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THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

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VOL. IX.—THIRD SERIES.  
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LONDON:

PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.

SOLD BY LONGMAN, GREEN, LONGMANS, AND ROBERTS; SIMPKIN, MARSHALL,
AND CO.; PIPER AND CO.; BAILLIÈRE, REGENT STREET, AND PARIS:
LIZARS, AND MACLACHLAN AND STEWART, EDINBURGH:
HODGES AND SMITH, DUBLIN: AND ASHER, BERLIN.

1862.

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New Books:—General Outline of the Organization of the Animal

The chief characters of *Hanburia* are its campanulate corolla, monadelphous stamens, longitudinally arranged anthers, peltate stigma borne on an elongated style, solitary pendulous ovules, and setoso-echinate fruit bursting open when fully ripe, like that of *Momordica*. In its monadelphous stamens and setoso-echinate fruit it approaches *Cyclanthera*; but the corolla of that genus is hemispherical, the anthers are arranged transversely, the stigma is sessile, and the ovules are horizontal and indefinite. In its definite ovules and shape of the seed it exhibits some relationship to *Fevillea*; but the fruit of that genus does not burst open, nor is it covered with spines. In any new arrangement of the genera of Cucurbitaceæ, *Hanburia* will probable form the type of a distinct tribe.

HANBURIA, Seem., in 'Bonplandia,' vol. vi. p. 293 (1858),
et 'Bonplandia,' vol. vii. p. 2 (1859).

Char. gen. emend.—*Flores* monoici. *Masc. Calyx* campanulatus, 5-dentatus. *Corolla* campanulata, calyci adnatim inserta, 5-fida, lobis triangularibus acutis. *Staminum* columna elongata in discum peltatum orbicularem margine antheriferum desinens; *antheræ* longitudinaliter adnatæ. *Fœm. Calyx* tubo oblongo cum ovario conato, limbo 5-partito. *Corolla* maris. *Ovarium* inferum, 4-loculare, loculis 1-ovulatis. *Ovula* pendula axi centrali adnata. *Stylus* elongatus. *Stigma* peltatum. *Bacca* ovata, pulposâ, setoso-echinata, maturitate elastice irregulariter rupta. *Semina* pauca, plana, suborbiculata, margine incrassato cincta. *Embryonis* exalbuminosi cotyledones foliaceæ. Herba Mexicana, glabra, rhizomate perennante, caule 5-angulato, foliis longe petiolatis cordatis acuminatis integerrimis, cirrhis simplicibus spiraliter tortis, floribus axillaribus v. terminalibus pedunculatis albis, masculis racemosis, fœmineis solitariis.

Species unica :—

Hanburia mexicana, Seem., in 'Bonplandia,' vol. vi. p. 293 (1858),
et 'Bonplandia' vol. vii. p. 2 (1859).

Nomen vernaculum Mexicanum "Chayotilla."

Prope Cordova, reipubl. Mexican. (W. Schaffner!).

22 Canonbury Square, London, N.

Nov. 21, 1861.

III.—On the Anatomy of *Sacculina*, with a Description of the
Species. By JOHN ANDERSON, M.D.*

[Plate I.]

THREE years ago, I drew the attention of this Society to the fact of the frequent occurrence of *Sacculina* and *Peltogaster* on some

* Read before the Royal Physical Society of Edinburgh, Nov. 27, 1861

of the Crustacea of the Firth of Forth. For some years past the subject of the affinities of these parasites has been occupying the minds of many foreign observers; and the following observations, therefore, are brought before the Society in the hope that they may tend to throw some light upon this difficult question. In the present paper I have purposely abstained, as far as possible, from dogmatizing regarding their systematic position, but elsewhere I have referred them to the Cirripedes*. I may mention that the relative position of the investing sacs, the character of the ovaries and the ovigerous lamellæ, and the apparent hermaphrodite nature of the adult animal, when viewed in connexion with the larval form, appear to me clearly to indicate their Cirripedian nature. Accordingly, in my graduation thesis, I created a new order (Sacculinacea) for their reception†.

