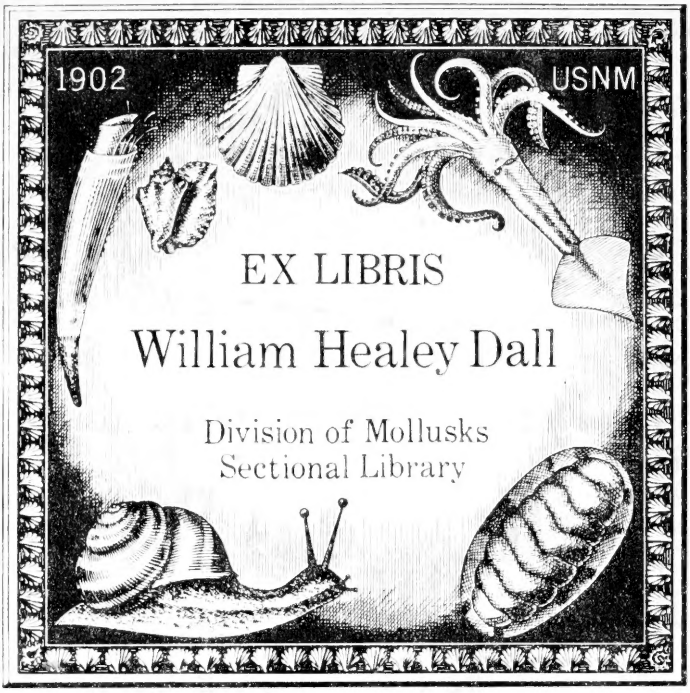

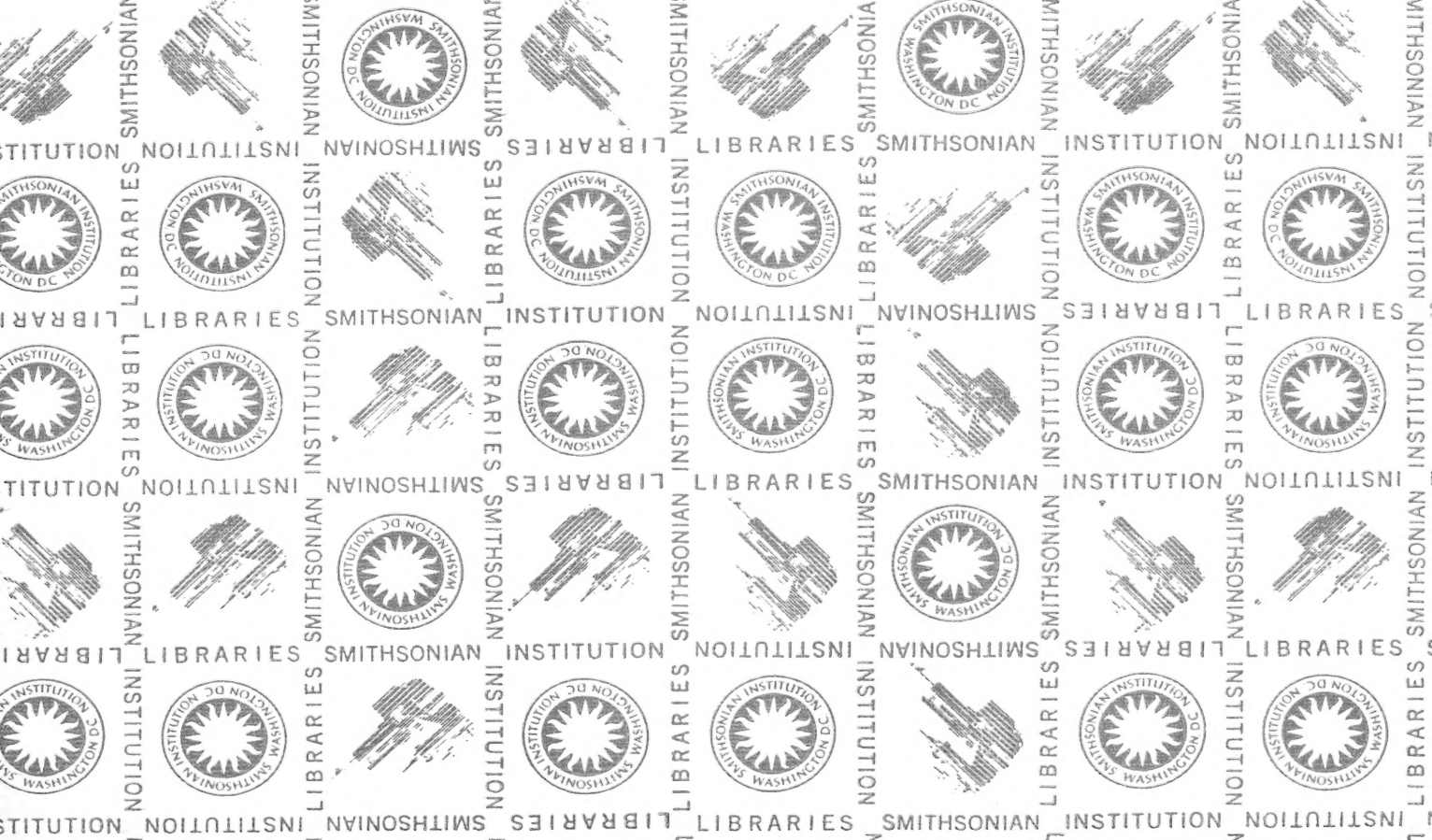
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MALACOLOGICAL SOCIETY OF LONDON.

VOL. II.

1896—1897.

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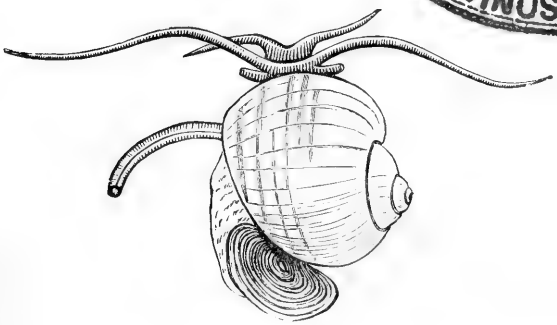

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CONTENTS OF VOL. II.

PROCEEDINGS :—

LIST OF ILLUSTRATIONS IN VOL. II.

ERRATUM.

P. 227, line 11, *should read*: "(*A*) Central tooth uni- to *tri*cuspid," etc.

PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY OF LONDON.

DESCRIPTIONS OF SEVEN NEW SPECIES OF TERRESTRIAL AND FLUVIATILE MOLLUSCA FROM THE HADRAMAUT, SOUTH ARABIA.

By James Cosmo Melvill, M.A., F.L.S., etc., and John Henry Ponsonby, F.Z.S., etc.

Read 8th November, 1895.

PLATE I.

Upon the occasion of their second visit to the Hadramaut (1894–5), Mr. and Mrs. J. Theodore Bent collected a few species of Mollusca, all from a desert region in the neighbourhood of Dhofar, some 800 miles east of Aden, and kindly placed them in our hands for examination.

The specimens were, in great measure, dead shells, but all in a condition to describe; and of the nine or ten different forms included, no less than seven appear new to science, the remaining two or three being *Melaniæ—M. tuberculata* and what is possibly a variety of that species, and also *Buliminus Luntii*, Melvill,[1] both juvenile and mature shells.

1. Stenogyra Bentiæ, n.sp. Pl. I, Fig. 4.

S. testa cylindrica, attenuata, haud pellucente, recta, pallide ochracea, anfractibus decem, lævigatis, vix ventricosulis, apertura ovata, peristomate simplice, paullum incrassato. Long. 14, lat. 4 mm.

Hab —Dhofar.

A conspicuous shell, pale ochraceous in colour, non-transparent, cylindrical, attenuate, ten-whorled, mouth ovate, lip slightly thickened, simple. Named in honour of the collector, Mrs. Bent.

2. Hyalinia (Arnouldia[2]) eremias, n.sp. Pl. I, Figs. 12–14.

H. testa depresso-conica, anguste umbilicata, corneo-pellucida,

[1] *Cf.* Proc. Mal. Soc., Vol. I, 1894, p. 224.

[2] *Conulus*, Fitz., is preoccupied for Echinodermata.

nitida, tenui, anfractibus quatuor, ventricosulis, apud suturas impressis, applanatis, lævissimis, apertura lunata, peristomate tenui simplice, marginem apud columellarem triangulatim reflexo. Long. 3·75, lat. 4·50 mm.

Hab.—Dhofar.

A very pretty shining, depressedly conical, thin, horn-coloured species, narrowly umbilicate, with the whorls uniformly very smooth, slightly swollen, impressed at the sutures, peristome thin, but triangularly reflexed over the columellar margin, mouth lunate in form.

3. Otopoma Dhofarense, n.sp. Pl. I, Figs. 9–11.

O. testa crassiuscula, umbilicata, conica, cinereo-albida, anfractibus quinque vel sex, ventricosis, arcte clathrato-liratis, longitudinaliter indistincte striatulis usque ad medium anfractus ultimi, infra, usque ad basim, lævissima, umbilico profundo sed angusto, apertura rotunda, peristomate continuo, expanso, margine columellari triangulatim reflexo, umbilicum semi-obtegente. Long. 10, lat. 10 mm.

Hab.—Dhofar.

Three specimens, all in dead condition, and almost colourless, but showing the sculpture, etc., very satisfactorily. The shell is conical, somewhat thickened in substance, umbilicated, five or six whorled, closely latticed, and longitudinally indistinctly striated above, the lower half of the last whorl, towards the base, being perfectly smooth. The mouth is round, peristome continuous, expanded, and triangularly reflexed over the columellar margin.

4. Otopoma consimile, n.sp. Pl. I, Figs. 5–7.

O. testa umbilicata, depresso-conica, albo-calcarea, crassiuscula, anfractibus 4½, sub lente clathrato-liratulis, ultimo anfractu apud medium et infra ad basim perlævi, nitido, apertura rotunda, peristomate incrassato, continuo, marginem ad columellarem paullum effuso, umbilicum nequaquam obtegente. Long. 8, lat. 10 mm.

Hab.—Dhofar.

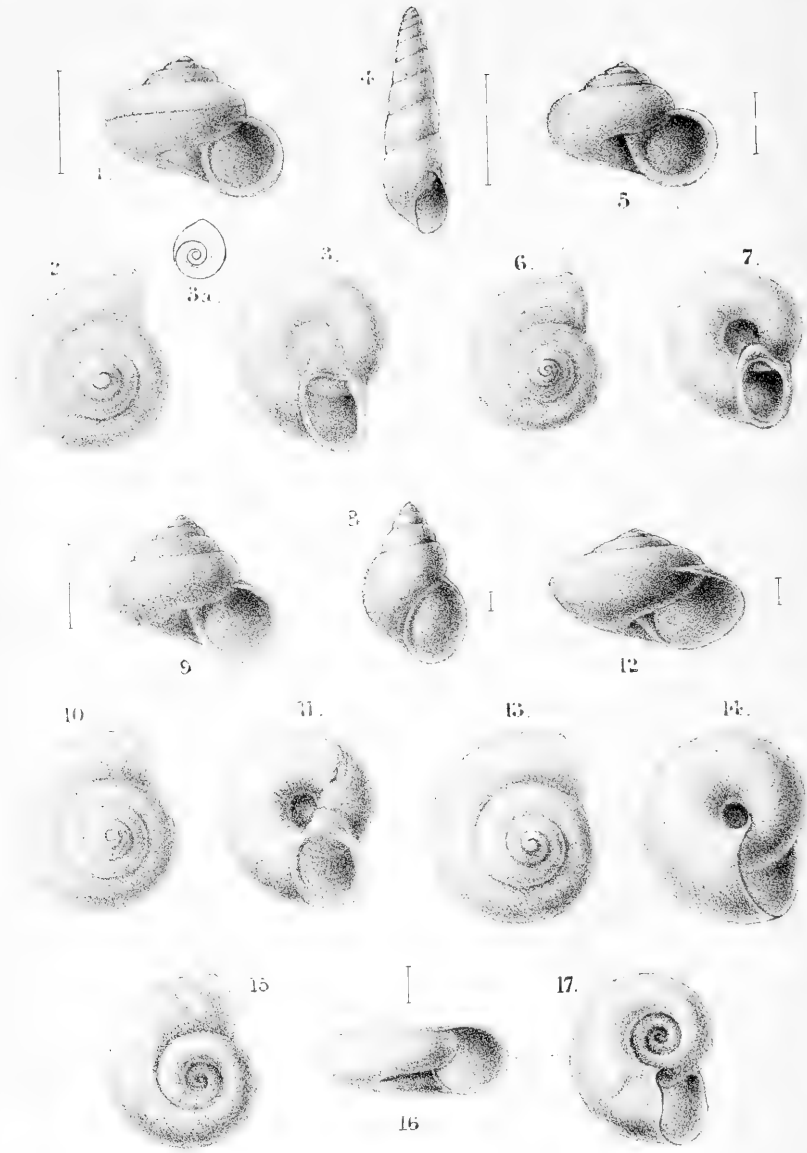
Very similar to the last species (*O. Dhofarense*), but differing in being markedly more depressed. The sculpture of both species is to a great extent the same, though clearer and sharper in this shell. Two specimens, one juvenile, and showing transverse sculpture on the basal half of the last whorl, which is probably the case in all the immature specimens of this section of the genus *Otopoma*.

5. Otopoma Hadramauticum, n.sp. Pl. I, Figs. 1–3.

O. testa incrassata, globoso-conica, subnitente, ochracco-fulva, anfractibus quinque, ventricosulis, supra striatulis, ultimo ad basim lævissimo, in medium apud peripheriam cingulo fulvo decorato, callo umbilicari albido, nitido, apertura rotunda, peristomate paullum reflexo. Long. sp. maj. 16 mm., lat. 18 mm.

Hab.—Dhofar.

Three mature specimens, and a fourth, evidently an immature shell, showing a deep umbilicus. The smallest of these four (long. 13, lat. 15 mm.) is in live condition with operculum, and of a warm



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NEW NON-MARINE SHELLS FROM THE HADRAMAUT.

ochreo-fulvous colour, a reddish band encircling the middle of the last whorl, which, in common with the upper whorls, is striatulate above. The lower portion, however, towards the base, is quite smooth and shining. It differs from *O. Bentianum*, Melv. (Proc. Mal. Soc., Vol. I, p. 224), in being globosely conical, not orbicularly depressed in form, and in having the peristome less effuse.

6. Planorbis Arabicus, n.sp. Pl. I, Figs. 15–17.

P. testa ochraceo-cinerea, tenui, parum nitente, lævigata, sub lente tenuissime obliquistriata, anfractibus quatuor, ventricosulis, lente crescentibus, disco superiore multum excavato, inferiore magis applanato, apertura lunata. Long. 5, lat. 12 mm.

Hab.—Dhofar.

An ordinary-looking shell, but not exactly to be matched, when compared with the other species of the genus. Ten or twelve specimens.

7. Paludestrina glaucovirens, n.sp. Pl. I, Fig. 8.

P. testa minuta, oblonga, vix rimata, subpellucida, anfractibus quatuor vel quinque, ventricosulis, sub lente indistinctissime transversim liratis, apertura ovata, peristomate simplice, continuo. Long. 2, lat. 1 mm.

Hab.—Dhofar.

A very minute, insignificant little shell, of which three specimens were collected. These are to some extent eroded on the last whorl; the colour is olive-glaucous-green. The whorls, under a very strong lens, appear in certain lights to be very obscurely transversely striate, but this appearance is only observed when the shells are viewed at a particular angle. The mouth is ovate, the peristome simple and continuous; whorls four to five, slightly ventricose.

EXPLANATION OF PLATE I.

Figs.	1–3.	Otopoma Hadramauticum, n.sp.
,,	3*a*.	———— (Operculum).
,,	4.	Stenogyra Bentiæ, n sp.
,,	5–7.	Otopoma consimile, n.sp.
,,	8.	Paludestrina glaucovirens, n.sp.
,,	9–11.	Otopoma Dhofarense, n.sp.
,,	12–14.	Hyalinia (Arnouldia) eremias, n.sp.
,,	15–17.	Planorbis Arabicus, n.sp.

NOTES ON THE ANATOMY OF *HANLEYA ABYSSORUM*, M. Sars.

By R. H. Burne, B.A.,
Assistant in the Museum of the Royal College of Surgeons of England.

Read 8th November, 1895.

PLATE II.

1. On the probable Presence and Position of an Osphradium.

An osphradium, it need scarcely be said, is the name given by Professor Ray Lankester[1] to a sense organ, presumably olfactory, situated at the base of the gills in molluscs; it reaches its greatest development among the Prosobranchs, where it assumes a bipectinate gill-like form constituting the well-known "false branchia." The original discovery of this organ in isolated instances, although interesting, is practically of small moment, for it was not till 1881 that it emerged from the obscurity of isolation, to rank as one of the most important of molluscan organs. In that year Spengel[2] issued an important paper on the relationships existing between the various orders of the Mollusca, in which he pointed out the constancy of the occurrence and position of this olfactory organ in a great number of instances, and from this constancy was led to infer the unity of origin of the entire phylum. His wisdom in basing so great a generalization upon such a foundation has been called in question, as was almost inevitable; but from the favour with which his views are received in many quarters, especially, I believe, in England, we are amply justified in regarding this sense organ as one possessing somewhat exceptional interest, not only for students of the Mollusca, but for zoologists generally.

Such being the case, one cannot but regret to find that among the Chitons—molluscs that, on account of their many archaic characteristics, are justly considered to possess a fundamental importance—the exact position, and even the presence, of this organ are subjects still enveloped in doubt.

The following brief historical survey will display the present state of our knowledge, or rather ignorance, upon this point.

As far as I am aware, Spengel in 1881[3] was the first to suggest the presence of an osphradium in Chiton, but unfortunately it was only a suggestion based upon superficial observation. As sundry Chitons crawled up the sides of an aquarium, he noticed upon the outer side of each gill a brownish patch, the position and general appearance of which were strongly suggestive of an osphradium; and as such, Spengel was inclined to regard it; but although he emphasizes

[1] Encycl. Brit., article "Mollusca."
[2] J. W. Spengel, "Die Geruchsorgane und das Nervensystem der Mollusken": Zeitschr. Wiss. Zool., xxxv, 1881, p. 338.
[3] *Loc. cit.* p. 356.

the importance of this organ, especially for the determination of the true nature of the gills, he apparently did not at the time enter upon an examination of its detailed structure. Two years later the matter was investigated by Béla Haller[1] in the course of an exhaustive inquiry into the anatomy of two species of *Chiton* (*C. siculus*, Gray, and *C. fascicularis*, Poli). He was unable to confirm Spengel's suggestion. In transverse sections of the gills he observed that, although the epithelial cells covering the outer walls of both branchial vessels were slightly larger than those upon other portions of the gill, and were provided with enormous cilia, yet there was no marked local epithelial thickening characteristic of an osphradium, and no pigment cells. The absence of the latter, and the strongly pigmented nature of the blood, led him to suppose that probably Spengel had been deceived by the pigmented appearance given to the living tissues by the blood. This is practically the last we hear of Spengel's osphradium on the outer surface of the gill. The subject was revived again in 1891 by Blumrich,[2] who devotes some pages to the description of an organ, which he regards as the osphradium, situated this time not on the outer but on the inner side of the gill. The organ consists essentially of two ridges of lofty epithelium extending from the first to behind the last gill: one ridge (parietal) is situated on the body-wall; the other (paraneural) beneath the lateral nerve-cord, extending somewhat on to the surface of each gill. The epithelium consists of large glandular cells and hair cells; the latter are specially concentrated in certain positions, forming sensory knobs; in some species the ridges may vanish, leaving only the knobs; the hair cells are in communication with the lateral nerve-cords. The lining of the genital duct is continuous with the paraneural ridge. These tracts of modified epithelium were originally described by Haller,[3] but were considered by him to be glandular in function and not sensory. The true meaning of this epithelium is doubtful, for Haller[4] still persists in his original view, laying stress on the close relationship between the ridges and the genital ducts, and pointing out that most probably it is homologous to the hypobranchial gland of Prosobranchs. Thiele[5] also is unconvinced by Blumrich's observations. On the other hand Simroth,[6] taking an impartial survey of the question, considers that Blumrich's interpretation is probably correct; and this view has also been adopted by Lang,[7] although he does not discuss the matter.

During the spring of the present year, three specimens of *Hanleya*

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[1] B. Haller, "Die Organisation der Chitonen der Adria." Pt. 2: Arb. Inst. Wien, v, 1883, p. 26.

[2] J. Blumrich, "Das Integument der Chitonen": Zeitschr. Wiss. Zool., lii, 1891, p. 460.

[3] *Loc. cit.* p. 21.

[4] Haller, "Beiträge zur Kenntnis der Placophoren": Morph. Jahrb., xxi, 1894, p. 34.

[5] Thiele, "Beiträge zur Kenntnis der Mollusken": Zeitschr. Wiss. Zool., liii, 1892, p. 586.

[6] Bronn's Klassen und Ordnungen des Thier-reichs, Bd. iii, Mollusca, 1894, p. 262.

[7] A. Lang, Lehrbuch der vergleichenden Anatomie, 1888–94, p. 744.

abyssorum, a Chiton found at a depth of from 150 to 200 fathoms off the coast of Norway, were bought for the Royal College of Surgeons. After dissecting these specimens for the purposes of the Museum, it seemed desirable to confirm certain details by the examination of microscopic sections made from the remaining fragments. These sections, cut with the object of verifying certain points in the respective shape and size of different regions of the lateral nerve-cords, revealed upon investigation, as so often happens, other points of interest besides those actually expected, throwing in this instance considerable light upon the vexed osphradial question.

The individual gills of a Chiton are innervated from the lateral nerve-cord by means of a pair of fine nerves, one of which runs down the outer wall of each blood-vessel.[1] Both nerves, in contradistinction to the lateral cords from which they spring, are entirely devoid of ganglion cells. Although such an arrangement is the general rule, it does not hold in the case of *Hanleya abyssorum*, except for the three anterior gills; for in that Chiton, from the fourth gill to the sixteenth and last, the outer branchial nerve, that is the nerve situated in the wall of the efferent branchial vessel, is ganglionated in varying degrees (Fig. I, iv–xvi). In the fourth and fifth gills the ganglion cells are confined to the proximal portion of the nerve, forming a small oval ganglion, lying without the gill on the floor of the main efferent branchial vessel. From the sixth gill onwards ganglion cells are present upon the nerve, both before and after its passage from the main efferent branchial vessel into the individual vessel of the gill. The maximum number of ganglion cells is reached about the tenth gill, and from that point to the sixteenth gill the size and extent of the ganglionic masses have a slight tendency to diminish. Looking closer at a well-marked example, say the tenth gill, it will be noticed (Pl. II, Fig. 1, *e.n.*) that the ganglion cells are not evenly distributed over the entire surface of the nerve, as in the cords of the central nervous system, but are aggregated into patches, thus forming a string of ganglionic enlargements, giving the nerve a beaded appearance. In the first ganglion, the one, that is, lying without the gill in the main efferent branchial vessel (Pl. II, Fig. 1, *gg.*), the ganglion cells form a cortex surrounding a central bundle of fibres, but in the portion of the nerve situated within the gill they are chiefly confined to the surface directed towards the cavity of the blood-vessel (Pl. II, Fig. 2, *e.n.*). The ganglion cells in question are small, closely congregated together, and provided with a round nucleus, thus agreeing with the cells that are considered to be characteristic of a *sensory* ganglion.[2] The side of the nerve directed towards the exterior is fibrous in structure, and is closely applied to the epithelial covering of the blood-vessel. Before leaving the nerves and turning to the epithelium, I wish to draw attention to a slight peculiarity of the lateral nerve-cord itself: it will

[1] An idea of the general anatomy can be obtained from Pl. II, Fig. 1.

[2] J. Thiele, "Ueber Sinnesorgane der Seitenlinie und das Nervensystem von Mollusken": Zeitschr. Wiss. Zool., xlix, 1890, p. 425.

be seen on referring to Fig. I, that in its anterior part, in fact till it arrives at the region of the gills (confined in this species to the hinder part of the body), it is circular in cross-section; at that point it becomes distinctly larger, broader, and flatter, and though this enlargement is not very striking, yet it is sufficiently so to be suggestive of a tendency to concentration in this region, a tendency that may be due, no doubt, to the restricted area occupied by the gills.

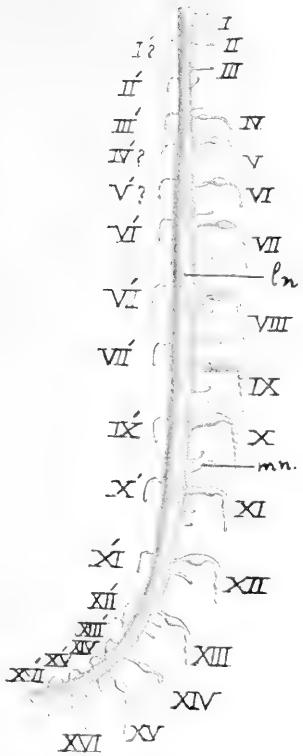

FIG. I.—Posterior portion of the right lateral nerve-cord of *Hanleya abyssorum*. × 8 (reconstructed from sections). *l.n.* lateral nerve-cord. *m.n* mantle nerves. i-xvi. external branchial nerves. i'-xvi'. internal branchial nerves.

We will now turn to the epithelial covering of the efferent branchial blood-vessel. In spite of the necessarily imperfect condition of such delicate tissues, in specimens preserved merely in spirit, a transverse section makes it sufficiently clear that its structure does not entirely tally with the description given by Haller.[1] Apart from the enormous

[1] *Loc. cit.* p. 26.

cilia, which one could hardly expect to see in material so preserved, the epithelium, instead of consisting of a single row of cells of a slightly larger size than those covering the surrounding parts, is considerably thickened at the anterior and posterior margins of the vessel, and in these localities is apparently composed of more than one row of cells, for the nuclei are arranged in two fairly distinct layers—a distal row of regularly disposed nuclei continuous with those of the low epithelium of the gill lamellæ, and an irregularly scattered proximal layer (Pl. II, Fig. 2, *ep.*). In the central portion of the blood-vessel the epithelium resumes its low, single-layered condition. The ganglionated nerve-cord lies beneath the anterior thickening.

It would be rash to give any definite opinion upon the nature of this epithelium, but this much one may say with safety—Its structure is not repugnant to the idea that it may possess a sensory function, for the distal row of nuclei may very possibly belong to indifferent supporting cells, and the proximal scattered layer is somewhat suggestive of hair cells packed between the supporting cells; then, again, the local thickening of the epithelium would be in perfect harmony with such a view. Of course the sensory nature of this epithelium is the vaguest of possibilities, if we consider the epithelium by itself alone; but when taken in conjunction with the presence of a nerve-cord close beneath it, richly endowed with sensory ganglion cells, the possibility becomes so strong a probability that I think we may with some confidence regard this complex of lofty epithelium and ganglion as a sensory organ, in all probability an osphradium.

With the hope of gaining further knowledge on this point, it seemed desirable to examine the gills of some other species of Chiton which could be obtained in a state more suitable for the microscope; I therefore procured some specimens of *Acanthochites discrepans* (Brown), a fair-sized Chiton occurring among the Channel Islands. In this mollusc the gills are not restricted so entirely to the hinder region as in *Hanleya abyssorum*, but extend backwards from about the middle of the body, gradually increasing in size from the anterior end. When examined with a pocket lens, there can be seen running down the efferent branchial vessel of each gill a narrow brown line, which recalls to the mind Spengel's brown patch, with this difference, however, that whereas his was a diffuse patch, this is a hard narrow line, which is fairly distinct at the base and gradually becomes fainter as it approaches the tip of the gill.

A transverse section of one of the gills shows that this brown line is due to a narrow ridge of elevated pigmented epithelium surmounting the nerve, and following its course for a considerable distance towards the point of the gill.

The detailed structure of this epithelium (Pl. II, Fig. 3, *p.ep.*), as far as I have been able to make it out, leaves little doubt as to its nature, for it appears to consist of narrow hair cells packed into the interspaces between large pigmented supporting cells, a condition highly characteristic of a sensory epithelium. The supporting cells are somewhat conical in shape; the base of the cone is directed towards the exterior, and is the portion of the cell richest in pigments. The hair

cells, for such, on comparison with Bernard's[1] figures, I take certain dark staining streaks lying between the supporting cells to be, occur chiefly in this strip of elevated epithelium, but are also scattered throughout the low epithelium covering the rest of the walls of the blood-vessels.

The locality, pigmentation, and minute structure of this strip of elevated epithelium, when added to the ganglionic character of the external branchial nerve of *Hanleya abyssorum*, appear to warrant us in regarding this region of the gill as the seat of a sense organ, in all probability the representative of the osphradium in more highly specialized molluscs. The fact that the hair cells are not strictly confined to this modified portion of the epithelium suggests a certain diffuse sensibility, a condition in accord with the well-known lack of centralization in archaic creatures.

Although the general structure of this sense organ corresponds to that of an osphradium, yet before we conclude that such is indeed its nature, there are two considerable objections that must be mentioned. In the first place it is related to the wrong branchial vessel; in all cases the osphradium is in connection with the afferent branchial vessel, whereas this organ is on the efferent. With reference to this difficulty, it may be worth noting that a sense organ for testing the purity of the water would probably be so situated as to be most easily and rapidly accessible to the stream of water coming to the gills, a condition realized more nearly on the outside than on the inside of the gill; but whether such a change of position in a very constant organ can depend on so slight a physiological advantage may very well be doubted. The second difficulty occurs in the relations borne by the lateral nerve-cord to the viscera. Among the higher molluscs an osphradium invariably receives its nerve supply from the visceral loop, a nervous loop passing from one pleural ganglion to the other, situated morphologically entirely beneath the intestine. The lateral nerve-cord of Chiton, however, which from its relations to this assumed osphradium would be homologous to the visceral loop, passes above, not beneath the viscera.

This latter difficulty can, of course, be met by a supposed migration of the anus during the course of evolution; but perhaps a less violent escape is afforded by Hubrecht's[2] ingenious suggestion that possibly the posterior pedal commissure lost its original connection with the pedal cords, but remained united to the lateral by a pair of stout latero-pedal connectives; at the same time the normal posterior union of the lateral cords degenerated and vanished, thus transforming a dorsal into a ventral loop. Either of these alternatives is possible, but the magnitude of the assumptions necessary would excuse a certain amount of scepticism with regard to their probability.

If, in spite of these two difficulties—difficulties, I may add, which

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[1] F. Bernard, "Sur les Organes Palléaux des Prosobranches": Ann. Sci. nat. 1890.

[2] A. A. W. Hubrecht, "*Proneomenia Sluiteri*": Niederl. Arch. Zool. 1881, p. 25.

neither prevented Spengel[1] from suggesting, nor Lankester[2] from accepting, the possible presence of an osphradium upon this identical spot—we decide to regard the sense organ in question as the representative of an osphradium, this will be a suitable place to very briefly indicate the influence that an osphradium would possess in regard to one or two questions of Chiton morphology.

Passing over the interest attached to the mere occurrence of the organ among the Amphineura, the first question with which an osphradium is concerned is the nature of the gills. Now, although it is usually held that in a Chiton each separate gill is a ctenidium complete in itself, it has been lately maintained that this is not the case,[3] but that the gills of a Chiton are processes of the mantle, organs of the lateral line homologous to the sense organs on the epipodium of the Rhipidoglossa and on the mantle of the Lamellibranchs. The presence of an osphradium (if we accept Spengel's view) would at once set this question at rest, for an osphradium is a constant adjunct of a ctenidium. In speaking of this point we have entered an outlying region of the epipodial controversy, a dispute that naturally suggests another important matter in connection with the osphradium, namely, the nature of the loop formed by the lateral nerve-cords. There are, I fancy, four alternative homologies: it may be considered as homologous to either—(1) the sensory ganglia in the epipodium of Rhipidoglossa, the pallial nerve of Lamellibranchs,[4] etc.; or (2) the outer division of the pedal nerve-cord of *Haliotis*,[5] if such a division exists; or (3) the pleural ganglia and anterior pallial nerves of Anisopleura and Lamellibranchs[6]; or, finally, the visceral loop of other molluscs.[7] The presence of an osphradium enforces our acceptance of the last alternative, on account of the constant innervation of the ctenidium and its associated osphradium from the visceral loop.

Such are the reasons, as far as I have been able to ascertain them, that tell both for and against the sensory and osphradial nature of this organ in the above two species of Chiton; and it must be left to others to judge whether the approximate situation and highly characteristic structure of an osphradium are to be outweighed by certain anomalous details of position[8] and innervation.

2. Further Notes on the Anatomy of *Hanleya abyssorum*.

(*a*) *The anterior buccal commissure.*—The condition of the buccal commissures in this species owes a great part of its interest to the conflicting statements that have been made with regard to this point

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[1] *Loc. cit.* p. 356. [2] *Loc. cit.*

[3] Thiele, "Ueber Sinnesorgan . . . von Mollusken," etc.: Zeitschr. Wiss. Zool., xlix, 1890, p. 411.

[4] *Ibid.*

[5] H. v. Jhering, Morph. Jahrb., iii, 1877, p. 172.

[6] P. Pelseneer, "Sur l'epipodium des Mollusques": Bull. Sci. France et Belge, 1891.

[7] Spengel, *loc. cit.* p. 353.

[8] In this connection the wide separation of the osphradium from its associated gill in *Ampullaria* should be noted.

in different species of Chiton. Brandt,[1] in *Chiton fascicularis*, and later, Von Jhering,[2] in *Chiton squamosus*, described two commissures uniting the buccal ganglia to one another—a posterior passing, as usual, between the œsophagus and the radula sheath; and an anterior connecting the buccal ganglia across the anterior region of the roof of the buccal chamber. Béla Haller,[3] on the contrary, says that in *Chiton fascicularis* and *C. siculus* there is no anterior commissure, and that it was probably an erroneous observation of the œsophageal nerves that led Brandt and Von Jhering to the description of a non-existent structure.

