characterized by the less prominent and acute frontal lobes and smaller spots on the body and legs. The latter is not a character dependent upon the age of the individual, since in the smallest example from Etoile, length of carapace only  $2\frac{1}{2}$  lines (5 millim.), the spots are as large as in the adult and large example from the Glorioso group. Another specimen from Etoile exhibits an intermediate condition in its markings, since several small spots are intermingled with the larger ones.

Dr. J. G. de Man, in the first of his papers on Crustacea collected by M. J. A. Krøyer in the Red Sea near Djeddah‡, regards *T. rufopunctata* and *T. guttata* as distinct species (*t. c. ii. p. 176*)§.

\* In Smith's Zool. S. Africa, Annulosa, p. 67 (1849).

† Beschreib. 24 kurzschwänzigen Krabben des rothen Meeres, p. 27 (1830).

‡ Vide 'Notes from the Leyden Museum,' vol. ii. p. 171 (1880), and iii. p. 93 (1881).

§ I subjoin here a description of a mutilated Crustacean from Providence Island, 19 fms. (No. 217), which I cannot certainly identify with any genus or species with which I am acquainted. As it is a female and wants the cheli-

*Quadrilla*

42. *Tetralia cavimanus*, Heller.

Seychelles, 4-12 fms. (No. 194), nine specimens; Etoile Island, 13 fms. (No. 191), five specimens.

Specimens are in the British-Museum collection from Rodriguez (*H. H. Slater*); Red Sea, Gulf of Suez (*R. MacAndrew*); Dadalus Shoal (*Lt.-Col. Playfair*); Fiji Islands, Ovalau, Totoya (*H.M.S. 'Herald'*); and others without special locality. In some specimens there is a very distinct transverse band of darker colour on the front; in others it is scarcely, or not at all, discernible. The pit on the outer margin of the hand near the wrist, whereby Dr. Heller distinguishes this species from *T. glaberrima* (Herbst), varies greatly in depth: ordinarily, in well-grown and even in smaller examples, it is deep, well defined, and clothed with hair; but in other rather small specimens it is so shallow as scarcely to be distinguishable and devoid of hairs. Ordinarily, in adult males, the lower finger of the larger chelipede is more or less strongly dentated on its inner margin, and there is scarcely any interspace between the fingers when closed; but in two very dark-coloured males from the Seychelles, in the 'Alert' collection, the fingers are scarcely dentated and are strongly arcuated, meeting only at the tips. A similar variation occurs in a male from the collection of H.M.S. 'Herald,' which, on account of the entire absence of the palmar pit, is referred to *T. glaberrima*.

I think the *T. heterodactyla* of Heller is probably a mere variety of *T. cavimanus*, to which species (if, indeed, it be distinct from *T. glaberrima*) nearly all the specimens of this genus in the Museum collection must be referred. Although several species of this genus have been described, of earlier date than *T. cavimanus*, by Dana, Stimpson, and Lucas, by none of these authors, I believe, is any mention made of the subbasal pit on the palm of the chelipede which is so characteristic of *T. cavimanus*.

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pedes, I am not even sure whether it should be referred to the Cyclometopa or to the Catometopa. In most of its characters, however, it nearly resembles a species of *Trapezia*, differing mainly in the more elongated convex and regularly hexagonal carapace and in the dactyli of the ambulatory legs. The carapace is smooth and slightly but regularly convex; the front is about half the greatest width of the carapace, and is divided by three notches into four prominent triangular teeth, the median notch being the deepest; there is also a small spinule or tooth at the inner supraccular angle, and a short spine at the widest part of the carapace at the angle where the antero-lateral and postero-lateral margins unite. The endostome or palate has faintly indicated longitudinal ridges. The postabdomen is shaped nearly as in *Trapezia*. As in *Trapezia*, the inner and inferior margin of the orbit reaches to the front and excludes the antennæ, and bears a strong spine; the basal peduncular joint of the antennæ is rather short, and the penultimate joint reaches to the frontal margin. The outer maxillipedes present nothing remarkable, having a truncated merus-joint, and exognath reaching to its extero-distal angle. Of the legs only the third and fourth are present on each side; these are rather longer and slenderer than in *Trapezia*, and the three terminal joints are somewhat hairy; the dactyli are armed on their inferior margin with about half-a-dozen spinules, which increase successively in length. Colour (in spirit) yellowish white. Length of carapace nearly  $4\frac{1}{2}$  lines (9 millim.), breadth nearly 5 lines (10 millim.).



43. *Xiphonectes vigilans* (Dana), var. *obtusidentatus*.  
(PLATE XLVIII. fig. A.)

Thus is designated a female with ova, from the Seychelles, 4-12 fms. (No. 194), which may be specifically distinct from Dana's types, which were collected at the Fijis. As, however, Dr. F. Richters\* has recently recorded *X. vigilans* from the Seychelles, and notes important variations in the number of the antero-lateral marginal teeth, I do not at present venture to separate the specimen before me from this species. It is distinguished from *X. vigilans* and *X. longispinosus*, as figured by Dana, and also from *X. leptocheltes*, A. M.-Edwards, by the form of the frontal lobes, which are not triangulate and acute, but obtuse and broadly rounded, so that the two prominent submedian lobes are semicircular in form. There are eight antero-lateral marginal teeth on one side and seven on the other (including the outer orbital tooth, but excluding the long lateral spine); these teeth are very irregular and unequally developed.

Specimens which I refer to *X. vigilans*, Dana, are in the British-Museum collection from the Fiji Islands, *i. e.* Nairai, Ovalau, and Matuka (*H.M.S. 'Herald'*). These all have the submedian frontal teeth more triangulate than in the specimen from the Seychelles; in the largest specimen, which is about as large as the example from Seychelles, they are very prominent and acute. The antero-lateral marginal teeth are much more regularly and evenly developed, and vary from five to nine in number; they are least numerous in the largest example.

44. *Scylla serrata* (Forskål).

A small male is in the collection from Mozambique, between tide-marks (No. 227).

As is usual in immature examples, this specimen has the teeth of the front very obscurely developed.

Specimens of this very common species are in the Museum collection from the Mauritius (*Lady F. Cole*); Port Natal; S. Africa, at the mouth of the Swartkopfs River (*Dr. A. Smith*); Dukhun (*Col. Sykes*); Bali and W. Borneo (*coll. Dr. Bleeker*); Philippines, Luzon (*Cuming*); Hong Kong, China (*J. Reeves*); Fijis, Vanua Levu and Bau (*H.M.S. 'Herald'*); and New Caledonia (*J. Macgillivray*).

45. *Achelous granulatus*, M.-Edw.

Seychelles, 4-12 fms., a female with ova (No. 194).

The distribution of this species has been already noticed on p. 230.

\* In Möbius's 'Beitr. zur Meeresfauna der Mauritius und der Seychellen,' Decapoda, p. 152 (1880).

46. *Goniosoma natator* (*Herbst*).

A female was collected at Poivre Island, or Ile des Roches, 13–20 fms. (No. 183).

Specimens are in the British-Museum collection from the following localities:—Port Natal; Indian Ocean (*Gen. Hardwicke*); Penang (*Dr. Cantor*); Philippines (*Cuming*); and Shanghai.

47. *Thalamita sima*, *M.-Edw.*

Several young specimens were collected at the Seychelles, 4–12 fms. (No. 194); a series of specimens of both sexes and varying sizes at Poivre Island and Ile des Roches, 13–20 fms. (No. 183); a young male at the Glorioso Islands, 7–10 fms. (No. 219); and a female on the beach at Mozambique (No. 224).

I have remarked upon the distribution of this common species on p. 231.

48. *Thalamita quadrilobata*. (PLATE XLVIII. fig. B.)

The carapace is markedly transverse, of the form usual in this genus, depressed, with the lateral margins forming nearly a right angle with the front; the carapace marked with transverse lines, one of which passes across it at its greatest width from the bases of the fifth lateral marginal teeth, being interrupted only on the sides of the gastric region by the shallow depression indicative of the cervical suture. The frontal margin is divided into four squarely-truncated lobes of nearly equal width; the median lobes are more prominent than the lateral, with their anterior margins very shallow, concave, or excavate, and are separated by a narrow median incision; the lateral lobes have a straight margin. On the post-frontal part of the carapace, on either side of the middle line, are two slight prominences. The upper margin of the orbit has two distinct fissures, the lower margin is also marked by a deep fissure; and the inner suborbital lobe is very prominent and squarely truncated. There are five very strong, acute, subequal, lateral marginal spines; the postero-lateral margins are deeply concave; the posterior margin bounded by a raised line. The postabdomen of the male is five-jointed; the third to fifth joints coalescent; the basal antennal joint is armed with three strong spines. The chelipedes are massive and of equal size; the merus or arm has its posterior margin obtusely angulated, and its anterior margin armed with three principal spines and one or two very small intervening ones; the wrist granulated externally, with two small spines on its outer surface and a very strong spine on its inner margin; the palm granulated above and armed with five or six spines, externally traversed by three granulated lines, of which the lowermost is prolonged along the outer margin of the immobile finger; the fingers are very distinctly denticulated, those of the right side having each a larger subbasal tooth. The three following legs are slender; the

fifth or last pair are shorter than the preceding, the merus-joint is armed with a spine near the distal end of its posterior margin, the penultimate joint has its posterior margin armed with a series of spinules, the last joint ovate, of the form usual in the genus. Colour (in spirit) yellowish white; chelipedes punctulated externally with red, and fingers broadly banded with dark brown; the ambulatory legs are marked with dusky spots as in some other *Thalamitæ*. Length of carapace nearly 1 inch 2 lines (29 millim.), breadth to apex of the fifth lateral spines about 1 inch 11 lines (47 millim.); length of chelipede nearly 2 inches 7 lines (65 millim.).

The single specimen (an adult male) was obtained at the Seychelles, 4-12 fms. (No. 194).

It is distinguished from all other *Thalamitæ* known to me having four frontal lobes and the penultimate joint of the fifth ambulatory legs denticulated, by the form of the lobes of the front, the longer fourth lateral marginal spine of the carapace, and the strongly spinulose basal antennal joint.

#### 49. *Thalamita integra*, Dana.

Seychelles, 4-12 fms. (No. 194); an adult male.

Two very small specimens collected with this example belong either to *T. admete* or *T. savignyi*, since the basal antennal joint is granulated.

Of *T. integra* there are specimens in the British-Museum collection from the Fiji Islands, Nairai (*H.M.S. 'Herald'*), and Sandwich Islands (*U.S. Exploring Expedition*), and also specimens from Honolulu in the same group (*Lieut. Strickland*), besides the specimens of the Atlantic variety of this species which I have recently designated *africana* \*.

#### 50. *Thalamita crenata*, Rüppell.

Mozambique, between tide-marks (No. 227); three small specimens.

For the geographical distribution of this species see p. 232. One of the three specimens from Mozambique (a male) approaches *T. stimpsonii* in the somewhat smaller fourth tooth of the lateral margins, but there are no granulations upon the palms of the chelipedes as usual in that species.

#### 51. *Thalamita picta*, Stimpson.

A small male from the beach, Darros Island (No. 200), is here, but with some uncertainty, as the fifth ambulatory legs are deficient.

In a male, also of small size (length of carapace about 7 lines,

\* Ann. & Mag. Nat. Hist. ser. 5, viii. p. 218 (1881).

15 millim.), without exact locality (*H.M.S. 'Herald'*), the carapace has three brilliant patches of red—one on either side of the middle line on the frontal region, and one on the cardiac region reaching to the posterior margin. No trace of this coloration appears in the specimen from Darros Island, but in other particulars they are closely alike. This species, although rare, has a wide Oriental distribution. Stimpson's types were from the island of Ousima, and A. M.-Edwards records it from New Caledonia; Hilgendorf (though doubtfully) from Mozambique. By Kossmann (*t. c.* p. 47) this species, as also *T. crenata*, is united with *T. prymna*, Herbst: possibly therefore it occurs also on the coasts of the Red Sea, but there is nothing to show whether Kossmann had among the specimens he refers to *T. prymna* any examples truly referable to *T. picta*, Stimpson.

## 52. *Lissocarcinus orbicularis*, Dana.

A small male from the Seychelles, 4–12 fms. (No. 194), seems to be referable to this species; it has the carapace very prettily marked with circular spots of a dusky purplish colour with darker borders. Specimens are in the British-Museum collection from the Samoa Islands (*Rev. S. J. Whitmee*) and Suwarrow Island (*R. Hart*). In these specimens, as in the one figured by Dana from the Fijis, the purplish markings usually predominate, so as sometimes nearly to cover the carapace.

Of the type of the genus (*L. polybioides*, Ad. & White), which has a more elongated carapace with more prominent front and more distinctly developed lateral frontal lobes, there are, besides the original specimens from Borneo, two examples from Ceylon (*E. W. H. Holdsworth*) in the Museum collection.

## 53. *Gelasimus annulipes*, M.-Edw.

A series of specimens was obtained on the beach at Mahé Island (No. 196).

To the localities (whence the Museum possesses specimens) mentioned in 1879, in my Report on the Crustacea of the Transit-of-Venus Expedition, the following are to be added:—River Zambesi (*H. Waghorn*); Port Natal, D'Urban Bay (*Alfred E. Craven*); Celebes (*H.M.S. 'Samarang'*); Batjan (*coll. Dr. Bleeker*); and Timor Laut (*H. O. Forbes*), received together with *G. tetragonum* and *G. vocans*.

Kossmann (*t. c.* p. 53) records a variety (*albimanus*) from the Red Sea, which is apparently scarcely distinguishable from the typical form of the species.

## 54. *Gelasimus dussumieri*, M.-Edw.

A specimen obtained at Mahé Island with the preceding species is referred here, although with some hesitation. *G. dussumieri* has been hitherto a desideratum in the Museum collection.

This example is a male of moderate size, and resembles the figure of Milne-Edwards \*, but differs from those of Hilgendorf † and Hoffmann ‡, who record this species from Zanzibar and Nossi-Bé, in having the fingers of the larger chelipede destitute of prominent teeth or denticles; the fingers are, however, less elongated than in M.-Edwards's figure, based on specimens from Malabar and Samarang; the arm has but a single denticle near the distal end of its anterior margin. Its recorded range extends eastward to New Caledonia.

#### 55. *Ocypoda ceratophthalma* (Pallas).

Ile des Roches, beach (No. 210), an adult male.

This species has been already referred to in the earlier part of this Report (p. 237).

#### 56. *Ocypoda cordimanus*, Desmarest.

Three adult males are in the collection, obtained respectively at Bird Island, Seychelles, African Island, on the beach, and Providence Island; also an adult female from the Ile des Roches (No. 210). The specimen from Bird Island was found in the interior of the island.

For the distribution of this and the preceding species I may refer to my recent revision of the genus §.

#### 57. *Macrophthalmus parvimanus*, Latr. (ined.), M.-Edw.

Mahé Island, beach (No. 196); an adult male.

This species, hitherto a desideratum in the Museum collection, is remarkable on account of the extreme smallness and slenderness of the chelipedes in the male, which resemble those of the females in many other species. In the specimen before me the fingers are slightly inflexed and concave on their inner surfaces, but scarcely excavated; the palms have a patch of hair on their inner surface, but apparently no spine.

Dr. Richters records this species (which was originally described from supposed Mauritius examples) from the Fouquets, and M. A. Milne-Edwards from Réunion.

#### 58. *Euplax* (*Chænostoma*) *boscii* (Audouin).

Five males and a female lacking the chelipedes, obtained on the beach at Mozambique (Nos. 225, 227), are referred to this species, to which also belongs, as I think, a very small male from the Red Sea, received from the Godeffroy Museum as *Macrophthalmus depressus*, Rüppell (No. 16403).

\* Ann. Sci. Nat. sér. 3, xviii. p. 148, pl. iv. fig. 12 (1852).

† Crust. in Van der Decken's 'Reisen in Ost-Afrika,' p. 84, pl. iv. fig. 1 (1867).

‡ In Pollen and Van Dam's 'Recherches sur la Fauna de Madagascar,' p. 17, pl. iii. figs. 19-22 (1874).

§ Ann. & Mag. Nat. Hist. ser. 5, x. p. 376 (1882).



In these specimens the carapace is very distinctly granulated over its upper surface; the chelipedes are hairy on their inner surface, but are not ciliated on their margins; the palm is not carinated; the upper (mobile) finger has the blunt or quadrate tooth on its inner margin mentioned by Rüppell as characteristic of the male of *Macrophthalmus depressus*; the lower finger is slightly deflexed, so as to form an angle with the lower margin of the palm. I have already referred to *Euplax boscii* in the earlier part of this Report. The carapace is not quite so broad as in Rüppell's figure of *M. depressus*, based on a female specimen, and the upper orbital margin is sinuated, not straight as in that figure; so that I must regard *M. depressus* as a distinct species.

### 59. *Dotilla fenestrata*, Hilgendorf.

Mozambique, between tide-marks (No. 227), eleven specimens, all of them males.

There is in the British-Museum collection a series of specimens of both sexes of the allied *D. sulcata* (Forskål), from the Red Sea. The distinctive characters pointed out by Hilgendorf are constant in the two series.

*D. fenestrata* has been hitherto a desideratum to the collection of the Museum. Hitherto it has apparently been recorded only from the east coast of Africa, where it ranges from Ibo to Natal, if (as Hilgendorf notes, and as is doubtless correct) the specimens referred by Krauss to *D. sulcata* belong to *D. fenestrata*.

### 60. *Carcinoplax integra*. (PLATE XLVIII. fig. C.)

The body and limbs are everywhere clothed with a short close pubescence; the antero-lateral margins of the carapace, the frontal region above the anterior margin, and the chelipedes and limbs are fringed with longer hairs. Carapace transverse, with the antero-lateral margins entire and much shorter than the postero-lateral; the front is about one third the greatest width of the body, somewhat deflexed; its anterior margin nearly straight, with a very small median notch; the endostome without longitudinal ridges; the orbital margins entire, without teeth or fissures. The post-abdomen (in the young female) has none of the segments coalescent, at base it covers the whole width of the sternum. The eyepeduncles are pubescent, lie closely within the transverse orbits, and have a distinct black cornea; the basal (or actual second) joint is narrow and slender, and does not quite attain the front. The outer maxillipedes have a nearly quadrate merus-joint, with straight anterior margin and rounded, not excavated, antero-internal angle. The chelipedes are subequal and densely pubescent and hairy; merus short and trigonous, with a small blunt tooth or lobe near the distal end of the upper margin; wrist somewhat angulated, but not toothed on its inner margin; palm about as long as the wrist, rounded above and below; fingers naked at the tips and meeting

along their inner margins, which are strongly dentated. Ambulatory legs very hairy and pubescent, with the merus-joint slightly compressed, but not dilated; dactyli unarmed on the inferior margins and terminating in a small corneous claw. Colour (in spirit) pinkish; hairs yellowish white. Length of carapace nearly 2 lines (4 millim.), breadth about  $2\frac{1}{2}$  lines (5 millim.); length of third ambulatory leg 4 lines (nearly 9 millim.).

The single female in the collection was obtained at the Seychelles (4-12 fms.).

The species described by A. M.-Edwards as *Carcinoplax setosa*, from New Caledonia\*, resembles this form in many of its characters, but has a narrower, more areolate front, and dentated antero-lateral margins. To it I refer a specimen from the Fijis, Totoya (*H.M.S. 'Herald'*), and perhaps two from the Philippines, Bohol (*Cuming*), in the British-Museum collection.

*Ceratoplax arcuata*, described in the earlier part of this Report, is at once distinguished by the very differently shaped carapace, acute-edged eye-peduncles, &c.

#### 61. *Grapsus maculatus* (Catesby).

Two adult females of this very common and widely distributed species are in the collection from African Island (No. 210). To the localities mentioned in my Report in 1879 on the Transit-of-Venus Crustacea (*t. c.* p. 489), the following are to be added:—Canaries, Teneriffe (*Old Collection*); Lanzarote (*Rev. R. T. Lowe*); Madagascar, Tamatave (*Rev. Deans Cowan*); Amboina (*coll. Dr. Bleeker*); and Loyalty Islands, Lifu (*Rev. S. J. Whitmee*).

This species, as hitherto recorded, ranges throughout the Oriental Region southward to the Cape of Good Hope and New Zealand, eastward to the coasts of California and Peru, and occurs in the Atlantic Region at the Canary and Cape-Verd Islands and St. Helena, and on the American coasts and islands from Florida to Pernambuco (*cf.* Kingsley, *Proc. Acad. Nat. Sci. Philad.* p. 193, 1880, who has shown that Catesby's designation *maculatus* must be used for this species instead of *pictus* of Latreille). I have never seen the edition of Catesby's work published in 1771. In the original and pre-Linnean edition (1743) the figure and description are so bad as to be scarcely recognizable.

#### 62. *Grapsus strigosus* (Herbst).

Mozambique, beach (No. 227); a small male.

I refer to this common species, which is sometimes scarcely distinguishable from *G. maculatus*, specimens in the Museum collection from the Red Sea, Egyptian coast (*Sir J. G. Wilkinson*); Gulf of Suez (*R. MacAndrew*); Port Natal (*purchased*); Karachi (*the Karachi Museum*); Duke of York Island (*Rev. G. Brown*); Timor

\* *Nouvelles Archives du Muséum*, ix. p. 267, pl. xii. fig. 2 (1873).

Laut (*H. O. Forbes*); Keeling or Cocos Island (*Lt. Burnaby*); Fiji Islands, Nairai (*H.M.S. 'Herald'*); and Samoa Islands (*Rev. S. J. Whitmee*).

From *G. maculatus* this species seems to be best distinguishable by its usually broader, less abruptly deflexed front, with straighter margin, and by the more widely transverse, shorter epistoma.

### 63. *Geograpsus grayi* (*M.-Edw.*).

Ile des Roches, two adult males; Providence Island, an adult female (No. 210).

The series in the Museum collection includes specimens from Egypt (*Sir J. G. Wilkinson*); Mauritius; Zanzibar (*Sir J. Kirk*); Madagascar, Tamatave (*Rev. Deans Cowan*); Ceylon, Galle (*Dr. W. Ondaatje*); Loyalty Islands, Lifu (*Rev. S. J. Whitmee*); Maré (*W. Wykeham Perry*); and Fiji Islands, Matuka (*H.M.S. 'Herald'*).

Mr. Kingsley has already (*t. c.* p. 196) noted the identity of *Geograpsus rubidus*, Stimpson, under which name specimens from East Africa and Réunion are referred to by Hilgendorf and Hoffmann, with *G. grayi*.

### 64. *Metopograpsus messor* (*Forskül.*).

Mahé Island, beach (No. 196); a male.

The distribution of this common species has been referred to in the preceding part of this Report (p. 245.) The specimen from Mahé Island appears to belong to the variety designated by M.-Edwards *M. intermedius*, characterized by the larger markings of the carapace, the front is only very obscurely denticulated.

Mr. J. S. Kingsley, in his recent revision of the Grapsidæ\*, places the *Grapsus* (*Pachygrapsus*) *ethiopicus*, Hilgendorf, as a distinct species in the genus *Pachygrapsus*, being apparently unaware that Hilgendorf has himself admitted the correctness of Kossmann's identification of this species with *M. messor*†.

### 65. *Liolophus planissimus* (*Herbst*).

Thirteen specimens (among them but one adult male) were obtained at Darros Island on the beach (No. 200), and a very small male at Etoile Island, 13 fms. (No. 191).

Since my revision of the genus in 1878‡ specimens have been added to the Museum collection from Ascension Island (*Staff-Surgeon T. Conry*); Vizagapatam (*A. E. Craven*); and the Korean seas (*Capt. H. St. John*).

\* Proc. Acad. Nat. Sci. Philad. p. 200 (1880).

† Hilgendorf, Monatsb. Akad. Wiss. Berlin, p. 808 (1878).

‡ Ann. & Mag. Nat. Hist. ser. 5, i. p. 153 (1878).

66. *Xanthasia murigera*, White.

An adult female and small male from Mozambique, obtained on the beach (No. 237), agree in all particulars with White's typical specimens in the British-Museum collection from the Philippines (*Cuming*), and with a series of specimens from the 'Herald' collection, without indication of locality, but labelled as "parasitic on *Tridacna*." Dana records this curious species from the Fijis (Vanua Levu), and A. Milne-Edwards from New Caledonia; its occurrence at the western limit of the Indo-Pacific Region is now, I believe, recorded for the first time.

67. *Philyra rectangularis*. (PLATE XLIX. fig. A.)

Carapace of somewhat rhomboidal form, depressed, about as broad as long, with the angles at the junction of the antero-lateral and postero-lateral margins rounded; its dorsal surface is everywhere uniformly and very distinctly punctated; the front projects but little, and its anterior margin is slightly concave. The pterygo-stomial regions are slightly angulated; the posterior margin of the carapace projects somewhat and is perfectly straight, the postero-lateral angles being right angles. The eyes project slightly from the orbits, whose upper margins are marked with a fissure; the exognath of the outer maxillipedes is nearly as broad as the ischium-joint of the endognath, and reaches nearly to the acute distal end of the merus-joint. The chelipedes (in the female) are of moderate length and slender; the arm or merus-joint is granulated both above and below, but more thickly on its inferior surface; its margins are not distinctly angulated; the palm and wrist are minutely punctated on their upper and lower surfaces, and are granulated on their outer (or posterior) margins: the fingers are more than half as long as the palms, straight, acute, and are not denticulated on their inner margins: the ambulatory legs small and slender, with the dactyli longer than the preceding joints. The colour (in spirit) is light yellowish brown, carapace and chelipedes being punctulated with dusky grey. Length of carapace (of the female) under 3 lines (nearly 6 millim.).

A single female was collected at the Seychelles, 4-12 fms. (No. 194). The abdomen in this specimen has all the segments, except the first two and the last, coalescent.

This species is distinguished from nearly all of its congeners with which I am acquainted by the straight posterior margin of the carapace, with its prominent postero-lateral angles. *Philyra tuberculosa*, Stimpson\*, from Hong-Kong, which it resembles in this character, has the branchial, post-gastric, and genital regions of the carapace tuberculated. *Philyra levidorsalis*, Miers, from Goree†,

\* Proc. Acad. Nat. Sci. Philad. p. 160 (1860).

† Ann. & Mag. Nat. Hist. ser. 5, viii. p. 264, pl. xv. fig. 2 (1881).

also has a straight posterior margin to the carapace, but the postero-lateral angles are not prominent, and the chelipedes are of very different form; these characters will also apply to *P. carinata*, Bell, and another apparently undescribed species in the Museum collection from Penang (*Dr. Cantor*), which is allied to *P. carinata*, but has a more granulated carapace, a distinctly tridentate front, the lateral margins of the carapace bounded by a sharp cristiform line marked at intervals by small granuliform teeth, and much slenderer chelipedes, the palms of which are not distinctly granulated. This species, which only differs from *Pseudophilyra* in its less prominent front, I will designate as *Philyra rudis*.

### 68. *Pseudophilyra polita*. (PLATE XLIX. fig. B.)

In this little species the carapace is subrhomboidal, but (with the front) much longer than broad, slightly sinuated at the hepatic regions; the posterior margin nearly straight, but without prominent postero-lateral angles, the antero-lateral margins with a series of very distinct granules, which is continued for a short distance along the postero-lateral margins; the posterior margin is defined by a minutely granulated line; the frontal or cephalic region is very prominent, the front obscurely trilobate; the median lobe distinct and slightly deflexed, but the lateral lobes nearly obsolete; the dorsal surface is polished, and only very minutely punctulated. There is no distinct thoracic sinus, but one or two tubercles near the base of the chelipedes. The postabdomen (in the male) has all the segments (except the first and last) coalescent; the eyes are very small and lie well within the nearly tubular orbits, which have an external fissure and an internal hiatus for the reception of the small antennæ. The outer maxillipedes have the merus as long as or rather longer than the ischium-joint, acute at its distal extremity, near to which its margins are granulated; the exognath broad, with its outer margin somewhat arcuated and its distal end obtuse, the margins granulated, except towards the base. The chelipedes are rather short and somewhat triquetrous, with the margins very strongly granulated, as are also the upper and the anterior faces toward the base; on the inferior surface of the arm the granules are smaller and more crowded; palm and wrist nearly smooth; the palm suberistate on its upper and granulated on its lower margin; fingers about as long as the palm, slightly incurved at the tips, with a slight hiatus between them when closed. Ambulatory legs with the merus-joints more or less distinctly granulated on their lower margins. Colour (in spirit) yellowish white. Length of the only specimen nearly 4 lines (8 millim.); breadth rather over 3 lines (7 millim.), which is also the length of the chelipede when extended as far as its conformation will allow.

A male is in the collection from Poivre Island or Ilo des Roches, dredged in 13-20 fms. (No. 183).



This species is distinguished from the three others of the genus by its much less distinctly trilobate front. *P. tridentata*, Miers, which is its nearest ally in this genus, has a much more coarsely punctulated carapace, and differs in other characters.

Three small male specimens of a species of *Leucosia* from the Gulf of Suéz (*R. MacAndrew*) in the Museum collection, which were not described when I published my memoir on this group in 1877\*, because I doubted if they presented the characters of the fully adult, bear a curious resemblance to this species. They are distinguished not only by possessing a distinct, although shallow and imperfectly defined thoracic sinus, but also by the absence of the lines of granules from the inferior margin of the palm of the chelipedes and from the margins of the outer maxillipedes.

#### 69. *Nursilia dentata*, Bell.

A male was obtained at the Seychelles, 4-12 fms. (No. 194). The wide Oriental distribution of this species, which has been already noticed in the earlier part of this Report (p. 253), is evidenced by the acquisition of this specimen.

#### 70. *Arcania undecimspinosa*.

*Arcania undecimspinosa*, De Haan, *Faun. Japon. Crust.* p. 135, pl. xxxiii. fig. 8 (1841); Bell, *Trans. Linn. Soc.* xxi. p. 309 (1855); *Cat. Leucos. Brit. Mus.* p. 21 (1855).

*Arcania granulosa*, Miers, *Trans. Linn. Soc.* ser. 2, Zool. p. 240, pl. xxxviii. fig. 29 (1877); *Proc. Zool. Soc.* p. 44 (1879).

Seychelles, 4-12 fms. (No. 194); an adult male.

This specimen scarcely differs from De Haan's figure and the specimen from Moreton Bay in the British-Museum collection, which I formerly separated on insufficient grounds under the name of *A. granulosa*, except in its somewhat less strongly granulated carapace and the slightly recurved lateral spines of the third pair. Unfortunately the three posterior spines of the carapace were (subsequent to its examination) accidentally crushed in the specimen from the Seychelles.

There is in the collection another male specimen from the Seychelles (4-12 fms.), apparently referable to this genus, but which I hesitate to separate as a distinct species, as, on account of its very small size, I think it may not present all the characters of the fully-grown animal. The carapace is nearly circular in outline and is covered with close-set granules; its lateral and posterior margins are armed with twelve small nearly equidistant and equal granulated spines, those on the posterior margin being smaller and tuberculiform. The front is bilobate and slightly concave above;

\* *Trans. Linn. Soc.* ser. 2, Zool. i. p. 235 (1877).

the lobes but little prominent. The postabdomen has all the segments, except the last, coalescent. The inferior surface of the carapace is closely granulated. The exognath of the outer maxillipedes is rather narrow, with a straight outer margin, and does not reach to the distal end of the merus-joint of the endognath. The chelipedes are rather small, and arm, wrist, and palm are closely granulated, but otherwise unarmed; palm not twice as long as the wrist, rather turgid; fingers about as long as the palm, slender, and meeting along their inner edges. Colour (in spirit) pinkish. Length of carapace barely 2 lines (4 millim.).

This specimen is distinguished from all of the species of this genus with which I am acquainted by the evenly-granulated carapace and the number and disposition of the spines of the lateral and posterior margins. If the characters should prove constant, I would propose to designate it as *Arcania duodecimspinosa*.

*Arcania pulchella*\*, from the Fijis, which is evidently very nearly allied to it, has the lateral margins armed (on each side) with about seven teeth, the front nearly straight, the regions of the carapace strongly mammillated.

#### 71. *Ebalia granulata* (Rüppell)?

Since the original diagnosis is very brief, I append the following description:—

The body and legs are everywhere covered with numerous very close-set and crowded perliform granules, which are largest on the postabdomen and on the merus-joints of the chelipedes; the carapace is nearly circular in outline (not rhomboidal), but a little broader than long, moderately convex, the gastric and cardiac regions defined by faintly indicated lateral *sulci*. The front is slightly concave, and projects less than the buccal cavity, so that the outer maxillipedes are just visible in a dorsal view; the hepatic regions are prominent, the lateral margins are slightly sinuated, but not lobate or toothed. The postabdomen (of the female) has all the joints, except the first two and the last, coalescent. The eyes are closely set in the nearly circular orbits; the small antennæ enter the inner orbital hiatus; the merus-joints of the outer maxillipedes are shorter than the ischium-joints; the rather narrow exognaths have a straight outer margin, and do not reach to the distal ends of the merus-joints; the chelipedes (in the female) are rather small, the merus-joint or arm has its inner distal angle somewhat produced and rounded, but is not toothed; carpus small, rounded; palm little longer than the carpus, rather turgid; the fingers are longer than the palm, meet along their inner edges, and are slightly incurved at the tips. The ambulatory legs are very slender; the dactyli bear a minute terminal claw. Colour (in spirit) pinkish. Length of carapace about  $2\frac{1}{2}$  lines (5 millim.); of chelipede (of the female) about 3 lines (nearly 7 millim.).

\* *Ebalia pulchella*, Journ. Mus. Godeffroy, iv. p. 85, pl. xiii. fig. 2 (1873).

The single example was collected at Providence Island, 24 fms. (No. 215).

It only differs from Rüppell's figure (*t. c.* p. 17, pl. iv. fig. 3) in the somewhat broader carapace and shorter granulated chelipedes, and I do not venture, therefore, to separate it as a distinct species.

*Ebalia granulata* has been hitherto a desideratum in the Museum collection. Originally described by Rüppell as *Nursia granulata*\*, it was retained as a doubtful member of that genus by Milne-Edwards†, who had seen no specimens. Prof. T. Bell, in his monograph of the family‡, makes no mention of the species; but it is included by Von Martens in his conspectus of the East-African Crustacea§, who refers to it as *Ebalia granulata*.

The nearest ally to this species with which I am acquainted is *Ebalia miliaris*, A. M.-Edwards||, a species from Upolu, Samoa Islands, which is only very briefly characterized, but which differs in the shorter dactyli of the chelipedes and the much more robust ambulatory legs. *Ebalia orientalis*, Kossmann¶, from the Red Sea, differs altogether in the form of the carapace, which is subrhomboidal, with deep concavities behind the antero-lateral margins.

## 72. *Calappa hepatica* (Linn.).

Mozambique, beach (No. 224); an adult male.

This very common species has been referred to in the preceding part of this Report (p. 257).

## 73. *Calappa gallus* (Herbst), var. *bicornis*.

This variety is so nearly allied to the typical *Calappa gallus* (Herbst), with which I believe the W.-Indian *C. galloides*, Stimpson, to be identical, that it will suffice here to point out the characters by which the specimens in the Museum collection may always be distinguished. The rostrum is not, as in the ordinary condition of *C. gallus*, entire and obtuse or very slightly excavate at its distal end, but is deeply emarginate, so as to consist of two distinct lobes or spines, on the outer side of each of which there is a smaller tooth, which tooth is, however, sometimes distinguishable in the typical *C. gallus*; the upper margins of the orbits are denticulated, not smooth as in the typical form, the tubercles of the carapace are usually more conical and acute. It may not improbably prove to be a distinct species.

\* Beschreib. 24 kurzschw. Krabben des rothen Meeres, p. 17, pl. iv. fig. 3 (1830).

† Hist. Nat. des Crust. ii. p. 138 (1837).

‡ Trans. Linn. Soc. xxi. pp. 277-313 (1855).

§ In Von der Decken's Reisen in Ost-Afrika, iii. (1) p. 110 (1869).

|| Journ. Mus. Godeffroy, iv. p. 85, pl. xiii. fig. 2 (1873).

¶ Malacostraca, in Zoolog. Ergebn. roth. Meeres, i. p. 65, pl. i. fig. 6, pl. iii. fig. 16 (1877).

A single female, in which the chelipedes are deficient, was obtained at Providence Island, 19 fms. (No. 217).

A specimen also of this variety is in the British-Museum collection from the Indian Ocean, and others from the collection of H.M.S. 'Samarang' without special locality. Of the typical *C. gallus*, there are specimens in the collection from the Mauritius; Ceylon (*E. W. H. Holdsworth*), and others without special locality; also specimens from the West Indies; and Garden Key, Tortugas (*Smithsonian Institution*, designated *C. galloides*). Specimens from the Philippines (*Cuming*) and Eastern Seas (H.M.S. 'Samarang'), which possibly belong to this species, have the tubercles of the carapace larger, smoother, and more rounded than in the typical *C. gallus*.

A. Milne-Edwards has recently described a species, *C. angusta*\*, from the West Indies, which is too briefly characterized to be identified with certainty, but with which *C. gallus* var. *bicornis* may possibly be identical. The lateral margins of the carapace are, however, described as finely granulated, whereas in var. *bicornis* they are distinctly dentated, as usual in the genus *Calappa*.

#### 74. *Cymopolia whitei*. (PLATE XLIX. fig. C.)

The carapace is shaped nearly as in *C. jukesii*, White, which this species much resembles; it is subquadrate, transverse, with the posterior margin slightly rounded; the cervical and other *sulci* of the carapace are distinct and smooth, the dorsal surface between them is everywhere granulated, but is without spines. The front is moderately prominent, and is divided by a median fissure into two median lobes; outside of which the frontal margin is sinuated, but not distinctly lobate; the upper orbital margin is divided by two deep fissures, the median lobe truncated, the outer orbital angle prominent and acute; behind it on the lateral margin of the carapace are two smaller teeth. The fourth to sixth segments of the postabdomen are partially coalescent; its sides are subparallel to about the middle of the penultimate segment, whence they converge rapidly to the distal end of the terminal segment, which lies just between the bases of the outer maxillipedes, as in *C. dentata*, A. M.-Edwards. The cristiform lobe on the anterior margin of the eye-peduncles has its anterior margin regularly arcuated. The inner suborbital lobe is subacute and but little prominent; there is a prominent subquadrate lobe on the outer side of the peduncles of the antennæ, whose flagella are about 14-jointed. The merus-joint of the outer maxillipedes has an incurved tooth or lobe at its extero-distal angle as in *C. jukesii*. The chelipedes (in the small males I have examined) are rather small, slender, and of nearly equal size; merus and carpus unarmed; palm about twice as long as the wrist, and smooth or very obscurely granulated; fingers about half as long as palm, acute, and somewhat deflexed, with their inner edges

\* Bull. Mus. Comp. Zool. vii. p. 18 (1880).

not denticulated. Ambulatory legs with the joints unarmed; the merus-joints in the third and fourth pairs, although slightly dilated, much less so than in *C. jukesii*, nor is their surface tuberculated and their margins denticulated as in that species; the penultimate joints are also less dilated, the dactyli about as long as the preceding joints. Colour (in spirit) yellowish or whitish. Length of carapace of the largest specimen (a female) about 4 lines (nearly 9 millim.), length of leg of the third pair about 8 lines (17 millim.).

Seychelles, 4-12 fms. (No. 194); an adult and smaller female and two small males.

This species is nearly allied to *C. jukesii*, White\*, from Sir C. Hardy's Island, Australia, from which it is distinguished by the different form of the cristiform lobe of the ocular peduncles, and the much less dilated and non-denticulated merus-joint of the third and fourth ambulatory legs. From *C. dentata*, A. Milne-Edwards†, from the West Indies, to which it is also apparently nearly related, it is distinguished by the non-spinose or dentated merus-joints of the legs and by the smaller chelipedes of the male.

#### ANOMURA.

##### 1. *Dromidia spongiosa*, Stimpson, var. ? *stimpsonii*.

(PLATE L. fig. A.)

A female from Mozambique, obtained between tide-marks (No. 224), may perhaps be referred to this species. It differs from Stimpson's description only in the form of the front, which, although deeply longitudinally concave, is not at all bicuspidate, and in the coloration, which (in spirit) is brownish, the fingers only being red. This character and also the absence of orbital teeth will distinguish this species from the *Dromidia? rotunda*, M'Leay‡, also from the Cape. From the *Dromidia unidentata*, Rüppell, which Bianconi§ records from Mozambique, it is apparently distinguished by the much shorter pubescence of the carapace and legs, and by the obsolescence of the lateral marginal tooth, as well as by the non-bicuspidate front. If it be specifically distinct, I would propose the designation *D. stimpsonii* for this form, which when received was deeply ensconced in a species of tunicate Ascidian.

A very small male is in the collection from Poivre Island or Ile des Roches, whose generic position (in the absence of specimens of the female sex) must remain uncertain, which is possibly referable to the *D. rotunda*, M'Leay. As in that species, the front is distinctly bicuspidate, and there is a tooth above the inner margin of the orbit. There is no tooth, but only a slight prominence, behind the lateral sutures of the carapace. The body and legs are clothed with

\* Appendix to Jukes's Voyage H.M.S. 'Fly,' p. 338, pl. ii. fig. 1 (1847); Miers, Crust. in Zool. 'Erebus' and 'Terror,' p. 3, pl. iii. figs. 4, 4a (1874).

† Bull. Mus. Comp. Zool. viii. p. 28 (1880).

‡ Annulosa in Smith's Zool. S. Africa, p. 71 (1849).

§ Mem. Accad. Bologna, ser. 2, ix. p. 207 (1869).



rather long whitish hairs, the chelipedes rather slender; finger-tips white.

By Kossmann (*t. c. zweite Hälfte*, p. 67, 1880) *D. unidentata* and *D. rotunda* are regarded as synonymous. The specimens collected by Kossmann in the Red Sea are distinguished from *D. spongiosa* var. *stimpsonii* by the prominent lateral teeth of the rostrum and the existence of a distinct lateral marginal tooth behind the cervical suture.

## 2. *Dromia vulgaris*, M.-Edw.

Two very small specimens from Providence Island, 19 fms. (No. 217), are perhaps referable to this species. They do not present the elongated tubercles on the sternal surface characteristic, as Hilgendorf has shown, of *D. rumphii*\*, to which species a specimen from the Mauritius (*M. Robillard*), which I formerly designated as *D. vulgaris*, is to be referred, as the sternal tubercles are strongly developed. A female, presumably from the Indian Ocean (*General Hardwicke*), apparently belongs to *D. vulgaris*, since in this specimen the sternal tubercles are absent; yet it is to be noted that it presents but slight indications of the secondary tubercle or spine behind the base of the second antero-lateral marginal spine which is generally characteristic of *D. vulgaris*. In the specimen from Mauritius also the secondary lateral spine is absent, but in an adult male Malayasian specimen from Dr. Bleeker's collection it is strongly developed.

## HOMALODROMIA, gen. nov.

Carapace flattened above, somewhat hexagonal in shape, almost as broad as long. Front broad, consisting of two prominent lobes which project over and beyond the bases of the antennæ, and are each excavated at the distal extremity. Epistoma (or interantennular septum) triangulate and united with the front. Palate with faintly defined longitudinal ridges (*colliculi*). The sternal *sulci* in the female terminate in two strong tubercles, which are nearly in contact at their bases, and are situated between the bases of the chelipedes, which have the apices of the fingers denticulated, corneous, and excavated. Ambulatory legs of the second and third pairs without spines or tubercles, with the merus-joint not dilated, the dactyli slightly curved and armed on the inferior margin with two or three accessory spinules. Fourth legs more robust and much shorter than the fifth pair and scarcely prehensile, the penultimate joint being armed at its distal extremity with a very small spinule. Fifth legs slender and elongated (yet less elongated than in *Pseudodromia*), shorter than the second legs, prehensile, with the penultimate joint shorter than the preceding, and its terminal spine slender, arcuate, and about as long as the slender arcuate dactylus.

This genus cannot be confounded with any known to me. It

\* Monatsber. Akad. Wiss. Berlin, p. 813 (1878).

seems to be most nearly allied to *Pseudodromia*, Stimpson\*, of which I have seen no specimens, but is distinguished by the flattened carapace, the different form of the front, which joins the antennular septum, and the much shorter fifth ambulatory legs.

### 3. *Homalodromia coppingeri*. (PLATE L. fig. B.)

Carapace (in the female) flattened above, with the frontal region slightly deflexed, the sides convergent to the posterior margin from the hepatic regions. The front is about one-half of the greatest width of the carapace; the two lobes of which it is composed are separated to their bases by a rather wide interspace, and each lobe has a wide and rather shallow excavation at its distal extremity, with the antero-lateral angles produced and spiniform. There is a small spine or tooth at the exterior orbital angle, and one at the inner inferior orbital angle. The sternal tubercles are somewhat elongated and divergent from their bases. The eyes are deeply set in the small orbits. The second peduncular joint of the antennæ terminates in two spines, and thus appears furcated at its distal extremity; the antennal flagella are considerably elongated. The merus-joint of the outer maxillipedes is about as long as the ischium-joint, and widens somewhat to its distal extremity, which is truncate; it bears the next joint at the inner end of its distal margin; the narrow, straight exognath reaches to the distal end of the merus. The chelipedes (in the female) are rather shorter and little more robust than the following joints, with the arm and merus short and unarmed, wrist with two spines on its outer surface near the distal extremity; palm about as long as fingers, rounded above and below, and without spines; fingers dentated on their inner margins and at the semi-excavated distal extremity; the second and third legs are without spines or tubercles, with the dactyli slightly shorter than the penultimate joints, terminating in a corneous claw, and bearing, as already stated, two or three accessory spinules; in the fourth legs the strongly curved dactyl is unarmed and about equals the penultimate joint in length; in the fifth legs the merus is slender and elongated, longer than the following joint; the spiniform process of the penultimate joint is strongly curved and constitutes with the dactyl a perfectly formed prehensile organ. Colour (in spirit) pinkish; the body is everywhere closely pubescent: longer hairs clothe the margins of the carapace at the hepatic regions and the margins of the postabdominal segments and legs. Length of the carapace of the single example (an adult female) to end of rostrum nearly  $3\frac{1}{2}$  lines (7 millim.), breadth a little less; length of first ambulatory leg about  $4\frac{1}{2}$  lines (nearly 11 millim.); of fifth leg  $3\frac{1}{2}$  lines (nearly 8 millim.).

The single specimen was collected at Providence Reef, 24 fms. (No. 215), and has the carapace somewhat crushed on the dorsal surface and the fifth ambulatory legs detached.

\* Proc. Acad. Nat. Sci. Philad. p. 225 (1858).

4. *Birgus latro* (Linn.).

Du Lise Island, Glorioso Group; beach (an adult female).

Specimens are in the British-Museum collection from the Mauritius (*Lady F. Cole*), Malayasian seas (*Dr. P. Bleeker's coll.*), and Fiji Islands, Nairai (*H.M.S. 'Herald'*), besides others from the 'Samarang' and 'Herald' collections without special indication of locality.

5. *Cænobita perlata*, *M.-Edw.*

Eagle and African Island, beach (No. 210). Five males are referred to this species, mostly inhabiting shells of the genus *Dolium*.

Specimens are in the British-Museum collection from the Mauritius. In this species there is usually an oblique series of somewhat more elongated tubercles on the upper surface of the palm, occupying the place of the series of oblique ridges in *C. rugosa*. The basal joint of the right fifth ambulatory leg is in the adult male furnished with an elongated curved styliform lobe, as noted by De Haan; this does not exist in a small male from Batjan (*coll. Dr. Bleeker*) which I have designated *C. perlata* var. ? *affinis*, and which may belong to a distinct species.

6. *Pagurus punctulatus*, *M.-Edw.*

Darros Island, beach (No. 199); a small example in a shell of *Voluta geographica* (L.).

Specimens of this very common species are in the Museum collection from the Mauritius (*Old Collection*); Rodriguez (*G. Gulliver*); Seychelles (*Dr. E. P. Wright*); Madagascar (*Dr. J. E. Gray*); Celebes, Batjan (*Dr. Bleeker*); Borneo (*L. Dillwyn*); Philippine Islands (*Cuming*); Duke of York Island (*Rev. G. Brown*); Australia, Bramble Key (*J. B. Jukes*); and other Australian specimens without special locality; Fiji Islands, Ngau (*H.M.S. 'Herald'*); and Samoa Islands (*Rev. S. J. Whitmee*).

A. White\* refers to this species under the designation of *P. megisto* (Herbst); but on examination of his figure† I find that Milne-Edwards's citation of this as an imaginary (or manufactured) type is correct; and therefore I retain the name *P. punctulatus*, which is usually adopted for the species (*cf. Hilgendorf, Crust. in Von der Decken's Reisen in Ost-Afrika*, iii. (1) p. 95, 1869).

7. *Pagurus guttatus*, *Olivier?*

As our specimen differs somewhat from the brief description published, I subjoin the following:—

The carapace is depressed, with the postfrontal, lateral, longi-

\* List Crust. Brit. Mus. p. 60 (1847).

† Naturgesch. der Krabben u. Krebse, iii. p. 23, pl. lxi. fig. 1 (1804).

tudinal, and cervical sutures well defined; there is no median rostral lobe, and the lateral lobes of the frontal margin (situate between the eyes and antennæ) are obtuse and little prominent. These lateral margins are armed with a few very small spinules at and behind the antero-lateral angles; the branchial regions are moderately dilated. The sternum between the bases of the fourth pair of legs is of considerable width, and the coxæ of this and of the third pair widely remote from one another, but those of the first and second pair are contiguous. The postabdomen (in the female) bears three triramose ciliated appendages, and in the middle of its inferior surface a strong conical and somewhat hairy fleshy protuberance; above it is protected by membranaceous plates; its terminal segment is very small. The eye-peduncles are thickened somewhat distally, and are somewhat longer than the anterior margin of the carapace; their corneæ are small and occupy about a fifth of the total length; their basal scales are as broad as long and denticulated on the distal margins at and near the antero-internal angles. The peduncles of the antennæ are rather shorter than the eye-peduncles; the antepenultimate joint is armed above with a strong setose spine, at base of which is a smaller spine; the two last peduncular joints are slender; the joints of the flagella nearly naked. The larger (left) chelipede has a trigonous merus-joint, whose upper margin is not toothed, but whose lower margin has about half a dozen irregular spines and teeth; the carpus is spinulose on all its upper and outer surface; the palm (nearly twice as long as the wrist) has its upper and half of its outer surface spinulose, but the lower half of its outer surface smooth, except at the inferior and proximal angle; the lower margin, both of palm and immobile finger, is thin-edged, straight, and spinulose; the inner surface of the palm has a few granules on its upper part; the mobile finger is spinulose above, near the base, and both fingers have their apices subacute, with only very small corneous tips. In the slender smaller chelipede both wrist and palm are spinulose and hairy on their upper and outer surface, the fingers are sub-excavate at apex, with corneous tips, the upper spinulose at base; the second and third legs are slender and rather hairy, with the dactyli slender, arcuated, and much longer than the preceding joints; on the left side the second legs have the penultimate and last joints spinulose above, but nearly smooth on the outer surface; the terminal joint externally longitudinally canaliculated; the third (left leg) has its penultimate joint spinulose all over the outer surface; its terminal joint is broken, but was apparently externally longitudinally canaliculated and strongly spinulose above; in the fourth legs the penultimate joint terminates as usual in a scabrous pad, and the dactyl is arcuate and denticulated on its inner margin; the fifth legs are apparently more distinctly chelated, and are densely hairy at the distal extremity. The chelipedes and ambulatory legs are rather scantily clothed with hair. Coloration (in spirit) yellowish with reddish patches (interpunctulated with white) on the postfrontal regions of the carapace, chelipedes, second and third legs. Length



of carapace, in the middle line, about  $6\frac{1}{2}$  lines (14 millim.); length of larger (left) chelipede nearly 11 lines (23 millim.); of second (left) ambulatory leg 1 inch  $1\frac{1}{2}$  line (28 millim.).

Seychelles, 4–12 fms. (No. 194); an adult female.

*P. guttatus*, Olivier, as described and figured, differs somewhat in the spinulation of the chelipedes and two following legs and in the coloration.

In the form and spinulation of the larger chelipede it somewhat resembles *P. varipes*, Heller\*; but that species is distinguished by many important characters, as (*e. g.*) by the shorter eye-peduncles, the existence of a strong tooth on the upper margin of the merus-joint of the larger chelipede, and in the form and sculpture of the left leg of the third pair (*cf.* Dr. Heller's figure, *t. c.* pl. ii. fig. 3).

The type of *P. guttatus* was from the Mauritius; Lenz and Richters record this species from Madagascar.

Dana refers specimens from Upolu (which may, however, be specifically distinct) to this species.

### 8. *Calcinus tibicen* (Herbst).

Mozambique, between tide-marks (No. 225); a female.

A specimen from the same locality was presented to the British Museum by the late Dr. Livingstone. Specimens are in the Museum collection from Rodriguez (*H. H. Slater*); Madagascar, Tamatave (*Rev. D. Cowan*); Keeling or Cocos Islands (*Lieut. Burnaby*); Pelew Islands (*Dr. G. L. King*); and Sandwich Islands (*W. H. Pease*); besides a series of specimens from the 'Herald' collection without locality.

### 9. *Petrolisthes lamareckii* (Leach).

Darros Island, beach (No. 200); an adult male and female.

These specimens present the distinctive characters of the species referred to in the preceding part of this Report (p. 268). The body (in spirit) is of a reddish colour, punctulated with yellow; the carpus and penultimate joints of the first and second ambulatory legs alternately banded with yellow and red. In some specimens from Ceylon (*Dr. W. Ondaatje*) the yellowish colour predominates, as in the following variety.

### 10. *Petrolisthes lamareckii*, var. *asiaticus*, Leach.

Of this variety, if it can be so styled, three specimens were collected with the typical *P. lamareckii* at Darros Island. In these specimens, and in almost all I have examined, except Leach's type, from the Mauritius, a longitudinal purplish line exists on the upper surface of the palms of the chelipedes, and the outer (or posterior) margin of the palm and mobile finger is marked with a series of

\* Sitz. Akad. Wissensch. Berlin, xliv. (1) p. 244, pl. i. fig. 1, and pl. ii. figs. 2, 3 (1862).



spots of a similar colour, which are larger than those with which the hand is covered.

To this variety are referred specimens from the Philippines, Corregidor (*Cuming*); the island of Ty-pin-san (*H.M.S. 'Samarang'*); Keeling or Cocos Islands (*Lt. Burnaby*); and Fijis, Ovalau (*H.M.S. 'Herald'*).

#### 11. *Petrolisthes annulipes*, White (ined.), Miers.

Seychelles, 4-12 fms. (No. 194); an adult female and small male.

The occurrence of this species (described in the preceding part of this Report) in the western limits of the Indo-Pacific region proves its wide geographical range, and it may be that it will prove to be not specifically distinguishable from its near allies *P. scabricula*, Dana, from the Sooloo Sea, and *P. militaris*, Heller, from the Nicobars; but even if it should be necessary to unite the three forms, the distinctions referred to in my description of *P. annulipes* would apparently suffice to constitute it a very distinct variety, and I do not venture to unite them in the absence of types of the two first-mentioned species for comparison.

A small specimen obtained at Ile des Neufs, 15 fms. (No. 187), more nearly resembles *P. scabricula* in having the outer margin of the palm of the chelipedes pubescent, and a series of spinules extending along the whole length of the posterior margin of the wrist, but in this specimen the palms are pubescent, but not transversely striated; it is probably not fully grown, but I think belongs to a distinct species.