Among recent observers, Leuckart drew the attention of naturalists to Thompson's systematic description of *Sacculina*, and proposed the adoption of his generic term. "If we restore," he says, "the name *Sacculina* either for *Peltogaster* in Rathke's sense, or, at least, for the form characterized by Diesing as *Pachybdella*, we are only discharging an old, superannuated debt." In the same article he described a new form parasitic upon *Hyas araneus*, and which he named *Sacculina inflata*. In accordance with Leuckart's proposal, I use the term *Sacculina* as referring to the parasite alluded to by Cavolini, and as synonymous with *Peltogaster carcini*, Rathke, and *Pachybdella Rathkei*, Diesing.

The Larva. Pl. I. fig. 1.

The larva, in the first stage, is oval, and presents no marks of segmentation. Placed near the centre of the anterior margin of the body is a yellow speck—the eye (*a*). The ocellus is placed nearly in the centre of a dark-coloured ring (*b*). Krohn, who has observed a structure similar to this in the larva of a Balanide, regards it as the œsophageal ring. The lateral margins of the body, on either side of the ocellus, are prolonged into two horns (*c*); and in this respect the young resembles the Cirripedian larva in its first stage. It is provided with three pairs of natatory legs: the first pair (*d*) are situated immediately posterior to the horns of the carapace; they are uniramous, are provided at their extremities with bristles, and appear to be

* Graduation thesis, 'Contributions to Zoology.'

† The following are the characters of this order, as given in my thesis:—
Cirripedia sine segmentis, oculis et appendiculis. Carapax sacciformis et appendiculata est: foramen in carapace situm est. Pedunculus annulo corneo affixus est. Os suctorium. Larva primo monocula cum 3 crurum paribus. Cirripedia parasitica sub abdomine Crustaceorum Decapodorum Brachyurorum.

composed of two joints: the second and third pairs (d' d'') are larger than the first, and are both biramous. The rami are furnished with bristles. The under surface of the body is prolonged into two spines (e e), which project beyond the posterior margin of the carapace. Besides these terminal spines, I have observed, through the transparent body, two other structures (f f), which resemble very much the middle pair of spines described by Darwin as occurring on the larva of *Chthamalus stellatus*. The greater portion of the body is occupied by an oval mass of nearly spherical globules (g). The various transformations of the larva remain yet to be determined.

The Adult Animal. Pl. I. figs. 10, 11, 12, 15.

According to the present state of our knowledge, this parasite seems to be peculiar to the Decapod Crustacea. All the specimens I have obtained have been attached over the terminal portion of the intestinal canal (figs. 10 & 11 b') of the crabs on which they were parasitic, the females of which they appear to infest more than the males. This latter circumstance seems to be owing to the large size of the purse of the female, as compared with that of the male crab, affording them a better protection and means of support.

The external sac (figs. 2, 4 a).—The external skin is a tough, brownish-coloured, corrugated, and highly contractile structure. It is chiefly by means of this membrane that the parasite is attached to the crab on which it lives. The part which is attached to the crab forms a short peduncle (b), but afterwards it suddenly expands to form the external sac. The pedunculated portion (b) is very firmly connected by means of a horny ring (d) to the skin which invests the gut of the crab. The posterior extremity of the sac remains open, forming a small orifice (c), which I have called ovario-branchial.

The peduncle (b).—The external skin of this structure is a continuation of the external sac (a), and contains within it a prolongation of the parasite (k), which passes through the horny ring, and rests upon the intestine of the crab. The prolonged portion is tubular. In this arrangement we have evidence for the parasitic nature of *Sacculina*, and are entitled to regard the anterior portion of the peduncle as the mouth. The mouth, structurally as such, is entirely absent; and the only way the animal appears to derive its nourishment is by this process absorbing the required nutriment.

