

A survey of the genus *Cypræa* (Linn.), its Nomenclature, Geographical Distribution, and Distinctive Affinities; with descriptions of two new species, and several varieties. By James Cosmo Melvill, M.A., F.L.S.

(Received April 17th, 1888.)

CYPRÆA, or more classically Cypria, is derived from one of the many attributes of Aphrodité, owing, doubtless, to her worship not only having been inaugurated, but for long years principally centralized, in Cyprus, then a luxuriant and smiling island, teeming with industrial wealth.*

Horace addresses her as "Diva potens Cypri,"^b and Tibullus, when apostrophizing the goddess thus:

"Et faveas conchâ, Cypria, vecta tuâ,"^c

surely pictured her but lately risen from the foam, reposing in some glassy Nautilus shell, her most seemly fairy sea-chariot. Allowance must always be made for mythical as well as poetical license; yet it is almost impossible to comprehend how some old writers, as Rondelet, the famous chemist and natural historian of Montpellier, can have supposed the Cowry to have been the dreaded *Echeneis*,^d or *Remora*, a sucking fish which, on the authority of Herodotus, so clogged the course of Periander's warships at the instance of Venus, as to stay the meditated execution of the youths of Corcyra, and hence, in gratitude to the engine that averted this wholesale massacre, the title of *Cypria*, or *Concha Venerea* was bestowed. Certainly this is a primæval instance of Beauty and the Beast, of earlier date probably than the well-known legend, but we argue that the Cowry

* *Æs Cyprium* = *ῥέπρον*, copper. Plin. 34, § 20.

^b Hor. Od. i. 3. 1.

^c Tibullus iii. 3. 4.

^d Cf. Pliny N. H. 9, 25.

cannot have been the Beast, far more likely the gigantic Calamary, or Octopus, was intended, of which specimens of almost Titanic size abound in deep sea caverns in Sicily and the rocky Calabrian shore.

Granted the name arose on account of the grace of form of these shells, it is a matter of some little difficulty to conjecture exactly the time *when* it was bestowed upon the genus exclusively. Linnæus probably did not coin it himself; he was fond of using ancient appellations, yet no mention can be found of it in Pliny or Aristotle; indeed, as late as the time of Rumphius at the end of the seventeenth century, it was termed PORCELLANA, or ERYTHRÆA;^a it is probable, however, that about that date, or certainly not later than 1740, CYPRÆA usurped these old titles, and it was, at all events, finally fixed, in strict accordance with the revised canons of priority by Linnæus (xii. ed. "Systema Naturæ") in the year 1767.

Now, however, *Cypræa* is, perhaps, the most conspicuous and generally known of all Mollusca. Although we have only one small representative of the family on our own coasts, the variable little Nun Cowry, (*C. [Trivia] Europæa*, *Montagu*), certain of the Tropical species are imported very plentifully. No sandal-wood box, forwarded from the East by native collectors, who abound at Singapore, Amboyna, and Ceylon, but is certain to contain at least twenty of the most ubiquitous and showy of the smaller kinds; whilst of the larger, *C. Mauritianæ*, *pantherina*, *talpa*, and *tigris* are well known as ornaments on many a cottage mantel-shelf. Owing to the protection the surface of the shell receives through its being more or less covered by the mantle of the

^a *C. pantherina* comes from the Red Sea, also some other beautiful species. "E. rubro lucida concha mari," Tibullus ii. 4, 30, and cf. Prop. iii. 11, 16. The *Meleagrina*, or Pearl oyster, may however be more probably intended in these allusions—as fisheries for the purpose are known to have been carried on in the "Mare Erythræum."

mollusc during life, a specimen in inferior condition is the exception, not the rule, and this fact adds to their abundance and, perhaps, popularity.

(I.) *Uses, commercial or otherwise.*—The Money Cowry (*C. moneta* L.) is of commercial interest, from being used as a substitute for coin, especially in Africa and certain parts of India. This is a very abundantly distributed species, of less beauty either of form or colour than many of its kindred, but of very marked individuality. It is collected plentifully throughout the Eastern Islands, especially in the lagoons of the low-lying Laccadives and Maldives, in the Indian Ocean. About 3,200 Cowries equal a rupee in value. From a very remote period we read of these shells, or some allied species, being used for various purposes. The term Cowrie, or Gowrie, is derived from the Greek χοῖρος, a little pig; and the χοιρίνη, according to Liddell and Scott, was a 'small sea mussel, probably the *porcelain shell*,' which was used by the Athenian dicasts in voting:—so quoted by Aristophanes,

οὐ χοιρινῶν ὄζων, ἀλλὰ σπονδῶν.^a

and, again,

ἢ δῆτα λίθον με ποίησον ἔφου
τὰς χοιρίνας ἀριθμοῦσιν.^b

Following the example of the Greeks, the Romans termed these little shells *porci* or *porculi*, whilst the French nowadays term them pou de mer; and in the word *porcelain* we can also trace the same derivation.

Some of the larger species, too, especially *C. tigris* and *Arabica*, are used for ornamental shell work. The latter, when decorticated with acid, has a fine lilac surface; the Lord's Prayer, and other inscriptions I have seen carved on these species; also heads, as on the true Cameo shells, *Strombus* or *Cassis*, but the effect is usually inferior, the Cowry shells being hardly massive enough for this purpose.

^a Aristoph. Eq. 1332.

^b Aristoph. Vespe. 333, 334.

(II.) *Fossil Forms.*—The Cowries first appear in the Cretaceous and Tertiary Periods: there are between ninety and a hundred fossil forms, mostly smaller than many of their recent congeners. Dr. F. Jousseume published, some four years ago, a proposed subdivision of the genus, taking into consideration the extinct as well as the recent species;—a very laudable attempt, but we can hardly agree with him in considering it necessary to propose no less than thirty-six genera, most of them new, for their reception! His *Zoila*, for instance, formed for *C. Scottii*, *Thersites*, and *marginata*, his *Mauxiena*, for *C. Mauritiana*, and *Trona*, for *C. stercoraria* and *venusta*, should surely be all included as very nearly allied, in one section of the genus; and the same might be said for three more of his so-called genera *Luria*, *Zonaria*, and *Adusta*, since *spadicea*, *physis*, and *onyx*, severally representatives of these three, are of extremely near affinity. And other instances might be adduced. I am very pleased, however, to find Dr. Jousseume and myself agreeing in several particulars, and, as I had not the opportunity of seeing his interesting article until I had drawn up the annexed list of the approximate relations of the species to each other, my conclusions have been in every way independent. He isolates *C. umbilicata*, *C. tessellata*, and *C. Childreni*, allies *C. stercoraria* to *C. venusta*, but includes *C. lynx* and *mappa* with the *tigris* section, called by him *Vulgusella*, which I am unable to do. *C. mus* and *leucostoma*, which would appear survivals of an otherwise extinct group, he places in the genus *Gisortia*, the type being the large fossil *Ovula gisortiana* (Val.). The puny little *C. Adamsonii* (Gray), again, is the only recent representative of some attractive fossil forms, of which *C. elegans* and *C. cancellata* (Swainson) may be considered the types, peculiar from the surface being covered with raised reticulated striæ.

(III.) *Catalogues and monographs of the Genus*.—Besides the monograph of Dr. Jousseau just alluded to, and which was published in the *Bulletin de la Soc. Zoologique de France*, 1884, the following catalogues, treatises, and monographs, which include descriptions of *Cypræa* and *Trivia*, exist:—

- Linné, C. *Systema Naturæ* (Ed. xii.), 1767.
 Martini. *Conchylien-Cabinet*, Vol I., 1769.
 Perry, George. *Conchology*, 1811. (Five plates of the 61 devoted to *Cypræa*).
 Dillwyn. *Descr. Catalogue of Recent Shells*, 1817.
 Lamarck. *Histoire naturelle d'Animaux sans Vertèbres*, Vol. VII., Ed. i., 1822, and Ed. ii., augm. par Deshayes et Milne Edwards, Vol. X., 1844.
 Gray, Dr. John Edward, F.R.S. *Zoological Journal*, 1824.
 Wood, W. *Index Testaceologicus*, 1828.
 Sowerby, G. B. (the elder). *Conchological Illustrations*, 1837.
 Deshayes, G. P. *Encycl. Méthod.*, Vol. III.
 Jay, J. C. *Catalogue of Shells in his Cabinet*, 4 Editions. New York, 1835-52.
 Hanley, Sylvanus. *Ipsa Linnæi Conchylia*, 1855.
 Kiener, L. C. *Coquilles Vivantes*, about 1840.
 Catlow and Reeve. *The Conchologist's Nomenclator*, 1845.
 Reeve, Lovell. *Conchologia Iconica*, Vol. III, 1845.
 Adams, H. & A. *Genera of Recent Mollusca*, 1858.
 Sowerby, G. B. *Thesaurus Conchyliorum*, 1870. (Vol. III. pars).
 Weinkauff, H. C., in Küster's *Conchylien-Cabinet*, 1881.
 Roberts, S. Raymond. *Monograph of the Family Cypræidæ*, in Tryon, *Man. Conch.*, Philadelphia, 1885; also *Catalogue of Porcellanidæ*, 1869; *Amer. Jour. Conch.* V.

- * Paetel, Fr. *Conchylien-Sammlung*, 1887, Berlin. Catalogue of all hitherto described recent Shells, 6 parts, all published.

(IV.) *Systematic position*.—The Family *Cypræidæ* is placed amongst the *Rostriferous* Section of Gasteropoda Prosobranchiata, following the *Strombidæ* and *Terebellinæ*, and immediately preceding the *Ovulidæ* (*Amphiperasidæ*, Adams) and *Pedicularidæ*, this last curious little genus of somewhat distorted shells, living imbedded in corals.

With *Ovula* (Brug.) there is, of course, the most near relationship of all other genera; but no *spire* exists in the true Egg-shells at any period of growth, the *colour* is mostly pure white porcellanous, sometimes pink, yellow, or lilac, *extremities* more or less beaked, *outer lip* often toothed or plicate, *inner lip* always smooth. *Head* of the animal furnished with a *contractile Snout*.

The *Ovulæ* appear first in the Chalk, but are rare, and often confounded with *Cypæa*. About fifty-five recent species are known.

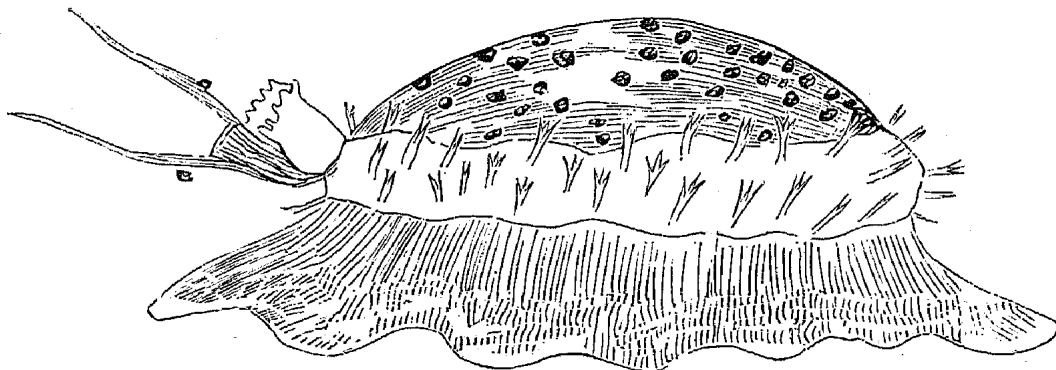
The similitude of the family to certain forms of *Cassidæ*, e.g. *C. rufa* (L.) and *C. testiculus* (L.), in the toothed lip, is but superficial. Mr. Stutchbury separated these two species from the true Helmet shells, under the name *Cypræacassis*, but they are now included in the subgenus *Cassidea* (Brug.).

We are indebted for the accepted classification of the Mollusca, mainly to the researches of the late Dr. Gray, of the British Museum, Dr. Forbes, Mr. S. P. Woodward, author of that admirable work, "*Recent and Fossil Shells*," and Messrs. Henry and Arthur Adams. This classification, founded as it is on the truest scientific basis, viz., the drawing of the characters not so much from the shell as its

* NOTE.—Owing to the lamented death of Herr F. Paetel last October, at the age of 76, it is to be feared that this useful Catalogue may not be completed. Only six parts have been issued, down to the *Ampullaridæ*. We have also to regret the demise of Mr. G. W. Tryon, junr., of Philadelphia, author of the yet incomplete "*Manual of Conchology*," and other valuable works.