#### 12. *Petrolisthes maculatus*, M.-Edw.

Since I identify this species with the very short diagnosis of *P. maculatus* with much uncertainty, I append the following description:—

The carapace is rather convex, smooth, and polished, and very much longer than broad; the front is slightly deflexed, very prominent, of a rounded triangulate form, with a slight lateral sinus or dilatation above the inner orbital angle; the outer orbital angle is obtuse; there is a spinule on the lateral margins of the carapace, at some distance behind the outer orbital angle; on the sides of the carapace, below the lateral margins, is a longitudinal furrow. The second joint of the peduncle of the antennæ bears an acute lobe or spine. The chelipedes are smooth and naked; the merus-joint is very short, with a tooth or lobe at its antero-internal angle; the anterior margin of the wrist is armed with a prominent acute sub-basal tooth or lobe, followed by one or two very indistinct smaller teeth; the posterior margin is entire; the palm is flat and smooth above, its anterior margin bordered by a raised line, its posterior margin (and that of the immobile finger) cristiform and acute; the

fingers are acute, slightly incurved at the tips, and have their inner margins thin-edged and entire; the three following pairs of legs have the joints smooth, naked, and rounded; the merus-joints but little thickened and without spinules; the penultimate joints have a small mobile spinule at the distal end of their posterior margin; dactylus with a single small accessory spinule. The whole of the upper and lateral surface of the carapace and the legs are closely punctulated with small circular red spots; the ground-colour is yellowish. Length of carapace nearly 6 lines (12 millim.).

A single male was obtained on the beach at Mozambique, between tide-marks (No. 224).

There is scarcely any character mentioned in M. Milne-Edwards's very short description, based on a specimen from New Ireland, that will not apply to the specimen from Mozambique, unless it be what relates to the spines of the wrist.

### 13. *Petrolisthes villosus* ?

? *Porcellana villosa*, Richters, *Decapoda*, in Möbius's *Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen*, p. 160, pl. xvii. figs. 11, 12 (1880).

A small male collected at Darros Island (No. 200) with *P. lamarchii* is referred here. To Dr. Richters's short description I may add the following:—The median frontal lobe is prominent and rounded, and more distinctly defined than in *P. lamarchii*, var. *asiatica*. There is apparently no spinule on the lateral margin of the carapace. There is a strong lobe or tooth at the distal end of the merus-joint of the chelipedes; between the three prominent lobes or teeth of the anterior margin of the wrist are one or two smaller teeth; the posterior margin of the wrist is entire. The dactyli of the first to third ambulatory legs have three small accessory spinules. This species has been hitherto a desideratum to the Museum collection.

### 14. *Polyonyx biunguiculatus* (Dana).

Several specimens from the Seychelles, 4–12 fms. (No. 194), and Etoile Island, 13 fms. (No. 191), are referred to this species, which, as I have stated in the preceding part of this Report (p. 271), is distinguished from *P. obesus* by the much more prominent and acute median lobe of the front. I may add that the specimens I have examined, both from the 'Alert' collection and from the Gulf of Suez (*R. MacAndrew*), have a prominent lobe at the inner and distal angle of the merus-joint of the chelipedes, which is not represented in Dana's figure of this species, and which is scarcely or not at all developed in *P. obesus*. This character will perhaps be found sufficient to distinguish these specimens from *P. biunguiculatus*, Dana, at least as a marked variety.

15. *Galathea spinosirostris*, Dana ?

To this species are rather doubtfully referred female specimens collected at Marie-Louise Island, 17 fms. (No. 186); Ile des Neufs, 15 fms. (No. 187); and Providence Island, 19 fms. (No. 187).

These specimens differ from Stimpson's description of *Galathea labidolepta*\*, based on specimens from the Cape of Good Hope, and from a dried example (probably male) in the Museum collection from Simon's Bay (*J. Macgillivray*, H.M.S. 'Rattlesnake'), only in having the strigæ of the carapace (in the adult) very scantily pubescent, the lateral margins of the carapace armed with nine spinules, and the palms of the chelipedes very slender and scarcely scabrous above, but they are spinulose and setose nearly as in Stimpson's description.

Dana's *G. spinosirostris* is but briefly described, and he does not state how many spinules there are on the lateral margins of the carapace in his types, which were from the Sandwich Islands; the description and figures, however, agree fairly well with our specimens. Dr. Richters refers to this species specimens from the Fouquets.

Two small specimens from Darros Island, 22 fms. (No. 233), much more nearly resemble *G. labidolepta* in the more distinctly strigose and pubescent carapace, whose lateral margins are armed with seven or eight spinules (including the infra-antennal spine). In one of these specimens (a male) the palm of the chelipede is more broadly dilated and the fingers relatively shorter than in the specimen from Simon's Bay referred to above.

16. *Munida edwardsii*. (PLATE LI. fig. A.)

The carapace, as usual in the genus, is transversely strigose; the strigæ ciliated; the lateral spines of the rostrum are rather more than half as long as the median spine; outside of the lateral rostral spines there is a small supraocular spine. The front of the gastric region is armed with a transverse series of about eight spinules; on the sides of the carapace, near to the lateral margins, are two spinules, situated one in front of and one behind the cervical suture; the antero-lateral angles of the carapace are bispinulose, and posterior to these, on the lateral margins, are six spines; the postabdomen is without spinules on the dorsal surface, and the lateral margins of the second to sixth segments are rounded. The corneæ of the eyes are considerably dilated; the terminal peduncular joints of the antennules are armed with four spinules, of which one is very long; the peduncular joints of the antennæ (except the last) are each armed with a spinule (the flagella, both of antennules and antennæ, are wanting in the single specimen examined). The chelipedes (in the male) are rather robust, the merus enlarging distally and armed with superficial and marginal spinules at and toward its distal extremity; carpus spinulose above and on the margins; hand some-

\* *Vide* Proc. Acad. Nat. Sci. Philadelphia, p. 251 (1858).

what dilated, and vertically flattened and compressed; the margins, both of palm and fingers, spinulose, but the surface smooth, without spines. But one ambulatory leg remains attached to the body (on the left side); this is rather small and slender, and has the upper margin of the merus, carpus, and penultimate joints spinulose, the dactyl obscurely denticulated below. Colour light brownish pink or yellowish. Length of the body to end of rostrum nearly 6 lines (12 millim.); of a chelipede about  $6\frac{1}{2}$  lines (14 millim.).

The single specimen (which is, I think, a male) was obtained at Ile des Neufs, 15 fms. (No. 187), with *Galathea spinosirostris*.

The spinulation of the carapace, with the form of the chelipedes, distinguishes it from all the species with which I am acquainted.

The presence of supraocular spines will at once separate it from the Oriental forms *Munida gregaria* (Fabr.)=*M. subrugosa*, Dana, *M. japonica*, Stimpson, and also from *M. spinulifera*, described at p. 279 of this Report.

## MACRURA.

### 1. *Alpheus obesomanus*, Dana.

A specimen was obtained at the Seychelles, 4-12 fms. (No. 194). It has been already noticed at p. 287 of this Report.

### 2. *Alpheus edwardsii* (Audouin).

A specimen, in which the smaller chelipede is wanting, was obtained at the Seychelles, 4-12 fms. (No. 194). I have already referred to the distribution, sexual characteristics, and variability of this species at p. 284 of this Report.

### 3. *Alpheus lævis*, Randall.

Of this widely distributed species specimens were collected at the Seychelles, 4-12 fms. (No. 194); African or Eagle Island, 10 fms. (No. 184); and Etoile Island, 13 fms. (No. 191): most of these are ova-bearing females.

Specimens are in the British-Museum collection from the Red Sea, Gulf of Suez (*R. MacAndrew*); Gulf of Akaba (*Major Burton*); El Tor (*Major MacDonald*); Dædalus Shoal (*Lt.-Col. Playfair*); also Red-Sea specimens received from the Godeffroy Museum, and wrongly designated *A. tricuspidatus*, Heller; also from Rodriguez (*H. H. Slater*); Ceylon, Galle (*Dr. W. Ondaatje*); Samoa Islands (*Rev. S. J. Whitmee*); and Fiji Islands, Matuka (*H.M.S. 'Herald'*).

There is in the collection a specimen of *Alpheus* from African or Eagle Island, 10 fms. (No. 184), which for the present I refrain from designating by a distinct specific name. It is evidently very nearly allied to *Alpheus collumianus*, Stimpson\*, from the Bonin

\* Proc. Acad. Nat. Sci. Philad. p. 31 (1860).



Islands, and may be identical with it; but differs from his brief description in some minor points, *e.g.* in the absence of the small spinules at the base of the third and fourth legs.

#### 4. *Alpheus minor*, var. *neptunus*, Dana.

Specimens of this species, whose synonyms and distribution have been referred to at p. 288 of this Report, are in the collection from Darros Island, 22 fms. (No. 185), Ile des Neufs, 15 fms. (No. 187), and Glorioso Islands, 7-10 fms. (No. 219).

#### 5. *Pontonia*? *brevirostris*. (PLATE LI. fig. B.)

The body of this species is shaped nearly as in *P. tridacnæ* (Peters). The rostrum is very small, not at all laterally compressed; viewed dorsally it is triangular and acute, and scarcely prolonged beyond the bases of the eye-peduncles; the anterior margin of the carapace, near to the antero-lateral angles, is armed with a spine; the lateral margins of the second to fifth postabdominal segments are obtusely rounded, those of the sixth segment posteriorly spiniform and acute; the terminal segment is subtriangulate, with the apex subacute (broader and more rounded in the adult female), and bears on its dorsal surface two strong spines near to each lateral margin. The eye-peduncles are subcylindrical, thick, and project laterally. The first exposed joint of the antennular peduncles is flattened and considerably dilated, and has two spines on its outer margin, of which one is at the extero-distal angle of the joint; the next joint is very short, the terminal joint longer; the outermost of the two short flagella is thickened and shortly bipartite. The antennæ are inserted beneath and outside of the antennules, and their short peduncles in a dorsal view are hidden by the antennal scales, which are large, ovate, and distally ciliated, and prolonged beyond the distal end of the peduncles and the antennules. The slender mandibles are without a palpus; the outer maxillipedes are subpediform, with the antepenultimate joints but slightly thicker and a little longer than the two terminal joints taken together. The anterior legs are slender and unarmed, with merus and carpus of about equal length, and each about as long as the palm and fingers taken together; the palm is not dilated, and the fingers are not denticulated on their inner margins. The second legs (in the specimens examined) are but moderately thickened and of nearly equal size; ischium, merus, and carpus of about equal length, but the carpus somewhat thicker; palm longer than the carpus, smooth and rounded, scarcely compressed; fingers about as long as palm, meeting along their inner margins, which are not denticulated. Ambulatory legs slender, with the penultimate joints about twice as long as the preceding; dactyli styliform and acute. The rami of the uropoda are ovate and ciliated, and the outermost has a small spinule near to the distal end of its outer margin. Colour (in spirit) reddish yellow. The exact dimensions of the larger specimen, owing to its imperfect condition,



cannot be given; but it is somewhat smaller than adult *P. tridacna*. The chelipede of the second pair measures about 7 lines (15 millim.).

Two specimens, of which one is an adult female with ova, were obtained at the Seychelles (12 fms.), where they inhabited "clump shells" (bivalves?).

They are distinguished from all the species with which I am acquainted, except *P. unidens*, Kingsley, by the extremely short rostrum, which is not laterally compressed, and from all by the form of the chelipedes of the second pair. From the species of *Coralliocaris*, Stm. (*Edipus*, Dana), they are distinguished, among other characters, by the form of the dactyli of the ambulatory legs.

In *P. unidens*, Kingsley, from Florida\*, not only is the form of the chelipedes different, but also the antennal scale is shorter, reaching only to the end of the last joint of the peduncle.

### 6. *Coralliocaris graminea* (Dana).

Four specimens, of which two are adult females with ova, were obtained at the Seychelles, 4-12 fms. (No. 194). Specimens from the same locality were presented to the Museum by Dr. E. P. Wright.

These specimens agree with the description of Dana in all particulars except that no trace remains of the characteristic markings of the carapace, the coloration in spirit being yellowish; and the margins of the rostrum above the eyes are slightly convexly arcuated; the tooth on the inferior margin of the rostrum, or one of the teeth of the superior margin, is occasionally absent.

Dana's specimens were from the Fijis. Dr. Stimpson records this species from Hong Kong.

*Coralliocaris nudirostris* (Heller), from the Red Sea, may possibly be identical with this species; but in the figure the dactyli of the chelipedes are of very different form (*cf.* Heller in Sitz. Wien. Akad. xliv. (1) p. 279, pl. iii. fig. 25, 1862).

### 7. *Penæus canaliculatus*, Olivier.

A small specimen, I think a male, was obtained at Poivre Island, on the beach (No. 198).

Since reference was made to this species in my memoir on the genus, in 1878†, specimens have been added to the collection from Richmond River, N. S. Wales (*A. P. Goodwin*); there is also in the Museum collection a small example, in bad condition, from Swan River (*Dring*).

*Penæus brevirostris*, Kingsley‡, is very nearly allied to, and may be identical with, this species, but it has two teeth on the inferior

\* Proc. Acad. Nat. Sci. Philad. p. 422, pl. xiv. fig. 9 (1879).

† Proc. Zool. Soc. p. 298 (1878).

‡ Proc. Acad. Nat. Sci. Philad. p. 98 (1878).

margin of the rostrum, whereas in *P. canaliculatus* there is commonly but one; and it is not stated in the author's description whether the terminal segment of *P. brevirostris* bears lateral marginal spinules. As the type was from Realejo, on the west coast of Nicaragua, the range of *P. canaliculatus* (if it be identical with that species) seems to extend eastward to the American coast.

I may add here, that *P. occidentalis*, Streets\*, from the Isthmus of Panama, to which reference is not made in my paper above referred to, seems to be identical with *P. stylirostris*, Stimpson, which I supposed (in 1878) to be synonymous with *P. indicus*; but according to Mr. Spence Bate, who has since examined the types in the Paris collection, not only *P. indicus* but also *P. semisulcatus*, De Haan, *P. carinatus*, Dana, *P. takitensis*, Heller, and *P. esculentus*, Haswell, are varieties of *P. monodon*, Fabricius (*vide* Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 177, pl. xii. fig. 5, and p. 178, 1881). The designation *P. stylirostris* has precedence by a few weeks only over *P. occidentalis*.

### 8. *Penæus richtersii*. (PLATE LII. fig. A.)

Carapace with the cervical region scantily clothed with a short pubescence. Rostrum very short, reaching about halfway to the end of the eye-peduncles, ascending slightly, and laterally compressed; armed above with six teeth, of which the two posterior are situated on the dorsal surface of the carapace, and behind these, but at no great distance, on the gastric region is another tooth; the lower margin, under a low magnifying-power, appears entire, but is very minutely denticulated; the distal end is subacute, but not prolonged into a spine. On the carapace is an antennal and hepatic spine, and also a small supraocular spine or tooth; its dorsal surface, behind the gastric spine, is not distinctly carinated. The post-abdomen is smooth and nearly glabrous; its fifth and sixth segments are slightly dorsally carinated, but the carina does not terminate in a spine; there is a very small spiniform tooth at the postero-lateral angles of the sixth segment; the terminal segment is narrow and acuminate at its distal extremity, dorsally canalculated in its proximal half, with three pairs of lateral mobile spines, of which the posterior pair are much longer and jointed in the middle. The eye-peduncles are shaped nearly as in *P. velutinus*, and scarcely reach to the distal end of the antepenultimate joint of the antennular peduncles, the longer of whose flagella is shorter than the carapace. The peduncle of the antennæ is concealed, in a dorsal view, by the much longer antennal scale, which reaches nearly to the distal end of the peduncle of the antennules; the antennal flagellum is slender and nearly naked (broken in the specimen described); the outer maxillipedes are short, scarcely reaching to the end of the eyes. The legs present nothing remarkable; there is a small spine on the second and, I think, the third joint

\* Proc. Acad. Nat. Sci. Philad. p. 242 (1871).

of the legs of the first pair, but none on the second and third pairs of legs; the fifth legs are scarcely longer than the fourth; and the dactyli, in both pairs, about equal the penultimate joint in length. The rami of the uropoda are rather narrow ovate, and longer than the terminal segment, slightly pubescent above and with long ciliated margins. Length of the larger specimen (a male) about 1 inch  $2\frac{1}{2}$  lines (31 millim.).

Cerf Island, 10 fms. (No. 232); two males.

The description is taken from the largest specimen.

This species is distinguished from most of its congeners by the form and extreme brevity of the rostrum, the armature of the terminal segment, &c.

From *P. ? podophthalmus*, Stimpson, from Hong Kong\*, it is at once distinguished by the length of the eye-peduncles and antennules.

It is apparently allied to *P. palmensis*, Haswell, from Palm Island, which has, however, a longer rostrum with more numerous teeth, the second to sixth segments of the postabdomen carinated, &c.

There are in the collection three small specimens of a species of this genus, also obtained at Cerf Island with *P. richtersii*, which I refrain at present from designating by a distinct specific name, although I cannot refer them to any described species. The body is everywhere covered with a short hispid pubescence. The rostrum is short and slender and acute, scarcely reaches beyond the eyes, and is armed above with five teeth, whereof the first is separated by a wider interval and is placed on the gastric region, the second tooth on the postfrontal region, just behind the anterior margin of the carapace; the second to sixth segments of the body are carinated (as in *P. palmensis*); on the sixth segment the carina terminates in a small spinule. From *P. richtersii* they seem to be distinguished by the much slenderer, more acute, and longer rostrum, and the longer carina of the postabdomen; and from *P. palmensis*, Haswell, with which, however, they may prove to be identical, by the fewer rostral teeth, &c.

## STOMATOPODA.

### 1. *Gonodactylus chiragra*, Fabricius.

An adult female is in the collection, from Mozambique, beach (No. 224), and small specimens from the Seychelles, 4-12 fms. (No. 194); Darros Island, 22 fms. (No. 185); and Etoile Island, 13 fms. (No. 191).

\* This species cannot be included in *Penæus* as recently defined by Mr. Spence Bate (Ann. & Mag. N. H. t. c. p. 173, 1881).

## 2. *Gonodactylus graphurus*, *Miers*.

A series of specimens was obtained at the Seychelles (No. 194) with the preceding species.

Both *G. chiragra* and *G. graphurus* are referred to at p. 298 of this Report.

## 3. *Gonodactylus elegans*. (PLATE LII. fig. B.)

The body is smooth, not longitudinally costated; carapace nearly oblong, without spines at the antero-lateral angles. Rostral plate smooth and somewhat transverse, with its anterior margin regularly arcuated, and the posterior margin straight, its distal extremity not acute. Antepenultimate and penultimate thoracic segments rounded on the sides, and the former but little laterally produced; the last thoracic segment is overlapped on the sides by the produced and rounded antero-lateral lobes of the first postabdominal segment. The postero-lateral angles of the fourth to sixth postabdominal segments are acute; the third to fifth segments have each on the dorsal surface five small pits; the sixth segment has its posterior margin armed with four small spines (including the produced and spiniform postero-lateral angles); the terminal segment is about as long as broad, dorsally nearly smooth, with an acute longitudinal median carina, which terminates posteriorly, behind the distal margin, in a small spinule; the posterior margin is armed with six strong spines, of which the submedian pair are tipped with a small mobile spinule, and have between them about twenty-six minute spinules; between the submedian and the next large spines are two smaller teeth, and between the second and third larger spines one smaller tooth. The eye-peduncles are robust, and about reach to the distal end of the penultimate joint of the antennules, one of whose three flagella is much shorter than the others. The antennæ are about as long as the antennules; the antepenultimate peduncular joint is armed with a short spinule; the basal scale is very much narrowed at base, and rounded and ciliated at its distal extremity. The raptorial limbs have the merus-joints thickened through about two thirds of their length, and thence narrowing distally; carpus and penultimate joint slender and unarmed; dactylus slender and but little ventricose at base, armed on the proximal half of its inner margin with two teeth, and with the distal extremity slender and acute. The appendage to the antepenultimate joint of the three posterior thoracic limbs is styloform, slender, and very nearly as long as the penultimate joint. The postabdominal uropoda are about as long as the terminal segment, their basal processes terminate in two strong and nearly equal spines, and there is a small spine above the outer ramus, which latter is a little longer than the inner ramus, biarticulate, the basal joint armed on its outer margin with a series of strong spinules; the inner ramus is ovate, ciliated, and unarmed. Length of the largest specimen about 11 lines (23 millim.).

A specimen was obtained at Providence Island or Ile des Roches, 13-20 fms. (No. 183), and also one at Providence Reef, 24 fms. (No. 215). Both are apparently females.

The form of the rostrum, together with the armature of the terminal segment, distinguish this species from all with which I am acquainted.

Kossmann (*t. c.* zweite Hälfte, p. 100) mentions a species of this genus, *Gonodactylus brevisquamatus*, Paulson, occurring in the Red Sea, with which *G. elegans* may possibly be identical; but as I have never seen Paulson's work, I can say nothing of the true affinities of *G. brevisquamatus*.

There is in the collection a small male from Providence Island, 19 fms. (No. 217), which is allied in many points to the preceding; but the rostrum is transverse, with its distal extremity deflexed, so that in a dorsal view it appears transversely oblong, with a straight anterior margin, which does not project beyond the anterior margin of the lateral divisions of the carapace. The penultimate post-abdominal segment is armed with six teeth, including those of the postero-lateral angles. The terminal segment has a smaller longitudinal carina on each side of the median longitudinal dorsal carina. The terminal joint of the large raptorial limbs (second maxillipedes) is even less distinctly ventricose at base, and its inner margin is armed with about eight teeth. These characters may be peculiar to the male sex; but if the specimen should prove, on further study, to belong to a distinct species, I would propose to designate it *G. brevirostris* (see Plate LII. fig. C).

*Pseudosquilla empusa* (De Haan)\* is perhaps the species most nearly allied to our new *Gonodactylus*; it has the transverse truncated rostrum of the male above described, with the few-spined dactyl of the female; it is distinguished not merely by the non-ventricose dactyl of the raptorial limbs with its longer spines, but also (if the figure be correct) by the distinctly costated sixth post-abdominal segment, the slightly divergent lateral dorsal carinae of the terminal segment, &c.

## AMPHIPODA.

### 1. *Mœra diversimanus*. (PLATE LII. fig. D.)

The body is slender, with the coxæ not so deep as their respective segments; the head is about as long as deep, with a small triangular median rostral lobe, and with its antero-lateral angles rounded; the coxæ of the first segment of the body have their antero-lateral angles acute and produced below the lateral margins of the head; in the succeeding pairs the antero-lateral angles are rounded. The first

\* Fauna Japonica, Crust. p. 224, pl. li. fig. 6 (1849).



to third segments of the postabdomen have their posterior margins dorsally armed with a series of minute spinules; the first segment has a few spinules on the postero-lateral margin above the postero-lateral angle; in the second segment the spinules are more numerous, and on the third they extend along nearly the whole length of the postero-lateral margins and along part of the infero-lateral margins and (in one specimen) are of very unequal length; the fourth segment is dorsally armed on its posterior margin with about five alternately larger and smaller spinules; there are a few minute spinules on the posterior margin of the fifth segment, and one at the postero-lateral angles of the sixth segment. The telson is double, each of the lobes terminating in a spinule, above which are several stiff setæ. The eyes are large, round, and black. The superior antennæ exceed the inferior in length; the antepenultimate peduncular joint is rather shorter and stouter than the next joint; the last peduncular joint not longer and scarcely stouter than the first joint of the flagellum; accessory flagellum about 5-jointed, flagella imperfect. The antepenultimate joint of the inferior antennæ is about half the length of the next joint; second and third joints subequal; flagellum scarcely longer than the third joint. The first pair of legs (gnathopods) are comparatively slender and feeble; wrist and palm of about equal length and thickness, and palm with a very small and obscure notch in the middle of its distal margin; dactyl about half as long as palm. Second legs with the hands unequal; in the smaller (right) leg the wrist is dilated distally where it is applied to the base of the palm, which is oblong-oval in form, with its very oblique distal margin obscurely crenulated and defined by an obscure lobe or tooth; dactyl not half as long as palm. The larger (left) leg has the wrist posteriorly deeply excavated and distally enlarged to the width of the palm, which is large, massive, nearly oblong in shape, with its distal margin deeply excavated, the notch enclosing a small tooth and followed by a broad truncated and denticulated lobe and by a spine defining the postero-distal angle; the dactyl is about as long as the distal margin of the palm, and has a blunt subbasal lobe or tooth on its inner margin. The three posterior pairs of legs have the second or basus-joints oblong-oval in shape, and posteriorly produced at the distal extremity into a prominent tooth or lobe, which in the posterior pair is spiniform. The rami of the first three pairs of postabdominal appendages are considerably elongated; the fourth and fifth pairs are biramose, with the rami subequal, styliform, and (like the bases) armed with stiff setæ; in the last pair the rami are subequal and foliaceous, with the margins serrated. Colour (in spirit) reddish. Length of the body nearly 4 lines (8 millim.).

Seychelles, 4-12 fms.; two specimens.

Both are somewhat mutilated; the description was therefore taken partly from one, partly from the other specimen.

This species, in the form and denticulation of the hand of the larger leg of the second pair, somewhat resembles the Mediterranean

*Mæra truncatipes* (Spinola) described by Mr. Spence Bate\*; but in that species (and also, it would appear, in *M. quadrimanus*, Dana, from the Fijis, and in *M. viridis*, Haswell, from the East-Australian coast) the hands are similar and the segments of the postabdomen smooth. It is nearly allied to *M. ramsayi*, Haswell, referred to in the earlier part of this Report, which, however, differs in the form of the hands of the second pair of legs (which have not the deep notch of *M. diversimanus*, and are armed with three nearly equal teeth), and also in the larger posterior pleopoda, &c.; yet it is possible that a larger series of specimens would be found to offer transitional characters serving to unite the two forms. I may note here that there is in the British-Museum collection a specimen from the Corean Seas (*Capt. H. C. St. John*) which cannot, I think, be distinguished specifically from *M. truncatipes* (Spinola).

\* Catalogue of Amphipoda in British Museum, p. 189, pl. xxxiv. fig. 4 (1862).

Table showing the Distribution of the Species on the East Coast of Africa and Islands adjacent.

N.B.—In this table the asterisks in the first column denote that the species was collected at the Seychelles, unless the locality be otherwise stated. Under the heading "Mascarenes," in the second column, are included the three islands of Mauritius (with the Islet Fouquets), Réunion, and Rodriguez. Under "Madagascar," in the third column, are included the small islands adjacent (as Nossi Faly, Nossi Bé). Under "E. Africa" is included any locality on the coasts of Zanzibar and Mozambique, and also the island of Zanzibar. Under the heading "Red Sea" it seemed desirable (in view of the uncertainty regarding the particular localities of many of the recorded species) to include also localities on the Arabian coast.

Where "varieties" are mentioned, the distribution indicated is that of the variety, and not of the typical form of the species; but doubtless some of the recorded localities of the species will, upon comparison, be found to be applicable to the new varieties, now for the first time indicated.

	Seychelles, &c.	Mascarenes.	Madagascar, &c.	Red Sea.	E. Africa.	Natal.	Cape Colony.
<i>DECAPODA.</i>							
<i>Achaus leviculus</i> , n. sp. ....	*						
<i>Camposcia retusa</i> , Latr. ....	.....	*	.....	.....	*		
<i>Huena pacifica</i> , Miers .....	*						
<i>Menæthus monoceros</i> , Latr. ....	*	*	.....	*	*		
<i>Stilbognathus martensii</i> , sp. n. ...	Amirante and Providence groups.						
<i>Paramithrax</i> (Chlorinoides) longi- spinus, <i>De Haan</i> , var. bituber- culatus, n. ....	Amirante and Providence groups.						
<i>Hyastenus</i> (Chorilia) oryx, <i>A.</i> <i>M.-Edw.</i> .....	Providence group.						
— (—) ovatus, <i>Dana</i> .....	Amirante group.						
— (—) —, var. tenniros- tris, n. ....	Amirante group.						

Naxia (Naxioides) petersii, <i>Hilg.</i>	.....	.....	.....	*	
Eurynome stimpsonii, sp. n. ....					
Micippa thalia ( <i>Hbst.</i> ), var. haani, <i>Stimpson</i>	* ?	.....	* ?	*	
Paramicippa asperimanus, sp. n.					
Entomonyx spinosus, g. & sp. n. ...					
Lambrus (Parthenopoides) calap- poides, <i>Ad. &amp; Hite</i>	*	*			
Euxanthus exsculptus, var. rugo- sus, n. ....	.....	*	*		
Lophactæa semigranosa ( <i>Heller</i> )	.....	.....	*	*	
Lophozozymus dodone ( <i>Hbst.</i> )	*	.....	.....	*	
Liomera punctata ( <i>M.-Edw.</i> )	*	*	*	*	
Actæa rufopunctata ( <i>M.-Edw.</i> )	*	.....	*	*	
Ategatopsis granulatus, <i>A. M.- Edw.</i>	*	.....	*	*	
Xanthodes lamarekii ( <i>M.-Edw.</i> )	*	*	*	*	
Carpilodes rugatus ( <i>M.-Edw.</i> )	*	*	*	*	
Actæodes tomentosus ( <i>M.-Edw.</i> )	*	*	*	*	
Leptodius exaratus ( <i>M.-Edw.</i> )	*	*	*	*	* ?
—, var. gracilis ( <i>Dana</i> )	*	*	*	*	
Phymodius rugipes ( <i>Heller</i> )	*	*	*	*	
Chlorodius niger ( <i>Forskål</i> )	*	*	*	*	
— miliaris, <i>A. M.-Edw.</i>	*	*	*	*	

Table (continued).

	Seychelles, &c.	Mascarenes.	Madagascar, &c.	Red Sea.	E. Africa.	Natal.	Cape Colony.
<i>Chlorodopsis melanodactylus</i> , A. <i>M.-Edw.</i> .....	* Amirante group.	*	.....	.....	*	*	*
— <i>areolatus</i> ( <i>M.-Edw.</i> ) .....	* Amirante group.	.....	.....	*			
<i>Etisodes electra</i> ( <i>Herbst</i> ) .....	*	*	.....	*			
<i>Cymo andreossii</i> ( <i>Audouin</i> ) .....	* Amirante and Providence groups.	*	.....				
<i>Actumnus setifer</i> ( <i>De Haan</i> ) .....	* Amirante group.	.....	.....	.....	*		
<i>Eurüppellia annulipes</i> ( <i>M.-Edw.</i> ) .....	*	.....	*	*	*	*	
<i>Ozius</i> ( <i>Epixanthus</i> ) <i>frontalis</i> , <i>M.-Edw.</i> .....	* Amirante and Glorioso Islands.	*	*	.....	*	*	
<i>Eriphia lævimanus</i> , <i>M.-Edw.</i> .....	Glorioso Islands	.....	*	.....	*	*	
— —, var. <i>smithii</i> , <i>MacLeay</i> .....	* Amirante group.	*	*	.....	*		
— <i>scabricula</i> , <i>Dana</i> .....	* Amirante and Glorioso Islands.	.....	.....	*	?		
<i>Trapezia cynodoce</i> ( <i>Herbst</i> ) .....	* Amirante and Glorioso Islands.	*	.....	*	*	.....	*
— <i>ferruginea</i> , <i>Latr.</i> .....	* Amirante and Glorioso Islands.	*	.....	*	*	.....	*
— <i>rufopunctata</i> ( <i>Herbst</i> ) .....	*	*	*	*	*	.....	?
<i>Tetralia cavinanus</i> ( <i>Heller</i> ) .....	*	*	.....	*	*	.....	*
<i>Xiphonectes vigilans</i> ( <i>Dana</i> ), var. <i>obtusidentatus</i> , n. ....	*	*	.....	*	*	.....	*



<i>Scylla serrata</i> ( <i>Forskål.</i> ) .....	* .....		Mayotte Isd. *	*	*
<i>Achelous granulatus</i> ( <i>M.-Edw.</i> )..... {	* Amirante group.	{	Mayotte &c. 	*	*
<i>Goniosoma natiator</i> ( <i>Herbst</i> ) ..... {	* and Glorioso Islands.	}		*	*
<i>Thalamita sima</i> , <i>M.-Edw.</i> .....	.....			*	
— quadrilobata, sp. n.....	*				
— integra, <i>Dana</i> .....	*			*	*
— erenata, <i>Rüppell</i> .....	*			*	*
— picta, <i>Stimpson</i> .....	.....			**?	*
<i>Lissocarcinus orbicularis</i> , <i>Dana</i> .....	* group.	{		*	*
<i>Gelasimus annulipes</i> , <i>M.-Edw.</i> .....	*	*	*	*	*
— dussumieri, <i>M.-Edw.</i> .....	*	.....		*	*
<i>Ocypoda ceratophthalma</i> ( <i>Pallas</i> ) .....	Amirante group.	{		*?	*
— cordimanus, <i>Desm.</i> .....	Amirante and Providence groups.	} *	*	*	*?
<i>Macrophthalmus parvimanus</i> , <i>Iatr.</i> .	*		*	*	*
<i>Eoplax</i> ( <i>Chænostoma</i> ) <i>boscii</i> ( <i>Aud.</i> ) .....	.....	....	*	*	*?
<i>Dotilla fenestrata</i> , <i>Hilgnd.</i> .....	.....	.....		*	*
<i>Carcinoplax integra</i> , sp. n.....	*			*	*
<i>Grapsus maculatus</i> ( <i>Catesby</i> ) .....	Amirante group.	{	*	*?	*
— strigosus ( <i>Herbst</i> ) .....	.....	*?	*	*	*
<i>Geograpsus grayi</i> ( <i>M.-Edw.</i> ) .....	Amirante and Providence groups.	} *	*	*	*
<i>Metopograpsus messor</i> ( <i>Forskål.</i> ) ... {	*		*	*	*
<i>Liophilopus planissimus</i> ( <i>Herbst</i> )... {	Amirante group.	{		*	*
<i>Xanthasia murigera</i> , <i>White</i> .....	*	*		*	*
<i>Philyra rectangularis</i> , sp. n. ....	*	.....		*	*

Table (continued).

	Seychelles, &c.	Mascarenes.	Madagascar, &c.	Red Sea.	E. Africa.	Natal.	Cape Colony.
<i>Pseudophilyra polita</i> , sp. n. .... {	Amirante group.						
<i>Nursilia dentata</i> , <i>Bell</i> ..... *	*						
<i>Arcania undecimspinosa</i> , <i>De Haan</i> .....	*						
<i>Ebalia granulata</i> ( <i>Rüppell</i> ) ..... {	Providence group.		.....	*			
<i>Calappa hepatica</i> ( <i>Linn.</i> ) ..... *	*	*	*	*	*	*	
— gallus ( <i>Hbst.</i> ), var. <i>bicornis</i> , n. {	Providence group.						
<i>Cymopolia whitei</i> , sp. n. .... *	*						
<i>Dromidia spongiosa</i> , <i>Stm.</i> , var. {	.....		.....	.....	*		
<i>stimpsoni</i> , n. .... *	*						
<i>Dromia vulgaris</i> , <i>M.-Edw.</i> ..... {	Providence group.						
<i>Homalodromia coppingeri</i> , g. & {	Providence group.						
sp. n. .... *	.....						
<i>Birgus latro</i> ( <i>Linn.</i> ) ..... {	Glorioso group		.....	.....	Comoro Isds.		
<i>Cœnobita perlata</i> , <i>M.-Edw.</i> ..... {	Amirante group.	*					
<i>Pagurus punctulatus</i> , <i>M.-Edw.</i> ... {	* Amirante group.	*	*	*	*		
— guttatus, <i>Olivier?</i> ..... *	*	*	*				
<i>Calcinus tibicen</i> ( <i>Herbst</i> ) ..... {	Amirante group.	*	*	.....	*	*	
<i>Petrolisthes lamareckii</i> ( <i>Leach</i> ) ... {	Amirante group.	*					
— —, var. <i>asiaticus</i> ( <i>Leach</i> ) {	Amirante group.						
— annulipes ( <i>White</i> , ined.) ..... *	*						
— maculatus ( <i>M.-Edw.</i> ) ..... {	.....		.....	.....	*	*	*

— villosus ( <i>Richters</i> )? .....	*	.....	*	Amirante group.
Polyonyx biunguiculatus ( <i>Dana</i> )	*	.....	*	* Amirante group.
Galathea spinosirostris, <i>Dana</i> ? ...	*	.....	*	Amirante and Providence groups.
Munida edwardsii, sp. n. ....	*	.....	*	Amirante group.
Alpheus obesomanus, <i>Dana</i> .....	*	.....	*	*
— edwardsii, <i>Audouin</i> .....	*	.....	*	*
— lævis, <i>Randall</i> .....	*	.....	*	*
— collumianus, <i>Stm.</i> ? .....	*	.....	*	* Amirante group.
— minor, <i>Say</i> , var. neptunus, <i>Dana</i> .....	*	.....	*	Amirante group.
Pontonia? brevirostris, sp. n. ....	*	.....	*	Amirante group.
Coralliocaris graminea ( <i>Dana</i> ) .....	*	.....	*	Amirante group.
Penæus canaliculatus, <i>Oliv.</i> .....	*	.....	*	Amirante group.
— richtersii, sp. n. ....	*	.....	*	Providence group.
STOMATOPODA.				
Gonodactylus chiragra, <i>Fabr.</i> .....	*	.....	*	* Amirante group.
— graphurus, <i>Miers</i> .....	*	.....	*	*
— elegans, sp. n. ....	*	.....	*	Providence group.
AMPHIPODA.				
Mæra diversimanus, sp. n. ....	*	.....	*	*

## COLEOPTERA.

BY

C. O. WATERHOUSE.

DR. COPPINGER obtained at Eagle Island, in the Amirante group, some Curculionidæ belonging to the genus *Cratopus*. The species of this genus are found in the island of Johanna, in Bourbon, Mauritius, and Rodriguez. Species have also been described from India and the Cape of Good Hope, which appear to belong to the genus. I have not yet seen any species from Madagascar.

As the species from Eagle Island appears to be undescribed, I propose to call it *Cratopus adpersus*.

***Cratopus adpersus*.**

Oblongo-ovatus, nigro-piceus, pube brevissima grisea vestitus, guttulis minutis cuprascentibus irregularibus adpersus; thorace antice fortiter, postice paulo angustato, lateribus rotundatis; scutello pube pallida dense vestito; elytris ad apicem modice acuminatis, punctato-striatis, interstitiis fere planis; femoribus anticis subtus ante apicem dente minuto instructis. Long.  $4\frac{1}{2}$  lin., lat. 2 lin.

Head finely granulose, with a very slight fovea between the eyes. The eyes not very prominent, nearly round, only very slightly oval. Antennæ pitchy, not very long, moderately stout; the first joint of the funiculus about three times as long as broad; the second joint twice as long as broad; the following joints only a trifle longer than broad. Thorax convex, finely granulose, much narrowed in front, distinctly narrowed at the base, the sides much rounded; the pubescence very fine and sparse, but closer at the posterior angles, where it forms a pale spot. Scutellum oblong, pale sandy white. Elytra distinctly broader than the thorax, rather ample, gradually (but not much) widened posteriorly for two thirds their length, not quite four times as long as the thorax, obliquely acuminate at the apex; the apical margins finely serrate. The striæ are very distinct, the intervals flat and finely granulose; the pubescence is fine (not sufficient to cover entirely the under colour of the surface), but there is an admixture of less fine slightly coppery pubescence, which gives the elytra a speckled appearance.

*Hab.* Eagle Island, Amirante Islands.

This species resembles *C. alboscuteclatus*, Bohem., in general form, but is a much shorter insect, and has the thorax more narrowed at the base, &c.

The only other Coleopterous Insects found in Eagle Island were *Dermestes felinus*, Fabr., and *Opatrum micans*, Germar, both common and widely distributed species.

## LEPIDOPTERA.

BY

A. G. BUTLER.

THE only Lepidopterous insect worthy of special notice is a species of Moth of the family Lithosiidæ; this moth is very distinct from any species of the genus hitherto described, being unusually free from the beautiful spotting peculiar to the group.

*Deiopeia lactea*.

Primaries above cream-coloured, in the female with two black dots, one above the other, upon the discocellular veinlet; a marginal series of black spots, the largest of which is placed at the apex; a greyish indication of an irregular discal belt seen through the wing. Secondaries pure pearly snow-white, the apex broadly black from costal margin to third median branch, with a conical white spot at the apex; two small depressed black marginal spots upon the median interspaces; an extremely slender sordid brownish marginal line between the black spots and the anal angle. Thorax cream-coloured, with the usual black dots—that is to say, two on the collar and two on each tegula; a spot of pale ochreous on each shoulder. Abdomen pure white. Under surface pure white: the primaries slightly tinted with cream-colour, strongly so on the costal border; a more or less interrupted, externally irregularly dentated black band across the disk, commencing upon the subcostal vein, and terminating in a more or less distinct furca near the external angle; a more or less complete marginal series of black spots as above, and, in the female, a black angulated bar across the end of the cell upon the discocellular veinlet; two or three obliquely-placed rose-red subapical spots: secondaries with a black spot at apex, an irregular black subapical oblique band, and from one to four marginal spots. Pectus slightly cream-tinted, with one or two minute lateral black dots. Proboscis pale ochreous. Anterior tibiæ and tarsi fuliginous grey in front. Venter with pale ochre-tinted anal segment; female with a blackish spot on each side of the opening. Expanse of wings 37 millim.

One pair, Providence Island (Mascarenes), April 1882.

The entire absence of the usual scarlet markings from the upper surface of the wings in this species renders it conspicuously distinct from every *Deiopeia* hitherto described; it bears more resemblance to pale examples of *D. pura* (from Guatemala) than to any other species.



## ALCYONARIA.

BY

STUART O. RIDLEY.

THE series of Alcyonaria collected in this district is small, but would no doubt, from what has been recorded from Mauritius by other authors (*e. g.* by Studer, Möbius, and myself), have been largely increased had time and apparatus for the investigation of depths exceeding 30 fathoms been available. As will be seen below, the Amirantes and outlying Mascarene localities supply most of the species—a circumstance which is satisfactory, inasmuch as (with the exception of the Seychelles Islands, where Dr. E. P. Wright made collections) the Alcyonaria of this part of the district have been hitherto practically unknown. Two of the eight species recorded (*viz.* *Spongodes studeri*, n. sp., and *Juncella gemmacea*) were obtained by the 'Alert' in the Australian seas as well; of the remainder, the species of *Wrightella* are probably confined to the Red Sea and its neighbourhood. The second new species (*Muricea bifurcata*) also exhibits Australian affinities.

*Distribution, within that area, of Alcyonaria obtained in the Western Indian Ocean.*

	Mozambique.	Glorioso Islands.	Providence Island & Reef.	Amirante Islands.	Seychelles.
Family ALCYONIIDÆ.					
1. <i>Spongodes unicolor</i> , Gray .....	...	...	...	*	
2. — <i>studeri</i> , n. sp., var. <i>lævior</i> .....	...	...	*	*	
3. <i>Nephthya</i> , sp. ....	...	...	...	*	
4. —, sp. ....	...	...	...	*	
Family PRIMNOIDÆ.					
5. <i>Muricea bifurcata</i> , n. sp. ....	...	...	*		
Family GORGONELLIDÆ.					
6. <i>Juncella gemmacea</i> , <i>M.-Edw. &amp; Haime</i> .....	...	...	*		
Family MELITHÆIDÆ.					
7. <i>Wrightella chrysanthus</i> , Gray .....	...	...	...	...	*
8. — <i>coccinea</i> , Gray .....	...	...	...	...	*

## ALCYONIIDÆ.

1. *Spongodes unicolor*.

*Spoggodes unicolor*, *Gray*, *P. Z. S.* 1862, p. 29, figs. 1, 2.

Varies in colour in the spirit-specimens of the present series from pale orange throughout to—stem pale orange, lobules dark orange; or—stem pale scarlet, lobules crimson. The spicules carry small but numerous tubercles.

*Hab.* Marie Louise and Etoile Islands, Amirante group, 13–17 fms.

*Distribution.* Bellona Reefs (*Gray*).

2. *Spongodes studeri*, n. sp., var. *lævior*.

See Part I. of this Report, p. 333.

Some small specimens, agreeing closely in form with those described by me from Australia: the stem and branches may be white and the heads deep scarlet, or the stem and branches pink, the lobules crimson, and the polypes themselves white; in one case the stem is stout, and about as long as the head. The tubercles of the larger spicules are slightly larger and more numerous than in the Australian specimens of the variety; but the clustered and forwardly-directed arrangement of the tubercles upon the superior end of the small lobule-spicule is less strongly marked than in those.

*Hab.* Marie Louise Island, Amirante group; Providence Island, Mascarenes, 16–19 fms.

*Distribution.* See Part I. of this Report.

3. *Nephthya*, sp.

A very young specimen, in spirit. It is distinct from *N. chabroli*, the Red-Sea species.

*Hab.* Marie Louise Island, Amirante group, 17 fms. (attached to *Spoggodes*).

4. *Nephthya*, sp.

A young specimen, distinct both from the former species and from *N. chabroli*. In neither case are the specimens old enough to be positively identified with described species or to be described as new.

*Hab.* Darros Island, Amirante group, 22 fms.

## PRIMNOIDÆ.

5. *Muricea bifurcata*.

Branches distant, lying approximately in one plane, forming angles of about 50°; thickness of stem and main branches, exclusive of verrucæ, 1.5 millim. Verrucæ broad and truncate above, in the retracted condition of the zooids; basal diameter about 1 millim.,

apical diameter about  $\cdot 75$  millim.; anterior and posterior faces scarcely distinguishable; verrucæ subserially arranged down the lateral margins, more sparingly on the anterior and posterior aspects, distance apart 1–1.5 millim. (the latter is the interval characteristic of the anterior and posterior sides of the branches; this interval also occurs occasionally on the sides). Colour, in spirit, deep umber-brown, almost black. Surface between verrucæ minutely granular. The spicules have their tubercles closely aggregated, prominent ( $\cdot 04$ – $\cdot 05$  millim. high), broad (about  $\cdot 04$ – $\cdot 05$  millim.), and very richly and minutely tuberculate and frequently compound (branching); the general outline of the spicule is a rude oval, flattened parallel to the long axis, with the ends broad, but one end tends to be subglobose, while the other is constricted, forming a kind of handle; size of spicules about  $\cdot 19$  by  $\cdot 14$  millim.

*Hab.* Providence Reef, Mascarene Islands, 24 fms.; bottom, sand and dead coral.

This species is related not distantly to *Muricea umbraticoides*, Studer, from which it differs chiefly in its erect and more slender habit, in the shorter and less regularly formed spicules, and in their longer and more ragged tubercles.

The height of the single specimen (which is preserved in spirit, divides three times, and has a slight spreading base) is 70 millim. (nearly 3 inches). As it is well preserved and apparently normal in growth, I have ventured to give it a distinctive name.

*M. perramosa*, mihi (Ann. & Mag. Nat. Hist. 1882, x. p. 128\*), from Mauritius, the only other nearly allied form described from the Western Indian Ocean, is at once distinguished from it by the red colour and much-branched habit.

## GORGONELLIDÆ.

### 6. *Juncella gemmacea*, Milne-Edwards & Haime.

Several specimens, dry and in spirit, of the deep scarlet form, which was the most abundant in the North-Australian collections of the 'Alert.'

*Hab.* Providence Island, Mascarene Islands, 19 fms.

## MELITHÆIDÆ.

Melithæadæ and Mopselladæ, Gray, Cat. Lithophyt. Brit. Mus. pp. 3–12.

### WRIGHTELLA.

Gray, op. cit. p. 31.

Mopsea (part.), Ehrenberg, Cor. roth. Meer. p. 131; Klunzinger, Kor. roth. Meer. p. 57.

This genus is closely allied to *Mopsella*, Gray, having "Blattkeule"

\* The branches as there described are much too slender; the figure is, however, correct; the primary branches measure 7, the terminal twigs  $\cdot 75$  millim. in greatest diameter, excluding verrucæ.

spicules in the cortex, and the branches arising from the soft joints. It has no special connexion with Dr. Gray's group *Elliselladae*, in which he placed it, and appears to have been overlooked by recent writers. It is distinguished by the very massive form of the *Blattkeule* spicules and the swelling out of their "Blatt" into rounded bodies with scarcely perceptible edges.

### 7. *Wrightella chrysanthus*.

*Wrightella chrysanthos*, Gray, *op. cit.* p. 32.

Both this and the following are small species, not known to exceed 4 inches in height, and they are proportionally slender; they do not exhibit the lateral impression on the branches described by Dr. Gray. They are nearly allied to each other, and *Mopsea erythraea* of Ehrenberg (*l. c.*), from the Red Sea, must be referred to the same genus. A well-preserved spirit-specimen, 61 millim. ( $2\frac{1}{2}$  inches) long, and some fragments represent *W. chrysanthus* in this collection; they are of the normal white colour with lemon-yellow zooids. A variety occurs in the British Museum in which the cortex also is yellow.

*Hab.* Seychelles Islands, 4–12 fms.

### 8. *Wrightella coccinea*.

Gray, *op. cit.* p. 32.

This species is distinguished from the former by its colour and by the cortical spicules being somewhat smaller than in that species. Some fragmentary (but spirit) specimens occur here. Gray has omitted to mention a fact which these and the original specimens show, that the verrucæ are usually yellow.

*Hab.* Seychelles Islands, 4–12 fms.

Both species were originally described from this locality, where they were collected by Prof. E. P. Wright. I am glad to have this opportunity of pointing out the true affinities of these two beautiful little species, which in their slender proportions probably approach the beautiful *Psilacabaria* of the Australian collection more nearly than any other described species.

## SPONGIIDA.

BY

STUART O. RIDLEY.

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THE collections of Sponges made during the latter part of the 'Alert's' voyage, although not so important from the number of species or the interest attaching to the new forms as those made in Australian waters, constitute nevertheless, considering the extent to which these waters have been the subject of previous investigations (see Introduction to Melanesian Report, p. 371) and the somewhat less favourable circumstances under which Dr. Coppinger carried on his collecting, an invaluable contribution to our knowledge of the Spongiida of the Indian Ocean. On the latter point Dr. Coppinger, in a letter dated Sheerness, Sept. 11, 1882, says:—"The latter part of the 'Alert's' commission has been devoted to a hurried survey of the Amirante Islands and of two other small groups. . . . The time at our disposal has been so short that we have had comparatively few opportunities of doing anything in the way of dredging. What little has been done in the localities has been accomplished from the ship itself, by laying out a dredge from the stern at every anchorage and giving it the benefit of the swing of the ship. At Seychelles, where we stopped to take in coals &c., we dredged several times from the boats; but at all the other stations our dredging-operations have been limited to the swing of the ship about her anchor. I mention this to account for the scantiness of the collection of dredged specimens from a region whose fauna is undoubtedly so rich. I have, however, had plenty of occupation for my spare time in exploring the beaches and reefs at times of low water, and have therefore been able to accumulate a good number of marine specimens from between tide-marks." In spite of difficulties, Dr. Coppinger sent 56 species belonging to this group, including 21 species not previously distinguished by naturalists. Many of the species are represented by fine series from various localities; and fortunately the genus *Carterispongia*, hitherto so imperfectly known, comes under this category, furnishing a most important contribution to the material available for the distinction of its species, and for the study of the interesting question of polymorphism of Sponges, so well illustrated by this genus.

*Distribution.*—This is perhaps the most important aspect under which this Collection is to be regarded. I have arranged the localities for convenience under five heads, viz.:—1. Mozambique Island (as



representing the African coast); 2. Glorioso Islands (as the most southern investigated member of the outlying groups of islands; 3. Providence Island and Reef, still further north; 4. Amirante Islands, a further northward step in the direction of (5) the Seychelles.

The physical relations of these different localities and their coasts are ably described in Dr. Coppinger's 'Cruise of the Alert'; I have added to my descriptions of the species notes as to localities and nature of bottom, taken from his own notes accompanying the specimens.

*Depth.*—It will be seen that the depths investigated did not exceed 24 fms.

*Locality.*—About half the gatherings are from a bottom composed either of sand, sand and coral, or broken coral; in but two cases (in the Amirante Islands) is mud recorded; the remaining localities are given either "beach," reef, or "between tide-marks." I know of no previous descriptions of Sponges from Mozambique or any part of the Eastern coast of Africa nearer than Zanzibar, whence A. Hyatt\* derived many of the Ceratose species referred to in his paper "Revision of the North-American Porifera" &c. Prof. E. P. Wright has introduced us to the Sponges of the Seychelle Islands in a paper † on *Alema seychellensis*, collected with many other species by himself many years since. The Glorioso and Amirante Islands and Providence Reef and Island are entirely new ground in this respect. Practically the only acquaintance we have hitherto had with the Sponge-fauna of this Western part of the Indian Ocean is derived from papers by Mr. Carter describing a few Silicea from Mauritius (especially in Ann. & Mag. Nat. Hist. 1879, iii. p. 284, five species), and one by Schuffner ('Jenaische Zeitschrift,' xi. p. 403, pls. xxiv.—xxvi.) describing 6 new Calcareia from Möbius's collections at Mauritius. Thus it may justly be claimed that in magnitude and interest the present collection far exceeds any collection hitherto described from these waters.

Looking generally at the distribution of the fifty-six species here described (see Table of Distribution, p. 586), and comparing it with that of the species obtained at or near the eastern confines of the same Ocean (this Report, Part I. p. 372), we find a similar resemblance to the Atlantic fauna (including the Mediterranean) in both areas: excluding doubtful cases we have here 7 out of 55 species as against 12 out of 106 species decidedly identical with Atlantic forms. We have the same number (3) of species recorded also from Ceylon. Some species (*Iotrochota purpurea*, *Clathria frondifera*) range to the Straits of Malacca, and hence, as we have seen above (p. 371), to Australia; two extend across into mid-Pacific (*Carterispongia otahitica*, *Stelletta acervus*). The almost cosmopolitan Australian species *Leucetta primigenia* and *Tedania digitata* are found here also.

Passing to the more direct relations of the Australian and Western

\* Mem. Bost. Soc. ii. pt. 4, nos. ii. & v.

† Proc. R. Irish Academy, xxviii. p. 13, pl. i.

Indian Ocean shallow-water faunas, we find 16 out of the 56 species obtained in the latter region to be identical with Australian species, a proportion to the whole of 2:7, or 28 per. cent. It is still more remarkable to find that of these, three (viz. *Carterispongia otahitica*, *Iotrochota purpurea*, *Clathria frondifera*) occur abundantly in both places. Had Dr. Coppinger's researches enabled me to add more species to the list, I have little doubt that still greater proofs would have been forthcoming of a former communication between these two widely remote districts. As might almost have been expected, 14 of these identical species occur in *tropical* waters in Australia also (chiefly from Torres Straits or N. Queensland, but one third of the number from Port Darwin).

Of the mutual relations of the different localities in the district at present under notice I have little to say, as the investigation of them must be admitted not to be sufficient for a satisfactory comparison. In spite of its much more westerly longitude and of its separation from the other localities by much open sea and in part by that great body of land, the island of Madagascar, we find no decided differences between the fauna of Mozambique and that of the rest of the district; perhaps the Mozambique current partly accounts for this. On the other hand, we find that 7 out of the 13 species recorded from the Seychelles were not found in the other localities: probably this is partly due to the fact that here alone was dredging regularly carried out. The Amirante Islands have the greatest number of species (26).