The ovario-branchial orifice (c) is so named from the twofold function it is supposed to fulfil in the economy of the parasite. If a living *Sacculina* is carefully watched for a few minutes, this orifice will be seen to open and contract slowly, while a current

of water may be seen to pass into and out of the cavity of the body, the sac at the same time alternately distending and contracting. The ova, when fully developed, are extruded by this orifice, the structure of which confines the water to the sac which contains them. The orifice is situated upon the posterior margin of the body, and is slightly raised above the level of the sac. There is a constriction at its base, and a thickened portion of the sac plays the part of a sphincter muscle. The inner margin of the orifice is thrown into folds, usually eleven in number, sometimes of a delicate and pellucid appearance. By this arrangement the orifice is capable of great distention.

The corium (fig. 2 e).—On reflexion of the external skin we expose the underlying corium, which invests nearly the whole inner surface of the sac. I have succeeded, in one or two instances, in separating this membrane into two well-marked layers. The external layer is a very thin membrane investing the whole inner surface of the sac, attached at its anterior extremity to the horny ring of the peduncle, and posteriorly to the ovario-branchial orifice. I think it probable, when the external skin is moulted, that its place is supplied by this structure. The inner layer, following it from the ovario-branchial orifice to which it is attached, passes forwards, closely applied to the outer layer, till it nearly reaches the anterior margin of the sac, where it becomes reflected on to the anterior portion of the peduncle, and can be traced no further as a separate structure. At the left margin of the peduncle the corium is attached by a septum (fig. 3 g) to a pulpy body embraced in the folds of the ovigerous lamellæ.

Organs of reproduction.—On opening *Sacculina* by an incision extending through the sac and continued from the ovario-branchial orifice to the peduncle, we expose a pellucid sac (fig. 4 i) filled with ova. This sac is found on both sides of the pulpy body above referred to (fig. 2 h), which it embraces within its folds. The sac is merely a temporary structure including the ova till their full development; and at this period I have seen the ovario-branchial orifice plugged up by the extruded sac and its contents, and in other cases I have found it lying quite loose in the general cavity of the parasite. In specimens like these, a delicate membrane may be separated, by gentle manipulation, from the inner surface of the corium and from the surface of the pulpy body or internal ovaries. This membrane appears to be an ovigerous sac, in the process of growth, destined to receive a brood of ova, but, after their development, to be cast off like its predecessor (fig. 5). The ovigerous sac appears to be continually present in one stage or another of its development; so that the water which passes in at the ovario-branchial orifice is never in

contact with any other structure. In a large specimen of *Sacculina carcini*, I found two small mussels living in and attached to the inner surface of its ovigerous sac. The ova (fig. 6) are enclosed in the sac, and are arranged in a racemose manner, enveloped in a very delicate membrane.

The internal ovaries (figs. 2, 3, & 3', *h*), are situated posteriorly to the peduncle. They constitute an oval, flattened, pulpy mass, dividing the cavity of the parasite into two compartments; they are attached by the centre of their posterior margin to the left wall of the ovario-branchial orifice; and also, as previously mentioned, by the septum which runs along the left side of the sac they are connected to the corium (fig. 2 *g*). In the many specimens examined, I have always found a small tubercle (figs. 2 & 3 *o*), with a minute and apparently horny speck on its summit, placed on both surfaces (figs. 3 & 3', *o*) of the body of the ovaries lying opposite to one another, a little to the left of the centre of its posterior margin. On removing the little speck of horny matter, a depression is seen in the centre of the tubercle, apparently communicating with the substance of the ovaries. May not these structures be the orifices of the oviducts, closed by a temporary secretion of horny matter till the brood of ova in the ovigerous sac has attained its full development? This view of the nature of these tubercles has suggested itself to me from the difficulty of accounting for the passage of the ova into the ovigerous sac. The fact that the ova found on the external surface of the ovaries are always more fully developed than those further removed from the surface suggests another view of the subject—viz. that they are developed in successive layers, and thus constitute the ovigerous lamellæ.