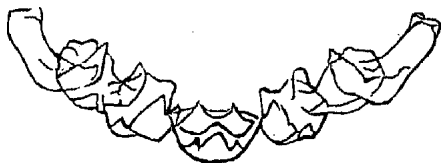
inhabitant, is full of inherent strength, and will probably hold its own, as regards its most salient features, against any proposed changes.

(V.) *Animal*.—The *Animal* has been figured by Messrs. Adams, and by Chenu, "Manuel de Conchyliologie," Vol. I., f. 7. In this latter a coloured representation of *C. moneta* is given, the *tentacles* are stout and gradually tapering, *eyes*



Animal of *Cyprea tigris* (Linn.).

situated on slight excrescences about one quarter the distance from the head, *mantle* fastened into two folds, meeting over the back of the shell at the dorsal sinus, and likewise ornamented with forked filaments, papillæ, or verrucæ, and sometimes they are smooth—the mantle is furnished also with a *siphon*, which is often fringed. The *foot* is large, and simple, fastened at either end, frequently contracted in front. *Head* obtuse, furnished with a contractile snout, or rostrum. No *operculum*. *Lingual Riband* long, with seven series of teeth



Lingual Dentition of *C. tigris* (L.).

{3, 1, 3}. According to Adams, each row is composed of "one broad, quadrate, uncinated axile tooth, flanked on each side by three hooked laterals; outer lateral teeth conical, entire or toothed." The animals are often resplendent with gaudy coloration, and white, yellow, vermilion, and rose are mentioned as predominant.

(VI.) *Growth and recuperative power*.—The *Young Shell* differs extremely from the mature, it is Bulla-shaped, thin, with a distinct spire often covered with a fine epidermis; the pattern and markings, as a rule, blurred and hardly commenced. The whole of plate xxvii. of Reeve, Conch. Icon., is taken up with figures of Cowries in this state, and is worth consulting.

During growth, another phase is entered upon, the shell somewhat solidifies, the lip and columella thicken and show more development, the dentition commences, and the pattern, usually in triangular or zigzag flames and waves, asserts itself. The *third*, or concluding period, is when the calcifying process of the dorsal lobes of the mantle applies its energies to the base, teeth, and sides, covering the whole shell with porcellanous enamel, and completing the now recognisable design.

As regards the unique power attributed to this genus of shells, by one observer only, Lieut. J. B. Hankey, R.N. (whose correspondence with Mr. Lovell Reeve on the subject may be found in Conch. Icon. Cyp. pl. i. Letter-press), viz., that he had been "in more than one instance an eyewitness" of a Cowry dissolving and decomposing its own shell as a preliminary to enlarging its borders, with some solvent fluid secreted in its mantle; far be it from me to cast a shadow of doubt on this officer's veracity or powers of discrimination, yet it does appear strange that no other observer has noticed this phenomenon, more especially as there are at this time five Naturalists at least

in the Tropics to one in Lieut. Hankey's day, now nearly fifty years ago. This Naturalist adds that when the Cowry had virtually become naked and defenceless, in a short time a thin layer, of the frail consistency of shell-lac, began to cover it, and it assumed the form of a Cymba, of the family Volutidæ, but owing to the extreme delicacy of the organization, he could not preserve any specimens.

(VII.) *Generic and subgeneric divisions, hitherto adopted.*—

Dr. Gray's subdivision of the genus, adopted with some modifications by Messrs. Adams, 1858, in their "Genus of Recent Mollusca," Vol I., p. 263, is as follows:—

CYPRÆA (L.).

Shell ovately cylindrical, polished; spire obsolete, or concealed by enamel; aperture narrow, linear, inner lip denticulated; outer lip greatly inflected, denticulate or crenate.

Type *C. talpa* (L.). 32 sp.

ARICIA (Gray).

Shell ovate, dorsally gibbous, flattened at the base, the sides thickened and dilated, polished; spire concealed; aperture narrow, linear; inner lip gently expanded and callous, dentato-lirate; outer lip dilated, flattened and callous, dentato-lirate.

Type *A. annulus* (L.). 21 sp.

LUPONIA (Gray).^a

Shell ovately pyriform, ventricose, smooth, polished; spire concealed, often depressed; aperture narrow, linear, inner lip plicato-dentate, the plaits often obsolete posteriorly; outer lip inflexed and crenate.

Types *L. tigris* (L.), *L. Algoensis* (Gray). 59 sp.

^a Of *L. Edentula* (Sowb.) Mr. Roberts has made a genus GASKOINIA, the only characteristic of which is that the teeth are obsolete. As, however, some specimens are slightly toothed, I see no necessity for maintaining this name even as a subdivision.

NARIA (Gray).

Front of columella narrow, dilated into a sharp toothed ridge, shell smooth.

Type *N. irrorata* (Soland.). 1 sp.

CYPRÆOVULA (Gray).

Shell oval, ventricose, surface covered with elevated striæ, aperture narrow, linear; inner lip denticulated, outer lip inflected and transversely striated.

Two species—*C. capensis* (Gray), *C. Adamsonii* (Gray).

TRIVIA (Gray).

Shell oval, rather depressed, surface covered with elevated, transverse ribs, or tubercles, spire concealed, aperture narrow, inner lip sulcated, outer lip transversely grooved.

Type *T. Europæa* (Mont.). 34 sp.

Subgenus PUSTULARIA (Swainson).

Back with elevated tubercles, extremities slightly produced.

Type *P. pustulata* (Lamk.). 4 sp.

Subgenus EPONA (H. & A. Adams).

Shell globose, back smooth, or with elevated tubercles.

Type *E. cicercula* (Gmel.). 4 sp.

These subdivisions are almost purely artificial, and do not always hold good. *C. carneola* (L.), for instance, has two forms, one a typical *Cypræa*, the other with flattened base, would have to be placed in *Aricia*. I am inclined to agree with Sowerby, Thes. Conch. III., in allowing merely a subgeneric rank to TRIVIA alone, and entirely ignoring all the others. In the early part of this year I received from Mr. G. B. Sowerby a shell which, while it possesses the facies, dentition, and raised striæ on the lower surface, of *Cypræovula Capensis*, has the form as well as markings of *Luponia Algoensis* (these being Dr. Gray's types of his two genera), and a new and most important link in the

chain of connection is thereby shown. I propose to call this *C. amphihalæ*, and am convinced it is specifically distinct, having seen several specimens, all alike, though mostly a little worn on the dorsal surface, which is, however, always *smooth*, specimens in fine condition having been lately sent home by Mr. Bairstow. As will be seen subsequently, I append to this paper a list of all the known kinds, with their synonyms and varieties, devised upon a circular system; that is to say, although the species are necessarily arranged in what appears at first sight a tabular form—from Nos. 1 to 189—I mean that No. 189 will bear the nearest link to 188 on one hand and to No. 1 on the other, and so on. The extremes that according to this circular catalogue are thus placed in juxtaposition, *C. leucodon* (Brod.) and *C. Valentia* (Perry), or *princeps* (Gray) are, to quote a very interesting writer,^a “probably the tips of the branches of the Conchological *stammbaum* or genealogical tree, which may have reached the limit of possible development in their own direction.” Both of these will be discussed more fully in another paragraph, it will suffice to say at present that there would seem to be some divided marks of affinity to bind them to each other, isolated as they stand in the series.

Again, the *Trivia*, hitherto usually considered a distinct genus, are intimately connected with the *Cypræa* proper on the one hand through *T. pustulata* (Lamk.), the young of which infringes closely upon *Cypræovula Adamsonii* (Gray), and, on the other, through the numerous smooth varieties of *Trivia staphylæa* (L.), which trench upon *C. Helvola* (L.), var. *Hawaiiensis*, and the rest of the members of that section (*Erosæ*) whose marginal pitting of the sides is also found in the varieties of *staphylæa* just mentioned, e.g. *polita* (Roberts), *limacina* (Lamk.), etc.

^a Notes by a Field Naturalist in the Western Tropics, by the Rev. H. H. Higgins, M.A., 1877.

(VIII.) *Geographical Distribution*.—Mr. A. R. Wallace's^a six regions are, in the subjoined table, slightly modified, especially as regards (c), which here must be understood to comprise Europe alone, with the whole of the Mediterranean and the Azores and Madeira; (e) Australia, New Zealand, Tasmania, and the Fiji Isles alone; while (f) becomes much the largest and most important subdivision, embracing the Red Sea, Persian Gulf, India, the East Indies, and the whole of the rest of Polynesia. The extremely wide distribution of many of the commoner species of the genus causes the above alterations to be necessary, let alone the fact that Mr. Wallace's regions were proposed by him more with a view to the inhabitants of the land than of the sea. Of about ten or eleven species the locality is altogether doubtful.

Region.	No. of Species.	Region.	No. of Species.
(a) <i>Nearctic</i> ; i.e., United States & Canadian Coasts, Atlantic, and Pacific.	8	(d) <i>Ethiopian</i> ; including Madagascar and the Mascarene Islands in the Pacific, C. de Verdes and Canaries in the N. Atlantic, also St. Helena and Ascension Isles in S. Atlantic.	32
(b) <i>Neotropical</i> ; i.e., Mexico, and Central American Coasts, Gallapagos Isles, W. Indies and South America, Atlantic and Pacific.	28	(e) <i>Australian</i> ; here signifying Australia, Tasmania, New Zealand, and the Fiji Isles.	48
(c) <i>Palaearctic</i> ; here simply including European Seas proper, with both shores of the Mediterranean, the Madeiras, and Azores.	8	(f) <i>Oriental</i> ; embracing Chinese Seas and Japanese, E. Indies, Polynesia, Persian Gulf, and Red Sea, also Indian Seas and Ceylon.	105

^a “Geographical Distribution of Animals,” by A. R. Wallace, F.R.S., &c. 2 vols., 1876.

In Polynesia alone Mr. Andrew Garrett^a found no less than 75 species himself, with many varieties. His valuable paper is to be found in the *Journal of Conchology*, Vol. II., 1879, pp. 165 sqq. And in Moreton Bay, Queensland, Mr. Brazier mentions Mr. Coxen and himself discovering 27 sp.—*J. of Conch.*, 1879, p. 318. The same collector also enumerates (*Proc. Zool. Soc.* 1872, pp. 82-86) 39 species as occurring on the shores of New South Wales. The late Mr. G. F. Angas, who likewise collected largely in Australia, published a list of *Cypræa* at various times in *Proc. Zool. Soc.* 1865-77, from that region, especially from the neighbourhood of Port Jackson, in which about the same number are reported. Again, in the list of Mollusca collected by Dr. Anderson, F.R.S., Superintendent of the Indian Museum, Calcutta, in the islands of the Mergui Archipelago and coasts of Tennasserim, 16 *Cypræa* are mentioned by Prof. Von Martens (*Journ. Linn. Soc. Zool.*, Vol. XXI., p. 185 sqq.), 1888. Of these, *C. Saulæ* (*Gaskoin*) from Elphinstone Island, is the only rarity. Several tropical species, *e.g.* *lynx*, *Arabica*, *vitellus* occur in the Bay of Yeddo, Japan (Lischke). Swinhoe detected eight common species only at Formosa, while Jickeli (*J. B. Mal. Ges.* XI.) gives 30 species as occurring in the Red Sea. Mr. R. Rossiter, exploring in New Caledonia,^b mentions (*Proc. Linn. Soc. N. S. W.* VI., pp. 817, 832) 60 species on those shores, whilst Mr. Philip P. Carpenter only noticed 7 sp. at Panama (*Proc. Zool. Soc.*, 1863).

The figures above quoted must be taken with all reserve, for there is every probability further researches in (*d*) and (*e*) will raise the figures nearer those attained by (*f*).

^a News has only lately been received of the death of this celebrated conchologist after a lingering illness, aged 65 years, at his residence at Huahine, Society Islands. Mr. Garrett contributed several very valuable papers to various learned Societies on the distribution of certain genera of Mollusca in the Polynesian Islands, and had amassed a very large collection, one half of which (4,000 species) had been gathered by his own hands.