From my dissections of this region in *Hanleya abyssorum*, there seems to be no doubt that the latter observers were not mistaken; in this species the anterior commissure is not only easily traced from ganglion to ganglion, but the whole thing can, with a little care, be removed entire[4] (Fig. II, *a.b.c.*). I have also seen this

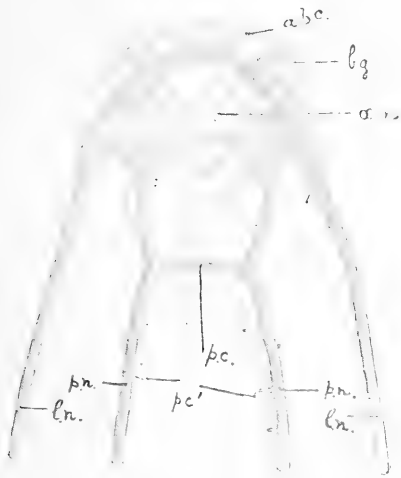


FIG. II.—Anterior portion of nervous system of *Hanleya abyssorum*. × 4. From Nos. 1305 C and D. R.C.S. *a.b.c.* anterior buccal commissure. *b.g.* buccal ganglion. *l.n.* lateral nerve-cords. *œ'.n.* œsophageal nerve. *p.c.* anterior pedal commissure. *p.c'.* roots of one of the succeeding pedal commissures. *p.n.* pedal nerve-cord.

commissure, though with greater difficulty, in *Cryptoplax striatus*. In a point of this kind it is not at all necessary that one or other of

[1] E. Brandt, "Ueber das Nervensystem von *Chiton fascicularis*": Bull. Acad. St. Petersb., xiii, 1869.

[2] H. v. Jhering, "Beiträge zur Kenntnis des Nervensystems der Amphineuren," etc.: Morph. Jahrb., iii, 1877, p. 157.

[3] Haller, "Der Chitonen der Adria." Pt. 1: Arb. Inst. Wien, iv, 1882, p. 7.

[4] No. 1305 D, Physiological Series, Roy. Coll. Surg. Museum.

the conflicting statements must be wrong; the probable explanation being that we have here one of those details in which different species vary from one another.

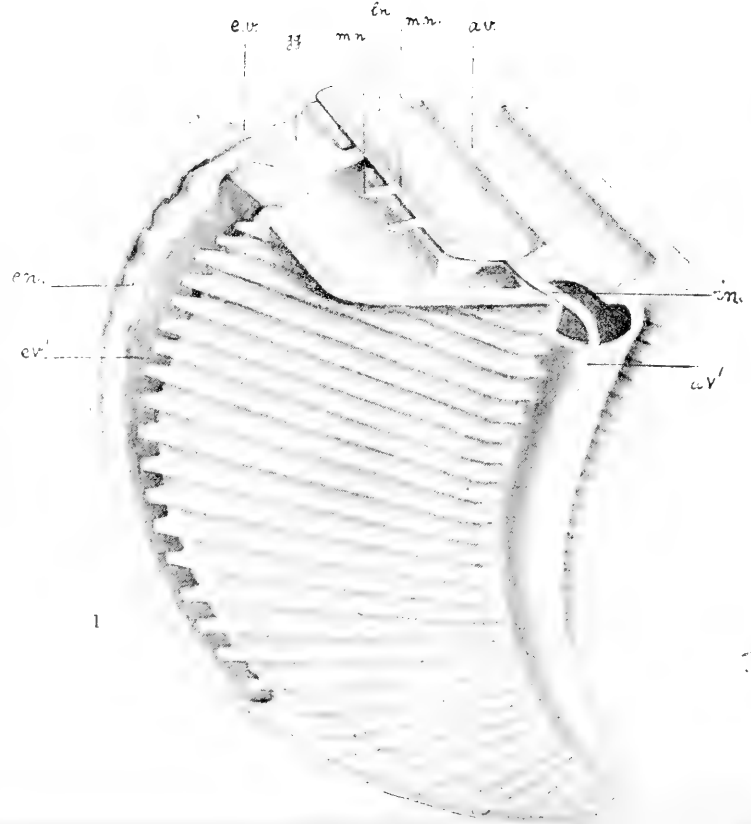
(*b*) *The pedal commissures.*—Here again, as regards the anterior pedal commissure, my observations uphold Von Jhering to the disadvantage of Haller: for the latter,[1] in contradiction to Von Jhering's[2] assertion that the anterior commissure considerably exceeds its successors in size, denies that it can be distinguished from the rest in any way. In *Hanleya abyssorum* the anterior pedal commissure is a simple unbranched strand passing directly from one pedal cord to the other (Fig. II, *p.c.*). In size it is about equal to the subœsophageal commissure, and is strikingly larger than its companions, for whereas they could only with difficulty be seen at their origin from the pedal nerves, the anterior commissure could be easily traced and removed.[3] The comparative difference in size between the anterior pedal commissure and the roots of its successors can be seen in Fig. II, *p.c.*, *p.c'*.

As we follow the pedal cords to their posterior extremity, we find that they gradually approach each other, till at the extreme end of the foot they appear to become continuous, forming a loop comparable to that made by the lateral cords above the rectum. In reality, however, this is not exactly the case, for the examination of a series of sections through this region makes it evident that a short tract uniting the two cords is devoid of ganglion cells, so that they must be said to be united by a short, stout, fibrous commissure (Fig. III, *c.*).

Fig. III.—Posterior extremity of the pedal nerve-cords of *Hanleya abyssorum*. × 30 (reconstructed from sections). *c.* fibrous commissure. *n.* nerves dipping into muscles of the foot (these nerves are about equal in size to the preceding pedal commissures). *p.n.* pedal nerve-cords.

(*c*) *The heart.*—The heart, in certain parts of its structure, seems to be a most interestingly variable organ in the different species of Chiton. From a paper published last year by Haller,[4] one can recognize no less than four different types dependent on the number and position of the auriculo-ventricular openings. At the bottom of the scale he describes four pairs of such openings in *Chiton magnificus*; then comes the condition found in most Chitons, two pairs; after that, one pair with

[1] *Loc. cit.* pt. 1, p. 12.
[2] Von Jhering, "Vergleichende Anatomie des Nervensystems und Phylogenie der Mollusken," p. 45.
[3] No. 1305C, Physiological Series, Roy. Coll. Surg. Museum.
[4] Haller, Morph. Jahrb., xxi, 1894, p. 29.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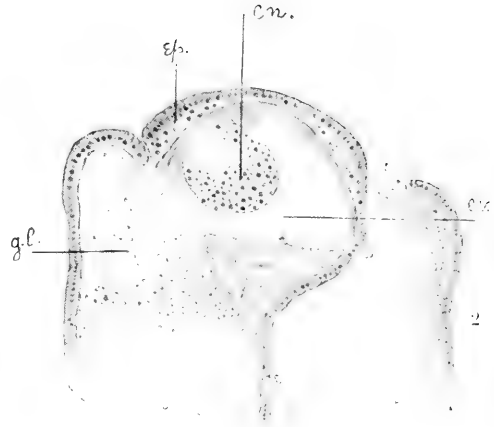
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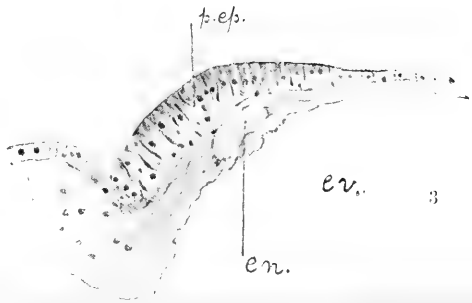
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a single posterior unpaired opening; and finally, in one case (a species allied to *C. monticularis*, Quoy) a single pair only. The rarity of the final condition, in which only one pair is left, makes it a noteworthy fact that this type is also to be found in *Hanleya abyssorum*. In this Chiton the ventricle is short and rounded (more so than in Haller's figure, but the shape may be a good deal dependent upon the contraction caused by the preserving fluid); its posterior extremity rests loosely upon the united auricles, but is in no way attached to them; the single pair of auriculo-ventricular openings are situated rather towards the anterior end of the ventricle.

The above deviations from the structure of the more commonly observed species of Chiton, most of them tending in the direction of concentration, and suggestive of a more specialized condition—*e.g.* separate olfactory ganglia, enlarged anterior and posterior pedal commissures (the only two still persistent in *Patella*[1]), the concentration of the lateral cords in the branchial region, and the condition of the heart—gain a new interest when considered in relation to the habitat of their possessor; for we find them congregated in a creature that has strayed from the haunts of its surf-loving relatives into the home of the more specialized Aplacophora, a region verging upon the deep sea.[2]

My best thanks are due to my friend and former teacher, Professor G. B. Howes, for his kindness in reading over and criticizing this paper, and to Professor C. Stewart for permitting me to examine the gills of some of the rarer species of Chiton.

EXPLANATION OF PLATE II.

FIG. 1.—Model of the tenth gill from the left side of *Hanleya abyssorum*, reconstructed from sections. × 30. *a.v.* main afferent branchial vessel. *av'.* afferent vessel of the individual gill. *e.n.* external branchial nerve. *e.v.* main efferent branchial vessel. *e.v'.* efferent vessel of the individual gill. *i.n.* internal branchial nerve. *l.n.* lateral nerve-cord. *m.n.* mantle nerves. *gg.* proximal ganglion on the external branchial nerve.

FIG. 2.—Transverse section of a portion of the gill of *Hanleya abyssorum*. × 80. *e n.* external branchial nerve. *ep.* epithelium. *e.v.* efferent vessel. *g.l.* gill lamella.

FIG. 3.—Transverse section of a portion of the gill of *Acanthochites discrepans*. × 240. *e.n.* external branchial nerve. *e.v.* efferent vessel. *p.ep.* pigmented epithelium.

These figures were drawn with the camera lucida. Fig. 3 is a combination of two sections, in one of which the pigment cells were more distinct, in the other the hair cells.

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[1] E. L. Bouvier, "Système nerveux des Gastéropodes Prosobranches": Ann. Sci. nat. (Zool.), sér. VII, iii and iv, 1887, p. 17.

[2] H. Simroth, "Kritische Bemerkungen über die Systematik der Neomeniden": Zeitschr. Wiss. Zool., lvi, 1893, p. 326.

DESCRIPTION OF *CASSIS ADCOCKI*, A NEW SPECIES.

By G. B. Sowerby, F.L.S., etc.

Read 8th November, 1895.

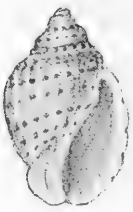
Cassis Adcocki, n.sp.

Testa oblongo-ovata, albida, rubescente tincta, maculis parvis quadratis, quinque-seriatim dispositis ornata; spira conica, sub-elongata, obtusiuscula; anfractus 6, convexiusculi, primi læves, sequentes spiraliter dense lirati, longitudinaliter plicati, superne angulati, supra angulum leviter concavi, lira crassiuscula granulosa conspicue fusco-maculata juxta suturam instructi; sutura angusta; anfractus ultimus oblongus, convexus, leviter inflatus, superne plicatus; plicis confertis circ. 22, ad angulum nodulosis; apertura elongato-ovalis; columella levissime plicata; labrum crassum, intus levissime dentato-liratum, extus lævigatum, conspicue fusco quinque-maculatum. Long. 28, diam. maj. 17, min. 13 mm.

Hab.—Yankalilla Bay, South Australia.

This is one of the smallest species of the genus; it is chiefly characterized by the number and smallness of the brown spots constituting the five series so prevalent in this group of the genus, as well as by the numerous plications on the posterior half of the shell. The slightly concave area at the top of the body-whorl is bordered against the narrow suture by a prominent brown spotted ridge.

This new species has been mistaken by South Australian conchologists for *Cassis pila*, Reeve, from which it is obviously distinct. My friend Mr. W. T. Bednall, of Adelaide, being in doubt as to the identification, sent a very dilapidated specimen for my opinion. I at once informed him that it was not *C. pila*, and that in my opinion it was a new species. Since then Mr. D. J. Adcock has been kind enough to send me his somewhat smaller but perfect specimen for description.



Cassis Adcocki, n.sp.

Cassis Adcocki is so different from *C. pila* and its allies that comparison is hardly necessary. In form it is much less inflated, its markings are very different, and it exhibits plications such as are altogether wanting in *C. pila*.

I agree with Mr. Tryon that the Chinese *C. pila*, the Japanese *C. Japonica*, Reeve, and *C. Pfeifferi*, Crosse, are forms of one and the same species, but I consider them distinct from the Mediterranean *C. saburon*, Lamk.

DESCRIPTION OF A NEW SPECIES OF *VITRINA*, AND NEW FORMS OF HELICIDÆ, WITH A LIST OF THE HELICOID SHELLS HITHERTO FOUND IN THE CANARY ISLANDS.

By G. K. Gude, F.Z.S., etc.

Read 8th November, 1895.

The land-shells which Colonel G. S. Parry collected during his third visit to the Canary Islands (January to April, 1895), and several of which he has kindly placed at my disposal, are interesting, not so much on account of the new forms, since these, in view of the repeated and thorough exploration of the group, could scarcely be expected to be numerous, but chiefly because certain species were found in islands where they had hitherto been looked for in vain, and also for the discovery at San Sebastian, Gomera, of living specimens of *Hygromia multigranosa*, a species previously known only in a subfossil condition. An extended range for *Helicella phalerata*, which was believed to be confined to Tenerife, is established by the taking of specimens at Galdar, Grand Canary. Mousson recorded it for Palma, but the correctness of that habitat has been doubted; it is probable, however, that the species had already been collected in Grand Canary by Wollaston, for his variety *umbilicata* from that island, regarded by him as pertaining to *H. persimilis*, appears to Colonel Parry and myself to be identical with *H. phalerata*.

The new records referred to are: *Vitrina Canariensis*, Mouss., Gomera (one specimen); *Hyalinia cellaria*, Müll., Palma; *Helicella conspurcata*, Drap., Palma; *H. phalerata*, W. and B., Grand Canary; *H. Despreauxii*, D'Orb., Palma. The finding of *Pyramidula scutula*, Shutt, in Tenerife, is of interest, from the fact that Mousson and Wollaston regarded it as a doubtful member of the fauna.

Colonel Parry's shells included a *Vitrina*, which I describe as a new species, and four varieties of Helicidæ, which appear to be worthy of distinctive names.

Vitrina Parryi, n.sp.

Testa depressa, transverse oblonga, tenuis, corneo-virens, nitidissima; spira plana; sutura linearis, distincte marginata; anfr. 3, celeriter accrescentes, ultimus ample dilatatus, superne valide gibboso-canaliculatus; apertura perobliqua; peristoma simplex, acutum. Diam. maj. 8, min. 5·5, alt. 3 mm.

Hab.—Galdar, Grand Canary.

Its nearest ally appears to be *V. Blauneri*, from which it differs in being smaller and in having pronounced gibbous grooves on the upper side. Colonel Parry informs me that the animal is jet-black, while in *V. Blauneri* it is pale-brown mottled with darker brown.

Helicella tumulorum var. pulchra, n.var.

Differt a typo, fasciis fuscis fere nigris ornata, subtus validius costulata. Diam. maj. 13·5, min. 12, alt. 9 mm.

Hab.—Isleta, Grand Canary.

Differs from the type in having darker, almost black bands, one below, one above the periphery, and in being more strongly and coarsely ribbed below.

HELICELLA TUMULORUM var. ARUCASENSIS, n.var.

Differt a typo testa minore, magis elevata, fasciis minus interruptis, apertura latiore. Diam. maj. 10·5–11·5, min. 9·5–10·5, alt. 7·5–8·5 mm.

Hab.—Arucas, Grand Canary.

Differs from the type in being smaller, more elevated, in the fasciæ being less interrupted and less sharply defined, and in the

I. *Vitrina Parryi*, n.sp.
II. *Helix Pouchet* var. *geminàta*, n., and portion of whorl. × 2.
III. *Helicella tumulorum* var. *Arucasensis*, n.
IV. *Helicella tumulorum* var. *pulchra*, n.

aperture being wider. It approaches *H. phalerata* in contour, from which, however, it is separated by the acute, compressed keel. The specimens were found at the top of a volcanic cone, near Arucas, at an altitude of 1200 feet.

HEMICYCLA BITUMINOSA var. UNICOLOR, n.var.

Differt a typo testa unicolore, ad peripheriam magis angulata, apertura latiore.

Hab.—Valley of Galdar, Grand Canary.

Differs from the type in being of a unicolorous, corneous brown, in being more strongly angulated at the periphery, and in having a wider aperture. This variety was found with the type in the proportion of 1 in 3, "in an isolated locality under one fig-tree."

HEMICYCLA POUCHET var. GEMINATA, n.var.

Differt a typo testa tenuiore, sine fasciis, costulis geminatis.

Hab.—Santa Cruz, Tenerife.

The paired costulæ and the smooth alternate interstices give this variety a totally different appearance from the type; its general aspect rather recalls *H. plicaria*. It was taken by Colonel Parry with the type in 1893, but it appears rather scarce, for a suite of about fifty yielded only two specimens.

Classified List of the Species of Helicoid Land-shells from the Canary Islands.

Since the publication of Wollaston's "Testacea Atlantica" in 1878, many new species have been discovered; and, since the descriptions are scattered through various publications, I have thought it useful to append a classified list of all the Helicoid land-shells now known to be comprised in the fauna. With regard to the species of *Hemicycla*, Pilsbry's classification appears to me to be hardly satisfactory, and it is notorious that some of Mabille's species are based upon insufficient characters. I have therefore endeavoured to rearrange the genus, and have found it necessary to reduce certain of the species to varietal rank, or to sink them as synonyms.

The shells taken by Colonel Parry during his visits to the Islands in 1887, 1893, and 1895 are marked with an asterisk. A † implies that the species is subfossil; while the islands are designated as follows:—

C. Grand Canary. Gr. Graciosa. P. Palma.
F. Fuerteventura. H. Hierro. T. Tenerife.
G. Gomera. L. Lanzarote.

Vitrina, Drap.
Lamarckii, Fér.—*T. P. H.
=*Teneriffæ*, Quoy.
Canariensis, Mouss.—H. *G. (? P. T.).
latebasis, Mouss.—*P. H.
Blauneri, Shutt.—*T. P. *C.
Parryi, n.sp —*C.
reticulata, Mouss.—*T.

Hyalinia, Fér.
Sect. Vitrea, Fitz.
crystallina, Müll. — F. *T. P. H.
vermiculum, Lowe.—*T.
Sect. Polita.
cellaria, Müll.—*T. H. *C. *P.
—— var. *Canariæ*, Mouss. —C.
themera, Mab.—C.
festinans, Shutt.—P.
Osoriensis, Woll.—C.
Sect. Nautilinus.
Clymene, Shutt.—*T.
Sect. Lyrodiscus, Pils.
=*Lyra*, Mouss.
circumsessa, Shutt.—*T. P.
Rochebruni, Mab.—G.
lenis, Shutt.—*P. H.

Janulus, Lowe.
Pompylia, Shutt.—P.
Pyramidula, Fitz.
Sect. Patulastra, Pfr.
placida, Shutt.—T. P. H.
=*Luscana*, Paiva.
=*pusilla* var. *sericina*, Lowe.
pusilla, Lowe.—T. P. H.
=*servilis*, Shutt.
=*hypocrita*, Dohrn.
Sect. Gonyodiscus, Fitz.
=*Discus*, Fitz. et Auct.
textilis, Shutt.—P. T.
kompsa, Mab.—H.
=*concinna*, Lowe.
putrescens, Lowe.—P.
ganoda, Mab.—G.
Garachicoensis, Woll.—T.
=*agrestis*, Lowe.
—— var. *submarmorata*, Woll.
engonata, Shutt.—T.
retexta, Shutt.—P.
scutula, Shutt.—*T.
Sect. Lyrula, Woll.
Loweana, Woll.—L.
=*torrefacta*, Lowe.
=*usurpans*, Furt.

Leucochroa, Beck.
ultima, Mouss.—F.
pressa, Mouss.—F.
accola, Mouss.—F.
Geomitra, Swains.
Sect. Heterostoma, Hartm.
paupercula, Lowe.—L.
Helicella.
Sect. Heliomanes, Fér.
maritima, Drap.—F. *C. *T.
=*lineata*, Oliv.
=*simulata*, W. and B.
=*Canariensis*, Shutt.
=*herbicola*, Shutt.
—— var. *submeridionalis*, Bgt.—C.
Sect. Candidula, Kob.
apicina, Lam.—T.
conspurcata, Drap.—*T. *P.
Sect. Monilearia, Mouss.
monilifera, Mouss.—L. F. C. *T. G. P.
Lancerottensis, W. and B.—L. F. T.
=*Orbignyi* var. *calcarea*, Mouss.
—— var. *Webbii*, Lowe.—L. F.
—— var. *adoptata*, Mouss.–G.
Orbignyi, W. and B.—*T.*P. C. L. F. H.
=*Orotavana* (Tarn.), Mouss.
—— var. *mitigata*, Mouss.—T.
persimilis, Shutt.—F. C. *T. G. *P. *H.
—— var. *præposita*, Mouss.—C.
—— var. *devia*, Mouss.—T.
phalerata, W. and B.—*T. *C. (? P.).
=*persimilis* var. *umbilicata*, Woll.
=*Rosetti*, W. and B.
=*Nivariensis*, Shutt.
tumulorum, W. and B.—*C.
=*atomata*, Mke., juv.
—— var. *pulchra*, n. var.—*C.
—— var. *Arucasensis*, n. var.—*C.

Monilearia (*continued*).
oleacea, Shutt.—P.
—— var. *deusta*, Lowe.—P.
Woodwardia (Tarn.), Mouss.—*T.
Watsoniana, Woll.—C. T.
lemniscata, W. and B.—*C. P.
phryganophila, Mab.—T.
dendrophila, Mab.—C.
aglaometa, Mab.—C.
Sect. Jacosta, Gray.
Argonautula, W. and B.—C. + var. *Canariensis*, Mouss.
=*Renati*, Dautz.
pulverulenta, Lowe.—C.
granostriata, Mouss.—L. F.
morata, Mouss.—†F.
multipunctata, Mouss.—†F.
Sect. Obelus, Hartm.
cyclodon, W. and B.
Despreauxii, D'Orb.—C. *P.
=*Preauxii*, Hartm.
— var. *immodica*, Mouss.—C.
moderata, Mouss.—L. F.
Mirandæ, Lowe.—*G. H.
—— var. *nodosostriata*, Mouss.—G.
Sect. Trochula, Schlüter.
inops, Mouss.—C.
Sect. Cochlicella, Risso.
ventricosa, Drap.—C. T.
Hygromia, Risso.
Sect. Fruticicola, Held.
multigranosa, Mouss.—*G. (recent).
Sect. Ciliella, Mouss.
leprosa, Mouss.—*T.
lanosa, Mouss.
pavida, Mouss.—T. P.
=*nubigena*, Lowe.
Acanthinula, Beck.
spinifera, Mouss.—C. P.
Vallonia, Risso.
pulchella, Müll.—C. *T. P.
Helicodonta, Fér.
Sect. Caracollina, Beck.
lenticula, Fér.—*C. *T. *P. *H. G. L. F.
=*subtilis*, Lowe.
=*Pintorella* (Bonelli), Villa.

CARACOLLINA (*continued*).
lenticula var. *virilis*, Mouss. —F.
—— var. *major*, Shutt.—*P.
hispidula, Lam.—*T. G.
—— var *subhispidula*, Mouss. —T.
—— var. *Bertheloti*, Fér.— *T.
—— var. *everia*, Mab.—T.
pthonera, Mab.—T.
Parryi, Pons. and Sykes.—*T.
affecta, Fér.—P.
=*lens*, D'Orb.
=*planaria*, Lam.
planaria, Mouss.—T.
discobolus, Shutt.—*G.
=*affecta*, D'Orb.
fortunata, Shutt.—*T. G.
crispolanata, Woll.—P.
beata, Woll.—F.
Gomeræ, Woll.—G.
eutropis, Shutt.—F.
ophthalmoricn, Mab.
=*ophthalmorycha*, Mab.

LEPTAXIS, Lowe.
Sect. LAMPADIA, Alb.
cuticula, Shutt.—*T. G. P.

HELICOGENA, Fér.
aspersa, Müll.—C. *P. (introduced).
=*spumosa*, Lowe.

OTALA, Schum.
=*Macularia*, Auct.
lactea, Mull.—*C. *T. H.
—— var. *Canariensis*, Mouss. —T. G. H.
atavorum, Mab.—C.
Jacquematana (Bgt.), Mab.— C.
gibbosobasalis, Woll.—T.
Ahmarina (Bgt.), Mab.—C.
efferata, Mouss.—†G.
Moussoniana, Woll.—†G.
=*Adonis*, Mouss.

HEMICYCLA, Swains.
plicaria, Lam.—*T.
=*plicatula*, Lam.
=*orbiculata*, Wood.
=*planorbula* (Gray), Villa.

HEMICYCLA (*continued*).
Bethencourtiana, Shutt.—*T.
—— var. *chersa*, Mab.—T.
Berkeleyi, Lowe.—C.
Thespesia, Mab.
desculpta, Mouss.—†F.
retrodens, Mouss.—T.
modesta, Fér.—*T.
=*Paivana*, Lowe.
—— var. *idiotrypa*, Mab.—T.
saponacea, Lowe.—C.
Pouchet, Fér.—*T. (? C.).
=*Adansoni*, W. and B.
—— var. *Hedeia*, Mab.—T.
—— var. *evergasta*, Mab.—T.
—— var. *geminata*, n.var.—*T.
thoryna, Mab.—T.
malleata, Fér.—*T.
=*bidentalis*, Lam.
=*tridentalis*, Lam.
hedonica, Mab.—†T.
eucalypta, Mab.—C.
bathycoma, Mab.—C.
Nivariæ, Woll.—*T.
Justini, Mab.—C.
=*Poirieri*, Mab.
callipona, Mab.—†T.
helygaia, Mab.—†T.
glyceia, Mab.—*†T.
idryta, Mab.—†T.
zelota, Mab.—†C.
=*themera*, Mab.
=*psathirella*, Mab. (Nouv. Arch., t. xv, fig. 12: not named in text or index).
Glasiana, Shutt.—*C.
=*pellislacerti*, Rve.
=*malleata*, var. *β*, Pfr.
thanasima, Mab.—†T.
ephora, Mab.—†T.
empeda, Mab.—C.
cardiobola, Mab.—†T.
Fritschi, Mouss.—*G. T.
——var. *major*, Mouss.—†G.
Guamartemes, Grass.—*C.
=*Guanartemes*, auct.
=*Manriquiana*, Lowe.
=*Guartemes*, Mts.
distensa, Mouss.—G.
hedybia, Mab.—(? G.)

Hemicycla (*continued*).
Maugeana, Shutt.—T.
=*Gaudryi*, Pfr. and Rve.
invernicata, Mouss.—T.
=*consobrina*, W. and B.
consobrina, Fér.—*T.
—— var. *vetusta*, Mouss.—T.
—— var. *cacopera*, Mab.—G. C.
bathycelera, Mab.—T.
indifferens, Mouss.—*†H.
Perraudierei, Grass.—H.
Hierroënsis, Grass.—*H.
=*ralverdensis*, Lowe.
Gaudryi, D'Orb.—*C. (? G.).
—— var. *evergeta*, Mab.—C.
—— var. *Gaudryopsis*, Mab.—C.
—— var. *Ripochi*, Mab.—C.
—— var. *amblasmodon*, Mab.—C.
—— var. *ephedrophila*, Mab.—C. G.
ianthina, Mab.—C.
granomalleata, Woll.—*P.
vermiplicata, Woll.—P.
Verneaui, Mab.—†T.
Perrieri, Mab.—†T.
cacoplasta, Mab.—†T.
zorgia, Mab.—C.
merita, Mouss.—†G.
bituminosa, Mab.—*C.
—— var. *unicolor*, n.var.—*C.
psathyra, Lowe.—C.
=*psathyropsis*, Mab.
Agaetana, Mab.—*C.
Galdarica, Mab.—*C.
cateucta, Mab.—†C.
bathycampa, Mab.—F.
gravida, Mouss.—†F.
sarcostoma, W. and B.—*L. (fossil), F. *C. (? T.).
—— var. *Canariæ*, Mouss.—*C.
—— var. *thaumalea*, Mab.—L. F.
—— var. *Fuerteventuræ*, Mouss.—F.
—— var. *guanche* (Tarn.), Mouss.—F. L.
Paeteliana, Shutt.—F.
harmonica, Mouss.—H.
Gomerensis, Morel.—G.

Hemicycla (*continued*).
cacopista, Mab.—†C.
ethelema, Mab.—C.
digna, Mouss.—†G.
Sauleyi, D'Orb.—*C.
—— var. *Ledrui*, Mab.—†C.
crypsidoma, Mab.—C.
embritha, Mab.—†C.
temperata, Mouss.—*C.
stulta, Mab.—†C.
baia, Mab.—†C.
subgravida, Mab.—†T.
carta, Mab.—†C.
Barckeriana, Mab.—†C.
=*Barkeri*, Mab.
planorbella, Lam.—G.
=*strigata* var., Fér.
=*Villiersii*, D'Orb.
—— var. *incisogranulata*, Mouss.—T.
inutilis, Mouss.—T.
Plutonia, Lowe.—*†L. F.
semitecta, Mouss.—†G.
Sabiniana, Mab.—C.
Paivanopsis, Mab.—G.
=*Paivana*, Morel.
quadricincta, Morel.—*G.
? *examinata*, Mab.—T.
? *nubivaga*, Mab.—T.

Euparypha, Hartm.
Pisana, Müll.—L. *C. *T. G. P. Gr.
—— var. *Pisanella*, Serv.—C.
—— var. *geminata*, Mouss.—*F.
=*alboranensis*, Pfr.
—— var. *clausoinflata*, Mouss.—F.
—— var. *parvula*, Mouss.—F.
—— var. *hierophanta*, Mab.—T.
—— var. *Grasseti* (Tarn.), Mouss.—*C.
=*pisanoides*, D'Orb.
=*planata*, W. and B. (*pars*).
impugnata, Mouss.—L. Gr.
=*festiva*, Lowe.
=*planata*, W. and B. (*pars*).
—— var. *subgeminata*, Mouss.—L.

Doubtful and Spurious Species.

Vitrina fasciolata, Fér. Quoted by Férussac from Tenerife, but not found by any subsequent naturalist.

Hyalinia (*Polita*) *semicostulata*, Beck. Reeve gives the Canaries as a habitat; but since it has never been confirmed, and since his records have frequently proved untrustworthy, it is advisable to remove this species from the list. Beck reported it originally from Portugal.

Helix marcida, Shutt.
—— *melolontha*, Shutt.
—— *umbicula*, Shutt.
—— *cæmentitia*, Shutt.
} These four species were obtained from bags of dried orchil, the precise origin of which was unknown.

—— *elegantula*, Jan. (one of the many forms of *polymorpha*, a Madeiran species).

—— *anaglyptica*, Rve.
=*nitidiuscula* var. *major*. Flat Deserte, Canaries (*sic*, error for Madeira).

—— *tæniata*, W. and B.
—— *tiarella*, W. and B.
} Two Madeiran species erroneously recorded from the Canaries by Webb and Berthelot.

Bibliography.

1810.—Ledru, Voyage aux Îles de Tenerife, etc., i, p. 186.

1832.—Quoy and Gaimard, Voyage de l'Astrolabe, Zoologie, ii.

1833.—Webb and Berthelot, Synopsis Molluscorum terrestrium et fluviatilium quas in itineribus per insulas Canarias observarunt: Ann. Sci. nat., xxviii,[1] p. 307, etc.

1839.—D'Orbigny, in Webb and Berthelot, Histoire Naturelle des Îles Canaries, Zoologie ii, 2nd part.

1852.—Shuttleworth, Diagnosen Einiger neuen Mollusken aus den Canarischen Inseln: Mitth. naturf. Ges. Bern, 1852, p. 137, etc.

1856.—Grasset, Description de Coquilles provenant des Îles Canaries: Journ. de Conch., v, pp. 345 and 346.

1857.—Mousson, Appendix to G. Hartung's Geologische Verhaltnisse der Inseln Lanzarote und Fuerteventura: Neue Denksch. Schweizer. Ges. Naturw. Zurich, xv, art. 4, p. 130.

1859.—Mousson, On the Land-shells of Lanzarote and Fuerteventura, with observations on the Molluscan Fauna of the Canary Islands in general: Ann. and Mag. Nat. Hist., ser. III, iii, p. 80, etc.

1861.—Lowe, Diagnoses of new Canarian Land Mollusca: Ann. and Mag. Nat. Hist., ser. III, vii, p. 104, etc.

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[1] Cited erroneously in the Royal Society's Catalogue of Scientific Papers as vol. xxix.