*Taxonomy.*—Of the strictly taxonomical aspects of this part of the collection little has to be said which has not been already said in the Melanesian portion of this Report. I therefore refer those interested in the subject to that part of the Report for most questions relating to the general zoology of the Group and to the bearing of these collections on classification and morphology. The full descriptions of new species and genera which are represented also in the Melanesian collection will be found in the Report on that collection; they are not noticed at length in this place. This collection from the Western Indian Ocean is remarkable for the large proportion (31 per cent. of the whole) which the Ceratose sponges bear to the remaining groups: this is no doubt largely due to the number of "beach specimens" included in the collection, representing, as such specimens naturally would, most chiefly this less perishable order. This proportion probably more closely resembles that which would be obtained in the South-west of Australia than that found by the 'Alert' in the Eastern and Northern parts of that continent (which was about 18 per cent.); but the species are smaller than the generality of those which contribute so largely to the shore gatherings at Freemantle, West Australia.

No species of the order *Ceratosa* call for special notice here.

Of the *Monactinellid* *Silicea* none of the Families are strongly represented, the Renieridae, with 7 species, being the most abundant, and yet maintaining only about the same proportion (15 per cent.) to the remainder of the Sponges as in the Melanesian collection.

Among Ectyonidæ, *Echinonema*, abundant in South and South-west Australia, but apparently wanting in the North and East, appears here. Of the *Tetractinellida* we have a fine new Geodine form (*Erylus cylindrigerus*), belonging, however, to a type found already in Australian and in European seas. *Calcarea* are relatively rather abundant, at any rate in individuals, and the new species *Leucortis anguinea* is of somewhat unusually large growth.

What strikes us in a survey of the species, both of this and the Melanesian collection, is, notwithstanding the large proportion of new specific types, the comparative scarcity of forms showing marked distinctive characters of generic importance which are not also found in the more familiar Atlantic fauna. It is true that *Carterispongia*, *Phyllospongia*, *Ianthella*, *Toxochalina*, *Psammodiplosia*, *Echinodictyum*, and *Rhaphidophylus* have not yet been recorded from elsewhere than the Indo-Pacific area, and are probably most of them peculiar to it, but several of these are not distantly related to Atlantic forms; and within this wide Indo-Pacific region (of which, it must be admitted, the Eastern part is very imperfectly known) the number of districts exhibiting at all peculiar shallow-water sponge-faunas is small. Certainly the Western part of the Indian Ocean is not one of these, and may be considered in this respect, as well as geographically, as transitional between Australia, South-west Asia, and the Mediterranean.

## Distribution of Sponges obtained in the Western Indian Ocean.

	WESTERN INDIAN OCEAN.						AUSTRALIA.						OTHER LOCALITIES.
	Mozambique.	Glorioso Islands.	Providence Island and Reef.	Amirante Islands.	Seychelles Islands.	Port Jackson.	North-eastern.	Torres Straits.	Arafura Sea.	Port Darwin.	Western.	Southern.	
<b>Order CERATOSA.</b>													
<b>Family SPONGIIDÆ.</b>													
1. <i>Cacospongia cavernosa</i> , <i>Schmidt</i>	.....	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	Adriatic; Algiers. Mediterranean.
2. <i>Hippospongia intestinalis</i> , <i>Lamarck</i> , var. 3. ——— <i>sinuosa</i> , <i>Pallas</i> .	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	
4. ———, var. <i>nauridiana</i> , <i>Hyatt</i>	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	} Mauritius; Cuba. Tranquebar. Madagascar.
5. ———, var. <i>decidua</i> , <i>Hyatt</i>	*	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	
6. <i>Phyllospongia papyracea</i> , <i>Esper</i>	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	} Tahiti. South Seas. Mauritius, Zanzibar.
7. ——— <i>madagascariensis</i> , <i>Hyatt</i>	.....	.....	*	*	*	.....	*	.....	.....	.....	.....	.....	
8. <i>Carterispongia otahitica</i> , <i>Esper</i>	*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	} Ceylon. Southern Seas, or Australia.
9. ——— <i>mantelli</i> , <i>Dowerbank</i>	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
10. ——— <i>pennatula</i> , <i>Lamarck</i>	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
<b>Family HIRCINIIDÆ.</b>													
11. <i>Hircinia fusca</i> , <i>Carter</i>	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	} Ceylon. Southern Seas, or Australia.
12. ——— <i>byssoides</i> , <i>Lamarck</i>	.....	*	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	
13. ———, sp.	.....	.....	.....	.....	*	*	.....	*	.....	.....	.....	.....	

## Family DYSIDEIDÆ.

12. *Dysidea conica*, *Bowerbank* ..... \*  
 13. — *gumminea*, n. sp. .... \*  
 14. *Oligoceras condosum*, n. sp. .... \*

Ceylon.

## Family APLYSINIDÆ.

15. *Aplysina fusca*, *Carter* ..... \*  
 16. — *pallasi*, n. sp. .... \*  
 17. *Ianthella flabelliformis*, *Pallas* ..... \*

Ceylon.

## Order SILICEA.

## Suborder MONACTINELLIDA.

## Family GUMMINIDÆ.

18. *Chondrilla mixta* (*Schulze*?) ..... \*

Red Sea ?

## Family CHALINIDÆ.

19. *Chalina elongata* (*Lamarck*, sp.)? ..... \*  
 20. —, sp. .... \*  
 21. *Acervochalina finitima*, *Schmidt* ..... \*  
 — —, var. .... \*

West Indies.

## Family RENIERIDÆ.

22. *Reniera indistincta*, *Bowerbank* .....  
 — —, var. ....  
 23. — *rosea*, *Bowerbank* ..... \*  
 24. — *camerata*, n. sp. .... \*  
 25. — *cribriformis*, n. sp. .... \*  
 26. —, sp. near *crateriformis*, *Carter* ..... \*  
 27. *Pellina*, sp. .... \*  
 28. *Tedania digitata*, *Schmidt* ..... \*

{ British Isles and  
Channel Islands.

Ditto; Kerguelen.

{ Kurrachee; Mediter-  
ranean; Atlantic.





## Family SUBERITIIDÆ.

44. Suberites, sp. ....  
 45. Vioa schmidti, *Ridley* .....  
 46. Spirastrella transitoria, n. sp. ....  
 47. — punctulata, n. sp. ....  
 48. Tethya cliftoni, *Dowerbank* .....

## Suborder TETRACTINELLIDA.

## Family CHORISTIIDÆ.

49. Tetilla dactyloidea, *Carter* .....  
 50. Erylus cylindrigerus, n. sp. ....  
 51. Stelletta acervus, *Dowerbank* .....  
 52. — purpurea, n. sp. ....  
     — —, var. parvistella, nov. ....

## Order CALCAREA.

## Family LEUCONIIDÆ.

53. Leucetta primigenia, *Häckel*.....  
     — —, var. megalirrhaphis, *id.* .....  
 54. Leucaltis bathypia, *Häckel*.....  
     — —, var. mascarenica, nov. ....  
 55. Leucortis anguinea, n. sp. ....  
 56. Leuconia echinata, *Schiffner* .....

Adriatic.

Mauritius.

S.E. Arabia.

Fiji Islands.

Almost cosmopolitan.

Red Sea.

Mauritius.

## CERATOSA.

This Order is well represented, viz. by 17 species (or 31 per cent.), as the tropical position of the localities would lead one to expect. *Carterispongia* is the dominant type, and probably more abundant here in species, and not less so in individuals, than in any other part of the world; the two aberrant *Hippospongiae* described are also wonderfully abundant. A Mediterranean type, *Oligoceras*, is for the first time recorded from the Indo-Pacific area.

## SPONGIIDÆ.

1. *Cacospongia cavernosa*.

*Schmidt, Spong. Adr. Meer.* p. 28; *F. E. Schulze, Zeitsch. wiss. Zool.* xxxii. p. 653, pls. xxxiv. fig. 11, pl. xxxv. fig. 17, pl. xxxvii. figs. 7, 13.

In spite of the remarkable geographical distribution which is involved by identifying the present specimens with a Mediterranean species, the identity seems to me fairly certain. The characters agree well with those given by Schmidt and with Schulze's figures. The conuli are 2-4 millim. high and about 5 millim. apart, in spirit; the colour in spirit is dark grey; the primary fibres measure 18-24 millim. in diameter. Vents numerous, 2-3 millim. in diameter, grouped at summits of the lobes formed by the sponge. Represented here by semi-repent masses growing between and over stones or rocks, and sending up cylindrical lobes 18-25 millim. in diameter, which tend to divide above and to attach foreign bodies to themselves. The skeleton shows an irregularly rectangular arrangement of the fibres similar to that figured by Schulze.

*Hab.* Seychelles Islands, 4-12 fms.

*Distribution.* Adriatic (*Schmidt* and *Schulze*); Algiers (*Schmidt*).

2. *Hippospongia intestinalis*, var. (PLATE LIII. fig. D.)

*Spongia intestinalis*, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 434.

*Spongelia velata*, *Hyatt, Mem. Bost. Soc.* ii. p. 534, pl. xvii. fig. 8.

The tortuous perforated tubes are sometimes single, but sometimes form confused reticulate masses (see fig. D, Plate LIII.), which, when the soft tissues are dried on them, have a very different appearance, and as such have been described under the above separate name by Hyatt, whose figure well represents this state; their diameter varies from about 5 to 20 millim. The surface is covered in fresh specimens by a delicate diteliform network, as stated by Hyatt, and as found in our specimens; the sareode in spirit is opaque pale brownish yellow. The species must be nearly related to *Hircinia clathrata*, Carter; but that species would seem to assume a decidedly vertical growth, whereas this has the appearance of being subrepent. Mr. Carter's description of that form speaks of sand-cored fibre as only occurring here and there, especially near the surface, whereas in *H. intestinalis* long straight primary fibres cored with foreign

bodies are constantly present, traversing the main mass of the skeleton; these fibres are, however, much less abundant than in the original specimen of Lamarek, and the wall of the sponge is thinner. Abundant.

*Hab.* Providence and Cerf Islands, Mascarenes, and Amirante group; beach to 24 fms.

*Distribution.* "Mediterranean" (Lamarck); Zanzibar (Hyatt).

### 3. *Hippospongia sinuosa*.

*Spongia sinuosa*, Pallas, *Elench. Zooph.* p. 394; *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 371.

? *Spongia fenestrata*, *Lamarck, tom. cit.* p. 374.

*Spongia lapidescens*, subspecies *mauritiana*, *Hyatt, Mem. Bost. Soc.* ii. p. 528.

Lamarck's and Pallas's *S. sinuosa* seem, by their descriptions, to be referable to a *Hippospongia* of which I describe two forms below. *S. fenestrata*, Lamarck, is probably a more sessile and in-crusting form of the same species. The question of identity is beset with great difficulties, owing to the want of authentic specimens of the different species for reference. A specimen long contained in the National collection, and labelled *S. mæandriiformis* or *mæandriniformis*, differs from the form described below as var. *mauritiana* mainly in its somewhat more slender fibre (·016–·045 millim. in thickness); but its history is unknown.

With regard to Pallas's description, I would remark (1) that the dry skeleton of our specimens is not tender ("tenera"), but hard and almost incompressible; (2) it attains a vertical thickness of 35 millim.; (3) the cavities meander and anastomose, and are not merely "oblongæ vel cotyloideæ"; (4) the colour is a fine amber-yellow; (5) in var. *mauritiana* the fibres are only approximately parallel and perpendicular, except at the very surface.

The term "surface nivellée" used by Lamarck in his description of *S. fenestrata* well expresses the appearance which the sponge has of having been pared smooth, as in the species *H. derasa* (see Part I., p. 382, of this Report).

It is easy to distinguish among the specimens two varieties, of which one apparently corresponds to the more typical form of Hyatt's subspecies, and may therefore stand under that name, viz.

#### *Hippospongia sinuosa*, var. *mauritiana*.

The general form of the sponge is that of a low, horizontally extended mass, apparently originally attached by one or more small points; it is about 35 millim. high, and throws out short subcylindrical, terminally-rounded lobes 25–35 millim. in diameter. Colour in macerated state bright amber-yellow. Diameter of the meandering canals of the skeleton 2·5 to 5 millim.

The skeleton consists of a strong horizontal system of long secondary fibres lying parallel to the surface, and of short stout, primary

fibres, meeting the surface at various angles, and projecting slightly above it, and of a system of crossing fibres connecting the two and forming approximately rectangular meshes, their direction being roughly vertical to one or other of the above systems. The mesh is very variable in diameter, viz. from .07 to .24 millim., the former chiefly at the surface. The diameter of the main fibre is .028-.07 millim., not including the ditelous network of fibres of small diameter which often surrounds the bases of the large primary fibres. Colour of fibre pale amber-yellow; no foreign bodies imbedded in any part of the skeleton; the fibre is homogeneous in appearance, with the occasional exception of a faint granular axial line. Size of sponge, 80-95 millim. (3-3 $\frac{2}{3}$  inches) in greatest diameter.

*Hab.* African Island, Amirante group (gathered on beach).

*Distribution.* "Indian Ocean?" (*Pallas*); Indian Ocean (*Lamarck*); Mauritius (*Hyatt*).

### *Hippospongia sinuosa*, *Pallas*, var. *decidua*, *Hyatt*.

The other variety of the species is very distinct in its external appearance, but on examination this is found to be due merely to modifications of the same structural arrangements as those of var. *mauritiana*. The surface is entirely broken up into small isolated tufts, or short meandrine ridges, flattened externally, about 1-2 millim. in diameter (the ridges of *mauritiana* being 3 or 4 millim. across), rising from a considerable depth, viz. 7-15 millim., and commencing below by very narrow bases, and not expanding until close to the surface. By the juxtaposition of these tall walls and tufts, a number of freely intercommunicating, very narrow (2 to 2.5 millim. wide) and deep channels are formed, very different in appearance from the subcylindrical and semi-tubular canals which represent them in var. *mauritiana*. The outward form of the sponge is essentially similar to that of the other variety, but the specimens are much larger; the largest, an example of incrusting growth about 30 millim. in average vertical thickness, measures 275 millim. (11 inches) in greatest diameter; some smaller specimens attain about twice the thickness. As in var. *mauritiana*, the tubular character of the channels of the skeleton is much more strongly marked on the lower surface, where (as observed by *Hyatt*) connecting laminae of horny fibre frequently bridge over the spaces between the summits of the tufts and ridges. The colour of well-preserved skeletons is a rather pale amber-yellow; those which have suffered much washing on the beach are almost white.

The general arrangement of the skeleton is similar to that of the other variety; but the following important differences are to be noted:—(1) It is the primary and not the secondary fibres which are the most distinct elements of the deep skeleton; they form continuous, almost straight lines, .4-.5 millim. apart, and are placed vertically to the surface. The primary fibres of the outer surface form a decided *pile* of short projecting points, being much more numerous than in var. *mauritiana*. (2) Owing to the



regularity and straightness of the primaries, the secondaries more constantly form right angles with them, and the meshes are more commonly rectangular. (3) The primary fibres are more or less constantly sand-cored; the core occupies about half the thickness of the fibre.

In the characters of the purely horny fibre and the size of the meshes *decidua* agrees with *mauritiana*; the diameter of the fibre varies from .025 to .063 millim. in the specimen examined (*i. e.* about the same range as in *mauritiana*).

*Hab.* African Island, Amirante group, from beach.

*Distribution.* Mauritius, Havana (*Hyatt*).

It is possible that the forms which I have called varieties should rank as distinct species; but until the arrangement of the soft parts is known I prefer to keep them under one specific heading. Younger specimens of var. *decidua* have shallower channels, and one has broader tufts and ridges than the rest, thus approaching var. *mauritiana*. The distinctness of the two forms, found at precisely the same spot, shows that the differences between them cannot be due to locality.

#### 4. *Phyllospongia papyracea*.

*Spongia papyracea*, *Esper*, *Pflanzenh. Fortsetz.* ii. p. 38, pl. lxx., pl. lxx. A. figs. 1 & 2.

*Phyllospongia papyracea*, *Ehlers*, *Espersch. Spong.* p. 22 (? *Hyatt*, *Mem. Bost. Soc.* ii. p. 543, pl. xvii. fig. 31).

A dry specimen, 195 millim. ( $7\frac{3}{4}$  inches) high by 155 millim. ( $6\frac{1}{2}$  in.) in greatest lateral extent. It is proliferous, a single base giving rise to the main frond, which is irregularly flabelliform, and to a few smaller strip-like fronds, some of which unite with each other by their edges at a short distance above the base; main frond also proliferating by giving off at or near its margin, and in one instance from the face, a few small secondary fronds similar in character to the smaller fronds which arise from the base. Vents few, near margin on both front and back of large fronds, diameter 1 millim. Primary fibres .035–.053 millim. in diameter; secondary fibres about .035 millim. thick; both devoid of foreign bodies. Some minute intermediate fibres or dense strands of sarcodites are also present. Meshes of main skeleton about .15 millim. wide, of dermal skeleton .18–.28 millim. A few scattered foreign bodies in the dermal fibres. In other respects it agrees with *Esper's* figure, and his and *Ehlers's* descriptions. The latter writer says of the fibres of the *Esperian* specimens that they are "homogeneous," which may fairly be taken to imply that, as in this specimen, they contain no extraneous matter. *Hyatt*, however, assigns to this species specimens (from the Cape of Good Hope) which, from his description, I understand to contain a large amount of foreign material in the primary fibres.

*Hab.* Mozambique.

*Distribution.* Tranquebar (*Esper*).

### 5. *Phyllospongia madagascarensis*.

*Carteriospongia madagascarensis*, Hyatt, *Mem. Bost. Soc.* ii. p. 542.

Extremely variable in external form, viz. from single flexible cylindrical stems about 2 millim. in diameter to palmate fronds arising from similar stems, forming large compound growths; the cylindrical form also occurs compound; the same colony may show transitions from the cylindrical to the palmate type. A spirit-specimen of the cylindrical form has a pale brownish-yellow colour, and its surface is seen under the lens to be very minutely hispid with the projecting ends of the primary fibres. The primary fibres are mostly somewhat, though slightly, sand-cored near the surface (much less than in *C. pennatula*); they measure about .04 millim. in diameter, the secondaries somewhat less; fibres very pale yellow in spirit-specimens, colourless in dry skeletons. Surface-texture much finer than in *C. pennatula*; surface never broken up into the ridges and grooves which distinguish macerated specimens of that species. Vents slightly projecting, and sparsely distributed up and down the cylindrical axes; abundant, not projecting, on one side of the palmate fronds, diameter about .7 millim. Consistence in all cases very soft and flexible in the macerated state. Owing to the unbroken character of the surface, this species is best placed under *Phyllospongia*. I am indebted to Dr. Polkjaeff for pointing out the importance of this character in *Phyllospongia*.

*Hab.* Amirante Islands, beach and 17 fms.

*Distribution.* Madagascar (*Hyatt*).

### *Phyllospongia madagascarensis*, var. *supraoculata*, nov.

(PLATE LIII. figs. M, M'.)

Some specimens of firm texture, not readily compressible, with very smooth dense surface; form simple palmate, much and deeply divided or multicaulate; sometimes partly cylindrical. Vents very small, viz. about .4 millim. in diameter, on one side of the frond and also on its free margin. Meshes of skeleton very close (*i. e.* primaries only .1 millim. apart at surface); sand-cores of primary fibres extending a very short distance below the surface. Colour, in dry state (well preserved specimens), cream to pure white.

Several small specimens, the greatest height and lateral expansion being about 70 millim. ( $2\frac{3}{4}$  inches).

*Hab.* Providence Island, Mascarene group; African Island, Amirante group, beach.

## CARTERISPONGIA.

*Carteriospongia*, Hyatt, *Mem. Bost. Soc.* ii. p. 540.

*Mauricea*, Carter, *Ann. & Mag. N. H.* 1877, xx. p. 174.

Curiously enough, these two generic terms were published within four months of each other (*Carteriospongia*, May, *Mauricea*, September, 1877). As, however, the former, besides having this slight

priority, is accompanied by a diagnosis, while the characters of the latter are merely hinted at, I believe the right course is to adopt the former.

### 6. *Carterispongia otahitica*.

*Spongia otahitica*, *Esper, Pflanzenth. Fortsetz.* i. p. 209, pl. lxi. figs. 7, 8.

A flabelliform and two cup-shaped, internally proliferating specimens. The former exhibits signs of incipient formation of a cup, and thus shows Esper to have been right in uniting the two outwardly different forms under one head. Two simple cup-shaped specimens and an irregularly grown proliferating flabelliform one also occur.

*Hab.* Glorioso Islands, beach and between tide-marks; Amirante Islands, beach; Seychelle Islands, 7 fms.

*Distribution.* See Part I. of this Report, p. 386.

### 7. *Carterispongia mantelli*.

*Halispongia mantelli*, *Bowerbank, P. Z. S.* 1874, p. 303, pl. xlvii. figs. 3, 4.

A small but deep regularly cup-shaped specimen, gross height 45 millim., that of cup 35 millim., diameter of cup at margin 32 millim. The outside is marked by faint longitudinal ridges; on the inner surface the vents, about .5 millim. in diameter, are arranged in approximately concentric series round the cup, at intervals of 3-4 millim. Bowerbank's description of the vents is unsatisfactory.

The skeleton contains much less sand than Bowerbank's specimen, but agrees with it in the general characters of the skeleton, the differences being to some extent due to age. As stated in the Report on the Australian collections, this species agrees essentially with the characters of *Carterispongia*. The colour (in spirit) is greyish brown outside, dirty white inside.

*Hab.* Mozambique, between tide-marks.

*Distribution.* "South Seas" (*Bowerbank*).

### 8. *Carterispongia pennatula*.

*Spongia pennatula*, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 440.

*Carterispongia radiata*, *Hyatt* (typical form and var. *complexa*), *Mem. Bost. Soc.* ii. pp. 541, 542.

*Mauricea lacinulosa*, *Carter, Ann. & Mag. N. H.* 1877, xx. p. 174.

This species varies in outward form from contort flabellate, with single thick stem, to compound, multicaulate, anastomosing, with thin stems, the terminal fronds narrower or broader flabelliform. In much-washed specimens the surface has an eroded appearance, from the exposure of the ramifications of the canal-system, and such specimens are usually of a pale brownish-yellow colour; when the sarcode is preserved, the surface of dry specimens is white, and

appears as if covered by a dense fine incrustation; the vents are small, .5 to 1 millim. across, placed on both sides of the fronds. The primary fibres are strongly sand-cored for some distance below the surface, but little or no sand occurs in the centre of the frond. Var. *complexa* of Hyatt seems to be founded on fresh specimens, whereas his typical form seems to have suffered from abrasion.

*Hab.* Glorioso Islands, beach.

*Distribution.* Australian seas (*Lamarek*); Mauritius (*Carter*); Zanzibar (*Hyatt*).

*Obs.* I have had the advantage of being able to examine original specimens of Carter and Lamarek while making my identification.

## HIRCINIIDÆ.

### 9. *Hircinia fusca*.

*Carter, Ann. & Mag. N. H.* 1880, vi. p. 36.

Branched cylindrical solid stems, 8 millim. in mean diameter, becoming somewhat dilated at the ends; conuli of skeleton only about 1 millim. high. Central core of foreign bodies in primary and secondary fibres not large, and sometimes absent here and there; fibres also coated in places with foreign bodies; diameter of primaries about .18 millim., of secondaries .1 millim. Mr. Carter's description is extremely short, but seems to be sufficient for the purpose of the present identification. A skeleton occurs in the present collection.

*Hab.* Boudense Island, Amirante group, 10 fms.

*Distribution.* Ceylon (*Carter*).

### 10. *Hircinia byssoides*.

*Spongia byssoides, Lamarek, Ann. Mus. Hist. Nat.* xx. p. 375.

Some small horizontally-spreading sessile specimens, about 4 millim. in thickness and 30–40 millim. in greatest diameter. Texture in spirit, with sarcode attached, harsh, firm. Primary fibres cored at intervals with small core of foreign bodies, about .07 to .1 millim. wide; all fibres strongly laminate, of light to dark amber-yellow colour. Diameter of primary fibres .1 to .24 millim., of secondaries .1 to .14 millim. There is also an intermediate system of narrow uncored fibres, .035 to .05 millim. wide. Colour (in spirit) black. Conuli about 1 millim. high, 2 millim. apart.

This species agrees fairly well with Lamarek's species, of which I have examined a specimen, but the fibre is decidedly stouter. The form is rather that of his var.  $\beta$ , which is described in the words "massis planulatis"; the original specimen of this in the Paris Museum is firm and harsh to the touch, like the present specimen.

*Hab.* Glorioso Islands, Seychelle Islands, 7–12 fms.

*Distribution.* Southern Seas or Australia (*Lamarek*).

11. *Hircinia*, sp.

The same species as the unnamed *Hircinia* mentioned in Part I. of this Report, p. 387.

A flattened specimen. The secondary fibres are somewhat stouter and darker in colour than in the Australian specimen, and the primaries contain less sand.

*Hab.* Seychelle Islands, 4–12 fms.

*Distribution.* See Part I. of this Report, p. 387.

## DYSIDEIDÆ.

*Dysidea* has a remarkably wide range in latitude, its localities including (among others) Iceland and England in the North Atlantic, the West Indies in the tropical Atlantic, the Cape and South Australia in the Southern Ocean, the Western Indian Ocean and the North of Australia in the tropical parts of the Indo-Pacific area. While, on the other hand, it is abundant in *individuals* in temperate waters (as is the case on the British coasts), it appears to be more prolific in *species* in subtropical and tropical waters (Mediterranean and Indian Ocean). Two species occur in the district at present under notice, and four others were obtained by the 'Alert' off the Australian coast. The other genera appear to be much more limited in range: *Psammopemma*, Marshall, was but once obtained by the 'Alert' (viz. in Torres Straits). *Psammoclema* and *Psammascus*, id., have not been recognized in any of the 'Alert' collections.

12. *Dysidea conica*.

*Bowerbank*, *P. Z. S.* 1873, p. 26, pl. vi. fig. 1.

To this species, so fully described by Bowerbank, I assign a fragmentary Dysideid closely resembling the top of the specimen figured by him, also some skeletons. Although the mesoderm contains abundant foreign bodies, the species does not fall into either of the genera *Psammascus* and *Psammoclema*, which Marshall has formed for Dysideidæ exhibiting this character, as it has neither the tubular form of the one nor the smooth surface of the other, but agrees with *Dysidea* in its well-developed conuli. The dermis is dark to the naked eye, but is transparent under the microscope. It is infested by a *Spongiophaga* (Carter), of large size, the head measuring about .012 and the filament about .009 millim. in diameter.

*Hab.* Glorioso Islands, 7–10 fms.

*Distribution.* N.W. Ceylon, 8 fms. (*Bowerbank*).

13. *Dysidea gumminea*. (PLATE LIII. fig. C.)

? *Dysidea kirki*, pars, *Carter*, *Ann. & Mag. N. H.* 1881, vii. p. 374, nec *Bowerbank*.

A species bearing a close external resemblance to *D. conica*,



Bowerbank, but differing in its very dense and opaque dermis, and the strictly Dysidean distribution of its foreign bodies, viz. only in the skeleton-fibres. The primary fibres are either single or multiple in the same conulus, and range from about .07 to .36 millim. in diameter. The sponge forms low, longitudinally-extended masses, about 50 millim. (2 inches) in greatest length, 12 millim. in greatest vertical thickness, throwing out rounded lobes which are 15 millim. in greatest diameter. Vents round, few, placed near ends of lobes, 1 to 2.5 millim. in diameter. Texture in spirit rather elastic, compressible. Conuli sharp-pointed, usually connected by radiating ridges with each other; height .75 to 1 millim., distance apart 1-2 millim. Dermal membrane very dark grey, glabrous. Primary fibres, as such, apparently existing only in the conuli, and not extending beneath them into the mass of the sponge; secondary fibres also very slightly developed, except in the ridges connecting the conuli, where they form a dense network of horizontal fibres, extending to a depth of about 1 millim. below the surface. Skeleton-fibres .05 to .18 millim. thick; generally compact in structure, exhibiting no horny substance to view.

*Hab.* Mozambique, between tide-marks (on back of crab); Providence Island, Mascarene group, 19 fms. (on rock).

Carter's species *D. kirki*, from Mauritius, South Australia, and the Cape of Good Hope, above cited, may possibly include this; but as from his description and specimens it is evident that he groups more than one species together, and as the present form is decidedly distinct from Bowerbank's *D. kirki* (from the far smaller diameter of the largest skeleton-fibres), it is not necessary to pursue the question further. The very tough and opaque dermal layer and the remarkable development of the secondary or horizontal fibre-system, which assists in producing it, distinguish this *Dysidea* from all intelligibly described species. *Spongelia elegans*, Nardo, as described by F. E. Schulze, appears to approach it in the fasciculated arrangement of the primary fibres, the proportions of the conuli, and the general shape, but differs in its pale colour and in having the secondary fibres more or less free from sand.

## OLIGOCERAS.

*Schulze, Zeitsch. wiss. Zool.* xxxiii. p. 34.

This genus, introduced (and rightly, as it seems to me) by Marshall into this family, is based on a species from the Adriatic, remarkable for a habit of attaching to itself foreign bodies of some size. Prof. Schulze has expressed to me verbally a doubt as to whether the genus will prove to have been rightly established. If, however, this is due to the supposition that *Oligoceras* is a young stage of a horny sponge, I think it may be set aside\* by a consi-

\* Since writing the above, I have been assured by Dr. Poléjoeff, whose Report on the 'Challenger' Ceratosa is in the press, that he has found the skeleton of

deration of the large size of a specimen from Mauritius (probably from deep water) in the National collection: this measures 170 by 100 millim. in greatest length and breadth; the primary fibres project strongly from the paper-like dermis, and the conuli are 5–10 millim. apart; the fibre shows just the branching arrangement described in *O. collectrix*. The species now to be described agrees remarkably in general characters with the same species, and is also sufficiently large to be called adult.

#### 14. *Oligoceras conulosum*.

Incrusting, strongly flattened from above downwards, forming a leathery crust, but occasionally throwing out flattened, pointed, free lobes from lateral margin; strongly hirsute above with the very prominent, slender, and pointed conuli, 1–2 millim. high, 2–4 millim. apart at tips; terminated by the single or (more rarely) multiple ends of primary fibres, which stand out about 1 millim. beyond the dermis. Surface between ends of conuli forming a series of slightly concave spaces (in spirit), smooth, glabrous, of leathery appearance. Colour in spirit dull putty-colour to pale grey; consistence (when occupied by *Spongiophaga*) flexible, tough. Main skeleton—primary fibre occasionally branched at apex, about .17 to .27 millim. in diameter; axis composed of closely packed foreign bodies, occupying from  $\frac{2}{5}$  to  $\frac{9}{10}$  of the entire diameter: secondary fibres apparently absent. Dermal skeleton composed of irregularly arranged fibres, chiefly straight and parallel to each other, varying in composition from an almost entirely horny to an almost entirely sandy state; diameter about .14 to .35 millim., meshes about .35 millim. wide: a small quantity of free foreign bodies is to be found interspersed in the intervals between the fibres. Tissues between fibres of main skeleton also containing a considerable proportion (about one fourth) of free, small, foreign bodies. Horny matter of fibre normally pale amber-yellow, transparent. Parenchyma very pale brown, transparent.

*Hab.* Glorioso Islands, 7–10 fms.; bottom, sand and coral.

A single specimen in spirit, 60 millim. in extreme diameter at base, 8 millim. in greatest thickness of the same; the lateral lobe (which seems to have been decumbent) is 30 millim. high, 14 by 4 millim. in basal diameter. Tissues infested by a *Spongiophaga* (Carter)—head oval or subpyriform, long diameter .095 to .013 millim., short diameter .006 to .0095 millim.; filament, diameter .004 to .005 millim.—which has partly destroyed the horny matter of the fibre, and forms sheets in the mesoderm.

The apparent total absence of secondary fibres is perhaps due to youth or the ravages of the parasite: the arrangement of the skeleton is that ascribed by F. E. Schulze to *Oligoceras collectrix*, Schulze, from

*Oligoceras* to possess in parts the ordinary reticulate arrangement found in *Cacospongia*, &c. This observation seriously militates against its generic distinctness.

the Adriatic. The conuli are more prominent and distant than in that species, and the proportion of horny matter in the fibre is considerably greater.

### APLYSINIDÆ.

Although Pallas and Lamarek cite *Ianthella flabelliformis* as from the Indian Ocean, I am not aware that the genus has been hitherto shown to occur on the western side of that ocean.

#### 15. *Aplysina fusca*.

*Carter, Ann. & Mag. N. H.* 1880, vi. p. 36.

A spirit-specimen, agreeing in its more slender fibre (maximum diameter about  $\cdot 7$  millim.), especially near the surface, and in its smaller interconular spaces with the Ceylon specimen rather than with that from S.W. Australia, subsequently assigned to the same species by Carter (*Ann. & Mag. N. H.* 1881, viii. p. 107), which I have seen. In this spirit-specimen the cells which are so numerous congregated in the surface-membrane are not colourless, as in the dry specimen from Australia, but are very granular and of brownish colour; they measure  $\cdot 008$  millim. in average diameter, whereas those of the Australian specimen measure about  $\cdot 013$  millim. Having regard to these differences, it seems to me not unlikely that the latter specimen is specifically distinct. If the expression "hollow" of Mr. Carter's original description denotes fistulose, the present specimen differs from the Ceylon form in being solid (with the exception of the usual spaces between the fibres).

*Hab.* Seychelle Islands, 12 fms.

*Distribution.* Ceylon, S.W. Australia? (*Carter*).

#### 16. *Aplysina pallasi*.

? *Spongia membranosa*, pars, *Pallas, Elench. Zooph.* p. 398.

Columnar masses, generally less than an inch in diameter at their broadest part, and tending to bifurcate early and at acute angles into secondary lobes of a diameter inferior to that of the main body of the sponge; the ends of the conuli are only about 5 millim. apart, except near the ends of the lobes, where they approach each other more closely; a single or bifurcate purple-black fibre projects about 1 millim. from the end of almost every conulus, replacing the blunt compound fibrillated mass which is characteristic of this part in *A. membranosa* (see Carter, also Part I. of this Report). Vents oval, 2–4 millim. in diameter, few, at sides of terminal lobes. Consistence elastic, very compressible.

The skeleton-fibre is much branched and anastomoses frequently, and ranges in diameter from about  $\cdot 9$  millim. in main fibres to as little as  $\cdot 1$  millim. in some subdermal twigs; those which terminate the conuli are about  $\cdot 3$  millim. in average diameter; the main direction is upwards and outwards; the fibre is firm, compact, tough;

its wall about .05 millim. thick, of a fine transparent purple colour, and is composed of a transparent matrix containing closely packed subglobular transparent cells .008 to .013 millim. in diameter, provided with small opaque refringent nuclei; the laminae composing the wall of the fibre are readily separated. The dermal membrane is not, as in *A. membranosa*, traversed by raised thickenings which radiate from the tips of the conuli, but is externally homogeneous and subtransparent; it is pale purple in colour and quite thin; under the microscope it is subtransparent, granular and speckled in parts with the less transparent and darker purple nuclei or condensed pigment-masses, about .005 millim. in diameter, which occupy the centres of large cells.

*Hab.* Marie Louise Island, Amirante group, 16 and 17 fms.; Providence Island, Mascarene group, 19 fms.

The species appears to be most nearly related to *A. carnosa*, Schmidt (Spong. Adr. Meer. p. 26, pl. iii. fig. 3), from the Adriatic, and *A. cauliformis*, Carter (Ann. & Mag. N. H. 1882, ix. p. 270), from the West Indies; but differs from the former in its far more loosely reticulate skeleton, and from the latter in not having the surface nearly even. It is perhaps identical with the *elongated* specimens described by Pallas (*l.c.*) under *Spongia membranosa*. It differs superficially from the typical form of that species in the closer approximation of the conuli, the more slender habit of the sponge, the smoothness of the dermal membrane, in its minute structure, and in the simple, not compound, character of the skeleton-fibre.

The larger specimens are slightly compressed laterally, and both measure about 60 millim. ( $2\frac{1}{3}$  inches) in height; four spirit-specimens form the series.

### 17. *Ianthella flabelliformis*.

*Spongia flabelliformis*, Pallas, *Elench. Zooph.* p. 380.

A macerated fragment agreeing in outward form, so far as it goes, and in the proportions and character of its fibre with the above species. The places in the fibres originally occupied by the purple cells are chiefly represented by vacant spaces, giving a honeycombed appearance to the skeleton-fibre in some parts.

*Hab.* Providence Reef, Mascarene Islands, 24 fms.

*Distribution.* See Part I., p. 392, of this Report.

## SILICEA.

### MONACTINELLIDA.

The great abundance of *Ceratosa* has for its complement a corresponding comparative scarcity of Monactinellid Silicea; this deficiency is largely accounted for by the few Ectyonidæ collected here as compared with the Northern Australian waters.



## GUMMINIDÆ.

Gumminæ, *Schmidt, Spong. Küst. Alg.* p. 1.

Gumminida, *Carter, Ann. & Mag. N. H.* 1881, viii. p. 248.

I retain this group provisionally at the commencement of the Silicea, but believe it will ultimately have to be placed near the Tetractinellida.

18. *Chondrilla mixta*.

? *Chondrilla mixta*, *Schulze, Zeitsch. wiss. Zool.* xxix. p. 116.

Prof. Schulze's description of his species is scarcely sufficient for me to determine its relations to the present specimen, as he does not mention the size and exact form of the spicules. It agrees with the present form in having two kinds of spicules, stellates and globostellates, in having a fibrous outer layer about 1 millim. thick, and in the distribution of the spicules in the substance. On the other hand the sections of this (very young) specimen exhibit but scanty traces of the system of subcortical canals which appears to be so well developed in the Red-Sea species, and the colour (in spirit) is pale brown or buff rather than "pale grey, speckled with brown." The stellate spicules have rather coarse rays which often bifurcate, as in *C. australiensis*, Carter; they measure .025 millim. in diameter, the globostellates .032 millim. Having regard to the nearness of the two localities, and to the points of positive agreement between the present specimen and Schulze's species, I am disposed to consider them to be identical. The present specimen differs from *C. australiensis* in the relatively longer and more slender arms of the stellate (*radiostellate* of Carter), the greater abundance of the spicules in the subcortical tissues, and the larger size of both spicules (in *C. australiensis* the globostellate measures .025, the stellate about .02 millim.).

A very small specimen, about 5 millim. across, on a Nullipore which has been partly overgrown by a repent *Chalina*.

*Hab.* Marie Louise Island, Amirante group, 16-17 fms.

*Distribution.* Red Sea (*Schulze*)?

## CHALINIDÆ.

The percentage of species of Chalinidæ in this collection is small for the Tropics, viz. less than 8 per cent., that of the Chalinidæ in the Australian collections being 15 per cent. This inferiority in numbers is due in part to the absence of the tubular forms, which are represented by *Tuba*, *Siphonochalina*, and *Tubulodigitus* near Australia, and chiefly by *Tuba* in the West Indies. As, however, *Siphonochalina* occurs both at the Cape (*Ehlers*) and the Red Sea (*British-Museum* collection), it probably will be ultimately found also in the intervening district. If the wide-mouthed genus *Tuba* is really absent here, the circumstance is of considerable importance, as it seems to be represented abundantly in the tropical parts of both sides of the American continent and in the Malay archi-



pelago, but it has not yet, so far as I am aware, been recognized on either coast of Africa.

### 19. *Chalina elongata*.

? *Spongia elongata*, Lamarch, *Ann. Mus. Hist. Nat.* xx. p. 451.

? *Spongia lanuginosa*, Esper, *Pflanzenh.* ii. p. 243, pl. xxiv.

An erect *Chalina*, with short common stem and somewhat tortuous branches, few, tapering to sharp points, uneven in diameter and shape, ranging from 2 (at the tips) to 8 millim. in thickness, cylindrical or compressed, simple, or bearing a short incipient or stunted branchlet here and there. Length of branches 20–55 millim. Common stem 25 millim. long, compressed, greatest diameter 11 millim. Vents? (perhaps .6 to 1 millim. in diameter, few). Mode of branching dichotomous, branches given off at angles of about 50°. Surface rendered minutely pilose by the projecting ends of the primary fibres. Consistence in spirit very soft, compressible, elastic (like that of the finest Turkey sponge); colour very pale brown (almost white). Main skeleton rectangular in arrangement; primary fibres .35–.7 millim. apart, .035–.043 millim. in diameter, containing 3–5 series of spicules, with a narrow horny margin visible; secondaries .024 millim. thick, with 1 (rarely 2) series of spicules, the fibres at intervals of .18 to .35 millim. Dermal skeleton as main skeleton, but primary fibres only about .14 to .28 millim. apart. Skeleton-fibre pale yellow. Sarcode transparent, almost colourless. Spicule smooth, acerate, straight, tapering from one or two diameters from ends to moderately sharp points; size .13 by .0057 millim.

*Hab.* Darros Island, Amirante group, 22 fms.; bottom, broken coral.

Two specimens, one 80 millim. ( $3\frac{1}{5}$  inches) high, the other quite low, their bases growing among some branching Polyzoa. The species agrees with Lamarch's description of his *S. elongata* so far as it goes, but it is too short to be decisive; he gives "Mers Australes" as its locality. Esper's figure (*l. c.*) strongly resembles it in colour and in the shape of the branches, but his specimen was from Brittany. Possibly some of the specimens from other localities, which he mentions as belonging to his species, may be identical with the present.

### 20. *Chalina*, sp.

A small specimen of a tender repent species, the horny matter of the fibres being small in quantity and very pale and transparent. Colour in spirit a fine nut-brown; consistency soft and very yielding. Surface even, rendered minutely pilose by the ends of the primary fibres. Branches rather tortuous, subcylindrical, compressed here and there; greatest diameter (where not affected by accidents of growth) 2–6 millim.; stem similar, diameter about 2.5 millim. Vents orbicular, .5 to 1.5 millim. in diameter, arranged in a series on one side of sponge, at intervals of about 5 millim. Main

skeleton—primary fibres vertical to surface, about a spicule's length apart, containing 3 to 5 series of spicules; secondaries at various angles to primaries, spicules 1- or 2-serial. Sarcode rich brown, subtransparent. Spicules acerate, slightly curved, tapering to sharp points from about 3 diameters from ends; size  $\cdot 17$  by  $\cdot 0085$  millim. It branches once at an angle of about  $35^\circ$ , its total length is 50 millim. (2 inches), and it has involved a mass of *Polytrema*, Nullipore, &c., in its course; the Nullipore bears the specimen which I have provisionally assigned to *Chondrilla mixta*, Schulze.

In the character of the skeleton and the size of the spicules this species resembles the British species *Isodictya simulans*, Bowerbank, and *Chalina montagui*, Johnston; but it has not the firm texture of the former, nor the tubular form of the latter, and I have not found any more nearly allied species. In spite of its repent growth I have assigned it to *Chalina* rather than to *Cladochalina*, the proportions of the spicules and the character of the fibre agreeing with those of typical *Chalina* (*Chalinula* of Schmidt), and being in my view far superior as diagnostic characters to those taken only from the external habit.

*Hab.* Marie Louise Island, Amirante group, 16–17 fms.

### ACERVOCHALINA, gen. n.

See Part I., p. 398, of this Report.

#### 21. *Acervochalina finitima*, var.

*Chalina finitima*, Schmidt, *Spong. Atl. Geb.* p. 33.

As on the North-Australian margin of the Indian Ocean, so also in its North-western angle this otherwise West-Indian\* species seems at home. Two specimens (the one 25 millim., the other 40 millim. in extreme diameter) show the essential characters of the species; the vents, however, unlike those of the Australian specimens, are placed on the margins rather than the upper surface of the sponge, and the spicules are slightly thicker than in both the Australian and W.-Indian forms, viz.  $\cdot 003$  millim. as against  $\cdot 0018$  in the one and  $\cdot 0025$  in the other.

*Hab.* Seychelle Islands, 4–12 fms.

*Distribution.* See Part I., p. 399, of this Report.

### RENIERIDÆ.

Besides the probably almost cosmopolitan species *Tedania digitata*, I find that several of the representatives of this generalized Family type have quite a European *facies*, and I have identified two of them (*Reniera indistincta* and *rosea*) with British species; but two members of the same genus, now described for the first time, possess external characters of a definiteness and singularity unusual

\* Also British, if *Chalina limbata*, Bowerbank, is identified with it.

in their genus and family. A fifth species, assigned also to *Reniera*, has affinities which find expression elsewhere, so far as my knowledge extends, only in Indo-Pacific waters.

## 22. *Reniera indistincta*, var.

*Isodictya indistincta*, *Bowerbank, Mon. Brit. Spong.* ii. p. 290, &c.

A specimen almost identical in form and size with that described above from the Australian collections (from Torres Straits) under this title: it has, however, a superficial rich umber-brown coloration, produced by a sarcode darker than that of the same parts in the Australian specimen, the external colour of which is grey. The dermal skeleton-fibres are also constantly, and not merely occasionally, biserially spiculate, and the spicules measure  $\cdot 19$  by  $\cdot 008$  millim., instead of  $\cdot 16$  by  $\cdot 0063$  millim. The occurrence of this form on the western side of the Indian Ocean, together with the dark coloration (resembling that of the British specimen), are confirmatory of its identity with a British species.

*Hab.* Darros Island, Amirante group, 22 fms.

*Distribution.* See Part I., p. 407, of this Report.

## 23. *Reniera rosea*.

*Isodictya rosea*, *Bowerbank, Mon. Brit. Spong.* ii. p. 282, iii. pl. xlix. figs. 12-14.

Some small, sublobate, apparently subsessile, soft pale brown specimens. Skeleton-fibre formed of uniserially (rarely biserially) arranged spicules; the rectangular arrangement is rather obscure. Spicules curved, acerate, tapering to fine points from about 4 diameters from ends; size  $\cdot 16$  by  $\cdot 006$  millim. Vents about 1.5 millim. in diameter, placed at extremities of lobes. The agreement with the British specimens is comparatively close; the spicule in the type specimen, which I have examined, is slightly shorter; as depicted by Bowerbank, the spicule is made too stout.

*Hab.* Marie Louise Island, Amirante group, 16 and 17 fms.

*Distribution.* Tenby, Sark (*Bowerbank*); Kerguelen Island (*Carter*).

## 24. *Reniera camerata*\*. (PLATE LIII. figs. H, H'; PLATE LIV. fig. n.)

Sponge generally subcylindrical or subconical, perforated above by large irregular openings; formed of thin compact lamellæ 1-2 millim. thick, thinning off into knife-like edges, and much folded and anastomosing with each other within the sponge, so as to form a labyrinthine system of passages, 3-5 millim. in diameter, chiefly more or less vertical in their direction. Outer surface of sponge smooth, gently undulating; inner surface of passages very minutely pitted by the openings of the excretory canals.

Consistency of sponge-wall, in spirit, very flexible and compres-

\* From *camera*, a chamber, in allusion to the *chambered* interior.

sible, readily torn. Colour pale brown; general appearance that of soft leather. Main skeleton composed of multispicular secondary tracts of loosely aggregated spicules, 8- to 15-serial, placed parallel to the surface at intervals of  $\cdot 2$  to  $\cdot 3$  millim., and of primary lines represented by groups of 4 to 10 spicules crossing the intervals of the secondaries, ladder-like, at intervals of about  $\cdot 3$  millim., the spicules composing these groups being so loosely associated as often hardly to be in contact; they turn to one side at the points at which they come into contact with the secondaries, thus rounding off the angles of the otherwise rectangular spaces of the meshwork. Dermal skeleton formed by the outward projection of slender primary tufts of spicules, 2 to 4 spicules broad. Sarcode pale brownish yellow, subtransparent. Spicules smooth acerate, slightly curved, tapering to sharp points from 2 or 3 diameters from ends; size  $\cdot 18$  by  $\cdot 007$  millim.

*Hab.* Seychelle Islands, 2 fms.; Marie Louise Island, Amirante group, 16-17 fms.; bottom coral.

This species, by its polypspicular fibre and compact structure, differs from most species of *Reniera*. Indeed the former character would appear to ally it to *Schmidtia*; but it is remarkable that, probably in connexion with the thinness of the wall and consequent need of resistance to lateral pressure, it is the secondary, and not the primary, fibres which are the stoutest; possibly it is to the exigencies entailed by the peculiar external form that the whole of the internal peculiarities are due. The largest of the specimens, which are somewhat fragmentary, measures 30 millim. high by 18 millim. in extreme breadth.

## 25. *Reniera cribriformis*. (PLATE LIII. fig. G; PLATE LIV. fig. o.)

Some fragments in spirit of a hollow cushion-shaped sponge seem worthy of a description, as it has characters by which it may be recognized. The wall is  $\cdot 5$  to 3 millim. thick, compact, folded back at the margin so as to enclose a space below the surface. Surface very even and glabrous, perforated at intervals of 1-5 millim. by circular vents,  $\cdot 5$  to  $2\cdot 5$  millim. in diameter. Consistence elastic, rather firm; colour pale dull brown. Primary fibres of main skeleton about  $\cdot 18$  millim. apart, vertical to surface, spicules 2-3-serial; secondary fibre represented by separate spicules, traversing at various angles the spaces between the primaries. Dermal skeleton a close meshwork of irregularly disposed single spicules, not united to form fibres. Sarcode transparent, almost colourless. Spicule smooth, sub-cylindrical acerate, very slightly curved, tapering from near centre to points of various degrees of bluntness; size  $\cdot 2$  by  $\cdot 007$  millim.

*Hab.* Seychelle Islands, 12 fms.; bottom coral.

This species seems to approach *R. testudinaria*, Lamarck (see Australian Report), in the tendency of its spicules to assume the cylindrical form.

Carter's "*Reniera*, dark brown" from the Gulf of Manaar (Ann. & Mag. N. H. 1880, vi. p. 48), differs decidedly from this in its



colour, and its cylindrical spicule is curved and apparently stouter than that of this species.

26. *Reniera*, sens. lat., allied to *crateriformis*, Carter.  
(PLATE LIV. fig. i.)

Some small dark-brown fragments of a species belonging to the group *Crassa* (*Renieridae*), Carter, to which the preceding species is related, and which is probably connected with *Schmidtia*. The spicules are smooth, slightly curved, subcylindrical, tapering somewhat to the well-rounded ends; size  $\cdot48$  by  $\cdot028$  millim. Arrangement of skeleton as in *Schmidtia*, viz. massive fibre forming rounded meshes (except near the surface). Species of this character are especially abundant in the Malay Archipelago, whence *R. crateriformis* is obtained. Not knowing the external form of the sponge, I content myself with indicating the occurrence of this well-marked group in this region.

*Hab.* Providence Island, Mascarene group, 19 fms.

27. *Pellina*, sp.

I have little doubt of the identity with the species from Australia, described at p. 413 (No. 48) of Part I. of this Report, of an erect, laterally compressed, suboblong specimen in spirit in this collection, 45 millim. high, 30 millim. in greatest diameter, 14 millim. in greatest thickness. It is squarely truncate above and diminishes slightly in diameter towards the broken lower end; the surface is rather uneven, but the dermal membrane is smooth, thin, and transparent. Vents chiefly at the margin; round or suborbicular, deep, diameter 1-5 millim. Spicules  $\cdot33$  to  $\cdot35$  by  $\cdot019$  millim. Other characters essentially as in Australian specimen, from which it differs chiefly in wanting the short lobes.

*Hab.* Darros Island, Amirante group, 22 fms.

28. *Tedania digitata*, Schmidt.

For synonyms and distribution see this Report, Part I. p. 417.

A fine specimen from Mozambique, very different in external characters from those described by me from Australia and Hindostan. In this case the vents are strongly developed, and the mass consists of four superiorly distinct, more or less bullate tubes, with thin, smooth margins, 3-9 millim. in diameter at their mouths, arising out of a very irregularly shaped, massive, suberect base, the surface of most of which is broken up into closely-set pits and grooves, about 1.5 millim. in diameter, which are the external openings of the excretory canals of this solid part of the sponge. The colour is pale, rather reddish, brown. The acute measures  $\cdot19$  by  $\cdot0095$  millim., the tibiella  $\cdot19$  by  $\cdot005$  millim. While the outward form is rather that of Mediterranean specimens, the proportions of the spicules agree more closely with examples from Kurrachee and Queensland than with Mediterranean or Port-Darwin specimens.

The spicules of a small incrusting fragment from the Amirante



Islands give the following measurements: acuate .2 to .25 by .007 millim.; tibiella .2 to .25 by .004 millim.

*Hab.* Mozambique; Marie Louise Island, Amirante group; tide-marks to 17 fms.

### DESMACIDINIDÆ.

The occurrence of a true *Desmacidon* in the Indian Ocean is perhaps for the first time indicated by the new species described below. The two species assigned to the genus by Ehlers ('Die Esoperschen Spongien') appear to belong respectively to *Amphilectus* and *Clathria*. The wide range possessed by species of the new genus *Iotrochota* is shown also by the occurrence of our two new Australian species, one of them being abundant in both localities.

### RHIZOCHALINA.

The scarcity of this genus, so common in the tropical waters of Australia, and well represented also in the south of that continent, is probably due to the absence of mud from the localities investigated; slightly deeper dredging, clear of the reefs, might be expected to reveal more of this interesting genus, which had not hitherto been noted from any localities nearer than Ceylon (Carter, Ann. & Mag. N. H. 1880, vi. p. 37, under the name of *Desmacidon jeffreysi*).

#### 29. *Rhizochalina pellucida*. (PLATE LIV. fig. j.)

Elongate, tapering gradually from base of sponge to summit of fistula. Fistula single, straight. Surface even, glabrous. Consistence in spirit soft, brittle; colour very pale brown; appearance semitransparent. Body of sponge oval, compressed; includes foreign bodies.

Main skeleton a somewhat confused mass of moderately closely felted and irregularly crossing spicules, traversed at intervals by tracts of compact spiculo-fibre, 4-8 spicules broad, running parallel to the surface. Dermal skeleton consisting of long, straight, compact spiculo-fibres, 4-20 spicules broad, branching at acute angles, and thus spreading over the surface; the intervals occupied by a loose open reticulation of single spicules or of fascicles two or three spicules broad, crossing at various angles. Sarcode pale yellowish brown, subtransparent. Spicule acerate, slightly curved, tapering gradually to sharp points from about middle of spicule; size .26 by .01 millim.

*Hab.* Providence Island, Mascarene group, 19 fms.; bottom coral.

A single specimen, 87 millim. ( $3\frac{1}{2}$  inches) long, 12 millim. in greatest basal diameter; greatest diameter of present end of fistula 3 millim.

In its subtransparency, and in the great thinness of the dermal layer of the skeleton, as well as in its having been apparently sessile by a bulbous base, this differs from all described species of the genus.

30. *Desmacidon rimosa* \*. (PLATE LIIII. fig. F; PLATE LIV. figs. *m-m''*.)

Erect, stipitate; stem and branches solid, more or less antero-posteriorly compressed, except the extreme apices of the latter, which are cylindrical and terminally rounded, finger-like. Branching very irregular, not confined to one plane, the first division approximately dichotomous; the resulting (secondary) axes are either flattened strongly (2-4 times as broad as they are long), with but short subcylindrical marginal branchlets, or subcylindrical, giving off several subcylindrical (tertiary) branches; the largest of these branches may attain a length of 35 millim.; diameter of tips of branches, just before termination, 4-5 millim. Surface of stem and, to a less extent, of branches scored by winding furrows, 1-3 millim. deep, 1-3 millim. wide, generally directed transversely when on the flat surface of the branch, more longitudinally when they have reached its margin; they either vanish by becoming gradually shallower distally, or end abruptly in an oscular opening. Vents .5 to 1.5 millim. in diameter, circular, deep, numerous, scattered along the above-mentioned grooves. Surface pilose, like coarse velvet, owing to projection of primary skeleton-fibres to a height of .25 to 1 millim., at distances of .25 to 1 millim. apart. Texture in spirit firm, tough, subelastic, the surface slightly harsh to the touch; colour in spirit normally brown, inclining to grey, and to rufous where shrinkage or abrasion of sarcode has more or less exposed the skeleton.