^b Also *cf.* Crosse et Fischer, Les Mollusques de Nouvelle Calédonie.

One cannot help being struck, however, with the poverty of the new world compared with the old; and I believe that in many other marine genera of shells, *e.g.*, *Conus* and *Mitra*, the same proportionate inequality would occur, especially in the Neotropical South Atlantic Coasts. *Conus cedo nulli* (L.), however, is a native of West Indies, and two of the recent species of *Pleurotomaria*, which make up for many deficiencies of lesser note.

When comparing the nearly allied genus *Ovula*,^a the species of which are about fifty-five in number, the preponderance of those found in (*f*.) is almost overwhelming.

				No. of Species.
(a) Nearctic	...	...	...	3
(b) Neotropical	...	...	...	5
(c) Palæarctic	...	...	...	3
(d) Ethiopian	...	...	...	7
(e) Australian	...	...	...	4
(f) Oriental	...	...	...	33

The *localities* in which the tropical Cowries and *Ovulidæ* are found are mainly amongst coral reefs, or in the sands near shelving rocks: while certain of the *Ovulidæ* are attached to gorgonias, whose colours they often assimilate: they all move slowly, and are extremely susceptible of fear, feeding mainly upon coral zoophytes. But few inhabit the deep sea: only 13 species, mostly single individuals, are recorded as being found during the "Challenger Expedition," 1873-1876. (*Rep. Expl. Challenger*, Vol. XV., Zoology, p. 421, sqq.)

(IX.) *Total Number of Species*.—Paetel in his last catalogue (1887) enumerates 223 of *Cypræa* and *Trivia* combined, but various errata and duplications have to be expunged, reducing the total to 181. To this add eight, four being good species relegated by him to varietal rank, and four

^a *Ovula* must be taken here in a collective sense, as embracing *Volva* and *Cyphoma* (both of Bolten), *Simnia* (Risso), and *Calpurnus* (Montfort).

newly described *C. Hungerfordii* (Sowb.), *C. Rashleighana* (Melv.), *C. amphithales* (Melv.), and *C. caput draconis* (Melv.) which brings up the total to 189. In the collection now exhibited there are about 170 species, besides varieties, and several of these are type shells, notably some of those formerly in the collection of Mr. J. S. Gaskoin, who for years made a special study of the Cowries, and whose whole series was acquired by Mr. T. Lombe Taylor, of Starston Hall, Norfolk, the dispersion of whose vast stores in 1879 made an unusual stir in the conchological world.

(X.) *Prominence and isolation of some Species.*—In no other genus of shells do certain members of it take so distinctive a place; there are, for instance, six kinds which add the charms of being almost or quite unique to their beauty and unusual forms. Amongst these first to be noted is:

Cypræa leucodon (Broderip), described in 1828, Reeve C. I. f. 23, and cf. Sowb. Thes. Conch., pl. iv., f. 19, 20, a large handsome species between three and four inches in length, tawny with a few large round white spots, base tawny, teeth very strong, deeply sulcated, white.

No locality known. This has been unique in the National Collection for sixty years, and was considered by Mr. Lovell Reeve to be, with *C. princeps*, the most valuable of all yet discovered shells. A slight affinity in shape with this latter, and in the arrangement of the teeth with *C. sulcidentata* (Gray)^a may be traced, but it does not very nearly approach any known species—recent or fossil, nor could it be an undue development of any other kind.

C. princeps (Gray).—This, originally described by Mr. Perry^b as *C. Valentia*, which name has priority, from the

^a *C. sulcidentata* (Gray) is connected with *C. arenosa* (L.) and *ventriculus* (L.), but differs from all except *leucodon* (Brod.), in its deeply channelled tooth- grooves. It is a shell of some rarity.

^b Mr. George Perry in 1811 published a large folio volume, in which many

first known specimen having been sold by Mr. Humphrey to Lord Valentia, a patron of science in the last century, is even more extraordinary a shell than the last. Figured by Perry, Conch., pl. xxiii., f. 2; by Sowerby, Thes. Conch., pl. i., f. 1, 2; and by Reeve, Conch. Icon. pl. vi., f. 20. Its length is very nearly four inches. It is yellowish, tinged with purplish rose, painted over the dorsal surface with yellowish brown markings, clouded on each side with a large darker blotch, at each extremity there are three rows of brown lines, sides with blue and brown spots. Base white, teeth also shining white.

Recent discoveries have resulted in five specimens, all exactly similar, in addition to the original shell in the National Collection. These six are disposed as follows:—

2 in the National Collection, South Kensington.

1 in Coll. Zool. Soc., Amsterdam.

1 in Coll. Miss Saul, Bow Lodge, London, N.

1 in Coll. Dr. Cox, Sydney, N. S. W. Dredged off New Guinea Coast.

1 in Coll.—uncertain.

The original specimen was called the “Brindled Cowry of the Persian Gulf,” in old Humphrey’s handwriting, but no other specimens have been known to come from that region, I believe. Mr. Perry mentions Amboyna, but that place must always be taken with some reserve, being a trading centre where such things are imported from a distance.

C. guttata (Gray).—This shell evidently belongs to the *Lamarkii* and *erosa* section of *Cypræa*, and yet there are

shells were delineated and described for the first time. Unfortunately he does not appear to have taken the trouble to consult previous authors, hence his writings abound with duplicate names, glaring errors, description of young shells as separate species, and the like. He has fallen under the lash of subsequent writers, especially Messrs. Sowerby and Reeve, who ignore all his descriptions, but in justice to him and to the law of priority, where his species can be deciphered, many of the paintings being very fanciful, it is only right to attach his names—*C. princeps* (Gray.), *nebulosa* (Kien.), *turdus* (Lamk.), and *melanostoma* (Leathes), thus become *Valentia*, *Surinamensis*, *ovata*, and *camelopardalis* (all of Perry).

no closely connecting links. I am inclined to think *C. fuscudentata* and *capensis* may not be so far removed from it after all; and in *C. bicallosa* (Gray) with its large varieties, *ingloria* and *Aubreyana*, a slight resemblance may be traced.

The length is about $2\frac{1}{2}$ inches. Shell yellow-fawn, of light texture, sprinkled with several large and small round white spots over the dorsal surface; on the base and over the sides the teeth extend, which are bright orange, and ridged.

The localities given are China, N. S. Wales, Red Sea, and New Britain, but I doubt these being substantiated, except, perhaps, the first and last, this being recorded by Mr. Hobson (1879). It is probable, from its thinness, that it is a deep water species.

The specimens known are seven, or, at most, eight in number, disposed as follow:—

1 in National Collection (not very good), *cf.* Reeve, *Conch. Icon.*, pl. viii., f. 30.

2 in Miss Saul's Collection.

1 formerly in Dr. Prevost's Collection, Alençon (subsequently in M. Grasset's, of Algiers, and now in the museum, Dijon, France).

1 in the Leyden Museum.

1 in Mr. J. C. Melvill's Collection, Prestwich (Fig. 7). This specimen is one of the finest known, and was formerly in the collection of Mr. Hugh Owen, from whom it was procured through the agency of Mr. R. Damon, of Weymouth. It is the type figured by Sowerby. (*Thes. Conchyl.*, pl. xvii., f. 104, 105).

1 in Mus. Acad. Scient., Philadelphia, presented by Dr. T. B. Wilson, a fine specimen.

I believe Herr Paetel, of Berlin, also possesses one.

N.B.—This species has been long known. Martini (1769) figured it in his "Conchylien-Cabinet," Vol. I.

Some authors imagine *C. Jenningsia* (Perry) to be a synonym, but neither the figure (pl. xix., f. 4) nor the description bear out this theory. I will refer to this again under the head of "doubtful species."

C. Barclayi (Reeve).—A small, deep water form. Length a little over 1 inch. It is white, sprinkled over with tawny yellow, the extremities and unusually developed teeth, quite unlike any other species, bright yellow-orange, the labial teeth overlapping the base.

Sir David Barclay, Bart., a most experienced Conchologist, and resident for many years at the Mauritius, dredged this off I. Diego Garcia. He allowed it to pass from his hands, thinking that more would reward his research, but, to his disappointment, another specimen has not turned up. The original and unique shell adorns the collection of Miss Saul.

The other two extremely scarce species are *C. Broderipii* (Gray) and *C. venusta* (Sowb.). Reference will shortly be made in another place to the former of these, and the latter, whilst differing in colour (being of a pale creamy fawn,) and in some other particulars from *C. stercoraria* (L.), can hardly claim an isolated position in the genus. Miss Saul and Dr. Cox, of Sydney, possess the only specimens yet known to exist.

C. aurantium (Martyn).—The far-famed Orange Cowry, termed by Chemnitz the "Aurora Solandri," was for many years considered the most esteemed of the genus, as it is still by far the most conspicuous. The length of the full grown mollusc is nearly 4 inches,—shining, globose, orange, within darker, teeth bright orange, base bright white. The Fiji, Loyalty and Friendly Islands, produce this shell. It is considered the badge of Royalty amongst some of the savage tribes, hence specimens coming to this country are occasionally found to have been perforated with holes, so that they might be strung together as a necklace. The natives of these Islands now know, or more than know,

their value, and two might be obtained at the marts in London for the price at which one inferior specimen could be obtained in Fiji at the present time.

Mr. Marrat considers this species is very near, if not identical with, *C. mappa*. I can hardly agree with him. The yellow teeth seem to me the only link of affinity, and I am strongly of opinion that it has no congeners in the genus.

C. testudinaria (L.) is a very isolated shell. In length about $5\frac{1}{2}$ inches, oblong, narrow, whitish brown, back marked with burnt sienna—brown and black, like tortoise-shell, besprinkled, in the adult, with indented white punctures, teeth smallish, white. A common species from the East Indies, but one of the handsomest of all. No other species, excepting *C. Bregeriana*, has the peculiarity of the small white specks, but some affinity in the cylindrical shape with *C. argus* (L.) may be traced.

C. umbilicata (Sowerby).—The resemblance to *C. pantherina*, of which it was thought once to be a monstrosity, is entirely superficial. It is depressed in front, with produced extremities, the spire deeply umbilicated, teeth brownish, markings pale fawn-coloured brown. Length, nearly four inches. A species, formerly very rare, dredged abundantly and without any variation, except an occasional white variety, in Australia. (var. *alba* of Cox).

C. lynx (L.).—It may surprise some conchologists to find this spoken of as an isolated species, but in attempting an arrangement of exact affinities I have had much difficulty. The nearest relation it possesses is undoubtedly *C. Walkeri*, with which it agrees in form, and coloration of the teeth interstices. It is variable, but always known by its oblong shape, clouded bluish and brown markings, with occasionally a dash of red, base and teeth white, base often with peculiar longitudinal sharply cut angled depression, which is very characteristic, interstices between the teeth invariably

bright orange red. Length normal, 1 to $1\frac{1}{2}$ inch. Mr. J. M. Williams, of Liverpool, has a magnificent specimen, $3\frac{1}{4}$ long., $1\frac{3}{4}$ lat.

Native of all Eastern Seas. Abundant.

(a) *Williamsi* (var. nov.).—Base suffused with orange red, pattern on dorsal surface much blurred with fawn colour. Length 2 in., lat. $1\frac{1}{4}$. In Mr. Williams' coll. A striking colour variety.

(b) *Caledonica* (Crosse).—Distorted var., with extremities elongated, and unequally produced. Rare. New Caledonia. cf. Tryon, Man. Conch. pl. xiv. f. 98.

C. tessellata (Swb.).—Dorsal surface tawny, with three broad bands; sides squarely marked with black-brown blotches bordered with white, and two chesnut-brown spots; base pale tawny and white, banded transversely; teeth orange; mouth straight, narrow. Length $1\frac{1}{8}$ inch. Rare. Eastern Archipelago. New Zealand has been recorded, but I doubt its occurrence there. Only very few specimens are known otherwise than in a decorticated state. Those belonging to Miss Saul and the late Mrs. De Burgh surpass all others.

C. Childreni (Gray).—Transversely ribbed throughout, pale coloured, extremities angularly expanded below. This last development does not occur in any other species. Native of Polynesia.