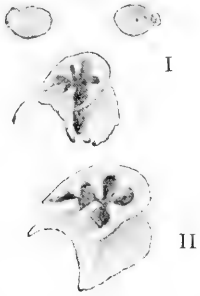
1864.—Morelet, Description de Coquilles inédites: Journ. de Conch., xii, p. 155.
1866.—Bourguignat, Recherches sur la Distribution géographique des Mollusques terrestres et fluviatiles en Algérie et dans les regions circonvoisines: Ann. Sci. nat., sér. v, v, p. 326.
1872.—Hidalgo, Molluscos del Viaje al Pacífico. I Univalvos terrestres.
1872 —Mousson, Révision de la Faune malacologique des Canaries.
1878.—Wollaston, Testacea Atlantica.
1882.—Mabille, Molluscorum novorum diagnoses succinctæ: Bull. Soc. philom. Paris, sér. vii, vi, p. 132, etc.
1883.— —— Diagnoses testarum novarum: *op. cit.*, vii, p. 43, etc.
1884.—Smith, On the Mollusca of the "Challenger" Expedition, Canary Islands: Proc. Zool. Soc. 1884, p. 276.
1884 } —Mabille, Matériaux pour une Faune malacologique des Îles
1885 } Canaries: Nouv. Arch. Mus. Hist. nat. Paris, sér. ii, vii, p. 201, etc.; viii, p. 27, etc.
1886.—Hidalgo, Supplement to F. Quiroga, Apuntes de un viaje por el Sahara occidental: Ann. Soc. Españ. Hist. nat., xv, p. 520.
1887.—Furtado, Sur la denomination de l'*Helix torrefacta*, Lowe, des Canaries: Jorn. Sci. Lisboa, xi, p. 86.
1890.—Dautzenberg, Recoltes malacologiques de l'Abbé Cullieret: Bull. Soc. zool. France, 1890, p. 147, etc.
1891.— —— Voyage de la Goelette Melita aux Canaries et au Sénegal, 1889–90: Mém. Soc. zool. France, iv, p. 22, etc.
1894.—Ponsonby and Sykes, Two new Land-shells from Tenerife: Proc. Malac. Soc. London, 1, p. 55.
1895.—Krause, Landschnecken von Tenerifa: Nachbl. Deutsch. malak. Ges. 1895, p. 20, etc.

DESCRIPTION OF *STREPTAXIS PAULUS*, A NEW SPECIES.

By G. K. Gude, F.Z.S., etc.

Streptaxis paulus, n.sp.

Aff. *S. Heudei*, S. et B., sed minus solidula, minor; margo superior peristomatis ad suturam minus recedens; lamella superior in parte parietis non margine dextro conjuncta; peristoma minus incrassatum; anfr. penultimus in umbilicum recedens. Diam. maj. 6, min. 4, alt. 3 mm.



I. *Streptaxis paulus*, n.sp. Mouth, × 3.
II. Mouth of *S. Heudei*, × 3.

Hab.—Unknown. Chinese region probably.

Two specimens of this shell, without indication of habitat, were acquired by me in a miscellaneous collection at Stevens' sale-rooms. Upon recently receiving a specimen of *S. Heudei*, its resemblance to my unnamed shells struck me at once; and I submitted them to Dr. Boettger, who wrote: "New species, next to *S. Heudei*." It differs from that shell in the deeper umbilicus; the penultimate whorl recedes further; the upper lamella on the parietal wall is not joined to the right margin of the peristome, and the latter is less reflexed at the suture; it is also smaller and less solid.

LIST OF THE PLEUROTOMIDÆ OF SOUTH AUSTRALIA, WITH DESCRIPTIONS OF SOME NEW SPECIES.

By G. B. Sowerby, F.L.S., etc.

Read 10*th January*, 1896.

PLATE III.

Since the publication of "A list of Aquatic Mollusca inhabiting South Australia" by Mr. D. J. Adcock in 1893, a considerable number of species have been discovered, principally through the researches of Dr. J. C. Verco, who has placed in my hands for identification and description the Pleurotomidæ found by him. Mr. Adcock and Mr. Bednall have also kindly sent me a considerable number of specimens for comparison; so that I have had pretty good material to work upon. Most of the species are very small, and some are at first sight so much alike that the mere sorting of them has been no little labour. The generic distinctions are still very unsatisfactory, and it may be thought that I have taken liberties with certain of them by placing the species in what seem to me the most natural and convenient groups.

From Mr. Adcock's list I have removed some names, and added others, out of which sixteen are new, making a total of thirty-seven species.

1. Surcula Quoyi, Reeve, Conch. Icon., *Pleurotoma*, sp. 137. This is the largest species recorded of South Australian Pleurotomidæ. It appears at present to be somewhat rare.

2. Drillia harpularia, Desmoulins, Actes Soc. Linn. Bordeaux, tom. xii, p. 162; Reeve, Conch. Icon., *Pleurotoma*, sp. 124. (= *P. harpula*, Valenc.) Spencer's Gulf.

3. Drillia Walcotæ, Sowerby, Proc. Zool. Soc. 1893, p. 487, pl. xxxviii, figs. 7, 8. Spencer's Gulf; also St. Vincent's Gulf, 13 fathoms (Verco).

—— var. *pallida*. Nearly white, with a pale-buff basal zone, and the longitudinal ribs less prominent. With shell sand from Macdonnell Bay (Adcock).

4. Drillia exarata, Reeve, Conch. Icon., *Pleurotoma*, sp. 201. St. Vincent's Gulf (Verco).

5. Drillia dimidiata, n.sp. Pl. III, Fig. 2.

Testa fusiformis, tenuicula, pallida, antice balteo lato rubro, maculis rufis marginato ornata; spira acuminata, apice obtuso; anfractus $7\frac{1}{2}$, declives, superne leviter concavi, inferne convexiusculi, sulcis numerosis angustissimis spiraliter insculpti, costis longitudinalibus obliquis, irregularibus, paucis, latiusculis sed parum elevatis; sutura anguste canaliculata; anfractus ultimus spiram fere æquans, costis indistinctis vel obsoletis, basim versus attenuatus, haud rostratus; apertura mediocriter lata; columella rectiuscula, tenuiter callosa,

labrum acutum, obsolete crenulatum, antice leviter sinuatum, sinu postico lato et profundo. Long. 10·50, diam. 4·50 mm.

Hab.—Backstairs Passage, 16–18 fathoms (Verco).

I have only seen three specimens of this species, of which only one is adult. The shell is of simple character, with the spire about as long as the body-whorl, which slopes gently to the base without rostrum. The lower half of the whorl is pink, spotted at the margin of the zone with somewhat deeper red.

6. Drillia Bednalli, n.sp. Pl. III, Fig. 3.

Testa elongato-turrita, albida, lineis fuscis numerosis cingulata; spira acuminata, apice papillari; anfractus 9½, primi 2–3 læves, cæteri convexi, obtuse angulati, supra angulum leviter concavi, spiraliter sub-obsolete lirati; costis longitudinalibus ad angulum leviter elevatis, aliter vix conspicuis; sutura leviter impressa, carina parva marginata; anfractus ultimus spiram paulo brevior, convexus, basim versus acuminatus, vix rostratus; apertura oblonga, mediocriter lata; columella leviter contorta; labrum tenue, postice mediocriter sinuatum. Long. 16, diam. 5 mm.

Hab.—St. Vincent's Gulf (Verco).

A very characteristic species, marked with brown transverse lines, about six on the body-whorl. The specimens vary somewhat; the type being pretty distinctly longitudinally ribbed, and the ribs raised to form a crown at the angle; in other individuals the ribs are obsolete, only the nodules at the angle remaining; and one large dead specimen obtained by Dr. Verco at Backstairs Passage (20 fathoms), has but the very faintest sign of nodules and no trace of ribs. This last specimen measures 20 mm., and although it does not exhibit the characteristic brown lines, I have, after careful comparison, no doubt as to its identity. Other specimens are pure white, without lines, but being dead shells I take them to be simply bleached, and not, as one might at first sight suppose, examples of a colourless variety.

7. Drillia gratiosa, n.sp. Pl. III, Fig. 1.

Testa elongata, glabra, rufo-carnea, flammis rubris latiusculis irregularibus longitudinaliter picta; spira producta, acuta, ad apicem obtusa; anfractus 9, leviter convexi, læves, sutura impressa sejuncti; anfractus ultimus breviusculus, leviter inflatus, basim versus contractus, vix rostratus; apertura ovalis; columella sinuata, labrum acutum, postice late et profunde sinuatum. Long. 17·50, diam. 6 mm.

Hab.—St. Vincent's Gulf (Verco).

A smooth shell, pink, with longitudinal red flames; the spire is acutely elongate, but the apex blunt and papillary.

Of this species I have only seen one adult (dead), one young (fresh) specimen, and a fragment.

8. Drillia saxea, n.sp. Pl. III, Fig. 4.

Testa turrita, solida, alba; spira acutiuscula, ad apicem obtusa; anfractus 6½, convexi, obscure angulati, longitudinaliter obscure plicati, aliter læves; anfractus ultimus spiram brevior, ad basim

truncatus, haud rostratus; apertura curta, latiuscula; labrum leviter inflexum, postice late et profunde sinuatum; columella fere recta. Long. 7, diam. 3 mm.

Hab.—St. Vincent's Gulf (Verco).

A little, stony, white shell, with a short mouth, and lip slightly inflexed; in form it resembles *D. Hottentota*, Smith.

9. Daphnella dulcis, n.sp. Pl. III, Fig. 5.

Testa oblonga, subfusiformis, alba, dilute fusco irregulariter maculata, antice zona pallide purpurascente, fusco-marginata picta, ad apicem fusca; spira acuminata, apice papillari; anfractus 6, primi 2 læves, rotundati, cæteri convexi, obtusissime angulati, spiraliter densissime lirati; anfractus ultimus oblongus, vix inflatus, spiram paulo superans, basim versus leviter contractus, vix rostratus; apertura breviuscula, mediocriter lata; columella levissime contorta, fusco tincta; labrum obsolete crenulatum, postice late et profunde sinuatum. Long. 11, diam. 2·50 mm.

Hab.—St. Vincent's Gulf (Verco).

A charming little shell, delicately coloured and sculptured. The apex is obtuse and papillary, the whorls convex and very obscurely angled; there are no longitudinal ribs, but the whole surface of the shell is very finely and closely spirally ridged.

Var. *alba.*—Testa omnino alba.—A perfect fresh specimen of pure shining white, without colour or markings, was taken by Dr. Verco in same locality.

10. Daphnella fragilis, Reeve, P.Z.S. 1845, p. 111; Conch. Icon., sp. 179=*lymnæaformis*, Reeve (*non limneiformis*, Kiener), *loc. cit.* sp. 325. Specimens dredged by Dr. Verco in St. Vincent's Gulf vary much in size, the largest being nearly 20 mm. in length.

11. Daphnella diluta, n.sp. Pl. III, Fig. 6.

Testa oblongo-ovata, albida, fulvo sparsim maculata; spira acute conica; anfractus 6, convexi, rotundati, spiraliter subtilissime striati; anfractus ultimus spiram superans, ovalis, haud rostratus; apertura latiuscula, labrum tenue, arcuatum, postice mediocriter sinuatum. Long. 10, diam. 4·25 mm.

Hab.—Backstairs Passage, 20 fathoms (Verco).

This shell has much finer striæ than *D. fragilis*, and is of a shorter and more ovate form.

12. Daphnella (?) fallaciosa, n.sp. Pl. III, Fig. 7.

Testa elongato-turrita, sordide alba; spira acuminata, apice papillari; anfractus 6½, convexi, vix angulati, spiraliter dense striati, primi 2 læves, sequentes 2–3, longitudinaliter plicati; sutura anguste canaliculata; anfractus ultimus spiram fere æquans, superne obscurissime angulatus, basim versus leviter attenuatus, haud rostratus; apertura latiuscula; labrum tenue, postice breviter sinuatum; columella rectiuscula. Long. 10, diam. 3·25 mm.

Hab.—St. Vincent's Gulf (Verco).

A shell of simple character, with a rather long spire and short

mouth; closely spirally striated, only the upper whorls showing ribs or plicæ. It is with some uncertainty that I place this with *Daphnella*.

13. Daphnella bitorquata, n.sp. Pl. III, Fig. 9.

Testa parva, ovata, rugosa, nigro-fusca, albo interruptim zonata; spira obtusiuscula, gradata; anfractus $4\frac{1}{2}$, sub-quadrate angulati, spiraliter lirati, longitudinaliter subtilissime lamellati; anfractus ultimus spiram superans, inflatus, supra medium leviter biangulatus, undique liris conspicuis rugosis instructus; apertura lata; labrum arcuatum, postice mediocriter sinuatum. Long. 4·50, diam. 2·50 mm.

Hab.—Spencer's and St. Vincent's Gulfs (Adcock).

This little shell is very dark brown, relieved by a pale zone between two white keels, crossed by dark-brown streaks. The transverse liræ are pretty prominent, and the whole surface is roughened by minute laminæ. Another specimen sent me by Mr. Adcock is almost entirely white.

14. Daphnella (Teres) mimica, n.sp. Pl. III, Fig. 10.

Testa turrita, alba; spira elongata, acutiuscula; anfractus 6, convexi, rotundati, superne leviter concavi, undique liris conspicuis alternatim minoribus instructi, inter lirus lamellis minutis oblique longitudinaliter sculpti; anfractus ultimus spiram brevior, ad basim contractus, brevissime rostratus; columella parum contorta; apertura ovata; labrum tenue, arcuatum, sinu postico, latiusculo. Long. 7, diam. 2·50 mm.

Hab.—St. Vincent's Gulf (Verco).

This little shell bears rather a curious resemblance to the British *D. teres*. I have only seen three specimens, the type here described being the largest; the two smaller ones are shorter in proportion, and not so concave at the top of the whorls.

Var. *fusca*.—A dark-brown variety, represented by a single specimen in Mr. Adcock's collection.

15. Daphnella Vercoi, n.sp. Pl. III, Fig. 8.

Testa acuminato-ovata, rugosa, tenuis, pallida, stramineo irregulariter maculata et strigata; spira acuta; anfractus $8\frac{1}{2}$, primi 2 læves, cæteri convexi, obtuse angulati, spiraliter dense lirati, lamellis obliquis minutissimis confertissimis sculpti; costis longitudinis obliquis parum elevatis, plerumque indistinctis et evanidis; anfractus ultimus spiram sub-æquans, leviter inflatus, supra angulum convexiusculus, basim versus contractus, vix rostratus; apertura lata; columella rectiuscula; labrum tenue, postice mediocriter sinuatum. Long. 20, diam. 9 mm.

Hab.—Backstairs Passage, 6–20 fathoms.

A thin, delicately sculptured shell, of which the ribs are of an undecided character, entirely disappearing on the last whorl. The spiral liræ are narrow and close, and crossed by extremely delicate and profuse oblique laminæ. The type specimen, besides the irregular light-brown markings, has two narrow zones below the periphery; while others are pale straw-colour, without markings. All the

specimens are similar in detail of sculpture, but sometimes the longitudinal ribs are only to be seen on the upper whorls; and in one shell sent me by Mr. Bednall from St. Vincent's Gulf, the body-whorl is distinctly ribbed.

16. Clathurella modesta, Angas, Proc. Zool. Soc. 1877, p. 38, pl. v, fig. 15. St. Vincent's Gulf.

17. Clathurella lamellosa, n.sp. Pl. III, Fig. 11.

Testa parva, abbreviato-turrita, straminea, fusco sparsim maculata; anfractus 5; apicales læves, cæteri tabulati, valde angulati, spiraliter tricarinati, lamellis pulcherrimis longitudinaliter ornati; sutura canaliculata; anfractus ultimus spiram æquans, quadricarinatus, ad basim contractus, liratus, breviter rostratus; apertura latiuscula; labrum arcuatum, postice profunde sinuatum. Long. 4, diam. 2 mm.

Hab.—St. Vincent's Gulf (Verco).

A very characteristic little shell, with angular whorls forming a tabulated spire; the spiral keels, of which there are four on the body-whorl, as well as the interstices, are crossed by fine close lamellæ. The unique specimen is straw-coloured, with a single brown blotch in front.

18. Clathurella Lallemantiana, Crosse, Journ. de Conch. 1865, p. 423, pl. ii, fig. 5. I think *Cl. incrusta*, Ten.-Woods (Proc. Roy. Soc. Tasm. 1876, p. 136), is the same; but I cannot agree with Mr. Tryon as to the identity of *C. Letourneuxiana*, Crosse (Journ. de Conch. 1865, p. 425, plate ii, fig. 7). The latter species I have not seen from South Australia.

19. Clathurella tincta, Reeve, Proc. Zool. Soc. 1846, p. 5; Conch. Icon., *Pleurotoma*, sp. 347.

= *albifuniculata*, Reeve, Conch. Icon., *Pleurotoma*, sp. 350.
= *rubroguttata*, H. Adams, Proc. Zool. Soc. 1872, p. 14, pl. iii, fig. 25.
= *rufozonata*, Angas, Proc. Zool. Soc. 1877, p. 38, pl. v, fig. 13.

The spots and lines vary in number, size, and colour, from black to orange, and occasionally the species occurs white without spots.

20. Clathurella parvula, Reeve, Proc. Zool. Soc. 1845; Conch. Icon., *Pleurotoma*, sp. 254.

= *Clathurella crassina*, Angas, Proc. Zool. Soc. 1880, p. 416, pl. xl, fig. 6.
?= *Mangilia philomena*, Ten.-Woods, Roy. Soc. Tasm. 1875, p. 141.

Reeve's description of this species is somewhat inadequate, and he gives no dimensions, but judging from a series of specimens, I am convinced that Angas' *crassina* cannot be separated from it. The fine fresh specimens submitted to me are yellowish, with a brown band below the periphery, tinged with brown at the sutures, between the ribs, and on the lip and columella. Worn specimens are sometimes white, and probably there is a white variety. Angas mistook bleached specimens of this species for *Pleurotoma spurca*, Hinds, which, although somewhat similar in general appearance, may be clearly distinguished

by the decided outward curve of the lip forming a sharp angle on each side of the sinus.

From the description I think Tenison-Woods' *Mangilia philomena* is a synonym for *Clathurella parvula*, but, in the absence of a figure, and not having seen an authentic specimen, I cannot say with certainty.

21. Clathurella bicolor, Angas, Proc. Zool. Soc. 1871, p. 18, pl. i, fig. 20. This species may be distinguished from the smaller forms of *C. parvula*, by its more elongated and less angular form.

22. Mangilia Adcocki, nom. nov.

I propose this name for the *M. bella* of Adams and Angas (Proc. Zool. Soc. 1863, p. 419, pl. xxxvi, fig. 6), their name being preoccupied by Hinds. Tryon (Manual of Conchology, vol. vi, p. 270) considers it identical with *M. Boakei*, Nevill, a Ceylon shell with which, from the figure and description, it seems to me to have but little affinity. Adcock's list gives as a synonym *M. gracilina*, Ten.-Woods, but I have sought the records in vain for the name. *M. Adcocki* is an elegantly formed shell, with a very acute spire and moderately attenuated base; the ribs are numerous, thick and rounded, crossed by numerous rather faint spiral sulci. Fresh, adult specimens are much larger than Adams' type, measuring 16–19 mm. in length. It is a true *Mangilia*, though approaching *Cythara* in form.

23. Mangilia picta, Adams and Angas, Proc. Zool. Soc. 1863, p. 419, pl. xxxvii, fig. 7.

=*Meredithæ*, Ten.-Woods, Proc. Roy. Soc. Tasm. 1875, p. 142.

=*tæniata*, Ten.-Woods, *ibid.* 1878, p. 36.

This species varies somewhat in form, and considerably in colouring. The type has a broad brown band occupying the upper half of the body-whorl; some specimens are pale straw-colour without markings, and others are covered with brown spiral linear bands; and usually a brown line appears just above the angle.

Hab.—Spencer's and St. Vincent's Gulfs.

24. Mangilia St.-Gallæ, Ten.-Woods, Roy. Soc. Tasm. 1876, p. 137; and var. *Benedicti*. I have not been able to identify this species.

25. Mangilia alucinans, n.sp. Pl. III, Fig. 12.

Testa breviter fusiformis, straminea, spiraliter fusco interruptim lineata; spira acuminata, acutiuscula, gradata; anfractus 7–8, obtuse angulati, spiraliter leviter sulcati, costis longitudinalibus crassis, rotundatis, rectis instructi; anfractus ultimus spiram æquans, superne obtuse angulatus, deinde leviter convexus, basim versus attenuatus, haud rostratus; apertura mediocriter lata, utrimque angustior; columella rectiuscula; labrum arcuatum, postice vix sinuatum. Long. 6·50, diam. 3 mm.

Hab.—Yankalilla Bay.

This species may be distinguished by its thick, rounded, straight ribs; the spiral grooves are more or less distinct. Some specimens

are nearly white; in others numerous brown spiral lines cross the ribs, interrupted by the interstices, as in *M. picta*. There is generally a brown line just above the angle.

—— var. ORNATA, Pl. III, Fig. 13. Spira longior; costis maculis fuscis pulcherrime ornatis. A beautifully marked shell, with a longer spire than the type, from Yankalilla Bay; belonging to Mr. Adcock.

Shells of this species have been mistaken for *M. Vincentina*, Crosse, and also for *M. lineata*, Reeve. The type of the former is a little plain brown shell, with very obscure bands of darker brown. It is more sharply angular, and the ribs are thinner than in *M alucinans*. *M. lineata*, Reeve (Conch. Icon., *Mangelia*, sp. 42) is a synonym for *M. rugulosa*, Philippi, a Mediterranean species, of which *M. pura*, Reeve (sp. 63), is another synonym. There is no doubt Mr. Angas mistook different forms of the species I now call *M. alucinans* for these.

26. MANGILIA INSCULPTA, Adams and Angas, Proc. Zool. Soc. 1863, p. 420, pl. xxxvii, fig. 8. The characters of this species are somewhat obscure, but it is more narrowly cylindrical and high-shouldered than others of the group. I have picked out a few specimens from a mixed lot of Dr. Verco's St. Vincent's Gulf shells.

27. MANGILIA HEXAGONALIS, Reeve, Proc. Zool. Soc. 1845, p. 118, Conch. Icon., *Pleurotoma*, sp. 293. St. Vincent's Gulf.

28. MANGILIA PAUCIMACULATA, Angas, (*Glyphostoma*) Proc. Zool. Soc. 1880, p. 416, pl. xl, fig. 7. St. Vincent's Gulf.

29. MANGILIA VINCENTINA, Crosse, Journ. de Conch. 1865, p. 422, t. xi, fig. 6. Among all the South Australian shells I have examined, none are quite conformable to Crosse's type of this species.

30. MANGILIA CONNECTENS, n.sp. Pl. III, Fig. 14.

Testa fusiformis, utrimque acuminata, sordide albida, spira acute turrita; anfractus 7, angulati, superne declives, infra angulum leviter convexi, spiraliter dense striati, liris spiralibus paucis tenuissimis cingulati; costis longitudinalibus circiter 9, leviter obliquis, tenuibus; anfractus ultimus basim versus leviter constrictus, striis obliquis conspicuis; apertura obliqua; columella rectiuscula; labrum tenue, postice late sed vix profunde sinuatum. Long. 8, diam. 3 mm.

Hab.—St. Vincent's Gulf.

An almost colourless shell, tapering anteriorly, and with a sharpish, turreted spire; the body-whorl being of about the same length as the spire. It is finely striated throughout, besides having thin, spiral, and somewhat distant ridges, though in some specimens these ridges are by no means prominent. The longitudinal ribs are narrow and slightly oblique. The specimens, in which the sculpture is more pronounced, seem to connect this species with *Clathurella*.

31. MANGILIA INORNATA, n.sp. Pl. III, Fig. 15.

Testa fusiformis, alba; spira acuminata, acutiuscula; anfractus 7, primi 2 læves, sequentes angulati, spiraliter obscurissime lirati, longitudinaliter sub-inconspicue costati, superne subconcavo-declives,

infra angulum leviter convexi; anfractus ultimus spiram fere æquans haud costatus, liris spiralibus numerosis per-inconspicuis sculptus, basim versus attenuatus, levissime constrictus; apertura oblonga; columella recta; labrum tenue, postice breviter sinuatum. Long. 8·50, diam. 3 mm.

Hab.—St. Vincent's Gulf.

A white shell, resembling in form the typical ribbed *Mangiliæ*, but the ribs are only faintly discernible on the spire, and obsolete on the body-whorl.

32. Mangilia alticostata, n.sp. Pl. III, Fig. 16.

Testa elongato-turrita, hexagonalis, sordide albida; spira per-elongata, ad apicem acuta; anfractus 8, planulati, spiraliter striati, costis longitudinalibus 6, elevatis, acutissimis, continuis instructi; anfractus ultimus brevis, basim versus constrictus, obtuse angulatus, brevissime rostratus; apertura oblonga, breviuscula; labrum acutum, sinu postico latiusculo. Long. 13, diam. 4 mm.

Hab.—St. Vincent's Gulf.

Shell like an exaggerated form of *M. hexagonalis*, Reeve, with longer spire, and ribs more prominent and acutely angular.

33. Mangilia cuspis, n.sp. Pl. III, Fig. 17.

Testa fusiformis, utrimque acuminata, albida, antice fusco late zonata, ad apicem fusca; spira acute turrita; anfractus 8, primi 3 (apicales) minuti, politi, cæteri obtuse angulati, spiraliter dense lirati, costis numerosis, angularibus instructi; anfractus ultimus supra angulum leviter concavus, infra convexiusculus, basim versus attenuatus; columella levissime contorta; apertura elongata; labrum tenue, postice brevissime sinuatum. Long. 8·50, diam. 3 mm.

Hab.—St. Vincent's Gulf.

Allied to *M. connectens*, with finer sculpture, and distinguished by its sharp brown apex and the brown lower half of the body-whorl.

34. Mangilia anomala, Angas, (*Purpura*) Proc. Zool. Soc. 1877, pl. v, fig. 1. This certainly belongs to the Pleurotomidæ, and was, in my opinion, correctly placed by Professor Tate in the genus *Mangilia* (Proc. Linn. Soc. New South Wales, vol. v, p. 131), although Mr. Tryon thought well to replace it in the family Purpuridæ.

35. Mangilia Australis, Adams and Angas, (*Bela*) Proc. Zool. Soc. 1863, p. 420; and var. *mitralis*=*Bela mitralis*, Adams and Angas, *loc. cit.* I cannot admit this last to be a species distinct from *M. Australis*, the only difference being a greater length of spine. This species was certainly misplaced in the genus *Bela*, which forms a characteristic group inhabiting the northern seas.

36. Mitromorpha Brazieri, Smith, Proc. Zool. Soc. 1891, p. 487, pl. ii, fig. 1. Small imperfect specimens from St. Vincent's Gulf.

37. Cythara compta, Adams and Angas, Proc. Zool. Soc. 1863, p. 419, pl. xxxvii, fig. 5. Mr. Tryon places this in the genus *Daphnella*, but, although on the confines, I think it a *Cythara*. In adult specimens there is a somewhat faint varix behind the lip, which is slightly denticulate within.

Rejected Species.

Mangilia lineata and *M. pura*, Reeve. — These are synonyms of *M. rugulosa*, Phil., a Mediterranean species not likely to be found in South Australia.

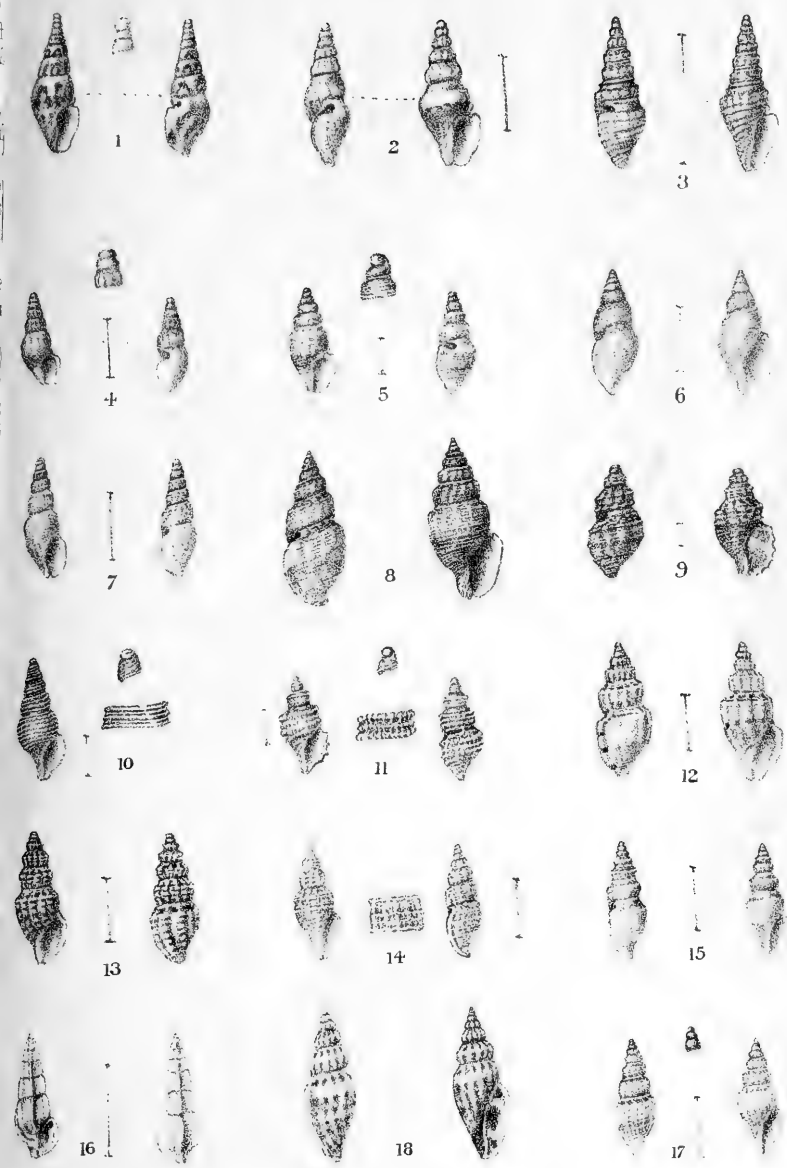
Mangilia Letourneuxiana, Crosse, Journ. de Conch. 1865, p. 425, pl. ii, fig. 7.—I have no evidence that this species occurs in South Australia. Specimens of *M. Lallemantiana* have been mistaken for it.

Mangilia gracilina, Ten.-Woods? (see note on *M. Adcocki*, *ante* p. 29).—It would have been convenient to adopt this name had it not been too near "*gracillima*," a name already twice employed in the family.

Glyphostoma spurca, Hinds.—I have no evidence that this species occurs in South Australia. Specimens of *Clathurella parva* have been mistaken for it.

EXPLANATION OF PLATE III.

Fig. 1. Drillia gratiosa.
,, 2. ,, dimidiata.
,, 3. ,, Bednalli.
,, 4. ,, saxea.
,, 5. Daphnella dulcis.
,, 6. ,, diluta.
,, 7. ,, fallaciosa.
,, 8. ,, Vercoi.
,, 9. ,, bitorquata.
,, 10. ,, mimica.
,, 11. Clathurella lamellosa.
,, 12. Mangilia alucinans.
,, 13. ,, ,, *var.* ornata.
,, 14. ,, connectens.
,, 15. ,, inornata.
,, 16. ,, alticostata.
,, 17. ,, cuspis.
,, 18. ,, Adcocki; nat. size.



J.B. Sowerby del. et lith. Hanhart imp.

SOUTH AUSTRALIAN PLEUROTOMIDÆ.

DESCRIPTIONS OF SOME NEW LAND MOLLUSCA FROM NEW ZEALAND AND MACQUARIE ISLAND.

By Henry Suter, Christchurch, New Zealand.

Read 10*th January*, 1896.

PLATE IV.

1. Lagochilus Chiltoni, n.sp. Pl. IV, Fig. 1.

Shell very small, turbinate, subperforate, rufous, slightly glossy, thin, semi-transparent, with rather close longitudinal membranous white costellæ, which easily rub off; they are nearly equidistant, five to six per millimetre. Spire conical, apex rather pointed; periphery rounded; whorls 5, convex, the first three increasing slowly, the others more rapidly, faintly microscopically spirally striated, the body-whorl about two-thirds of the total height; suture impressed. Aperture subcircular, slightly oblique; peristome simple, straight; notch at the suture very slightly indicated; columella lip somewhat callous, expanded, completely covering the small umbilicus; margins convergent, not united by a callus. Base rounded. Operculum not seen. Alt. 3, diam. 2·25 mm.

Type in my collection.

Hab.—Fern Flat, Buller River, South Island. A single specimen found under a log by Dr. Ch. Chilton, whose name I have much pleasure in connecting with this species.

L. Chiltoni is near to *L. Hedleyi*, Sut., but the latter is more depressed, the membranous plaits are not equidistant on the body-whorl, the margins of the aperture approximate more, and the narrow umbilicus is open.

2. Lagochilus (?) Studeri, n.sp. Pl. IV, Fig. 2.

Shell very small, globosely conoidal, perforate, whitish-horny, faintly glossy, fragile, transparent, smooth, showing under the lens regular and close lines of growth. Spire conoidal, rather short; whorls $3\frac{1}{2}$, rather rapidly increasing, convex, slightly flattened below the suture; periphery rounded; suture deep. Protoconch smooth, rather obtuse. Aperture ovate, longitudinal; peristome simple, acute, outer lip regularly arched, basal lip strongly convex, columella lip almost straight, vertical; margins converging, not connected by any callosity. There is no indication of a notch at the suture. Umbilicus pervious, very narrow. Base convex. Operculum thin, horny, transparent, with few whorls round a subcentral nucleus. Alt. 3, diam. 2·25 mm.; height of aperture 1·5 mm.

Type in my collection.

Hab.—Whangarei, North Island (Mr. Grosch).

Named in honour of Prof. Dr. Th. Studer, Berne, Switzerland.

The only specimen I possess is immature, so that the generic position is somewhat doubtful.

3. Athoracophorus (Pseudaneitea) Simrothi, n.sp. Pl. IV, Figs. 3, 4.

Animal (in spirit) elongate, about five times longer than broad, fulvous; head broadly rounded, tail tapering; back rounded, presenting a botryoidal appearance owing to the numerous strongly developed papillæ; it is separated from the foot by a broad lateral groove, keeled towards the sole, which is lighter-coloured; dorso-median groove, bifurcating towards the head, distinct, extending to the tail. There are about twenty lateral grooves on each side, and a lateral area contains two to three rather large papillæ. These papillæ are oval, 1 × 1·5 mm., on the central part of the body, and about ·75 to 1 mm. high; the interstices between are granulate. The mantle-area, which I cannot make out distinctly in the specimen before me, seems to be triangular, the pulmonary orifice being situated at its anterior angle. The lateral grooves, the keel, and the sole are crossed by numerous transverse furrows. Length 30, breadth 2, height 5 mm. (alcoholic specimen).