Main skeleton—primary fibres vertical to surface, about .07 millim. thick, .28-.35 millim. apart; the secondaries vertical to the primaries, about .05 millim. thick, .28-.35 millim. apart: fibres cored by spicule no. 2, with a few of no. 1 near the centre of the sponge; the horny fibre is almost wholly obscured by spicules; near the surface a distinct clear pale brown transparent margin of about a quarter the thickness of the fibre is usually left. Dermal skeleton made up of triangular to polygonal meshes (.28-.8 millim. wide) of spiculo-fibre, .035-.09 millim. thick, strengthened by much pale brown transparent horny substance, which is seen outside the spicules in the narrower fibres; the contained spicules are chiefly no. 1; the stouter fibres contain also, superficially, no. 2. Sarcode transparent, pale yellowish brown.

Spicules of skeleton:—(1) Acuate, smooth, slightly curved, tapering gradually, more rapidly towards apex, to moderately sharp point, and diminishing slightly in diameter towards the rounded base; length about .35 millim.; diameter, base .019, middle of shaft .022 millim. (most abundant in the fibre near surface, occasionally free in sarcode). (2) Acuate, approximately straight, tapering gradually from near head to sharp point; the base occasionally provided with a small number of minute spines; size .23-.33 by .005-.01 millim. (sometimes loose in sarcode, especially in dermis).

\* *Rimosus*, full of furrows, referring to the appearance of the surface.

Sarcode-spicules :—(3) Tricurvate acerate, smooth, tapering gradually to fine points; median curve rather sharp, forming angle of about  $150^\circ$ ; from this point arms almost straight, until just before tips, which turn up slightly; size  $\cdot 19$ – $\cdot 22$  by  $\cdot 006$  millim. (4) Equianchorate, navicular, shaft slender, smooth, curve gradual and slight; palms narrow, viz. about  $\cdot 08$  long by  $\cdot 0055$  millim. broad, tapering to sharp points at apex, square below; tubercle slight, rather elongate, length  $\cdot 022$  millim.

*Hab.* Mozambique, between tide-marks.

Two specimens and a fragment are in the collection. The largest measures 110 millim. ( $4\frac{1}{2}$  inches) in greatest height, 85 millim. ( $3\frac{1}{2}$  inches) in greatest lateral expansion; common stem 55 millim. long, 20 by 10 millim. in diameter at middle of its course, rather tortuous, deeply scored on one side by a main median longitudinal depression. The second specimen has its branches more cylindrical than those of the larger specimen; but it has grown abnormally, some of the branches being twisted back, and anastomosis occurs near the base of the specimen. The description of *Spongia palmata*, Lamarck (Ann. Mus. Hist. Nat. xx. p. 453), var.  $\beta$ , recalls this sponge. The typical form of the species, which I have seen at Paris, resembles it more closely than does the specimen on which this var.  $\beta$  was probably founded; however, microscopic examination shows *S. palmata* to be a *Chalina*. While the present species resembles *Desmacidon fruticosa*, Mont., in texture and in the structure of the skeleton, it is yet quite distinct on account of its solid branches, its acerate skeleton- and its tricurvate (not bihamate) flesh-spicules. *D. arciferum*, Schmidt (Algiers), appears to approach it the most nearly of described species, but an acerate spicule is mentioned in addition to the tricurvate. *D. frondosum* (Ehlers), Esper, from "East Indies," resembles this sponge in general appearance, but has echinating spicules, some of which are strongly spined, and no tricurvate is mentioned; hence it seems to be a *Clathria*.

### 31. *Iotrochota purpurea*.

*Halichondria purpurea*, Bowerbank, *P. Z. S.* 1875, p. 293.

See Part I., p. 434, of this Report.

Fine specimens, chiefly of the usual cylindrical form, and with the same coarsely roughened surface as in the Australian specimens. Like those specimens, too, they shew a tendency to become flattened, and to vary in colour from dark purple to dark green. The spiculation is essentially the same as in the Australian specimens. The maximum height is also just the same, viz. 150 millim. (6 inches).

*Hab.* Etoile Island, Amirante group, 13 fms.

*Distribution.* See Part I. p. 434.

### 32. *Iotrochota baculifera*.

See Part I., p. 435, of this Report.

Some small specimens, in spirit and in the dry state. In the

finely hispid surface and the low irregularly lobate form, together with the spicular characters, they agree closely with the Australian specimen, but the average diameter of the lobes is somewhat less (about 10 millim.).

*Hab.* Providence Reef, Mascarene Islands, 24 fms.

*Distribution.* Port Darwin.

### 33. *Esperia gelatinosa*. (PLATE LIV. figs. *f-f'''*.)

Low incrusting masses, frequently involving foreign bodies, occasionally rising into slender lobes. Surface in spirit undulating, glabrous. Consistence tough, elastic, firm. Colour pale greenish grey or pinkish brown; general appearance gelatinous, semi-transparent.

Main skeleton rather confused in the incrusting specimens; the vertical lines near the surface being short, broad, loose, and closely approximated; in thicker specimens the ordinary Esperian distinct spiculo-fibres appear at some distance below the surface; primaries crossed by more or less numerous detached skeleton-spicules. Dermal skeleton composed of confusedly intercrossing spicules not arranged into spiculo-fibrous reticulation. Sarcoderm very pale yellow, transparent.

Spicules:—(1) Skeleton subspinulate; head oval, slightly but distinctly demarcated from shaft, about two thirds the maximum diameter of the latter; shaft tapering rather abruptly to sharp point; size of spicule  $\cdot 5$  by  $\cdot 016$  millim. (2) Large inequianchorate; large end moderately broad, about half the total length of the spicule, tubercle long, lower angles of outer palms slightly rounded; small end subtriangular, rather small, pointed below, tubercle small, tongue-shaped, a small reverted margin extending as far as the tubercle in the middle; size of spicule  $\cdot 06$  by  $\cdot 0032$  millim. (3) Small inequianchorate, large end about three fifths the total length of the spicule; shaft and arms well but gradually curved, tubercle short; lesser end very small, not prolonged below into a point; length of spicule  $\cdot 019$  millim. (4) Bihamate, contort, slender, well curved, sharp-pointed; size  $\cdot 057$  by  $\cdot 002$  millim. (5) Trichites in oblong compact bundles about  $\cdot 02$  millim. long and  $\cdot 0063$  to  $\cdot 0075$  millim. in diameter; spicules approximately straight. Extremely abundant.

*Hab.* Providence Reef and Providence Island, Mascarene group, 19–24 fms.; bottom, sand or dead coral.

The longest lobes are 20–30 millim. long and 3–6 millim. in diameter. In habit, spiculation, and arrangement of skeleton it much resembles *E. levis*, Carter (Ann. & Mag. N. H. 1882, ix. p. 291, pl. xi. fig. 16), from Venezuela, and *E. pellucida*, mihi (Part I., p. 437, of this Report); but the small inequianchorate here has not the terminal point described by Carter, and the trichites are much smaller ( $\cdot 02$  millim. instead of  $\cdot 067$  millim. long); from *E. pellucida* it differs in the small, short, quadrangular trichite-bundles, in the smaller size of the anchorates, &c. The species is quite abundant, though no large specimens were found.



## ECTYONIDÆ.

Two of the six species obtained, viz. *Clathria frondifera* and *Acarnus ternatus*, must now be regarded as characteristic of the equatorial parts of the Indian Ocean. As this ocean appears to be the main focus of *Clathria*, it is not surprising to find this most prolific genus further represented here by two new species.

## CLATHRIA.

The three species found in this district contrast, by their decumbent or incrusting habit, with the fine arborescent species which prevail in Australia.

34. *Clathria frondifera*, Bowerbank. (PLATE LIII. fig. J.)

See Part I., p. 448, of this Report.

This species seems to be almost as abundant in this region as in the North-Australian seas. The specimens agree well, both as to outward form and size and in their fibre-characters, with those described by me (Part I. p. 448) from those seas. The only divergent points which they present are found in the spiculation, viz. the slightly greater diameter attained by the smooth deep-skeleton acute in some of the specimens, and the wide range of dimensions exhibited by this spicule: it ranges from .16 to .25 millim. in length and from .008 to .0127 millim. in thickness; the latter thickness is not reached by the Australian specimens, but is exhibited by one from Gaspar Strait, and exceeded (.0158 millim.) by the type specimen, from the Straits of Malacca.

*Hab.* Providence Reef and Island, Mascarene group: Amirante Islands; Seychelle Islands; 12-24 fms.

35. *Clathria decumbens*. (PLATE LIII. fig. K; PLATE LIV. figs. *g*, *g'*.)

Sponge massive, sessile; forming low, spreading masses, either (*a*) of submonticular form, *i. e.* highest in the middle and terminating laterally in a few short angular ends, or (*b*) commencing as a horizontal flattened cylinder, sessile by its lower side, terminated at each end by rounded (sometimes free) extremities, and sometimes sending off lateral lobes of similar character. Surface (in unmacerated condition) slightly undulating, either (in *b*) glabrous, formed by a parchment-like brown membrane which conceals the honeycombed main mass of the sponge, or (in *a*) much grooved, having a worm-eaten appearance, the surface between the grooves slightly and minutely pilose with the ends of the skeleton-fibres, the bottom of the grooves themselves smooth, membranous. Vents moderately abundant (7 or 8 in small specimen), scattered on all parts, round, suborbicular, or oval; opening level with surface; provided with thin membranous margins; diameter 1-4 millim.

Main mass of sponge composed of subcylindrical trabeculæ, 5 to



2 millim. thick, which form the boundaries of cavities 1–2 millim. wide, extending parallel to the surface; the intervals between the trabeculae are more or less tympanized by thin transparent membranous expansions. Consistency in spirit—(a) of monticular specimen soft and elastic, like Turkey sponge; (b) of subcylindrical specimens tough, parchment-like. Colour—(a) almost white, (b) dull putty- to reddish brown.

Main skeleton—primary fibres approximately vertical to surface, .05 to .07 millim. thick, .18 to .35 millim. apart; secondaries approximately vertical to surface, but often curved; size, as primaries; about .18 to .25 millim. apart. Dermal membrane in (a) based on fibre .035 to .1 millim. thick, forming oval meshes .1 to .18 millim. in diameter; in (b) fibre .035 to .088 millim. thick, meshes .14 to .3 millim. wide, oval or oblong. Fibre brown of various shades, axially cored by one to four series of spicule no. 1, echinated abundantly by the spined acuate spicules.

Spicules:—(1) Skeleton acuate, straight, tapering gradually from near centre to sharp point on the one hand and to rounded base on the other; base about two thirds the diameter of centre, and carrying a few very small spines; size of spicule, .15 to .175 by .0055 millim. (2) Spined acuate, straight, tapering gradually from base to sharp point, base rather rugose; spines sharp, small to moderate-sized, those of proximal two thirds vertical to shaft, rather scanty, those of apical third numerous, recurvate; size of spicule .075 by .0063 to .09 by .008 millim. (3) Equianchorate, navicular, shaft almost straight, slender; palms as seen from front truncate below, subpyramidal, elongate (each more than one third the total length of the spicule); tubercle rather elongate; size of spicule, .021 to .032 millim. (4) Same as (3), but shaft more curved, and size of spicule only .011 millim.

*Hab.* Boudeuse and Etoile Islands, Amirante group, 10–13 fms.; bottom, sand or coral.

The two externally very different forms which I have indicated in the description by (a) and (b) agree so closely in their microscopic characters that I do not feel justified in separating them, even varietally; the absence of a tough cortex from (a) is perhaps due to some local circumstance.

The greatest vertical thickness of the largest specimen is 23 millim., the length 60 millim., the diameter of the lateral lobes 17 millim. The brown specimens have a strong external resemblance to small specimens of the *Hippospongiae* with meandrine canals, and especially to *H. derasa*, mihi (see Part I., p. 382, of this Report); also to fresh specimens of *Chalinopsis clathrodes*, Schmidt; and to a specimen, now in the National collection, of an apparently MS. species allied to *Clathria*, named "*Spongia multifora*, Dufr.," but which is quite distinct from *C. decumbens*, owing to the strongly spined skeleton-spicules. The very slender skeleton acuate with its slightly spined head is an unusual feature in a *Clathria*, and few *Clathrias* are without either a bihamate or tricurvate flesh-spicule. The sessile massive habit distinguishes it from all other true

*Clathrias*, except perhaps *C. elegans*, Vosmaer (habit unknown), and *C. (Dictyocylindrus) anchorata*, Carter. The latter is only known from small shapeless masses, and has the skeleton-spicule stout, smooth, and strongly curved; otherwise the spicular complement is essentially the same. In the present species the two kinds of anchorates appear to be distinct, the smaller form being very abundant, the larger, though evidently normally present, much less common; the occurrence of a larger and smaller anchorate in some *Esperia*, as pointed out by Carter (Ann. & Mag. N. H. 1882, ix. pp. 298, 299), is an analogous circumstance.

36. *Clathria mæandrina*. (PLATE LIII. fig. I; PLATE LIV. figs. *h-h''*.)

Sponge only known as an incrusting, widely-spreading mass, consisting of a thin basal lamina not exceeding 1 millim. in thickness, from which arise vertically, at intervals of 1 to 3 millim., parallel-walled ridges, or triangular masses, about .5 to 1.5 millim. in diameter and 2-4 millim. in height, usually united laterally to form a series of meandrine ridges, generally 2-3 millim. apart, at the surface of the sponge. Surface of basal lamina very uneven under lens, honeycombed with round openings .25 to .75 millim. in diameter; the trabecula between the openings is hirsute with projecting spicules; surface of vertical ridges uneven, densely hirsute with projecting spicules and skeleton-fibres, towards the base it has a honeycombed appearance similar to that of the basal lamina. Consistence in spirit slightly resistant, but soft, compressible, elastic. Colour in spirit buff-yellow.

Main skeleton—arrangement subrectangular; fibre dense, pale amber-yellow, echinated sparsely below surface of sponge by spicule no. 2, set at right angles to fibre. Primary fibres approximately vertical to surface, terminating on it in short horny points densely clothed with spicule no. 1, which are directed outwards, parallel to the axis of the fibre; diameter of fibre about .05 to .1 millim.; cored with proper spicules, usually biserially arranged, to a variable distance, not exceeding .7 millim., below surface; distance of fibres apart about .17 to .35 millim. Secondary fibres uncored, .035-.07 millim. thick, placed at intervals of about .17 millim., approximately vertical to primaries. Dermal skeleton composed of a rather close rectangularly-meshed reticulation; fibres about .04-.07 millim. thick, apparently covered in parts by a thick incrustation of foreign bodies. Sarcode transparent, very pale yellow-brown.

Spicules:—(1) Acuate, or with slightly constricted base, either smooth or with the base minutely spined, moderately curved, tapering gradually from base to sharp point; size .023 by .011 to .013 millim. (echinating the apices of primary fibres). (2) Spined acuate, straight; a head slightly indicated by a subterminal neck, spines minute to moderate-sized, placed at right angles to long axis; size of spicule .075 by .0063 millim. (echinating fibres of main skeleton). (3) Subspinulate or acuate, smooth, almost straight, tapering gradually from

near centre to sharp points; size  $\cdot 32$  by  $\cdot 0063$  millim. (in axis of outer extremities of primary fibres, and loose in the meshes of the skeleton). (4) Tricurvate acerate, smooth; the curves bold; tapering to sharp points; size  $\cdot 076$  to  $\cdot 12$  by  $\cdot 0032$  millim. (in sarcode). (5) Equianchorate, shuttle-shaped, shaft slender, slightly and gradually curved, palms each about one third the total length of the spicule; length  $\cdot 025$  millim.

*Hab.* Marie Louise Island, Amirante group, 17 fms.: bottom coral.

The specimen on which this species is based coats continuously for a distance of 100 millim. (4 inches) most of the circumference of a stem (probably algal) 3 millim. in thickness. The surface of *Spongia vulpina*, Lamarek, in the Museum at the Jardin des Plantes, Paris, decidedly recalls this sponge; but that species is tall, stipitate, and arborescent, with a superficial spicular incrustation, and hence is rather referable to *Rhaphidophlus* than *Clathria*; it seems to want the tricurvate acerate spicule of the present species.

One remarkable point about the species is the unusually great proportion of horny matter to spicules in the fibres. This is also shown in *Tenacia clathrata*, Schmidt, of the W. Indies, which, besides its clathrous habit, differs from this species mainly in the very coarse horny fibre, the considerably superior dimensions of the smooth acuates, and the rather clumsy form of the spined echinating spicules.

### 37. *Acarnus ternatus*.

See Part I., p. 453, of this Report.

A young specimen. The tricurvates are somewhat shorter, thicker, and more strongly curved than in the Australian specimens.

*Hab.* Ile des Neufs, Amirante Islands, 15 fms.

### ECHINONEMA, Carter.

This genus was nominally established in 1875 (Ann. & Mag. N. H. 1875, xvi. p. 185), in Mr. Carter's "Notes Introductory to the Study and Classification of the Spongida," by the insertion of the words "*Echinonema typicum*, C., MS.," under the Group Pluriformia, Family Ectyonida, of the Order Echinonemata; but its characters were not made known until 1881 (*op. cit.* 1881, vii. pp. 378-380), when Mr. Carter somewhat briefly described two species under this name, viz. *E. typicum* and *E. anchoratum*, without, however, giving any definition of the genus. I have been able to examine a considerable number of the specimens thus identified by Mr. Carter, and find them to be nearly allied to *Rhaphidophlus* of Ehlers (Espersch. Spong. pp. 19, 31) and to *Clathria*, Schmidt, having the same general character of spiculation and arrangement of the skeleton as these genera, but differing from *Clathria* in having a non-fibrous and purely spicular cortical layer, composed of acuates or spinulates with their points directed outwards, and while agreeing with *Rhaphidophlus* in this point, differing from it in the possession (not

mentioned by Carter, *ll. cc.*) of a fine tricurvate acerate flesh-spicule in addition to an equianchorate. A third species, *E. vasiplicata*, assigned by Carter (*op. cit.* 1882, x. p. 114) to the genus belongs, as I have stated in my report on the Australian collections (Part I. p. 454), not to this genus, but to *Echinodictyum*, mihi. The genus was not met with by the 'Alert' on the north and east of Australia, although it is common on the south and south-west (Carter); it is a little strange therefore to find the following two species in the western part of the Indian Ocean.

### 38. *Echinonema*, sp.

A small, irregularly-grown specimen in spirit, consisting of an extended coating base and three low lobes, more or less flattened, two of them uniting with each other. Surface corrugated by low meandering ridges, giving an irregularly dimpled aspect to the surface; dermal membrane upon the ridges glabrous. Vents small, scattered, oval or circular, .6 to 1.0 millim. in diameter, generally placed on margins or in depressions rather than in the middle of surfaces. Consistence in spirit firm, very tough, elastic; colour dull umber-brown.

Main skeleton approximately rectangular in arrangement, the primary fibres being set vertically to the surface, and the secondaries parallel to it, but with their ends curved round to meet the primaries; fibre very strong, pale to dark amber-yellow in colour: the primary fibres about .14 millim. thick, and cored for one to two thirds of their thickness by subspinulate spicules; secondary fibre .07 to .14 millim. thick, either devoid of spicules or cored by at most two series. Dermal skeleton formed by a set of radiating tufts of subspinulate spicules, the bases of the tufts being placed about .25 millim. apart, and the ends of the spicules of the different tufts intercrossing. Sarcoderm pale yellowish brown, subtransparent. Spicules:—(1) Skeletal and dermal subspinulate; head slight, oval, provided with a few very fine terminal spines; head of about the same diameter as middle of shaft; tapering gradually to sharp point; size .26 by .008 millim. (2) Echinating spined subspinulate; the head and distal two thirds well spined; spines strong, sharp, projecting at right angles to surface; size of spicule .1 by .0085 millim. (3) Tricurvate acerate of sarcoderm, median curve rather sharp; size .04 by .001 millim. (4) Equianchorate, navicular, shaft slightly curved; length of spicule .012 millim.

*Hab.* Etoile Island, Amirante group, 13 fms.; attached to dead coral.

This species is evidently nearly related to *E. typicum* and *E. anchoratum* of Carter, from its resemblance in external form and in spiculation. The structure of the dermal "crust" is essentially the same as that described by me in the nearly allied genus *Rhaphidophlus* (see *R. arborescens* and *R. procerus*, Part I. pp. 450-1, of this Report).



39. *Echinonema gracilis*. (PLATE LIV. figs. *l, l'*.)

Erect, very slender, branching dichotomously and seldom; branches given off at angles of from about  $60^{\circ}$  to  $90^{\circ}$ , cylindrical or irregular, sometimes somewhat flattened, diameter 2 to 5 millim. Surface smooth. Vents not apparent. Consistence in spirit soft, elastic, very compressible, rather tough; colour very dark purplish brown.

Main skeleton subrectangular in arrangement; primary fibres  $\cdot 05$  to  $\cdot 07$  millim. in diameter, pale yellow, almost filled with the skeleton-spicule; secondaries  $\cdot 035$  to  $\cdot 05$  millim. in diameter, containing one or two series of spicules. Dermal skeleton consisting of radiating tufts of subspinulate spicules, the bases of the tufts about  $\cdot 25$  millim. apart, the points of adjacent tufts crossing each other. Sarcoderm of interior dark yellow, granular; that of dermis transparent, very pale purple. Spicules:—(1) Subspinulate of skeleton and dermis, straight, shaft smooth, head provided with a few terminal very fine spines; head oval, of about same diameter as middle of shaft, neck slight; spicule tapering gradually to sharp point; size  $\cdot 34$  by  $\cdot 012$  millim. (2) Acuate, minutely spined on base, straight, tapering gradually to sharp point; size  $\cdot 25$  by  $\cdot 014$  millim. (in centre of primary fibre). (3) Echinating spined subspinulate, tapering to sharp point from two or three diameters from end, well spined over head and distal two thirds; the spines sharp and strong, those on shaft recurvate towards head; size of spicule  $\cdot 082$  by  $\cdot 013$  millim. (4) Tricurvate acerate of sarcoderm, smooth, middle curve bold; size  $\cdot 057$  by  $\cdot 001$  millim. (5) Equianchorate, navicular, shaft slightly curved; length of spicule  $\cdot 02$  millim.

*Hab.* Providence Reef, Mascarene Islands, 24 fms.; bottom, sand and dead coral.

Several small and more or less imperfect specimens in spirit; the largest measures 75 millim. (3 inches) in length. In the slender proportions of the sponge (which gives it the appearance of a *Raspailia*) and in the weak development of the horny fibre this species stands quite apart from the Australian species as well as from the foregoing form.

## AXINELLIDÆ.

Of the four species to be enumerated, one is found also on the southern and one on the west northern coasts of Australia. The very variable character of the surface of *Leucophleus proteus* is a somewhat unusual manifestation of the polymorphism of Sponges.

40. *Axinella spiculifera*. (PLATE LIV. fig. *b*.)

*Spongia spiculifera*, Lamarck, *Ann. Mus. Hist. Nat.* xx. p. 449.

A specimen in spirit, agreeing well with the fragment in the Museum which represents Lamarck's species. It consists of two



approximately cylindrical stems, 50 by 13 and 80 by 20 millim. respectively in greatest height and thickness, arising close together from a common rocky base. The lower end of the larger one is almost smooth for a distance of about 8 millim.; the remainder, as well as the whole of the smaller stem, is beset with small, slender, wedge-shaped or pyramidal eminences, sometimes forked, 2-3 millim. high, about 2 millim. in diameter at their bases and 2-4 millim. apart at their summits; the general surface between these processes is honeycombed with circular openings, .5 to 1.0 millim. in diameter and .25 to 1.0 millim. apart. Consistence rigid, slightly compressible, tough. Colour very pale buff.

Skeleton typically *Axinella*-like; fibre 3 or 4 spicules broad; spicules united by dense, very pale yellow horny fibre; axial meshes close, .18 to .3 millim. across, the reticulation extending to exterior of sponge. Sarcode pale yellow, subtransparent. Spicules smooth acuminate, curved more or less boldly at from one third to one half of the distance from the base; base well rounded; spicules tapering to sharp points from about their middle; size .35 by .019 millim. In Lamarek's specimen the surface-tufts are smaller and only 1-2 millim. apart, the sponge is more flattened than here, and the spicules are slightly smaller, viz. .31 by .018 millim.

*Hab.* Darros Island, Amirante group, 22 fms.

*Distribution.* King Island, Australia (*Lamarek*).

#### 41. *Axinella proliferans*. (PLATE LIII. figs. E, E' ;

PLATE LIV. fig. c.)

Erect, with short flattened stem, expanding into flabellate fronds, which towards their ends proliferate into secondary flabellate frondlets which assume a course parallel to that of the main frond; as the latter is frequently plicate at its free margin, the aspect on looking down at a large specimen from above is that of a number of irregular funnel-shaped cells, bounded by lamellar walls, roughened by very numerous slashed ascending ridges. Surface of frond beset, at intervals of about 4 millim., with sharp ridges 3-4 millim. high (5 or 6 millim. near upper margin); the ridges notched at intervals of about 3 millim. by ascending teeth, 1-3 millim. high, or altogether replaced by longitudinal series of flattened, notched teeth.

Vents in spirit-specimen formed by circular openings, 1-2 millim. wide, leading obliquely downwards, scattered between the bases of the lacinate surface-tufts and ridges of the sponges, chiefly near the free margins of the latter. Texture in dry state tough, sub-elastic; of stem and midribs firm, woody, of margins of fronds and ridges flexible; in spirit, all parts relatively more pliable. Colour in dry state pale yellow-brown to rufous-brown, in spirit pale salmon-colour.

Cortical skeleton appearing on margins of surface-tufts and in some places on face of frond as tufts composed of a few of spicule no. 1, connected by their bases; in main stem consisting of confused linear

spicular columns radiating horizontally from the axial skeleton, but much disguised by crossing spicules, sometimes united into secondary fibres. Axial skeleton—the longitudinal lines strong, but in basal parts of sponge confused by close aggregation; the axis of the flabellate parts is composed, on the contrary, of a dense mass of horizontally arranged spicules, from which the short dermal tufts project so as to appear on the surface of the sponge. Bases of spicules of radiating lines and much of the entire axial spicular column enveloped in a tough transparent substance, amber-yellow in dry, salmon-colour in spirit-specimens.

Spicules:—(1) Acuate, smooth, curved slightly but rather abruptly at from one third to one half the distance from the base: tapering gradually from about middle, more rapidly from about three fourths of length, to sharp points, and sometimes slightly towards base; base rather squarely rounded; size  $\cdot 55$  by  $\cdot 032$  to  $\cdot 045$  millim. (forms chief part of the axial and radial columns and the secondary fibres). (2) Acuate, smooth, straight or slightly curved, tapering gradually to fine points from about one fourth of the length from the apex; base well rounded; size  $\cdot 5$  to  $1\cdot 8$  by  $\cdot 015$  to  $\cdot 02$  millim. (sparingly, in company with no. 1, in most parts; especially, attached to bases of radiating columns, and projecting outwards in a direction parallel to them).

*Hab.* Providence Island, Mascarene group, 18 and 19 fms.; bottom coral.

Two small specimens in spirit, one large dried dredged specimen, and two medium-sized beach-worn specimens represent the species; the largest measures 120 millim. (5 inches) in both greatest height and lateral extent; the stem is 20 millim. in greatest lateral by 8 millim. in greatest antero-posterior diameter. The species has much of the external appearance of *Spongia carduus*, Lamarek, of the Paris Museum, the spiculation of which, however, refers it to another genus. It differs from all the species described by Schmidt from European and W.-Indian seas in the absence of an acerate spicule; in the great stoutness of the main acerate it approaches *A. mastophora* of that author, from Florida. In general habit it resembles *Acanthella* rather than *Axinella*, but wants the long undulating cylindrical spicule hitherto found in species of that genus; it appears doubtful whether the existence of such species as this should not induce us to unite the two genera. I have been unable to identify it with any described species; the large stout acerate appears to be the most distinctive characteristic.

### LEUCOPHLEUS.

*Carter, Ann. & Mag. N. II.* 1883, xii. p. 323.

In its affinities this genus appears to be Axinellid; it is distinguished from *Axinella*, s. str., by its loose yielding texture, the skeleton-fibres being loosely united, but containing a dense keratose

or sarcodic material, and a single form of spicule, viz. smooth acuate of considerable length, and by the presence of a regular dermal skeleton composed of spicules laid horizontally. I do not know any other species except the original one, *L. massalis*, Carter, and the two described below.

42. *Leucophlœus proteus*. (PLATE LIII. fig. B; PLATE LIV. fig. k.)

Massive, suberect; irregularly columnar near base, showing a tendency to terminate above in several short and thin membranous or prismatic lobes, which by anastomosis *inter se* enclose cellular spaces, within which the chief excretory canals open. Surface very variable in character in different specimens; either rough or even and glabrous near the base, towards apex longitudinally ridged and grooved, leading up into the membranous expansions just described, and hispid with closely set, upwardly-directed sharp points, 1-2 millim. high, tending to coalesce into ridges, and terminated by single projecting spicules. Vents opening either upwards at the bottom of the spaces enclosed between the terminal lobes, or laterally between the larger lateral ridges, 1-3 millim. in diameter. Consistence in spirit—that of solid basal part firm, rather elastic, that of upper lacinate parts compressible, elastic; colour, surface reddish purple, interior dull pale brown. Main skeleton formed of very loose spicular tracts, 5-10 spicules broad, passing outwards from the centre of the sponge, at distances of about .28 to .6 millim. from each other, branching at acute angles, but maintaining a direction subparallel to each other, and not crossing. No visible horny uniting substance; spicules connected by a yellowish sarcode, rather darker than the interstitial sarcode. The terminal spicules of the fibres either penetrate or support the dermal membrane. Dermal skeleton consisting of irregular tracts of spicules laid obliquely or vertically along the ends of the main-skeleton fibres. Sarcode subtransparent, yellowish brown in centre, bright reddish purple at surface. Spicules smooth acuate, bluntly rounded at base and tapering gradually to sharp points from about the middle; size about 2.5 by .032 millim.

*Hab.* Providence Reef, Mascarene group, 24 fms.; bottom, sand and dead coral.

Of the two spirit-specimens from which this description is drawn up, the largest has the variable surface characters above described, and must have been 50 millim. (2 inches) high by 25 millim. broad when perfect; its basal portion is very irregularly formed, being curved to one side and ending in a cup-shaped depression, by which it was perhaps attached to a shell or other foreign body; the smaller specimen has lost its base. The specific name, *proteus*, is intended to commemorate the variability of the outward form.

The general habit is that of *L. massalis* and *fenestratus*; but the spicules differ from those of the former in being about five times as

long, from those of the latter in the greater relative stoutness of the basal end and in their superior length (about twice that of *fenestratus*).

43. *Leucophlœus fenestratus*, var. (PLATE LIII. fig. A.)

See Part I., p. 464, of this Report.

A spirit-specimen and some fragments, combining the external characters (viz. erect, laminate, with the upper portion echinated by fine upwardly directed processes, and with smooth, thick basal portion) of *Leucophlœus proteus*, mihi, with a spiculation of the character of *L. fenestratus*. The outward form of these two species is, however, essentially the same, and the differences observed in this point are mainly individual. The present specimen, linking the Australian to the more western form, has decided a doubt which I had as to the rightful position of the former species in the genus. The specimen is young, measuring 50 millim. (2 inches) in height by (including a fragment which appears to belong to it) 35 millim. in greatest diameter (that of the base). It consists of a massive basal portion, enclosing a large quantity of calcareous matter (Nullipore, &c.), and of a slender flattened expansion, 20 millim. high, 10 millim. broad, 4 millim. thick, arising from it; the base is glabrous, the surface being formed by a thin, transparent membrane, loosely attached. Main skeleton consisting of compact spiculo-fibres about 10 spicules broad, and of broad expansions containing a large number of spicules loosely aggregated. There is no sign of horny uniting substance. Spicules tapering gradually from near the centre, or about midway between the centre and base, to a smaller rounded basal extremity, which is about one half the maximum diameter of the spicule; spicule tapering rapidly to moderately sharp point from two or three diameters from apex; size of spicule .8 to 1.1 millim. by .02 to .032 millim. (a considerable range for only two or three specimens). The spicule has thus practically the same form as in both the Australian varieties, and in its range of dimensions connects the two. The colour, which is purple, as in *L. proteus*, but pale, is possibly derived from some purple sponges which had been kept in the same vessel.

*Hab.* Providence Reef, Mascarene group, 24 fms.

### SUBERITIDÆ.

The few species received illustrate well the wide affinities of Sponges from this district. *Tethya*, s. str., which was not found on the northern and eastern coasts of Australia, but which is recorded by Bowerbank from the west coast, appears here also, in the shape of a species described by Bowerbank from Freemantle. Of the two new species of *Spirastrella*, *S. transitoria* appears to throw fresh light on the homologies of the spinispirular spicule. The *Vioa* is identical with a Mediterranean species.



44. *Suberites*, sp.

A dull red-brown, smooth, incrusting film, about .5 millim. thick; the closely-set spinulate spicules measure about .8 by .02 millim.; the head is distinct, suboval, approaching a globular form, and of about the same diameter as the shaft. No other spicule. The species is perhaps nearly allied to *S. antarcticus*, Carter.

*Hab.* Seychelle Islands, 12 fms.

45. *Vioa schmidtii*.

*Vioa johnstoni*, var., *Schmidt, Spong. Atl. Geb.* p. 5.

*Vioa schmidtii*, *Ridley, P. Z. S.* 1881, p. 130.

*Vioa Schmidtii*, *Carter, Ann. & Mag. N. H.* 1882, ix. p. 354.

The specimen agrees with Schmidt's species from the Bocche di Cattaro (Adriatic), which Mr. Carter and myself have agreed in considering distinct from the original *V. johnstoni* from Sebenico. As the species has never been fully described, I give a description of the present specimen.

Main cavities formed by sponge botryoidal, wide. Colour of sponge bright pink to crimson. Vent- and pore-areas .5 to 1.5 millim. in diameter. Sarcode pale pink, for the most part very diffusely coloured, transparent. Spicules:—(1) Spinulate, smooth, straight or slightly curved, tapering gradually to sharp point; head large, oval, longitudinally elongate, distinguished from shaft by distinct neck, the diameter of which is .006 millim.; length of spicule .28 millim., diameter of shaft .008 millim., of head (transverse) .0095 millim. (2) Spinispirular, stout, with 4–6 sharp bends; spines sharp, arranged in regular uniserial spirals, 5 or 6 to a bend, length the same as thickness of the shaft; size of spicule .05 by .006 millim. (excluding spines). (3) Spinispirular, slender, with about 8–10 gradual bends, 5 or 6 to a bend; size of spicule .075 by .002 to .0042 millim. (excluding spines). Spicule no. 1 is generally loosely scattered; no. 3 sometimes aggregated in dense masses.

*Hab.* Eagle Island, Amirante group, 10 fms. (in base of lobate *Madrepora*).

*Distribution.* Adriatic (*Schmidt*).

The stout spinispirular appears to be normally confined to that side of the sponge which is in contact with the matrix, the slender one to occupy the internal sarcode; but they also occur mixed. Although the two kinds of spinispirular spicule approach each other somewhat nearly in the diameters of their adult forms, yet the longer spines and the constantly inferior length and inferior number of bends, and the superior sharpness of the bends, in the stouter form sufficiently distinguish it from the slender form. A further argument against the possibility of the two forms being merely stages of growth of one spicule is derived from the fact that the more slender form (which, from the analogy of siliceous sponge-spicules generally, would on this hypothesis be the young form of the other) is actually



longer and has more bends than the stout form, which could thus only have been derived from it by fission or retrogressive absorption, methods unknown, so far as I am aware, in the normal development of siliceous sponge-spicules.

#### 46. *Spiraustrella transitoria*. (PLATE LIV. figs. *q*, *q'*.)

Sessile, incrusting. Surface broken up by slight intercrossing ridges into very shallow angular areas 1 to 2 millim. wide; surface between and over ridges subglabrous. Consistence in spirit tough, elastic; colour pale pinkish brown.

Main skeleton chiefly composed of dense fascicles of the skeleton-spicule, with the points radiating outwards, set at various angles to the surface, viz. from right angles to a horizontal position; the points of the bundles frequently project slightly beyond the surface. Sarcode dense; that of surface subtransparent, dark greenish yellow; of subjacent tissues very pale yellow, transparent.

Spicules:—(1) Skeleton spinulate, straight or nearly so; head spherical, neck distinct; head and centre of shaft of about the same diameter, viz. .016 millim.; shaft tapering to sharp point from about 7 diameters from apex; length of spicule about .9 millim. (2) Spinispirular, extremely concentrated, composed of only one entire bend; spines numerous, closely aggregated, strong and sharp; shaft about .004 millim. thick; spines .004 millim. long; length of spicule, including spines, .016 millim.

*Hab.* Darros Island, Amirante group, 22 fms.; bottom broken coral.

This species is represented by a specimen of about 1 square inch in superficial extent, covering and following the inequalities of a small mass of shells and Polyzoa; the thickness varies from about .5 to 2 millim. It appears to be most nearly related to the form termed by Mr. Carter (*Ann. & Mag. N. H.* 1882, ix. p. 352) "*Spiraustrella cunctatrix*, variety," from Mauritius; but this form is stated to be white, to have a spinispirular with *two* bends, of a length of about .036 millim. It differs from *S. cunctatrix*, Schmidt, in the shorter spinispirular, and the globular, not oval, head of the spinulate. In *S. transitoria* we have the spinispirular almost in the form of the stellate, with which Schmidt (*Spong. Atl. Geb.* p. 5) and Carter (*op. cit.* 1879, iii. p. 355) consider it to be homologous.

#### 47. *Spiraustrella punctulata*. (PLATE LIV. figs. *p*, *p'*.)

"*Suberites*? sp. undescribed, Mauritius," Carter, *Ann. & Mag. N. H.* 1882, ix. p. 352.

Elongated, subconical. Vents single or few, terminal, oval, about 2 millim. in greatest diameter. Surface obscurely nodose, and covered besides on the upper parts of the sponge with a minute, but close and regular pitting, giving the appearance of shagreen; pits and intermediate elevations low, each about .3 millim. in diameter:

lower part of sponge glabrous. Consistence is spirit very tough, elastic; colour dull olivaceous brown.

Main skeleton rather loose, formed of broad tracts of loosely aggregated spicules, horizontally or obliquely arranged with regard to the surface, and of intercrossing spicules loosely scattered between them; that of the cortex, which forms a denser layer, consists of more compact bundles, 10 to 15 spicules broad, placed vertically with regard to the surface, from which their points project; the bundles are from  $\cdot 1$  to  $\cdot 14$  millim. apart. Sarcode subtransparent, bright greenish brown, crowded with globular cells about  $\cdot 011$  millim. broad, with large nucleus and one or more opaque granules.

Spicules:—(1) Skeleton spinulate, smooth, straight or slightly curved; head oval, longitudinally elongate, slightly flattened at free end, of about same diameter as middle of shaft, tapering gradually from centre of shaft to sharp apex; size of spicule  $\cdot 4$  by  $\cdot 013$  millim. (2) Spinispirular, short, slender, consisting of about four bends, about 6 spines to a bend; spines sharp, about  $\cdot 002$  millim. long; size of spicule  $\cdot 02$  by  $\cdot 002$  millim. (exclusive of spines).

*Hab.* Mozambique, between tide-marks.

*Distribution.* Mauritius (*Carter*).

The greatest height of the single spirit-specimen representing this species is 65 millim. ( $2\frac{1}{2}$  inches), the greatest diameter 25 millim.; its form is that of a much drawn-out, truncate cone, compressed so that the long diameter is about twice that of the small one; there is a nodular process, 5 millim. high, on one side near the extremity; the base includes a large amount of coarse foreign bodies. The characters agree well with those given by Mr. Carter (*l. c.*) for a fragment from Mauritius. It is nearly related to *Hymeniacidon angulata* of Bowerbank (Madeira), and *vagabunda* and *decumbens*, mihi (Australia, this Report, Part I. pp. 468, 470); but it is distinguished readily from all by its very short spinispirular spicule.

#### 48. *Tethya cliftoni*.

*Tethya cliftoni*, *Bowerbank*, *P. Z. S.* 1873, p. 16, pl. iii. figs. 14–18.

A single specimen, cream-white, covered with low papillæ about 1.5 millim. in diameter. The species, unless the separation of the large stellates into two distinct dermal zones proves to be constant and distinctive, can hardly be kept distinct from *T. ingalli* (Freemantle, Australia) and *T. robusta* (Australia), both of Bowerbank, the chief difference being in the diameter of the acute, which in *T. cliftoni* is about  $\cdot 025$  millim., in *T. ingalli*  $\cdot 035$  millim., and in *T. robusta*  $\cdot 045$  millim. Again, all three species are scarcely more than varietally distinct from *T. lynceurium* of Europe, differing from it mainly in the greater distinctness of the heads of the small stellates.

*Hab.* Seychelle Islands, 12 fms.

*Distribution.* S.W. Australia (*Bowerbank*).

## TETRACTINELLIDA.

As usual with shallow dredgings like those of the 'Alert,' the family Choristidæ is alone represented. The proportion of species to the rest of the collection is about the same as in the Australian collection; but we miss the genera *Geodia* and *Placospongia*, which might have been expected to occur here. The remarkable group with discoid dermal plates which stands between *Geodia* and *Stelletta* is represented by a new species.

## CHORISTIDÆ.

49. *Tetilla dactyloidea*.

*Tethya dactyloidea*, Carter, *Ann. & Mag. N. H.* 1869, iii. p. 15, figs. 1-5; 1872, ix. p. 82, pl. 10. figs. 1-5.

A somewhat imperfect specimen, having, however, probably had somewhat the form of *Thenea wallichi*, Wright, when perfect—*i. e.* not produced upwards into the long cylinder figured by Mr. Carter, but depressed and agariciform. Its diameter is much greater than that of Carter's specimen, viz. 40 millim. ( $1\frac{1}{2}$  inch); its present height is 25 millim. (1 inch). The spicules agree closely with Mr. Carter's descriptions and figures, with the exception that the forked anchor does not exhibit a constant inequality in the length of the arms.

*Hab.* Glorioso Islands, low water.

*Distribution.* S.E. coast of Arabia (Carter).

## ERYLUS, Gray.

*Stelletta*, pars, Schmidt, *Spong. Adr. Meer., Spong. Küst. Alg., Spong. Atl. Geb.*; Carter, *Ann. & Mag. N. H.* 1880, v. p. 135.

*Erylus* and *Triate*, Gray, *P. Z. S.* 1867, p. 549.

*Discifera*, of subsection *Pycnodermata* of group *Stellettina*, Carter, *Ann. & Mag. N. H.* 1883, xi. p. 348.

I have already indicated (Part I. pp. 471, 472) that the species called by Schmidt *Stelletta*, but provided with disks composed of modified trichites, should be definitely separated from that genus. I adopt for this distinct group the generic term which Dr. Gray assigned to *S. mamillaris*, Schmidt. It may be characterized as:—Comprising Choristid Tetractinellida with the surface covered by a layer of detached discoid trichite globates, and having besides a zone-spicule and small stellates with slender and few rays. Form lobate. Vents single or multiple.

It differs from *Geodia* in the discoid form of the trichite masses and their independence of each other (in *Geodia* they are united by ligaments). It includes the described species *Stelletta euastrum*, *S. mamillaris*, and *S. discophora*, Schmidt, and *S. euastrum*, Carter. *Stelletta geodina* and *S. intermedia*, Schmidt, should be referred to *Geodia*.

50. *Erylus cylindrigerus* \*.(PLATE LIII. fig. M; PLATE LIV. figs. *c-c''''*.)

Massive, suberect; terminating above in a lobate prolongation. Surface smooth, slightly uneven. Vents one (or more?) near apex of sponge, about 2 millim. in diameter, opening flush with surface, leading obliquely and deeply downwards into sponge. Texture in spirit tough, firm, but somewhat flexible; colour in spirit dark brown, almost black. Skeleton composed of bundles of spicule no. 1, 6-8 spicules broad, radiating from centre to just below surface, .17 to .3 millim. apart near surface. Surface covered with a layer about .1 millim. thick of the discoid spicule no. 2, arranged horizontally. Sarcode subtransparent, very pale brown, almost colourless.

Spicules:—(1) Zone-spicules subcylindrical, smooth, straight or very slightly and gradually curved, tapering from within about six diameters of ends to rounded terminations of about one third the diameter of the middle of the shaft; size about .7 by .032 millim. (2) Discoid, of subdiamond-shaped outline, viz. that of a rhombus with the angles rounded off; length .21 to .28 millim., breadth .1 to .14 millim., thickness about .04 millim.; covered with minute low punctiform spines, about .012 millim. apart (spines, as seen under a high power from above, stellate in outline; they are multifid terminally). (3) Acerate, smooth, slightly and gradually curved, tapering to sharp points from centre; size .06 by .0032 millim. (scattered abundantly throughout sarcode). (4) Stellate, with about 10-12 straight rays .003 millim. thick at base, tapering to sharp points, springing from a slight central body .01 to .013 millim. in diameter; expanse of spicule about .05 millim. (5) Stellate like the preceding, but arms about 16 in number and expanse about .02 millim.

*Hab.* Providence Reef, Mascarene group, 24 fms.; bottom, sand and dead coral.

A single specimen with a somewhat spreading base, which encloses calcareous fragments, rising into a subcylindrical, terminally rounded, finger-like column, 30 millim. high and 12 millim. in mean diameter, slightly overgrown by a delicate Sertularian Hydroid; extreme diameter of base 40 millim.

The species is most closely allied to *Stelletta euastrum*, Schmidt, from Algiers, and to forms so named by Carter (Ann. & Mag. N. H. 1880, v. pp. 135, 136) from Ceylon and Australia, which perhaps represent another species. Instead of the trifid zone-spicule with bifurcate arms found in Schmidt's species, it has simply a subcylindrical spicule, usually blunt at both ends, and wants the long slender acerate; the few-armed stellate has its arms more numerous (10-12 instead of 2-4, which is the range represented by Schmidt's

\* From the cylindrical zone-spicule.

preparation, although he says that the range is great); and I do not find in Schmidt's species the small multiradiate stellate which occurs here; the granulations on the surface of the disk are much coarser in this species. In having lost the trifid head of the zone-spicule it exhibits the same tendency as that which seems to have led in *Ancorina aaptus*, Schmidt, to the loss of all tetraradiate characters.

Early stages of the acerate spicule (no. 3) exhibit the central inflation found in the young acerates of some *Reniereæ* and *Spongillidæ*.

### 51. *Stelletta acervus*.

*Ecionemia acervus*, Bowerbank, P. Z. S. 1873, p. 322.

There appears to be only one form of minute stellate; those stellates in which the arms are small, relatively to the body, seem to be the young form of the longer-armed adult; the arms are very slightly capitate, as shown by Dr. Bowerbank's preparations and still more plainly in the present specimen, and vary in number from about 5 to about 12. The small acerates are scantily present in the cortex. Dr. Bowerbank considered his specimen to have been originally fixed, but the actual base was absent; the present specimen is decidedly free, and has an oval shape.

*Hab.* Etoile Island, Amirante group, 13 fms.

*Distribution.* Fiji Islands (Bowerbank).

### 52. *Stelletta purpurea*, var. *parvistella*, nov.

See Part I., p. 473, of this Report.

A small oval specimen  $7\frac{1}{2}$  millim. long, destitute of a vent, and of a purple colour, undoubtedly represents this species in a somewhat modified form. Thus the stellates do not exceed .0095 millim. across the arms, and usually measure about .007 millim., and the arms are generally more numerous than in the Australian specimens. The skeleton-spicules are also somewhat smaller, viz. :—diameter of shaft of zone-spicule .032 millim., of anchor about .023 millim., of acerate about .025 millim.; the arm of the zone-spicule curves boldly backwards, but does not make an angle in its course like that of var. *retroflexa*, mihi. The small size of the skeleton-spicules is perhaps partly due to the youth of the specimen. The variety approaches the form obtained in the Arafura Sea the most closely.

*Hab.* Providence Reef, Mascarene group, 24 fms.



## CALCAREA.

No Calcarea from this district are recorded in Hæckel's 'Kalkschwämme' (1872); but Schuffner (Jenaisch. Zeitsch. xi.) in 1878 described several species from Mauritius, where they were collected by Prof. Möbius.

## LEUCONIDÆ.

Two very widely distributed known species, a second species added to a hitherto monotypic genus (*Leucortis*), and a known Mascarene species, all belonging to the Leuconidæ, represent in this collection the Calcarea of the Western part of the Indian Ocean.

53. *Leucetta primigenia*, var. *megalirrhaphis*.

*Leucetta primigenia*, var. *megaraphis*, Hæckel, *Kalkschwämme*, ii. p. 118.

Two subglobular specimens 9 and 18 millim. in diameter, respectively, of the *Dyssycus*-form. Colour in spirit pale brown. Hæckel states that this variety is rare, but does not give localities. In the specimen which I examined, the small triradiates are chiefly confined to a thin cortical layer.

*Hab.* Seychelle Islands, 12 fms.

*Distribution of species.* Almost cosmopolitan.

54. *Leucaltis bathybia*, Hæckel, var. *mascarenica*, nov.

(PLATE LIV. figs. *a*, *a'*.)

*Kalkschwämme*, ii. p. 156, pl. xxviii. fig. 2.

Some specimens of the *Amphoriscus*-form, composed of branching and anastomosing tubes, cylindrical or somewhat compressed, 2·5 to 3·5 millim. in diameter; lumen 1·5 to 2·5 millim. wide, wall about ·5 millim. thick. Colour dull umber-brown to cream-colour. The large quadiradiates are very large, viz. rays about ·07 millim. thick, and rather short, with a long apical ray projecting into the cloacal cavity, and frequently a basal in the same plane but opposite to the apical; the small triradiates and quadiradiates are very small, viz. rays about ·007 millim. thick, and most commonly have the forms figured in figs. 2 *c*, 2 *d* of Hæckel's plate (*l. c.*), viz. with very large facial angle. The larger triradiates are usually regular, and their rays are about ·04 millim. in diameter. The slight thickness of the body-wall, the proportions of the spicules, and the general form of the specimens (which is simply cylindrical in Hæckel's specimens) distinguish this form from varr. *perimina* and *arabica*, Hæckel; but in the straight or but slightly curved spicular rays it approaches most closely the latter variety.

*Hab.* Darros Island, Amirante group; Seychelle Islands, 4–12 fms.

*Distribution of species.* Red Sea (Hæckel); Port Jackson (Part I., p. 482, of this Report).

55. *Leucortis anguinea* \*.

(PLATE LIII. fig. L; PLATE LIV. figs. d, d'.)

Erect, branched; stem and branches cylindrical, tubular. (Vent opening probably at end of tube and nearly as wide as tube.) Branches given off at angle of about  $140^\circ$  with each other. Wall  $\cdot 25$  to  $\cdot 35$  millim. thick; lumen of tube  $\cdot 8$  to  $1\cdot 2$  millim. in diameter. Outer and inner surfaces even, smooth. Consistence in spirit elastic, compressible (colour probably white or grey naturally, at present pale purple, probably derived from other sponges). Skeleton mainly composed of triradiate spicules; those (1) of outer surface sagittal, with large facial angle, viz.  $150^\circ$  to  $170^\circ$ , the distal three fourths of the lateral rays being, in the latter case, bent back so as to be nearly in a line with each other; basal ray about  $\cdot 28$  millim. long, laterals  $\cdot 16$  to  $\cdot 22$ , diameter of rays at base  $\cdot 013$  to  $\cdot 019$  millim. Surface triradiates occasionally provided with a short stout apical ray. (2) Triradiates of inner and central part of wall either sagittal, with facial angle of about  $140^\circ$ , the rays as in the surface-spicules, or subregular, the angles being about  $120^\circ$  each and the lateral rays slightly unequal; in both cases the lengths and diameters of the rays as in the surface-spicules. Rays of triradiates, except in the case above mentioned, almost straight, tapering from base to point. (3) Linear spicules of general body-wall, stout, fusiform, acerate, slightly curved, tapering equally to similarly sharp points at both ends; size  $\cdot 65$  by  $\cdot 032$  millim.; scattered singly at right angles to surface, points not projecting except at peristome slightly. (4) Fine acerate? of peristome, length probably about  $\cdot 22$  millim., thickness  $\cdot 0032$  millim.; closely aggregated at outer surface, at right angles to surface (the inner end is sharp, the outer end has not been observed). Canals leading from cloacal cavity small: chambers of canal-system small, inconspicuous. Spicules of centre of wall densely aggregated.

*Hab.* Providence Reef, Mascarene group, 24 fms.; bottom, sand and dead coral.

A single specimen, imperfect at both extremities, represents the species. It is 25 millim. in height, and consists of a short common stem and of two branches, little inferior to the stem in diameter, one of them even increasing in diameter towards its termination.

From the occurrence of the fine linear spicules in some of the first sections which were made it is inferred that they were from a peristome, which was probably almost as wide as the tube and had a slight fringe. The occurrence of a few quadriradiates has been observed also in the only species assigned by Hackel to the genus, viz. *L. pulvinar*, Hackel; and thus, if Hackel's terms were employed, this specimen would be distinguishable as a "connecting variety" under the name *Leucandra anguinea*. This species is markedly distinct from *L. pulvinar* in its slender form, in the relatively small size of the acerate spicules of the body-wall, and in

\* *Anguineus*, snake-like, from the elongate pliable character of the specimens.

the presence in the peristome of fine acerates; the triradiates have their arms straighter than those figured by H $\ddot{u}$ ckel for his species, but their forms and dimensions are about the same in the two species.

#### 56. *Leuconia echinata*.

*Leucandra echinata*, Schuffner, *Jenaisch. Zeitschr.* xi. p. 411, pl. xxiv. fig. 4.

A compressed purse-shaped specimen, with the mouth-opening lost. The outer termination of the acerate is slightly enlarged just before the point, forming a hastate apex, not noticed by Schuffner, who only says that the spicule is "unequally pointed at the two ends." The specimen measures 20 millim. in greatest diameter, whereas Schuffner's did not exceed 10 millim.

*Hab.* Darros Island, Amirante group, 22 fms.

*Distribution.* Mauritius (*Schuffner*).

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# EXPLANATION OF THE PLATES.

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## MELANESIAN COLLECTIONS.

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### HUMAN CRANIA.

#### PLATE I.

Skulls of Torres-Straits Islanders.

Figs. A and B. Side views, one half natural size.

#### PLATE II.

Skulls of Torres-Straits Islanders.

Figs. A and B. Front views.

### FISHES.

#### PLATE III.

Fig. A. *Trachynotus coppingeri*.                      B. *Doryichthys serialis*.

### MOLLUSCA.

#### PLATE IV.

Fig. A. *Octopus polyzenia*, dorsal view; A<sup>1</sup>, ventral view; A<sup>2</sup>, end of hectocotylized arm, lower side; A<sup>3</sup>, lateral view of same.



Fig. B. *Octopus tenebricus*, dorsal view; B<sup>1</sup>, oral aspect; B<sup>2</sup>, end of hectocotylized arm, lateral view; B<sup>3</sup>, lower side of same.