Situated immediately posterior to the peduncle, is a well-defined cavity, lined by a special membrane, and containing two oval-shaped bodies (*b*) placed side by side. These pellucid sacs (figs. 7 & 8) contain in their cavities peculiarly shaped bodies (*c*), and are provided with convoluted ducts (*a*). The ducts appear to pass towards the right side of the parasite (figs. 3 & 3', *h*) along the anterior margin of the ovaries, where they unite and become lost. From the close relation of their ducts to the ovaries, it has all along appeared to me that these vesicles probably play an important part in the generative economy of the animal. This opinion seems to be strengthened by the fact that, on one occasion, when examining under the microscope a portion of the ovaries in the immediate neighbourhood of the vesicles, I detected among their convolutions a tube identical in appearance with the structure of their ducts. As yet, I have found it impossible, from the soft nature of the tissues of these parasites, to trace the ducts to their final termination; but, from the appearance of the

tube above described, it seems to me very probable that they terminate in the ovaries. The walls of the vesicles are simply granular. A peculiarly formed body (figs. 7 & 8 c) is placed in the interior of each of the vesicles, immediately over the opening of their ducts. The portion of this body situated immediately over the ducts (b) is of a brown colour, and apparently of a horny consistence, and is terminated by three processes. The whole structure (fig. 9) is extruded when pressure is applied to the vesicle. May not these vesicles represent the testes and cement-glands of these parasites?

These observations have been made from dissections of a new species, parasitic upon *Cancer pagurus*: it differs in its anatomy from *Sacculina carcini* in the form and position of the vesicles. In the former species, these organs are oval, and placed immediately posterior to the peduncle, while in the latter they are elongated (fig. 16), and buried in the left anterior angle of the ovaries.

The relation of the septum to the surrounding structures, and the double nature of the ovigerous sac, hypothetical oviducts and testes, indicate a tendency to bilateral symmetry.

Genus SACCULINA, Thompson.

Sacculina carcini, Thomps. Pl. I. figs. 10 & 12.

(Thompson, J. V., Entomol. Mag. vol. iii. 1836, pp. 452–456.)

Peltogaster carcini, Rathke, Beiträge zur Fauna Norwegens, Acta Leop. xx. p. 247, tab. 12. figs. 18, 19.

Pachybdella Rathkei, Diesing, Syst. Helm. i. p. 435.

Diagnosis.—Bilobata est, maxima diametro per transversum; parasitica in *Carcino mænade*.

This species is confined to *Carcinus mænas*, and, in my own experience, is almost always found on the female crab. It is bilobular in form, its greatest diameter being in the transverse direction. The figure given by Cavolini of the parasite he described exactly corresponds with this species. It varies greatly in size, and is undoubtedly the largest known species of these parasites. Some of my specimens are an inch in breadth. The skin, in the generality of specimens, is of a brownish-yellow colour, and is minutely corrugated.

This species has a wide geographical range. Cavolini obtained his specimens from the shores of the Mediterranean; Rathke first met with it in the Crimea, and afterwards in Norway; Schmidt found it in great abundance at Wangerooge, and he also obtained specimens on the Dalmatian coast; Steenstrup's specimens were from the Mediterranean and from the "Black Banks" in the North Sea. From the observations of Thompson,

this parasite appears to be of frequent occurrence on the Irish coast. Some years ago, I found this species for the first time in the Firth of Forth, but not nearly in such numbers as the following one.

Sacculina triangularis, n. sp., figs. 4, 11, 14.

Diagnosis.—Triangularis est, gregaria, raro sola; maxima diametro ab pedunculo ad posterius foramen pertinente: parasitus *Cancer paguri*.