Type in my collection.

Hab.—Collingwood, South Island (Mr. J. Dall).

Named in honour of Dr. H. Simroth, of Leipzig.

This slug is so distinct and peculiar in its appearance that I will not defer its preliminary description any longer. I have only one specimen, and that in a rather bad state of preservation, since the animal was probably placed alive in strong alcohol. The diagnosis and the sketches I give must be considered as merely provisional. I hope to get some living specimens later on, when the description will be completed, better figures given, and the anatomy investigated. I do not doubt that this species must be assigned to the subgenus *Pseudaneitea*, since it possesses the main characters of *Athoracophorus papillatus*, Hutton.

The New Zealand species of *Athoracophorus* now known to science are:—

A. bitentaculatus, Q. and G.
A. maculatus, Collinge.
A. (*Konophora*) *marmoreus*, Hutt.
A. (*Pseudaneitea*) *papillatus*, Hutt.
A. (*Pseudaneitea*) *papillatus* v. *nigricans* (v. Mts. MS.), Simroth.
A. (*Pseudaneitea*) *papillatus* v. *fasciatus* (v. Mts. MS.), Simroth.
A. (*Pseudaneitea*) *Simrothi*, Sut.

4. Endodonta (Charopa) Roseveari, n.sp. Pl. IV, Figs. 5–7.

Shell small, subdiscoidal, umbilicated, horny, with radiate rufous streaks which are irregularly disposed on the upper surface, form zigzag lines on the periphery, and are obscurely tessellated on the base; dull, thin, semi-transparent. Spire flatly depressed; periphery

rounded; whorls 5, slowly and regularly increasing, rounded, the last not descending in front; suture impressed; whorls radiately costate, the costæ sharp and elevated, directed forwards, arcuate on the upper surface, sinuate on the periphery and base, about ten per millimetre, interstices minutely decussate. Protoconch having fine, narrow costæ, obtuse. Aperture lunate, oblique; peristome regularly arched, straight, acute, the outer lip tapering, columella lip short, arcuate, not reflexed; margins convergent; umbilicus broad, nearly one-fourth of the greatest diameter, showing all the whorls; base rounded. Diam. max. 4, min. 3·5; alt. 2 mm.

Type in my collection.

Hab.—Tarukenga near Rotorua, North Island (Capt. T. Broun).

Named in honour of Mr. B. Rosevear, Fulham, London.

This species is nearest to *E. Sterkiana*, Sut., but may at once be distinguished from it by the costæ being wider apart.

5. Endodonta (Charopa) Titirangiensis, n.sp. Pl. IV, Figs. 8–10.

Shell small, discoidal, umbilicated, thin, horny, without colour markings, semi-transparent, dull; longitudinally costate, the costæ not much raised, slightly directed backwards, sinuated at the periphery; interstices with fine lines of growth, 9–10 costellæ per millimetre. Whorls 5, the first three gradually increasing, the last attaining relatively a considerable development, taking up about one-third of the maximum diameter; suture well impressed. Protoconch smooth, spire flat, periphery rounded. Aperture rotundly lunate, oblique; peristome straight, acute, columella lip slightly callous and reflexed; margins converging. Umbilicus about one-third of the greatest diameter, showing all the whorls. Base rounded. Diam. maj. 3·75, min. 3·25; alt. 1·75 mm.

Type in my collection.

Hab.—Nikau-bush, Titirangi, near Auckland (H. S.).

This shell is closely allied to *E. anguiculus*, Reeve, var. *montivaga*, Sut., but differs from it in the greater diameter of the four first whorls, the broader last whorl, etc.

6. Laoma elegans, n.sp. Pl. IV, Figs. 11, 12.

Shell minute, conoidal, perforate, horny, without colour markings, somewhat glossy, thin, transparent, surface radiately costate, the very distinct costellæ straight, directed backwards, 15 per millimetre. Spire dome-shaped; periphery slightly keeled; whorls 5, flatly rounded, gradually and slowly increasing; suture impressed. Protoconch smooth, rather large. Aperture transverse, semicircular, with six long slender lamellæ, two on the penultimate whorl and four on the base, the latter lying far back, and only showing through the transparent shell on the exterior as white lines. Peristome straight, acute, basal lip broadly rounded, columella lip slightly callous, reflexed; margins only very slightly approximate. Umbilicus narrow, but pervious, not covered by the columellar reflection. Base smooth up to the periphery; whitish, flatly rounded. Diam. 2, alt. 1·5 mm.

Type in my collection.

Hab.—Whangarei, North Island (Mr. Grosch).

L. elegans is very distinct from all the species of the genus hitherto described; the aspect of the base and character of the lamellæ call to mind some of the species of *Sayda*.

7. Laoma (Phrixgnathus) lucida, n.sp. Pl. IV, Figs. 13–15.

Shell very small, depressly-turbinate, subperforate, yellowish-horny, shining, pellucid, thin, somewhat smooth, with fine lines of growth (more distinct at the suture), microscopically finely decussate. Spire conoidal; periphery rounded; whorls 5, gradually increasing, rounded; suture rather deep. Protoconch smooth. Aperture lunate, transverse; peristome straight, acute, somewhat callous, columella lip subvertical, slightly reflexed. Umbilicus very narrow, partly covered by the columella lip. Base rounded. Diam. maj. 3, min. 2·75; alt. 2 mm.

Type in my collection.

Hab.—Near Auckland, exact locality not stated (Mr. Wright).

This species comes nearest to *L. transitans*, Suter, which, however, is higher, banded with chestnut, and has the periphery keeled.

The jaw and radula are typical, the former being strongly papillate. The formula of the radula is 20–1–20.

—— var. elevata, n.var.—This variety is higher; the number of whorls is the same, but they are narrower, especially the fourth and fifth. The protoconch is also smooth, and the shell microscopically finely decussate. The colour is darker, the periphery keeled, and the mouth destitute of callosity. Diam. maj. 3, min. 2·75; alt. 2·5 mm.

Type in my collection.

Hab.—Whangarei, North Island (Mr. Grosch).

8. Laoma (Phrixgnathus) spiralis, n.sp. Pl. IV, Figs. 16–18.

Shell very small, depressly-turbinate, perforate, pale-horny with somewhat irregular radiate rufous streaks, dull, thin, semi-transparent, with close-set longitudinal membranous costellæ, produced into ragged processes at the periphery; there are five to six costellæ per millimetre; the interstices decussate. Spire conoidal, apex pointed, periphery sharply keeled; whorls 5, gradually increasing, flatly rounded; suture impressed, somewhat constricted, between the fourth and fifth whorls. The protoconch is smooth, but the rest of the shell is distinctly spirally striated, most conspicuously so on the base. Aperture transverse, squarish; peristome straight, acute, outer lip sharply keeled, basal lip regularly broadly arched, columella lip subvertical, slightly arched, and reflexed. Umbilicus narrow, pervious, deep. Base rounded. Diam. maj. 3·25, min. 2·75; alt. 2 mm.

Type in my collection.

Hab.—Pelorus Sound, Marlborough, South Island (Mr. J. McMahon).

L. spiralis stands nearest to *L. phrynia*, Hutton, but differs from it in having a more acute spire and a sharper keel on the periphery, in its less rounded whorls with their very distinct spiral striation, in possessing ragged processes to the costellæ, and a much narrower umbilicus as well as a constricted portion of the suture.

Note.—Laoma (Phrixgnathus) acanthinulopsis, Sut., which I described in Trans. New Zeal. Inst., vol. xxiii (1891), is a synonym of *Laoma* (*Phrixgnathus*) *phrynia*, Hutton. Since my description was published, well-preserved specimens of *L. phrynia* have come into my possession, and, after careful comparison, I have come to the conclusion that my species is nothing more than a local variety.

9. Laoma (Phrixgnathus) Moellendorffi, n.sp. Pl. IV, Figs. 19–21.

Shell very small, depressly-turbinate, pale-horny with irregular radiate streaks of chestnut; faintly glossy, very thin, semi-transparent, smooth, microscopically decussate. Spire broadly conoidal, arched; periphery slightly keeled; whorls 4, gradually increasing in size, convex, the last not descending in front. Protoconch smooth, blunt. Aperture transverse, lunate; peristome straight, acute, outer lip somewhat keeled, basal lip broadly arched, columella lip subvertical, slightly reflexed, and callous. Umbilicus narrow, deep, one-sixth of the major diameter. Base rounded. Diam. 2·5, alt. 1·5 mm.

Type in my collection.

Hab.—Mt. Wellington lava-fields, Auckland (H. S.).

This is another species closely allied to *L. phrynia*, but it is smaller, more depressed, is not ribbed, is microscopically decussate, and has a slightly narrower umbilicus. Named in honour of Dr. O. F. von Möllendorff, Manila.

10. Laoma (Phrixgnathus) Hamiltoni, n.sp. Pl. IV, Figs. 22–24.

Shell minute, subdiscoidal, umbilicated, yellowish-horny, glossy, pellucid, smooth, with distinct lines of growth, impressed at the suture, not decussate. Spire flat, but little elevated; periphery rounded; whorls $3\frac{1}{2}$, slowly and regularly increasing, convex, the last not descending. Protoconch microscopically spirally striate. Aperture diagonal, rotundly lunate; peristome straight, acute, outer and basal lip regularly rounded, columella almost straight, oblique, much reflexed. Umbilicus about one-eighth of the diameter, deep. Base rounded. Diam. maj. 2·5, min. 2; alt. 1·25 mm.

Type in my collection.

Hab.—Macquarie Island, where it was found by Mr. A. Hamilton, of Dunedin, in whose honour the species is named.

The specimens were kindly given to me by Prof. J. T. Parker, of Dunedin.

This species has its nearest allies, such as *Laoma occultus*, Cox, etc., in Tasmania; and it is no doubt also very near to *L. Campbellica*, Filhol, but I have not yet seen that species.

11. Laoma (Phrixgnathus) sublucida, n.sp.

Shell small, depressly-turbinate, subperforate, whitish-horny, glossy, semi-transparent, smooth, with faint, radiate, rufous streaks extending to the umbilicus, not decussate. Whorls 5, gradually increasing, flatly rounded; suture impressed; periphery rounded. Protoconch smooth. Aperture transverse, lunate; peristome straight, acute, slightly callous; outer and basal lip regularly arched, columella lip

very short, oblique, callous, reflexed, and partly covering the very narrow and pervious umbilicus. Base flatly rounded. Diam. maj. 3, min. 2·75; alt. 2 mm.

Type in my collection.

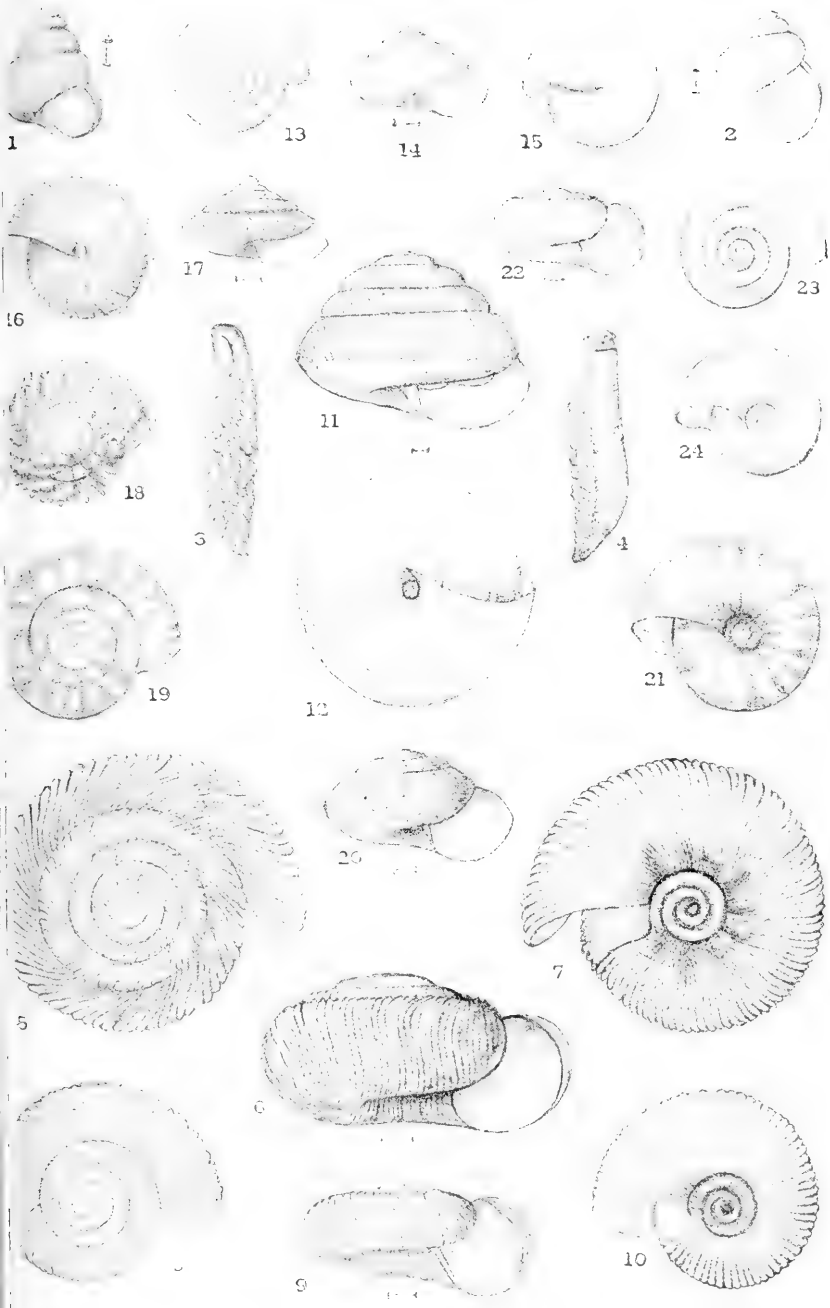
Hab.—Waitakerei, Auckland (Mr. T. F. Cheeseman).

This species is intermediate between *L. transitans* and *L. lucida*. It is distinguished from the latter by the colour-markings, the absence of microscopical spiral striation, and the more opaque texture. *L. transitans* differs from it in the higher spire, the distinct growth-lines, and the acute keel at the periphery.

No figure is given, as the outline of the shell is very similar to that of *L. lucida*.

EXPLANATION OF PLATE.

Fig.	1.	Lagochilus Chiltoni, n.sp. (×6.)
,,	2.	,, (?) Studeri, n.sp. (×6.)
,,	3, 4.	Athoracophorus Simrothi, n.sp. (nat. size.)
,,	5–7.	Endodonta Roseveari, n.sp. (×10.)
,,	8–10.	,, Titirangiensis, n.sp. (×8.)
,,	11, 12.	Laoma elegans, n.sp. (×15.)
,,	13–15.	,, lucida, n.sp. (×6.)
,,	16–18.	,, spiralis, n.sp. (×6.)
,,	19–21.	,, Moellendorffi, n.sp. (×10.)
,,	22–24.	,, Hamiltoni, n.sp. (×8.)



Suter, del.

NEW LAND-SHELLS FROM NEW ZEALAND.

ON *NEOHYALIMAX BRASILIENSIS*, N.GEN., N.SP. (ALLIED TO *HYALIMAX*), FROM BRAZIL.

By Dr. Heinrich Simroth.

Read 10th January, 1896.

PLATE V.

Not long ago I received for examination, from the Berlin Museum, a well-preserved specimen of a small slug, which Dr. Von Jhering had found in Rio Grande do Sul. It had been registered as a *Hyalimax*, and outwardly it resembles that genus. Its general appearance agrees with the figure given by Fischer (1); the mantle, however, is more flattened, and some other differences of minor importance exist, which will be discussed later on.

Since the genus *Hyalimax* is restricted to the Nicobar and Andaman Islands and to Pegu, the discovery of a closely allied form in Brazil is of great note, the importance of which is yet further increased by the fact that there is a striking deficiency of slugs in the neotropic region. Heynemann (2) enumerates from Mexico, Central America, Columbia, and the West Indies (omitting *Limax* and *Vaginula*) the genera *Tebennophorus*, *Megapelta*, *Peltella*, and *Cryptostracon*, and no other genus from the whole of South America. From the adjacent parts of North America we have *Arion*, *Ariolimax*, *Prophysaon*, *Hemphillia*, and *Pallifera*. The indigenous genera apparently have but a limited distribution. Without dissection it is impossible for me to throw any light upon the mutual relations of these genera, but there is no difficulty in eliminating them from the present discussion, because those genera living in Brazil which somewhat resemble the new slug—*i.e.* *Cryptostracon* and *Peltella*—have ribbed jaws.

The specimen in question, being unique, cannot be sacrificed, so the following description of it is necessarily imperfect.

The animal is a true slug, *i.e.* there is no opening in the mantle; nevertheless, it is not limacoid, for the body is flattened, the foot-sole is too broad, and the mantle too much expanded. Length, 17 mm.; breadth of the foot, 7 mm. The foot-sole is of a pale flesh colour, without grooves. The locomotor disc can only be distinguished from the sides towards the posterior end. The mantle occupies the full breadth of the animal, and half its length. It is flat on the upper surface, thus corresponding with the shell below. There is no mantle-cap, as in *Limax* or *Arion*, the prominent declivous portion not being broader than the mantle edge of *Helix*. The skin of the neck is united to the mantle almost immediately behind its anterior margin, and in front of the shell. The mantle has a groove all round the margin, a little deeper in front than behind. The pulmonary aperture is on the right-hand side of the mantle, somewhat behind the middle (Pl. V, Fig. 2). Although the mantle margin is thick and fleshy, the shell

and some obscure markings beneath it are visible through the thin, transparent dorsal region. A yellow spot (Pl. V, Fig. 1, *y.s.*) on the left side near the posterior end of the mantle looks as if it were the nucleus of the shell; this, however, is an illusion. The rest of the integument is smooth, with scarcely a wrinkle; indeed, it is difficult to trace the boundary of the foot-fringe (which I have named the "Sohlenleiste") by means of the parapodial groove (pedal-groove of Pilsbry). Only two tentacles are present, viz. the ommatophores. The genital opening is situated immediately behind the right tentacle, and appears as a fissure slanting obliquely towards the foot. In front of the foot-sole there is a broad transverse groove, as in all Stylommatophora. The mouth is situated directly above and almost within this groove, and is bounded on either side by a labial lobe. These lobes do not meet, a small free space being left immediately above the mouth itself. It thus offers a contrast to *Hyalimax Maillardi*, the upper lip of which presents a more complete arc. No osphradium ("Geruchsleiste") was observed beneath the mantle margin. The upper surface is of a very pale ochre colour, with a shade of lilac, principally on the surface of the mantle; greyish or blackish spots are scattered over it. The tail has two black bands shading off laterally. Rows of fine spots mark the median neck groove and the margin of the foot. The whole skin, though preserved in a firm condition, is transparent; hence it may be inferred, from analogy, that during life all the organs can be distinguished through the integument.

The mantle-sac and the shell.—The mantle encloses a large cavity, which is completely filled by the shell. This latter is a small flat plate of 9 mm. in length, and 6 mm. in breadth (Pl. V, Fig. 3). It did not appear to be attached at any point to the base of the cavity. Beneath the light-yellowish periostracum the lime was deposited in concentric rings, with an excentric nucleus to the left of the posterior end. The nearer the nucleus, the thicker is the shelly matter. The periphery is solid, surrounded, near the posterior right-hand margin, by a brown conchiolin line. The nucleus is somewhat thickened; the shell throughout is perfectly flat, and therefore does not enclose any of the soft parts. In *Hyalimax* it is slightly arched (Fischer). One is surprised to find that the yellow spot in the mantle is not over the nucleus of the shell. This spot forms the undermost layer of the mantle itself (Pl. V, Fig. 5). It is structureless and of a hard cartilaginous nature. The black spot above it is situated on the surface. It consists, not of a single chromatophore, but of a group. I consider, however, that the yellow spot is the primitive shell. This is demonstrated by its structure and position; for if the shell in the course of its growth increased slightly at its posterior end, the primitive shell, between which and the integument there is a singularly close connection, could not fail to become separated from it.

The pallial organs.—The membrane which constitutes the floor of the mantle cavity also forms the roof of the pulmonary chamber (Pl. V, Fig. 4), of the pericardium, of the nephridium, of parts of the liver, and of the intestine. The floor of the pulmonary chamber is smooth, colourless, and transparent. The details shown in Fig. 4

relate to the roof only. This presents a honeycombed structure, marked over with black, which disappears towards the left side. The pigmentation is most intense at the periphery. Thence some blackish threads radiate towards the pericardium: this blackish network attains its greatest density in the right corner of the pulmonary cavity, where respiration is most active. These blackish rays are visible from the outside through the shell and the mantle wall. The position of the heart is remarkable, it being situate on the short base of the elongate, triangular, yellow kidney, or nephridium. The latter bears the secretory lamellæ on its upper side, and these lamellæ are bound together by transverse, oblique connectives.

The pigment.—In addition to its occurrence in the roof of the pulmonary chamber, melanine is deposited in certain places in the interior of the animal, viz.—(1) As in all Stylommatophora, in the great, brown retractor muscles of the ommatophores; (2) in the wall of the hermaphrodite duct (Pl. V, Fig. 9, *h.d.*); (3) on the surface of the hermaphrodite gland, or gonad. This gland is situated on the left side, behind the liver, and is partly covered by a thin projecting portion thereof; it bears, on its outer side only, an ink-like spot of pigment, which also extends partly over the projecting process of the liver. I think the only conclusion to be drawn from this distribution of the pigment is, that its deposition results on the one hand from activity of growth, or function, and on the other from the action of light. Probably its deposition in the body-wall corresponds with the distribution of the nerves.

The alimentary system.—The pharynx and the alimentary canal, with the salivary glands and the two digestive glands, have the general form shown on Pl. V, Fig. 6. The jaw (Fig. 7) is brown, and has a sharp edge, with a slight median process (*oxygnath*) and a lighter-coloured palatal plate (*elasmognath*), the two posterior corners of which are somewhat prominent. This plate is finely sculptured, the thread-like markings converging towards the median projection. In the radula (Pl. V, Fig. 8) the median tooth is tricuspid, the middle cusp being very large. In the lateral teeth the median cusp is still larger, and directed obliquely towards the middle line of the radula; the inner cusp is reduced in size, whilst the outer one is duplicated. In the marginal teeth the inner cusp increases in size, whilst the exterior outer cusp subdivides, giving rise to three outer cusps (Pl. V, Fig. 8, No. 20). It is, however, uncertain whether the outermost tooth in the figure be a true marginal. The contents of the stomach were somewhat darker than is usual in carnivorous slugs. Plant fibres were observable. I came to the conclusion that the animal had not fed on green leaves, but on dead ones, that had fallen to the ground, on which it lives.

Genitalia.—The specimen is fully developed. The tubules of the roundish gonad converge towards the black hermaphrodite duct, which terminates in a small, slender, pale vesicula seminalis (Pl. V, Fig. 9). The albumen gland is yellow, small and kidney-shaped. Immediately beyond this the male and female ducts separate, no true hermaphrodite duct being formed. The male duct, or prostate, is wide and glandular,

becoming suddenly narrower to form the vas deferens, which also bears in its proximal portion some glandular swellings. The short retractor penis originates in the diaphragm, and has its distal insertion at the junction of the vas deferens with the long penis. The latter consists of a narrow spiral portion and a wider distal one: a true epiphallus cannot, however, be distinguished. Probably the sperm is not enclosed in a spermatophore, but freely ejected. The upper part of the pale-yellowish oviduct is wide and glandular; the distal portion is narrow and cylindrical: after uniting with the duct of the elliptical receptaculum seminis it forms a long vagina. A common atrium genitale is barely distinguishable. The receptaculum contained only mucous matter, and no traces of spermatophores: this accords with the structure of the penis. The inner walls of the penis and vagina are lined with papillæ. Those of the latter are cartilaginous, and disposed in rows of six, and higher up of five, presenting the appearance of a head of maize (Pl. V, Fig. 10). Those of the penis are stout and conical in shape, and vary somewhat in size (Pl. V, Fig. 11). The suggestion may be hazarded that during copulation the papillæ of the penis (*Reizpapillen*) interlock with those of the vagina.

The nervous system.—The most significant point about the nerve-collar is the shortening of the visceral commissure. The cerebral ganglia are connected by a long commissure, equalling in length the maximum diameter of a single cerebral ganglion. The arrangement of the buccal ganglia is precisely similar. The lateral connectives are, however, shorter than the cerebral commissure. The pedal ganglia are united as in all Stylommatophora; the pleuro-visceral ganglia, welded into a single transverse mass, lie immediately above them. This mass is narrower in the middle than it is towards the sides. The union of the ganglia appears to be very intimate, since there is apparently only a feeble connective-tissue sheath. The origin of the nerves I have not been able to trace out.

The muscular system and tentacles.—The degree of development of the tentacles seems highly interesting, since I can distinguish only two, *i.e.* the ommatophores, the lesser pair being wanting. Possibly a small knob on the left side might be interpreted as representing one; but since I found no corresponding one on the right side, this knob was probably a projection of the pedal gland, or a lobe of Semper's organ, or a mesenterial thickening. Indeed, the various delicate structures around the mouth are difficult to distinguish. I think it is certain that the smaller tentacles, if not wanting altogether, are yet more reduced than in *Succinea*. The right ommatophore embraces the penis on the outer side, as in *Helix*. The columellar muscle resembles in a certain sense that of *Urocyclus* or *Parmacella*, but a more careful investigation reveals some distinctive differences. The short, common stem originates on the right side of the posterior margin of the mantle-line. There is some reason for the suggestion that this point originally coincided with the nucleus of the shell and the yellow spot on the mantle above described, a divergence taking place during growth. Further on, the muscle splits up into

four bundles, the two shorter and inner ones being inserted in the buccal mass or pharynx, whilst the lateral ones are attached directly to the body-wall on each side of the mouth. These are not pigmented. The right lateral bundle lies on the inner side of the penis. The muscles of the ommatophores, which have slender terminations, unite with these bundles at a point near the cerebral ganglia, and represent only secondary branches of them. Thus the distal ends of the lateral bundles are on the same level as the roots of the ommatophores, the bundles themselves occupying the places of the missing smaller tentacles.

The pedal gland.—The pedal gland opens below the mouth, and is one-fourth the length of the body. It is sharply circumscribed, and somewhat flocky, the excretory duct being visible from the upper side. It is attached to the body-wall by mesenterial tissue.

Generic position.—It is much to be regretted that Fischer, when describing his *Hyalimax Maillardi*, paid no attention to the separation of the male and female ducts, the tentacles, the columellar muscle, the pedal gland, etc.; nor have we any information whether the shell envelops any portion of the intestinal sac or not, so that a correct comparison is very difficult. As far as it is possible to arrive at any conclusion, the Brazilian form agrees perfectly with *Hyalimax* in its habitat, its mantle, its foot-sole, jaw, radula, and the simple termination of its genital organs, as well as in the lack of accessory glands, dart sac, etc. The sole difference consists in the position of the genital opening. This in the Brazilian form is nearer to the ommatophore than in the true *Hyalimax*. The difference in the insertion of the receptacular duct is only one of specific, not of generic, value. It, however, seems very probable, considering the wide geographical separation of the two, that more exact investigation would bring further differences to light. I therefore propose to call the new form *Neohyalimax Brasiliensis*, which may rank either as a subgenus of *Hyalimax* or as a new genus altogether; the value of the more flattened shell and more forward position of the genital opening being merely subjective.

Position in the family: (a) *Its relation to the Succineidæ.*—The foregoing description demonstrates that *Neohyalimax* is closely allied to *Succinea*, on the basis of the following points of resemblance: the elasmognathous jaw; the radula; the early separation of the genital ducts; the absence of accessory genital glands; the wide separation of the supra-pharyngeal ganglia; the fusing together of the pleuro-visceral ganglia; the position of the heart; and the absence of foot-sole grooves. Possibly to this may be added the distribution of the blood-vessels in the wall of the pulmonary chamber, the respiratory area being equally divided into an intestinal lung and a columellar lung ("Darmlunge" and "Spindellunge") in Semper's sense (3). This hypothesis is founded on the suggestion that the principal black line in Fig. 4 is identical with the principal pulmonary vein. The relationship of *Neohyalimax* to the neotropical genus *Homalonyx*, which is placed between *Hyalimax* and *Succinea* in the textbooks (Fischer, Pilsbry), is more critical. Decision on this point must be deferred until a further and better

investigation of the present genus has been made. At present the connection with *Hyalimax* seems to be the more intimate; but possibly we have only to deal with the results of convergence. The Succineidæ, which show great predilection for moisture, in spreading out from a northern centre across the Equator would seem to have given rise to several forms of slugs. *Hyalimax* on the one side, *Homalonyx* and *Neohyalimax* on the other, would be southern outposts. This hypothesis would be in accordance with the theory put forward by Dr. Haacke and myself, that the greatest number of groups of terrestrial animals originate in those parts of the world where the continuity of land is greatest. An entirely different conclusion would result from the evidence of a nearer relationship between *Hyalimax* and *Neohyalimax* than between the latter and *Homalonyx*. It would accord with the idea of an old Jurassic land connection between South America and Africa. *Hyalimax*, indeed, is not African, but restricted to the Indian region; there is, however, a form from Kilimandjaro described by Von Martens as *Parmarion Kerstenii* (4), which is likely to be nearly allied thereto. I merely wish to show by these remarks that a more intimate knowledge of these animals would throw light upon questions of very general interest.

(b) *Its relation to the Athoracophoridæ.*—Succineoid slugs, such as *Hyalimax* and *Neohyalimax*, are in a certain sense of general systematic importance. Placing the Succineidæ at the end of the quadritentaculate Stylommatophora, the textbooks include the rest as Bitentaculata, in the families Athoracophoridæ, Vaginulidæ, Oncidiidæ, overlooking the disappearance of the smaller tentacles in some small Pupidæ, etc. I group these three families under Mesommatophora, taking the Athoracophoridæ as a transitional form. Fischer joins the Athoracophoridæ to the Succineidæ, and groups together the Vaginulidæ and Oncidiidæ as Ditremata. Pelseneer places the Succineidæ, with *Athoracophorus*, at one end of the Stylommatophora, and the Vaginulidæ and Oncidiidæ at the other. I should not like to do so. The intimate fusion of the pleuro-visceral ganglia demonstrates the derived character of the Succineidæ; on the other hand, the total absence of a columellar muscle is an important point of agreement between the Athoracophoridæ and the Ditremata, the lack of a common atrium genitale in the Succineidæ forming a transition to the state of separate genital openings which obtains in the Ditremata. *Atopos* would be the intermediate form. The relationship between the Succineidæ and the Athoracophoridæ has been founded upon the similarity of their jaws and radulæ. Perhaps the columellar muscle of *Neohyalimax*, in which the retractors of the tentacles attain a certain degree of independence, may prove another point of affinity. Nevertheless, the pallial organs, even though imperfectly known, exhibit a wide divergence. For this reason I should prefer the arrangement given by Fischer, *i.e.* Succineidæ, Athoracophoridæ, Vaginulidæ, Oncidiidæ, with the modification that each of the three latter families is to be looked upon as independent.

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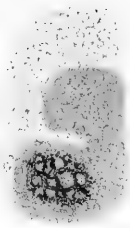

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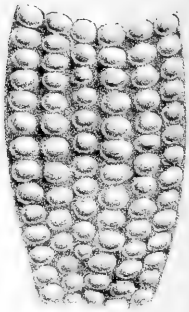

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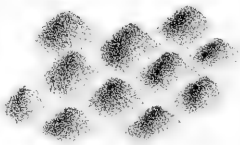

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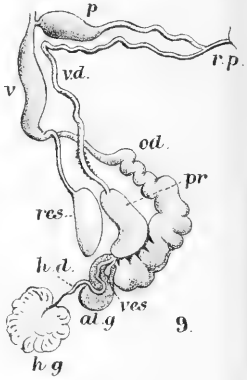

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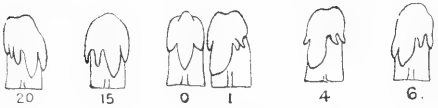

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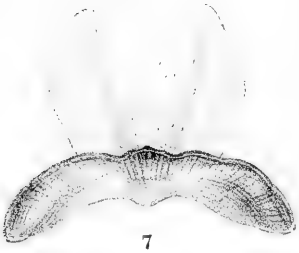

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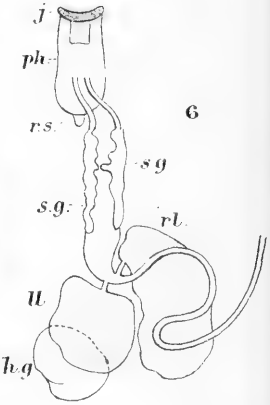

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H. Simroth del. J. Green lith. Mintern Bros. imp

NEOHYALIMAX BRASILIENSIS *n. gen. et sp.*

REFERENCES.

1. Fischer, P.—Anatomie de deux Mollusques pulmonés terrestres appartenant aux genres *Xanthonyx* et *Hyalimax*: Journ. de Conchyl., xv (1867), pp. 213–221, 1 pl.
2. Heynemann, D. F.—Die nackten Landpulmonaten des Erdbodens: Jahrb. Deutsch. Malak. Ges., xii (1885), pp. 236–330.
3. Simroth, H.—Zur vergleichenden Morphologie der Pulmonaten-Niere: Semper's Reisen im Archipel. Philippinen, Th. II, Bd. iii, Suppt.
4. ——— Nacktschnecken: Deutsch-Ostafrica, iv (1895), p. 19.