C. — *maculosus*.

D. *Pleurotoma (Drillia) torresiana*, front view; D<sup>1</sup>, side view.

E. — (*Drillia*) *laterculata* (the type). E<sup>1</sup>. Variety.

F. — (*Glyphostoma*) *spurca* (the type). F<sup>1</sup>. Variety.

G. — (*Daphnella*) *arafurensis*.

H. *Cythara cylindrica* (var.). H<sup>1</sup>. Lateral view.

#### PLATE V.

Fig. A. *Murex coppingeri*.

B. — *acanthostephes*.

C. — *macgillivrayi*.

D. *Fusus cereus*.

E. *Tritonidea curtisiana*.

F. *Latirus angustus*.

G. *Turbinella (Tudicula) armigera*.

H. — (—) *spinosa*.

I. *Mitra proscissa* (var.).

K. *Voluta volva* (var.).

L. *Natica limpida*.

M. *Rissoina curtisi*.

N. *Cerithium nigro-balteatum*.

O. — *torresi*.

P. *Trochus (Isanda) coronata* (type). P<sup>1</sup>. Variety; P<sup>2</sup>. Var. *lepida*.

#### PLATE VI.

Fig. A. *Trochus (Thalotia) torresi*.

B. — (*Monilea*) *lifuana*, front view; B<sup>1</sup>, upper surface.

Fig. C-C<sup>2</sup>. *Bankivia (Leiopyrga) picturata*.

D. *Chiton (Ischnochiton) curtisianus*.

E. — ( *Callistochiton* ) *coppingeri*.

F. — ( *Macandrellus* ) *costatus*.

G. — ( *Acanthochiton* ) *asbestoides*.

H. *Haminea cuticulifera*.

I. *Doridium marmoratum*, dorsal view. I<sup>1</sup>, posterior end, showing position of the shell; I<sup>2</sup>, ditto, showing branchiæ; I<sup>3</sup>, oral end; I<sup>4</sup>, inner view of shell.

K. *Pleurobranchus angasi*. K<sup>1</sup>. Shell.

L. *Plocamophorus insignis*, lateral view; L<sup>1</sup>, dorsal view.

M-M 2. *Venus torresiana*.

#### PLATE VII.

Fig. A-A 2. *Cytherea (Caryatis) coxeni*.

B-B 2. *Psammobia gracilentia*.

C-C 1. *Syndosmya elliptica*.

D-D 2. *Mactra (Oxyperas) coppingeri*.

E-E 2. *Teredo (Xylotrya) antarctica*.

F-F 1. *Kellia jacksoniana*.

G-G 1. *Scintilla alberti*.

H-H 1. — *aurantiaca*.

I-I 1. *Diplodonta subcrassa*.

K. — *sublateralis*.

L-L 2. *Leda darwini*.

M-M 1. *Modiolaria varicosa*.

N. — *miranda*.

#### ECHINODERMS.

##### PLATE VIII.

Fig. A. *Asterina brevis*, nat. size. a. Ambulacrum and ventral plates, × 3.

- Fig. B. *Pectinura infernalis*, showing the disk and the variations of the "naked plates,"  $\times 3$ .
- C. *Ophiopanax stellatus*, showing the arrangement of the radial and interradial plates on the disk,  $\times 2$ .

## PLATE IX.

Fig. A. *Cucumaria semperi*.

- B. *Colochirus tuberculosus*. Spicules seen from the side and from below.
- C. *Actinocucumis difficilis*.
- D. *Thyone okeni*. Calcareous ring and œsophagus.
- E. *a* and *b*, spicules of *Stereoderma validum*; *c*, *d*, the same, seen a little out of focus; *e*, a smaller spicule; *f*, a spicule seen in side view.
- F. *Phyllophorus proteus*. F'. Parts of calcareous ring.
- G. *Holothuria macleari*.

All but figs. D and F' are magnified 220 times, and are figures of spicules; D is magnified  $\frac{3}{2}$ , F' twice.

## PLATE X.

- Fig. A. *Antedon carpenteri*, nat. size. A *a*, A *b*, A *c*. First, second, and typical pinnules,  $\times 3$ .
- B. — *pumila*,  $\times 3$ . B *a*, B *b*. First and fourth pinnules,  $\times 3$ .
- C. — *loveni*, nat. size. C *a*, C *b*, C *c*. First, third, and typical pinnules,  $\times 3$ . C *d*, C *e*. Dorsal surface of arms in regions marked *x* and *y* in C,  $\times 3$ .

## PLATE XI.

- Fig. A. *Antedon bidens*,  $\times 2$ . A *a*. A cirrus,  $\times 4$ . A *b*, A *c*. First and third pinnules,  $\times 4$ .
- B. — *decipiens*,  $\times \frac{3}{2}$ . B *a*. Arm-joints from above,  $\times 4$ .

## PLATE XII.

Fig. A. *Antedon reginæ*, nat. size. A a. Cirrus,  $\times 3$ . The arms are correctly figured as thirty-eight in number; five in the text is a misprint.

B. — *gyges*,  $\times 2$ . B a. Cirrus,  $\times 4$ . B b. Second pinnule,  $\times 4$ .

## PLATE XIII.

Fig. A. *Antedon irregularis*,  $\times 2$ . A a, A b, A c. Second, third, and fourth pinnules,  $\times 4$ .

B. — *elegans*,  $\times 2$ . B a. Disk from below. [In the description (p. 162) *thirty* arms instead of *twenty* have been ascribed to this species by inadvertence.]

## PLATE XIV.

*Antedon briareus*, nat. size. a, b. Second and fourth pinnules,  $\times 4$ .

## PLATE XV.

*Antedon microdiscus*, nat. size. a, disk from below; b, second, c, seventh pinnule,  $\times 3$ ; d, cirrus,  $\times 2$ .

## PLATE XVI.

Fig. A a. Basal joints of the second pinnule of *Actinometra solaris*,  $\times 6$ .

A b. Basal joints of the second pinnule of *Actinometra intermedia*,  $\times 6$ .

A c. Basal joints of the second pinnule of *Actinometra robusta*,  $\times 6$ .

B. *Actinometra coppingeri*,  $\times 3$ .

## PLATE XVII.

Fig. A. *Actinometra paucicirra*,  $\times 2$ . a. First pinnule,  $\times 4$ .

B. — *variabilis*, nat. size. a. Second pinnule,  $\times 4$ .

## CRUSTACEA.

## PLATE XVIII.

- Fig. A. *Paramithrax* (*Chlorinoides*) *aculeatus*, var. *armatus*, adult ♂,  $\times 1\frac{1}{2}$ . *a*, lateral view of chela,  $\times 2$ .
- B. *Hyastenus* (*Chorilia*) *convexus*, adult ♂,  $\times 3$ . *b*, lateral view of chela,  $\times 4$ .

## PLATE XIX.

- Fig. A. *Euxanthus tuberculosus*,  $\times 1\frac{1}{2}$  (adult). *a*, inferior view of part of the orbit and antenna, showing the position of the basal antennal joint,  $\times 1\frac{1}{2}$ ; *a'*, outer view of chela,  $\times 1\frac{1}{2}$ .
- B. *Hypocælus punctatus*,  $\times 2$ . *b*, pterygostomian cavity,  $\times 2$ ; *b'*, outer view of chela,  $\times 2$ .
- C. *Banareia inconspicua*, ♂,  $\times 2$ . *c*, frontal region,  $\times 2$ ; *c'*, outer view of chela,  $\times 2\frac{1}{2}$ .

## PLATE XX.

- Fig. A. *Galene granulata*,  $\times 2\frac{1}{2}$ . *a*, frontal region,  $\times 2\frac{1}{2}$ .
- B. *Halimede?* *coppingeri*,  $\times 3$ . *b*, frontal region,  $\times 3$ ; *b'*, outer view of chela,  $\times 3$ .
- C. *Xantho macgillivrayi*,  $\times 2$ . *c*, outer view of chela,  $\times 1\frac{1}{2}$ .

## PLATE XXI.

- Fig. A. *Chlorodopsis granulatus*,  $\times 3$ . *a*, outer view of larger chela,  $\times 3$ ; *a'*, outer view of larger chela of a variety from Port Darwin,  $\times 4$ .
- B. *Pilumnus lanatus*, adult ♂,  $\times 3$ . *b*, outer view of larger chela,  $\times 2$ .
- C. *Pilumnus seminudus*, adult ♀,  $\times 1\frac{1}{2}$ . *c*, Outer view of larger chela,  $\times 1\frac{1}{2}$ .



## PLATE XXII.

- Fig. A. *Pilumnus pulcher*, adult ♂, nat. size. *a*, larger chela,  $\times 1\frac{1}{2}$ .  
 B. *Pilumnus semilanatus*, adult ♂,  $\times 2$ . *b*, larger chela,  $\times 1\frac{1}{2}$ .  
 C. *Pilumnus labyrinthicus*,  $\times 3$ . *c*, outer view of chela,  $\times 3$ .

## PLATE XXIII.

- Fig. A. Inferior view of the frontal, antennal, and part of the buccal regions of *Cryptocaeloma fimbriatum*, ♀,  $\times 8$ .  
 B. *Achelous granulatus*, var. *unispinosus*, adult ♂,  $\times 1\frac{1}{2}$ .  
*b*, inferior view of the antenna and part of the orbit of the same specimen,  $\times 4$ .  
 C. *Goniosoma spiniferum*, ♂,  $\times 2$ . *c*, inferior view of the antenna and part of the orbit,  $\times 4$ .

## PLATE XXIV.

- Fig. A. *Camptoplax coppingeri*,  $\times 4$ . *a*, the frontal and antennal regions, epistome, and palate, viewed from below, magnified.  
 B. *Pseudorhombila vestita*, var. *sexdentata*, ♂,  $\times 3$ . *b*, frontal and orbital regions; *b'*, outer view of chela,  $\times 3$ .  
 C. *Pseudorhombila sulcatifrons*, var. *australiensis*, ♀,  $\times 3$ .  
*c*, frontal and orbital region; *c'*, outer view of chela,  $\times 3$ .

## PLATE XXV.

- Fig. A. *Macrophthalmus punctulatus*, ♂,  $\times 4$ . *a*, outer view of chela,  $\times 4$ .  
 B. *Ceratoplax*? *arcuata*,  $\times 3$ . *b*, orbital region, showing the structure of the antennæ and their position in the orbits, &c.; *b'*, postabdomen of the male,  $\times 4$ ; *b''*, outer view of chela,  $\times 4$ .  
 C. *Ceratoplax*? *laevis*,  $\times 4$ . *c*, orbital region, showing the form of the eye-peduncles and position of the antennæ; *c'*, outer view of chela,  $\times 4$ .

## PLATE XXVI.

Fig. A. Chelipede of *Leucosia craniolaris*, var. *lævimanus*,  $\times 2$ .

B. *Oreophorus frontalis*,  $\sigma$ ,  $\times 4$ . *b*, outer view of chela,  $\times 5$ .

C. *Matuta inermis*, adult  $\varphi$ ,  $\times 1\frac{1}{2}$ . *c*, outer view of chela,  $\times 1\frac{1}{2}$ .

D. *Dorippe australiensis*,  $\times 3$ . *d*, outer view of the chela of a male from Moreton Bay,  $\times 3$ .

## PLATE XXVII.

Fig. A. *Petalomera pulchra*, adult  $\varphi$ ,  $\times 2$ . *a*, anterior view of frontal region,  $\times 2$ ; *a'*, part of the sternum, showing the position of the tubercles terminating the sternal *sulci*,  $\times 2$ ; *a''*, outer view of chelipede,  $\times 2$ .

B. *Paratymolus sexspinosus*,  $\times 4$ . *b*, outer maxillipede, showing the form of the merus-joint; *b'*, outer view of chelipede,  $\times 4$ .

C. Frontal region of *Diogenes rectimanus*, showing the structure of the rostrum, ophthalmic scales, and antennæ,  $\times 4$ . *c*, outer view of chelipede,  $\times 3$ .

## PLATE XXVIII.

Fig. A. *Pagurus hessii*,  $\varphi$ ,  $\times 2$ . *a*, outer view of chelipede,  $\times 2^*$ .

B. Frontal region of  $\sigma$  *Eupagurus compressipes*,  $\times 3$ , showing the form of the eyes, antennal peduncles and their appendages. *b*, outer view of larger chelipede,  $\times 3$ ; *b'*, outer view of smaller chelipede,  $\times 3$ .

C. *Eupagurus kirkii*,  $\sigma$ ,  $\times 3$ .

## PLATE XXIX.

Fig. A. *Petrolisthes haswelli*, adult  $\varphi$ ,  $\times 1\frac{1}{2}$ . *a*, part of the antennæ, showing the prominent spine on the antepenultimate peduncular joint.

\* In this species the postabdominal appendages are triramose; not, as stated in the description, quadriramose.

- Fig. B. *Petrolisthes annulipes*, adult ♀,  $\times 2$ . *b*, antennal peduncle, showing the spine on the antepenultimate joint.
- C. Dorsal view of frontal and antennal region of *Petrolisthes corallicola*, var. *dorsalis*,  $\times 6$ . *c*, chelipede,  $\times 3$ .
- D. *Polyonyx obesulus*, adult ♀,  $\times 3$ . *d*, frontal and antennal region,  $\times 5$ ; *d'*, outer view of chelipede,  $\times 3$ .

## PLATE XXX.

- Fig. A. *Pachycheles pulchellus*, adult ♂,  $\times 4$ . *a*, anterior view of the frontal region; *a'*, antennal peduncle; *a''*, dactylus of the third ambulatory leg.
- B. *Porcellana nitida*, var. *rotundifrons*, adult ♂,  $\times 2$ . *b*, outer view of chelipede,  $\times 2$ .
- C. *Porcellana dispar*, adult ♂,  $\times 3$ .
- D. *Porcellana quadrilobata*, ♂,  $\times 4$ . *d*, outer view of chelipede,  $\times 4$ .

## PLATE XXXI.

- Fig. A. *Galathea australiensis*, adult ♂,  $\times 4$ .
- B. *Munida spinulifera*, ♂,  $\times 4$ .

## PLATE XXXII.

- Fig. A. *Gebiopsis darwinii*, adult,  $\times 5$ . *a*, frontal region; *a'*, terminal segment and uropoda.
- B. *Harpilius inermis*, adult ♀,  $\times 4$ . *b*, terminal segment and uropoda; *b'*, dactyl of the third leg.
- C. Lateral view of rostrum of *Coralliocaris? tridentata*. *c*, dactyl of the third leg.
- D. *Pencæus batei*, adult ♀,  $\times 1\frac{1}{2}$ . *d*, terminal segment and uropoda.

## PLATE XXXIII.

- Fig. A. *Cirolana schiödtei*, adult ♂,  $\times 2$ . *a*, lateral view of the body, showing the epimera,  $\times 2$ ; *a'*, form of the interantennal plate.

Fig. B. *Cirolana tenuistylis*,  $\times 3$ . *b*, lateral view of the body, showing the form of the epimera,  $\times 3$ ; *b'*, interantennal plate.

C. *Cymodocea longistylis*, adult  $\sigma$ ,  $\times 6$ .

D. *Cerceis bidentata*, var. *aspericaudata*,  $\times 5$ . *d*, antennules and antennæ.

#### PLATE XXXIV.

Fig. A. *Leucothoë brevidigitata*,  $\times 4$ . *a*, terminal segment and posterior uropoda; *a'*, part of the leg of the first pair, showing the form of the distal process of the wrist-joint, palm, and minute daetyl; *a''*, penult. joint and daetyl of leg of the second pair.

B. *Megamæra thomsoni*,  $\times 5$ . *b*, terminal segment; *b'*, one of the legs of the first pair; *b''*, one of the legs of the second pair.

C. *Caprella attenuata*,  $\times 7$ .

#### PLATE XXXV.

Fig. A. *Achelia levis*, var. *australiensis*, ventral view,  $\times 30$ . *a*, dorsal view of the body of the same species,  $\times 30$ ; *a'*, oeculiferous tubercle.

B. *Phoxichilidium hoekii*, adult  $\sigma$ , ventral view,  $\times 7$ . *b*, oral aperture; *b'*, lateral view of the oeculiferous tubercle and mandible; *b''*, one of the ovigerous legs.

#### ALCYONARIANS.

#### PLATE XXXVI.

Fig. A. *Psammogorgia rectangularis*, tip of pinnule,  $\times 4$ ; *a* & *a'*, the spicules,  $\times 40$ . From type (dry) specimen from Port Darwin, 12 fms.

B. *Echinomuricea indo-malaccensis*, specimen in spirit, nat. size. B'. Portion of branch of same,  $\times 4$ . From Warrior Reef, Torres Straits. [Some specimens have the branches stouter and the ends more decidedly clavate.]

- Fig. C. *Leptogorgia australiensis*, var. *perflava*, type specimen (dry), reduced to  $\frac{1}{8}$  nat. size. C'. Portion of main axis of same, from about 4 inches above base, with origin of three pinules, showing the relations of the grooves and verrucæ,  $\times 2$ . c, larger, and c', smaller fusiform spicules,  $\times 150$ .
- D. *Juncella fragilis*. Portion of stem,  $\times 2\frac{1}{2}$ . From dry specimen from Port Denison, 4 fms.
- E. *Muricea tenera*, nat. size. E'. Portion of second branch on the left,  $\times 4$ . e. Cortical spicule,  $\times 25$ . e'. Portion of same spicule, much magnified, to show character of tubercles. From specimen in spirit from Port Molle, 14 fms.
- F. *Plexaura prelonga*, var. *typica*. Portion of one of the two main branches, an inch above the point of bifurcation,  $\times 4$ . From dry specimen from Port Curtis, 5-11 fms.

## PLATE XXXVII.

- Fig. A. *Spongodes studeri*, two terminal lobes,  $\times 2$ ; A', portion of lobule,  $\times 4$ : both from specimen in spirit from Port Molle, 14 fms. a. *Id.*, var. *lavior*, long zooid-spicule,  $\times 30$ , and portion of same,  $\times 90$ , showing axial cavity occupied by soft material. a'. Cortical spicule of same,  $\times 20$ , and portion,  $\times 90$ , showing canals radiating from tubercles to centre. a''. Lesser zooid-spicule of same,  $\times 90$ . The spicules are from a specimen from Arafura Sea.
- B. *Mopsella clavigera*. Portion of small specimen, near middle, about halfway upwards from base, front view,  $\times 2$ . From dry specimen from Port Curtis, 14 fms.
- C. *Melitodes albitincta*, type (dry) specimen, seen from front, nat. size. C'. Fifth bifurcation of main stem of same specimen,  $\times 4$ . C'' & C'''. Smaller and larger forms of verrucæ of same, showing 8 lobes of verruca-wall and 8 tentacular lobes within,  $\times 6$ .
- D. *Psilacabaria gracillima*. D and D'. Two dry fragments, probably from near base of specimen or specimens,  $\times 2$ .



[D' shows the naked calcareous axis of one of its branches.]

D''. Portion of D',  $\times 6$ . From Port Molle.

Fig. E. *Acabaria serrata*. Portion of larger specimen in spirit, nat. size. E'. Portion of second joint above first bifurcation, of same specimen, from Port Darwin, 7-12 fms.,  $\times 6$ .

F. *Iceiligorgia orientalis*. Type specimen, in spirit, reduced to one half nat. size. F'. Portion of left-hand branch, the margin as seen from the side, showing the depressions for the zooids and the common groove which contains them,  $\times 2$ . F''. Portion of main stem just below bifurcation, from front, showing four exsert zooids. From Torres Straits, 10 fms.

#### PLATE XXXVIII.

Fig. a. *Mopsella clavigera*, cortical clavate, a', cortical bifurcate, and a'' & a''', Blattkeule spicules.  $\times 100$ .

b. *Melitodes albitincta*, fusiform, and b', small nodular cortical spicules,  $\times 100$ .

c. *Acabaria serrata*, long, and c', short verruca-spicules; c'', short, and c''', long cortical fusiform spicules. All  $\times 150$ .

d. *Echinomuricea indo-malaccensis*. d & d', chief forms of the toothed spicule of the verruca, d'' & d''', cortical spicules. All  $\times 70$ .

e. *Iceiligorgia orientalis*. Chief forms of spicules,  $\times 70$ .

f. *Psilacabaria gracillima*, cortical, f' & f'', verruca-spicules,  $\times 70$ . [The ridged cortical spicule has been omitted.]

g. *Plexaura praelonga*, var. *typica*, radiate, and g', Blattkeule cortical spicules,  $\times 70$ .

h. *Plexaura praelonga*, var. *cinerea*, Blattkeule cortical spicule,  $\times 70$ .

#### SPONGES.

#### PLATE XXXIX.

Fig. A. *Stelispongos excavatus*. Type specimen (dry) from Arafura Sea. Reduced to one half nat. size.

- Fig. B. *Stelispongius implexus*. The most symmetrical of three specimens from coral-reef, Port Molle ; dry. Nat. size.
- C. *Siphonochalina bullata*. Left-hand half of largest dry specimen from Port Curtis, showing two completed tubes, and behind them (c) the margin of an incomplete one. Reduced two thirds nat. size.
- D. *Reniera testudinaria*. Small part of large dry specimen from 4 fms., Port Denison, showing the lobes and ridges which characterize the surface of the species. Reduced to two thirds nat. size.
- E. *Rhizochalina spathulifera*. The type (dry) specimen from Thursday Island, 4-5 fms. Reduced to two thirds nat. size. [The lower part overrun by the filiform stolons of a Hydroid Zoophyte.]
- F. *R. canalis*. Dry specimen, one of the types, from Port Darwin, 8-12 fms. [The lower end of the figure shows that one end of the canaliform Sponge has been broken off and the centre of the specimen coated by a calcareous Polyzoon (*Cellepora*).] Reduced to two thirds nat. size.
- G. *Toxochalina robusta*. Terminal branches of a spirit-specimen from Port Jackson ; upper surface, showing vents. Reduced to two thirds nat. size.
- H. *Cladochalina subarmigera*. Part of a specimen in spirit from Warrior Reef, Torres Straits, seen from above, showing vents and short and scanty spines. Nat. size.
- I. *Gelliodes fibulata*. One of the larger and more ramose specimens, exhibiting several anastomoses of the branches. Dry ; from Thursday Island, 3-5 fms. Reduced to two thirds nat. size.
- J. *Pellina muricata*. Part of the type specimen, in spirit, from Port Darwin, between tide-marks, showing serial arrangement of the hispid cloacal tubes to form a wall-like ridge. Nat. size.
- K. *Rhaphidophylus procerus*. The largest spirit-specimen from Port Darwin, 7-12 fms. [The basal portion includes a

Serpulid or *Vermetus*-shell, and forms several roots.] Reduced to one third nat. size.

Fig. L. *Iotrochota purpurea*. A small but symmetrically developed dry specimen from Torres Straits or its neighbourhood. Nat. size.

M. *I. baculifera*. Portion of type (spirit) specimen on stone, from Port Darwin, between tide-marks. Nat. size. [The small pointed conuli are not quite so well marked on this as on the reverse side of the specimen.]

N. *Schmidtia variabilis*. The greater part of the type specimen (spirit), from Port Darwin, 7-12 fms. [Seen from the side, the true base is towards the right-hand margin of the plate.] Reduced to two thirds nat. size.

O. *Pellina aliformis*. The type specimen (in spirit), from Port Darwin, 7-12 fms. Seen from one side, one wing almost concealing the other. Nat. size.

#### PLATE XL.

Fig. A. *Echinodictyum glomeratum*. Type specimen (dry), from Thursday Island, Torres Straits, 4-5 fms. Nat. size.

B. *Pachychalina macrodactyla*, portion, including the second and third bifurcations above base, seen from the front. B'. Apex of branch from front, slightly inclined to one side to show lateral series of vents. From dry, somewhat macerated, specimen from Friday Island, Torres Straits. Nat. size.

C. *Amphilectus hispidulus*. The greater part of the type (dry) specimen; the real base is on a shell (omitted) to the left. From Thursday Island, Torres Straits, 3-5 fms. Nat. size.

D. *Echinodictyum cancellatum*. The lower part (about half of the whole) of the type (dry and macerated) specimen from Warrior Reef, Torres Straits. One third nat. size.

Fig. E. *Stelletta purpurea*. One of the larger specimens from above, showing (*e*) vent. In spirit. West Island, Torres Straits, 7 fms. Nat. size.

F. *Clathria coppingeri*. The type specimen (dry), from Albany Island, Torres Straits, 3 fms. One third nat. size. [The margins are slightly reduced by fracture.] F'. The same; two meshes, from front, from specimen in spirit; West Island, Torres Straits, 3-4 fms. Nat. size.

G. *Myxilla arborescens*. About one half of type specimen (in spirit), from Port Jackson, 0-5 fms. Nat. size.

H. *Tethyopsis dissimilis*. Larger of the two specimens from Port Darwin, 7-12 fms. In spirit. Nat. size. [Imperfect above and below.]

I. *Clathria aculeata*. The type specimen, from Thursday Island, Torres Straits, 3-4 fms. In spirit. Nat. size.

J. *Raspailia bifurcata*. The type specimen (in spirit, but macerated), from Prince of Wales Channel, Torres Straits, 5-7 fms. Nat. size.

K. *Esperia pellucida*. One lobe of type specimen, with part of incrustation involving stones &c.; in spirit; from Alert Island, Torres Straits, 7 fms. Nat. size.

L. *Rhaphidophylus arborescens*. The type specimen (dry), from Friday Island, Torres Straits. Two thirds nat. size.

#### PLATE XLI.\*

Fig. A. *Hippospongia derasa*. The type specimen, from West Island, Torres Straits; dry, macerated. Seen from the longest side. Reduced to two thirds nat. size.

B. *Dysidea semicanalis*. The type specimen, from North-east coast of Australia; dry and macerated. Reduced to one half nat. size.

\* The microscopic details in this and the following Sponge-plates have been in almost all cases prepared with the aid of sketches made to scale by Mr. Ridley himself.

Fig. C. *Dysidea digitifera*. The type specimen, from Albany Island, 8 fms.; in spirit; growing over Hydroid zoophyte. Nat. size.

D. *Cladochalina diffusa*. One of the type specimens, from Singapore, between tide-marks; in spirit. Reduced to two thirds nat. size. *d*. Portions of primary and secondary fibre of vertical section,  $\times 95$ . *d'*. Detached spicule,  $\times 190$ .

E. *Hymeniacidon agminata*. The type specimen, from Port Jackson, 0-5 fms.; in spirit. Reduced to two thirds nat. size.

F. *Raspailia clathrata*. Basal portion of type specimen, from Thursday Island, 3-4 fms. Nat. size.

g. *Euspongia officinalis*, var. *cavernosa*. Vertical section of type (dry) specimen, from Torres Straits.  $\times 38$ .

h. *Psammopemma densum*, var. *subfibrosa*. Vertical section of type (spirit) specimen, from Torres Straits.  $\times 38$ . [The surface faces to the right.]

i. *Cladochalina nuda*. Portion of vertical section of type specimen, from Alert Island, showing the contained spicules.  $\times 190$ .

j. *C. nuda*, var. *abruptispicula*. Spicules of type specimen from Thursday Island.  $\times 190$ .

k. *Chalina monilata*, portion of primary fibre of vertical section of type, from Port Jackson, showing the contained spicules,  $\times 370$ . *k'*. An isolated spicule,  $\times 370$ .

l. *Cladochalina subarmigera*, portion of primary and secondary fibres of vertical section, *l'*, spicules, of type specimen, from Warrior Reef.  $\times 190$ .

m. *Toxochalina folioides*, fibre of main skeleton as seen in vertical section. *m'*. Skeleton-spicule,  $\times 68$ . *m''*. Tricurvedate flesh-spicule,  $\times 370$ . From specimen from Port Darwin.



- Fig. *n*. *Toxochalina robusta*, portion of skeleton, showing primary and secondary fibre. *n'*. Skeleton acerate and tricurvate acerate spicules.  $\times 370$ . From type specimen from Port Jackson.
- o*. *Pachychalina macrodactyla*. Skeleton-spicule,  $\times 190$ . From specimen figured Plate XL. fig. B.
- p*. *Protoschmidtia hispidula*, portion of vertical section,  $\times 68$ . *p'*. Skeleton-spicule,  $\times 190$ . From type specimen from Albany Island. [Note.—Some loose spicules in the interspaces of the skeleton have been omitted for the sake of clearness.]
- q*. *Rhizochalina spathulifera*. Skeleton-spicules,  $\times 68$ . From type specimen from Thursday Island.
- r*. *R. canalis*. Skeleton-spicule,  $\times 68$ . From type specimen from Port Darwin.
- s*. *R. singaporensis*, var. Spicules,  $\times 190$ . From specimen from West Island, Torres Straits.
- t*. *Schmidtia variabilis*. Spicules,  $\times 68$ . From type specimen from Port Darwin. [The median curve of the diagonally-placed spicule is represented as too sudden, and the two lateral curves introduced do not exist.]
- u*. *Reniera testudinaria*, part of vertical section,  $\times 38$ . *u'*. Spicules,  $\times 68$ . From dry specimen from Port Denison.
- v'*. *Pellina muricata*. Skeleton-spicule, with ends of two others, exhibiting the wide range of variation,  $\times 190$ . From type specimen from Port Darwin.
- w*. *P. aliformis*. Skeleton-spicule,  $\times 68$ . From type specimen from Port Darwin.
- x*. *P. eusiphonia*. Skeleton-spicules,  $\times 68$ . From type specimen from Port Darwin.
- y*. *Amphilectus hispidulus*, vertical section,  $\times 68$ . *y'*. Skeleton acuate spicule,  $\times 190$ . *y''*. Anchorate spicule from front and side,  $\times 370$ . From type (dry) specimen from Thursday Island.

Fig. z. *Gellius cymiformis*. Spicules,  $\times 370$ . From specimen from Thursday Island.

aa. *Crella schmidti*. Spicules (anchorate from front and side),  $\times 370$ . From type specimen from Port Jackson.

bb. *Gelliodes fibulata*, fibre of part of vertical section, showing the very stout and straight primary and the secondary fibres; bb', portion of secondary fibre, showing arrangement of spicules and isolated skeleton-spicule:  $\times 68$ . bb''. Bihamate spicules,  $\times 370$ . From dry specimen from Prince of Wales Channel.

cc. *Amphilectus tibiellifer*, skeleton acuate and tibiella-spicules,  $\times 190$  (head of latter enlarged). cc'. Tricurvate acerate,  $\times 190$ . cc''. Anchorate seen from front and side,  $\times 370$ . From one of the types from Prince of Wales Channel.

#### PLATE XLII.

Fig. a. *Myxilla arborescens*, portion of vertical section,  $\times 190$ .

a'. Skeleton acerate spicules,  $\times 190$ . a''. Equianchorate spicule from front and side,  $\times 370$ . From type specimen (in spirit) from Port Jackson.

b. *Acarnus ternatus*, acuate, grapnel, and tricurvate spicules, and head of grapnel as seen from above,  $\times 190$ . b'. Tibiella and equianchorate (from front and side) spicules,  $\times 370$ . From specimen from West Island, Torres Straits.

c. *Ophlitispongia australiensis*, fibre of vertical section,  $\times 190$ . c'. Skeleton cylindrical and echinating acuate spicules,  $\times 190$ . From type specimen from Port Molle.

d. *Clathria tuberosa*, vertical section,  $\times 38$ . From specimen in spirit from Prince of Wales Channel.

e. *Iotrochota purpurea*, vertical section, and e', dermis,  $\times 20$ . e''. Two sizes of skeleton-spicule,  $\times 190$ . e'''. Birotulate spicules,  $\times 370$ . From dry specimen from Prince of Wales Channel. e'''. Two ciliated chambers, from specimen of green var. from Amirante Island,  $\times 370$ .

f. *I. baculifera*, tibiella-spicule of dermis,  $\times 370$ . From type specimen from Port Darwin.

Fig. g. *Phoriospongia fibrosa*, cylindrical, bihamate, equianchorate (from front and side) spicules,  $\times 370$ . From type specimen from Prince of Wales Channel.

h. *Esperia pellucida*, skeleton acuate spicule.  $h'$ , large (from front),  $h''$ , small inequianchorate (from front and side);  $h'''$ , bihamate spicule; and  $h''''$ , trichite-bundle,  $\times 370$ . From type specimen from Alert Island, Torres Straits.

i. *Clathria coppingeri*, small and large spined acerate, and smooth variety of end of latter, and smooth subspinulate spicules,  $\times 190$ .  $i'$ , equianchorate spicule (from front and side),  $\times 370$ . From specimen from Albany Island.

j.\* *C. frondifera*, smooth acerate spicule, three sizes,  $\times 190$ .  $j'$ , spined acuate, two forms,  $\times 190$ ;  $j''$ , tricurvate spicule, and  $j'''$ , equianchorate (from front and side),  $\times 370$ . From specimen from Fitzroy Island, Queensland.

k. *C. aculeata*, smooth acuate and subspinulate, and spined acuate spicules,  $\times 190$ .  $k'$ , tricurvate, and  $k''$ , equianchorate (from front and side),  $\times 370$ . From type specimen from Thursday Island.

l. *Raspailia bifurcata*, portion of fibre from near base, showing spined acuate spicule *in situ*,  $\times 190$ .  $l'$ , smooth acuate and acerate spicules,  $\times 38$ . From type specimen (in spirit) from Prince of Wales Channel.

m. *R. australiensis*, part of vertical section from near middle of Sponge,  $\times 38$ .  $m'$ , larger and smaller acuate spicules,  $\times 68$ . From type specimen (in spirit) from Port Darwin.

n. *Rhaphidophylus arborescens*, smooth and spined acuate spicules, and head of spinulate variety of the former,  $\times 190$ .  $n'$ . Equianchorate seen from the front,  $\times 370$ . From type specimen from Friday Island.

o. *R. procerus*, part of vertical section,  $\times 68$ .  $o'$ , skeleton-spicules,  $\times 68$ ;  $o''$ , flesh-spicules,  $\times 370$ . From type specimen (in spirit) from Port Darwin.

\* This figure has been erroneously referred to as fig. i in the text on p. 443.

- Fig. *p.* *Echinodictyum glomeratum*, spicules,  $\times 190$ . From type specimen from Thursday Island.
- q.* *E. cancellatum*, spicules,  $\times 190$ . From specimen figured Pl. XL. fig. D.
- r.* *E. costiferum*, spicules,  $\times 190$ . From specimen from Port Moller.
- s.* *Leucophlæus fenestratus*, part of vertical section from type specimen,  $\times 38$ .
- t.* *Amphilectus tibiellifer*, skeleton acuate and tibella and trieurvate acerate spicules,  $\times 190$ . *t'*, head of tibella, and *t''*, equianchorate as seen from front and side,  $\times 370$ . From type specimen from Torres Straits.

## PLATE XLIII.

- Fig. *a.* *Axinella echidnaea*. Spicules,  $\times 68$ . From dry specimen from Thursday Island.
- b.* *Geodia globostellifera*, globostellate, external and internal stellate spicules, in tissue below dermal crust,  $\times 370$ . *b'*. Portion of cortex, showing crust of balls covered by membrane containing smaller stellates, and tuft of surface acerate spicules projecting from it,  $\times 68$ .
- c.* *Spirastrella decumbens*. Spicules,  $\times 190$ . From type specimen from Alert Island.
- d.* *S. congenera*, skeletal spinulate spicules, showing two forms of head,  $\times 190$ . *d'*. Flesh-spicules,  $\times 370$ . From type specimen from Thursday Island.
- e.* *S. vagabunda*, skeletal spinulate spicule,  $\times 190$ . *e'*. Flesh-spicules,  $\times 370$ . From specimen from Torres Straits.
- f.* *Hymeniacion agminata*, spicules,  $\times 190$ . *f'*. Head of spinulate spicules,  $\times 370$ . From type specimen from Port Jackson.
- g.* *Leucophlæus fenestratus*, var. Spicule,  $\times 68$ .
- h.* *Suberites epiphytum*, vertical section,  $\times 68$ . *h'*, spicule  $\times 68$ ; *h''*, head of spicule, chief forms,  $\times 370$ . From spirit-specimen from Port Curtis.

Fig. i. *Stelletta clavosa*, acerate, anchoring quadriradiate, and zone spicules,  $\times 68$ . *i'*, head of zone-spicule, as seen from above,  $\times 68$ ; *i''*, stellate flesh-spicules,  $\times 370$ . From type specimen from Prince of Wales Channel.

j. *S. purpurea*, acerate, anchoring quadriradiate, and zone-spicules,  $\times 68$ . *j'*, stellate flesh-spicules,  $\times 370$ . From type specimen from Torres Straits.

k. *S. purpurea*, var. *retroflexa*, the zone-spicule,  $\times 68$ . From specimen from Torres Straits.

l. *Tethyopsis dissimilis*, diagrammatic vertical section\* across upper end of larger† specimen from Port Darwin,  $\times$  about 2. *l'*. The same\* of smaller specimen from Port Darwin,  $\times$  about 3 [the dark parts represent canals, the dotted portions those occupied by the skeleton and tissues in the Sponge itself]. *l''*. Portion of dermis‡ from between two longitudinal skeletal lines, from larger specimen from Port Darwin, as seen from *inside*,  $\times$  about 25. *l'''*. Part of septum between two large canals, from same specimen,  $\times$  about 25. *l''''*. Skeleton triradiate spicules, one normal, the other with abnormally elongated third ray,  $\times 34$ . *l'''''*. Aerate spicule from small Port-Darwin specimen, and *l''''''*, from Torres-Straits specimen,  $\times 34$ . *l'''''''*. Flesh-spicules from larger specimen from Port Darwin,  $\times 850$ .

m. *Leucaltis bathybia*, var. *australiensis*, tri- and quadriradiate spicules of outer surface; *m'*, triradiate from centre of wall; *m''*, quadriradiates of subjacent parts. All  $\times 68$ . From type specimen from Port Jackson.

n. *Stellettinopsis carteri*, the skeleton-spicule,  $\times 68$ . *n'*, the larger, and *n''*, the smaller stellates,  $\times 370$ . From type specimen from Torres Straits.

\* *Canals*.—1, anterior; 2, posterior; 3 and 4, lateral; 5 and 6, antero-lateral; 7 and 8, postero-lateral; 9 (in *l*), axial.

† *Note*.—Since writing the account of the canals (given at p. 478 of Part I. of the Report), I have discovered that the apparently single pair of *lateral* spaces in the larger specimen is in reality double.

‡ Showing that the long arm of the skeleton-spicule commonly extends over two interfascicular spaces, and is not confined to one as stated in the description at p. 477.



## COLLECTIONS FROM THE WESTERN INDIAN OCEAN.

## MOLLUSCA.

## PLATE XLIV.

- Fig. A. *Conus martensi*.  
B. — *articulatus*.  
C. *Pleurotoma (Defrancia ?) grisea*.  
D. *Murex (Ocinebra) pumilus*.  
E. — (—) *infans*.  
F. — (—) *darrosensis*.  
G. *Columbella seychellensis*.  
H. — *cinnamomata*.  
I. — *rufopiperata*.  
K. — *amirantium*.  
L. — *albocaudata*.  
M. *Coralliophila amirantensis*.  
N. *Mitra tenuis*.  
O. *Turricula (Callithea) bipartita*.  
P. *Marginella picturata*.  
Q. *Cerithium albobaricosum*.  
R. — *amirantium*.  
S. — (*Rhinoclavis*) *acutinodulosum*.  
T, T<sup>1</sup>. *Triphoris mirificus*.  
U, U<sup>1</sup>, U<sup>2</sup>. *Turbo tursicus*.  
V, V<sup>1</sup>. *Trochus (Gibbula ?) amirantium*.  
W. *Chemnitzia coppingeri*.

## ECHINODERMS.

## PLATE XLV.

Fig. *a*. *Neoplax ophiodes*,  $\times 2$ .

*b*. Arm-joints of ditto, seen from above,  $\times 4$ .

*c*. The same, from the side,  $\times 4$ .

*d*. The same, from below,  $\times 4$ .

*e*. Lower surface of disk,  $\times 4$ .

## CRUSTACEA.

## PLATE XLVI.

Fig. A. *Acheus laeviculis*, ♂,  $\times 5$ . *a*, chelipede,  $\times 5$ .

B. *Stilbognathus martensi*, adult ♂,  $\times 2$ . *b*, buccal and antennal regions, showing the form of the joints of the outer maxillipede &c.,  $\times 3$ ; *b'*, chelipede,  $\times 2\frac{1}{2}$ .

## PLATE XLVII.

Fig. A. *Eurynome stimpsonii*, ♂,  $\times 4$ . *a*, chelipede,  $\times 6$ .

B. *Entomonyx spinosus*,  $\times 3\frac{1}{2}$ . *b*, inferior view of antennal region, showing the form of the basal antennal joint,  $\times 4\frac{1}{2}$ ; *b'*, postabdomen,  $\times 4$ ; *b''*, chelipede,  $\times 4$ .

## PLATE XLVIII.

Fig. A. Frontal region of *Xiphonectes vigilans*, var. *obtusidentatus*, showing the form of the marginal teeth,  $\times 5$ .

B. *Thalamita quadrilobata*, adult ♂. *b*, chelipede.

C. *Carcinoplax integra*, ♀,  $\times 5$ . *c*, inferior view of frontal and antennal region, showing the form of the peduncular joints of the antennæ and the merus of the maxillipedes; *c'*, chelipede,  $\times 7$ .

## PLATE XLIX.

Fig. A. *Philyra rectangularis*, ♀,  $\times 5$ . *a*, outer maxillipede.

B. *Pseudophilyra polita*, ♂,  $\times 3\frac{1}{2}$ . *b*, postabdomen,  $\times 3\frac{1}{2}$ ; *b'*, outer maxillipede.

C. *Cymopolia whitei*, adult ♀,  $\times 3$ . *c*, postabdomen,  $\times 4$ .

## PLATE L.

Fig. A. *Dromidia spongiosa*, var. *stimpsonii*, adult ♀,  $\times 2$ . *a*, outer view of chelipede,  $\times 2\frac{1}{2}$ .

B. *Homalodromia coppingeri*, adult ♀,  $\times 4$ . *b*, inferior view of the frontal, antennal, and part of the buccal region, showing the form of the epistoma, the nearly smooth endostome, &c.; *b'*, part of the sternal surface, showing the sternal tubercles; *b''*, outer view of chelipede.  $\times 7$ .

## PLATE LI.

Fig. A. *Munida edwardsi*, adult ♂,  $\times 4$ . *a*, dactylus of an ambulatory leg.

B. Frontal and antennal region of *Pontonia brevirostris*, ♂, dorsal view, showing the form of the small rostrum, the peduncular joints of the antennules, &c. *b*, terminal segment and uropoda; *b'*, outer maxillipede; *b''*, chelipede of the first pair; *b'''*, chelipede of the second pair; *b''''*, ambulatory leg (next after chelipedes), showing the form of the dactylus.

## PLATE LII.

Fig. A. *Penæus richtersi*, ♂,  $\times 3$ . *a*, dorsal view of the frontal and antennal region, showing the form of the eye-peduncles and antennules and antennal scales; *a'*, terminal segment and uropoda.

B. *Gonodactylus elegans*, ♀,  $\times 3$ . *b*, lateral view of the raptorial limb (second maxillipede),  $\times 3\frac{1}{2}$ .

Fig. C. Frontal region of *Gonodactylus* (*G. elegans*, ♂?), showing the form of the rostrum,  $\times 3$ .

D. Part of right gnathopod of *Meru diversimanus*. *d*, part of left gnathopod.

## SPONGES.

### PLATE LIII.

Fig. A. *Leucophteus fenestratus*. Specimen which has incorporated many calcareous fragments with its base, and gives off a remarkable smooth flat lobate process (*a*) from the base. In spirit. From Providence Reef, 24 fms.  $\times 1\frac{1}{2}$ .

B. *L. proteus*. Variety distinguished by its almost entirely massive and smooth habit, a small part only (*b*) of the surface exhibiting the usual ridged and pilose character. *b'*, apparently accidental pit. In spirit. From Providence Reef, 24 fms. Nat. size.

C. *Dysidea gumminea*. Small specimen, based on a stone, showing lateral extension into lobes. In spirit. From Providence Island, 19 fms. Nat. size.

D. *Hippospongia intestinalis*, var. Part of a large contorted mass, showing great irregularity of growth and variation in the stoutness of the twisted lobes [the dermal sheet of fibres has been abraded from the lobes towards the top of the figure (*d*)]. Dry. From Providence Island. Nat. size.

E. *Axinella proliferans*. Left-hand half of small specimen from Providence Island, 19 fms. In spirit.  $\times \frac{3}{2}$ . E'. Profile view of upper part of same specimen, slightly shaded. Nat. size.

F. *Desmacidon rimosa*. The type specimen, showing the large vents and well-marked grooves (*f. f''*) of the excretory canal-system. In spirit. From Mozambique. Nat. size.

Fig. G. *Reniera cribriformis*. The most complete of the fragments, representing the type specimen, from the exterior. In spirit. From Seychelle Islands, 12 fms.  $\times \frac{3}{2}$ .

H & H'. *R. camerata*. Two fragments, probably belonging to one (the typical) specimen. H shows the compact, even character which distinguishes the *outer* surface; H' the chambered or plicate condition of the *interior*. In spirit. From Marie Louise Island, 16-17 fms. Nat. size.

I. *Clathria mœandrina*. Part of the type specimen, incrusting a stem. In spirit. From Marie Louise Island, Amirantes, 17 fms. Nat. size.

J. *C. frondifera*. The largest specimen obtained; attached to rock.\* It shows a transition from a flattened expanded (*j*) to a rounded trabecular (*j'*) form of the constituent lobes of sponge-substance, and exhibits more definiteness of form as a whole than is usual in the species. Dry. From Providence Reef, 24 fms. Nat. size.

K. *C. decumbens*. The type specimen, showing considerable variation in the proportionate amount of fenestration to the surface (*e. g.* at *k* the surface is entire, at *k'* it is regularly fenestrated; at *k''* the surface is abraded. In spirit. From Etoile Island, 13 fms. Nat. size.

L. *Leucortis anguinea*. The type specimen, in spirit. From Providence Reef, 24 fms.  $\times 2$ . *l*, stem.

M. *Erylus cylindrigerus*. The type specimen, in spirit. From Providence Reef. Nat. size.

N\*. *Phyllospongia madagascarensis*, var. *supraoculata*. From African Island. Dry. N'. The same, upper margin of median lobe, from above, to show thickness of frond and characters of vents. Nat. size.

\* By an inadvertence these figures have been referred to in the text (p. 594) as M and M'.

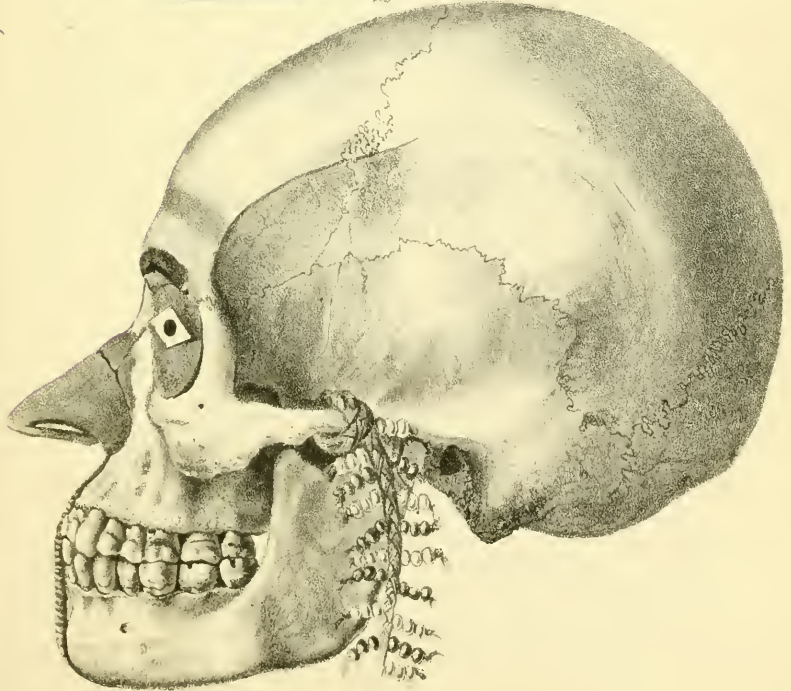
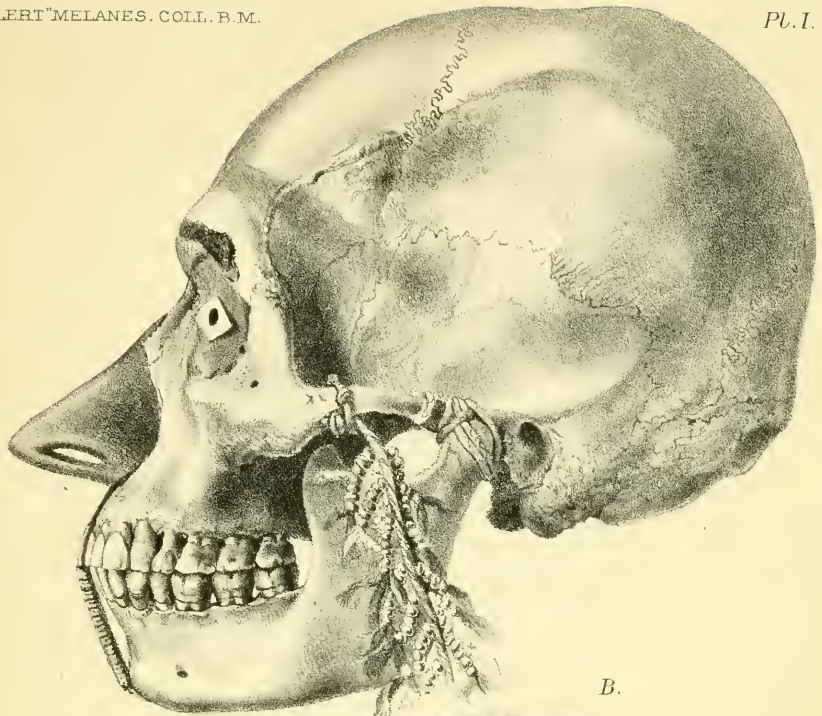


## PLATE LIV.\*

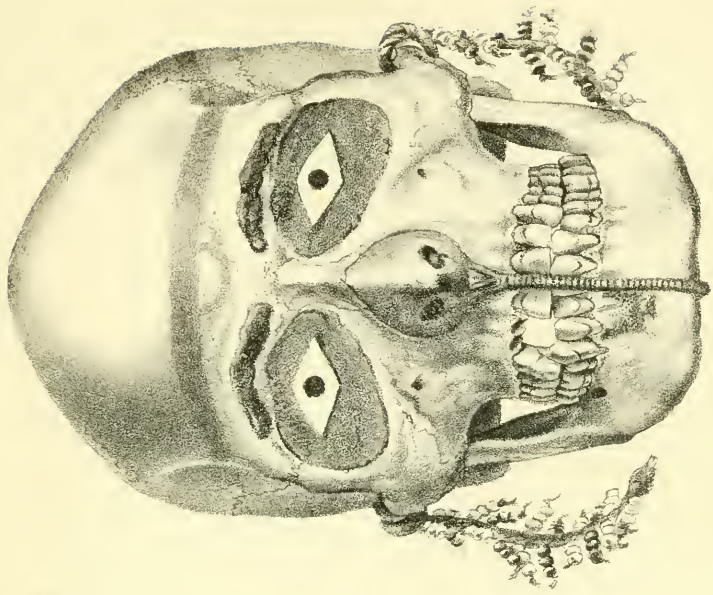
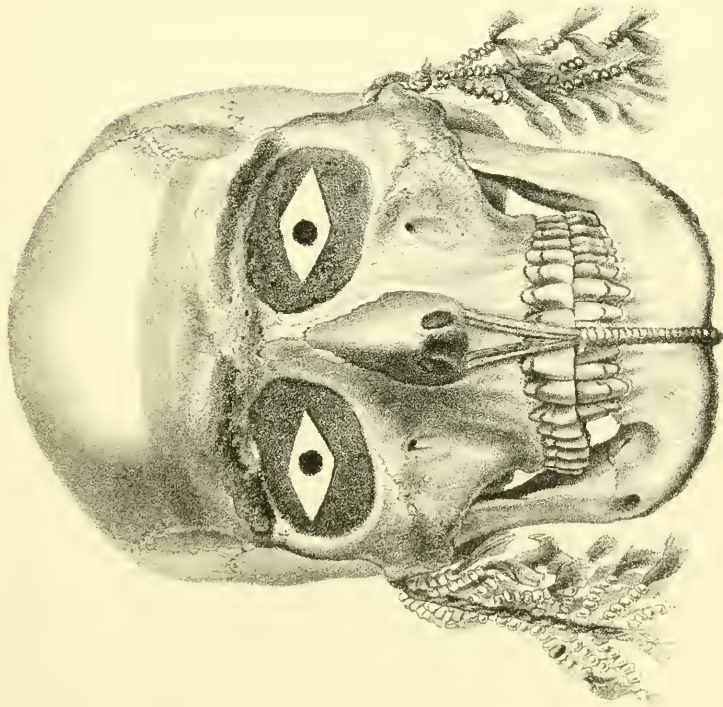
- Fig. *a*. *Leucaltis bathybia*, var. *maseareunica*, the two forms of stout quadriradiate and the triradiate spicules of the main skeleton,  $\times 38$ . *a'*. The minute tri- and quadriradiates of the cloacal surface,  $\times 370$ . From type specimen from Seychelle Islands.
- b*. *Axinella spiculifera*, two sizes of the skeleton-spicule,  $\times 68$ . From specimen from Darros Island.
- c*. *A. proliferans*, the skeleton-spicule,  $\times 68$ . From type specimen from Providence Island.
- d*. *Leucortis anguinea*, the stout acerate, and different forms of the tri- and quadriradiate spicules of the main skeleton,  $\times 68$ . *d'*, the slender acerate (?) of the peristome (the outer end imperfect),  $\times 370$ . From type specimen from Providence Reef.
- e*. *Erylus cylindrigerus*, part of the disk-spicule, in profile,  $\times 190$ . *e'*, the disk-spicule, from the front (tubercles omitted, except at apex),  $\times 190$ ; *ee''*, the same, the tubercles,  $\times 300$ ; *e'''*, the cylindrical spicule, two forms,  $\times 68$ ; *e''''*, the minute acerate spicule, young and adult,  $\times 190$ ; *e'''''*, larger stellate spicule, two forms, showing variation in the number and spination of the rays,  $\times 190$ ; *e''''''*, the small stellate,  $\times 370$ . From specimen from Providence Reef.
- f*. *Esperia gelatinosa*, the subspinulate, *f'*, large, and *f''*, small anchorate (the latter from the front and side), *f'''*, bihamate spicules; *f''''*, trichite-bundle.  $\times 370$ . From specimen from Providence Island.
- g*. *Clathria decumbens*, the skeleton and cehinating acuate spicules,  $\times 190$ . *g'*, the equianchorate flesh-spicule, from the front and side,  $\times 370$ . From type specimen from Etoile Island.

\* *Note*.—The figures in this Plate have been prepared with the aid of sketches, to scale, made by Mr. Ridley.