C. Adamsonii (Gray).—To the unique peculiarities of this species, as recent, I have already referred. As Mr. Sowerby aptly observes, young specimens of *Cypræa pustulata* (L.) are allied to this. It is a native of the Philippines and Mascarene Islands.

C. irrorata (Solander).

The prominence of the anterior columellar teeth distinguishes this species from any other, hence Dr. Gray created a new genus for it, *Naria* (Descr. Cat., Cyp., p. 12, 1832). Native of the Low Archipelago, Paumotu, etc. I think there are several points of connection between this somewhat isolated species and *fimbriata*, *microdon*, etc.

(XI.) *Groups of two or three in close affinity with each other, otherwise somewhat isolated.*

C. talpa (L.).

C. exusta (Sowb.).

Both these must surely have descended from a common ancestor, but the distinction is never failing, and known at once. The latter differs from the commoner and more widely distributed *talpa* in being more pyriform in shape, teeth more numerous, smaller, and somewhat immersed, aperture narrower. While *C. talpa* is found commonly in the Eastern tropics, *C. exusta* is confined to the Red Sea, but it is a great deal more than a local variety.

C. mus (L.)

C. leucostoma (Gaskoin).

The latter, which is rarer, has often been confounded with *C. mus*, indeed, it was not till 1843 that Mr. Gaskoin differentiated the two. The complete absence of teeth in the latter, the white base, and the heavier and white appearance of the shell, with one or two other distinctions of minor importance, amply distinguish them: but they are not nearly allied to any other of the genus, though a fossil form or two is rightly connected with them by M. F. Jousseume, Natives, *C. mus* of the Mediterranean, and W. African shores, *C. leucostoma*, Arabian coasts.

C. lurida (L.).

C. pulchra (L.).

C. controversa (Gray). *Isabella* (L.) var.

On the upper side these three are very similar, all being bluish-cinereous with two brown spots at either extremity. Below, however, the common *lurida* is wide-mouthed, with coarse dentition, *C. pulchra* and *controversa* have a narrower aperture, but the latter is pure white both as to the base and teeth, with the extremities yellow spotted as in its type *C. Isabella*, the former being olivaceous, with small, fine, somewhat obsolete teeth, of a reddish tint.

C. lurida is common in the Mediterranean and part of the Atlantic Ocean, *pulchra* only found in the Red Sea, and *controversa* from the East Indies and Mauritius. Mr. R. C. E. Stearns (*Proc. Ac. Phil.*, 1878, p. 399) thinks this variety distinct, and signalises it as having been found in California. Has this been confirmed?

C. Broderipii (Gray).

C. nivosa (Broderip).

C. vitellus (L.)

C. camelopardalis (Perry), *C. melanostoma* (Leathes).

The reason I call attention to this quaternion is that while they are all very nearly allied to each other, two of them are only distinguished by characters not seen at a glance, but when seen, proving how extremes meet, while *C. Broderipii* is one of the rarest and most beautiful of known shells. It is the largest of the four, measuring over 3 inches in length, and is globose, the dorsal surface tinted rose-colour, with brown network pattern overspread. Beneath, the teeth are long and well developed. Base pinkish. Native of Madagascar.

Six specimens are known; of which—

1 in National Collection, S. Kensington.

1 formerly in Mr. Hugh Owens' Collection.

2 in Miss Saul's Collection.

2—dispositions uncertain.

C. vitellus (L.) and *C. nivosa* (Brod.).—Both with near affinities to the preceding, are yet at first sight so close to each other as to appear hardly even varieties. And yet few species are so distinct. In the common *vitellus* a widely distributed East Indian species, the pattern of pure white spots is first deposited by the mantle of the animal, and then the grey-brown colour is enamelled over, but thinly, so as not to conceal the now slightly blurred and somewhat indistinct spots. In *nivosa*, on the other hand, the grey-brown colour is first deposited, and then the next, clear cut

eye-like holes are cut out, as it were, by some secreting juices; leaving them clearly defined, and there is no sign of the blurred lateral striæ, so conspicuous in *vitellus*. *C. dama* (Ferry), Conch. xxiii, 3, has been supposed to be *nivosa*, and thus to claim precedence of title. But I am convinced, on examining Mr. Perry's figure, that *vitellus* was intended, for the 'hair-like marks at the sides' are not only mentioned in this description, but also delineated. Broderip's name will therefore stand. This species is very rare; found at the Mauritius. My specimen came from Mr. Lombe Taylor's collection. The dentition of both these is identical.

O. vitellus (L.) (*α*) *sarcodes* (var. nov.).—A colour variety, of pale uniform flesh colour, otherwise as in the type. Figured. Sowb. Thes. Conch., pl. vi., f. 31.

O. camelopardalis (Perry) was for many years confounded with *vitellus*, but the absence of lateral striation, the clearness of marking, and the smoky black interstices between the columellar teeth distinguish it. Common in the Red Sea. Better known by the later name of *melanostoma* (Leathes).

C. pulchella (Swn.).

C. pyriformis (Gray).

Two beautiful and rare shells, allied to each other, and with a connection, too, with *O. Walkeri*, but otherwise isolated. This latter, however, has a characteristic violet tinge, never found in the two under observation, and through this shell there may be a connection with *O. lynx* (L.).

C. pulchella (Swn.) is truly pyriform, whitish, dorsal surface pale brown spotted, with or without a central deep brown blotch, sides spotted, base white, shining, teeth extending over the centre of the base, and labial teeth well developed, red. Length $1\frac{1}{4}$ inch. Chinese Seas.

C. pyriformis (Gray) and its small variety *O. Smithi* (Sowerby). On dorsal surface pale cinereous, mottled with darker. Truly pyriform in shape, teeth on the outer lip

white, on columella red, but not extending far over the base. Eastern Seas. Length $1\frac{1}{8}$ inch.

C. moneta (L.).

C. Annulus (L.).

C. obvallata (Lamk.).

Although kept distinct here for the sake of convenience, I think these three are really forms of one species. Typically they are all distinct, and easily discernible, but the varieties are many, especially of *moneta*, of which the best known is *icterina* (Lamk.) a smooth variety. *Barthelemeyi* (Born) is a distorted produced variety from New Caledonia. M. A. T. Rochebrune has added ten so-called species to this section from *moneta* and *annulus*. He gives the distribution as extending from Japan to Corsica (*C. Mercatorum* (Rochbr.), and from the Sandwich Isles to Zanzibar. It may probably have been accidentally introduced in the Mediterranean Sea. Most of these new forms are figured in Tryon. Man. of Conch., Cyp., pl. x., xi., and xxiii.

C. Noumeensis (Marie) is a curious form of *annulus* with double orange lines on the back of the shell.

C. obvallata (Lamk.).

(*α*) *calcarata* (var. nov.).

Shell dull, chalky white, uncoloured, otherwise as in the type. Two live shells in good state of preservation exactly similar in Mr. Williams' collection. The geographical distribution of this is not so extended as are the former and better known species. It is recorded, however, from Cook, Society, and Paumotu Islands (A. Garrett), Australia, and New Caledonia. The depressed centre of the dorsal surface is very characteristic.

(XII.) *Upon Variation*.—Far be it from me to augment the mass of literature that of recent years has flooded the world on the most important and, as yet, only partially solved question of *variation* and *limitation of species*. The doctrine

of specific immutability, is, in these enlightened days, vigorously assailed, but, as just pointed out, there are certain forms of this genus apparently unapproached and with no close relationships *inter se*. The case is widely different with others; and the question arises, 'Is a general *trinomial* system of nomenclature to be preferred for these, the specific, or *binomial* term being rigorously restricted to those prominent types that are the highest result of evolution in their own particular sphere?' Such a proposal has many advocates; and I am prepared to go thus far with them, in signaling certain leading *colour varieties* and other aberrations from the types, either in form or some other peculiarity, of which, in the course of long investigation, I have seen the frequent recurrence. I agree entirely with the late Dr. Gwyn Jeffreys' remarks (*J. of Conch.* III., p. 234): "Until an International Court has been established to decide the long-mooted question of not only what is a species, but also what are the limits of so-called species, it is useless to do more than argue it. Every naturalist has a perfect right to his own opinion, and time will be the only test of such opinions being correct or erroneous."

But if excessive latitude were given to such a trinomial system, there would be great fear of a too minute critical differentiation, especially in genera that 'sport' more than do the Cowries. Any conchologist, for instance, who has perused Mr. Marrat's researches on the genus *Nassa*,* in which are enumerated no less than 1,321 links by which the whole is bound together, would shrink from the task at being called upon to bestow appellations upon such a vast concourse (there having been hitherto only 250 recognised commonly), and thus the literature of the subject would become woefully embarrassed, and clogged with such a plethora of dog-Latin, as almost to deter the student of the future from voluntarily entering upon so formidable a study.

*On the Varieties of Shells belonging to the genus '*Nassa*,' by F. P. Marrat, Liverpool, 1880.

Briefly, then, it is evident that as a plant, insect, or shell may be considered a *perfect representative* of its species only so long as all the distinguishing traits and combinations of character exemplified in the original type are present, so it becomes a *variety*, when, owing to some local or other cause, one or more of these typical characteristics disappear, and change it to that extent.

In the genus under discussion, too much reliance must not be placed on either *form, colour, texture, size, pattern*, nor (always) *dentition*; but three or four of these points will be found present in every variety, while, crowning all, there is nearly always an indefinable and intuitive perception that will enable a specialist to recognise and relegate to its proper position with confidence, any individual he may be asked to decide upon.

(a) *Form*.—The chief variations are either undue prolongation, as in some specimens from *New Caledonia*, a more effuse growth than is ordinary, or a contracted and stunted form, generally thickened laterally. Monstrosities occur in many of the species.

(b) *Colour*.—Colour varieties affect some species far more than others; they run into each other very closely, e.g., *C. tigris* vars.: but certain stand out, constantly recur, and are always recognisable. The *Sandwich Isles* and the *Island of Mauritius* each possess races of Cowries, of various species, in which the whole shell has become semi-pellucid, and of a golden yellow or straw coloured hue, almost free from markings. These probably come from deep water, and, in a few species, unicolorous green varieties also occur.

(c) *Texture*.—Varieties from deep water are sometimes thinner than usual, and in certain forms, e.g., *C. carneola*, the lateral thickening spoken of under (a) gives a greater ponderosity to the shell.

(d) *Size*.—Certain species, as *C. lynx*, *carneola*, etc., often attain unusual size, three or more inches in length, when

normally only a third or quarter of that extent. Again, *C. caurica* has a very small variety, not much more than $\frac{1}{2}$ inch, and many other kinds vary in a similar manner.

(e) *Pattern*.—This has already been spoken of. The design of the adult Cowry is, as a rule, wonderfully uniform. Occasionally as in *C. tigris*, var. *ionthodes* and a form of *C. lynx*, large triangular blotches cover the dorsal surface, and, as in *stolida* var. *gelasima* certain spots, present in the type, disappear. Again, the pattern is often blurred over by the last deposit of colouring matter, as in *C. Arabica* var. *niger*, the black variety of *mappa*, *C. helvola* var. *Mascarena*, and others.

(f) *Dentition* is the least variable point, and the greatest holdfast in detecting a species, in nine cases out of ten. But in *C. stolida*, *C. staphylæa*, etc., much inconstancy is shown, so even this cannot always be relied upon.

No hybrids appear to have been ever detected, unless, indeed, some of the nearly akin forms we are noticing in this paper prove such; but these are questions for the future scientist to decide. It is to be hoped now, with the establishment of Marine Biological Laboratories, we shall be able in the course of a few years to learn something more definite of the life-history of these creatures, whose external skeletons are but an insufficient sign-post for guidance, and, till this achievement, we must be content with only very imperfect knowledge of the affinities and relationships of so interesting a group as *Cypræa*.

(XIII.) *Notes on certain species and proposed varieties.*

Cypræa mappa (L.), (Type, cf. Reeve, Conch. Icon. pl. vi., f. 18; Perry, Conch. pl. xxiii., f. 1, as *alga*). Three well known varieties of this well known Eastern shell occur.

(a) *panerythra* (var. nov.); cf. Sowb., Thes. Conch., pl. v., f. 28. Shell uniformly suffused with pale red or deep rose, which is generally deepest at the base. Teeth plain, or only slightly tinged with yellow. N. Caledonia, etc.