EXPLANATION OF PLATE.

Fig. 1. *Neohyalimax Brasiliensis*, n.gen., n.sp., viewed from above. × 2.
,, 2. The same, seen from the right side.
,, 3. The shell, viewed from above. × 2.
,, 4. Floor of the shell-cavity, seen from above. × 4. *per.* pericardium (with the auricle in front). *k.* kidney. *l.* digestive gland. The anterior portion is the roof of the pulmonary chamber.
,, 5. Part of the mantle with a portion of the yellow spot. The yellow conchiolin substance is beneath; the black pigment spot is above it.
,, 6. Alimentary system. *j.* jaw. *ph.* pharynx. *r.s.* radula-sac. *s.gl.* salivary glands. *l.l.* left lobe of the digestive gland. *r.l.* right lobe of the digestive gland. *h.g.* hermaphrodite gland.
,, 7. Jaw, enlarged.
,, 8. Teeth of the radula.
,, 9. Genital organs. *h.g.* hermaphrodite gland, or gonad. *h.d.* hermaphrodite duct. *al.g.* albumen gland. *ves.* vesicula seminalis. *pr.* "prostate." *v.d.* vas deferens. *r.p.* retractor penis muscle. *p.* penis. *od.* oviduct. *re.s.* receptaculum seminis. *v.* vagina.
,, 10. Interior of the vagina, magnified, viewed under reflected light.
,, 11. Part of the wall of the penis, magnified, viewed under transmitted light.

ON A COLLECTION OF SLUGS FROM THE SANDWICH ISLANDS.

By Walter E. Collinge, F.Z.S.,

Assistant Lecturer and Demonstrator in Zoology and Comparative Anatomy, Mason College, Birmingham.

Read 19th January, 1896.

Through the kindness of Mr. E. R. Sykes, I have been permitted to make an examination of the slugs collected by Mr. R. C. L. Perkins in the Sandwich Islands for a Joint Committee of the Royal Society and British Association. Some of the material has been hardened in a solution of corrosive sublimate, which has made dissection somewhat difficult. I have, however, been able to make out fairly well the chief features of the alimentary and reproductive organs.

I am also greatly indebted to Mr. Sykes for the assistance he has rendered me with respect to the bibliography; whilst to Professor Cockerell I must express my thanks for directing my attention to a species of *Janella*, said to have come from the Sandwich Islands.

The first mention of the slug-fauna of the Sandwich Islands is that by Eydoux and Souleyet, in their account of the molluscan fauna of this region in 1852–3. They there describe a new species, *Limax Sandwichiensis*, and figure the animal and shell. Their description is as follows:—

"*Limax Sandwichiensis*, *nobis*, pl. xxviii, figs. 8–11.—Limax, corpore elevato, posticè acuminato, obliquè striato, suprà nigricante, subtus albido; clypeo oblongo, anticè angusto, subrugosa. Ossiculo ovato, crasso, suprà gibboso."

Semper (11) in a foot-note to his description of *Limax tennellus*, Nilss., says that there is a species—*Limax Sandwichiensis*—exceedingly like *L. tennellus*, but somewhat smaller, which occurs in the Sandwich Isles. In external appearance and in the form of the reproductive organs, the two are in complete harmony. The only differences he found were some minor ones in the teeth of the lingual ribbon, and to these he was inclined to attach but little importance. Semper seems to have had but little doubt that the Limax he examined was identical with *L. tennellus*, Nilss. Unfortunately he makes no mention of the shell.

It was pointed out by Tryon (14) that in the figure of the shell of *Limax Sandwichiensis*, there was a central nucleus, like a *Patella*. With some reserve, on account of the insufficient description, he placed this species in the genus *Amalia*.

Heynemann (7) records from the Sandwich Islands an *Agriolimax Sandwichiensis* (Souleyet), which he thought to be near *Agr. lævis*.

Whether the slugs examined by Semper and Heynemann were the same as those collected by Eydoux and Souleyet, it is impossible to say. Neither Semper nor Heynemann, one would suppose, could overlook the very peculiar shell.

The slug here described as *Agriolimax globosus* is not unlike that imperfectly characterized by Eydoux and Souleyet in 1852, but it has no specialized shell such as they detail and figure; on the contrary, there were in the three specimens dissected only loose, minute, calcareous discs. Unless other material be forthcoming, I fear that the *Agr. Sandwichiensis*, Eyd. and Soul., will have to remain a very doubtful species, for at present we know of no species of *Agriolimax* or *Amalia* that possesses a shell at all approaching the one figured by Eydoux and Souleyet, and reproduced by Tryon (14), pl. liv, figs. 71–3. It is quite distinct from any of the known genera of Limacidæ, and that, I agree with Tryon, is in itself sufficient to justify the constitution of a new genus.

1. Agriolimax globosus, n.sp.

Animal, head, mantle, and dorsum of a bluish-grey colour; sides of the body a light yellowish-brown. Posterior portion of the body attenuated, pointed, and keeled. Mantle large, pointed in front. Foot-sole and foot-fringe yellow. Lateral rugæ arranged obliquely. Shell consists of a series of loose, minute, calcareous discs. Length (in alcohol) 15–18 mm., mantle 5·75–7 mm.

Hab.—Mauna Loa, Hawaii.

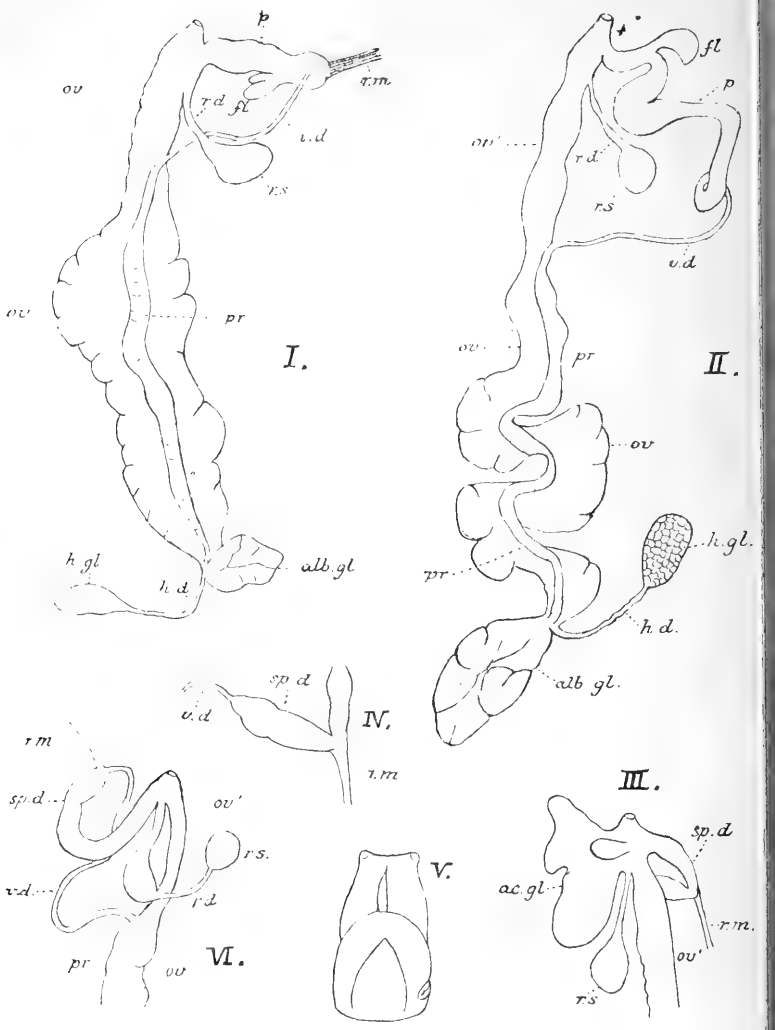
Anatomy.—There are four convolutions in the intestine, and the right lobe of the liver forms the apical portion of the visceral mass. The generative organs are very distinct from those of the other species of the genus, the nearest ally being *Agr. tennellus*, Nilss. The free oviduct is a long wide tube, and opens into a much convoluted sac-like oviduct. There is no distinction between the upper and lower portion of the free oviduct as in *L. tennellus*, Nilss. The penis is a wide short tube, terminating in a bulbous head, to which the retractor muscle is attached; this muscle, unlike that of *L. tennellus*, is short and broad. From the side of the penis (Fig. I), the vas deferens passes off, leading into a wide tube, the prostatic portion of the common duct. There is a small bilobed flagellum (Fig. I, *fl.*), passing off from the posterior portion of the penis. In *L. tennellus* there is little or no flagellum. The receptaculum seminis is an irregularly shaped sac with a short duct, which opens some little distance behind the penis; in this particular it differs from any other species of the genus, so far as I am aware. The albumen gland is small. The hermaphrodite gland (Fig. I, *h.gl.*) is single, and opens into the common duct by a short hermaphrodite duct.

2. Agriolimax Perkinsi, n.sp.

Animal, ground colour light-brown, dorsum, also head and posterior portion of the mantle, darker; sulci black, lighter towards foot-fringe; foot-sole and foot-fringe yellowish-brown. Mantle long and attenuated. Lateral rugæ arranged obliquely. Shell absent. Length (in alcohol) 18–21 mm.

Hab.—Lanai, 2000 feet.

Anatomy.—The free oviduct is an unusually long and wide tube, showing a series of constrictions, into the first of which the somewhat



DESCRIPTION OF FIGURES.

FIG. I. Generative organs of *Agriolimax globosus*, sp. nov. × 8.
,, II. Generative organs of *Agriolimax Perkinsi*, sp. nov. × 8.
,, III. Portion of the generative organs of *Amalia gagates*, Drap. × 8.
,, IV. Sperm-duct of *A. gagates*, Drap. Enlarged.
,, V. Head and mantle of *A. gagates*, Drap.
,, VI. Portion of the generative organs of *Tebennophorus striatus*, Hasselt. × 8.

Lettering.

alb.gl.	albumen gland.	p.	penis.
ac.gl.	accessory gland.	pr.	prostate.
fl.	flagellum.	r.d.	receptacular duct.
h.d.	hermaphrodite duct.	r.m.	retractor muscle.
h.gl.	hermaphrodite gland.	r.s.	receptaculum seminis.
ov'.	free oviduct.	sp.d.	sperm-duct.
ov.	oviduct.	v.d.	vas deferens.

long receptacular duct opens (Fig. II, *r.d.*). The receptaculum seminis is small and globular. The oviducal portion of the common duct (Fig. II, *ov.*), is a wide tube folded twice upon itself. The penis is a large twisted organ, and in length considerably exceeds the same organ in any other species of the genus (Fig. II, *p.*). At a point about one-sixth of its length from the genital opening it gives off a blunt flagellum; it then expands into a sac-like portion, thence it continues for a short distance as a straight tube, and then, making a sharp turn, becomes folded upon itself, at its junction with the vas deferens (Fig. II, *v.d.*). This latter is a narrower tube, leading into the prostatic portion of the common duct, which is longer and narrower than in *Agr. globosus*. There is a large oval albumen gland. The hermaphrodite gland (Fig. II, *h.gl*) is somewhat pyriform in shape, and opens into a short convoluted duct.

I have much pleasure in associating with this interesting species the name of Mr. R. C. L. Perkins.

The differences in the form of the reproductive organs of *Agr. globosus* and *Agr. Perkinsi* are fairly well marked, and easily distinguish them from their nearest allies. The question, however, of how far the form of the penis, free oviduct, etc., vary in a known species, is one of great interest, and must sooner or later be investigated. Dr. J. F. Babor, of Prague (2), has published some interesting notes in connection with this subject, and it is greatly to be hoped that he may find opportunity for further extending his researches.

The species of *Agriolimax*, recently described as new by Simroth (12), seem to me to be established on minute variations common to all mollusca, as do those figured and described by Babor and Kostal (1). Possibly later investigations may prove that in this genus the reproductive organs are subject to a wide range of variation, and that recourse will have to be had to the general anatomy. In *A. Sowerbyii* and *A. gagates* the only variations in the generative organs I have been able to find are in the form and number of the accessory glands and the constrictions in the sperm-duct (4).

3. Amalia gagates (Drap.).

The specimens of *A. gagates* which come from Maui differ slightly from those I have examined from various European localities. The groove on the mantle terminates anteriorly as a sharp point (Fig. V); and on the head, in the mid-dorsal line, there is the peculiar groove so conspicuous in *A. robici*, Simr. Internally there are also slight differences in the form of the sperm-duct (Figs. III and IV, *sp.d.*) and accessory glands. Probably all these characters are due to

isolation, and are not sufficient in themselves to separate them from the European *A. gagates*.

4. Tebennophorus striatus (Hasselt).

There are two examples of this species, which differ somewhat externally, but an examination of the generative system (in part represented in Fig. VI) leaves no doubt that they both belong to this species.

Hab.—Mount Tantalus, near Honolulu.

This species was first described by Hasselt (6) under the generic title of *Meghimatium*. In 1867 Von Martens (10) placed it in the genus *Philomycus*, Rafinesque, 1820. The anatomy has been carefully described and figured by Keferstein (9). I am using Binney's generic title of *Tebennophorus*, which, I think, is preferable, seeing that it is accompanied by a fairly good diagnosis. While admitting many of Professor Cockerell's arguments (3) against the rule, "once a synonym always a synonym," I think the safer plan is to accept such a rule. Concerning Binney's description there can be no doubt.

5. Tebennophorus Australis (Bergh)?

There is only one example of this species, and the generative organs are not developed. There is a single black line at either side of the body, and the dorsum is mottled with black. Length (in alcohol) 23 mm.

Hab.—Mount Tantalus, Oahu.

List of Species of Slugs recorded from the Sandwich Islands.

Those marked with an asterisk are doubtful.

Limax tennellus, Nilss. See Semper (11).
**Agriolimax Sandwichiensis*, Souleyet.
Agriolimax globosus, n.sp.
Agriolimax Perkinsi, n.sp.
Amalia gagates, Drap.
**Amalia Sandwichiensis*, Eydoux.
Tebennophorus striatus, Hasselt.
Tebennophorus Australis (Bergh)?
Janella sp.

Dr. J. G. Cooper records a species of *Janella*, "found in a bale of the Palu fern, brought from the Sandwich Islands for mattrass-making." (*Vide* Bull. Calif. Acad. Sci. 1871, vol. v, p. 195.)

Bibliography.

1. Babor, J. and Košťál, J —"Příspěvky ku poznání poměrů pohlavních u některych Limacïdů": Sitz. Gesell. Wiss. Prag. Math. Nat. Classe, 1893, No. li, p. 7, Taf. xx.
2. Babor, J. F.—"Über den Cyclus der Geschlechtsentwicklung der Stylommatophoren": Verh. deutsch. Zool. Gesell. 1894, pp. 55–61, figs. 1–10.

3. Cockerell, T. D. A.—"A Check-List of the Slugs": Conchologist, vol. ii, 1893, p. 215.
4. Collinge, W. E.—"On the Generative Anatomy of *Amalia marginata*, Drap., and some remarks upon the Genus": Journ. Malac., vol. iii, 1894, pp. 70–3, fig. 1.
5. Eydoux and Souleyet.—"Voyage autour du monde sur la corvette La Bonite." Paris, 1852: Zoologie, Tom. ii, p. 497.
6. Hasselt, F. C. van.—"Extrait d'une lettre de F. C. van Hasselt sur les Mollusques de l'île de Java": Bull. Sci. Nat. Geol., iii, 1824, pp. 81–7.
7. Heynemann, D. F.—"Die Nackten Landpulmonaten des Erdbodens": Jahrb. Deutsch. Malak. Gesell. 1885, pp. 236–330.
8. ——— "Die Kiefer von *Philomycus Carolinensis*, Bosc., und *Australis*, Bergh": Nachr. Deutsch. Malak. Gesell., iii, 1871, pp. 1, 2, Taf. i, figs. 1, 2.
9. Keferstein, W.—"Ueber die Anatomie der Gattungen *Incillaria*, Benson, und *Meghimatium*, Hasselt, im Vergleich mit der von *Philomycus*, Rafinesque": Malak. Blatt. 1866, pp. 64–70, Taf. i.
10. Martens, E. von.—Preussische Exped. Ost-Asien: Zool. Theil, Bd. ii, p. 178.
11. Semper, C.—"Reisen im Archipel der Philippinen." Th. II, Bd. iii, Landmollusken (1870), p. 84, note.
12. Simroth, H.—"Ueber einige von Herrn Dr. Sturany auf der Balkanhalbinsel erbeutete Nacktschnecken": Ann. k.k. naturhist. Hofmuseums, ix (1894), pp. 391–4, Taf. xix, figs. 1–11.
13. ——— "Versuch einer Naturgeschichte der Deutschen Nacktschnecken": Zeitsch. Wiss. Zool., xlii (1885), pp. 203–366, pls. vii–xi.
14. Tryon, G. W.—"Manual of Conchology." Ser. ii, vol. i, 1885, p. 220, Taf. liv, figs. 70–3.

ORDINARY MEETING.

Friday, 8th November, 1895.

Prof. G. B. Howes, Sec. L.S., President, in the Chair.

The following papers were read :—

1. "Descriptions of new species of Terrestrial and Fluviatile Mollusca from the Hadramaut, South Arabia." By J. Cosmo Melvill, M.A., F.L.S., etc., and J. H. Ponsonby, F.Z.S., etc.

2. "Notes on the Anatomy of *Hanleya abyssorum*, M. Sars." By R. H. Burne.

3. "Description of *Cassis Adcocki*, a new species." By G. B. Sowerby, F.L.S., etc.

4. "Description of a new species of *Vitrina* and new forms of Helicidæ, with a list of the Helicoid shells hitherto found in the Canary Islands." By G. K. Gude, F.Z.S., etc.

5. "Description of *Streptaxis paulus*, a new species." By G. K. Gude, F.Z.S., etc.

The President called attention to, and made some remarks upon, a portrait of Rondeletius, which had been presented by Dr. Woodward to the Linnean Society.

A letter from Mr. H. Fisher, of the Jackson-Harmsworth Expedition, written from winter quarters in Franz-Josef Land, was read.

Specimens were exhibited by Mr. Melvill, Mr. Sowerby, and Mr. Gude in illustration of their papers.

Mr. Sowerby also exhibited a remarkable shell from South Australia, belonging to the genus *Conus* (?).

Mr. Da Costa exhibited from the Galapagos Is. :—*Bulimulus nux*, Brod., *B. invalidus*, Reib., *B. rugulosus*, Sow., *B. unifasciatus*, Sow., *B. Bauri*, Dall, *B. amastroides*, Ancey, *Pleuropyrgus Chemnitzioides*, Forbes, *P. Habeli*, Stearns, *Leptinaria Chathamensis*, Dall, *Succinea Bettii*, Smith, and *Helicina nesiotica*, Dall, all from Chatham I.; *Bulimulus eschariferus*, Sow., and *Succinea Bettii*, Smith, from Charles I.; *Bulimulus olla*, Dall, from Duncan I.; *B. tortuganus*, Dall, from Albemarle I.

Mr. Moss exhibited a white specimen of *Helix perplexa*, Fér., from Grenada.

Mr. Sykes exhibited shells from a deposit at Blashenwell, Dorset.

ORDINARY MEETING.

Friday, 13th December, 1895.

Prof. G. B. Howes, Sec. L.S., President, in the Chair.

The following were elected Members of the Society: R. H. Burne, G. H. Clapp.

After a few introductory remarks by the President, Prof. W. A. Herdman, F.R.S., delivered a lecture entitled "The Culture of the Edible Oyster."

Some discussion took place, in which Dr. Woodward, Messrs. Burrows, Houston, B. B. Woodward, and others, joined, and Prof. Herdman replied. A vote of thanks was passed to Prof. Herdman.

ORDINARY MEETING.

Friday, 10th January, 1896.

Prof. G. B. Howes, Sec. L.S., President, in the Chair.

The following were elected Members of the Society: F. C. Crawford, W. S. Dun, the Rev. W. H. Whan.

Notice was given from the Chair that at the Annual General Meeting the following motion would be brought forward: "That Rule XVI be altered by the insertion in line 3, between the words 'of' and 'August,' of the word 'July.'"

On the motion of Mr. Burrows, seconded by Mr. Pace, Mr. W. Crouch and Mr. H. Groves were appointed Auditors of the accounts of the Society for the year 1895.

The following papers were read:—

1. "List of the Pleurotomidæ of South Australia, with descriptions of some new species." By G. B. Sowerby, F.L.S., etc.

2. "Descriptions of some new Land Mollusca from New Zealand and Macquarie Island." By H. Suter.

3. "On *Neohyalimax Brasiliensis*, n.gen., n.sp. (allied to *Hyalimax*), from Brazil." By Dr. H. Simroth.

4. "On a Collection of Slugs from the Sandwich Islands." By W. E. Collinge, F.Z.S., etc.

Mr. A. S. Kennard exhibited specimens of Pleistocene Mollusca from the Ightham fissure.

Mr. G. B. Sowerby exhibited specimens of *Conus scalaris*, Val., and *C. regularis*, Sow., to illustrate their specific distinction; also specimens in illustration of his paper.

On behalf of Mr. Preston, there was exhibited a specimen of *Helix nemoralis*, L., from Berrow, Somerset, having a second lip formed.

Mr. Sykes exhibited a supposed new species of *Clausilia* from South America, belonging to Miss De Burgh; also specimens of *C. magistra*, Sow., and *C. Dohrni*, Pfeiffer.

MALACOLOGICAL SOCIETY OF LONDON.

INCOME AND EXPENDITURE FOR THE YEAR ENDING 31st DECEMBER, 1895.

Dr.	£	s.	d.
To Balance from last year	83	17	6
,, Annual Subscriptions—			
Ordinary Members £40 6 6			
Corresponding Members 11 9 5			
	51	15	11
,, Annual Subscriptions in arrear—			
Ordinary Members £3 4 0			
Corresponding Members 4 17 6			
	8	1	6
,, Annual Subscriptions in advance—			
Ordinary Members £3 15 6			
Corresponding Members 2 13 0			
	6	8	6
,, Entrance Fees	8	8	0
,, Donations for Illustrations	2	9	6
,, Advertisements in "Proceedings"	9	3	0
,, Sale of "Proceedings"	7	2	0
,, Interest on Deposit Account	0	3	8
	£177	9	7

Cr.	£	s.	d.
By Cost of "Proceedings"—			
Printing and Postages £63 5 6			
Illustrating 24 9 11			
	87	15	5
,, Printing Circulars, etc.	3	4	6
,, Postages and Stationery	5	2	1
,, Gratuity to Attendants, etc.	2	15	6
,, Amount placed on Deposit at Bankers	50	0	0
,, Balance in hand	28	12	1
	£177	9	7

We have this day examined the accounts of the Treasurer of the Malacological Society of London, and we find the above statement to be correct.

GEO. F. HARRIS, Treasurer.
1*st February*, 1896.

(Signed) { WALTER CROUCH.
HENRY GROVES.

ANNUAL GENERAL MEETING.

Friday, 14th February, 1896.

Prof. G. B. Howes, Sec.L.S., President, in the Chair.

Mr. W. M. Webb and Colonel Wilmer were appointed Scrutineers.

The following Report of the Council for the year 1895 was read:—

"In submitting the third Annual Report to the Society your Council have, as in previous years, to chronicle a steady progress in the Society's work.

During the past year the Membership has increased from 153 to 158, while three candidates, nominated at the December meeting, were awaiting election at the close of the year.

The membership on December 31st stood as follows:

Ordinary members	95
Corresponding members	63
Total	158

During the past year twelve Members have been elected; while five have resigned, and two Members' names have been removed from the list—one by the Council, the other by the operation of Rule X. It is pleasant not to have to record any death amongst the Members.

The finances of the Society are still in a very flourishing condition. After payment of all liabilities there remains a balance of £28 12*s.* 1*d.* in the Treasurer's hands. In addition to the above the sum of £50 remains on deposit at the Society's Bankers.

Since the last Annual General Meeting three more numbers of the 'Proceedings' have been issued, completing Vol. I, and comprising 158 pages, including title-page, contents, and index, with eleven plates and numerous illustrations in the text. Another number will shortly be in the printers' hands.

Your thanks are due to the following Members, who have borne a large proportion of the cost of the illustrations, or who have assisted by furnishing the drawings: Lieut.-Col. H. H. Godwin-Austen, C. Hedley, J. Cosmo Melvill, S. Pace, E. A. Smith, G. B. Sowerby, E. R. Sykes, J. H. Vanstone, and Martin F. Woodward; as also to the West Indian Islands Committee of the British Association, for similar help.

Eighteen authors have contributed to the 'Proceedings' of the Society during the past year. Further, Professor W. A. Herdman very kindly delivered a lecture at the December meeting, which was very numerously attended, entitled 'The Culture of the Edible Oyster.'

By the great kindness of Dr. and Mrs. Woodward, the Society was permitted to hold its July meeting at their private residence.

The thanks of the Society are therefore due to Dr. and Mrs. Woodward, and to Professor Herdman.

The thanks of the Society are also due to the Council of the Linnean Society, by whose kindness the meetings (except that for July) were again held in the apartments of the Society in Burlington House."

On the motion of Mr. W. M. Webb, seconded by Mr. S. Pace, the Report was adopted as the Annual Report of the Society.

On the motion of Dr. H. Woodward, seconded by Mr. H. Groves, the following resolution was carried: "That in Rule XVI, line 3, the word 'July' be inserted between the words 'of' and 'August.'"

The Scrutineers reported that the following were duly elected as Officers and Council for the ensuing year:—

President.—Professor G. B. Howes, Sec.L.S., etc.
Vice-Presidents.—J. Cosmo Melvill, F.L.S.; E. A. Smith, F.Z.S.; Rev. R. Boog Watson, LL.D., F.L.S.; Dr. H. Woodward, F.R.S.
Treasurer.—G. F. Harris, F.G.S.
Secretary.—E. R. Sykes, B.A., F.Z.S.
Editor.—B. B. Woodward, F.L.S., F.G.S.
Other Members of Council.—S. I. Da Costa; W. H. Hudleston, F.R.S.; H. Wallis Kew, F.Z.S.; R. Bullen Newton, F.G.S.; G. B. Sowerby, F.L.S.; Rev. G. Ferris Whidborne, F.G.S.

The President then delivered an address.

The following motion was proposed by Dr. Woodward, seconded by Colonel Wilmer, and carried unanimously: "That a vote of thanks be passed to the President for his address; and that the address be printed *in extenso* in the 'Proceedings' of the Society."

Votes of thanks were accorded to the Retiring Officers, Auditors, and Scrutineers.

ORDINARY MEETING.

Friday, 14th February, 1896.

Prof. G. B. Howes, Sec.L.S., President, in the Chair.

The following were elected to membership of the Society: Percy Emary, Alfred Leicester, Rev. Newton Vanstone.

ADDRESS OF THE PRESIDENT,

Prof. G. B. Howes, Sec.L.S., etc.

Delivered February 14th, 1896.

Ladies and Gentlemen,

In acquiescing to the proposal that I should deliver an address on the present occasion, I was reminded by our Secretary that to do so would be to conform to a "good old custom"; and, in accordance with this, let me firstly offer some remarks by way of comment upon current research, and secondly say a few words of a more critical nature upon our relationships towards our fellow-zoologists, and upon the position of our chosen subject in the *rôle* of science.

It is now eighteen months since my predecessor in office delivered a formal address; and, looking back upon the work which our Society has accomplished in the interval, I feel myself proud to have been associated with it. Our meetings, although at times small, have been attended by people who came to work, and our discussions have been the more beneficial as they have been the more heated. In systematics we can show good results all along the line: Mr. Hedley has laid before us a good case for the Heteropod affinities of the mysterious *Pterosoma*[1]; Mr. Martin Woodward has given us papers on anatomy of much value; and Mr. Burne, in his "Notes on the Anatomy of *Hanleya abyssorum*," has put before us the results of an unusually laborious piece of work, having for its immediate object the settlement of debated points in minute structural detail. Mr. Burne's paper is worthy its association with the institution whence it emanated; and when we consider the difficult nature of his task, we have special cause to be thankful to the man who will act as peace-maker between contending parties, let it cost him what it may, if only he can arrive at the truth. Nor must I forget that we have been honoured by a valuable communication from our distinguished foreign member, Dr. H. Simroth.

Although the past year has not witnessed the removal by death of any member of our Society—an indication, let us hope, that Malacology is conducive to longevity—we have to mourn the loss of those who had direct and personal sympathy with our labours and with work of the kind upon which we are engaged, wherever performed in earnest—Thomas Henry Huxley—Sven Ludwig Lovén —John Bracebridge Wilson.

Beyond what I have previously remarked to you concerning Huxley (Vol. I, p. 289), I may say that he once expressed to me his interest in our Society and desire for its success. His joint monograph with

[1] Thus confirming the conclusions of Collingwood—"Rambles of a Naturalist on the shores and waters of the China Sea," p. 54, 8vo, London, 1868.

Professor Paul Pelseneer upon "*Spirula*"[1] marked the closing act of his zoological career, as it did that of the zoology of the "Challenger" expedition, in both of which we as Englishmen and zoologists do indeed glory. All through his active life Huxley was at heart a malacologist; and although his published papers on Mollusca are few and far between, his Rede Lecture,[2] and discourses such as those he gave to working-men in 1883 on "Shell Fishes," show that his love for the Mollusca never waned, and that the exigencies of other occupations alone prevented him from returning to them in earnest. Well do I remember the eventful morning on which he received the *Spirula* from the hands of Sir Wyville Thomson; how he at once collected the necessaries for working out "the last of the Belemnites," as he loved to call the little creature; how, with almost childish delight, he then and there buried himself in the task of investigation; and how, years later, after an interval of enforced abstinence from work, he on more than one occasion remarked that he could finish it within a month. It was not to be. The hand of death was near, to take from some of our number a dearest friend, and from all the man who with Darwin and Spencer revolutionized thought, by direct application of principles deduced from the study of animal life.

No one interested in topics involving Marine Zoology will need to be reminded of the claims of Lovén. Eighty-six years of life are not vouchsafed to all working naturalists; and long or short their lives, few have there been whose earnestness, singleness of purpose, and devoted application to consistent, conscientious work, have in any measure approached his. His writings on the Mollusca of the Scandinavian seas, although in a measure eclipsed by the brilliance of that which he accomplished later on the Echinodermata, will remain conspicuous for their wide range, and for the desire to determine all that was ascertainable about the structure and distribution of the animals before generalizing upon them. As a stimulus to others they have been productive of good results, and in connection with the initiation of Arctic research they will remain classical. Nor must we forget that he was the first to describe the comparative morphology of the radula, and to use that organ for purposes of classification.[3]

The name of Bracebridge Wilson has a special claim upon us, through our Secretary, who is now working out some of his Chitons. In the intervals of a busy life as a pedagogue, Mr. Wilson was many years dredging Port Phillip and Bass Strait. Our veteran Carter worked for years at Wilson's Sponges, and Agardh at his Algæ. The recent brilliant investigations of Dendy into the Sponges have been performed on his material. Spencer has worked out his Hydroids, Hickson his Alcyonarians, Haddon his Actiniæ, Spencer

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[1] Huxley and Pelseneer, "Rep. of the Voyage of H.M.S. 'Challenger,'" Appendix (Zool., part 83).

[2] Nature, vol. xxviii, p. 187.

[3] Lovén, in a paper remarkable for its thoroughness, Ofvers. K. Vet. Akad. Handlg. 1847, p. 175.

his Platodes (*Amphiptyches*), Miss Buchanan his Chætopods, Bell his Echinodermata, Jackson his Pycnogonida, Herdman his Tunicata, and Lucas his Fishes, while McGillivray and Dendy have been engaged upon his Bryozoa. The "Catalogues of the Australian Museum" and the "Prodromus of the Animals of Victoria," as volumes, bear witness to his industry and enthusiasm. For the past twenty odd years his yacht and its crew have been always at the service of marine biologists; they had but to express a desire and it was gratified, and if an animal or plant were required for legitimate work, were it ever so rare, no pains and no expense were too great to secure it. There are few collectors whose names will be associated with as great a number of novel forms of life as Bracebridge Wilson's. His decease has come at a time when steps were being taken to secure him some fitting recognition of his labours.

Turning now to general progress in Malacology, we find that during the past year the Belgian, Italian, and German Malacological Societies, and the English Conchological Society, have gone on in the even tenour of their ways; and that the publications devoted solely to the study of the Mollusca—the "Journal de Conchyliologie," "Nautilus," and the "Journal of Malacology"—have appeared as usual. Of monographs, we have to record with much interest the completion of Pilsbry's masterly study of the Helices, in Tryon's "Manual of Conchology." Though critical voices have been raised, there is no doubt of the solid success attained in this piece of work, and of the utility of the author's system of classification. We give expression of our indebtedness to the Academy of Natural Sciences, Philadelphia, for enabling the author to undertake his useful task, and note with satisfaction that the Marine Series of the work has punctually appeared.

The "Conchylien Cabinet," of which several parts, relating more especially to *Columbella*, *Aspergillum*, *Gastrochæna*, and *Helix*, have been issued, has made steady progress. A textbook of the Mollusca has been published by the Rev. A. H. Cooke, in which an attempt has been made to combine popular treatment with recent scientific research, and in which Geographical Distribution has received a predominant consideration. Among faunistic records, one of the most important dealing with the Marine Fauna is the "Catalogue of the Marine Mollusks of Japan" by Pilsbry. In that work, enumerating about 500 species and varieties more than were recorded by Dunker in 1882, the nomenclature has been carefully revised to date.

The Terrestrial Mollusca have formed the subject of several formal catalogues. We have to record those of the Bahamas, St. Vincent, and neighbouring islands, in our own Proceedings. Monsieur Crosse has published an elaborate review of the land and fresh-water shells of New Caledonia; and Colonel Godwin-Austen has compiled a list of the land-shells of the Andamans and Nicobars. Many new forms have been described, especially from the Philippines and Borneo. Monsieur Locard has issued a work on

the "Collection Draparnaud," in which he has followed the example of Hanley, who so carefully studied the Linnean Collections. At home, we note a further instalment of Taylor's "Monograph of the British Land and Fresh-water Mollusca."