- Fig. *h*. *Clathria mœandrina*, the stout and slender smooth acerato, and the spined acuate spicules,  $\times 190$ . *h'*, the tricurvate acerate, and *h''*, the equianchorate spicules (the latter from the front and side),  $\times 370$ . From type specimen from Marie Louise Island.
- i*. *Reniera*, sp. allied to *R. crateriformis*, average form of skeleton-spicule,  $\times 68$ . From specimen from Providence Island.
- j*. *Rhizochalina pellucida*, the skeleton-spicule,  $\times 190$ . From type specimen from Providence Island.
- k*. *Leucophloeus proteus*, the skeleton-spicule,  $\times 68$ . From specimen from Providence Reef.
- l*. *Echinonema gracile*, the skeleton- and echinating spicules,  $\times 190$ . *l'*, the tricurvate acerate, and *l''*, equianchorate spicules,  $\times 370$ . From type specimen from Providence Reef.
- m*. *Desmacidon rimosa*, the skeleton-, and *m'*, tricurvate acerate spicules,  $\times 190$ ; *m''*, the equianchorate, from the front and side,  $\times 370$ . From type specimen from Mozambique.
- n*. *Reniera camerata*, the skeleton-spicule,  $\times 190$ . From type specimen from Marie Louise Island, Amirantes.
- o*. *R. cribriformis*, the skeleton-spicule,  $\times 190$ . From type specimen from Seychelle Islands.
- p*. *Spirastrella punctulata*, the skeleton-spicule,  $\times 190$ . *p'*, the spinispirular flesh-spicules,  $\times 370$ . From type specimen from Mozambique.
- q*. *S. transitoria*, the skeleton-spicule,  $\times 190$ . *q'*, the spinispirular flesh-spicules and curiously attenuated variety of apex,  $\times 370$ . From type specimen from Darros Island.

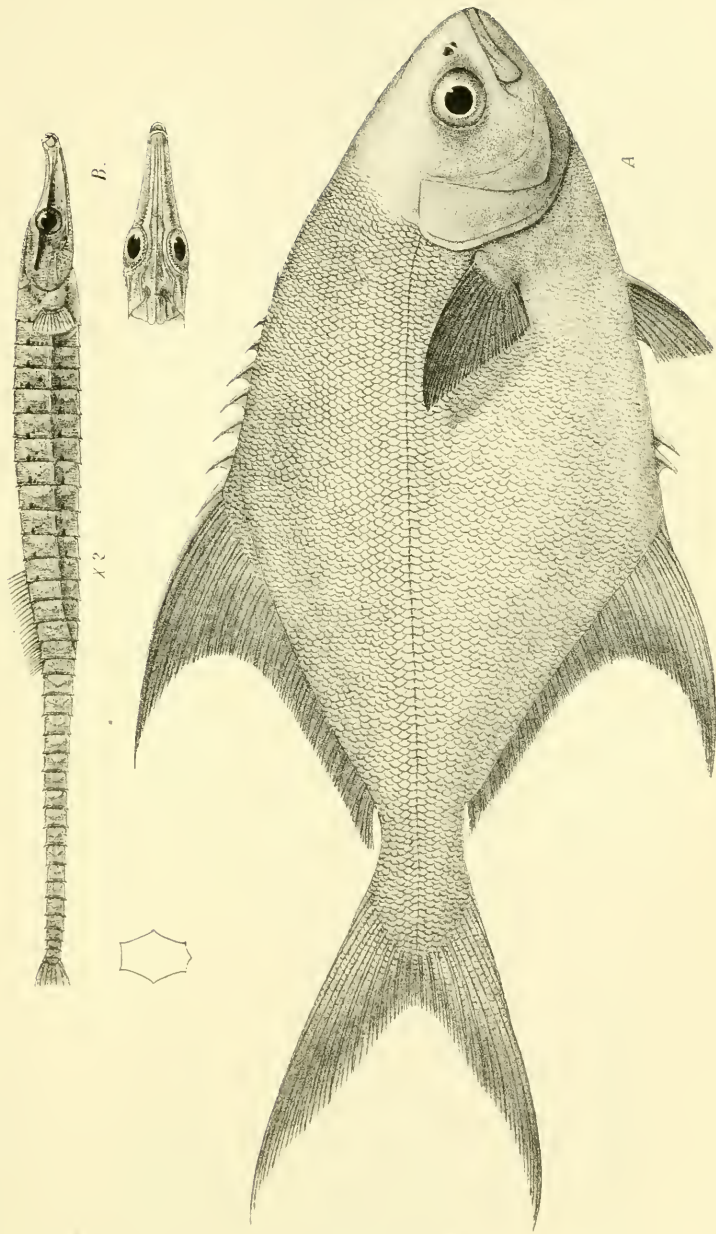




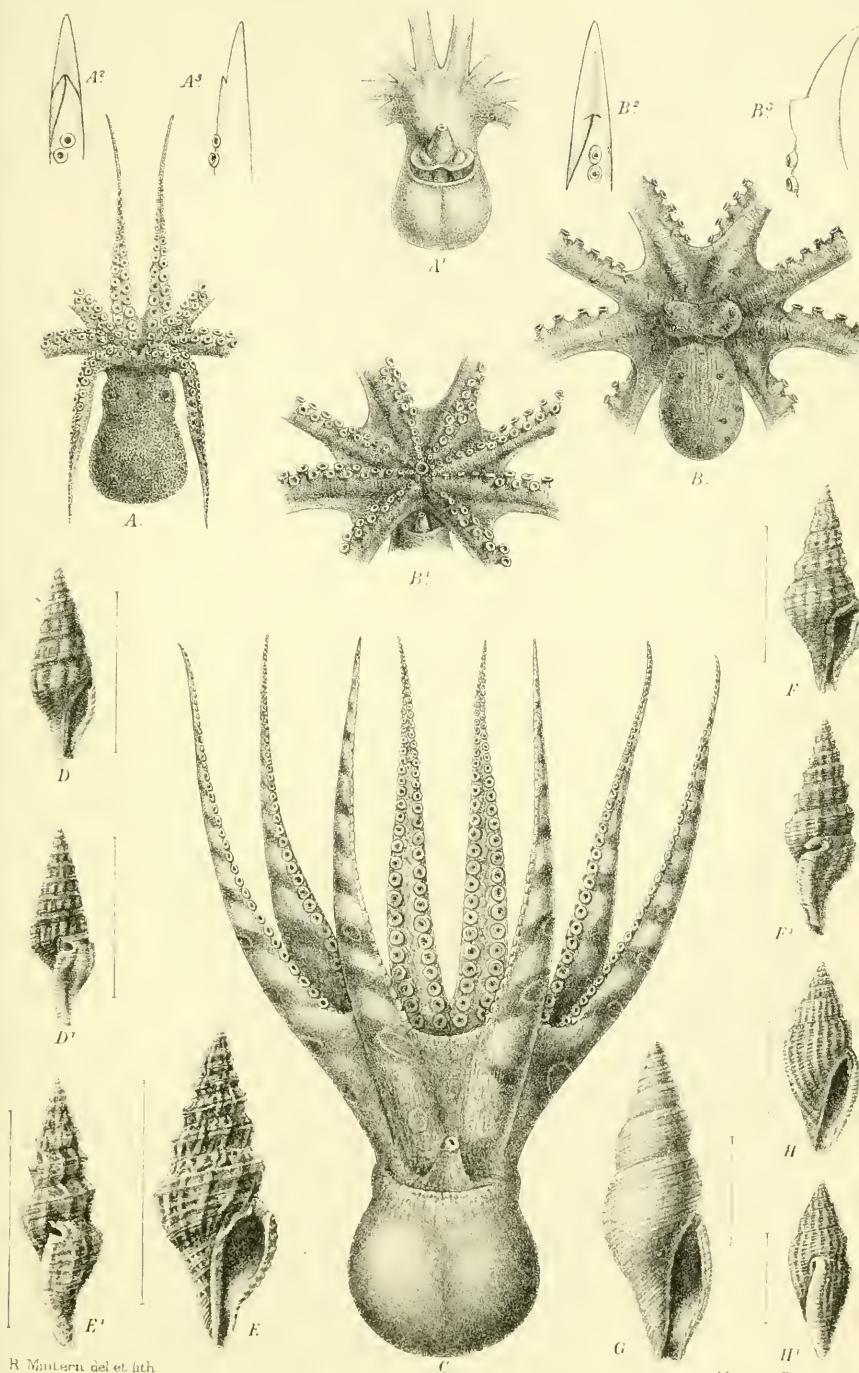












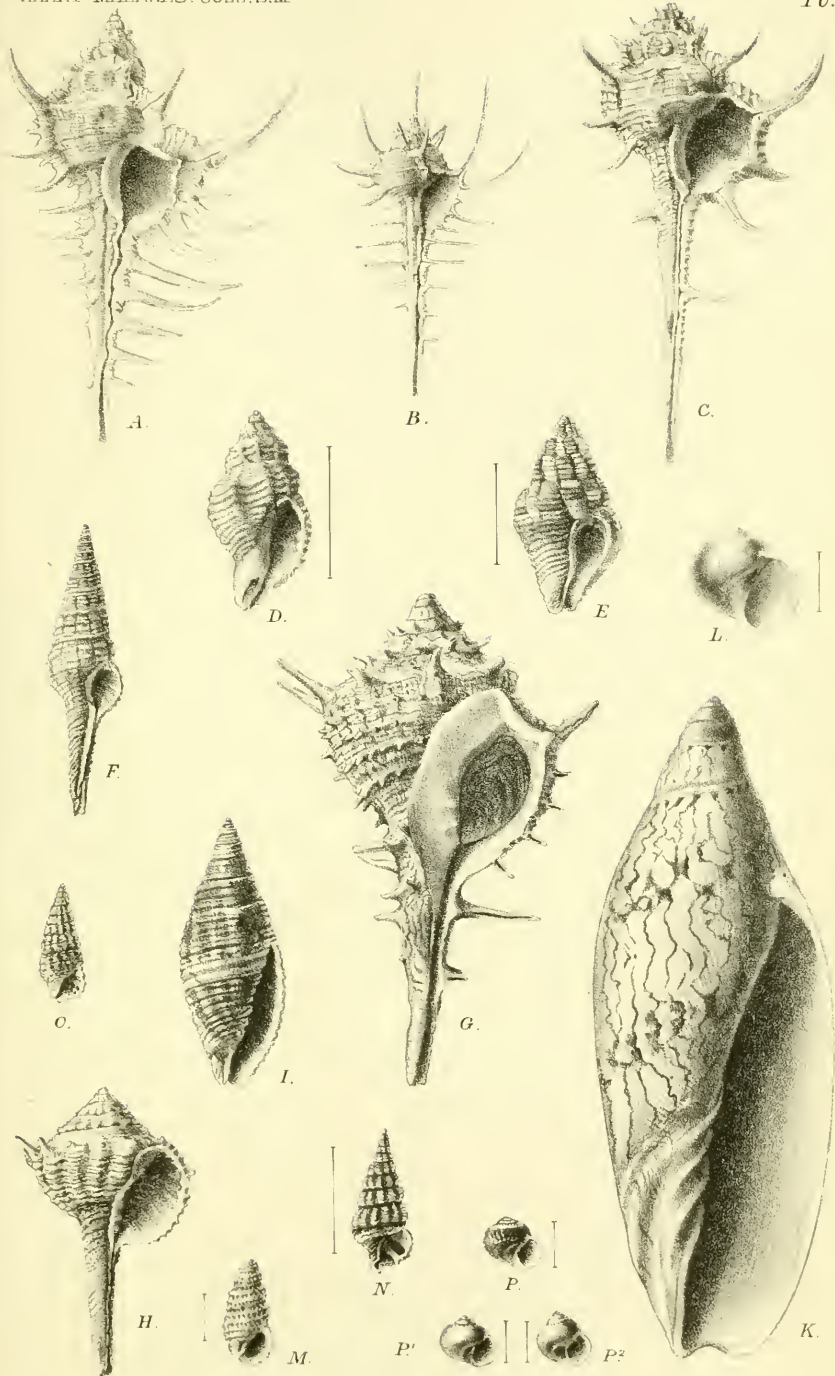
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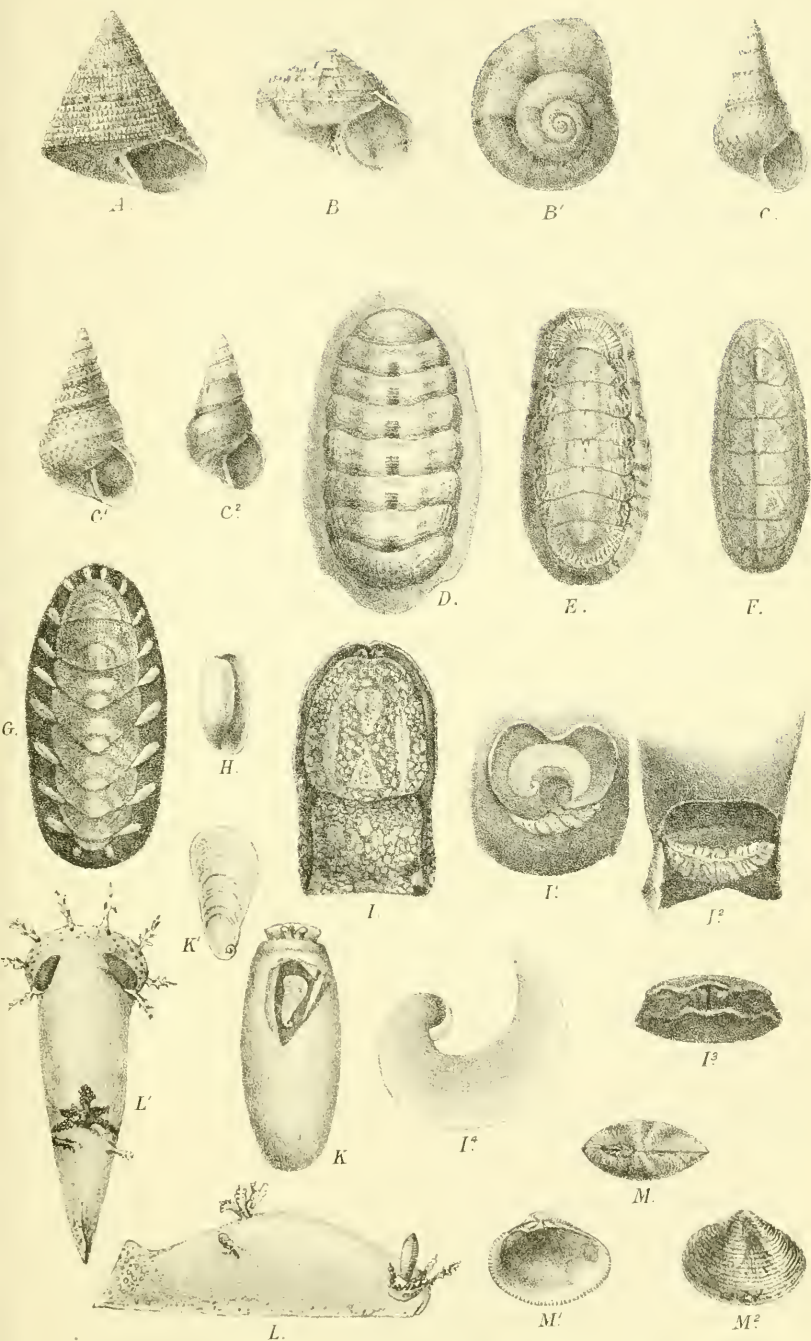
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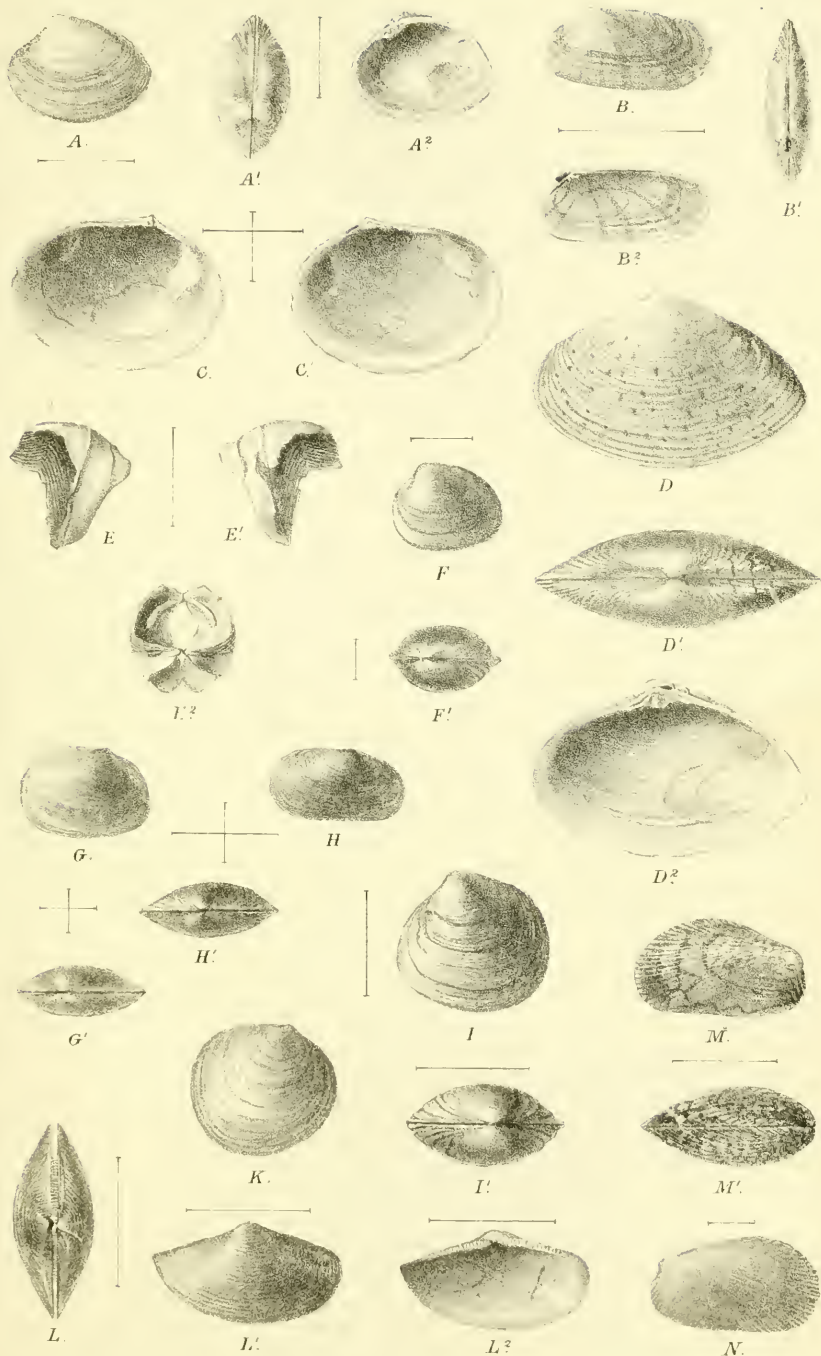






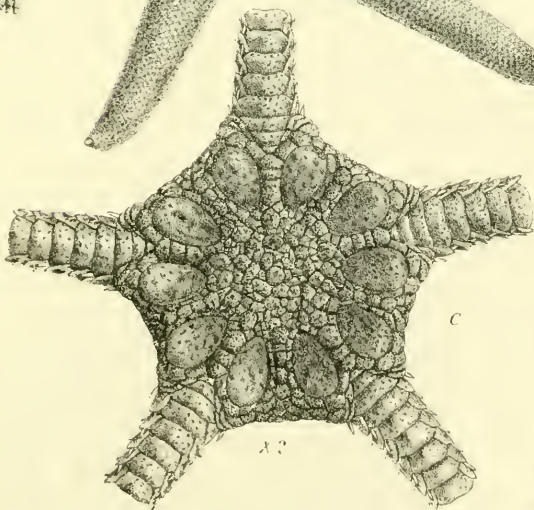
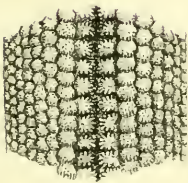
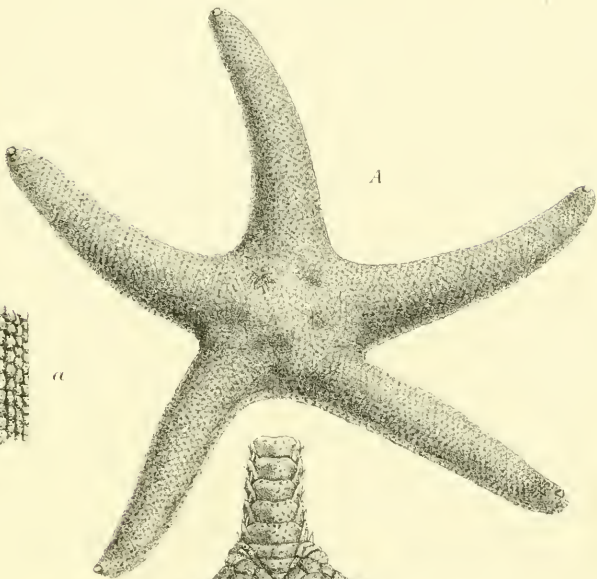
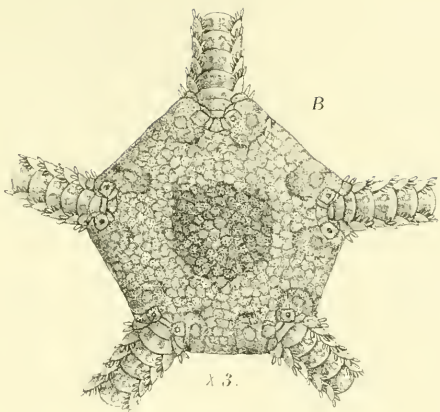








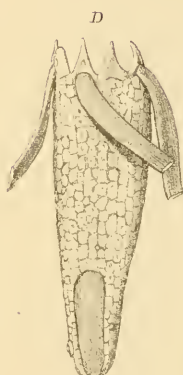








B



D



a



c

E



b



d



F



c



f



F'



G

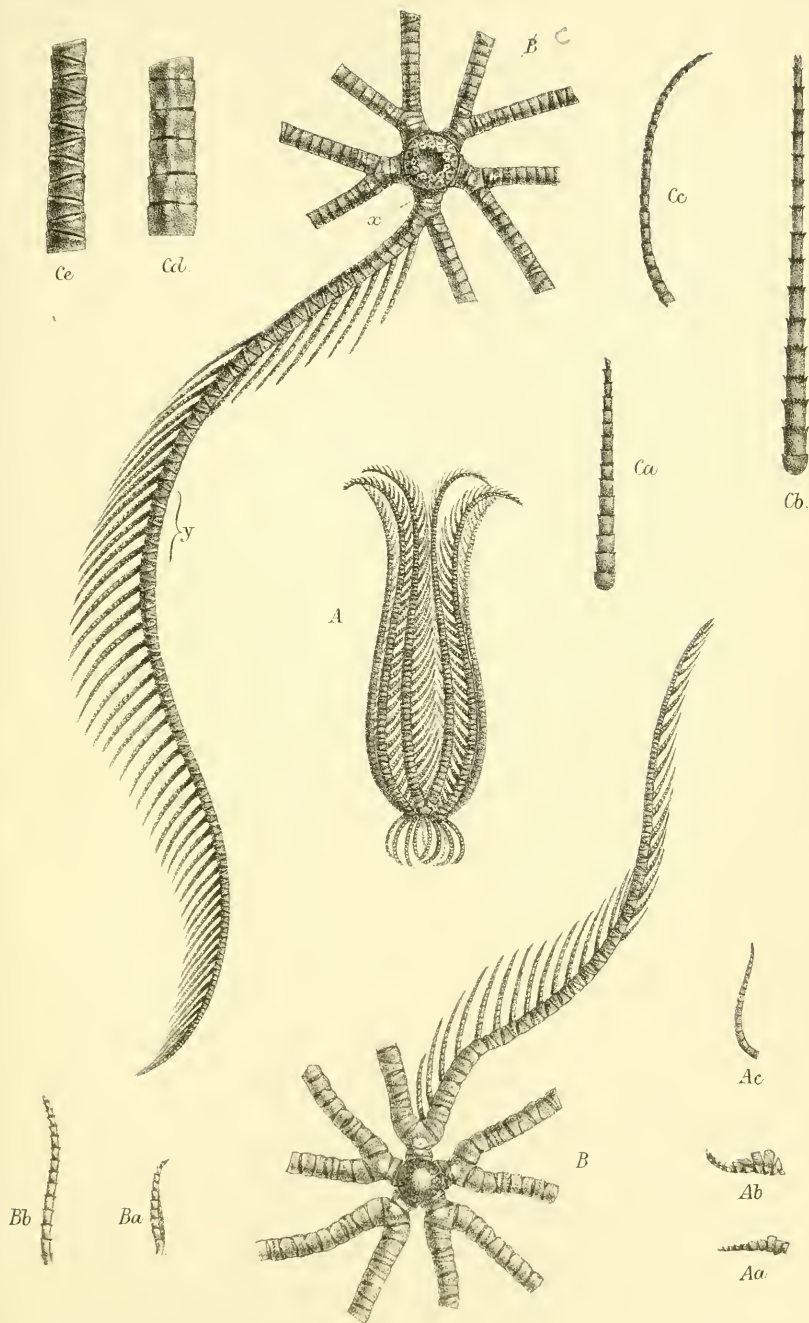


G









R. Minter del et lith

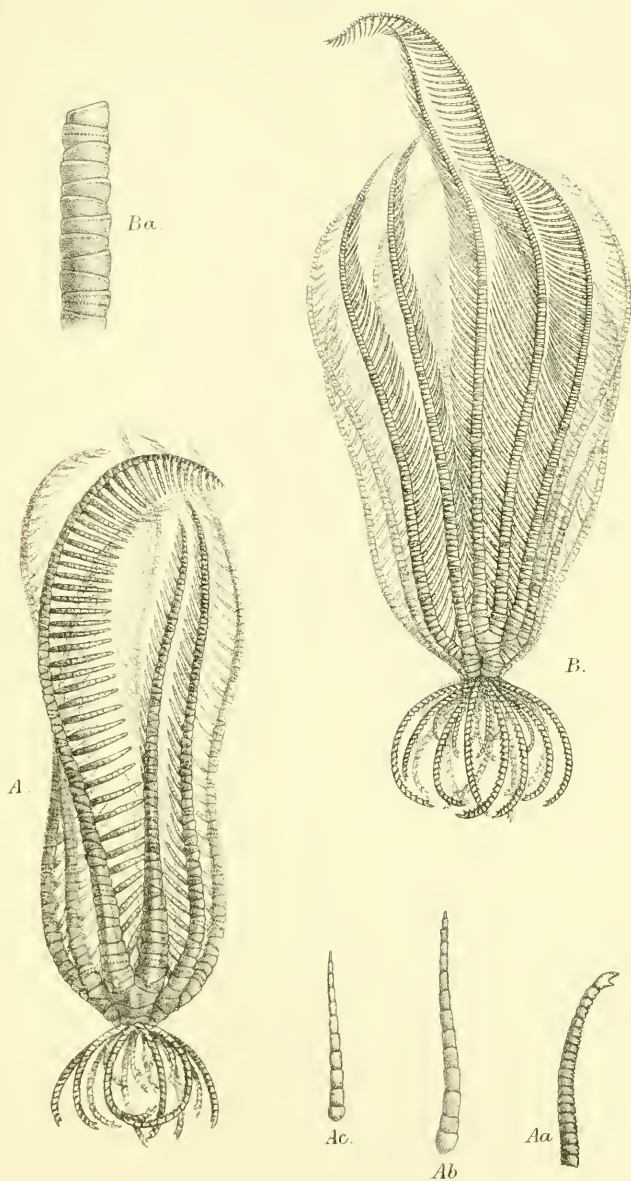
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Fig. A. *Antedon carpenteri*.

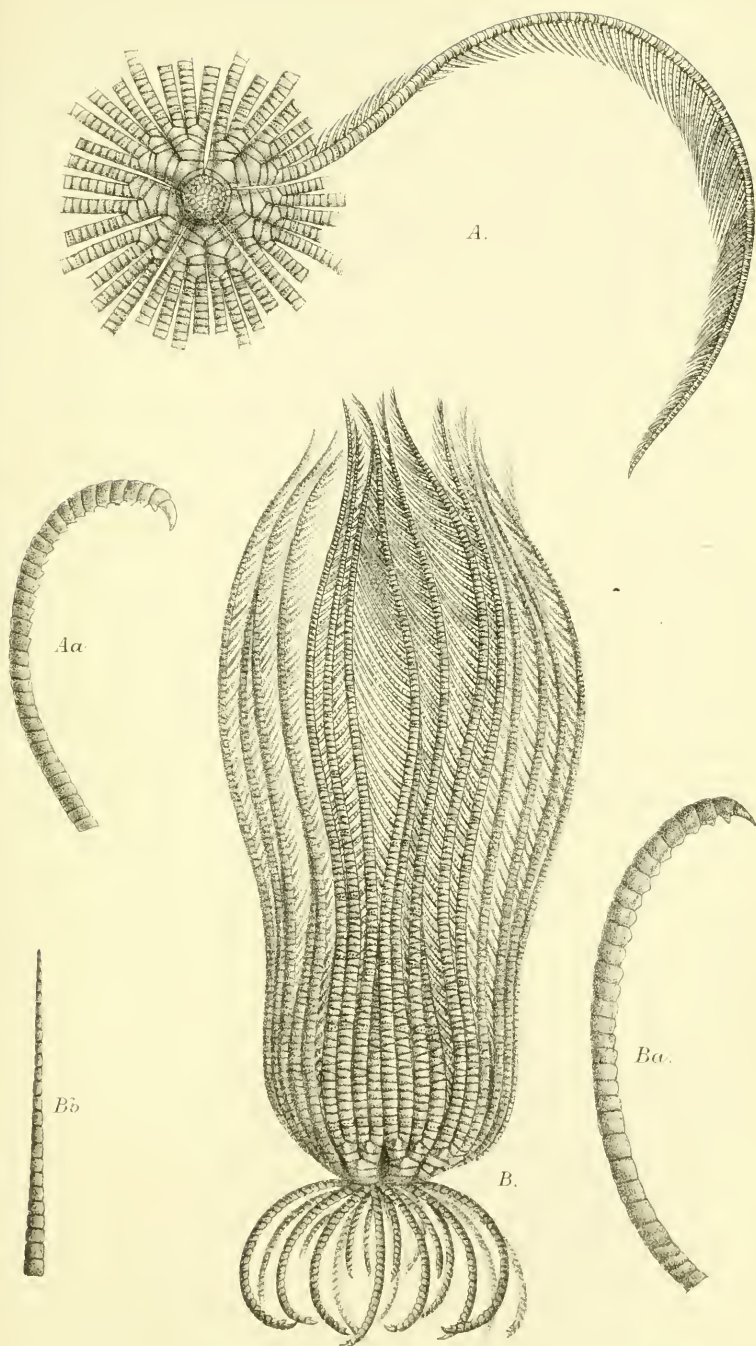
Fig. B. *Antedon pumila*.

Fig. C. *Antedon loveni*.









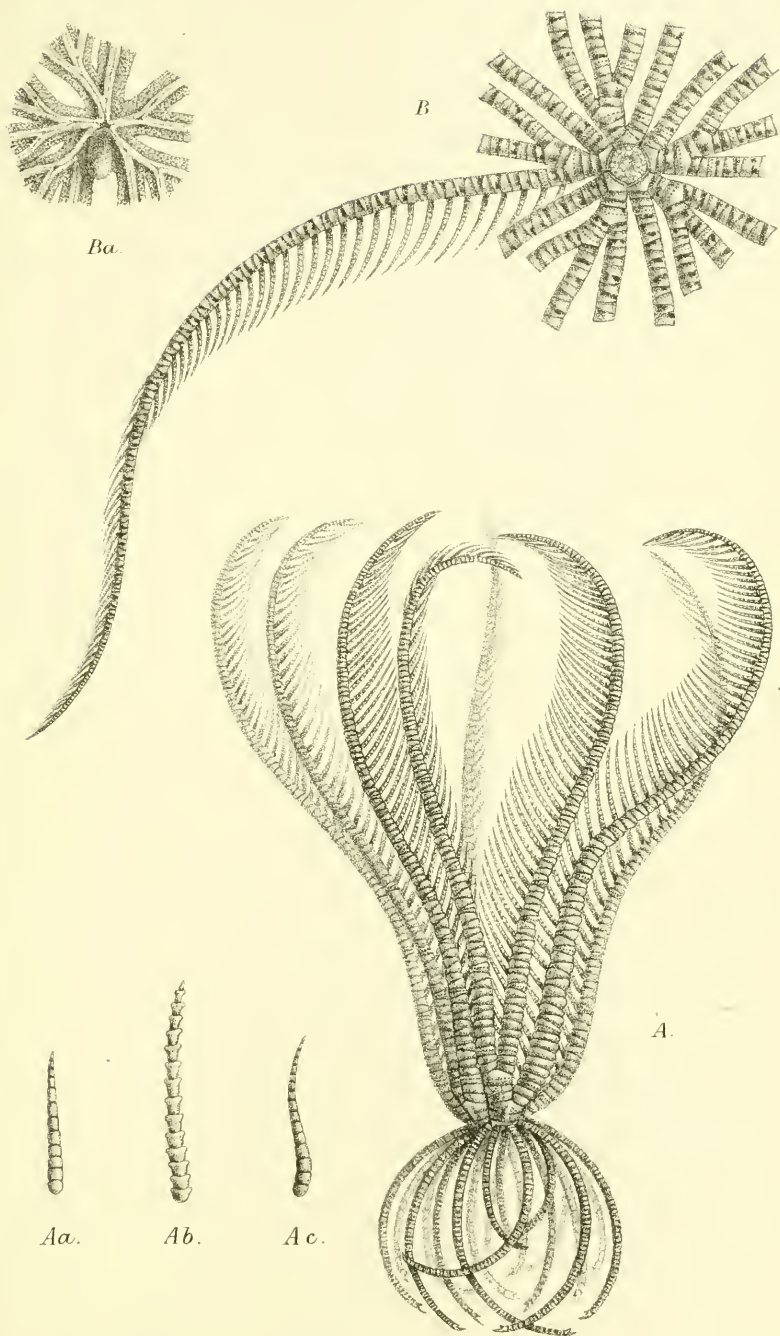
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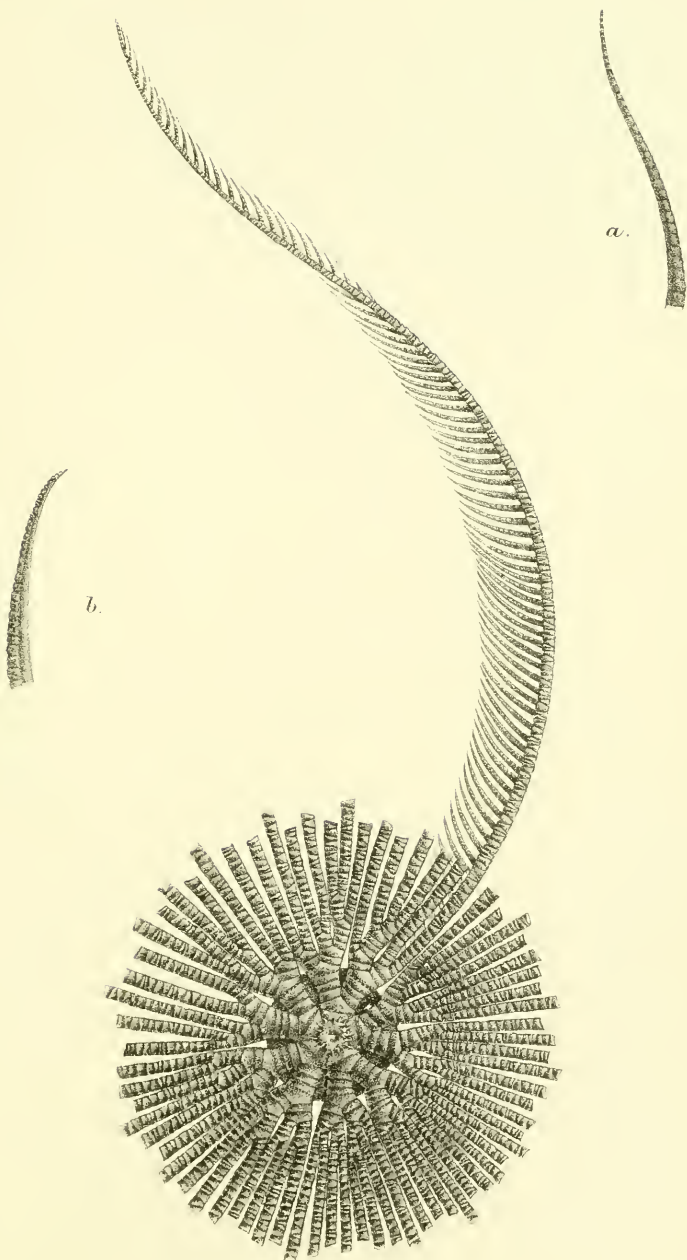
Fig. A. *Antedon reginae*. Fig. B. *Antedon gyges*.





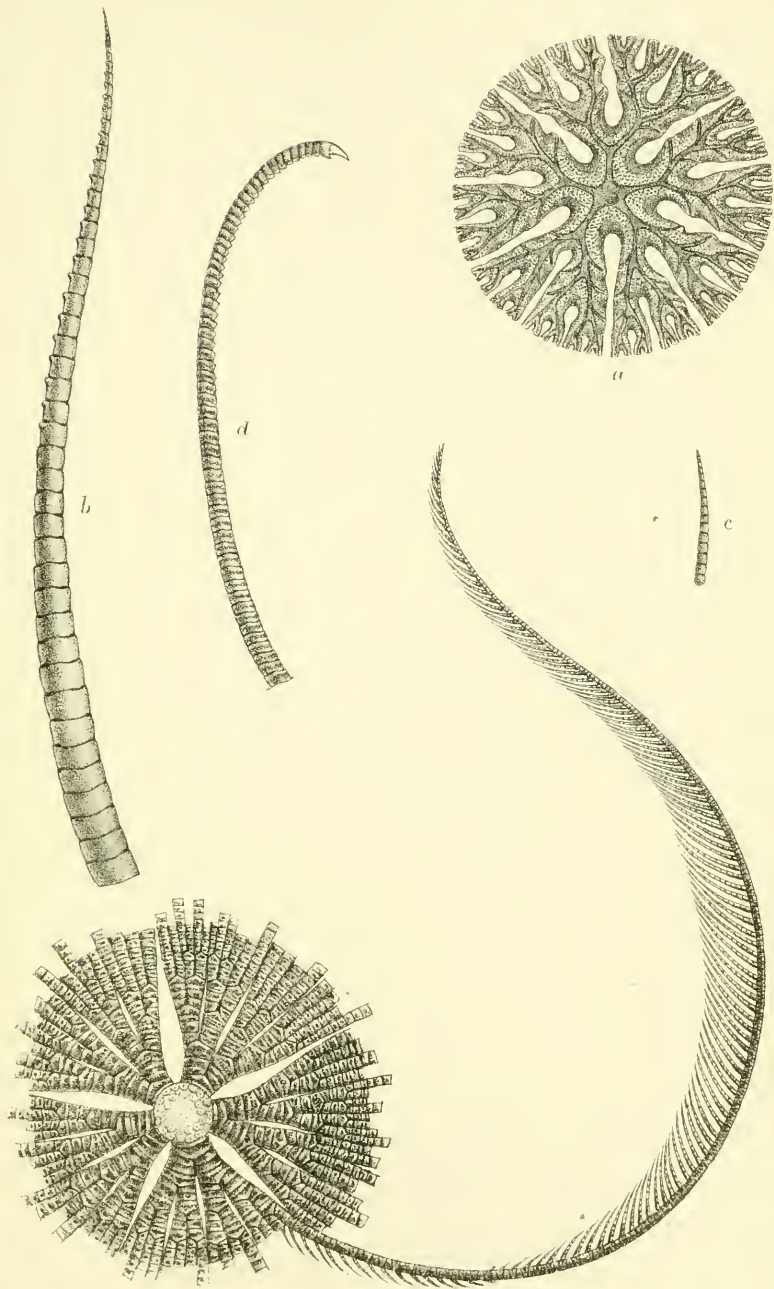










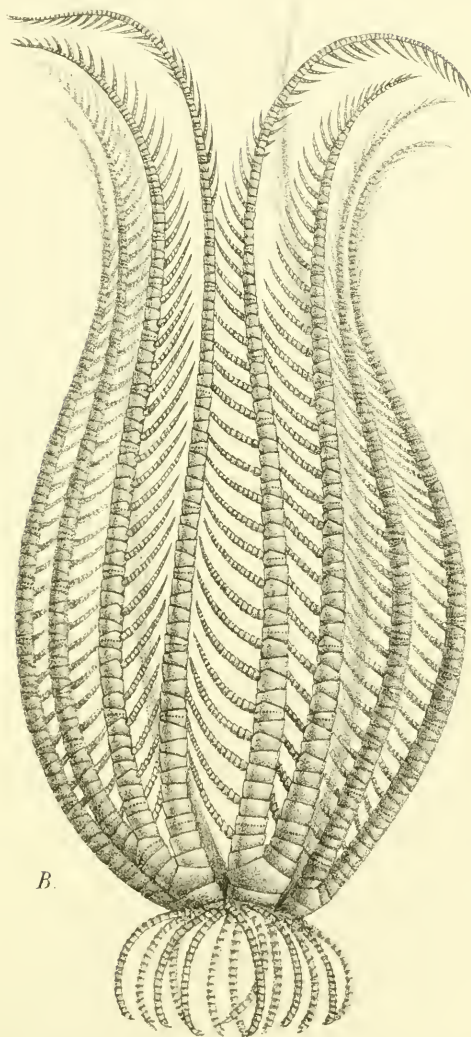
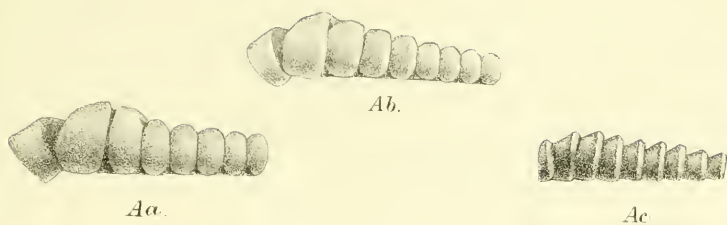


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*Antedon microdiscus.*

Minter Bros. imp



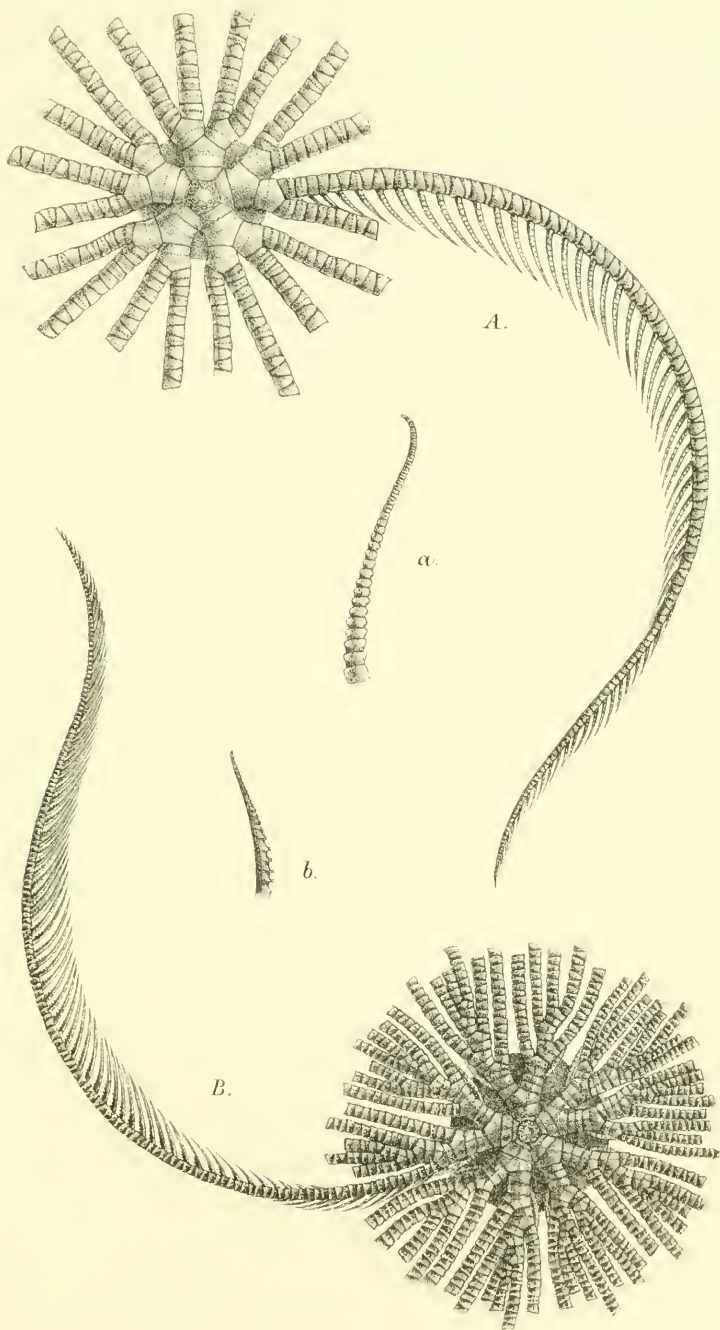


R. Minter del et lith

Minter Bros. imp.

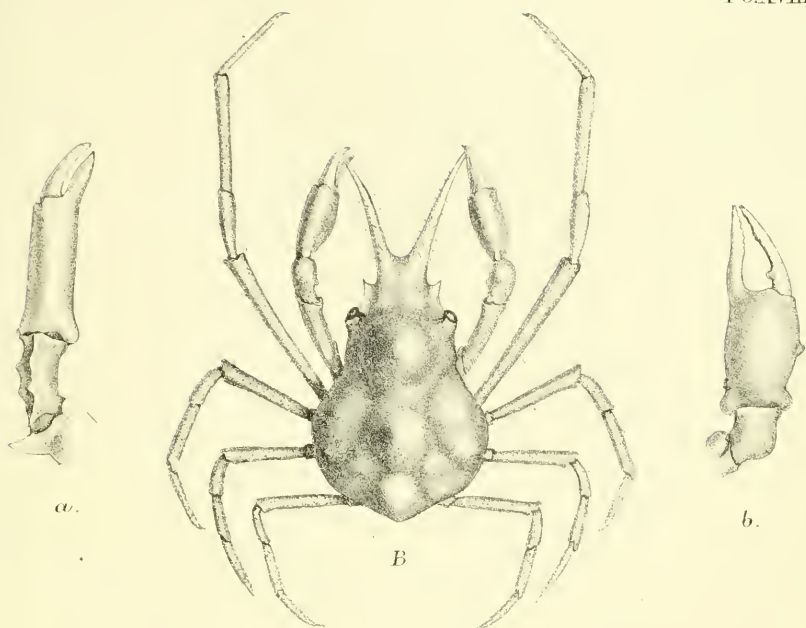
Fig. A. a. Second pinnule of *Actinometra solaris*. b. of *A. intermedia*. c. of *A. robusta*. Fig. B. *Actinometra Coppingeri*.



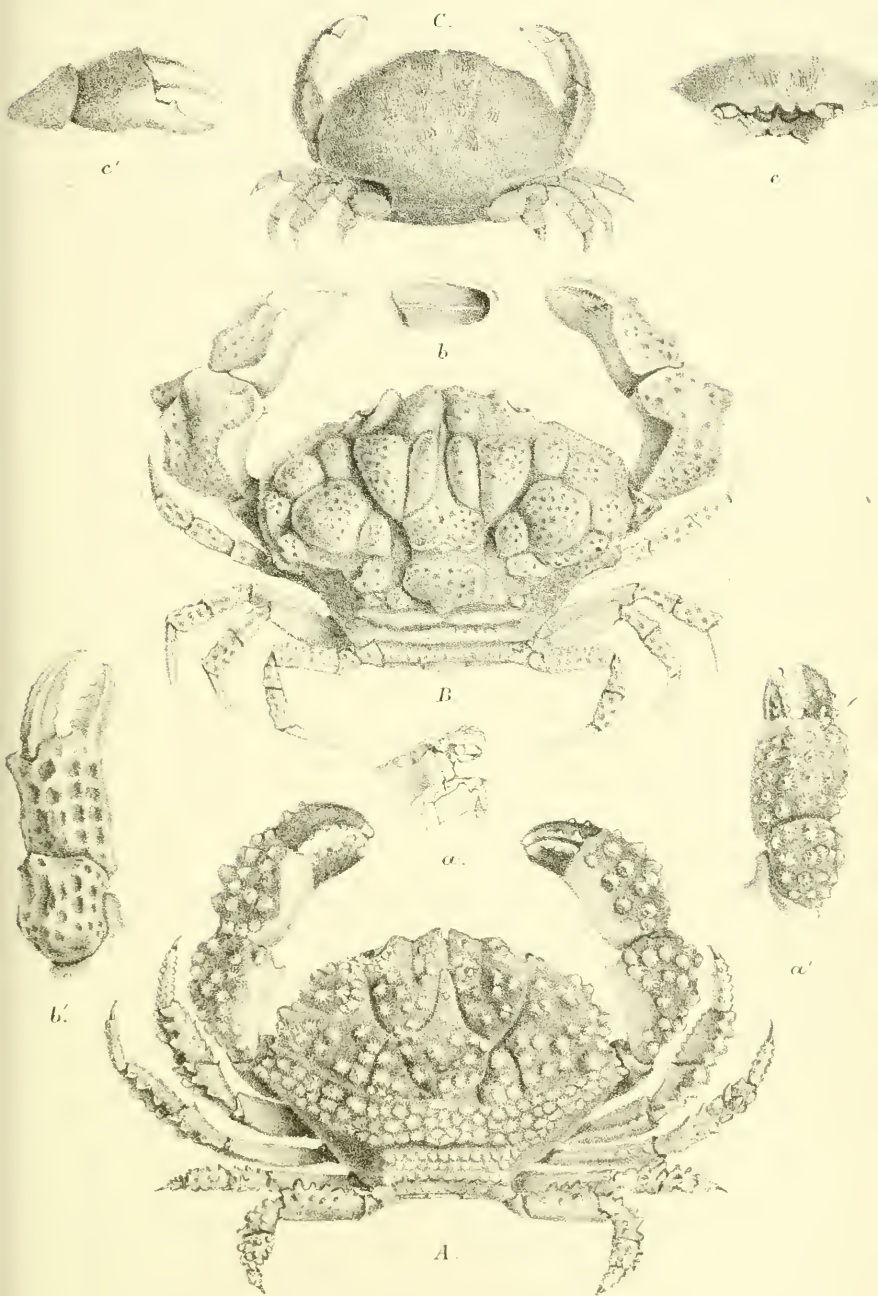












Robt Morgan del. et lith.

Mintern Bros imp.

Fig. A. *Eucanthus tuberculatus*. Fig. B. *Hypocaelus punctatus*.  
 Fig. C. *Banareia inconspicua*.



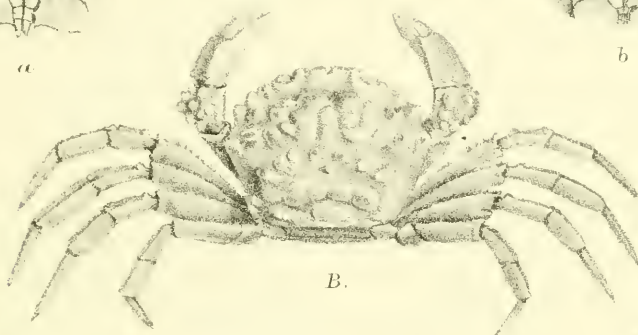




a



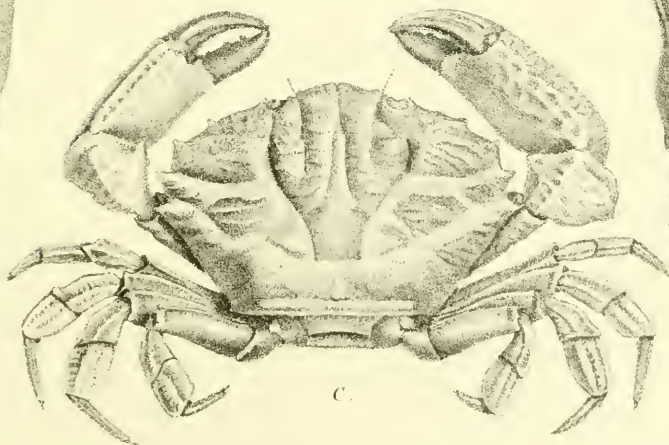
b



B.



b'



C.



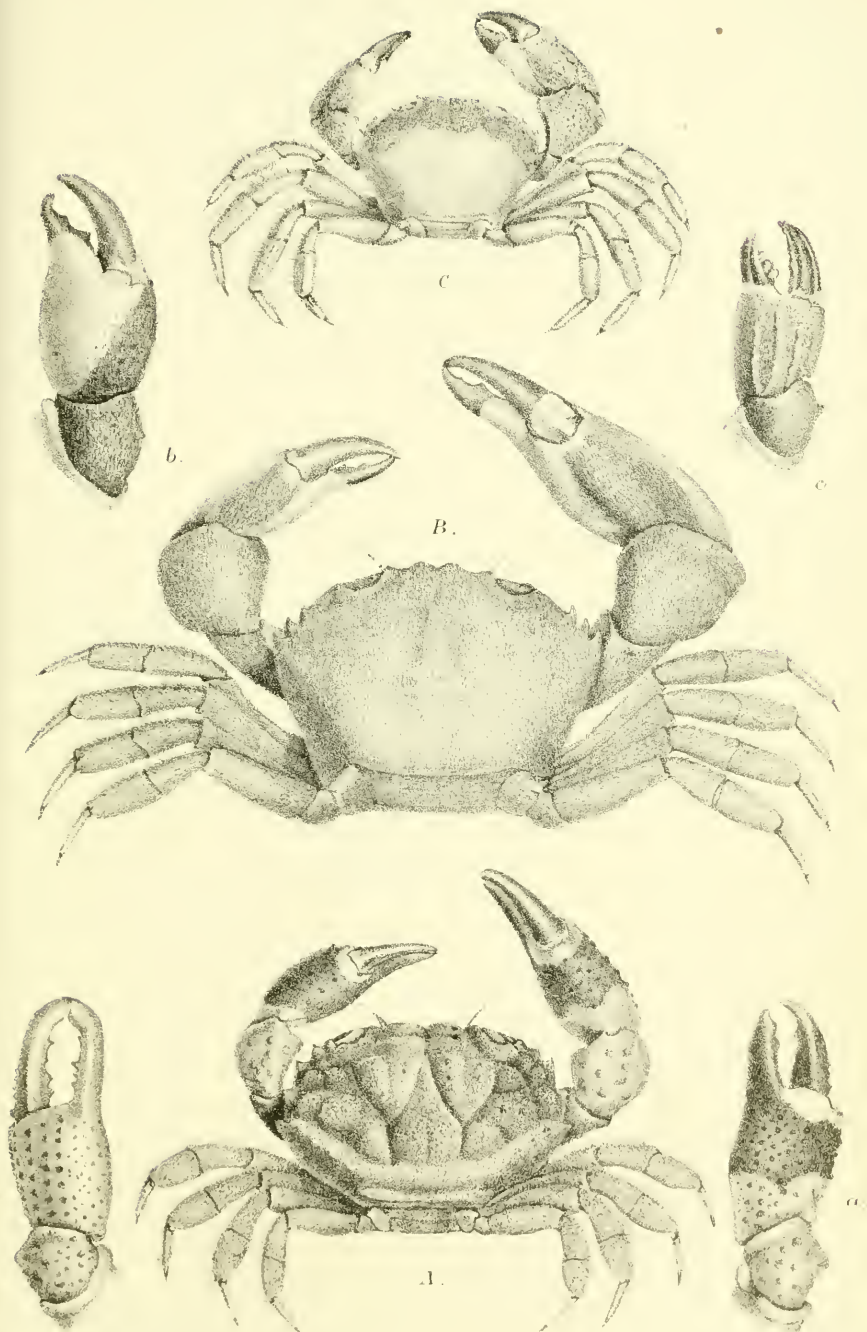
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Robt. Morgan, del et lith

Mintern Bros. imp

Fig. A. *Galene granulata*. Fig. B. *Hulimede coppingeri*.  
 Fig. C. *Xantho macgillivrayi*.