(b) *subsignata* (var. nov.); cf. Sowb., *ut supra*, f. 24, 25, 27. Base spotted with bright lilac, and conspicuously blotched with darker purple towards the centre; teeth conspicuously orange. S. Brandon Shoals, Indian Ocean, etc.

(c) *nigricans* (Mont.); suffused with black, extremities rostrate. Var. *monstr.* N. Caledonia.

C. pantherina (Sol). (Type, Reeve, Conch. Icon., pl. iii., f. 7; Sowb. T. C., pl. xi., f. 69, 70). Five colour varieties.

(a) *badionitens* (var. nov.). Shell smaller than the type, somewhat transparent, dorsal surface partly suffused with light golden brown, spots well nigh obsolete. A rare and striking variety.

(b) *theriaca* (var. nov.). Shell entirely, with the exception of the extremities and base, suffused with rich golden red-brown, not disposed in blotches as (a). Figured in Sowerby, Thes. Conch., pl. xi., f. 71. Common. Some specimens are almost, if not quite, *black*, and a monstrous form also occurs pretty frequently with warty extraneous growth, principally at one or other extremity (*theriaca distorta*).

(c) *albonitens* (var. nov.). Spots smaller, and more distant, giving therefore greater prominence to white body colour of the shell.

(d) *juvenca* (var. nov.). Very pale fawn colour, spots almost obsolete, owing to the enamel being laid on more thickly than is ordinary. This variety, which usually has some tendency to distortion, often resembles *C. umbilicata* (Sowb.), the base, however, will at once show its specific affinity.

(e) *syringa* (var. nov.). Shell with pale lilac tinge. Spots dark purple. Uncommon.

Note.—Weinkauff, in Küster's "Conchylien-Cabinet," has figured this and many of the above colour varieties.

C. tigris (L.). (Type, Reeve, C. I., pl. iv., f. 12, a and b; Sowb., T. C., pl. xxi., f. 172—3—4). The painting of this well known species is most variable; the principal colour varieties that stand out are as follows:—

(a) *flavonitens* (var. nov.). (Sowb., Thes. C., pl. xxi., f. 175.) Suffused with rich yellow or orange. Spots often more sparsely distributed. A very beautiful and well known form from Mauritius chiefly, also from the Fiji Islands.

(b) *hinnulea* (var. nov.). Pale grey brown coloured, spots almost obsolete. Of very infrequent occurrence, compared with the last variety, corresponding to *C. pantherina* var. *juvenca*.

(c) *russonitens* (var. nov.). Dorsal surface suffused with blackish grey, partly obscuring the spots; dorsal line an irregular broad blood coloured stain running longitudinally. A rare and striking variety. I have two, formerly in Mr. Lombe Taylor's collection.

(d) *chionia* (var. nov.). Spots fewer in number; dorsal surface therefore whiter in appearance. This runs into (a) frequently, and corresponds to *C. pantherina* var. (c).

(e) *ionthodes* (var. nov.). Dorsal surface with large, often triangular, black blotches, thus partly obscuring the ordinary markings. This colour variety is not very frequent.

(f) *lyncichroa* (var. nov.). Spotted and coloured with blue and fawn in pattern resembling *C. lynx* (L.), dorsal sinus reddish, very distinct; shell usually rather stunted, and smaller than the other forms, sides and base white.

(g) *symecrasta* (var. nov.). Dorsal spots obsolete, the surface entirely suffused with mixed blue red and brown wash, probably owing to the enormous extension of the sinus, from some defect in the mantle of the animal. I have seen a few specimens of this colour variety, and the effect is most striking. Sides as in the type, spotted, base white, normal.

C. decipiens (Smith). (*Proc. Zool. Soc.*, p. 482, pl. xlviii., f. 8, 1880). This, one of the most interesting discoveries in the genus of late years, has been amply confirmed by the arrival of several specimens, now in the National Collection, and received from Exmouth Gulf, W. Australia, through Mr. T. H. Haynes, and I also have one, from the same source, only acquired whilst these pages were passing through the

press. While it seems to present a very faint affinity with *C. mus* (Linnæus) in the base, and columellar lip, it is very near *C. Thersites* (Gaskoin) in all other respects. I have carefully examined the unique *C. marginata* (Gaskoin), also in the National Collection, and conclude it is the young form of *Thersites* or *stercoraria*, though, for convenience sake, I have still kept it distinct in the accompanying list.

C. caput serpentis (L.). The following is the description, from Reeve., *Conch. Icon.*, sp. 44. Cypr. testâ subquadrato-ovatâ, depressâ, planâ, crassâ, solidâ, dorso, acuminato, dentibus conspicuis, subelongatis; nigricante fuscâ, dorso guttis niveis circularibus inæqualibus asperso, extremitatibus albicantibus, dentibus, et aperturæ fauce fumeo-albidis. Long. $1\frac{3}{8}$ inch, Lat. 1 inch. Hab. Pacific Ocean, India, &c.

C. caput anguis (Phil.), 1849, in *Zeitschrift für Malako-Zoologie*, p. 24. "C. testâ oblongo-ovatâ, valde convexâ, lateribus incrassatis angulatis; basi convexâ, nigro-fuscâ, in dorso alboguttata, extremitatibus albidis; interstitiis dentium lacteorum aperturæ fuscis. Long. $1\frac{1}{2}$ ", Lat. $7\frac{1}{2}$ "

"Coloribus omnino cum *C. capite serpentis* convenit, sed maculæ albæ ad extremitates vix conspicuæ, dentes aperturæ in utroque labio, sedecim, lactei, sulcis fuscis divisi, producti, incisurâ ad basin aperturæ lata, in sinistram flexa, quibus notis forma oblonga, lateribus longé minus dilatata accedit."

This species is said by Mr. Garrett, Mr. Brazier, and Mr. G. F. Angas (all of whom have collected it plentifully, the first at the Sandwich Isles, the others in Australia) to be quite distinct, and to differ mainly from *C. caput serpentis* in the smaller size, less dilation of the sides, and more obscure marking. I apprehend all these specimens will be but varieties of the commoner form, distinguished by their greater convexity, and if this surmise be correct, the true *C. caput anguis* of Philippi is a lost species. Anyhow the shell is not known in this country, and I would appeal to

any conchologists who may collect it, or what they suppose to be it, in any quantity, to send a supply home either to the National Museum or to private collections, that we may have an opportunity of judging in England as to its specific merits. Neither Mr. Sowerby, Mr. E. A. Smith, or myself have ever seen a specimen.

* * * *

A truly distinct and extraordinary form has, however, lately come to hand from Hong Kong, where it was collected by Dr. Hungerford. Through the kindness of Mr. Sowerby I have become possessed of this shell, and have much pleasure in appending a photographic representation of both it and typical *caput serpentis* for comparison (Fig. 1, 1^a, 2, 2^a). The specimen of the latter selected is much the most clearly marked I have ever seen. The following is a description:—

C. caput draconis (sp. nov.). *C. testâ* ovatâ, convexâ, solidâ, dorso elevato-rotundo, aperturâ latiore quam in *C. capite serpentis*, dentibus utrinque quinquedecim, dorso brunneo confusé et obscuré reticulato, lateribus strictis, nequâquam depressis, extremitatibus cinereo-nigris, dentibus cinereo brunnescentibus, basi et aperturæ fauce brunneo-nigris. Long. $1\frac{5}{8}$ inch; lat. $\frac{1}{2}$ inch. Hab., Hong Kong.

This shell differs from the type *C. caput serpentis* in many ways.

- (i) In the straightness of the sides.
- (ii) Greater convexity.
- (iii) Difference of marking, and descent of the pattern almost to the base.
- (iv) Wider and greater sinuosity of aperture.
- (v) Dark ash coloured extremities.
- (vi) Flattened dark coloured base, as in *C. Mauritiana*.

From *C. caput anguis* it would appear, comparing it with Philippi's description, to be distinct in the following particulars:—

- (i) Sides not thickened, "incrassatis."
- (ii) Base not convex.

- (iii) Difference of marking and colour painting.
- (iv) Dark ash coloured extremities.
- (v) Ovate, not oblong.

It would seem to agree with *caput anguis* alone in its greater convexity and sinuosity of the aperture. The base is exactly like that of *C. Mauritiana* in miniature, and adds another link to that species with *C. caput serpentis*.

C. Arabica (L.). I can find no distinguishing points, that are permanent, to separate *C. histrio* (Gmel.) and *reticulata*^a (Martyn) specifically from the type. *C. amethystea* (Linnæus) is a name apparently given to the young or decorticated shell. *C. eglantina* (Duclos) is a shining brown, grey, or green thickened enamelled form, and *C. niger* (Roberts), the handsome elongated shell from New Caledonia. *C. intermedia* (Gray), a shining, somewhat obese, laterally thickened variety, considered distinct by Mr. A. Garrett, who collected it in the Paumotu and Society Islands (*cf. J. of Conch.*, 1879, p. 114).

C. Walkeri (Gray).

(a) *Bregeriana* (Crosse). (Sowb., T. C., pl. xxxvii, f. 536). This shell differs from the type in the orange base, with no violet tinge, teeth twenty-two or twenty-three in number, on each lip, dorsal surface banded much as in *C. Walkeri*, enamel pitted with small white specks, as in *C. testudinaria* (L.). This is very characteristic, and some authors, as Weinkauff, raise it to a specific position.

Mr. Edgar Smith, F.Z.S., has, within the last few weeks, received at South Kensington three specimens of a shell which I believe will be shortly described by him, collected by Mr. Ruddle, off the coasts of N. W. Australia. The shells are all alike, except in size, the larger of the three being of the shape and magnitude of *Bregeriana*, the two others smaller. Colour brick red, with a touch of grey, shining,

^a The dorsal pattern of *C. Arabica* is dark brown parallel longitudinal lines everywhere broken up and confused; *histrio*, more an open net-work, with round white spaces between; *reticulata* exactly intermediate between these two.

faint trace of transverse band on the larger specimen, under-side with dentition as in *Bregeriana*, teeth about twenty-one on each lip, a basal central patch of deep red-grey. The small white pitting is in these three shells extremely characteristic, and although they may be a distinct species, yet there is no doubt they impinge very closely on *C. Bregeriana*.^a

C. fimbriata (Gmel.). Reeve, f. 18, f. 92. Sow., T. C., pl. xxxii., f. 387—391. This species, always extremely variable, is known mainly by the violet painting of its extremities.

(a) *C. microdon* (Gray) I consider but a variety, with very beautifully minute teeth, extremities violet.^b

(b) *unifasciata* (Mighels). This variety is thus characterised by Mr. A. Garrett (*J. of Conch.*, 1879, p. 120:—"Larger (than *C. fimbriata*), teeth coarser, less numerous, and the ground colour, which is of a more bluish tint, marked with a more or less broken, transverse, yellowish-brown band. Both species have the terminal pink spots as well as the profusion of small yellow dots."

(c) *macula* (Adams), sp. Sow., T. C., 379—381, more pyriform than the type, with the extremities dark purple brown.

(d) *Cholmondeleyi* (var. nov.), Sow., T. C., pl. xxxii., f. 387, 388. This magnificent form is very uncommon, there is a good specimen, formerly in the collection of Reginald Cholmondeley, Esq., now in the Museum of the Owens College, Manchester. Length $1\frac{1}{8}$ inch, breadth $\frac{5}{8}$ inch. Native of Australia. The main distinction of this variety is its size, and greater dorsal effusion. Mr. J. M. Williams possesses Mr. Hugh Owen's original specimens; almost as large as the type now figured, pl. ii., f. 15.

C. fabula (Kiener) } cf. Sowb. Thes. Conch., pl. xxxii.,
C. felina (Gmelin) } f. 393-395.

^a The other variety of *C. Walkeri*, (b), *amabilis* (Jousseaume), is said by the author to differ in the more produced extremities, which are a little recurved, narrow bands dorsally, and only the inner lip purple tinted. I have never seen this. It is figured in Tryon. Man. Conch. Cypraea, pl. xiv, f. 1, 2.

^b The Rev. R. B. Watson (Rep. on Gast. Challenger Expedition, Vol. XV., p. 424) considers this a good species, so do Messrs. Roberts, Reeve, and Sowerby.