A pleasing feature of the year's work is the greater zeal in uniting malacological with conchological knowledge, betokening a healthy determination to deal wherever possible with sets of organs rather than mere organological detail.

On the Palæontological side we note two important works dealing, the one chiefly and the other wholly, with the Opisthobranchiata. I refer to M. Cossmann's memoir in the "Mém. Soc. Géol. France," Paléont., tom. v, mém. 14, and his "Essais de Paléoconchologie Comparé" the first fascicule of which appeared in February, 1895. The latter great work by our distinguished Foreign Member, when completed, is to contain brief diagnoses of all genera and subgenera of fossil Mollusca, and when the characters of these specially involve living forms the latter will be described. Ranges in time are given in much detail, and the work cannot fail to be of great service to Malacologists.

M. H. Douvillé has entered upon another masterly memoir on the Hippurites.[1]

The "Zeitschr. Deutschen geologischen Gesellschaft" for the year contains interesting papers on the Molluscan Fauna of certain Cretaceous beds by Günther Maas, and a summary of our knowledge of the Ammonite genus *Quenstedticeras* by Weissermel. The first portion of a large work on the Cephalopoda of the Cretaceous of Southern India has been issued by the Palæontological Institute of the Vienna University, from the pen of Dr. Franz Kossmat. This reviews the work of Stoliczka and brings it up to date, and adds much information on the subject generally. The author has had access to a quantity of new material, and his work is largely based on the study of type specimens.

The Pelecypoda of the Devonian beds of the Rhine have been monographed by Dr. L. Beushausen in the "Abhandlungen König. Preuss. Geol. Landesanstalt," with an accompanying atlas of 38 plates.

The monograph of the Mollusca of the Tertiary of Piedmont and Liguria, commenced by Professor Bellardi, and after his death continued by Professor F. Sacco, of Turin, has received another instalment. It deals with the Cerithiidæ, Triforidæ, Cerithiopsidæ, and Diastomidæ; and is notorious for the creation once again of a large number of "varieties" which Professor Sacco, and nobody but he, would appear to recognize.

It is with much pleasure that I draw your attention to the appearance of the first volume of the "Palæontographia Italia," published under the direction of Professor Mario Canavari, of the Geological Museum of the University of Pisa. It is intended that this work shall eventually describe the whole of the fossils of Italy, after the example set by our own Palæontographical Society; and in the part

[1] "Mém. Soc. Géol. France," tom. v, fasc. 4.

issued the following monographs will be of much service to Malacologists, viz.: "Nuove osservazioni sopra la fauna e l'età degli strati con Posidonomya alpina nei Sette Communi," by Sig. C. F. Parona, and "La Fauna del Trias Inferiore nel versante meridionale delle Alpi," by Sig. A. Tommasi. So, too, will the first portion of a synopsis of the Tertiary Mollusca of the Venetian Alps, which the volume contains.

In Monograph No. 24 of the United States Geological Survey, Professor R. P. Whitfield has for the first time systematically described the Mollusca of the Miocene of New Jersey; and our distinguished Foreign Member, Professor W. H. Dall, has written in "Trans. Wagner Free Instit. of Sci. Philad."[1] a work embodying a "new classification of the Pelecypoda." The whole forms an introduction to the description of the Tertiary Pelecypoda of Florida, and after "a brief discussion of the features of the Pelecypod organization chiefly available as diagnostic characters," an enumeration is given "of the differential characters of the orders, suborders, superfamilies, and families," and "a statement of their range in geological time, and an enumeration under each family of the chief generic groups believed to be referable to it."

Important communications upon the Cephalopoda, by Hyatt, and Michael, have appeared, and F. Bernard has given us[2] the first part of a most important study of the hinge of the pelecypodan shell. To the consideration of these monographs, which are special, I shall return; but I cannot dismiss comment upon work on the Continent without expressing our gratitude to Professor Karl von Zittel for the 198 pages which in his "Grundzüge der Palæontologie" he has devoted in so interesting and instructive a manner to the Mollusca.

In our own country, the annual monograph of the Palæontographical Society has brought us (1) Hudleston's Part i, No 8, of the "British Jurassic Gasteropoda," devoted exclusively to the Pleurotomariidæ of the Inferior Oolite; and (2) "*Carbonicola*, *Anthracomya*, and *Naiadites*, Part ii," by Dr. Wheelton Hind, in which the Anthracoptera are monographed,—both authors being members of our Society.

The Transactions of the various Societies more or less concerned in the study of the Palæontology of the Mollusca show that the work of the year has been in no respect below the average.

The growth of Marine Biology, so intimately associated with the work of our Society, has during the past year assumed a historical phase, in the completion of the "Reports of the Scientific Results of the Exploring Voyage of H.M.S. 'Challenger.'" When, twenty-three years ago, that vessel set sail, the most sanguine of specialists could have had little conception of what was about to be achieved. The discovery of the remarkable "Septibranchiata," and the capture of Pteropod forms which have enabled us to definitely settle the position of these organisms in the zoological series, are

[1] Vol. iii, part 3.
[2] Bull. Soc. Géol. France, sér. III, tom. xiii, p. 104.

conspicuous among the more important "results" which interest us. Of *Spirula* I have spoken. The report on the Cephalopoda strikes me as second to none in its thoroughness, and it is much to be regretted that its indefatigable author had not better and more extensive material at his disposal. It may be questioned whether the best was made of the existing methods of preservation on this memorable voyage; but, allowing for shortcomings which, now as always, become evident only when it is too late, the net result has been a monumental work which must form the basis for all future operations, and for this the world stands gratefully indebted to England's great naval authorities, who have here shown themselves as ready to respond to the call of scientific as of territorial warfare.

I question whether any zoological discovery of the "Challenger" will yield in importance to that of the anomalous *Cephalodiscus*; and if we are justified in embracing the study of the Brachiopoda within the scope of our Proceedings as members of a Malacological Society, I offer you no apology for claiming this remarkable animal as one which specially affects our interests. Permit me, however, to digress here, and raise the question whether we should not do well to reconsider the limitations of our Society; for if we are to claim the Brachiopoda as our own, the Bryozoa must follow, and if these, why not that zoologists' waste-paper basket the entire so-called "Class Vermes." To retain the Brachiopoda within our sphere of action, because they happen to be the bearers of a bivalved exoskeleton, now that Malacology stands upon a scientific basis and aims at something more and higher than the mere cataloguing of cabinets of shells, is unscientific, and certainly not calculated to advance our best interests.

With the closing in of the "Challenger" work, there has come the full light of that of subsequent expeditions, notably the "Albatross" and "Investigator." Malacologists are now in possession of reports upon the Heteropoda, Opisthobranchiata, and Pteropoda of the former; and the discovery of an animal so remarkable and unexpected as the free-swimming Holothurian *Pelagothuria* furnishes a result which to the reflective mind renders the achievements of the "Albatross" expedition not a whit less impressive than those of the "Challenger." Our American confrères, benefiting by our experience, have made the most of modern methods, and have furnished us with coloured drawings of the more important novelties, made from life. In their hands, and in those of persons whom they have called to their aid, there is accruing a result which will materially extend the world's knowledge along natural lines of growth.

As for the "Investigator," under Dr. A. Alcock results of the highest importance continue to accumulate. I hold experts' authority for the assertion that the versatility and reliability of Dr. Alcock's work is of an altogether exceptional order. Of his researches among the Fishes I can speak from experience. The malacological fruits of the expedition, under the care of our Vice-President Mr. Edgar Smith, are especially noteworthy for the discovery of a new and remarkable Gastropod genus (*Pontiothauma*), the systematic position of which has

yet to be decided. The two species of this genus are now in the hands of another of our members for anatomical study, and are yielding results which seem likely to have important bearings on our ideas of classification. If, as would appear, the genus is allied to the Pleurotomidæ, both species must be giants of the family (the larger measuring 136mm. in length).

The year has witnessed the appearance of the first portion of the work of the German "Plankton-Expedition" relating to the Mollusca, in which our Foreign Member, Dr. H. Simroth, has dealt very fully with the embryonic and larval forms of the Marine Gastropoda; and among the further instalments of the results of the "Hirondelle" expeditions, Dr. Joubert has written an excellent account of the Cephalopoda of the North Atlantic.

Intimately associated with progress in Marine Zoology is the growth of marine stations or observatories; and here our interest in the immediate future is turned to America and the far East. The work already accomplished at Newport and Wood's Holl in the former country, and at Misaki in the latter, is known to us all, and recognized throughout the world. The discovery in the Japanese seas of the shark *Chlamydoselache* and of a new Euplectellid, important in their way, are eclipsed in our eyes by that of a Pleurotomarian; and I am informed that this animal is now being made the subject of full investigation by Professor Ijima of Tōkyō. Our Eastern friends write of new species of *Hyalonema*, of Elasipoda, of "new and beautiful Gorgonias"; and when they tell us that as soon as matters are quiet at Formosa they intend to follow up conquest by scientific exploration, we return them the "duty of a devout and learned admiration" of their enterprise and far-sightedness.

Conspicuous among their schemes for the future is the foundation of a considerable Marine Laboratory, and it is an open secret that our American brethren contemplate a similar project. No sooner do the Americans discover a new genus of Chimæroid fish than the Japanese come forward with a second species of it. The description of the anatomy of *Pleurotomaria* by Dall is to be succeeded by one by Ijima. Indeed, seeing how vast is the field and how energetic are the workers, we are led to ask if the time may not be dawning when the representatives of these two great nations, which bound the opposite shores of the Northern Pacific, may make a bid for the biological, as they seem likely to do for the commercial, supremacy of the world.

Increased activity in the Marine Laboratory, during recent years, has been followed by that in the investigation of Life in Fresh Water and Marine Estuaries, with accompanying foundation of establishments for the purpose. Our County Councils, which have so enthusiastically taken up the cause of science and scientific education, are showing signs of activity in this direction, and the "Norfolk and Norwich Naturalists Society" is at present contemplating a scheme for nothing less than the systematic study of the Biology of the Broads. Under the auspices of the Royal Society and the British Association, Mr. J. E. S. Moore is now at work investigating the

African Lake Fauna. In this department of labour, however, interest for the session 1895–96 again centres in America. On the Illinois River, a hundred miles west of that city, there is now afloat, midst most picturesque surroundings, a laboratory affording accommodation for sixteen workers. Under Dr. C. A. Kofoid, as superintendent, and the University of Illinois, an efficient body of working biologists and chemists, with an artist, have been brought together. The institution has been primarily established for research by its own staff, but during the months of June, July, and August, competent investigators will be welcomed on easy terms; and, following the example set at Wood's Holl by Professor Whitman and his colleagues, it is expected that the membership of the station will be organized as a biological club, to hold stated meetings for conference, discussion, and occasional lectures.

The foregoing, however, is not all, for there is something significant in the words "Biological Experiment Station," applied to this floating Laboratory. One of the latest phases in post-Darwinian activity among Biologists has been the development of what Yves Delage has termed[1] the science of "Biomécanique."

Modern speculation upon heredity and other far-reaching problems in Biology has brought us, through the researches of Driesch, Herbst, Roux, Hertwig, Wilson, and others, to the application of experimental methods to the study of life. The descriptive method is now being supplemented by these; but do not let us fall into error as to what it is that is being attempted. The physicist and chemist taunt us with charges of inexactitude, and draw distinctions between theirs the "exact" and ours the "inexact" sciences. They overlook the fact that with organic matter it is impossible to remove for direct purposes of experiment this or that factor at will, as is customary with experiment upon the inanimate. Whereas they are dealing with inanimate elements and bodies of known or determinable composition, it is ours to deal with an animate compound at present indeterminable. By the so-called experimental method in Biology, it is possible only to institute changed conditions, and to observe the effects thereupon produced. It is daily becoming more and more evident that the moment we come into contact with living protoplasm (the "primordial utricle" of the earlier vegetable histologists), analogy to the inanimate, as involving chemical and physical processes, largely ceases. The time-honoured analogies between the parts of the animate body and the inanimate machine must be discarded as mischievous; and as to what is going on in the actual performance of what we term "vital activities," we are at present only able to judge by a process of close reasoning. Far be it from me, however, to depreciate the value of either the "statistical" or "experimental" methods, as now being applied to the study of vital phenomena. The work has to be done, come what may; and I am rather lost in admiration of the pluck of those who dare face conditions so complex and changeable—compass, thermometer, re-agent bottle, test-tube, scalpel, or needle, in hand.

[1] Yves Delage, Rev. gén. sci. pures et appliq., 6e Ann., No. x, Paris, 1895.

The experimental method has already achieved much, and in our own department signs are forthcoming of useful and suggestive results. Thus, in the year 1890 our energetic well-wisher Professor W. A. Herdman, as the result of some preliminary experiments on the periwinkle (*Littorina rudis*), was led to the conclusion,[1] which had been already foreshadowed by Jeffreys, that that animal may be becoming adapted to a terrestrial existence. Again, H. de Varigny, repeating the observations of Semper upon the growth of *Limnæa*, has shown,[2] from an elaborate series of experiments—varying the temperature, food supply, the access of air, the volume of water, and, above all, the limits of movement and the numbers of his colonies—that there is no reason for concluding that the favourable influences of a large volume of water are here due to the presence of chemical agents favourable to growth; but that, conversely, the retardation in growth would appear to be directly related to limitation of activity and power of movement. What a field lies before him who will continue the study of this plastic genus!

When, in addition to this, we reflect that in the so-called *Physa lamellata* of Madagascar, as Paul Pelseneer has successfully proved,[3] we have to deal with a Pulmonate which, in secondary adaptation to aquatic life, has developed a tegumental "gill" morphologically distinct from the ctenidium; that in *Planorbis corneus* and *P. marginatus* a similar tegumental lobe is present; that in *Ancylus* this same secondary adaptation has led up to the suppression of the lung-sac; that from the folds of the adhering Chiton air as well as water may be displaced on handling; and that Simroth has just recorded from the Tenimber Islands[4] a Chiton (*Acanthopleura spiniger*?) which would appear to have developed a pulmonary organ of respiration, our interest in experimental inquiry as it may relate to the environment and changed conditions of life is aroused to the utmost. If such things have come about in the course of time, and can be established by actual manipulation, who knows what may not await the patient experimentalist of the future. In its bearings on the conditions of local distribution in shallow water, on bathymetric extension, and specific variation as related to these influences, the experimental method appears to me to give promise of most important results in Malacology. Just as the physiological graduates off into the pathological, the full significance of many a healthy or a diseased state becoming intelligible only on a knowledge of its opposite, so, in the hands of the experimentalist, the normal phenomena of animal life will most assuredly, in course of time, become illumined by prolonged and careful study of the organism under changed conditions. And from all that is now going forward, it is plain that the pathologist holds the key to the solution of many a life problem.

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[1] Herdman, Rep. Liverpool Mar. Biol. Sta. Liverpool, 1890, p. 17.
[2] Journ. Anat. Phys. Paris, tom. xxx, p. 147.
[3] Comptes Rend. Acad. Sci. Paris, tom. cxix, p. 354.
[4] H. Simroth, Sitzb. Naturf. Gesellsch. Leipzig, Jhg. 19–21, 1895, p. 106.

Much of the experimental work already achieved in Biology has lain with the egg, and with the early stages of development, at which susceptibility to disturbing influences and the action of external stimuli is greatest; but, side by side with progress in this new departure, there has come about a more exact determination of the detailed processes at work during normal development. Our faith in the germ-layer theory, at any rate so far as it involves the so-called "mesoderm," is shaken to its foundations. We now know that what are usually termed homologous parts may differ fundamentally in origin under different conditions of development, and the structure and relations of the developed organ become once more the standards of comparison.[1] Following in the wake of Whitman and his classical monograph on the development of the leech *Clepsine*, we now seek to determine the relative values of the individual embryo-cells by their ultimate fate. "Cell-lineage" is the term applied to this most important departure in Comparative Embryology, and in the hands of Wilson, Kofoid, Castle, and others, it is revolutionizing our conceptions of the fundamentals of Embryology. As Kofoid's investigation[2] chiefly concerns a common slug (*Agriolimax agrestis*), a word in detail concerning it. In the first place, having observed an alternation in the direction of the spindles and the planes of division of the blastomeres, he formulates a law of "spiral cleavage," as distinct from "radial" and "bilateral." Critically examining the work of his predecessors, he proceeds to show that in a number of other Mollusca evidence for the operation of this spiral cleavage has been obscured by the nomenclature employed. He, however, formulates one "law," but to challenge another, and that bearing the honoured name of Francis Maitland Balfour. It was one of Balfour's greatest achievements to have attempted to correlate the rate of segmentation and the size of the blastomeres with the proportional development of food-yolk. "Where the yolk spherules are fewest," he wrote, "the active protoplasm is necessarily most concentrated, and we can lay it down as a general law that the velocity of the segmentation in any part of the ovum is, roughly speaking, proportional to the concentration of the protoplasm there; and that the size of the segments is inversely proportionate to the concentration of the protoplasm." Since Balfour's time it has become evident that of two eggs otherwise similar, the one bearing the larger amount of yolk cleaves the less rapidly, and that, all things considered, we may regard the greater development of food-yolk as favourable to the reduction or absence of metamorphosis, and the more rapid assumption of the fully-developed state. In *Agriolimax* and *Umbraculum* (*Umbrella*, auct.), however, on Kofoid's showing, it is the larger of the two first-formed cells which is the first to divide,

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[1] *Cf.* E. B. Wilson, "Embryological Criterion of Homology": Wood's Holl Lect. for 1894, Boston, 1895, p. 101.

[2] Bull. Mus. Comp. Zool. Harvard, vol. xxvii, No. 2; and prelim. paper in Proc. Amer. Acad. Arts and Sci., vol. xxix, p. 180.

and this tendency of the yolk-laden cells to cleave first is further evident in *Neritina* and in members of Invertebrate classes other than the Mollusca. As Kofoid points out, "a paradox is thus presented. Yolk appears to delay cleavage in the cells of the frog's egg, to hasten it in the cells of the snail's egg." The discovery by Ishikawa[1] that among the Daphnidæ the summer egg may be little yolk-laden and holoblastic, and the winter egg rich in yolk and meroblastic, like that of the so-called "dorsal" disposition of the endodermal blastomeres in some Tunicates[2]; and the announcement[3] that in *Limulus*, in which yolk-division would appear to be normally meroblastic, the segmentation of eggs of a batch may be either meroblastic or holoblastic, in accordance with comparatively trivial changes in position and environment, teem with interest in this association; and we are led to inquire into the part played by gravitation and specific gravity. History once more repeats itself; and we Biologists, having to deal with probabilities, have to be content with tentative conclusions —but we are none the further from the truth for all that!

Dr. Kofoid's monograph was immediately followed in time of writing by a short paper by H. E. Crampton, of New York, in which it is shown[4] that whereas in the dextral *Limnæa columella* cleavage is dextral, in the sinistral *Physa heterostropha* it is reversed and sinistral.

Dismissing this branch of our subject, with the remark that in respect to it our Japanese friends are not one whit behind,[5] let me now say a few words concerning one or two special advances which we in part owe to the older, and withal the ever-reliable, methods of comparative anatomy.

The genus *Siphonaria*, from the shell of which some of us whose occupation takes us into the examination room have learned much that is instructive and undreamed of by the conchologist, is once more to the front. Köhler, in an admirable and beautifully illustrated monograph,[6] has pointed out that its gill, in structure allied to that of the Pleurobranchidæ, is in position akin to that of the Bullas. Arriving at the conclusion that this is a true ctenidium, and that the points of structural agreement between the gills of *Siphonaria* and the Tectibranchiata are indicative of close genetic relationship, the author proceeded to carefully investigate their innervation. Support for his conclusion was obtained, and, finding that in respect to the general organization of the nervous and reproductive systems there were further points of structural community between *Umbraculum*, the Bullidæ, and *Siphonaria*, he closes a case for the retention of the latter much debated genus among the Opisthobranchiata. But no sooner is

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[1] Ishikawa. See paper by Watase in Journal of Morph., vol. iv, p. 260.
[2] Samassa, Archv. Mikr. Anat., Bd. xliv, p. 1. *Cf.*, however, Castle, Ann. New York Acad. Sci., vol. viii, p. 167.
[3] Patten, Zool. Anzeiger, Bd. xvii, p. 72.
[4] Proc. Amer. Acad. Arts and Sci., vol. xxx, p. 200.
[5] *Cf.* Mitsukuri, Anat. Anzeiger, Bd. xi, p. 406.
[6] Zool. Jahrb. Anat. Abth., Bd. vii, p. 1.

this position established, than Pelseneer, also relying upon the study of internal as well as external characters, builds up a no less forcible argument[1] for the retention of the genus among the Pulmonata.

As the necessity for a fuller study of the Molluscan nervous system comes here prominently forward, allow me to direct your attention to two somewhat earlier investigations of the same category, by which one of our most novel systems of classification has been brought under the action of time. I refer to that based on Spengel's important work upon the nervous system and sensory apparatus. *Actæon*, judged by the structure of its shell and its persistent operculum, would appear rightly placed among the lower Opisthobranchs. During a careful anatomical investigation, Bouvier has made the important discovery[2] that it has a twist in its visceral nerve-loop. Plate follows in the wake, with the discovery[3] that *Chilina* is also streptoneurous; wherefore, from the study of their nervous system alone, we might place these two genera among the Prosobranchs. From what is known of their general organization this would be an unwarrantable proceeding, and the only alternative is the conclusion that we have here to deal with an inherited streptoneury. If we are justified in this, the argument that the euthyneurous condition of the Opisthobranchiates and Pulmonates points to an orthoneurous ancestry must be held in abeyance.

Opisthobranchs and Pulmonates from Prosobranchs! A revolutionary deduction from a comparatively simple anatomical fact; but from what we know of the nervous system as a guide to affinity and inter-relationship among other great groups of animals, it is justified.

We may here most fittingly record the observation of Dr. J. D. Gilchrist[4] that although in the untwisting of the Gastropod body consequent on the reduction and loss of the shell, the original bilateral symmetry may be apparently resumed, the organs originally lost under the mechanical effects of torsion do not reappear. I cannot dismiss this paper without diverting your attention to Dr. Gilchrist's ingenious proposal to simplify our conceptions and our classifications by discriminating between Mono-, Di-, and Poly-placophora, expressing the hope that in his new office at the Cape he will not forsake the Mollusca.

Passing to the Isopleura, we note the discovery by Haller[5] of the recurrence of auriculo-ventricular valves, there being four pairs in *Chiton Goodalli*.[6] Our member, Mr. R. H. Burne, has partly confirmed Haller's observations during the year. The occurrence of recurrent symmetry of parts of the bodies of these Molluscs which are popularly regarded as approximate to the worms, is of manifest interest; but the facts appear to me to support the conclusion now

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[1] Mem. cour. 4°, Acad. Sci. Belg., tom. liii, No. 8.
[2] Comptes Rend. Anat. Sci. Paris, tom. cxvi, p. 68.
[3] Zool. Jahrb. Anat. Abth., Bd. ix, p. 200.
[4] Proc. Roy. Soc. Edinb., vol. xx, p. 357.
[5] Morph. Jahrb., Bd. xxi, p. 28.
[6] Originally described as *C. magnificus*. *Cf.* Zool. Anz., Bd. xix, p. 200.

steadily gaining ground that metamerism is everywhere and in all its forms secondary, and therefore valueless as a criterion of class relationship. Equally interesting, is Pruvot's discovery[1] that *Myzomenia* (*Dondersia*) *banyulensis* is in the young condition the bearer of dorsal plates—important this, as affecting the rescue of the Neomenidæ from a dangerous association with the Platodes, and full of meaning in its general bearings upon simplification of organization.

We turn now to the Cephalopoda. One direct result of the recent salting of the European market with Pearly Nautili has been a very useful paper by Mr. Graham Kerr, of Christ's College, Cambridge, dealing[2] with some disputed points in the anatomy of that animal. Passing over his work upon the body-cavity, which has altogether special bearings, and his discovery that the lamellar organ is functional as a receptaculum seminis, it is interesting to find in this archaic Mollusc a plate-like ovary, akin in its fundamental characters to that occurring at the base of the vertebrate series. Thanks to Mr. Kerr's work, we are justified in concluding that the assumption of a "cystoarian" condition by the higher vertebrate and molluscan types is unquestionably expressive of a parallelism of modification of corresponding parts.

Interest in Mr. Kerr's inquiry is greatest as involving a re-determination of the morphology of the "arms" of Cephalopoda. It is needless to recapitulate details concerning the rival theories of Leuckart and Huxley that they are pedal, and of Grobben and others that they are circumoral in origin; suffice it to say that Kerr, taking his stand upon the homologizing of the Cephalopod "funnel" with the whole "foot" of the Gastropoda, and upon the conviction that there is insufficient justification for the assumption that any one ganglionic mass of the Cephalopod can be really said to correspond to the "pedal" ganglion of the Gastropoda, makes out a plausible case for the upholders of the pedal theory. He appears to me, however, to have been working under too great a bias in favour of the argument for a Platode ancestry of the Mollusca. His substantiation of the pedal nature of the "funnel" is certainly borne out by the condition in *Nautilus*, and it receives considerable support from Jatta's recent conclusion[3] that the funnel (Müller's or Verrill's) organ of the Cephalopoda is a mucus-secreting structure, homologous with the pedal gland of the Gastropoda. His observations do not appear to me to render it still impossible, however, that the "funnel" may not be mesopodial, and that therefore the cephalic tentacles may be propodial and, after all, pedal. The last word has not been said upon this important question.

As Mr. Kerr's paper was passing through the press, there appeared a valuable monograph by Haller,[4] based upon material collected by

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[1] Comptes Rend. Acad. Sci. Paris, tom. cxi, p. 689.
[2] Proc. Zool. Soc. 1895, p. 664.
[3] Jatta, Boll. Soc. Nat. Napoli, ser. I, tom. vii, p 45.
[4] Haller, Semon's "Forschungsreisen in Austr. und i. d. Malayischen Archipel." See Denkschr. Med. Naturw. Gesellsch. Jena, Bd. viii, p. 187, 1895.

Prof. R. Semon during his recent sojourn in Australia and the Malay Archipelago. As a result of the excellent preservation of Semon's specimens, Haller has been enabled to describe several interesting points in histological detail.

Following close upon these papers is a preliminary report on a critical study of the *Nautilus* from Australia, by Professor Haswell of the Sydney University; and when we consider that he of necessity commands ample material, and that some of the recent descriptions of the parts of this animal are grossly misleading by error of orientation, we await the full report of so trustworthy an observer with eagerness. Special interest attaches to Professor Haswell's work, in its bearings on the question of sexual differences in the tentacular lobes.

This naturally leads us to a recognition of the attempt now being made by Willey to work out the development of this archaic creature—an attempt which we know to have been rewarded[1] by the capture of young specimens, through the adoption of a lobster-pot method, akin to that long ago successfully employed and recommended for use in deep water by Dr. Günther.[2]

D'Orbigny, as is well known, more than fifty years ago suggested that certain differences in the shells of Ammonites might possibly be indicative of sexual dimorphism. The first important conclusion put forward by Willey is, that in the adults of the *Nautilus pompilius* this is the case; and the interest of the observation is heightened by its confirmation a month later by Vayssière, with extension to *N. macromphalus*.

Intimately related to this topic is that of the determination of the inter-relationships of the hordes of extinct Cephalopoda—alas! known to us only by their shells. To mention the name of Hyatt in this connection is to command respect. Within a month of my predecessor's address to you, Hyatt had eclipsed himself. Dealing[3] with the dorsal furrow or "impressed zone" from a developmental standpoint, in an important monograph laid before the American Philosophical Society in August, 1894, he has sought to establish a case for "the phylogeny of an acquired characteristic" which little short of a refutation of his determinations would appear to me to weaken—and the glove is once more thrown down on behalf of the palæontologists, but by one of their number who happens to be also an embryologist.

That vexatious organ the aptychus has during the year yielded a point of supreme interest, Dr. R. Michael, of Breslau, having discovered[4] a Solenhofen slab bearing an *Oppelia steraspis*, within the body-chamber of which there lie the remains of some sixty shells of the offspring, each with its own aptychus. From the detailed study of the specimen the conclusion has been drawn that

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[1] Willey, Nat. Sci., vol. vi, p. 409.

[2] Günther, "Instructions for collecting Reptiles, Batrachians, and Fishes" for Brit. Mus. Nat. Hist. Lond. 1891, p. 15, primarily in Anleitung z. Wiss. Bobachtungen auf Reisen, Berlin, 1880, p. 423.

[3] Proc. Amer. Phil. Soc., vol. xxxii, p. 349.

[4] Zeitschr. Deutsch. Geol. Gesell., Bd. xlvi, p. 697.

the shell of the parent was functional as a brood-chamber, and that the aptychus, being developed by all individuals, was not confined to the females.

In concluding this section of my address, let me direct attention to what I believe to be one of the most fruitful outcomes of recent biological inquiry, viz. the wide recognition of the phenomenon of convergence; and by that I mean the realization, more or less marked, of a similar definitive condition by members of distinct groups of animals—a principle forcibly, though often unconsciously, expressed in the declaration that this or that group is di- or polyphyletic.

That inextricable tangle the question of mammalian tooth-genesis is to-day yielding overwhelming evidence of its importance; and it is now a question in the minds of those best competent to judge whether even some of the characters which Man and the apes possess in common may not have been independently evolved, by parallelism of adaptive modification. Among the great vertebrate classes, in the Tunicata, Arthropoda, "Vermes," and away down to animals still lower in the scale, marked indications of the working of this principle are to be recognized. And within the close of the year 1895, under the category of "a special case of mimicry," that which appears to me a convergence has been recognized[1] in the Didymoid Graptolites among lowly organisms wholly extinct, by Messrs. Nicholson and Marr.

So far as I can gather, the evidence for convergence among Mollusca has not been sufficiently admitted, if indeed it may not have been denied; but among recent monographs I may cite that of F. Bernard on the hinge-teeth and ligament of the Eulamellibranchiata, as one which teems with it. The bearings of this principle on our classificatory schemes are only too obvious, and in dealing with it, it cannot be too strongly enforced that its certain appreciation is only possible when systems, and not mere parts, are studied in their natural association. And it is pertinent to this statement that our own members, Messrs. Collinge and Godwin-Austen, after investigating both the external and visceral anatomy of the slugs of Borneo, have concluded[2] that these bear the same relationship to the shell-bearing Gastropods of their locality as do similar forms occurring in other regions of the globe.

When, on a sufficient knowledge of their all-round anatomical structure, we were able to say what it is that constitutes a Cephalopod a Cephalopod, and what a Pteropod a Pteropod, it became only too evident that the development of peri-oral lobes and buccal cones among the latter is but a parallelism with that of the "arms" and suckers of the former. And if, with Köhler, we are to relegate the *Siphonaria*, and with Plate, the *Gadinia*,[3] to the Opisthobranchiata, we have next to consider how far the characters upon which they have so long been associated with the Pulmonata

[1] Nicholson and Marr, Geol. Mag. 1895, p. 538.

[2] Collinge and Godwin-Austen, Proc. Zool. Soc. 1895, p. 248. *Cf.* also Godwin-Austen on *Parmarion*, Ann. and Mag. Nat. Hist., ser. 6, vol. xvi, p. 434.

[3] Sitzungsber. Akad. Wiss. Berlin, 1893, p. 962.

may be but an index of parallelism of modification with that group. In this association, the mind reverts to Pelseneer's *Pulmobranchia* and its allies, with a peculiar interest and suspicion. In this genus the neomorphic "gill-fold," as in *Planorbis* and most *Ancylus*, is present on the left side, but in *Ancylus lacustris* it is on the right. So great a difference between species of a genus is by no means unknown on the vertebrate side; and one is led to inquire whether the Mollusca possessed of this secondary organ of aquatic respiration may not be disconnected forms, as certainly are some of the fishes which have independently developed organs of terrestrial respiration and of electrical discharge. And, to bring the matter home, permit me to remark that the "Investigator" *Pontiothauma*, which, judged by the characters of its shell alone, would be referred to a position approximate to *Sipho*, appears, on preliminary dissection by our member, Mr. S. Pace, to be a Toxoglossate, and thus closely allied to *Pleurotoma*.

I will not pursue the question further, but rather again emphasize the necessity for its investigation, under the firm conviction that Molluscan genera such as *Fasciolaria*, *Pisania*, *Engina*, and *Ricinula*, the smaller species of Pleurotomidæ, and *Columbella*, would well repay extended inquiry into the anatomy of their soft parts, to say nothing of the animals lying generally on the borderland of the Pulmonata and Opisthobranchiata. I would remind you that the North American genus "*Acanthina*" is now known to be an assemblage of species of *Purpura*, *Latirus*, *Ocinebra*, and *Trophon*; and I trow that in respect to this far-reaching principle of convergence the class Mollusca will be found second to none in interest.

Advancement indeed has the Malacotomist to record. And when we reflect that the classification of the Pelecypoda by their gills has been of late widely accepted; that in not a few of our most recently described Pulmonata visceral characters of specific value have been recognized; and that for the diagnosis of the newest family of Nudibranchiates[1] internal as well as external characters have been found requisite,—the spirit of Johannes Müller, the father of Comparative Anatomy and a Malacologist, rises before our minds, as it were, to demand its rights.