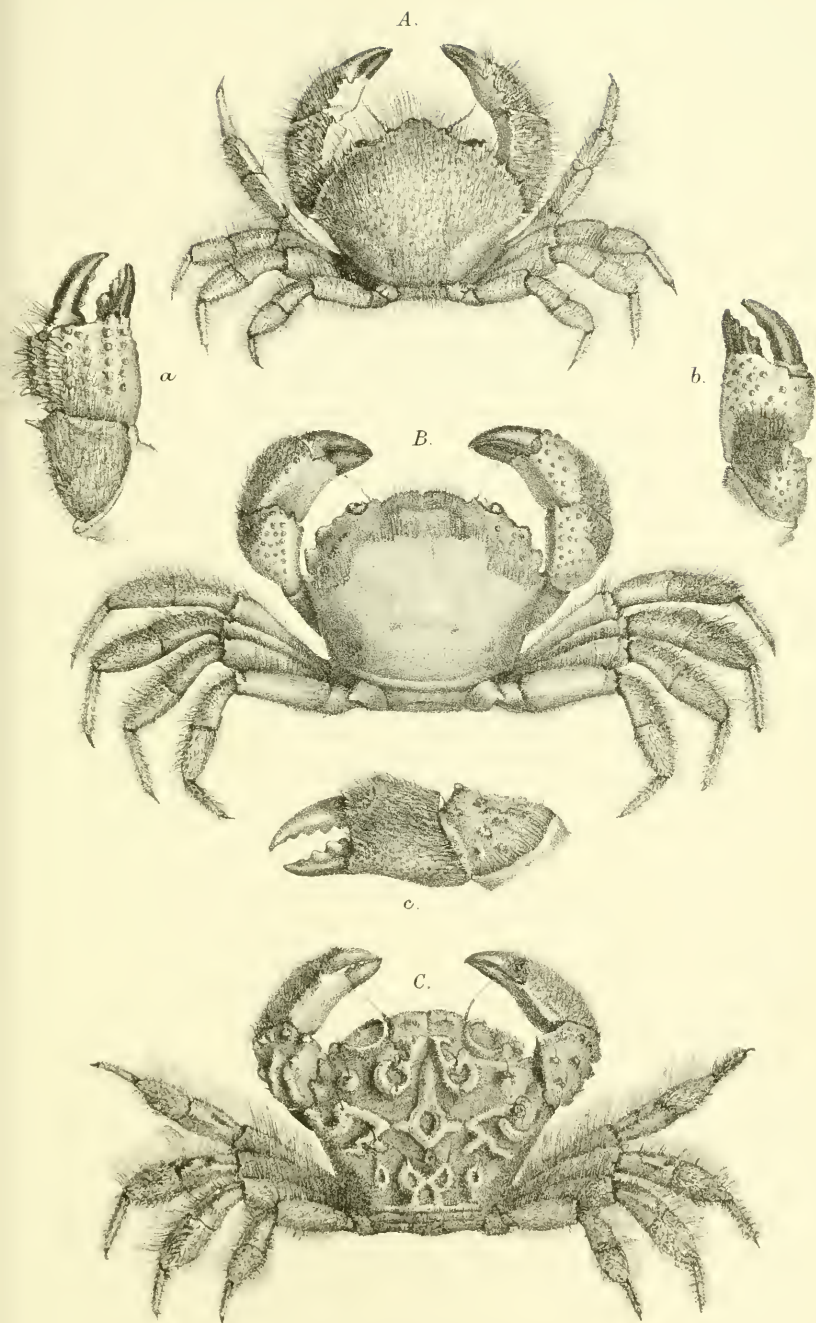


Robt. Morgan, del. et lith.

Mintern Bros. imp.

Fig. A. *Chlorodopsis granulatus*. Fig. B. *Pilumnus lanatus*.  
Fig. C. *Pilumnus seminudus*.





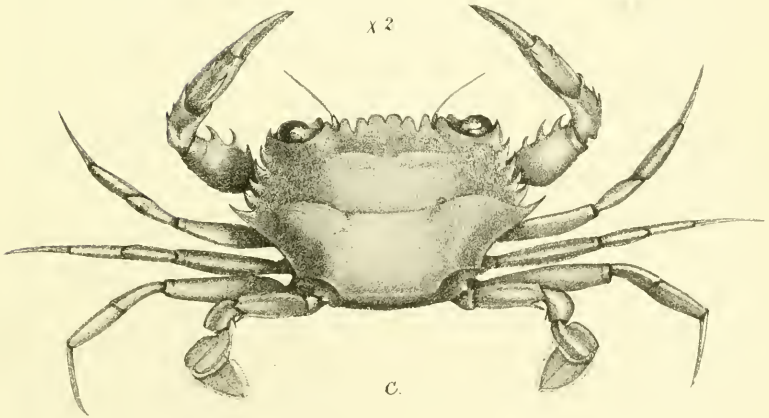
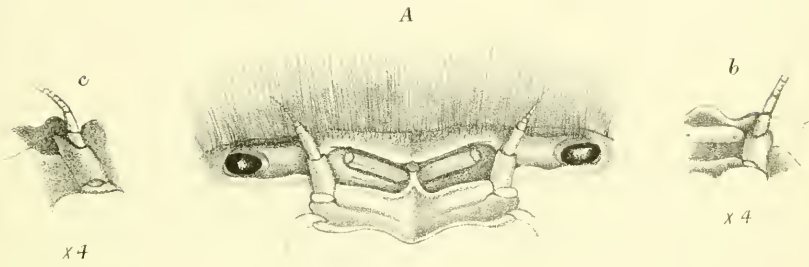
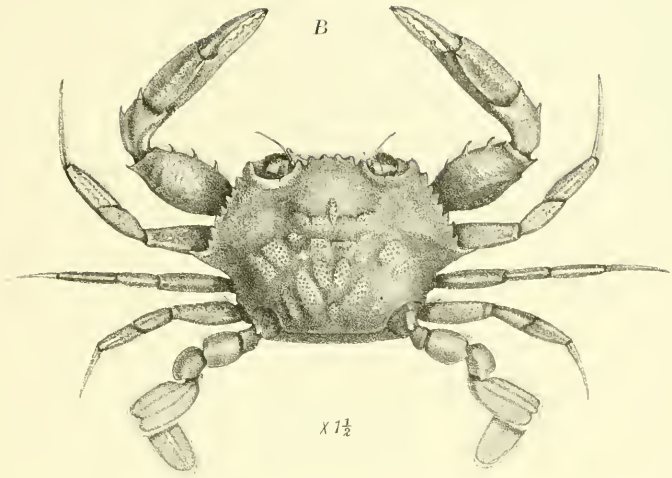
Robt Morgan del et lith.

Mintern Bros imp

Fig. A. *Pilumnus pulcher*.      Fig. B. *Pilumnus semilanatus*.  
Fig. C. *Pilumnus labyrinthicus*.





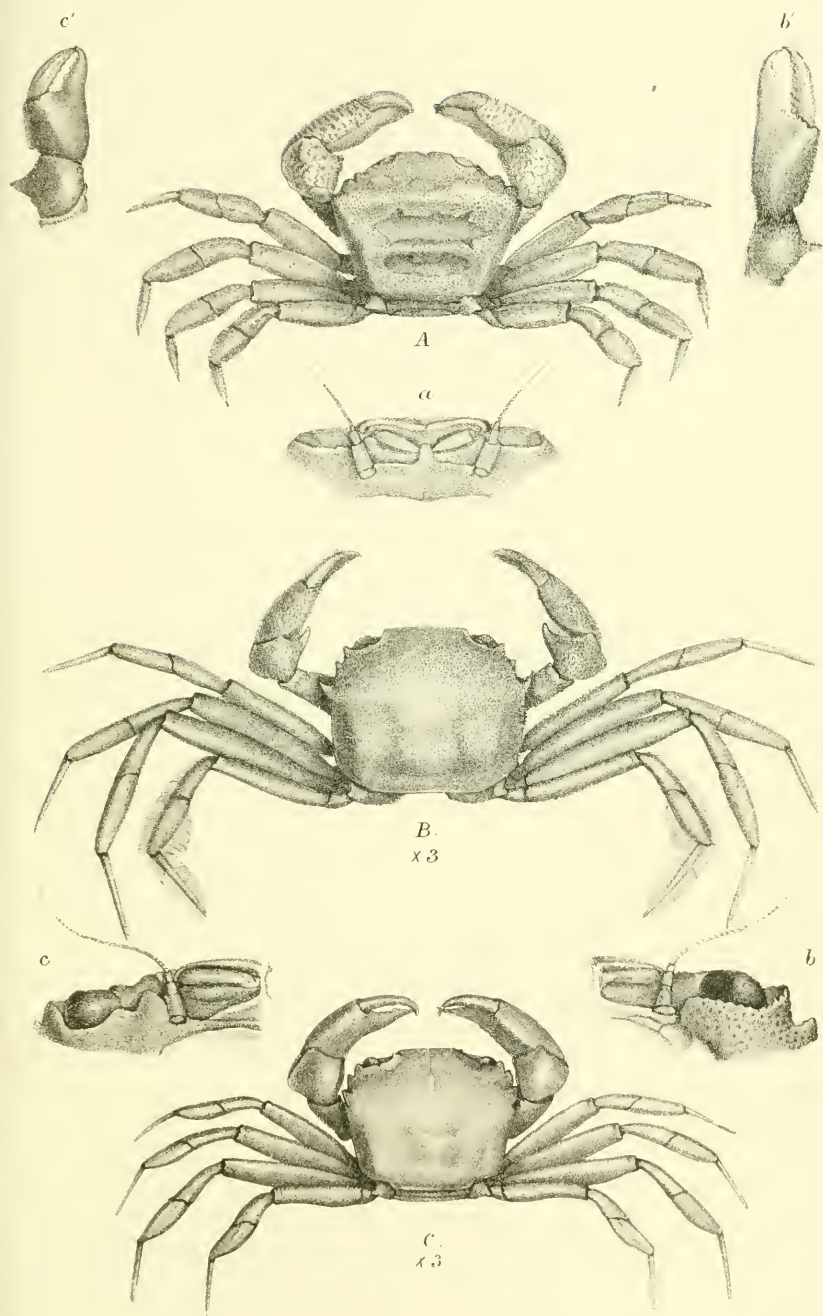


Robt Morgan del et lith.

Mintern Bros. inc.

Fig. A. *Cryptocaelma fimbriatum*. Fig. B. *Achelous granulatus*, var. *unispinosus*.  
Fig. C. *Gontiosoma spiniferum*.





Robt Morgan del et lith.

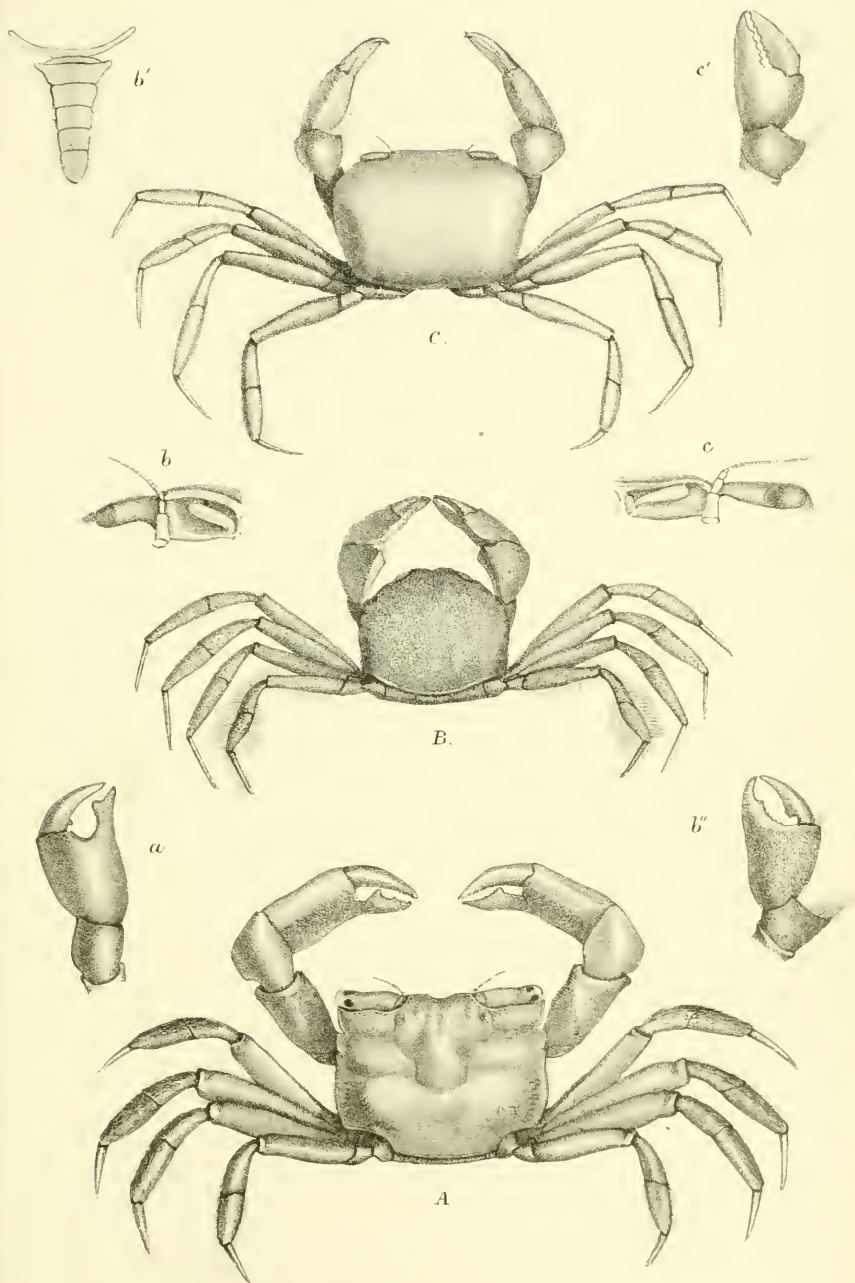
Mutern Bros imp

Fig. A. *Camptoplax coppingeri*. Fig. B. *Pseudorhombila vestita* var. *scaberrata*.

Fig. C. *Pseudorhombila sulcatifrons* var. *australiensis*.





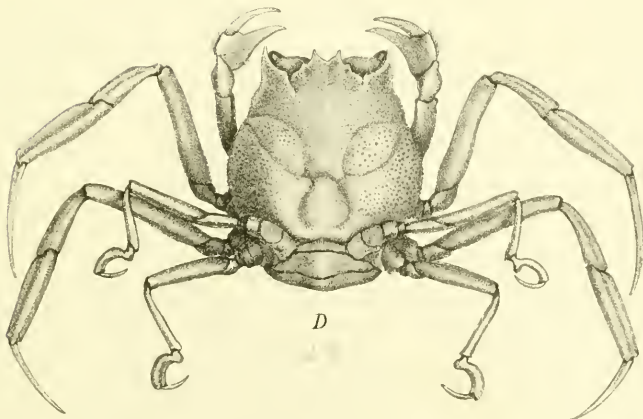
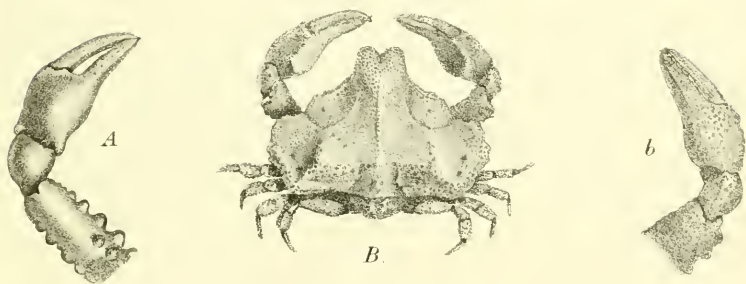
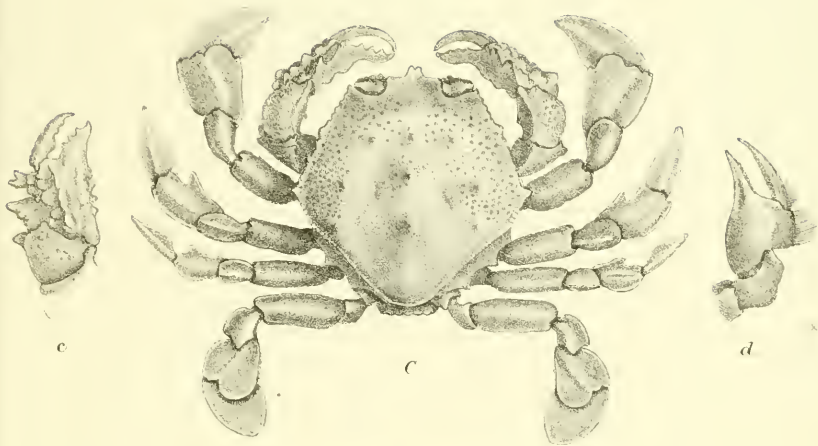


Robt. Morgan del et lith.

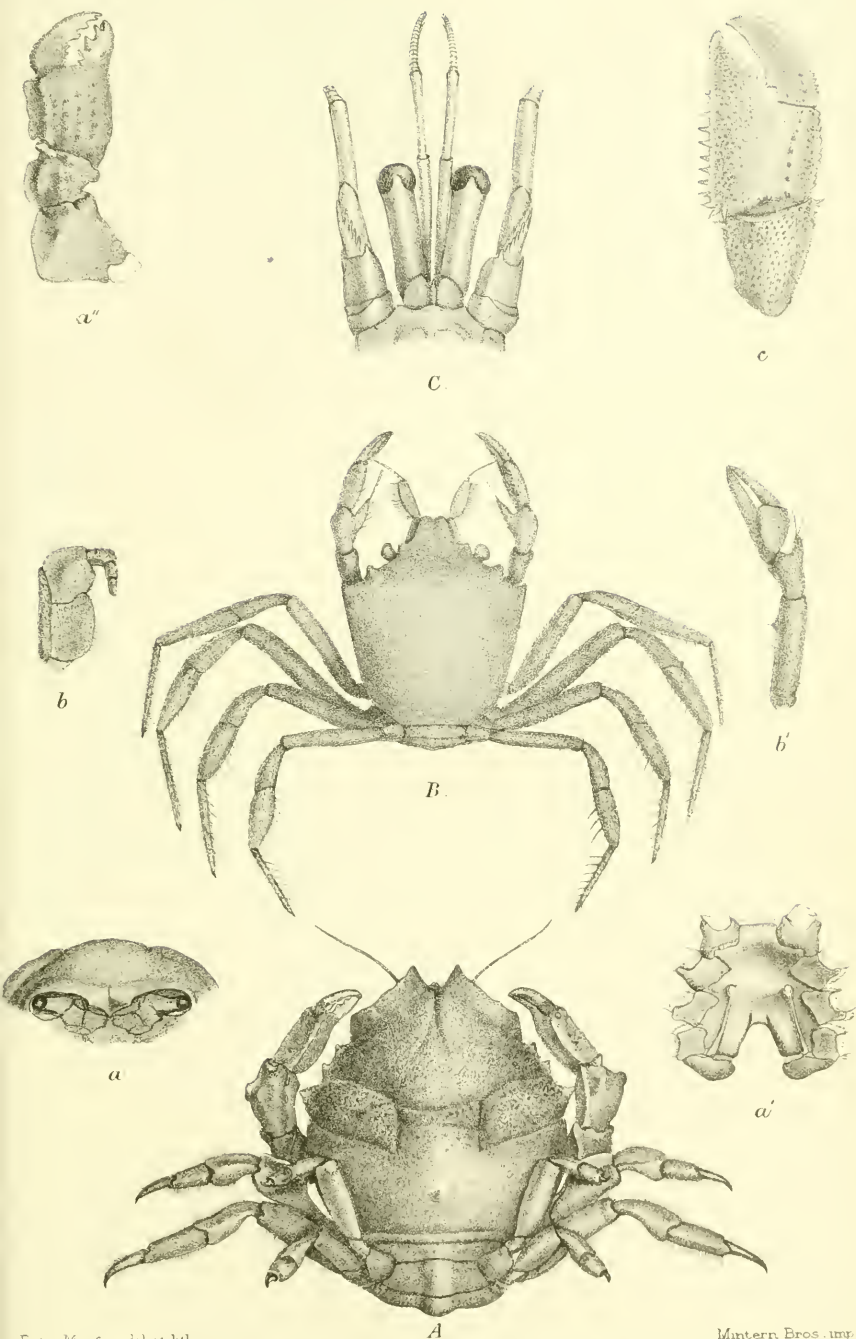
Mintern Bros. inc.

Fig. A. *Macrophthalmus punctulatus*. Fig. B. *Ceratoplax arcuata*  
Fig. C. *Ceratoplax laevis*.









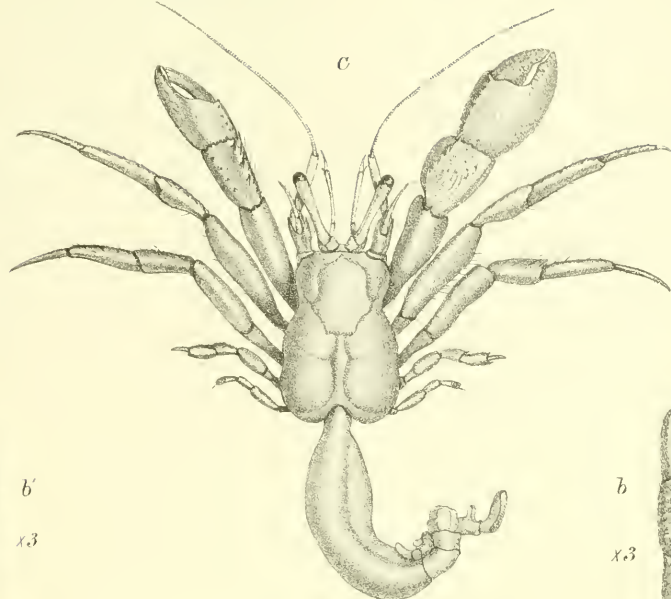
Root Morgan, del et lith

Mintern Bros. imp

Fig. A. *Petalomera pulchra*. Fig. B. *Paratymolus scæspiusus*.  
Fig. C. *Diogenes rectimanus*.







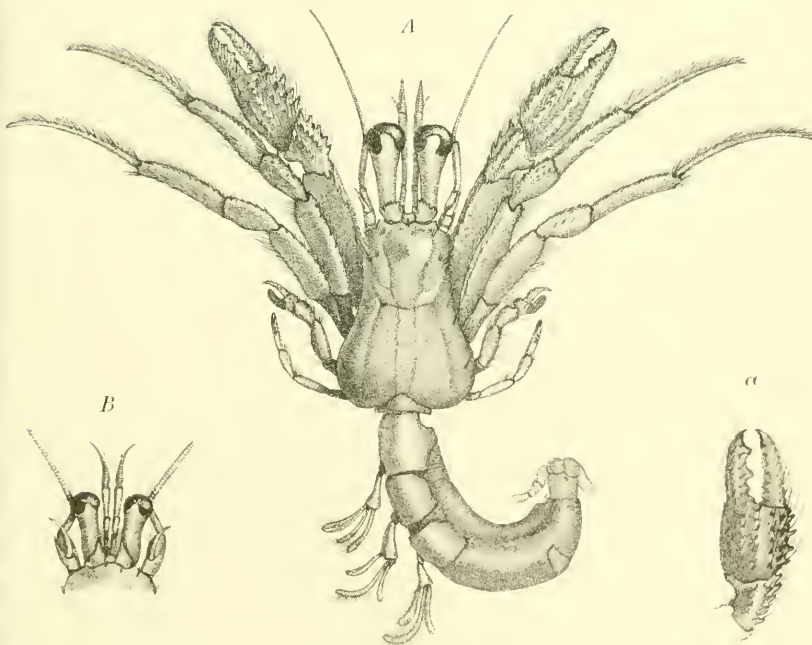
b'

x3



b

x3



A

B



a



Robt. Morgan, del et lith.

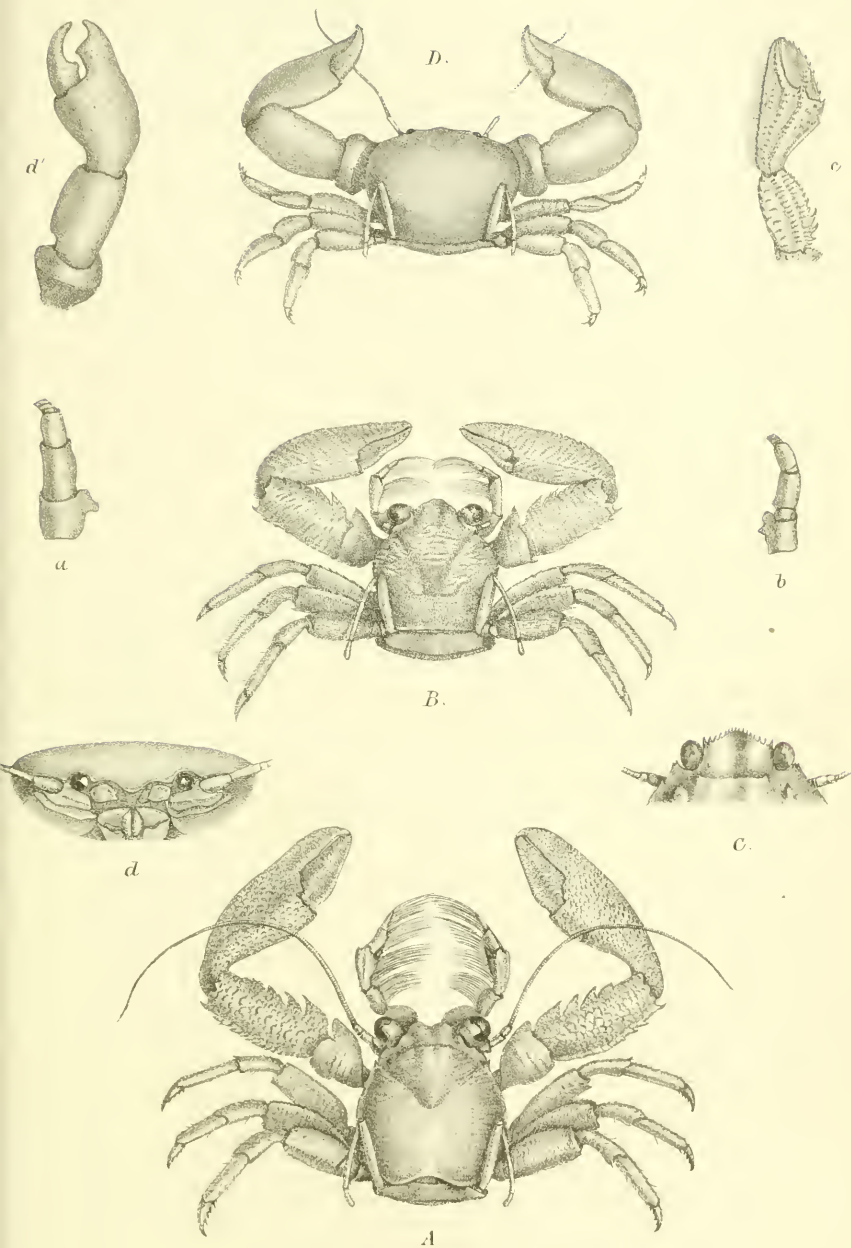
Mintern. Bros. imp.

Fig. A. *Pagurus hessii*.

Fig. B. *Eupagurus compressipes*.

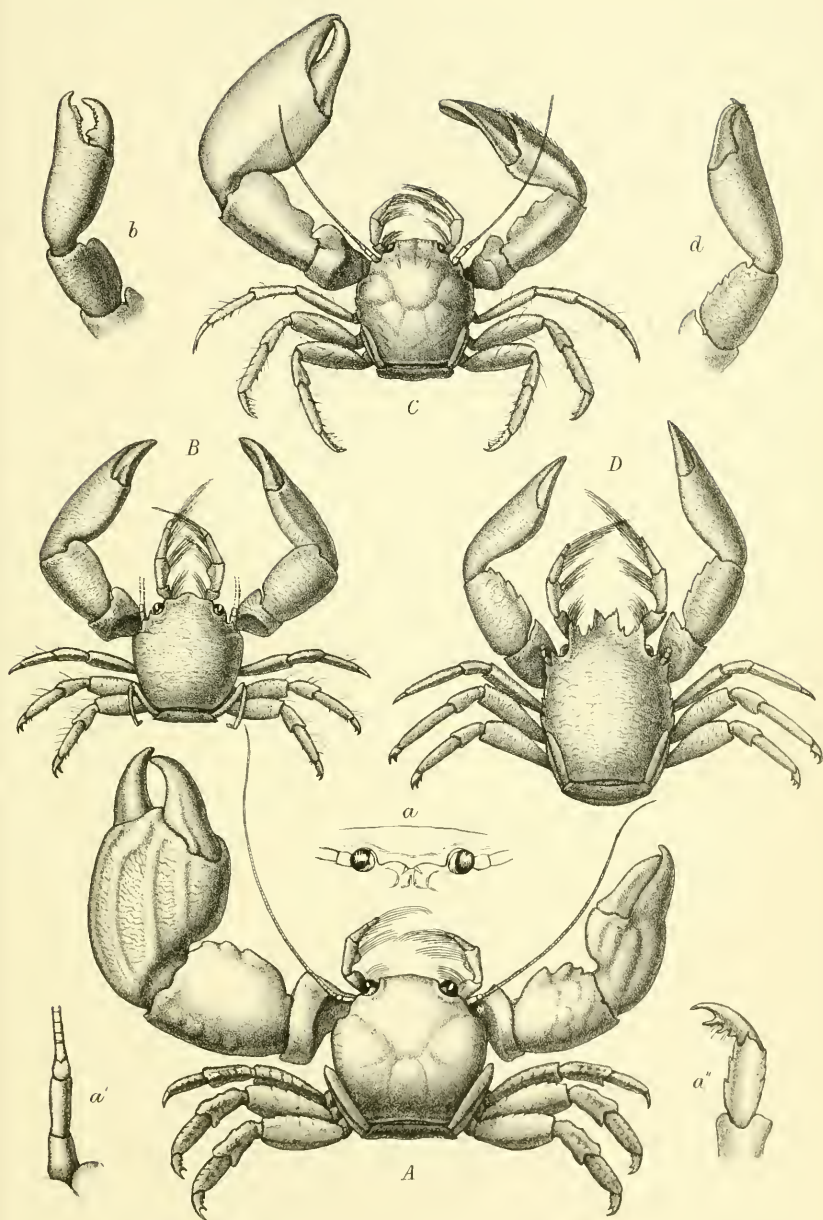
Fig. C. *Eupagurus kirkii*.



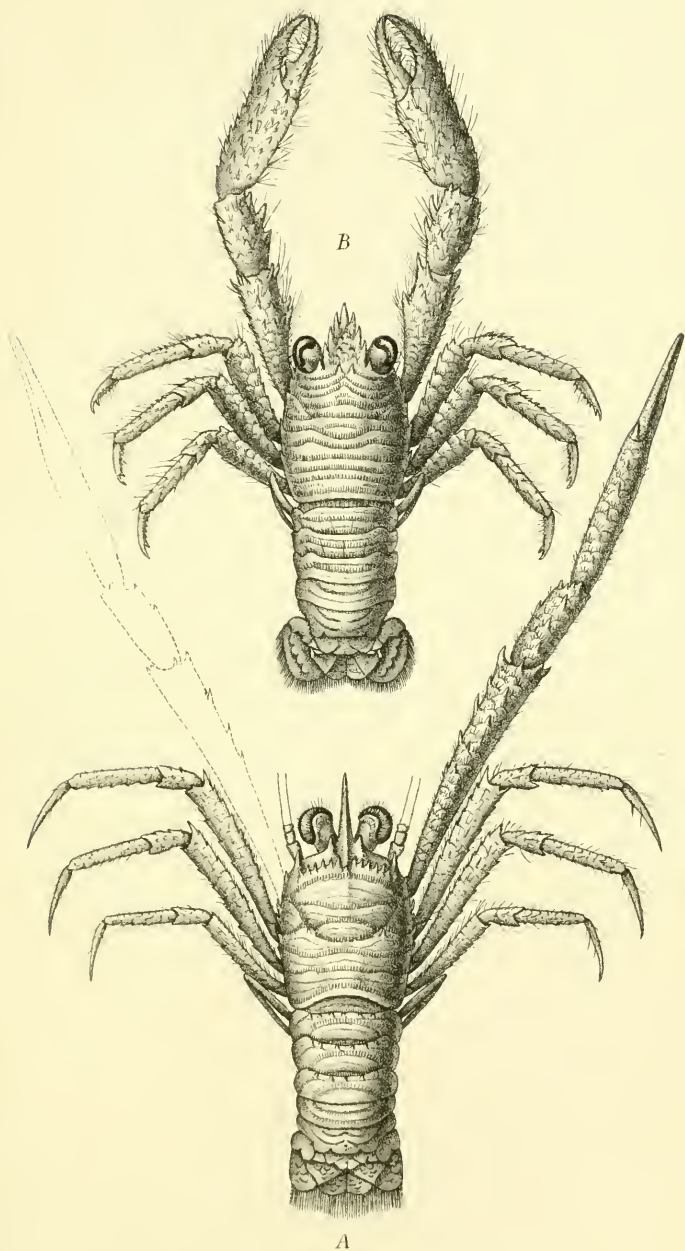




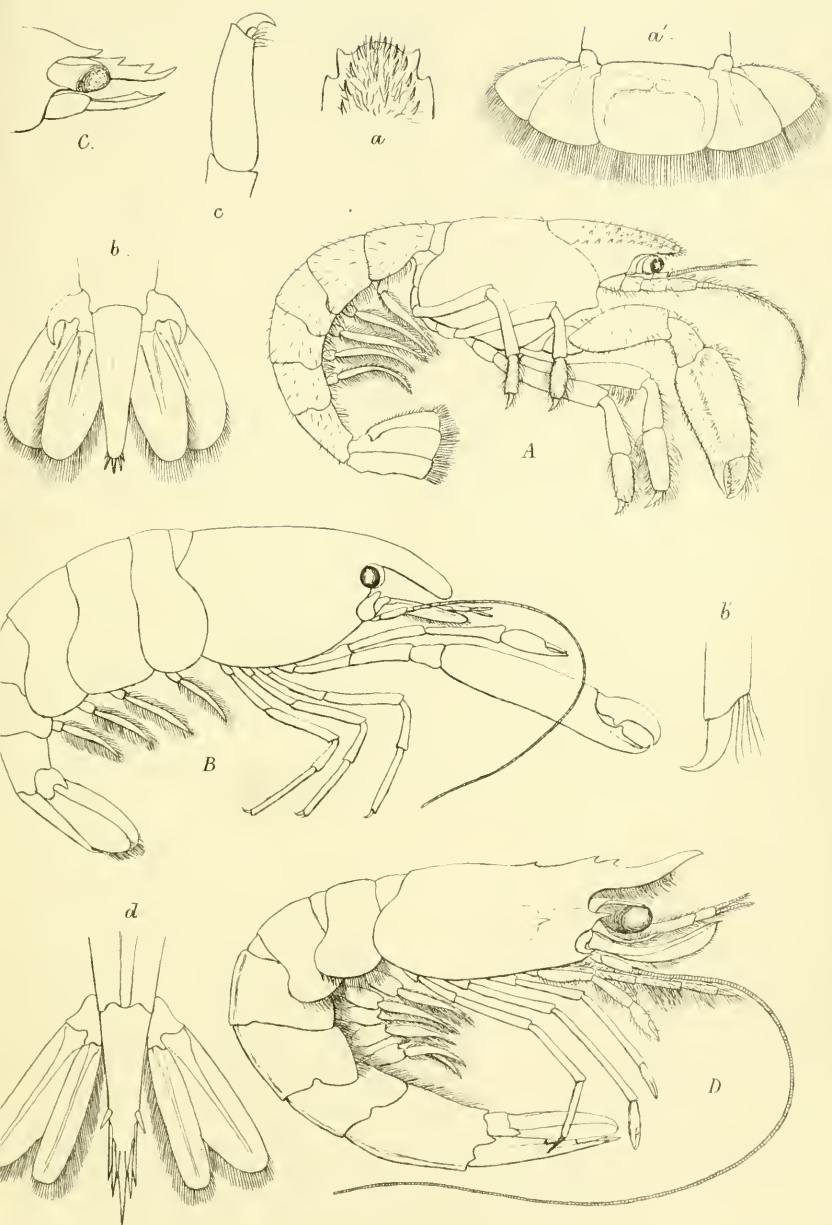






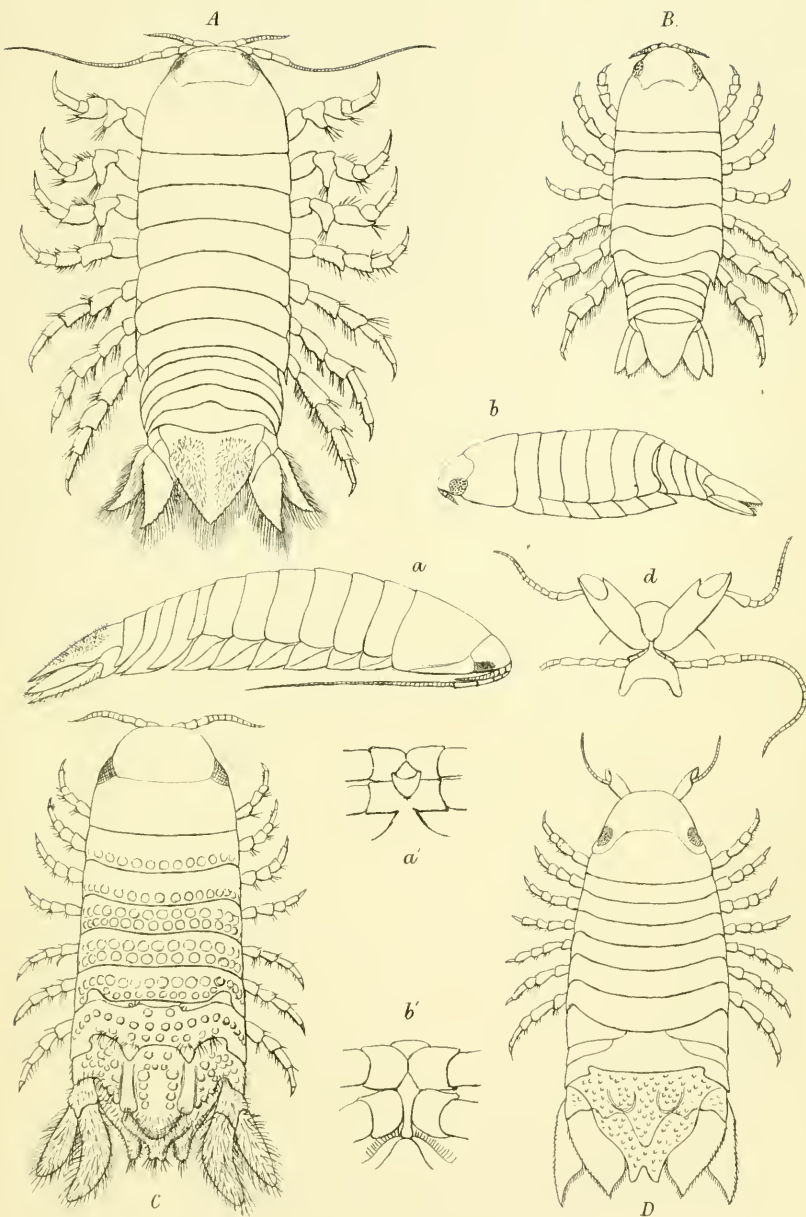












Bergeau & Highley del et lith.

Mintern Bros. imp

Fig. A. *Cirolana schiodtei*. Fig. B. *Cirolana tenuistylis*.  
 Fig. C. *Cymodocea longistylis*. Fig. D. *Cerceis bidentata*.



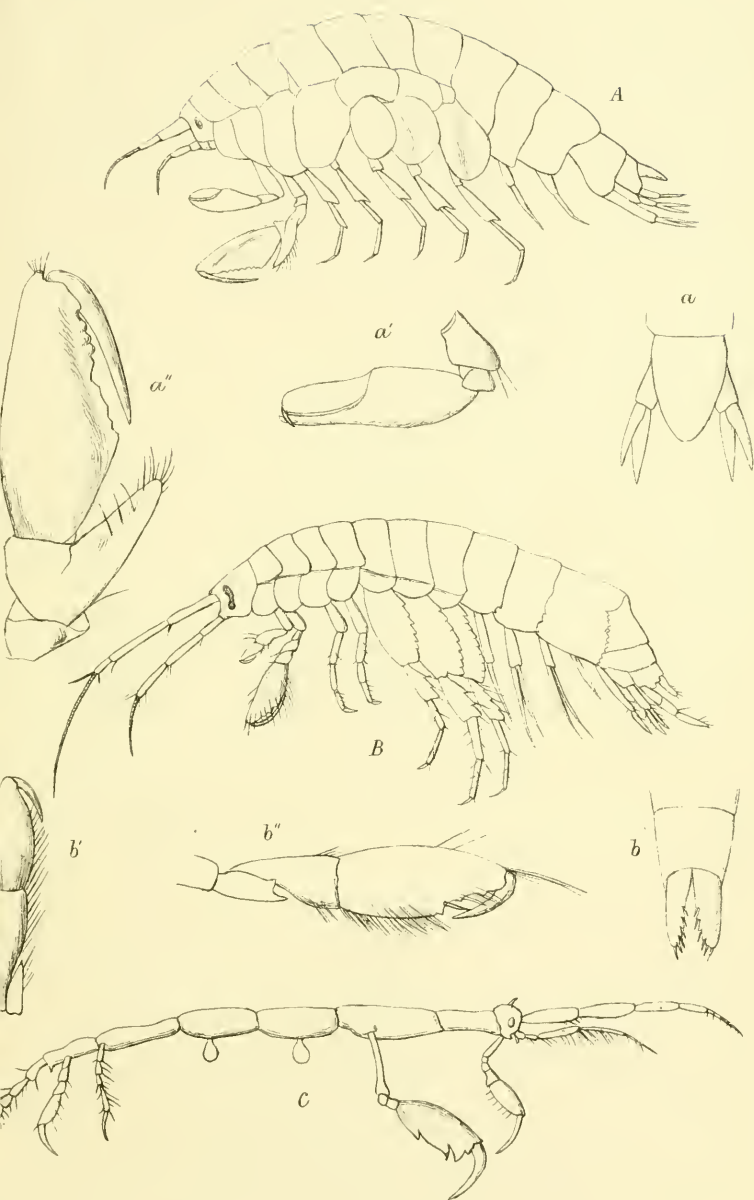


Fig. A. *Leucothoe brevidigitata*.

Fig. B. *Megamæra themsoni*.

Fig. C. *Caprella attenuata*.





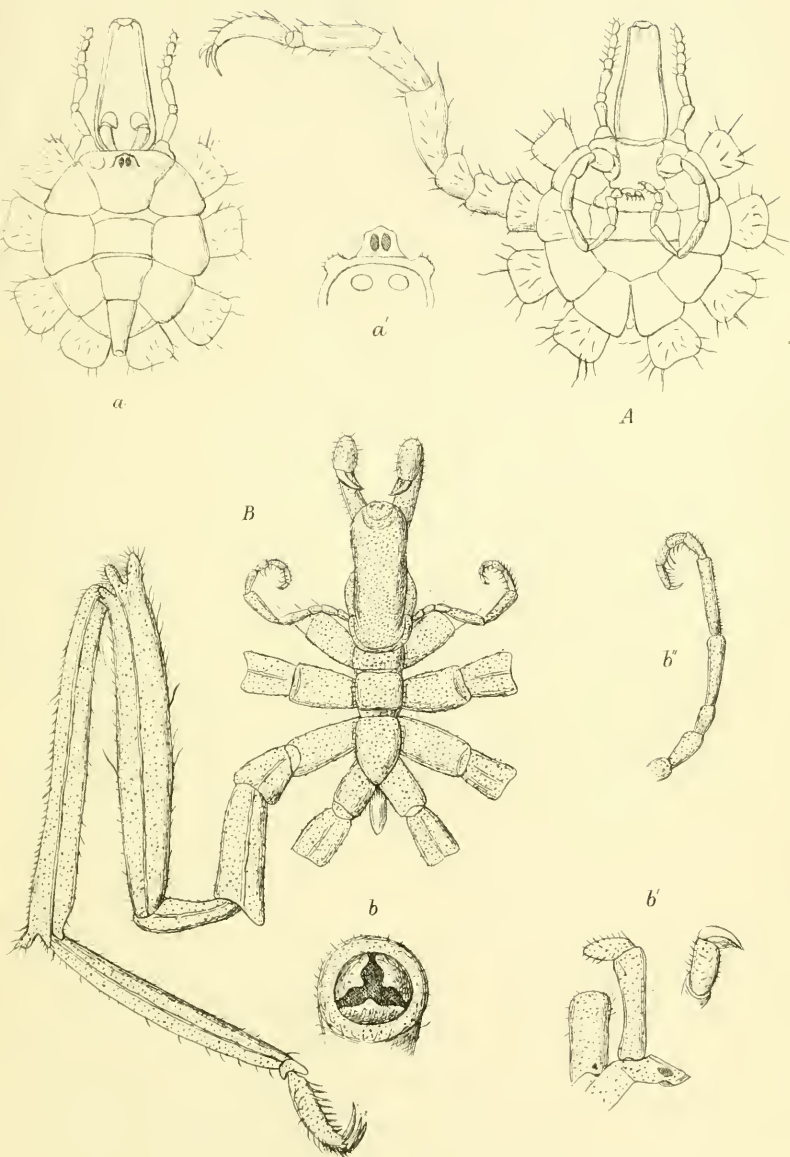
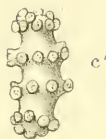
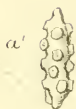
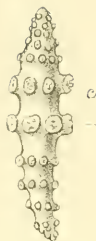
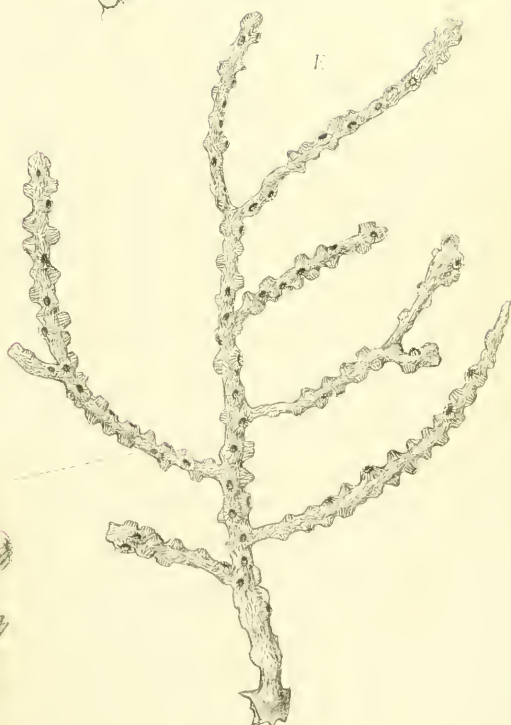


Fig. A. *Achelia laevis*, var. *australiensis*.  
 Fig. B. *Phoxichilidium hookii*.





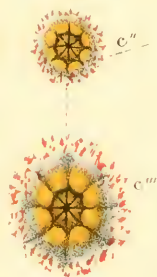
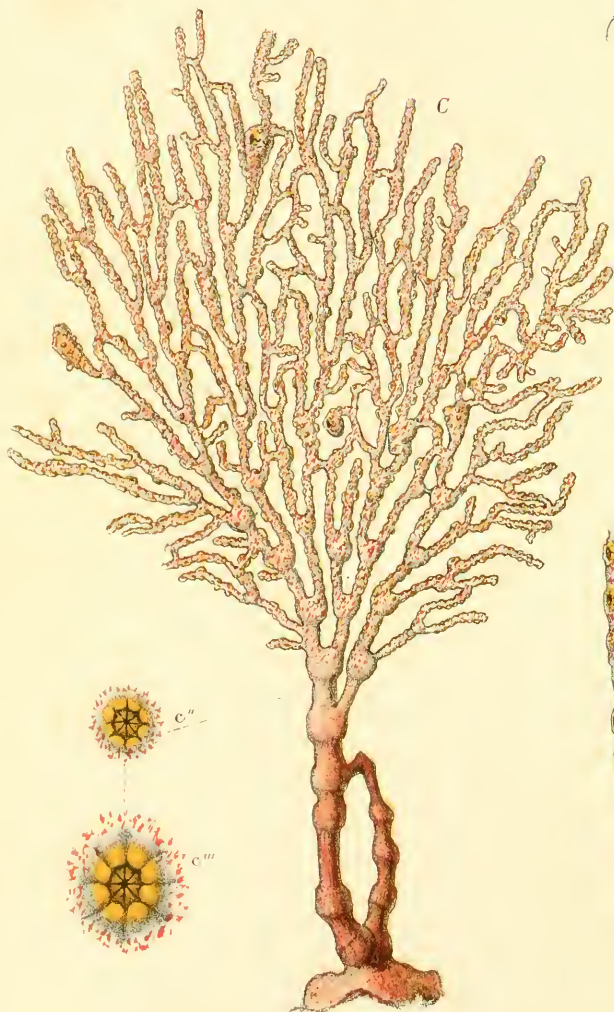
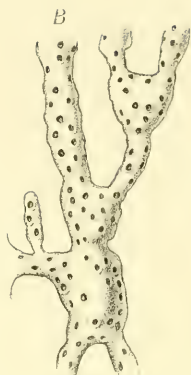
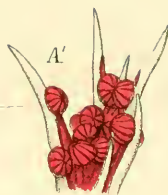
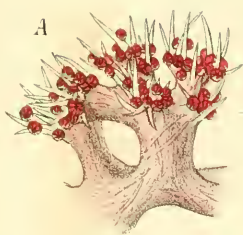


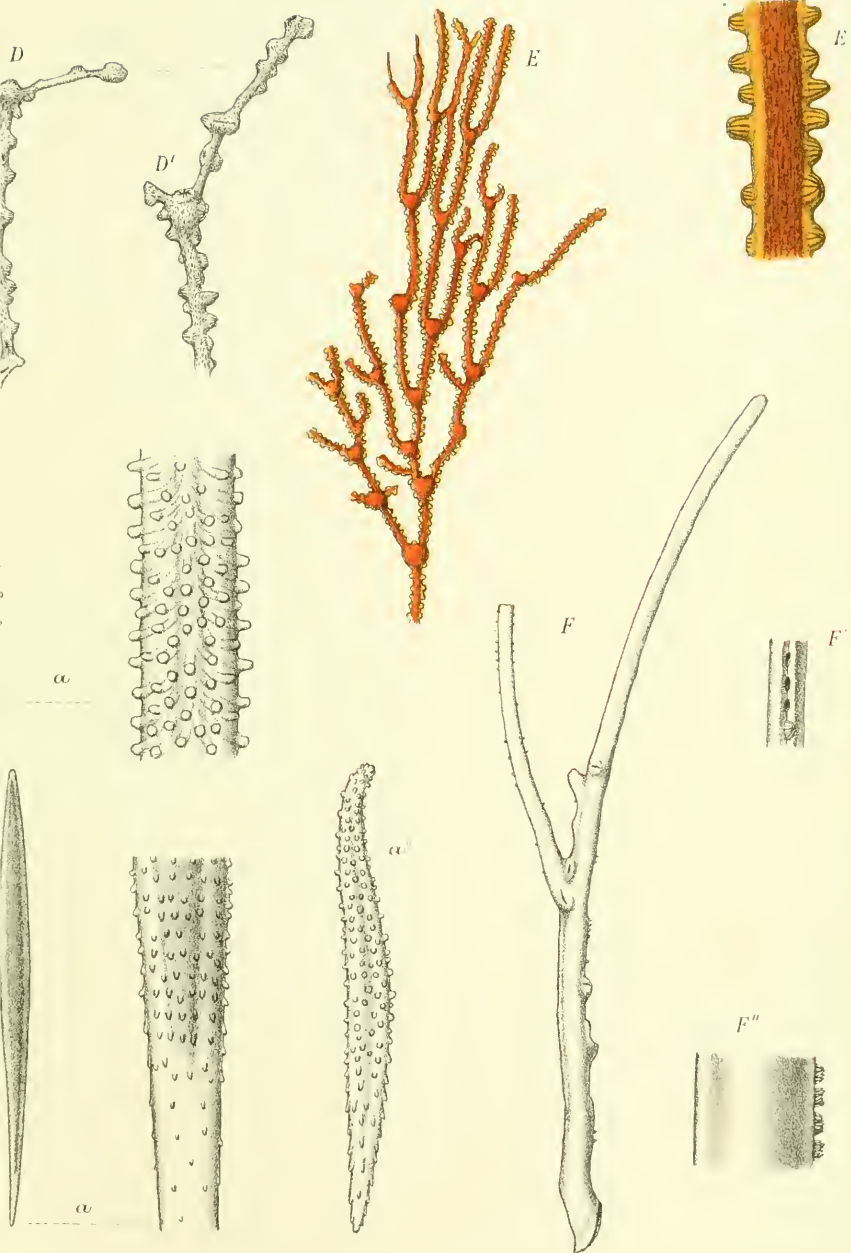






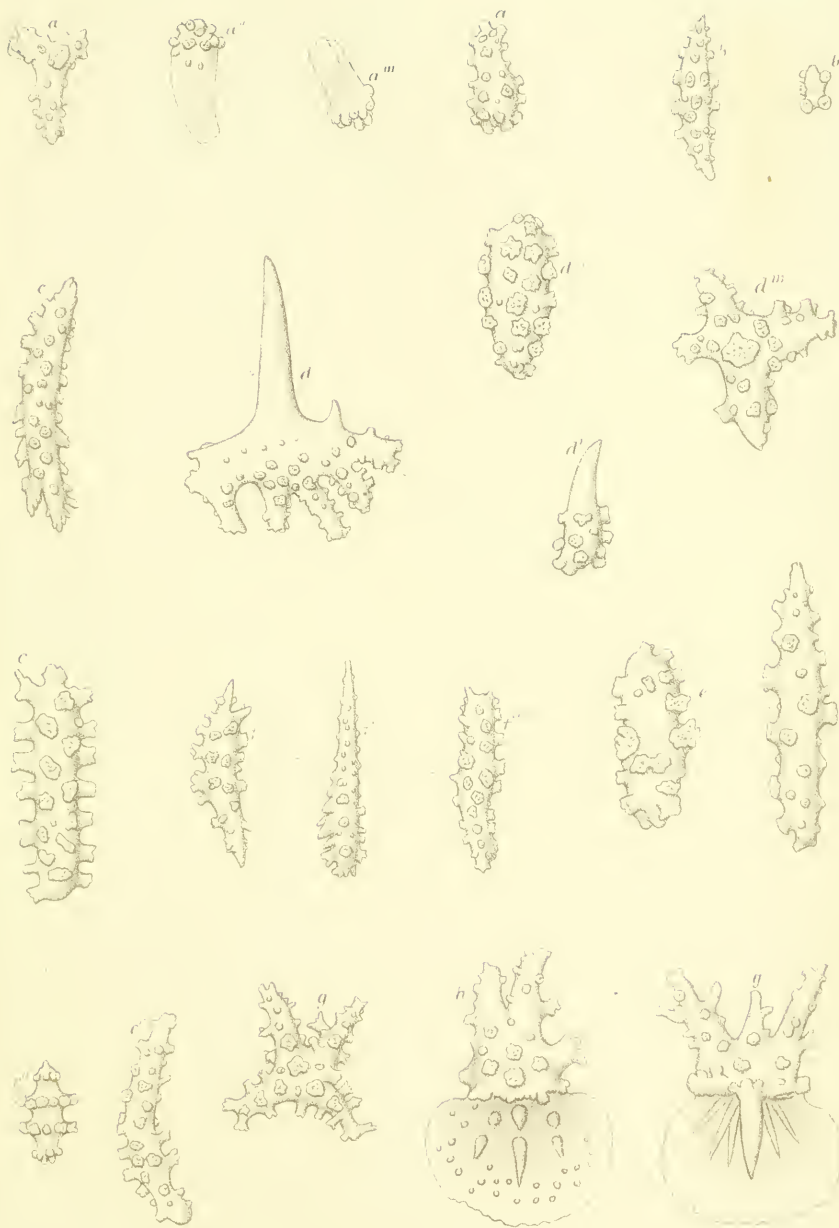












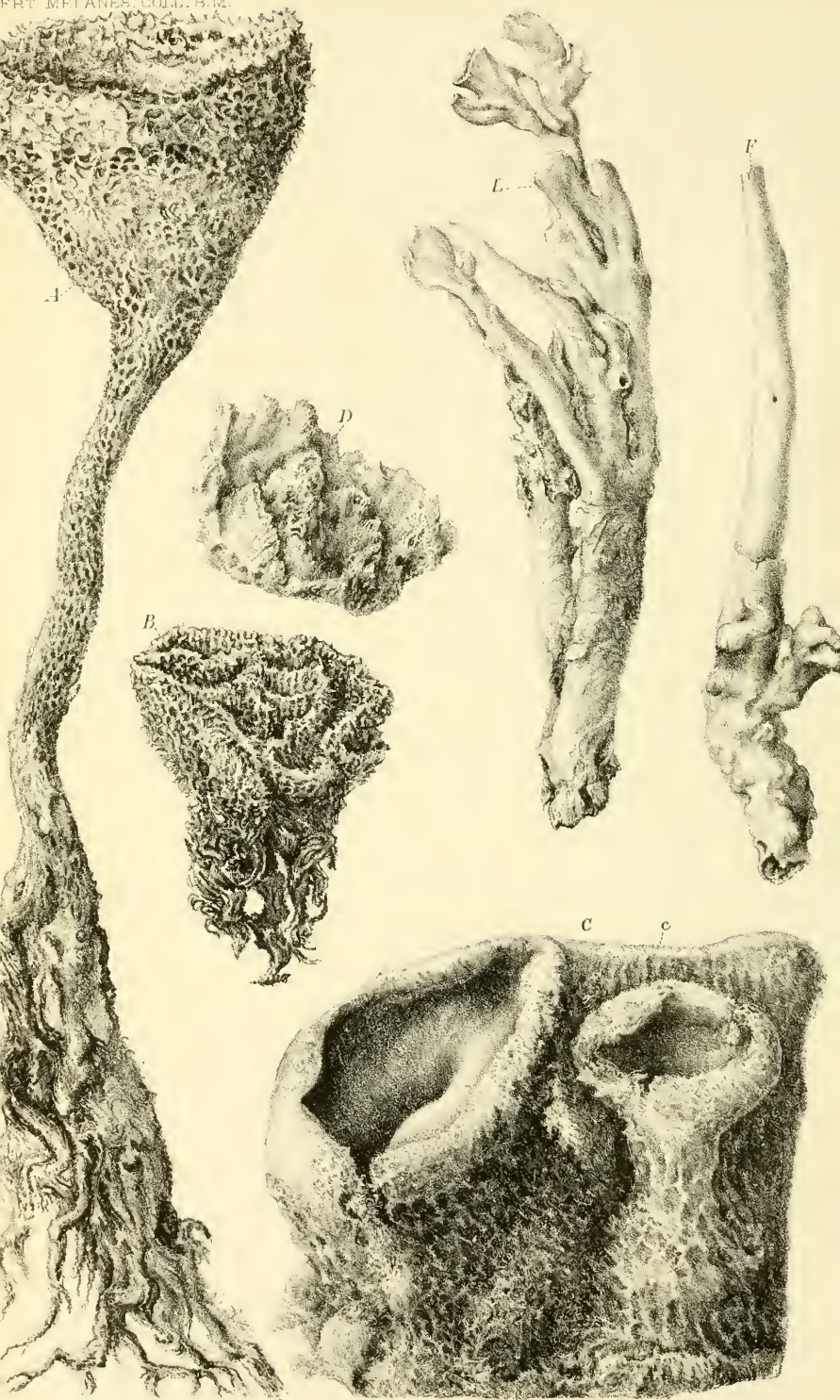
Berkeley & Highley del. lith.