These species are usually considered forms of one, but I fancy there is more difference between them than is usually given credit for.

C. fabula is ovate, stunted, not spotted at the extremities, dorsal surface suffused with brown, laterally thickened, base white, mouth narrow, teeth coarser than in the next.

C. felina and its variety *ursellus* (Gmel.) (the latter characterised by white base as opposed to yellow in the typical form) are cylindrical, not thickened laterally, spotted very clearly, with large blotches at the sides, dorsal surface cinereous, brown extremities spotted, mouth wide, teeth about fourteen in either lip.

C. caurica (L.). The type of this abundant mollusc is well given by Sowerby, Thes. Conch., pl. xxiii., f. 188, 189, and Reeve, Conch. Icon., pl. xi., f. 46. Reeve says truly, "This specimen varies from long and rounded forms with thin sides, to short and depressed with thickened sides." Long. max. $1\frac{7}{8}$ inch. A small full grown form from my collection may be seen in the plate appended (fig. 9), only $\frac{3}{4}$ inch in length. East Indies, general.

(a) *oblongata* (var. nov.), (fig. 8). Shell oblong, thinner than the type, and often of much greater length, say $2\frac{1}{4}$ inches, somewhat effuse, back pale green, densely clouded over with brown confused markings. Sides rounded, thin, scarcely spotted, in one of my specimens dark banded, teeth about eighteen, not so prominently developed as in the type, base usually yellowish white, the base of typical *caurica* being usually flesh colour, and mouth wider. Same localities as above. There is every gradation between this and the typical form. This may be *C. elongata* (Perry), cf. Conch., pl. xxii., f. 5, but the delineation is, as usual, fantastic in the extreme.

(b) *concava* (Owen). An almost distorted state from R. Gambia; cf. Sow., Thes. Conch., pl. xxix., f. 318, 319.

(c) *obscura* (Rossiter). A black banded var from New Caledonia.

C. cruenta (Gmel.) is very nearly allied to the preceding, and the variety *coloba* (fig. 7), so called from the stunted appearance, is also figured in Sowb. Thes., f. 190, as *caurica* var.; it would appear nearer this species: the base is always brighter coloured, and teeth interstices bright red. I possess stunted *caurica*, with which this var. cannot be mistaken.

There are two species, *C. tabescens* (Sol.) and *C. teres* (Gmel.), allied to *C. caurica* (L.).

The former of these is at a glance known by its teeth, small and numerous, and white base; but on the dorsal surface it is often impossible to recognise it as distinct from *caurica*. And I have another variety which is tending to the form of *teres*. The two are always, however, distinguishable, and I do not doubt the genuineness of the specific rank they hold, *C. teres* itself being a narrow, cylindrical, delicately marked shell, with fine, almost obsolete teeth. It ranks among the more prized of the smaller kinds. Cf. Sowb., pl. xxvii., f. 259, 260.

C. tabescens (Solander). Type, cf. Sowb., T. C., pl. xxvii., f. 261, 265.

(a) *laticus* (var. nov.). Cf. Reeve, Conch. Icon., pl. xiv., f. 66_a. A pyriform shell, broader and more stunted than the type, with brighter coloration, and very distinct dorso-lateral spots. A handsome and rare form, almost sub-specific.

(b) *pellucens* (var. nov.). Transparent form, from the Sandwich Isles, dorsal markings indistinct, pale brown. Some specimens large and effuse, others pyriform and broader as var. (a).

(c) *alveolus* (Tapparone Canefri). I do not know this form. It is reported from Mauritius, from whence also I have seen unicolorous, thickened, dark green enamelled specimens, shape as in the type, which may be signalized as (d) *elaiodes*.

C. Rashleighana (Melvill). *J. of Conch.*, V., p. 288, 1887, pl. ii., f. 26; also fig. 3 in photographic plate appended.

As it is only four months since this was described, it may not be amiss to transcribe the particulars. "*C. testâ ovatâ, anticé subprolongatâ, dorso convexiusculo, lilacino, tribus brunneis fasciis decorato, fasciâ centrali distinctiore et latiore, lateribus albis parvipunctatis, extremitatibus immaculatis, dentibus parvulis, albis, basi albâ nitente. Long. 18 mm., lat. 11 mm. Habitat ?*"

"A very pretty addition to the known species of cowry, albeit of small size, the disposition of the brown bands on the lilac ground is a little like the arrangement in *C. sanguinolenta* (Gmelin), the shape and upper surface slightly recall *C. macula* (Adams), though the underside has a perfectly different disposition of teeth, *C. macula* being allied more to the *fimbriata* section of the genus. Nothing at all nearly resembling this cowry is to be found in the National Collection, or in the latest monograph (that of Mr. Raymond Roberts). With this shell I have associated the name of my late friend Mr. Jonathan Rashleigh, Junr., of Menabilly, Cornwall, who died December, 1872, aged only 27. His collection of *Cypræa* was extremely large and perfect, and had he lived he would have made great mark in a science to which he was profoundly attached.

Of this unique shell I am glad to be able to give a photographic representation (fig. 3). I consider it now nearer to *C. tabescens* than *macula*, or any of the *fimbriata* section, but differing as much from the stunted form of *tabescens* on the one hand, as *C. teres* does from the smaller, more elongate variety.

C. stolidus (L.). Type, Reeve, Conch. Icon., pl. xiv., f. 67_a, 67_b. Sowb., T. C., pl. xxx., f. 327, 329.

(a) *moniontha* (var. nov.), (fig. 4). Dorsal surface rounded, not humped, with one rounded blotch only, and occasionally this is absent, sides streaked and speckled, teeth not so prolonged, white. Length in largest specimen $1\frac{1}{4}$ inch. This is intermediate between the type and *C. brevidentata* (Sowb.). A common form, almost a sub-species.

(*b*) *dianges* (var. nov.), (fig. 5). Yellow, shining, semipellucid, shape as in type. One pale central dorsal blotch, otherwise unspotted and uniform pale yellow, including the extremities and teeth. Bears the same relation to the type that *C. Helvola*, pale var., bears to that shell. Mauritius.

(*c*) *gelasima* (var. nov.). Shape as in type, with flattened dorsal surface, pale olive green, very delicately pale brown spotted, and with no dorsal blotch, extremities pale fawn. Teeth as in (*b*). Mauritius. A beautiful variety in the National Collection.

(*d*) *Crossei* (Marie). A large, attenuated, almost monstrous form, from New Caledonia.

N.B.—*C. brevidentata* (Sowb.) and *C. erythræensis* (Gray) both seem extreme forms of this species. I would refer to Reeve, Conch. Icon., pl. xiv., f. 63, for a differentiation of the latter. The characters are clear enough when compared with the type, and not with intermediates. It is, however, always of uniformly smaller size. Found at the Red Sea, as far S. as Zanzibar. My largest specimen only measures $\frac{3}{4}$ inch in length. *C. brevidentata* (Sowb.) is well figured in Thes. Conch., pl. xxx., f. 325, 326. A very rare form, from Borneo, of which but few examples are known in European or American Cabinets.

C. clandestina (L.). The type of this common species is pale whitish, oblong, ornamented with very fine zigzag brownish yellow lines, sides and base white: teeth very well marked. It varies extremely in size, the largest specimens I have seen are in the collection of Mr. J. M. Williams, of Liverpool, nearly 1 inch in length.

(*a*) *candida* (Pease). A pure white unmarked variety.

(*b*) *Artuffelli* (Joussemae). Is this the same as *C. asellus* var. figured in Sowerby, Thes. Conch., pl. xxx., f. 327*? It compares well with the plate in Tryon. Man. Conch., pl. xvi., f. 61. I recollect this specimen in the collection of my late friend Mr. Rashleigh, but have had no opportunity of com-

paring it, as since his death in 1872, his collections have been left packed in the Bedford Pantechnicon, London, and are not in a condition, therefore, to be consulted.

(*c*) Mr. Williams also possesses a very ovate form of this species, marked dorsally with leaden blue. Should subsequent investigations cause this to be entered as a good variety, I would suggest the name var. *C. passerina* (cf. Sowb., Thes. Conch., f. 534).

(*d*) *aberrans* (Ancey). I do not know this form.

C. capensis (Gray); cf. Reeve. Conch. Icon., pl. xvii., f. 86. Sowb., T.C., pl. xxix., f. 306, 307, 308^a. This shell, with *C. Adamsonii* (Gray), were originally made sole types of the genus *Cypræovula*, the surface being ribbed transversely. *Luponia* (Gray) was characterised by the pyriform shape, smooth, polished, spire concealed and depressed, inner lip plaited-toothed, outer inflexed and crenate. Type, *L. Algoensis* (Gray); cf. Sowb., Thes., pl. xxix., f. 311, 312.

As announced previously in this paper, I recently obtained a specimen of a very extraordinary shell from Port Elizabeth, S. Africa, which appears to unite these two forms, types of two different genera of Gray, in its own person. The following is the description:—

C. amphithales (sp. nov.), (fig. 19).^b *C. testâ rotundato-pyriformi, subumbilicatâ, stramineo-albâ, lateribus brunneis maculis conspersis, latere dextro extremitatibusque ambabus angustè marginatis, aperturâ angustiore quàm in C. algoensi latiore quàm in C. Capensi, dorso omnino lævi, brunneâ centrali maculâ decorato, basi transversim liris triatâ, labio dentibus octodecim, quasi liri-duplicatis, columellaribus ut in C. capensi.* Long. 1 in. Hab., Port Elizabeth.

^a The annexed plate (fig. 20) shows perhaps the finest specimen known of *C. capensis* (Gray), which is in my collection. The dorsal blotch is of a fine rich brown, and the transverse liræ unusually clear and sharply cut.

^b The specific name, ἀμφιθάλης, *blooming out on both sides*, was suggested by the ramifications presented on the one hand towards *Cypræovula*, and on the other towards *Luponia*.

The upper shoulder of this new form resembles *C. algensis* (fig. 21), with which it is of uniform size. In shape it assimilates either shell; it is not, however, deeply umbilicated, as is *C. capensis*, the base is white, with numerous striæ, the converging liræ developing into fine labial teeth, two liræ meeting at the tooth projection, eighteen in number, while I have counted as many as twenty-five on well developed *C. capensis*. The columellar teeth, as in that species, are represented by the fine projecting liræ alone, thus differing from all the *Luponia*, which have developed teeth on both sides, with the exception of *L. edentula*. But the smooth dorsal surface, size of the aperture, and the spotted lateral margins, are as in *Luponia*.

C. gangrenosa (Sol.). Reeve, Conch. Icon., pl. xviii., f. 96a. In the typical form, the tips, fuscous above, orange beneath, are characteristic.

(a) *Boivini* (Kiener), fig. 96 b. Rientzii (Dunk.). This is a large shell, dorsal surface grey, the sinus usually marked by brown streak. Extremities uncoloured. Very close to *erosa* (L.); var. *a.* cf. Sowb., Thes. Conch., f. 232. From Zanzibar.

(b) *melanosema* (var. nov.). Smaller, the extremities of dorsal surface with very wide, black, suffused extension of marking, sides white enamelled as far as dorsal sinus. I have seen fine specimens of this in the National Collection, and in that of Mr. Williams. From Mauritius. This may be what Dunker intends by his var. *Rientzii*, but authors seem much mixed in their opinions, and the name and description are hopelessly confused with *Boivini*.

C. erosa (L.). Type Reeve, Conch. Icon., pl. xi., f. 43. Sowerby, Thes. Conch., pl. xviii., f. 111—112. There are several constant varieties of this common and well-known species, the type of which may be described as follows:—Shell ovate, oblong, somewhat flattened, but few specimens exceeding long. 1·60, lat. 1·12 mm. The back buff-

coloured, with many small round white dots, more copiously besprinkled over some parts than others, the sides in the type callous, somewhat extended, pitted, and crenated, teeth (in largest specimen) about nineteen, very strong and well developed, underside white, but rarely spotted, livid-blotched at the sides, this being almost central, and broadly square. Habitat, India, Ceylon, coast of the Pacific Islands, including Mauritius, coasts of tropical Australia, in fact universally distributed over the East.