I come now to the fulfilment of my last resolve, viz. to say a few words upon our relationships to our fellow-zoologists, and upon the position of our chosen subject in the *rôle* of science. The former is, at any rate, a vexed question in the minds of some, though not of the truly scientific. The species-man, weighing his minute characters, is derided as a "mere systematist," the "morphologist," glorying in the breadth of his horizon, barely condescending in some cases to give him passing notice, entirely overlooking the fact that our greatest generalizations in Biology are based on work in systematics

[1] The Hedylidæ, R. Bergh, Verhandl. k.-k. zool.-botan. Gesellsch. Wien, Bd. xlv, p. 4.

and synonymy. While on the "morphologist" honours and popular recognition are bestowed, the "systematist" is but too often put aside as unscientific; and the public, for want of knowing better, are apt to imagine that the discipline of the "systematist" is antiquated and of a totally different order to that of the "morphologist." Our young men can only with difficulty be persuaded to take up so-called "systematics"; and as this estrangement exists and threatens us with disaster, let us briefly consider the situation, "Morphologist" *v.* "Systematist."

The modern methods of elementary instruction in Biology, so largely morphological, are blamed, but for this there is insufficient justification in Zoology. The attractions of the newer branches of morphology — to wit, Comparative Embryology — owing to the readiness with which they lend themselves to discursive treatment, are unquestionably great, but I do not think the root of the matter lies here. What, then, is the explanation, and what the remedy?

It is a strange fact that in the minds, not only of the public, but of scientific men themselves, an almost mischievous confusion exists concerning the limitations of the domain of Biology and of its subsidiary departments.[1] This is no doubt primarily due to the fact that the term is used in a totally different sense by British and Continental workers. We understand by "Biology" the study of all the phenomena manifested by organic matter, whether living or dead; while their term "Biologie," in being applied to the study of life and of the living in action, is more nearly equivalent to our "Physiology." Under the changes of time and growth, which words like all other things undergo, it has become customary with English-speaking Zoologists to regard as a "morphologist" the worker who deals chiefly with internal and minute structure and development. "Morphology," etymologically construed, means the study of form and symmetry, of likeness and unlikeness, of structural similarity and dissimilarity—of phenomena which, as distinct from the physiological, may be as well, if not best, dealt with in the dead state. Our conceptions of the points of external difference and resemblance among animals are expressed in our ordinary classificatory systems; and hence the word "systematist," whose classification is but a formulated expression of his conceptions of the inter-relationships of the animals under his hand. There are "morphologists," however, who construct classificatory systems, based on the study of *internal* difference and resemblance, as an expression of *their* conceptions of inter-relationship. The more advanced "systematists" of to-day take cognizance of internal characters which necessitate dissection, as well as of external which do not; and as the two lines of study thus overlap, it becomes difficult to distinguish between "morphologist" and "systematist." To make a long matter short, setting aside jealousy and monopoly, the confusion lies in the fact that the

[1] *E.g.* the distinction between Biology (instead of Zoology) and Botany, and the remark "most comparative anatomists—or biologists, as they now call themselves."

distinction, if maintained, should be between "Taxonomy" and "Anatomy." Taxonomist and anatomist both adopt the comparative method, both are intent on determining the nature and significance of points of structural similarity and dissimilarity, of likeness and unlikeness, of form and symmetry, and they meet on a common ground as morphologists. In other words, so-called "systematics," properly pursued, is but a branch of morphology, and the so-called "systematist" is a morphologist; and your anatomist, in deriding the species-man, is discounting his own occupation.

But this is not all. Sire, says the anatomist, for want of appreciation of the value of anatomy you classify creatures together having no intimate genetic relationship; and except that you name me my animals I give you up. Sire, retorts the taxonomist, you offend me by your over-generalization. You tell me that, because you find certain points of resemblance between the nervous system of the Isopleura and the Polyclad Turbellarians, the one group has had its origin in the other. I regard you as dangerous, and recommend to you the reflection that points of structural similarity such as these may be but the impress of a common ancestry. You go further—and dare to suggest,[1] because you find a Rhipidoglossan with a dorsally placed operculum, that the operculum and shell of the Gastropoda are serially homologous representatives of the shell-plates of the Polyplacophora. You amuse but do not instruct me, and I, too, give *you* up.

So long as the animating motives in scientific work are as diverse as at present, this difficulty will remain. Haste, slovenliness, want of real (as opposed to personal) interest, the desire for mere notoriety, will always be productive of bad work in science, be it in taxonomy or anatomy; and I am bound to confess that the systematology of the anatomist offends me vastly more than the anatomy of the taxonomist. Species-makers who are content to regard the varieties of spine development in the Neritinidæ and of the shelly processes of the Melaniidæ and *Paludomus* as a sufficient basis for rigid diagnosis, or who offend us by their "*Extra extra*"s, may be left, with the reckless generalizers among anatomists, to their own devices. Beyond merely encumbering the literature, these people do no great harm; indeed, the vaporous speculator may even do good in bringing about his own refutation, just as the breaking down of an experiment may mark the era of a new discovery. None other than Johannes Müller has reminded us that "Die Phantasie ist ein unentbehrliches Gut." The danger lies not here, but in extreme specialization. So long as taxonomist remains taxonomist, and anatomist anatomist, and nothing more, the terminology of the one becoming a jargon to the other, estrangement must continue, and, each going his way, counting his little own supreme, confusion and waste of time and energy must result.

Herein, to my mind, lies the explanation of our difficulty: what the remedy?

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[1] *Cf.* Thiele, Jenaische Zeitschr., Bd. xxv, p. 508.

Specialization must continue in so wide a field, hemmed in by so overwhelming a literature; and as this is so, we seek relief in a choice of departments. Concerning our conceptions of species and varieties, Huxley (writing of the Canidæ) suggested[1] that "it may be as well to give up the attempt to define species, and content oneself with recording the varieties of pelage and stature which accompany a definable type of skeletal and dental structure in the geographical district in which the latter is indigenous." Leaving this pregnant passage to your consideration, I would urge for the future that specialization in the non-applied branches of Zoology should go not along organological lines—one man studying shells, and only shells—but zoological in the broad sense. Let each worker take a scientifically definable group and determine all that he can of its external and internal structure and palæontology (*i.e.* its morphology), and its distribution, before deciding upon his classificatory system. Indications of the dawn of this higher morphology are forthcoming in our own "Proceedings," most conspicuously in Mr. Collinge's paper on the "Myology of some Pulmonate Mollusca"; but I venture to think that we are here going to too great an extreme. What we require is a rational system, in which the study of structure as related to function shall be recognized as a fundamental method of discrimination between "characters" and "characters." Students of more especially the Tunicata and Cœlenterata no longer recognize genera and species founded exclusively on the study of external characters, and it follows that unless we Malacologists recognize anatomy, we must fall behind.

On analysis of a given series of forms we come to genera and species which, in respect to salient morphological characters, depart widely from the more typical members, and it is in the pursuit of these points of departure that our most fruitful results are to be obtained. This argument applies especially to the lower members of a group, as is only too evident from the revolutionary results so recently obtained by Pelseneer from the study of *Nucula*[2] and by Bouvier from that of *Actæon*.

Our immediate point of attack is thus clear.

Form and symmetry are the outcome of physiological forces, and the ultimate aim of biological inquiry is the determination of the natural laws of which they are the expression. If this be admitted, we cannot but deplore the casual dismissal of facts of structure so remarkable as those pertaining to the peristomial region of such genera as *Cataulus*, *Pupina*, *Pupinella*, *Spiraculum*, and the Cyclophoridæ generally, or of the partial constriction of the apertures of many terrestrial and marine Gastropods as "characters," and only characters. It is binding on us for the future to give structural features such as these the full and special attention which they deserve.

In conclusion, let me point out that our newer classifications of the

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[1] Huxley, Proc. Zool. Soc. 1880, p. 286.
[2] Archiv. d. Biol., tom. xi, p. 153.

year have been based on the study of systems and parts not usually employed for the purpose. Pilsbry, from the study of all-round characters, has revolutionized our conceptions of the Helices; Bernard, from the study of the ligament and hinge-teeth of the Heterodont and Desmodont bivalves, dealing with both recent and fossil forms, has thrown a new light on the inter-relationships of the Pelecypoda; while Köhler and Plate, in the discovery of streptoneury among Opisthobranchs and Pulmonates, have struck at the root of one of our most cherished subclass distinctions.

The field is wide, the prospect pleasing, and topics for investigation suggest themselves on all hands. The discovery of a poisonous *Spondylus*[1] bids us beware; the observation that the sperm whale is a trap for big game, in the form of gigantic scaly Cephalopods, offers us sport undreamed of years ago, and the determination of H.S.H. the Prince of Monaco to face the odds and make the most of this,[2] commands our admiration and respect.

Returning to ourselves, we have cause for congratulation in the progress of our Society: no deaths, a completed volume with which to face the world, a Treasurer and Secretary intent only on advancement, an Editor who finds his greatest pleasure in making good our defects. We have passed through the critical period of our history, and it becomes a question of resolve for the future. Let us then leave jealousy and monopoly—sure signs of weakness both—to the grasping; and, remembering that by science we understand common-sense at its best, and by the scientific method, observation with confirmation and deduction, and rejection of the non-confirmable, let us bury our differences before the altar of a New Morphology. Doing this, we need have no fear for the future. Science, with Love, now rules the world.

As for myself, writing *currente calamo*, I have given free expression to my feelings; but I sincerely trust that I have done something towards aiding development in the future, and towards fostering that amicable spirit of brotherhood which has never yet shown itself alien to truly scientific discipline.

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[1] Rochebrune, Bull. Mus. Hist. Nat. Paris, 1895, p. 151.

[2] *Cf.* Comptes Rend. Acad. Sci. Paris, tom. cxxi, p. 1172; and Nature, vol. liii, p. 225.

ON THE APERTURE OF A BACULITE FROM THE LOWER CHALK OF CHARDSTOCK, SOMERSET.

By G. C. Crick, F.G.S., etc.

Read 13th March, 1896.

In 1876 Meek[1] pointed out that the genus *Baculites*, as usually understood, seemed to be divisible into at least two sections, according to the nature of the aperture. In one division the aperture is directed forwards, as in *Baculites vertebralis*, Lam.; in the other it opens towards the antisiphonal side, as in *Baculites baculoides* (Mantell).

Meek restricted the name *Baculites* to the former division, and proposed for the latter section the name *Cyrtochilus*, observing that "the direction of its aperture, and the curvature of the projection of the siphonal margin of its lip, are such, that the head of the animal, and other parts connected therewith, must have been protruded at right angles to the longitudinal direction of the shell instead of on a line with the same—a peculiarity that was probably accompanied by important differences in the structure and habits of the animal." Meek's views, however, with regard to the division of *Baculites* do not seem to have met with general acceptance.

As the type of his *Cyrtochilus*, Meek selected *Baculites baculoides* (Mantell). The specimens hitherto figured showing this form of aperture have usually been referred to Mantell's species. In describing this fossil in 1822 Mantell[2] placed it in the genus *Hamites*. The two specimens which he figured are now in the British Museum, but neither of them show any trace of the aperture, although a considerable portion of the body-chamber is preserved in each.

Several authors have, however, since figured the aperture of specimens which they have referred to Mantell's species; still, examples showing the aperture are by no means common.

The earliest figure appears to be that given by James de Carle Sowerby[3] in his "Mineral Conchology" in 1828. Under the name *Baculites obliquatus*, which he regarded as identical with *Hamites baculoides*, Mantell, he figures and describes an example as "an unique specimen, that shows the form of the aperture, which is placed obliquely; on each side is a large oval lobe, placed anteriorly and bent backward." This specimen is now in the British Museum Collection. It was without doubt this same specimen that Mantell

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[1] "United States Geol. Surv. of the Territories," vol. ix, pp. 392–3.

[2] "Foss. S. Downs," 1822, p. 123, pl. xxiii, figs. 6 and 7 (B.M. Nos. 8,612 and 36,576 respectively).

[3] "Mineral Conchology," vol. vi, p. 186, pl. dxcii, fig. 2 (B.M. No. 44,005).

figured (and somewhat restored) in 1833 in his "Geology of the South-east of England,"[1] under the name *Baculites obliquatus*; and that he more correctly depicted in 1844 in his "Medals of Creation"[2] as *Baculites baculoides*.

In 1842 D'Orbigny[3] gave figures of the aperture of a specimen which he referred to this species in his "Paléontologie Française," and in 1876 Schlüter[4] figured and referred to this species a specimen showing the aperture.

The best figures and description of the aperture known to the present writer were given in 1885 by Noetling,[5] who depicted both a lateral aspect and a view of the aperture from above.

The specimen of *Baculites* from the Isle of Wight, figured by Norman[6] in 1887, shows the curved portion of the siphonal area of the shell in the region of the aperture, but no traces of the margin of the aperture.

In the British Museum there is an example (No. C. 422) probably belonging to this species from the Lower Chalk of Chardstock, Somerset, which, though only a natural cast of the anterior portion of the body-chamber, nevertheless shows the aperture so remarkably well as to be deserving of notice.

The specimen is 46 mm. long, is laterally compressed, and in cross-section is oval. The greatest thickness of the body-chamber is at the posterior margin of the aperture, its dorso-ventral and transverse diameters here being 15·5 and 13·5 mm. respectively. The aperture, subelliptical in outline, is 25 mm. in length by 14 mm. wide, and is only slightly inclined to the longitudinal axis of the shell. Anterior to the posterior margin of the aperture, the body-chamber gradually decreases in width, and is somewhat narrower than the aperture itself. The anterior portion of the body-chamber for a length of about 5 mm. is very much more compressed than the rest, and has only a width of about 4·5 mm.

In the neighbourhood of the aperture the siphonal area of the body-chamber curves towards the antisiphonal, but its anterior portion, *i.e.* a length equal to about one-fifth of the entire length of the aperture, instead of following the curve of the rest of the siphonal area, turns abruptly forward in a direction almost parallel to the longitudinal axis of the shell; and since the shell here is much more compressed laterally than it is at the adjacent parts, the anterior portion of the aperture has therefore a spout-like appearance.

The siphonal portion of the body-chamber adjoining the aperture exhibits five coarse folds imbricating forwards, that gradually become

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[1] "Geology S.E. of England," 1833, p. 160, fig. 1.

[2] "Medals of Creation," 1844, vol. ii, p. 499, lign. 110, fig. 2.

[3] Pal. Franç. Terr. Crét., vol. i, pl. cxxxviii, figs. 6, 8, 9. Referred since by Geinitz to a distinct species, *B. subbaculoides*.

[4] "Palæontographica," vol. xxiv, 1876, pl. xxxix, fig. 15.

[5] "Die Fauna der Baltischen Cenoman-Geschiebe," Paläont. Abhandl., Dames and Kayser, vol. ii, pt. 4, p. 42, pl. viii (xxiii), figs. 7, 7*a*.

[6] "Popular Guide to the Geology of the Isle of Wight," 1887, plate facing p. 96.

more pronounced towards the anterior portion; the anterior side of each is steep and only 1·5 mm. in length, but the posterior side is feebly inclined to the longitudinal axis and is about 4 mm. in length. In passing round to the sides these folds curve gently backwards, and gradually disappear at about the centre of the lateral area. With the exception of the anterior one, these folds pass uninterruptedly over the siphonal area. The anterior fold is, however, flattened at the middle of the siphonal area, and passes laterally on to the everted margin of the aperture. A yet more feeble ridge or fold arises on either side of the median portion of the anterior spout-like projection, and passes round, over the lateral area, parallel to the other folds, to the margin of the aperture.

On the antisiphonal area immediately behind the aperture there is a constriction about 4 mm. wide, having its greatest depth (1 mm.) close under the margin of the aperture; in passing round to the sides, this is only about 2 mm. wide, and keeping close to the margin reaches across about one-third of the lateral area.

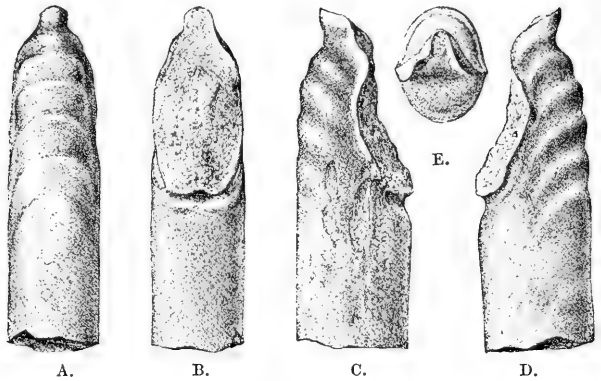
The margin of the aperture is not quite perfect; but where one side is incomplete, the other side, fortunately, is well preserved, so that by a comparison of the two sides, the original form of the entire margin can be ascertained. On the antisiphonal and lateral areas the margin is somewhat thickened and everted. In the central line of the antisiphonal area, the margin projects slightly forwards and outwards, forming a blunt antisiphonal apophysis about 1 mm. long. Starting from this apophysis, the margin, as seen in a lateral aspect, first curves backwards and towards the siphonal side, over about one-third of the width of the lateral area; then, after passing forwards with but a slight inclination to the longitudinal axis of the shell, it forms a broad curve having its convexity towards the siphonal side, the deepest part of the curve being at about the middle of the lateral area; then, having curved towards the antisiphonal area to a point distant from that area about one-third of the ventro-dorsal diameter, the margin curves somewhat abruptly towards the siphonal side to meet the most anterior projecting portion of the siphonal area. The lateral lappet thus formed is separated from the corresponding lappet on the opposite side by a narrow horseshoe-shaped sinus 4·5 mm. wide.

The principal difference between this specimen and those previously figured consists in the prolongation of the siphonal margin of the aperture into a spout-like projection.

An examination of Sowerby's figured specimen, now in the British Museum Collection (No. 44,005), shows that the anterior extremity is abraded, so that if any spout-like projection were originally present, it has been broken off. Noetling's figure is so similar to Sowerby's that it is not at all improbable the lack of any such projection in his specimen may be due to the same cause.

The projection indicates the position of the funnel. Its relative smallness, and therefore the smallness also of the latter, indicate an animal with crawling rather than free-swimming habits. In the case of such an animal with a long (and in the adult, straight) shell, when

crawling the latter would probably have an oblique direction, and hence the aperture would naturally be oblique to the longitudinal axis of the shell.



Baculites baculoides? (Mantell).

Lower Chalk: Chardstock, Somerset.

A. Siphonal aspect. B. Antisiphonal aspect. C. Left lateral aspect. D. Right lateral aspect. E. Aspect from above.

THE FEMALE ORGANS OF *NERITINA FLUVIATILIS*.

By G. Gilson,
Professor of Zoology at the University of Louvain.

Read 13th March, 1896.

Amongst the multifarious dispositions of the genital ducts met with in Gastropoda, one of the most interesting is that in which the copulatory organ is separated from the duct of the gonad. In *Clio*, for instance, the penis is situated at some distance from the genital opening, an epidermal groove forming the only connection between the two. In *Doris*, the copulatory vesicle is connected internally with the female part of the hermaphroditic system, but has a separate opening on the surface of the body.[1]

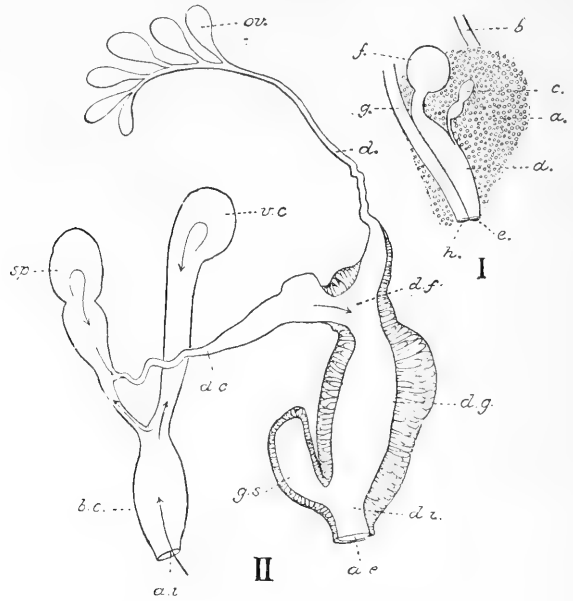
So far as I am aware, however, no case of a separation between the copulatory and reproductive organs has yet been described in the female system of a dicœcious type. I have thought it worth while, therefore, to call attention to the fact that such a disposition is realized in *Neritina fluviatilis*, especially as Claparède's classical monograph[2] on the anatomy and development of the genus contains an entirely erroneous description of the organs in question.

According to Claparède's description, the female system is very simple, and presents no special interest. It consists (Fig. I, which is a reproduction of one of Claparède's drawings) of an oviduct (*b*) provided with an enormous glandular dilatation (*a*), followed by a muscular "uterus" (*f*) with two appendicular vesicles or receptacula (*c*). The system was thus supposed to have only one aperture of communication with the exterior, serving both for copulation and oviposition. Claparède believed the eggs to pass down through the oviduct into the glandular dilatation, and that from this they passed through a narrow portion of the general duct into the "uterus," to be deposited after being surrounded with albumen and shell.

The structure of the female ducts is, in fact, as follows:—The gonad (Fig. II, *ov.*) gives origin to a narrow tortuous oviduct (*d*). This soon divides into two branches, which open separately on to the exterior. These two branches are very different in structure and function. One of them we must regard as the main part, the normal base of the oviduct; and it terminates in what we may call the *incubatory chamber* (*d.i.*). The other (*d.c.*) is an accessory duct, and ends in what may be termed the *copulatory chamber* or bursa (*b.c.*). The incubatory chamber is continuous with an enormous dilatation of the oviduct, the thick wall of which contains very remarkable glandular cells, which secrete an albuminous product. This portion (*d.g.*) may be termed the glandular segment

[1] See P. Pelseneer, "Introduction à l'étude des Mollusques." Bruxelles, 1894.
[2] Claparède, "Anatomie und Entwickelungsgeschichte der *Neritina fluviatilis*": Müller's Archiv. 1857.

or "uterus." At its lower end it bears a flattened vesicle (*g.s.*), glandular also, which may very likely secrete the hard egg-shell. The very short portion beyond this vesicle (incubatory chamber, *d.i.*) is not glandular, and opens freely into the pallial cavity.



EXPLANATION OF FIGURES.

FIG. I.—Copy of Claparède's fig. 30.

a. Weibliche Nebendruse. *b.* Eileiter. *c.* Samentasche. *d.* Scheide. *e.* Scheidenöffnung. *f.* Kugelige Auschellung der Gebärmutter. *g.* Darm. *h.* After.

The author states that there is a communication between Samentasche (*c*) and Nebendruse (*a*); this latter, according to his view, has no opening on the outer surface.

FIG. II.—The reproductive apparatus of the female of *Neritina fluviatilis*. (Much enlarged. The course taken by the spermatozoa prior to fertilization is indicated by arrows.)

a.e. External oviducal aperture. *a.i.* Intromittent aperture. *b.c.* Bursa copulatrix. *d.* Oviduct. *d.c.* Connecting duct. *d.f.* Fertilization or impregnation chamber. *d.g.* Glandular segment of oviduct. *d.i.* Incubatory segment of oviduct. *g.s.* Supposed shell gland. *sp.* Spermatheca. *v.c.* Copulatory vesicle.

The copulatory branch presents a totally different aspect. Its lowest part (*b.c.*), which may be called the "vagina" or bursa copulatrix, opens a short distance from the incubatory aperture (*a.e*), close to the anus, and bears at its upper end two diverticula. The larger of these (*v.c.*) I propose to term the *copulatory vesicle*. The smaller (*sp.*), which

is flask-shaped and divided into two parts by an annular constriction, is the *spermatheca*. The fundus of the *spermatheca* is related to a narrow canal (*d.c.*), which is really the upper part of the copulatory branch of the oviduct. This canal increases in calibre as it approaches the main oviduct, and opens into the glandular portion of that structure. It may accordingly receive the name of *connecting duct*. An irregular cavity (*d.f.*) is formed at the meeting-point of this connecting duct with the main oviduct, which I propose to term the *fertilization* or *impregnation chamber*.

The terminology which I have employed is justified by a knowledge of the process of fertilization, which takes place as follows:—The spermatic fluid is deposited by the male in the bottom of the "vagina" (*b.c.*), and enters the copulatory vesicle (*v.c.*). This latter is then found to contain numberless spermatozoa, no particular arrangement being noticeable in their disposition. A short time after copulation, the vesicle contracts, and the spermatozoa are pressed out and sent down towards the vagina. They do not stay long in this, however, but travel up into the flask-like spermatheca (*sp.*). Within that they assume a radiate disposition, becoming arranged with extraordinary regularity in a layer coating the inner wall of the vesicle, all heads being turned towards the axis, the tails being directed outwards. Towards the time of impregnation the spermatheca contracts also, and the spermatozoa are sent out, not down to the vagina again, but up into the connecting duct (*d.c.*), in which they are to be found in disorder. They thus reach the impregnation chamber (*d.f.*), which the eggs, coming down through the oviduct, enter sooner or later. Impregnation takes place, and the eggs are passed down into the glandular portion of the incubatory branch (*d.g.*). They receive there, first an albuminous coating, then the substance which makes up the shell, and are finally extruded.

It follows from this that the part Claparède designated the "uterus" ("Gebärmutter," Fig. I, *f*) cannot be so termed, since it never receives any egg. If the word "uterus" is to be used at all, it must be applied to the glandular part of the oviduct (Fig. II, *d.g.*). The organ which the Swiss naturalist considered as an accessory gland appended to the oviduct (Fig. I, *a*) is, in fact, the lower section of the main genital duct, the opening of which he had failed to discover. The really accessory part of the system is that which he considered as the main one, *i.e.* the copulatory chamber, with a special opening which Claparède believed to be the only genital aperture. The connecting duct he regarded as a narrow portion of the only genital duct he believed to exist, whilst it is, in fact, only a communication between the main (incubatory) and the accessory (copulatory) branches of the forked oviducal system. These facts must needs be taken into account by those who would undertake a comparative study of the genital organs in Gastropoda; and further details, together with a histological description, will be forthcoming in a monograph of *Neritina fluviatilis* which my assistant, Dr. Lenssen, has in course of preparation.

REPORT ON A COLLECTION OF POLYPLACOPHORA FROM PORT PHILLIP, VICTORIA.

By E. R. Sykes, B.A., F.Z.S., etc.

Read 13th March, 1896.

PLATE VI.

The very interesting collection to which the following pages refer was formed by Mr. J. Bracebridge Wilson,[1] M.A., F.L.S., and placed in my hands by the Port Phillip Exploration Committee of the Royal Society of Victoria.

One fact brought out strikingly by a study of this collection is how little we yet know of the fauna of the Australian seas, so far as relates to the present group. Of twenty-two species, no less than seven were, when collected, new or undescribed. Five of these are described in the present paper; one has recently (December, 1895) been described by Mr. Pilsbry; and the other will, I understand, shortly appear under the name of *Ischnochiton Tateanus*, Bednall.

To Mr. Pilsbry, who has in so special a manner made the group his own, I desire to tender my most grateful thanks for the invaluable assistance he has rendered me in the elucidation of difficult points.

The first question which arises is the determination of the correct name for the Order in which these molluscs are placed. In my opinion this should be Polyplacophora, Gray. The references which it is necessary to mention are as follows:—

1816. Polyplaxiphores, Blainville: Bull. Soc. Philom. Paris, p. 122.
1821. *Polyplacophora*, Gray: London Medical Repository, vol. xv, p. 234.
1824. *Polyplaxiphora*, Blainville: Dict. Sci. Nat., Article "Mollusques," vol. xxxii, p. 380.
1825. *Polyplaxiphora*, Blainville: Manuel de Malacologie, p. 601.
1829. *Polyplakiphora*, Guilding: Zool. Journ., vol. v, No. 17, p. 25.
1879. *Polyplaciphora*, Dall: Scient. Results of Expl. of Alaska, p. 83.
1886. *Polyplacophora*, Haddon: Zoology of H.M.S. "Challenger," part xliii.
1892–4. *Polyplacophora*, Pilsbry: Man. Conch., ser. i, vols. xiv–xv.

Blainville's original publication contained no definition of the group, and he only used the French word. Gray defined the group, and he also used the Latin termination; but, curiously enough, he named as a synonym *Polyplaxiphora*, Blainville. I have been unable

[1] It is with great regret that I record Mr. Wilson's death, which occurred on October 22nd, 1895, at the age of 67.

to trace any use of the Latin termination, or any description by Blainville, prior to 1824. Since, in my judgment, Gray's name can stand as the author, the emendations of various authors appear to be unnecessary. Hermannsen has suggested that the derivation is from πολύς, πλάξ, and φέρω: it appears, however, that φορέω is better than the last word as the origin, since it not only makes the Latinization more accurate, but also supplies a better meaning.

The difficulties which beset those who endeavour to emend original names are illustrated in the Manual of Conchology, by Mr. Pilsbry, who, while writing *Polyplacophora*, Blainville, for the Order, still uses *Plaxiphora*, Gray, for a genus.

The measurements throughout this paper are taken from specimens which have somewhat contracted and curled in spirit, and an attempt has been made to allow for this. They must therefore be taken as only approximate, as, indeed, must all measurements of length in this group, when not arrived at from living specimens.

The name "Port Phillip" may convey to some persons the idea of a small area; and it may be therefore useful to note that this district contains 800 square miles, and is intermediate in size between Oxfordshire and Herefordshire.

Name of Species.	Distribution outside Victoria.
Lepidopleurus inquinatus (Reeve).	New Zealand, Tasmania.
Callochiton platessa (Gould).	Port Jackson, New Zealand.
Ischnochiton (*Stenochiton*) *juloides*, Adams and Angas.	Holdfast Bay (South Australia).
I. (*Heterozona*) *cariosus* (Carpenter MS.), Pilsbry.	? Port Jackson, South Australia.
I. crispus (Reeve).	Port Jackson, Port Hacking.
I. Tateanus, Bednall.	South Australia.
I. contractus (Reeve).	South Australia, ? New South Wales West Australia, Tasmania.
I. ustulatus (Reeve).	New South Wales, South Australia.
I. (*Haploplax*) *pura*, n.sp.	
I. Wilsoni, n.sp.	
Ischnochiton, sp. ?	
I. (*Ischnoradsia*) *Australis* (G. B. Sby.).	Port Jackson, ? Torres Strait.
Plaxiphora petholata (G. B. Sby.).	Port Lincoln, Tasmania, Port Jackson, New Zealand.
Acanthochites Bednalli, Pilsbry.	St. Vincent's Gulf.
A. Pilsbryi, n.sp.	
A. (*Notoplax*) *speciosus* (H. Ad.).	Tasmania, New South Wales, Flinders Island.
A. (*N.*) *Matthewsi*, Bednall and Pilsbry.	South Australia.
A. (*N.*) *glyptus*, n.sp.	
A. (*N.*) *Wilsoni*, n.sp.	
Cryptoplax striatus (Lam.).	Torres Straits, Port Lincoln, Port Jackson, Newcastle, Flinders Island, Tasmania.
Chiton Bednalli, Pilsbry.	Yorke's Peninsula.
Chiton limans, nom. nov.	New South Wales.

1. Lepidopleurus inquinatus (Reeve). Pl. VI, Fig. 4.

Chiton inquinatus, Reeve: Conch. Icon., pl. xxiii, fig. 154, May, 1847.
Ischnochiton inquinatus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 90, pl. xviii, figs. 49, 50.

The discovery that this little-known species of Reeve is a *Lepidopleurus*, extends considerably the range of the group. The genus is generally regarded as belonging to the North Atlantic and North Pacific oceans, and its discovery in the Southern Ocean is of much interest, the nearest known species formerly having come from deep water off the Philippine Islands. I had proposed to describe this shell as a new species; and so also, I find, had Mr. Pilsbry, from specimens he had received from New Zealand. On comparing Reeve's *Chiton inquinatus* with another species, I was struck by the remarkable resemblance between the two forms; and, having had the advantage of separating the valves of one of Reeve's specimens, I am enabled to be positive as to the identification. Reeve's type came from Tasmania, and the species is therefore common to New Zealand, Tasmania, and Victoria. The sculpture of the valves is not well shown in the original figures; the general outline and colouring are fairly accurate; some specimens, however, are much darker.

2. Callochiton platessa (Gould).

Chiton platessa, Gould: Proc. Bost. Soc. N. H., vol. ii, 1846, p. 143; U.S. Explor. Exped., p. 320, atlas, figs. 434, 434*a*.
Lepidopleura platessa, Gould: Otia (Rectifications), 1862, p. 242.
Callochiton platessa, Gould: Haddon, "Challenger" Report, p. 15; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 50, pl. x, figs. 1–5; Proc. Acad. Nat. Sci. Philad. 1894, p. 71.
Chiton crocinus, Reeve: Conch. Icon., pl. xxii, fig. 146, 1847.
Callochiton crocinus, Reeve: Pilsbry, Man. Conch, ser. I, vol. xiv, p. 50, pl. x, fig. 7; vol. xv, p. 67.
Leptochiton versicolor, A. Adams: Proc. Zool. Soc. 1852, p. 92, pl. xvi, fig. 5, May, 1854; Angas, Proc. Zool. Soc. 1867, p. 223.
Lepidopleurus empleurus, Hutton: Trans. N.Z. Inst., vol. iv, p. 178; Man. N.Z. Moll., p. 113, 1880; Pilsbry, Man. Conch., ser. I, vol. xv, p. 67.

Three small specimens appear to be the young of this species. Mr. Pilsbry, in his last volume dealing with this group, has raised *C. crocinus* to the rank of a species, after having in the earlier volume placed it as a synonym. From an examination of the specimens in the British Museum, I cannot see sufficient specific distinction.

3. Ischnochiton (Stenochiton) juloides (Adams and Angas).

Stenochiton juloides, Adams and Angas: Proc. Zool. Soc. 1864, p. 193; 1865, p. 58, pl. xi, fig. 15; Angas, *l.c.*, 1865, p. 188.
Ischnochiton (*Stenochiton*) *juloides*, Adams and Angas: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 55, pl. xvi, figs. 6–8.

One specimen only. It is in general of a greenish hue, with the dorsal ridge yellowish, marked with brown. The colouring as described by authors is a rufous brown.