This species is usually gregarious: sometimes as many as five individuals may be found huddled together and struggling for existence. I have never found it on any other crab than *Cancer pagurus*. Of the two species of these parasites found in the Firth of Forth, this is by far the most common: in some localities, along the coast, to find a crab free from it is the exception.

The form of the animal is triangular. The greatest diameter is in the longitudinal direction, *i. e.* from its attachment to the posterior orifice. Besides differing in its external characters from *Sacculina carcini*, it also differs from it, as already noticed, in the form and position of the vesicles.

I am indebted to Prof. Goodsir for a specimen of this parasite found in the collection of his lamented brother, the late H. D. S. Goodsir. It is a large specimen, apparently distended with ova, and adhering to the purse of a *Cancer pagurus*.

Sacculina inflata, Leuckart, fig. 15 (Wiegmann's Archiv, 1859, p. 232.)

Diagnosis.—Dorsi et ventris superficies multum arcuata est; posteriore foramine a corporis margine aliquantum remoto: parasitica in *Hyade araneo*.

I only know of this species through the description given of it by its discoverer.

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EXPLANATION OF PLATE I.

- Fig. 1. Larva of *Sacculina*; first stage: *a*, eye; *b*, œsophageal ring?; *c*, horns of carapace; *d*, first pair of feet; *d'*, second pair of feet; *d''*, third pair of feet; *e*, terminal spines; *f*, supposed anterior spines; *g*, central cellular mass of the body.
- Fig. 2. Dissection of *S. triangularis*: *a*, portion of external sac reflected; *b*, peduncle; *c*, ovario-branchial orifice; *d*, horny disk; *e*, corium; *h*, internal ovaries; *i*, ovigerous lamellæ; *k*, portion of peduncle prolonged beyond the horny disk; *l*, vesicles; *o*, tubercle of anterior surface.
- Fig. 3. Anterior surface of interior ovaries removed from their connexions: *g*, the septum; *h*, mass of internal ovaries; *o*, tubercle (oviduct?); *e*, portion of adhering corium [these letters apply also to fig. 3']; *l*, the vesicles.
- Fig. 3'. Posterior view of internal ovaries of *S. carcini*.
- Fig. 4. *Sacculina triangularis*; external skin and corium reflected: *a*, external skin covered internally by the corium; *i*, ovigerous lamellæ.
- Fig. 5. Ovigerous sac, showing the anterior and posterior folds which embrace the internal ovaries.
- Fig. 6. Mass of ova from the ovigerous lamellæ.
- Fig. 7. Greatly magnified view of one of the vesicles, drawn from a fresh specimen: *a*, the duct of the vesicle; *c*, the structure found in the interior of the vesicle; *b*, the horny substance found at the commencement of the duct.
- Fig. 8. The same organ as fig. 7, drawn from a specimen preserved in alcohol: *a*, the convoluted duct; *b*, the horny process.
- Fig. 9. The structure found in the interior of the vesicle, removed.
- Fig. 10. *Sacculina carcini*, with no ovigerous lamellæ, nat. size: *b*, the peduncle; *b'*, intestine of crab; *c*, ovario-branchial orifice.
- Fig. 11. *Sacculina triangularis*, nat. size. (Same references as in fig. 10.)
- Fig. 12. *S. carcini* distended with ova.
- Fig. 13. Posterior view of fig. 12: *d*, horny attachment of peduncle; *k*, prolonged portion of the same.
- Fig. 14. A group of *S. triangularis*.
- Fig. 15. *S. inflata* (after Leuckart).
- Fig. 16. Enlarged view of the vesicles of *S. carcini*.

IV.—*Descriptions of two new Species of Coleoptera from Angola.*

By the BARÃO DO CASTELLO DE PAIVA, Professôr de Botanica na Academia Polytechnica do Porto.

THE following two species of Coleoptera were discovered in Angola by my learned friend Dr. Frederic Welwitsch; and I have great pleasure in naming one of them after him, and the other after M. Sabin Berthelot, the French consul at Teneriffe