(a) *phagedaina* (var. nov.), (fig. 11). Sowb., T. C., pl. xviii., f. 113. Without the livid lateral blotches; unspotted shining white underneath, teeth about eighteen, not so prominently developed as in the type, and much resembling var. *Boivini* of *C. gangrenosa*. Back pale, light greenish brown, spots often very confused and indistinct.

(b) *chlorizans* (var. nov.), (fig. 12). Dwarf. 80 long, 60 lat. Form as in type. Lateral blotches conspicuous both on upper and lower sides. Back very dark olive green, spots clear, numerous and distinct.

(c) *straminea* (var. nov.), (fig. 10). Shell semi-pellucid, back delicate transparent pale ochreous yellow, spots barely visible, livid lateral blotches present, teeth about sixteen, very well developed, underside pure white, shining. Hab., Mauritius, deep water. Size as in type.

(d) *nebrites* (var. nov.), (fig. 13). Sowb., Thes. Conch., pl. xviii., f. 114, 115; Tryon. Cyp. f. 90. General shape slightly more compact and stunted than in the type, varying (in my seven specimens) from 1 to 1·30 inch in length, colour warm flesh, back yellow-brown, the lateral blotches, which are most conspicuous, black-brown, and extending towards the centre, not visible below. Extremities markedly lineated with red lines. Teeth well developed, uncoloured, but not to such an extent as in the type. Base pale red-brown with linear brown lines and dots, almost exactly similar to *C. ocellata*, with which species and typical *erosa* is here pre-

sented a link; indeed in the largest of my specimens of this variety some of the dorsal spots are distinctly ocellated. I have never, however, seen in *C. ocellata*, or any of the "*spurca*" group, the slightest symptom of the square lateral blotches, so characteristic of *erosa*, though absent in one of its varieties. Locality, Borneo.

C. ocellata (L.) differs mainly from all these varieties by its greater distinctness of ocellation and marking. It is a neater and more compact shell in every way.

(*a palatha* (var. nov.), (fig. 14). Ocellations less prominently coloured, with a tendency to become obsolete, otherwise as in the type. This variety connects *ocellata* with *erosa* still more closely, the two distinctions which still remain being absence of blotches on the sides, more distinct lateral clouding, and the conspicuous orange-brown tinting of the teeth and extremities on the underside. The specimen in the plate is in Coll. Mus., Owens College, Manchester, formerly in that of Mr. Reginald Cholmondeley, of Condover Hall, near Shrewsbury.

C. spurca (Linn.). Cf. Sowb., T. C., f. 118—122. This common Mediterranean and Atlantic Island species is not so variable as *C. erosa*; some of its forms are more pyriform, and the marking is more distinct, often with slight ocellation on the dorsal surface; I hold that *C. flaveola* (L.) is of true specific rank, although I am not quite so sure that *C. cernica* (Sowb.) from Mauritius is not a more beautiful and tropical form of *spurca*, var. (*a*), and as such I have placed it in the subjoined table. I certainly have intermediates. Sowerby (Thes. Conch., pl. xxvi., f. 238—240) remarks upon the dorsal white spots being round and clear. I have a specimen with distinct trace of ocelli, as in *spurca*. *C. flaveola* seems to be constant in small size, oblong form, and clear dorsal marking. It connects the *erosa-spurca* section with the *cribrariae*.

C. spurca (L.). (*b Verdensium* (var. nov.). Smaller than type, compact, sides slightly thickened, dorsal surface spotted

in a rather confused manner, brown, extremities lineated, teeth finer than in *spurca*, base white, somewhat spotted. Habitat, St. Vincent, Cape de Verde Islands. It much resembles a small form of *C. turdus* (Lam.), *ovata* (Perry).

Allied to *C. Thomasi* (Crosse), *Jour. de Conch.*, 1865, pl. vi., f. 3, of which I have only seen description and figure, the habitat being unknown. I hesitate before pronouncing them identical; the columellar teeth are described as being semi-obliterated, size 7 inch.

If it were not for the constancy of the lilac base in *C. Listeri* (Gray) and the chestnut-brown hue of *C. Helvola*, how like they are to some forms of species we have just been commenting upon! But *Listeri* is not a variable shell, and the peculiarity just mentioned always seems to distinguish it. Through it we come to *C. albuginosa* (Mawe) and *poraria* (L.), also with annulated ocelli on the back, and purplish base.

C. Helvola (L.) is one of the most easily distinguishable, and yet most variable of the genus. The only species with which it could possibly be confounded is *C. citrina* (Gray), which has more teeth, and yet not so prominently developed, dorsal surface olive brown, with rounded spots of paler colour, a rare form, found in Ceylon, Mauritius, and off N.W. coast of Australia (*fide* J. F. Bailey sec. Roberts). Sowb., Thes. Conch., pl. xxv., f. 218, 219. The type of *Helvola* is figured in Reeve, pl. xv., f. 72; Sowerby, pl. xxv., f. 214—216. A most abundant Eastern species. Found in every group of Polynesian islands worked by Mr. A. Garrett; also in India, Ceylon, Mauritius, &c.

(*a Mascarena* (var. nov.). Smaller, and of richer uniform burnt sienna brown colour, almost or entirely obliterating the white, grey, and brown spotted dorsal ornamentation. Native of the Mauritius. This is a colour variety, and I have traced every gradation to the type. *C. chalconia* (Perry), pl. xix., f. 6, is apparently intermediate between this and the type.

(b) *argella* (var. nov.). Shell usually oblong-ovate, sides not thickened, colour orange-brown, entirely enveloping the surface, the star like white dots appearing clearly defined over the back, the effect being exactly antagonistic to the normal condition, where brown specks appear on the dorsal surface on a greenish or bluish-white ground. I have four specimens of this variety, and have seen many others. Habitat, with the typical form.

(c) *Hawaiiensis* (var. nov.), (fig. 18). Pellucid, shining, straw-coloured on both sides. There are two forms of this well-known variety, one incrassated laterally, bearing a strong superficial resemblance to *C. cernica* (Sowb.), the other with straight sides. Often the extremities, of so conspicuous a lilac in this type, present a pale reflection of that colour; otherwise they are uniformly straw-coloured. From the Sandwich Islands. Also cf. Sowb., T. C., pl. xxv., f. 217.

C. poraria (L.). Type Sowb., Thes. Conchyl., pl. xxvi., f. 236—237. An abundant Eastern shell. The lilac-backed unspotted young shells are very bright and beautiful. A curious monstrosity is mentioned by Brazier (*Proc. Linn. Soc. N.S.W.*, VI., p. 202), destitute of white dots, and with the aperture shaped liked the figure 8.

(a) *Kauaiensis* (var. nov.). Pellucid. Pale yellow with purple tinge. From Kauai I., Sandwich Isles. Another of the characteristic Sandwich Island varieties.

C. Lamarckii (Gray). Reeve., C. Icon., pl. x., f. 37., Sowb., Thes. Conch., pl. xvii., f. 106, 107. Shell ovate, somewhat ventricose, slightly prolonged at either extremity, pitted at the sides, teeth about sixteen on either side, back ochreous, profusely dotted with large and small round white spots, some of them ocellated, but occasionally with no signs of ocellation, extremities lineated as in *C. turdus* and *C. erosa*. Sides scarcely thickened, brown-spotted. Length $1\frac{3}{8}$ in., lat. $\frac{7}{8}$ inch. Locality, Mozambique, &c.

(a) *redimita* (var. nov.), (fig. 16). Shell somewhat stout,

slightly flattened at the base, extremities less produced than in the type, but more so than in *C. turdus*, aperture fairly wide, two last anterior labial teeth distinct and projecting, as in *Lamarckii* and *miliaris*. Dorsal surface pale-ochreous, indistinctly marked with obscure whitish spots, laterally thickened with white callosity on each side, and a double row of brown spots (almost becoming blotches in one specimen), which impart a special character at first sight. Size about the same as the type.

I take this shell to be very well developed and full grown *Lamarckii*. I had at one time, some eighteen years ago, when I gave the MSS. name of *redimita* to the specimens then acquired at a dealer's in Liverpool, imagined the species was a new one. I have found an example among the Cholmondeley shells now at Owens College, rather larger than my own, but not so well marked as that now photographed.

The underside is the same as *C. turdus*, and were it not for the projecting ridges of the two last labial teeth, which are never found in that shell, I should have been inclined to connect the two species more closely.

C. miliaris (Gmel.); (a) *magistra* (var. nov.), (fig. 6). A very large variety, lately acquired through Mr. G. B. Sowerby, from Japan. Character the same as in the type, but teeth very well developed and size, long. $2\frac{1}{8}$, lat. $1\frac{1}{8}$ inch. I have seen five or six other specimens in no other way differing. It is a handsome shell, and in fine condition; it slightly resembles *C. guttata* on dorsal surface only. I consider *C. eburnea* (Barnes), often reckoned a mere albino form of this, a sufficiently good species.

C. miliaris (Gmel.), *C. Lamarckii* (Gray), and *C. Listeri* (Gray) are commented upon by the Rev. R. Boog Watson, B.A., F.L.S., in his "Report on the Gasteropoda, Voyage of H.M.S. Challenger," Vol. XV., pp. 424, 425. To quote his remarks: "In classing the Challenger specimen (of *C. miliaris*,

collected in eight fathoms, off Wednesday Island, Cape York) as *Gmelin's* species, I mean simply that it agrees with shells bearing Gmelin's name in the British Museum. My own opinion is, that these are the same as others marked *C. Lamarckii* (Gray), and that both are distinct from *C. erosa* (L.), of which Dillwyn (Vol. I., p. 461, No. 50) regards Gmelin's species as the young, while Deshayes simply unites them, followed herein by Gray (*Zool. Jour.* Vol. I., p. 504), who, however, at the same time resuscitates the *Cypræa miliaris* (Gm.) in the form of two new species, *C. Lamarckii* and *C. Listeri*, of his own making, but one of which at least, if they be good species, ought to have borne Gmelin's name." He then quotes Kiener, Reeve, Sowerby, and Weinkauff as further complicating the question.

I think the following distinctions amply serve to differentiate successfully any examples of the species that puzzled Mr. Watson:—

C. miliaris (Gmel.). Never possesses lateral spots; dorsal surface covered with small white round spots, which are never eyed, or, at all events, extremely rarely.

C. Lamarckii (Gray) always has lateral spots, dorsal surface with spots larger, round, and often ocellated.

C. Hungerfordii (Sowb.), 1888. This very handsome addition to the genus, procured by Dr. Hungerford at Hong Kong, is conspicuous for its pyriform shape and coronal of spots wreathing the dorsal surface. Sides white enamelled, thickened. Teeth fine, about twenty-four labial. Base as in *C. carnicolor* (Duclos). Long. $1\frac{1}{2}$ inch; lat. $\frac{3}{8}$ inch. I think should be placed between *onyx*, *spadicea*, and *physis*; to var. *achatidea* of this latter it approaches, but not very nearly.

C. subviridis (Reeve). Conch. Icon., pl. xii., f. 48; Sowb., Thes. Conch., pl. xxii., 176—178. Differentiated successfully by Mr. Reeve in 1835, having till then been confounded with *errones*. A local species; the dorsal

blotch is occasionally absent. A large variety occurs in New Caledonia (*cf.* Sowb., f. 176), and a beautifully coloured form (*cf.* id., f. 358), is figured as being in the Lombe Taylor Collection.

C. errones. (L.). Sowb., Thes. Conch., pl. xx., 156, 157, 158. This species mainly varies as to the presence or absence of the brown dorsal blotch, and the plain or saffron colour of the teeth; the specimens vary much, also in size, the smaller being the most brightly coloured.

(a) *chrysophæa* (var. nov.). Surface entirely coloured golden brown, enamel of base and sides shining, pale yellow, teeth and form as in type. A most beautiful colour variety in my collection from Port Blair. Andaman Islands.

(b) *C. Coxii* (Brazier) and (c) *C. Sophiæ* (Brazier) are varieties; the latter only differs in more lateral development of white enamel, and yellow teeth, and of this I possess a fine example; the former a pale brown uniform variety, from N. W. Australia; dentition and base as in the type. In the Cholmondeley Collection, Owens College, Manchester.