Morgan del. lith.

*Spicules of Alcyonaria.*





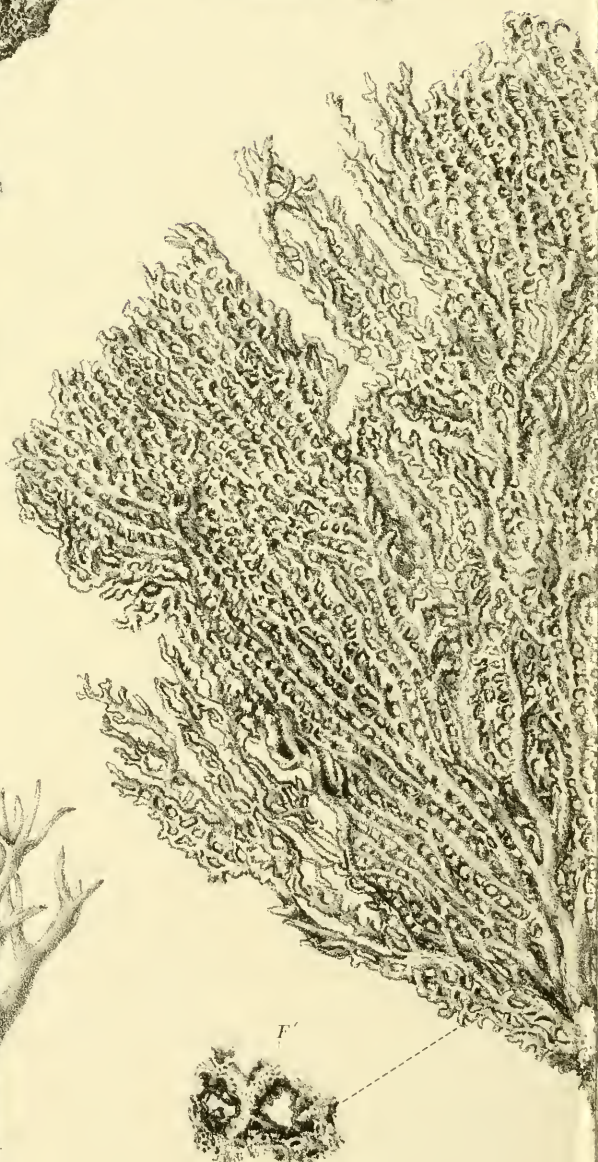
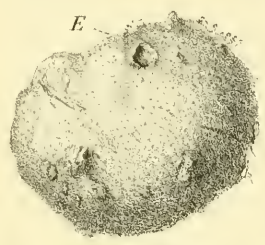
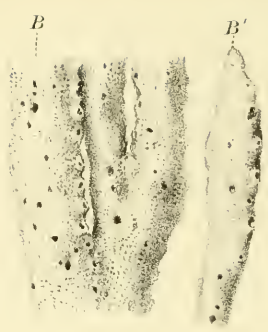


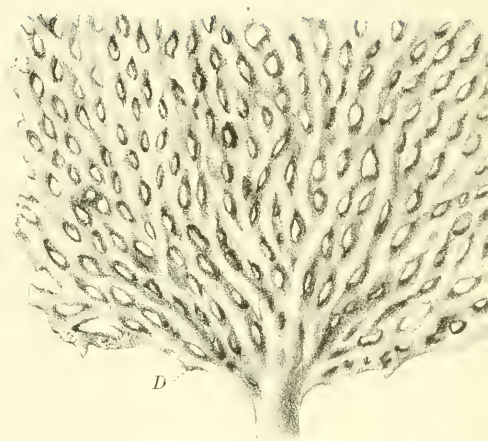








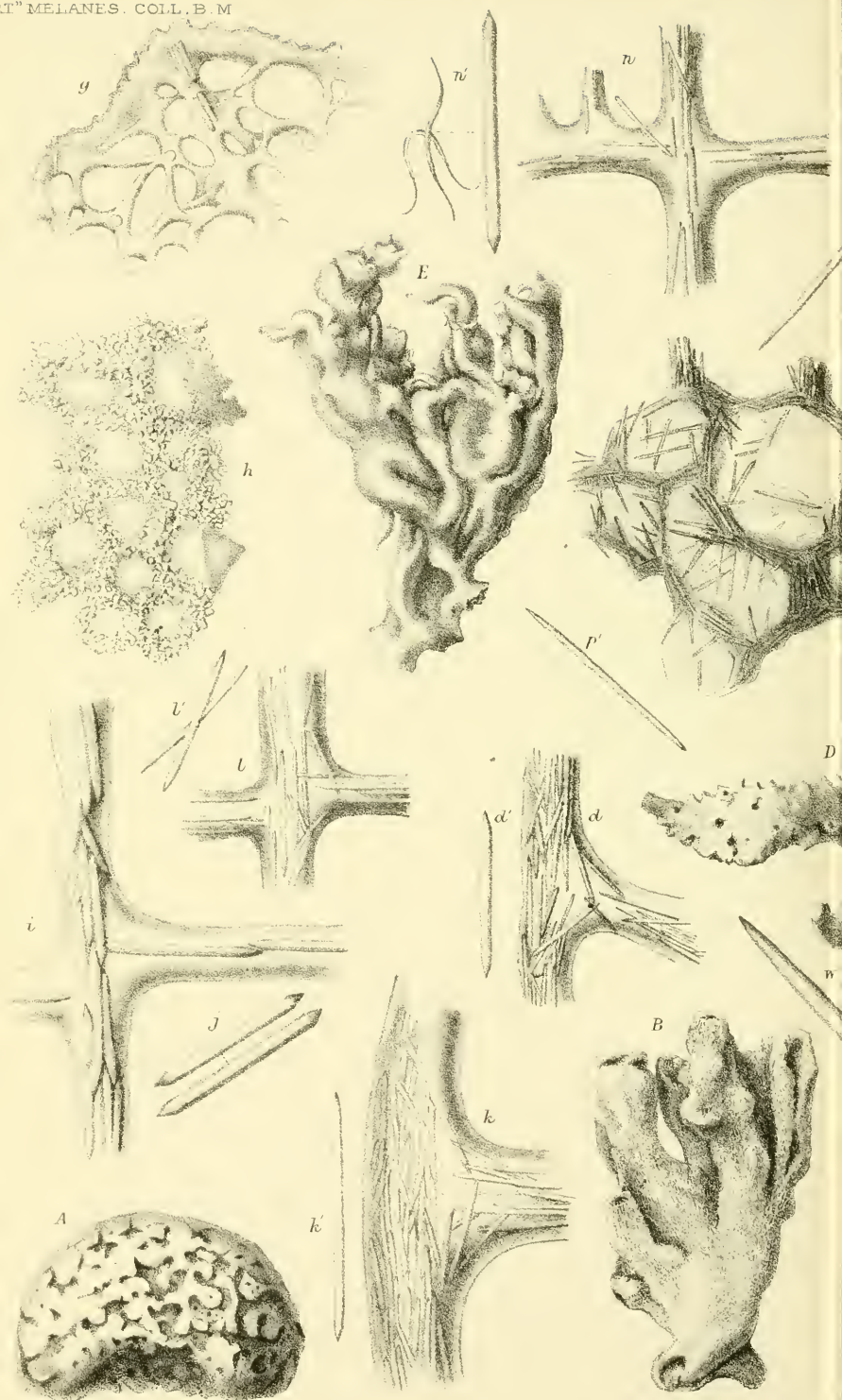


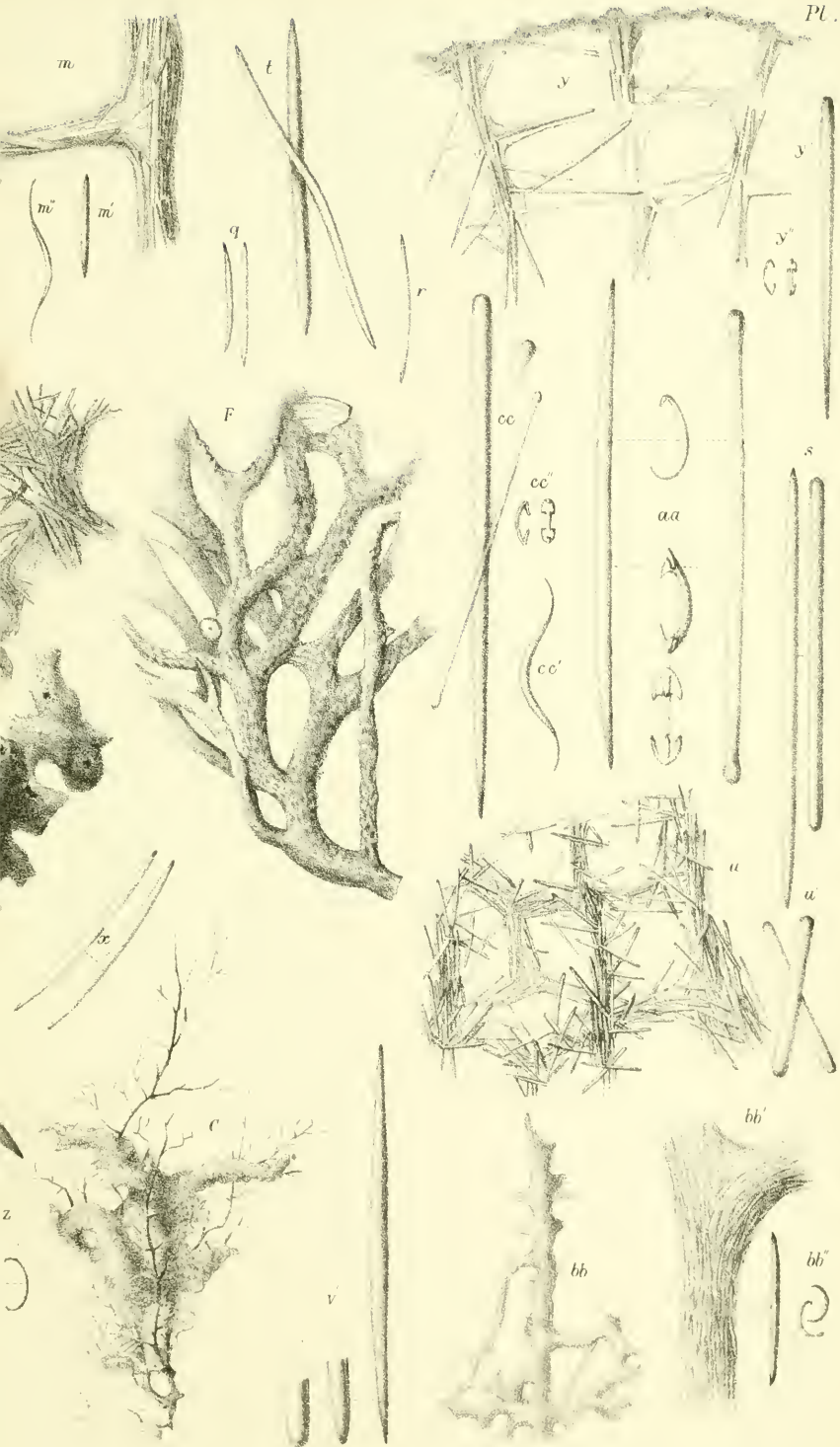








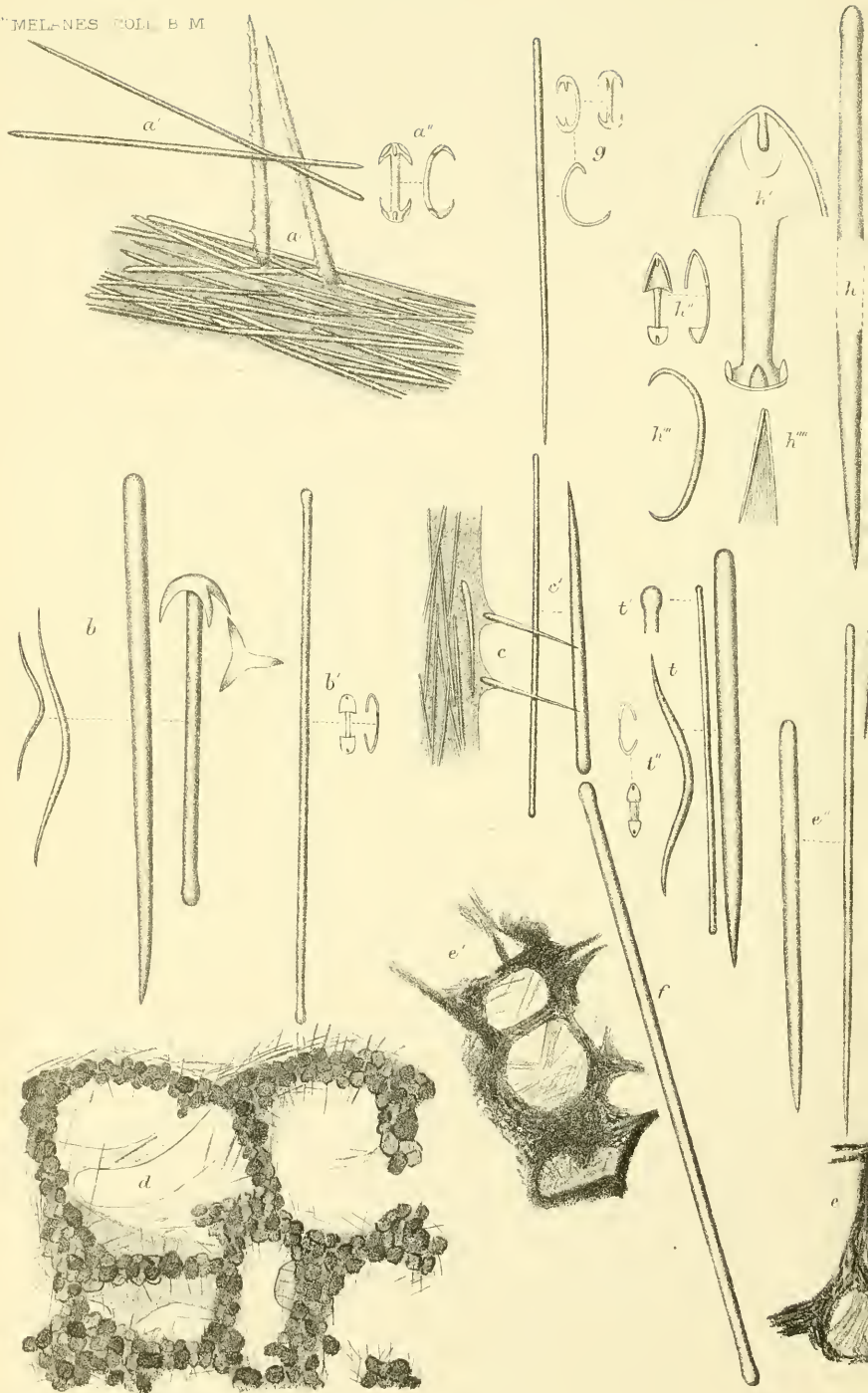








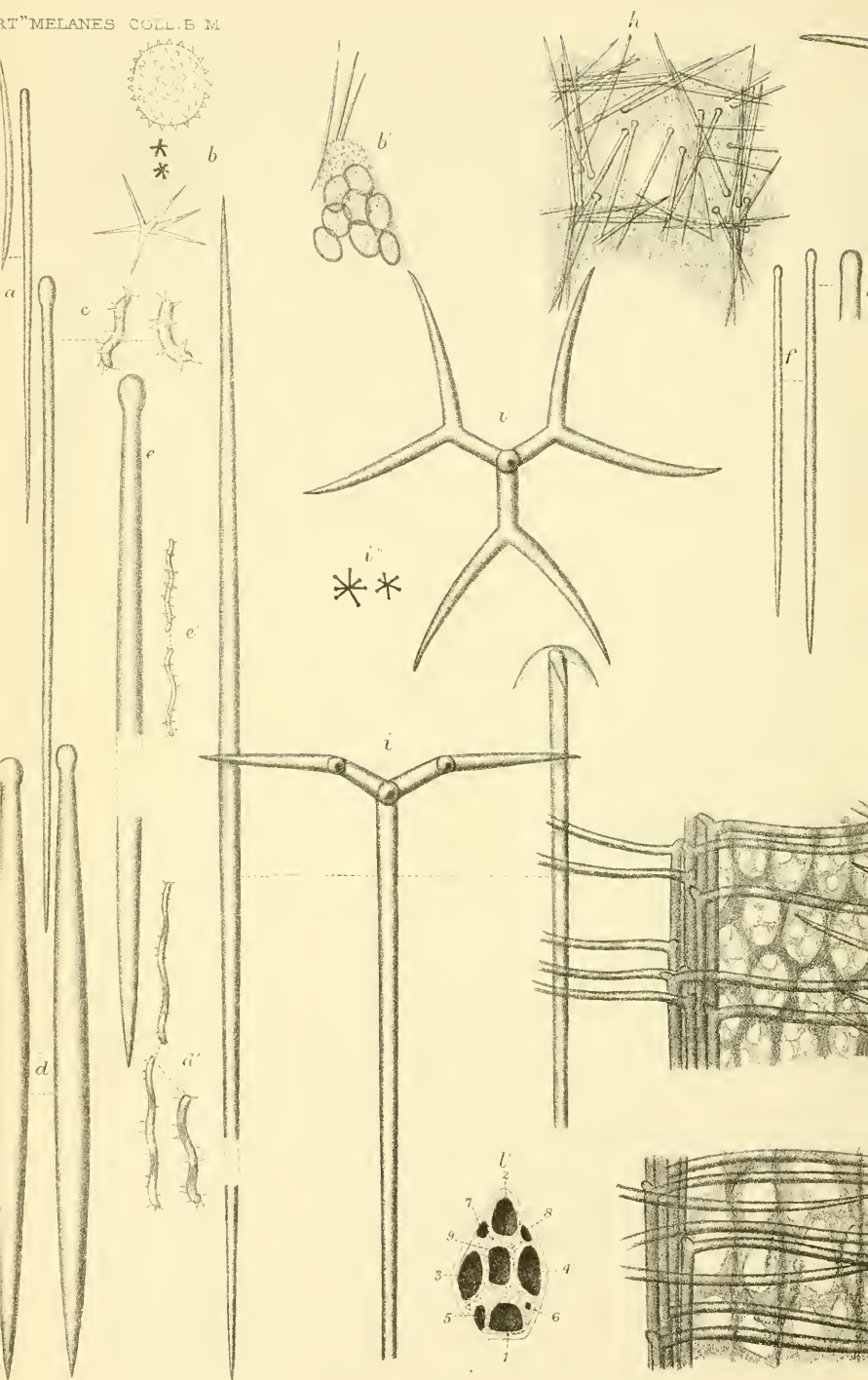




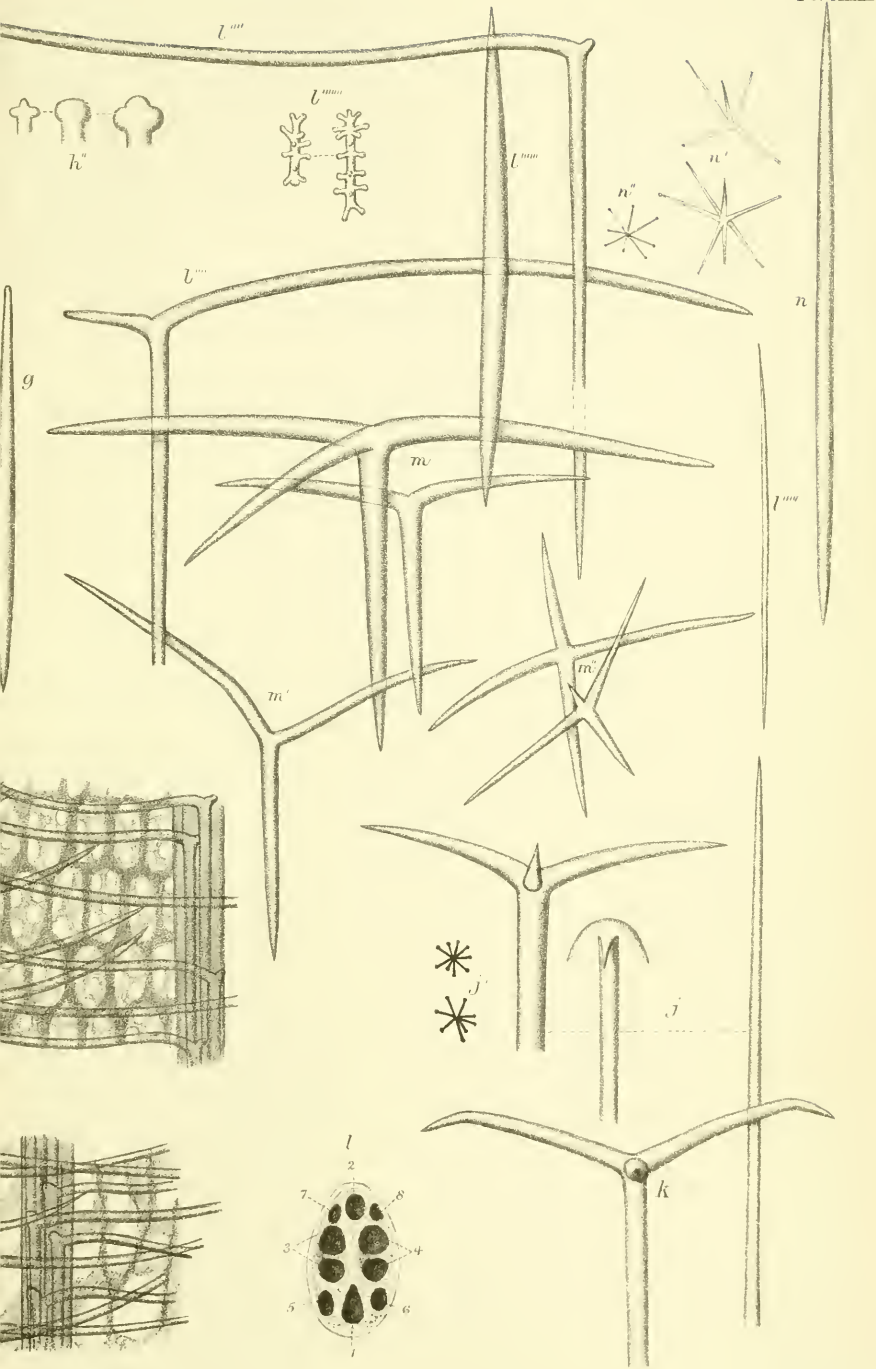




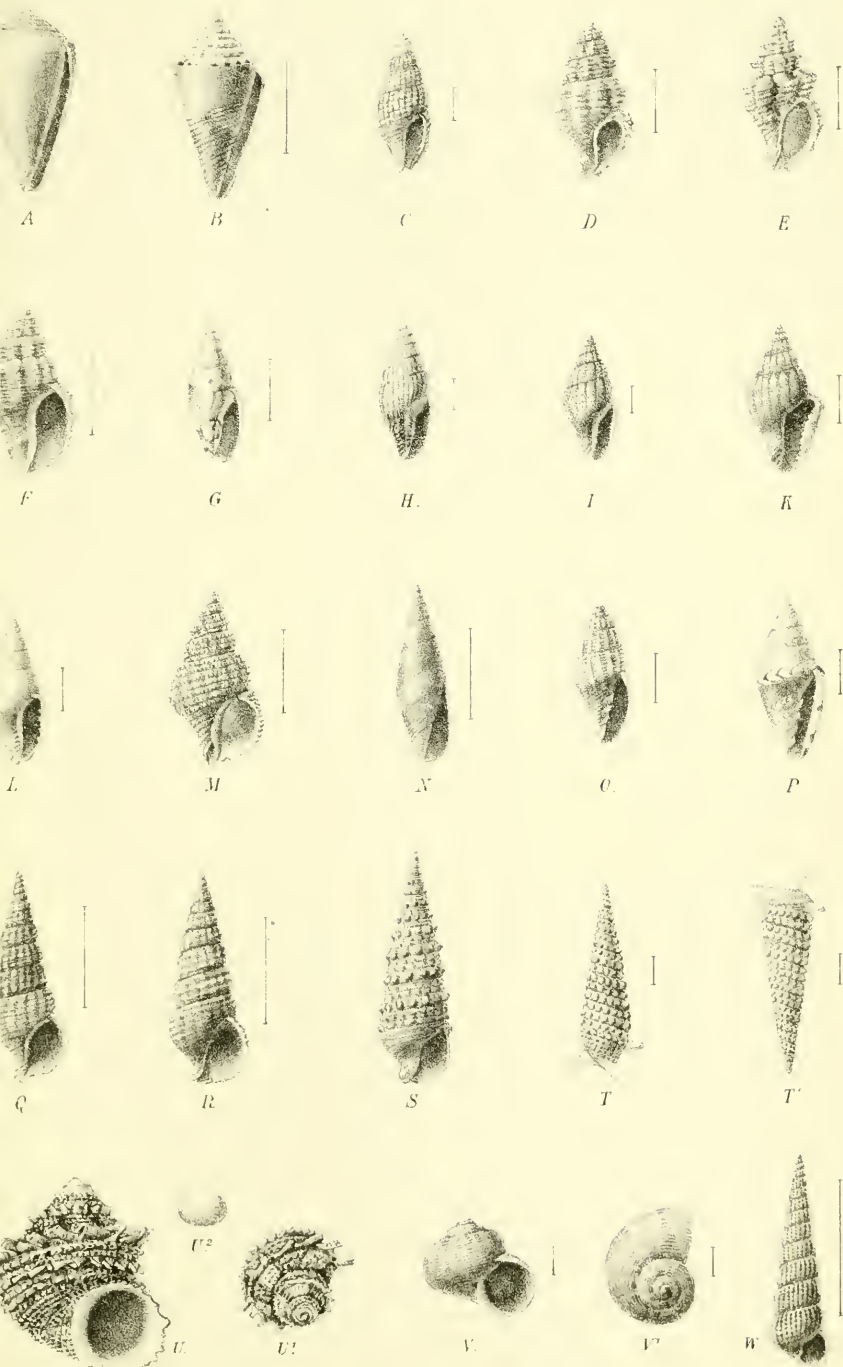




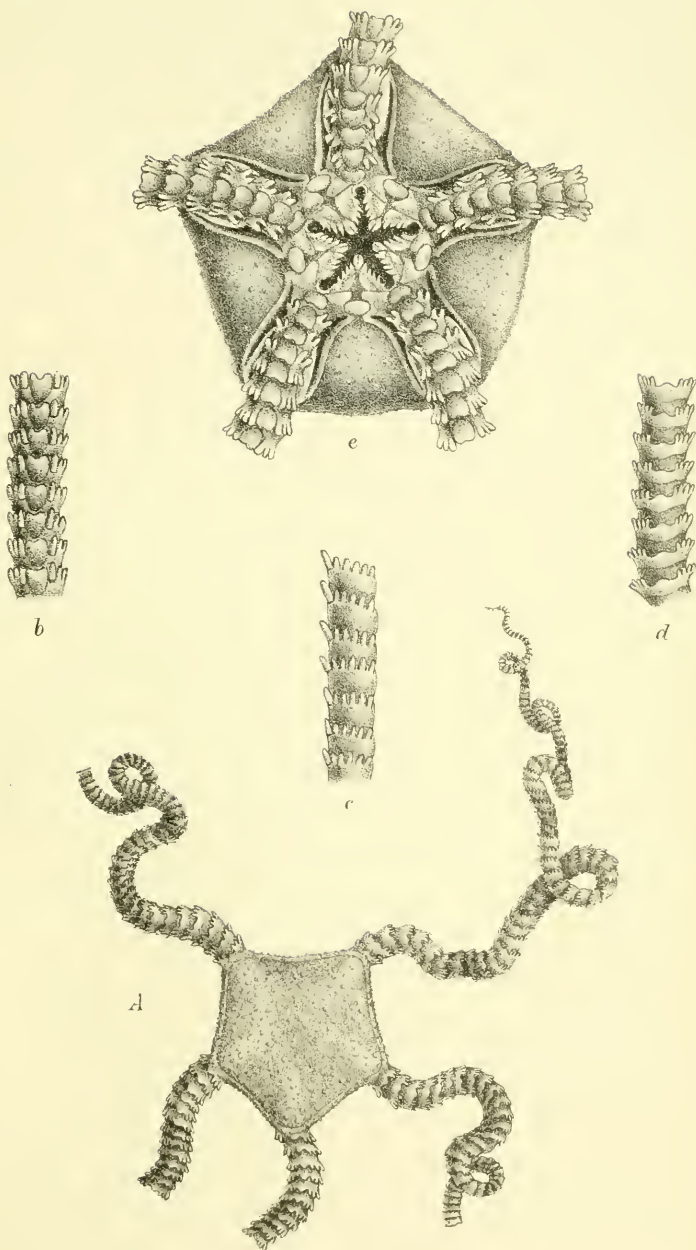






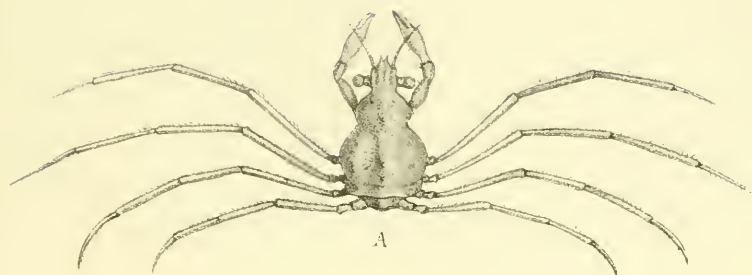




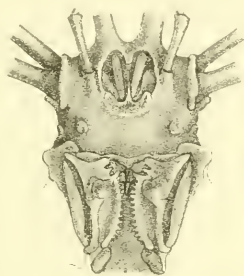








A



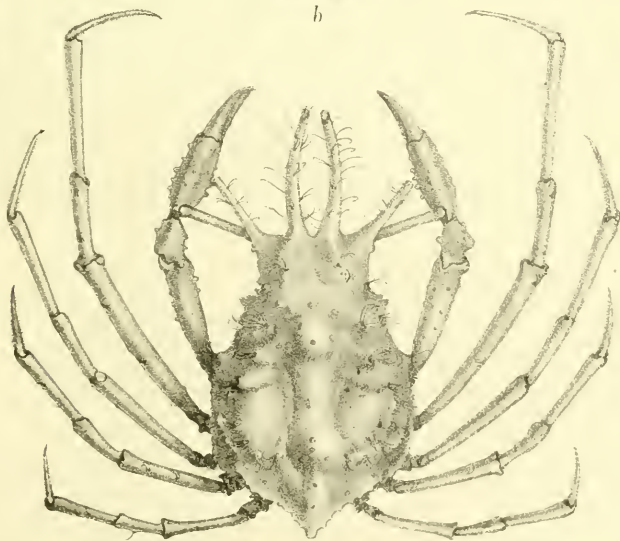
b



a



b



B.



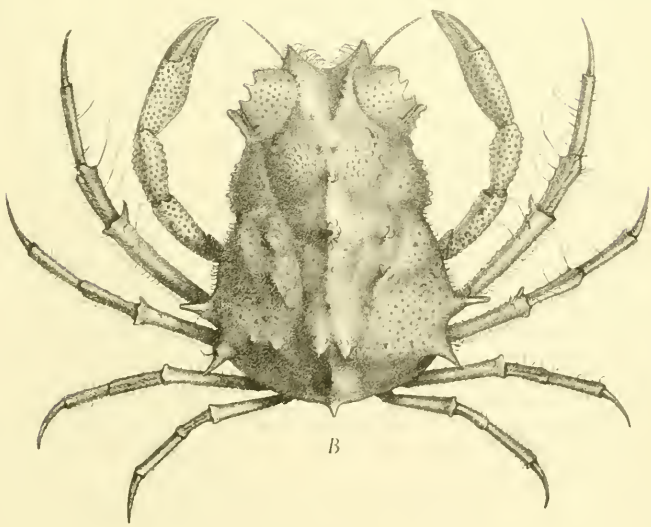
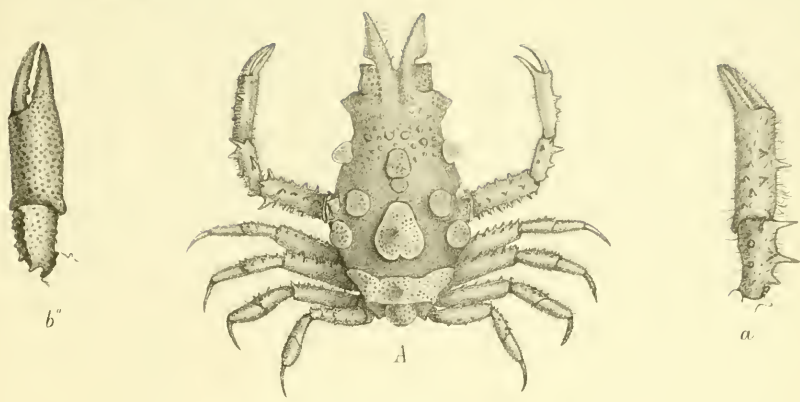
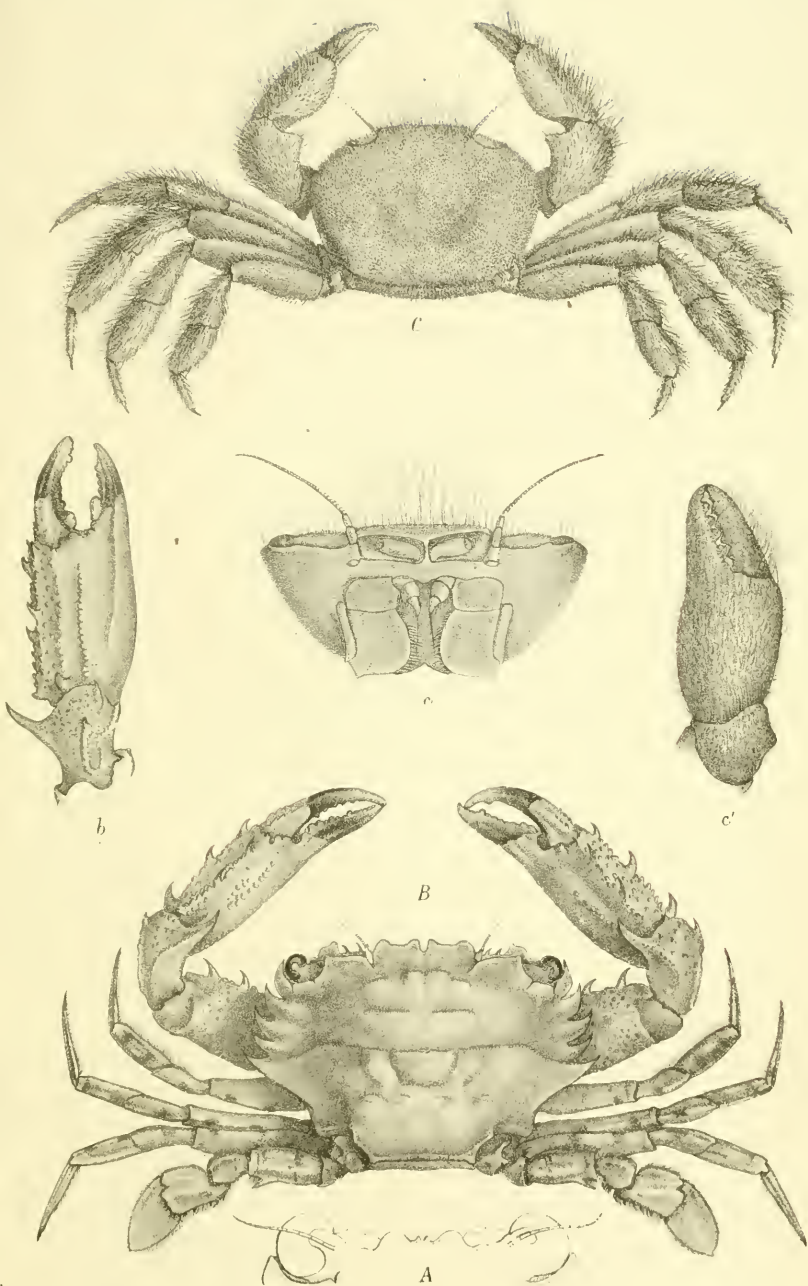


Fig. A. *Eurynome stimpsonii*. Fig. B. *Entemonyx spinosus*.







Robt Morgan del et lith.

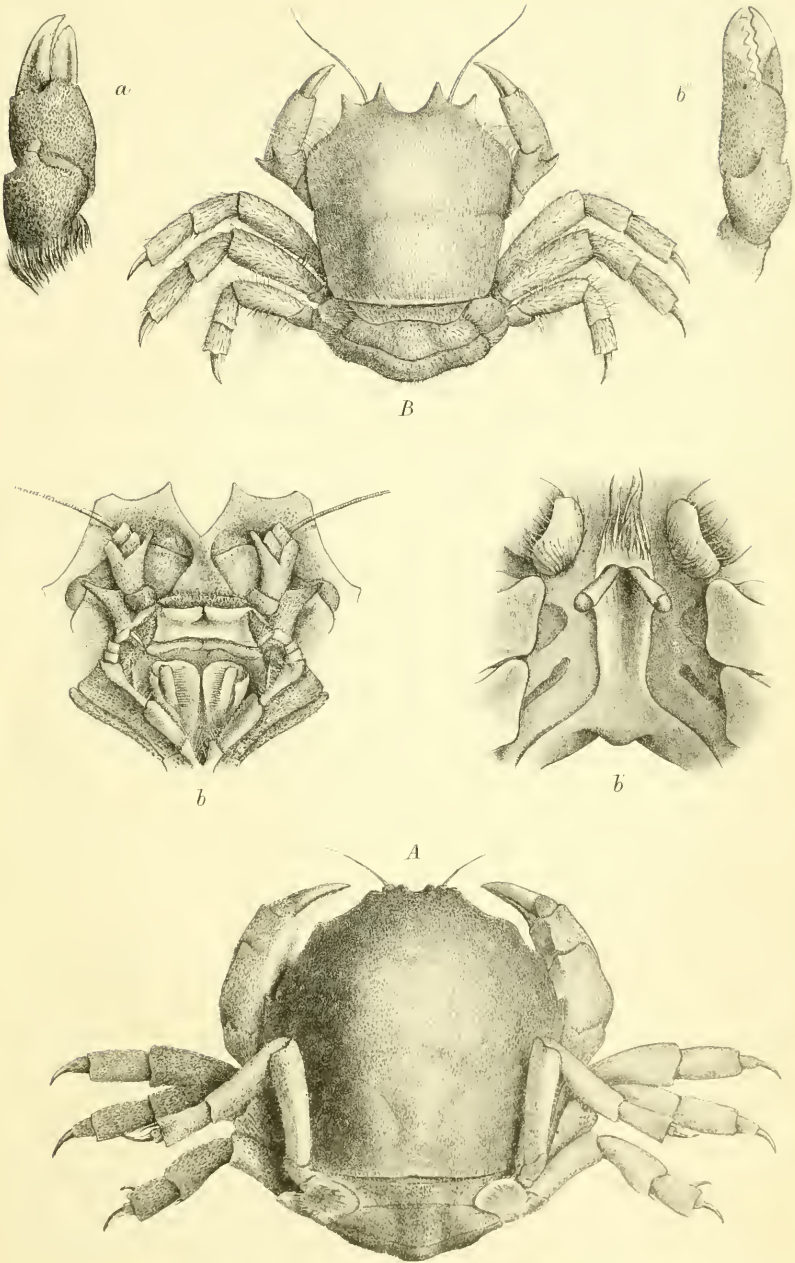
Wintern Bros. imp.

Fig. A. *Xiphonectes vigilans*, var. *obtusidentatus*.  
 Fig. B. *Thalamita quadrilobata*. Fig. C. *Carcinoplax integra*.









Knight & Morgan del et lith.

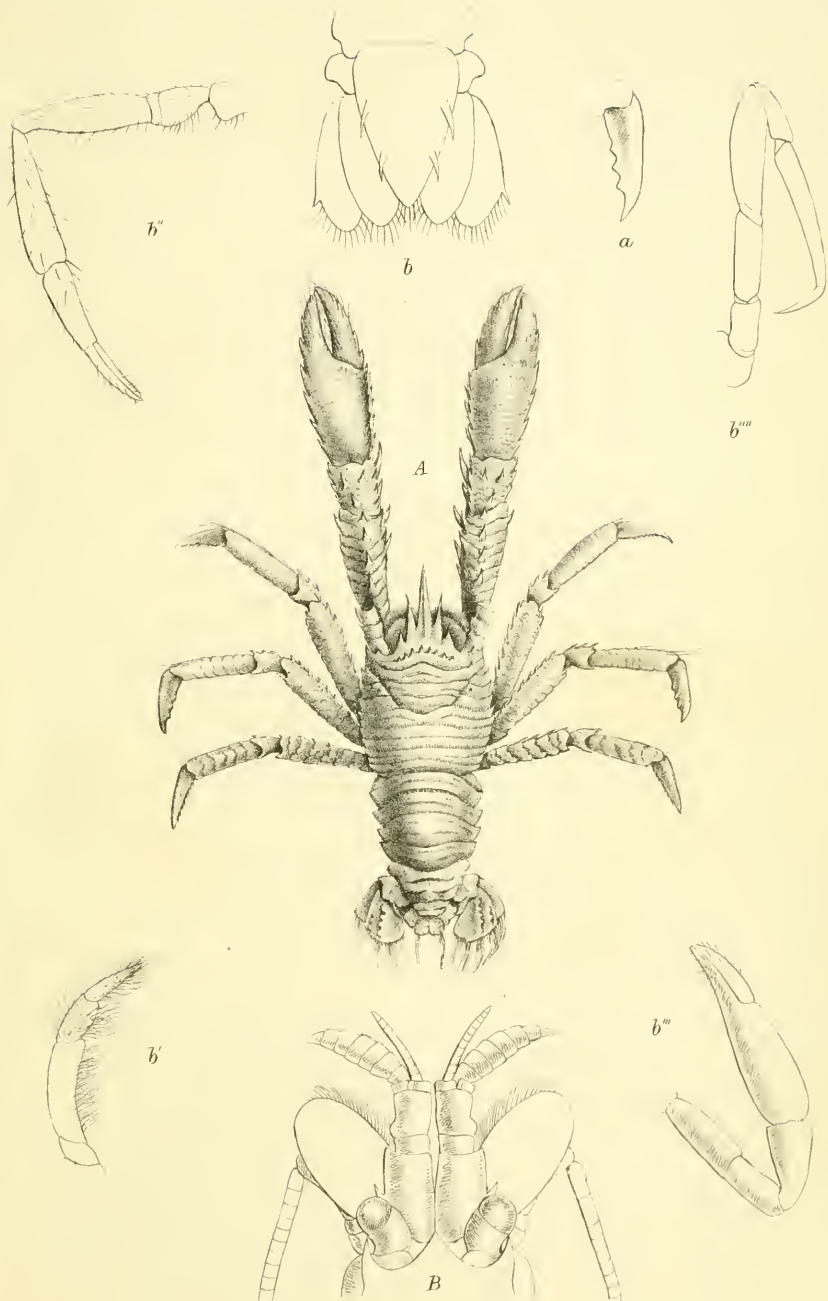
Mintern Bros. imp.

Fig. A. *Dromidia spongiosa*, var. *stimpsonii*.

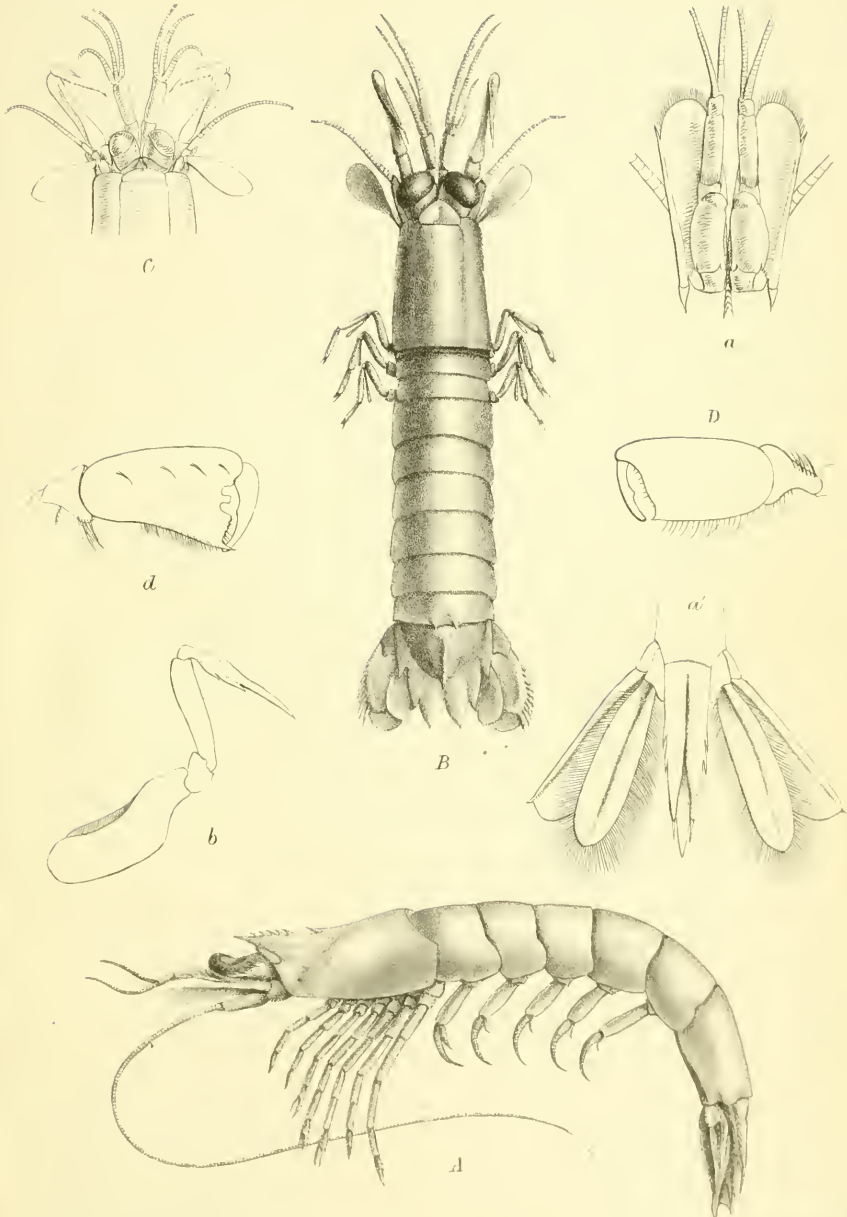
Fig. B. *Homalodromia coppingeri*.











Krughe & Morgan del et lith

Mintern. Univ. imp.

Fig. A. *Penaeus richtersi*.

Figs. B. C. *Cenodactylus elegans*. ♀, ♂.

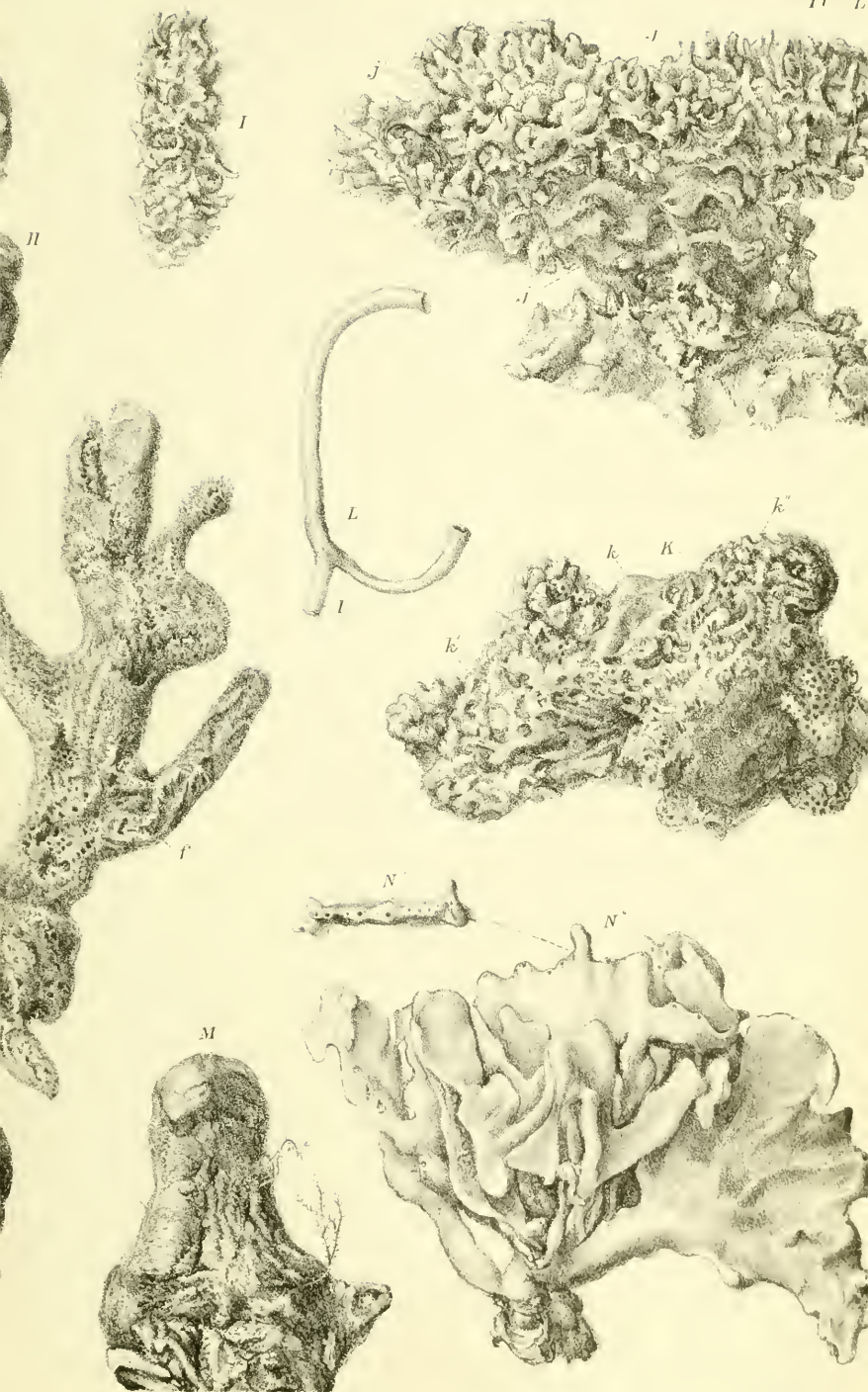
Fig. D. *Mera diversimanus*.

















Monty



Monte















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