C. cribraria (L.). *Cf.* Reeve, C. I., pl. xvi., f. 81. Sowb., Thes. Conch., pl. xx., f. 161—164.

(a) *translucida* (var. nov.). Of this well-known and handsome species I have pellucid varieties from the Sandwich Islands, which have been named *Peasei*, but this is a misnomer. It will be better to rechristen them *translucida*, as *Peasei* (Sowb.)^a is preoccupied by a different species. Form and dentition as in type.

(b) *Exmouthensis* (var. nov.). Another fine form I noticed recently in the Natural History Museum, S. Kensington. In this the dorsal markings are very rich blackish brown, the white spots more sparse; long. in size about 1 inch. Habitat., Exmouth Gulf, W. Australia, collected by T. H.

^a *C. Peasei* (Sowb.) figured in Thes. Conch. XX., 166, 167; and a curious monstrous var. of the same, from Mauritius, is figured *Proc. Zool. Soc.* XLVI., f. 13, 14, 1878.

Haynes. Mr. J. Michael Williams has another specimen approaching this. The dorsal covering matter seems to have been twice deposited, causing a very rich effect, with partial eclipse of the round white spots. This possibly may be *C. comma* (Perry, Conch., pl. xxi., f. 5), but the plate and description are both bad, and identification difficult in consequence.

Connected with *C. cribraria*^a are an assemblage of seven or eight species, all bearing considerable resemblance to it in the disposition of marking. Of these, *C. esontropia* (Duclos), a broader, more pyriform shell, is connected with the type by *C. Peasei* (Sowb.), which is a translucent Sandwich Island variety, appertaining to both *esontropia* and *Gaskoinii*. *C. cribellum* (Gaskoin) is a dwarfed form, with similar dorsal ornamentation. *O. fallax* (E. A. Smith) is perhaps only a fine large, more pyriform variety of *cribraria*, with smaller white spots and paler dorsal surface. *C. Gaskoinii* (Reeve), of which I possess the type specimen formerly in Mr. Gaskoin's collection, is a beautiful shell, straw-coloured marking, with clear cut ocelli, but I have very great doubt whether it be not an extreme form of *esontropia*. *C. Cumingii* (Gray)^b is more distinct, a very graceful attenuated pyriform shape, resembling *C. Macandrei* (Sowb.), and *C. Beckii* (Gaskoin), in a greater degree than the other species. This last was included in the *Trivia* by Messrs. H. & A. Adams, owing to some strange oversight. The *cribrariae* more nearly run into each other than do most of the sections of this genus, and though *cribraria*,

^a *C. Coxeni* (Brazier). (*Proc. Zool. Soc.*, 1873, pl. xlviii., f. 10). I have seen the type in the National Collection, but would hesitate before relegating it to the *cribrariae*, as Mr. Brazier proposes, the dentition being altogether different.

^b *C. compta* (Pease) is but a variety of *Cumingii* from the Kingsmill group (A. Garrett) and Phoenix Island (Harper Pease), a single example in each case. The dorsal sinus is branched, hinting at some malformation in the mantle, the result, however, being a beautiful little shell, now in the National Collection. Cf. Sowb., T. C., pl. xxxi., f. 351.

esontropia, *cribellum*, *Gaskoinii* are typically distinct, I should never be surprised at all being eventually united.

C. carneola (L.). Reeve, Conch. Icon., pl. ii., f. 19; Sowb., Thes. Conch., pl. iii., f. 11—13.

Type.—Reddish flesh colour, with four or five bands of a darker hue of the same tint, extremely variable in shape. My largest specimen $3\frac{1}{8}$ in. long, the smallest full grown 1 inch. The sides have more or less callous deposits. Every gradation exists between the large elongate shell, the sides not thickened, and the smaller with flattened sides, resembling an *Aricia*. Teeth purple-violet. Very abundantly distributed throughout the East.

(a) *Loebbeckeana* (Weinkauff). Sowb., Thes., pl. 321, f. 322. No bands of colour on dorsal surface, teeth uncoloured. Mauritius. My specimen of what I think is this, is of the usual translucent deep water character of so many Mauritian shells.

(b) *halmaja* (var. nov.). Dorsal surface covered with greenish callous deposit of enamel. Teeth purple, base greenish. Mauritius. From coll. Gloyne, collected by M. Robillard. I have seen a larger specimen of the same variety in the Lincolne Collection of Shells, Peel Park, Salford. An almost exact resemblance to a pickled olive may be traced, suggesting the varietal name.

(c) *propinqua* (Garrett). I think this is only the smaller solid form. Mr. Garrett says the number of teeth is but 25 to 30, form of *arenosa*. Paumotu and Society Isles. Cf. *J. of Conch.*, 1879, p. 117.

C. Isabella (L.). This common species mainly varies in

(a) *controversa* (Gray). An only apparently sinistral shell, back with no black dashes, base broader than the type, teeth not quite so fine.

(b) *limpida* (var. nov.). Uncoloured, transparent. Sandwich Isles. I have likewise seen deep olive green trans-

lucent varieties, with base yellowish white, and the orange painting of the extremities almost or quite disappearing.

C. staphylæa (L.). This is the most puzzling, variable shell in the genus. Many species have been made out of it. They all run so nearly into each other as to merge into varieties. The type is grey or brown, white pustulated all over with small excrescent granules, extremities reddish brown tipped, teeth extended across the base on each side in ridges, sometimes yellow, sometimes white. Very variable in size, .5 to .10 inch normally, but I have a specimen 1.25 inch.

(a) *interstincta* (Wood). A form with pustules semi-obiterated, sometimes larger, teeth coarser and darker.

(b) *limacina* (Lamk.). Smooth, oblong, white spotted, teeth not extending across the centre of the columellar base, very near the last var., but the pustules quite undeveloped. I have this also pellucid from the Sandwich Isles. Colour pale straw. A sub-species, as in the next.

(c) *polita* (Roberts). A shorter, more brilliantly coloured pellucid shell from the Sandwich Isles, the minute white spots often obsolete except laterally, base white, teeth much as in small specimen of *limacina*. I do not know *C. Anna* (Roberts), but suspect it to be a variety of this protean sub-species.

(d) *consobrina* (Garr.). Mr. Andrew Garrett (*J. of Conch.*, 1879, p. 122) has likewise described *Trivia* (*Pustularia*) *consobrina*, which he separates from *T. staphylæa*, the base being yellowish white instead of livid, and the teeth being margined with yellowish brown, hair like lines, extending quite across the face of the shell, and being more or less bifid; supplementary ones also may be observed between the primary teeth, which more or less anastomose towards the outer margins of the shell. Length 22 mm. Found rarely at the Viti and Samoa Islands, in dead, but perfect condition.

(e) *semiplota* (Mighels), 1848. *fimbriatula* (Sowb.), 1870. Undoubtedly synonyms. I have two specimens labelled by the latter name, in no way excepting in small size (.4 inch) differing from the smooth white spotted *limacina* (Lamk.). As Mr. Roberts suggests (*Man. Conch. Cyp.*, p. 194) *C. spadix* (Mighels) is the immature state of this variety.

The smaller *Trivia* have been so satisfactorily worked out by various eminent Conchologists, especially Gray and Gaskoin, as to be now almost perfectly systematized. As a rule they are fairly constant; and their differentiation is not a matter of undue difficulty, if the presence or absence of the dorsal impression or sinus, and the colour, quality and quantity of ribs, and disposition of marking be regarded.

* * * * *

Lastly, with respect to the other species and varieties of *Cypræa* proper, e.g. the *cervus* and *hirundo* sections, *xanthodon*, *picta* and allies, and others, complete acquiescence in, and acceptance of the diagnoses in Sowerby's "Thesaurus Conchyliorum" must be taken as valid reasons against the necessity of further alluding to them in this paper.

(XIV.) *Doubtful species.*

C. eximia (Gray), *Proc. Zool. Soc.*, 1849, is a fossil from Tasmania, very near *C. umbilicata* (Sowb.) It was supposed by Dr. J. E. Gray, the describer, to have become only recently extinct, after the fashion of *Bulimus auris-vulpina* (Chemnitz) from S. Helena,^a which, if one can compare the causes which lead to the annihilation of a *marine* form with those affecting a *terrestrial* species, seems to have been of equally restricted range, and to have eventually died a natural death.

^a Cf. Wollaston, *Testacea Atlantica*, p. 547. Melliss. S. Helena, p. 121, pl. xxii., f. 2, 2^a.

C. Galathææ (Reinhardt). Pet. J., 1872, p. 326. Of this I know nothing.

C. Jenningsia (Perry). Conch., pl. xix., f. 4. The following is Perry's description:—Shell of a beautiful pink colour, spotted with varied spots of a white colour, mouth paler pink, furbelowed and undulated; two dark brown spots at each end. Unique in the cabinet of Mr. Jennings, of Chelsea.

The figure does not represent *C. guttata* (Gray), with which some writers have supposed it identical, any more than the description. It is most likely a large and highly coloured variety of *C. staphylæa* (L.).

Brief descriptions will also be found in Tryon. Man. Conch. Cyp., p. 207, of three unrecognised species.

C. castanea (Anderson).

C. parvula (Phil.). "Near *fimbriata*,"

C. trigonella (Dufresne).

* * * * *

(XV.) *Enumeration of Museums, etc., consulted.*

In preparing this survey of the genus, for which I have been collecting material during the last eighteen years, besides utilizing my own specimens as much as possible, I have on many occasions been carefully through all the vast stores in the National Collection, South Kensington, where Mr. Edgar A. Smith, of the Zoological Department, and his assistant, Mr. Atkinson, have always been ready with kind help. Frequent visits have been paid to the Museum, Owens College, Manchester, where, in company with Mr. J. R. Hardy, the curator, I have thoroughly examined, classified and arranged the series of *Cypræa*, formed by the united collections of Mr. Swainson, Mr. Walton, and Mr. Cholmondeley. This contains some very interesting forms. At Peel Park Museum, Salford, through the courtesy of Mr. Plant, F.G.S., the Lincolne collection,

mainly acquired in 1825 at the sale of the celebrated Cabinet of Lord Tankerville, has been investigated. I have also often visited the Liverpool Museum, where the Rev. H. H. Higgins, Mr. T. J. Moore, and especially Mr. F. P. Marrat, have laid me under much obligation. The well selected collection of cowries, belonging to Mr. J. Michael Williams of the same city, have also been inspected with much pleasure and profit; and last, but not least, Mr. G. B. Sowerby, of Fulham Road, London, has rendered me much assistance, and to him and all the above-named I would return most cordial thanks.

As opportunity offered, I have likewise inspected the Natural History Museums in Paris, Brussels, Geneva, and some other Continental cities and towns; and, in the United States, the Academies of Natural Science at New York, Boston, the Smithsonian Institution, Washington, and portion of the Philadelphian Academy Collections, on which Mr. Tryon bases his volumes; also that of Montreal, Canada.

The fine series of Australian Mollusca, collected and exhibited by Dr. J. C. Cox, of Sydney, at the Indian and Colonial Exhibition in London, during 1886, was also twice attentively examined.

The works of Messrs. Sowerby, Reeve, and Adams, and the monograph of *Cypræa* in Tryon's Manual of Conchology, by Mr. S. Raymond Roberts, have all proved of the greatest service, and I also beg to tender my acknowledgements for the aid afforded thereby.

EXPLANATION OF PLATES

I., II.

- 1, 1^a. *C. caput draconis* (Melvill).
- 2, 2^a. *C. caput serpentis* (L.).
3. *C. Rashleighana* (Melvill).
4. *C. stolidus* (L.) var. *moniontha*.
5. *Do.* var. *diauges*.
6. *C. miliaris* (L.) var. *magistra*.
7. *C. cruenta* (Gmel.) var. *coloba*.
8. *C. caurica* (L.) var. *oblongata*.
9. *Do.* dwarf var.
10. *C. erosa* (L.) var. *straminea*.
11. *Do.* var. *phagedaina*.
12. *Do.* var. *chlorizans*.
13. *Do.* var. *nebrites*.
14. *C. ocellata* (L.) var. *palatha*.
15. *C. fimbriata* (Gmel.) var. *Cholmondeleyi*.
16. *C. Lamarckii* (Gray) var. *redimita*.
17. *C. guttata* (Gray).
18. *C. Helvola* (L.) var. *Hawaiiensis*.
19. *C. amphithales* (Melvill).
20. *C. Capensis* (Gray).
21. *C. Algoensis* (Gray).