4. Ischnochiton (Heterozona) cariosus (Carpenter MS.), Pilsbry.

Ischnochiton (*Heterozona*) *cariosus*, Carpenter: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 65, pl. xxiv, figs. 20–3; vol. xv, p. 82, pl. xiv, fig. 8.

Mr. Pilsbry notes that the anterior and posterior valves have eleven slits: in a specimen that I have separated there are only ten. This, however, is frequently a variable characteristic.

5. Ischnochiton crispus (Reeve).

Chiton crispus, Reeve: Conch. Icon., pl. xix, fig. 120, May, 1847.
Ischnochiton crispus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 89, pl. xxiv, figs. 98–9.
Ischnochiton Haddoni, Pilsbry: Man. Conch., ser. I, vol. xiv, p. 88, pl. xxii, figs. 67–73; Proc. Acad. Nat. Sci. Philad. 1894, p. 71.
Chiton longicymba, Blainville: Sowerby, Conch. Illust., fig. 67; Reeve, Conch. Icon., pl. xxiv, fig. 163 (*non* Blainville).
Ischnochiton longicymba, Blainville: Haddon, "Challenger" Report, p. 17 (*non* Blainville).

This species appears to vary greatly in colour and markings. Some are nearly white, but the generally prevailing colours seem to be olive or green in various shades; some specimens have a white band along the back. One specimen is so remarkable that I venture to describe it as var. *decorata*. In this the ground colour is nearly white, and the colour pattern is formed by regular rows of nearly black bands. There are also specimens of this form in the collection of the British Museum. None of the other specimens that I have seen show any gradation to this form of colour-marking. At the request of Mr. Pilsbry, I examined specimens of his *I. Haddoni* and compared them with the type of *I. crispus*, the result being published in *The Nautilus*.[1]

6. Ischnochiton Tateanus, Bednall.

From a specimen, very kindly named by Mr. Pilsbry, I have been able to identify three specimens of this, as yet undescribed, species, mingled with my *I. crispus*. I forbear to describe it, as I understand that Mr. Bednall will do so shortly.

7. Ischnochiton contractus (Reeve).

Chiton contractus, Reeve: Conch. Icon., pl. xv, fig. 78, May, 1847.
Ischnochiton contractus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 93, pl. xxiii, figs. 81–2; Nautilus, vol. viii, p. 129.

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[1] The Nautilus, vol. viii, p. 129, March, 1895.

Chiton pallidus, Reeve: Conch. Icon., pl. xvi, fig. 92, March, 1847.
Ischnochiton pallidus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 89, pl. xxiii, fig. 91.

There is a nice series of this species. I have carefully compared the original tablets in the British Museum, and am unable to separate *I. contractus* and *I. pallidus*.

8. Ischnochiton ustulatus (Reeve).

Chiton ustulatus, Reeve: Conch. Icon., pl. xvii, fig. 102, March, 1847.
Lepidopleurus ustulatus, Reeve: Angas, Proc. Zool. Soc. 1867, p. 222.
Ischnochiton ustulatus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 96, pl. xxiv, figs. 100, 1–4, 11, 12.

One specimen only. The valve slits are as follows: head-valve, 13; median, 1; tail-valve, 16. Some of those in the tail-valve seem to be caused by the splitting up of the slits, and probably the normal number is less than in the specimen examined. Both in the head- and tail-valve they are at very unequal distances apart. The interior of the valves is of a bluish colour near the slits, but becomes of a reddish hue towards the beaks.

9. Ischnochiton (Haploplax) pura, n.sp. Pl. VI, Figs. 3, 3*a*.

Shell elongate-oval, elevated, carinate. Surface smooth to the naked eye, but granular under a lens. Colour of valves nearly white, sometimes showing a faint trace of yellow. Girdle yellow-brown. The intermediate valves have straight sutures. The lateral areas are raised, and are separated from the median ones by a distinct diagonal. The sculpture over the whole of the valves is minutely granular, and in worn specimens has the effect of a series of pits. This sculpture continues right over the central carina. Valve viii is somewhat produced posteriorly, and has a projecting mucro a little behind its centre. The interior of the valves is of a whitish colour. There are eleven slits in the posterior valve, and the teeth are short: these latter are much larger in the anterior valve, where they number ten. The median valves have one slit each side, as usual in the true *Ischnochiton* group. The girdle-scales are yellowish, very small, and smooth. Length about 18 mm., breadth about 7 mm.

This interesting species, which appears to belong to the recently described[1] section *Haploplax*, does not possess any striking characteristics. It is very difficult to say whether a surface such as this shell has is really "punctate" or "granulate." This difficulty Mr. Pilsbry seems to have felt, as in the Manual of Conchology he has allowed the description of *I. smaragdinus*, Angas, to stand "most minutely punctured"; while he subsequently has made it the type of his section *Haploplax*, which is characterized as having the surface "smooth, except for minute granulation." Perhaps the shell will be

[1] Pilsbry, Proc. Acad. Nat. Sci. Philad. 1894, p. 71.

most easily recognized by its elongate form and generally white colour. "The very fine girdle-scales ally it to *Isch. ustulatus*, Reeve; but they are smooth, while *I. ustulatus* has the scales striated" (Pilsbry in MS.).

10. Ischnochiton Wilsoni, n.sp. Pl. VI, Figs. 1, 1*a*.

Shell oval, moderately elevated, carinate. Surface smooth to the naked eye, but under a lens minutely granular. Colour a rosy pink marked on all the valves with minute streaks and patches of white and brown. The pattern is more noticeable on the median areas in the central valves than on the lateral areas. Girdle yellowish. The sutures of the median valves are slightly concave, and the beaks are moderately prominent. The lateral areas are but very slightly raised, and the diagonal is inconspicuous, except for its being a line where the colour-marking changes in pattern. Tail-valve slightly produced posteriorly, with the mucro just in front of the middle. Interior of valves of a rosy hue. Tail-valve with ten slits; head-valve with nine slits, irregularly disposed; median with but one. The girdle-scales are small, yellowish-white, and, under a lens, conspicuously striated. Length about 16 mm., breadth about 8 mm.

This species appears to belong to the smooth group of Australian Ischnochitons. It is of a general rosy hue, and is not so much elongated as the last species, from which it may be at once separated, also from *I. smaragdinus* and allied species, by its striated girdle-scales. I have much pleasure in associating with it the name of Mr. Wilson, the discoverer.

11. Ischnochiton, sp.

The specimens are so minute that, though I cannot place them as the young of any known species, I forbear to describe them. Further specimens are required to show their true position.

12. Ischnochiton (Ischnoradsia) Australis (Sowerby).

Chiton Australis, Sowerby: Mag. Nat. Hist., n.s., vol. iv, June, 1840, p. 290; Conch. Illust., fig. 46; Reeve, Conch. Icon., pl. ii, fig. 10.

Chiton (*Ischnoradsia*) *Australis*, Sow.: Shuttlw., Bern. Mittheil. 1853, p. 66.

Lophyrus Australis, Sow.: Angas, Proc. Zool. Soc. 1867, p. 221.

Lepidoradsia Australis, Sow.: Dall, Bull. U.S. Nat. Mus., i, p. 79 (dentition), p. 115 (branchiæ), pl. ii, fig. 19 (dentition); Haddon, "Challenger" Report, p. 19.

Ischnochiton (*Ischnoradsia*) *Australis*, Sow.: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 144, pl. xviii, figs. 57–9; vol. xv, p. 87, pl. xvii, figs. 68–9; Proc. Acad. Nat. Sci. Philad. 1894, p. 72.

Chiton evanidus, Sow.: Mag. Nat. Hist., n.s., vol. iv, 1840, p. 291; Conch. Illust., fig. 139.

Chiton metallicus, Reeve: Conch. Icon. 1847, pl. xvii, fig. 104.

Chiton (*Lophyrus*) *lugubris*, Gould: Proc. Bost. Soc. Nat. Hist., vol. vii, 1859, p. 163; Otia Conch., p. 116; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 146.

Several specimens. I have followed Mr. Pilsbry[1] in the above synonymy, and am able to confirm it in regard to *C. metallicus*, Reeve, as I have examined the types.

13. Plaxiphora petholata (Sowerby).

Chiton petholatus, Sow.: Mag. Nat. Hist., n.s., vol. iv, 1840, p. 289; Conch. Illust., figs. 64, 65, and var. *porphyrius*, fig. 59; Reeve, Conch. Icon., pl. xiv, fig. 74.

Plaxiphora petholata, Sow.: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 323, pl. lxviii, figs. 62–7; Proc. Acad. Nat. Sci. Philad. 1894, p. 74.

Chætopleura conspersa, Ad. and Ang.: Proc. Zool. Soc. 1864, p. 193.

Chiton (*Plaxiphora*) *terminalis*, Cptr.: Smith, Voy. "Erebus" and "Terror," Moll., p. 4, pl. i, fig. 13.

? *Tonicia zigzag*, Hutton: Trans. N.Z. Inst., vol. iv, p. 181.

? *Chiton coelatus*, Reeve: Conch. Icon., pl. xvii, fig. 101.

Euplaciphora modesta, Cptr.: Haddon, Rep. "Challenger," pp. 33, 34.

The species of *Plaxiphora*, as Mr. Pilsbry states in the "Manual," are in great need of revision, and it is now very difficult to identify specimens with certainty. It is quite possible that two of Blainville's species, *Chiton costatus* and *Chiton raripilosus*, may be identical with *P. petholata*; but this will probably never be clearly settled. *Chætopleura conspersa*, Ad. and Ang., is, in my opinion, only a more strongly sculptured form of *P. petholata*, thus showing a link towards *P. terminalis*, which latter was described from New Zealand. In placing *P. terminalis* in the synonymy, I am guided by an examination of the type specimens, which appear to differ only in being more strongly sculptured, and in the valves being a little narrower and longer in proportion. Mr. E. A. Smith permits me to state that he agrees in this opinion. It should be noted that in *C. conspersa* the valves are even more strongly sculptured than in *P. terminalis*. There is no doubt as to the correctness of placing *E. modesta* as a synonym. What the *Tonicia zigzag* of Hutton is, only an examination of the type specimen can settle satisfactorily: he placed it as a synonym of *Chiton coelatus*, Reeve. There do not appear to be any specimens in the Cuming Collection much resembling Reeve's figure; and the, presumably type, tablet bearing this name, appears to me only to contain a form of *P. petholata*. The *Streptochiton cupreus*, Cptr. MS., appears to be a distinct species. There is a quaint slip in the "Manual,"[2] where the dimensions of *T. zigzag* are given as "Length 88 inch.; breadth 31 inch." This would indeed be a fine species!

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[1] Man. Conch., ser. I, vol. xiv, p. 144; xv, p. 87.

[2] Vol. xiv, p. 329.

14. Acanthochites Bednalli, Pilsbry.

Acanthochites Bednalli, Pilsbry: Proc. Acad. Nat. Sci. Philad. 1894, p. 81, pl. ii, figs. 7–11.

Two examples of this species, recently described, from St. Vincent Gulf. I have to thank Mr. Pilsbry for the identification.

15. Acanthochites Pilsbryi, n.sp. Pl. VI, Figs. 6, 6*a*.

Shell elongate; the valves of general greyish hue; girdle olivaceous. Intermediate valves (the exposed portions) convex behind, sculptured on the latero-pleural areas with coarse, round, scattered pustules. In valves ii to viii there is a narrow band-like jugal area, which appears smooth to the naked eye, but under a lens is seen to be obscurely striate both longitudinally and transversely. Posterior valve small, having the mucro obtuse and posterior; the posterior slope is nearly vertical. Girdle rather narrow, with eighteen tufts. The interior of the valves is of a white colour. Posterior valve with two slits, median with one, anterior not observed. Length about 10 mm., breadth 3·5 mm.

Only a single specimen, which I have much pleasure in dedicating to Mr. Pilsbry, who has done so much to advance our knowledge of the Australian species of *Acanthochites*. It falls in his "Key"[1] to the Australian species between *A. Coxi*, Pils., and *A. granostriatus*, Pils. "A typical *Acanthochites*, but different from any known to me from Australia in the narrow band-like jugal tracts, smoothish and transversely striate, the latero-pleural areas being sculptured as in *A. Coxi*, Pils., which species the tail-valve also resembles. The specimen is probably young" (Pilsbry in MS.). To this extremely lucid description I have nothing to add.

16. Acanthochites (Notoplax) speciosus (H. Adams).

Cryptoplax (*Notoplax*) *speciosus*, H. Adams: Proc. Zool. Soc. 1861, p. 385.

Acanthochites (*Notoplax*) *speciosus*, H. Ad.: Pilsbry, Man. Conch., ser. I, vol. xv, p. 32, pl. i, figs. 23–6; Proc. Nat. Sci. Philad. 1894, p. 83, pl. iv, figs. 31–3.

This species, originally known from Tasmania and Flinders Island, has recently been noted from New South Wales. We are now able to extend its range to Victoria.

17. Acanthochites (Notoplax) Matthewsi, Bednall and Pilsbry.

Acanthochites (*Notoplax*) *Matthewsi*, Bednall and Pilsbry: Nautilus, vii, p. 120; Proc. Acad. Nat. Sci. Philad. 1894, p. 83, pl. iv, figs. 27–30.

One damaged specimen: the remarkable sculpture (longitudinal riblets) on the pleural tracts will serve to distinguish this species. It was described from South Australia.

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[1] Proc. Acad. Nat. Sci. Phil. 1894, p. 77.

18. Acanthochites (Notoplax) glyptus, n.sp. Pl. VI, Figs. 5, 5*a*.

Shell rather elongate. Exposed portions of valves rather large in proportion. Valves elevated and sharply keeled; dorsal area nearly white; other areas of a salmon-pink colour, mottled with greyish, in varying pattern, but darkest near to the dorsal area. Girdle olive-brown; the tufts of a lighter colour. Intermediate valves convex behind and slightly concave in front. Dorsal area wedge-shaped, moderately large, smooth to the naked eye, but showing indistinct traces of sculpture under a lens. Lateral areas small, smooth, very slightly elevated, and separated from the pleural areas by an indistinct diagonal. Pleural areas smooth, except for four incised lines on each side, which, if produced over the lateral areas, would meet at about the beaks of the valves. Anterior valve smooth, except for five very flattened ribs, corresponding to the slits in the valve. Posterior valve sculptured before the mucro, which is at about the posterior third, as the intermediate valves; behind the mucro it is smooth, save for traces of radiating ribs. Girdle with short, obscure spicules, and having 16 (?) tufts. Interior of valves whitish, with traces of green staining. Valve-slits: anterior 5, median 1–1, posterior 6. Two of the slits in the posterior valve may be caused by the splitting of a median one. Length about 22 mm., breadth about 7 mm.

This shell is remarkable for the entire absence of well-marked sculpture, except the striking incised lines. There appears to be no other known species approaching it.

19. Acanthochites (Notoplax) Wilsoni, n.sp. Pl. VI, Figs. 2, 2*a*.

Shell moderately elongated, the visible portions of the valves occupying about one-third the total width. Valves elevated, moderately keeled; the ridge being marked with bands of reddish and salmon-pink; the lateral areas of a dark red; the pleural areas being marked with a red and white. Girdle olivaceous, densely clothed with spicules, but showing no visible tufts. Intermediate valves convex behind and concave in front, with well-marked beaks. Dorsal area of an elongate wedge-shape, well separated from the side areas, smooth to the naked eye, but marked under a lens with longitudinal and transverse striæ. Latero-pleural areas having no trace of a diagonal rib, sculptured all over with well-marked flattened tubercles. The anterior valve shows the latter sculpture all over. The posterior valve has an elevated and rather pointed mucro at about the posterior third. Interior of valves whitish, becoming stained with red under the jugal area. Valve-slits: anterior 5, median 1–1, posterior 6. Length about 25 mm., breadth about 10 mm.

The following valuable note, by Mr. Pilsbry, will give a better idea of it than any words of my own. "It differs from *A. Matthewsi* in having the entire latero-pleural tracts granose-lirate, while only the lateral areas are granose in the other; the tegmentum, especially, of the head-valve is smaller; the tail-valve approaches that of the typical *Notoplax* in form, and the girdle is densely clothed, though

J. Green del. et lith.

AUSTRALIAN CHITONS.

Mintern Bros. imp.

tufts seem quite absent. The tail-valve is considerably like *N. speciosus*, but the tegmentum is not pear-shaped; there are no spiculose girdle-bridges at the sutures, etc."

20. Cryptoplax striatus (Lamarck).

Chitonellus striatus (Lamarck): Anim. sans Vert., ed. i, tom. vi, p. 317, 1819.
Chitonellus Gunnii, Reeve: Conch. Icon., pl. i, fig. 5, 1847.
Chitonellus rostratus, Reeve: *l.c.*, fig. 6, 1847.
Cryptoplax striatus, Lamarck: Hutton, Chall. Rep., p. 39, pl. i, fig. 9, and pl. iii, fig. 9; Pilsbry, Man. Conch., ser. I, vol. xv, p. 53, pl. ix, figs. 11–15; pl. xi, figs. 37–9; Proc. Acad. Nat. Sci. Philad. 1894, p. 85.

21. Chiton Bednalli, Pilsbry.

Chiton Bednalli, Pilsbry: Nautilus, vol. ix, p. 90, Dec. 1895.

It is interesting to note that this species, so recently described from Yorke's Peninsula, is also to be found in Port Phillip.

22. Chiton limans, nom. nov.

Chiton muricatus, A. Adams: Proc. Zool. Soc. 1852 [May, 1854], p. 91, pl. xiii, fig. 6; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 175, pl. xxxvii, figs. 12, 13; *non* Tilesius: Mém. Acad. Sci. St. Petersb., ser. V, vol. ix, 1824, p. 483.
Lophyrus muricatus, Angas: Proc. Zool. Soc. 1865, p. 186; *l.c.*, 1867, p. 222.

Mr. Pilsbry has noted the description of a *Chiton muricatus* by Tilesius: what this species is exactly, I am not sure; it appears, however, to be a large Siberian form. The name of *C. limans* was used in MS. by Carpenter; I beg to call attention to the fact that I am *not* naming the shell as *C. limans* (Carpenter MS.), this last being a complicated and cumbersome process of nomenclature.

EXPLANATION OF PLATE VI.

Fig. 1. Ischnochiton Wilsoni, n.sp.
,, 1*a*. ———— separate valves.
,, 2. Acanthochites (Notoplax) Wilsoni, n.sp.
,, 2*a*. ———— separate valves.
,, 3. Haploplax pura, n.sp.
,, 3*a*. ———— separate valves. The dotted lines show the position of the valve-slits, which are not visible from above.
,, 4. Lepidopleurus inquinatus (Rve.), separate valves.
,, 5. Acanthochites (Notoplax) glyptus, n.sp.
,, 5*a*. ———— separate valves.
,, 6. Acanthochites Pilsbryi, n.sp.
,, 6*a*. ———— separate valves.

ON A COLLECTION OF LAND-SHELLS FROM SOUTH CELEBES.

By Edgar A. Smith, F.Z.S., etc.

Read 10*th April*, 1896.

PLATE VII.

The specimens about to be enumerated and described were collected by Mr. A. Everett at the southern extremity of the island of Celebes, at an elevation of 2,000 feet, also at a still greater height, 4,000 to 5,000 feet, upon Bonthain Peak. Several of the species are of considerable interest, notably the Bulimoid form, which appears to approximate more closely to the genus *Calycia* of New Guinea than to any other group. *Xesta dimidiata*, *Hemiplecta Bonthainensis*, *Chloritis Howesii*, and *Cyclotus pyrostoma*, are all very handsome forms; and the discovery of four additional species of *Clausilia* is of importance, as only a single species has been previously recorded. The Rev. A. H. Cooke,[1] in discussing the fauna of Celebes, has referred to the paucity of the species of that genus, and of *Amphidromus*, and to the relative proportion of Naninidæ to Helicidæ, as marking "the beginning of a distinct decrease in the Indo-Malay element." Many of these and similar deductions are often made upon insufficient knowledge of the respective faunas. In the present case, for example, the incompleteness of the list of the species of terrestrial molluscs which actually occur in the island is demonstrated by the fact that, in one very limited area, Mr. Everett has discovered no less than fourteen new forms, numerically equal to one-fourth of the previously known fauna. The greater part of the island has yet to be explored, and doubtless very many additional species will eventually be discovered. As our knowledge of this fauna is at present so incomplete, it is of very little use to compare it with that of other adjacent islands.

It is, however, interesting to note that the Philippine *Obba marginata* (var. *sororcula*), hitherto recorded only from North Celebes, also occurs in the south. Mention should also be made of the occurrence of six species of *Amphidromus* (eight if, like Prof. E. von Martens, we consider *A. interruptus* and *A. Sultanus* distinct from *A. perversus*), a number exceeding those known from Sumatra.

The following are the principal papers which treat upon the land-shells of Celebes:—

1. E. von Martens, Malak. Blätt. 1872, vol. xx, pp. 155–177.
2. *Id.*, Preuss. Exped. Ost-Asien, Zool. vol. ii, p. 99, etc.
3. *Id.*, in Max Weber's Zool. Ergeb., vol. ii, p. 209, etc.
4. *Id.*, Sitzungsb. Gesell. nat. Fr. Berlin, 1886, pp. 112–114.
5. Tapparone-Canefri, Ann. Mus. Genova, 1884, vol. xx, pp. 169–175.

[1] "Cambridge Natural History," vol. iii, p. 310.

A. Species Collected by Mr. Everett.

1. Helicarion Wallacei. Pl. VII, Figs. 7–9.

Testa tenuissima, pallide virescens, vitrea, polita, globosa, supra depressa, infra minutissime perforata; spira ad apicem vix elata; anfractus 3, supra convexiusculi, infra suturam concave marginati, et lineis incrementi hic illic subplicatis striati, ultimus inflatus; apertura inverse late auriformis; peristoma marginibus conniventibus, callo tenuissimo junctis, columellari ad insertionem anguste reflexo. Diam. maj. 9, min. 7·5, alt. 6 mm.

Hab.—South Celebes, at 2,000 feet.

An excessively thin, fragile species, with an obtuse spire and large apical whorls.

2. Helicarion Celebensis, Pfeiffer.

Hab.—South Celebes, at 2,000 feet (Everett).

A single specimen only, younger and smaller than the type, agreeing precisely in form, but without the pale line at the suture and not whitish at the base. Notwithstanding these differences, due possibly to disparity in age, I have no doubt respecting the identification of the specimen in question.

3. Macrochlamys indifferens. Pl. VII, Figs. 10–12.

Testa orbicularis, angustissime perforata, fusco-cornea, polita, striis incrementi levibus sculpti; spira depresse conica; anfractus 5, lente accrescentes, leviter convexiusculi, anguste marginati; apertura oblique lunata; peristoma tenue, margine columellari ad insertionem pallido, incrassato, sed vix reflexo. Diam. maj. 8, min. 7, alt. 4 mm.

Hab.—South Celebes, at 2,000 feet.

This species presents no special distinguishing features. The generic position of this and other similar forms is difficult to determine on the shell characters only.

4. Microcystina consimilis. Pl. VII, Figs. 13–15.

Testa depresse globosa, perforata, tenuis, pellucida, cornea, nitida, lineis incrementi prope suturam subplicatis striata; anfractus 4–5, celeriter crescentes, convexiusculi, superne concave marginati, ultimus circa umbilicum interdum pallidus; apertura oblique lunata; peristoma tenue, margine columellari albo, incrassato, supra umbilicum sinuatim reflexo. Diam. maj. 11, min. 9, alt. 8 mm.

Hab.—South Celebes, at 2,000 feet.

Very like *Helicarion Celebensis*, Pfr., but differing in the character of the columellar lip, etc. The margination of the whorls beneath the suture is palish in some specimens.

5. Microcystina consors. Pl. VII, Figs. 16–18.

Testa depresse globosa, tenuis, pellucida, fusco-cornea, lævigata, lineis incrementi substriata, anguste umbilicata; anfractus 4½, sublente

accrescentes, convexiusculi, anguste marginati; apertura oblique lunata; peristoma tenue, margine columellari ad insertionem sinuatim reflexo. Diam. maj. 7, min. 6, alt. 5 mm.

Hab.—South Celebes, at 2,000 feet.

Smaller than *M. consimilis*, of a somewhat browner tint, with a slightly more elevated spire, and smaller body-whorl.

6. Xesta trochus (Müller).

Hab.—South Celebes, at 2,000 feet.

The specimens from this locality belong to the form named by Reeve *Helix sulphurea*. The shell he figured is peculiar in having no brown zone upon the base of the body-whorl, a feature occurring in all the specimens in the present collection. On the other hand, in the latter, the sutural band is only faintly continued upon the last whorl, and in some it is entirely wanting. The largest specimen has a diameter of 31 mm.

7. Xesta dimidiata. Pl. VII, Fig. 19.

Testa orbicularis, perforata, solida, supra virens, haud nitens, infra lacteo-alba, zona obscura nigrescente cincta, circa umbilicum nigro-fusco tincta, hic illic irregulariter nigro-punctata; anfractus 5–6, convexiusculi, sutura alba nigro-marginata sejuncti, apicales læves, nigrescentes, ultimus et penult. striis spiralibus confertis microscopicis sculpti, lineis incrementi obliquis tenuibus striati, ultimus ad peripheriam rotundatus, infra concentrice plus minus minute striatus, haud descendens; apertura obliqua, late lunata, alba, zona lata nigro-fusca infra medium haud ad marginem attingente picta; peristoma tenue, simplex, margine columellari prope insertionem, leviter incrassato, reflexo, et subcontorto. Diam. maj. 33, min. 27, alt. 20 mm.; apertura 11 mm. alta, 16 lata.

Hab.—South Celebes, 2,000–5,000 feet.

Four specimens of this beautiful species were collected by Mr. Everett. Three are coloured as described above; but the fourth has all the upper part of the spire black, excepting a white line at the suture, the body-whorl, however, becoming normally greenish.

8. Xesta Wallacei (Pfeiffer).

Hab.—South Celebes, at 2,000 feet.

Three varieties of this species were collected by Mr. Everett in South Celebes, at an elevation of 2,000 feet, namely—(1) the typical form as figured in the Conchylien-Cabinet (*Helix*), pl. clxiv, figs. 13–15; (2) like the type, but darker above, livid purplish towards the apex, and chestnut brown near the aperture, pale beneath, with a brown stain around the umbilicus; last whorl dotted with black (dots very few on the under-surface) and encircled with a dark-brown zone, sometimes bisected by a pale line; (3) like Pfeiffer's var. β, but having a white instead of a brown peripheral band. Var. *bicingulata*, Von Martens, was not collected by Mr. Everett.

9. Hemiplecta Bonthainensis. Pl. VII, Fig. 20.

Testa depresse conoidea, ad peripheriam obtuse carinata, perforata, tenuis, saturate vel dilute purpureo-fusca, circa umbilicum virescens, ad angulum medianum plerumque flavescens; spira breviter conica, ad apicem mediocriter acuta, haud nitida; anfractus 5–6, leviter convexiusculi, lineis incrementi obliquis arcuatis aliisque spiralibus numerosis granulatim decussati, ultimus infra angulum convexior, nitens, lineis concentricis versus umbilicum sensim evanidis; apertura obliqua, late lunata, intus concolor; peristoma tenue, simplex, in exemplis adultis ad marginem levissime incrassatum et luteum, marginibus distantibus, columellari ad insertionem breviter expanso et reflexo. *Var.* Testa omnino dilute flavo-virescens. Diam. maj. 34, min. 28, alt. 22 mm.

Hab.—Bonthain Peak, South Celebes, at 4,000 feet.

Considerable variation in form and colour is observable in the series of specimens examined, but the sculpture is similar in all. Some examples are of a very dark purplish-brown or black colour throughout, with the exception of the umbilical region. Others are of a lighter tint. Some are greenish, with a broad purple-brown zone beneath the periphery, whilst others are uniformly light yellowish-green. The spire is more elevated and the body-whorl more inflated in some specimens than in others.

10. Rhysota rugata (Martens).

Nanina rugata, Martens, Preuss. Exped. Ost-Asien, Zool. vol. ii, p. 229, pl. x, fig. 5.

Hab.—South Celebes, at 2,000 feet.

This species has already been quoted from the southern part of the island by Wallace and by Martens. Young shells are very sharply keeled and angulate, and the two apical whorls are peculiarly malleated, a feature also observable in more adult specimens.

11. Obba marginata (Müller).

Var. *sororcula*, Martens, Preuss. Exped. Ost-Asien, Zool. ii, p. 294, pl. xvii, fig. 4.

Hab.—South Celebes, at 2,000 feet.

It is interesting to find this species occurring in the south of the island as well as the north. Similar small examples also occur at the Philippine Islands.

12. Chloritis plena (Godwin-Austen).

Helix (*Chloritis*) *plena*, Godwin-Austen, Proc. Zool. Soc. 1891, p. 44, pl. ii, fig. 8.

Hab.—South Celebes, 2,000 feet (Everett); Labuan (G.-A.).

Var. *Celebensis*, n.

Only a single specimen was obtained by Mr. Everett. It is rather smaller than the type from Labuan (maj. diam. 16 mm.), consisting of half a whorl less, the peristome is faintly tinted with livid lilac,

and the columellar margin is not quite so broadly reflexed and is rather more oblique. The supra-peripheral band or line is narrower, and bisects an indistinct pale zone. The "finely granulate" sculpture mentioned by Godwin-Austen occurs only upon the spire, the body-whorl in both being clothed with a dull, non-pilose periostracum.

13. Chloritis Howesii. Pl. VII, Figs. 21, 22.

Testa depressa, orbicularis, subanguste umbilicata, tenuiuscula, saturate castaneo-fusca, zona flavescente paulo supra peripheriam utrimque linea nigro-rufa marginata, ornata, et circa umbilicum pallida vel flavescens, epidermide minute pilosa undique induta; spira plana; anfractus quatuor, convexi, celeriter crescentes, ultimus antice oblique descendens; sutura profunda, linea nigro-fusca superiore notata; apertura subhorizontalis, lilacea, zonis externis translucentibus, late lunata; peristoma lilaceum, undique expansum, marginibus leviter conniventibus, columellari latius reflexo. *Var.* Testa pallidior, in exemplo unico linea inferiore deficiente. Diam. maj. 33, min. 24, alt. 16 mm.; apertura intus 11 mm. alta, 15 lata.

Hab.—South Celebes, 2,000 feet; and Bonthain Peak, 4,000 feet.

None of the specimens from the latter locality (var. *Bonthainensis*) have the dark rich brown colour of the type, whilst the "hairs" of the epidermis are a trifle coarser, conspicuously fewer and further apart. The spire also has the apex elevated slightly above the body-whorl, whereas in the specimens from the lower altitude it is depressed. This handsome species has somewhat of the form of *Chloritis tuba* (Albers), but is smaller, differently banded, etc. I have much pleasure in naming this beautiful shell after our distinguished President, Prof. G. B. Howes.

14. Amphidromus perversus (Linn.).

Hab.—South Celebes, at 2,000 feet.

Both the typical form of this species (Conchyl.-Cab., ed. 2, *Bulimus*, pl. ix, figs. 1, 2) and the variety *interrupta* (Delessert, Recueil de Coq., pl. xxvii, figs. 7*a*, 7*b*) were collected at the above locality. This discovery of the typical form fills up a gap in the distribution, as there has hitherto been some doubt respecting the exact locality. (*Vide* Fulton, Ann. Mag. Nat. Hist. 1896, vol. xvii, p. 67.)

15. Calycia Everetti. Pl. VII, Fig. 23.

Testa ovato-conica, ad peripheriam angulata, anguste perforata, albo-pellucida, epidermide virente nitente amicta; spira conica, ad apicem papillosa; anfractus 5½, celeriter accrescentes, apicales 2–3 convexi, cæteri planiusculi, infra suturam linea lactea angusta marginati, oblique striati et lineis impressis spiralibus obsoletis sculpti, ultimus amplus, in medio obtuse angulatus, malleatus vel corrugatus, et oblique striatus; apertura inverse auriformis, concolor, longit. totius ⅔ fere æquans; peristoma album, haud incrassatum, leviter expansum, margine columellari supra perforationem anguste reflexo. Longit. 26, diam. 20 mm; apertura 16 mm. longa, 11·5 lata.

Hab.—Bonthain Peak, South Celebes, at 4,000 feet.

This species is very peculiar, and does not suggest a comparison with any other known form. It hardly agrees with the genus *Calycia* in the expanded character of the peristome, but it appears to approach that group more closely than any other. I have much pleasure in associating Mr. Everett's name with this interesting discovery.

16. Clausilia Celebensis. Pl. VII, Fig. 24.

Testa elongata, subclavata, saturate purpureo-fusca, apicem versus propeque suturam pallida; anfractus 10, convexiusculi, oblique tenuiter striati, penultimus ultimo latior, ultimus antice paulo ascendens; apex mammillatus; apertura inverse auriformis, longit. totius ¼ paulo minor, intus livido-purpurea; peristoma albidum, leviter incrassatum, et reflexum. Lamella superior tenuis, ad marginem attingens, inferior longe intus, subcolumellaris gracilis, obliqua, l. inferiori approximata, ad marginem labri fere attingens; plica suturalis unica elongata, supra aperturam, suturæ parallela; lunella distincta, supra aperturam sita. Longit. 24, diam. fere 6 mm. *Var.* Testa tenuis pallido-cornea.

Hab.—Bonthain Peak, South Celebes, at 5,000 to 6,000 feet; also South Celebes at 2,000 feet.

Most of the specimens are of a dark purplish-brown colour, paler towards the apex and at the suture. In some of the older shells the surface becomes more or less decomposed and assumes a greenish chalky appearance, and frequently is somewhat worn away at the suture, which consequently presents a slightly channelled aspect. Only two specimens of the pale corneous variety were obtained. Some examples are much more slender than others, as shown by the following measurements: length 23·75, diameter 6 mm.; length 23·25, diameter 5 mm.

17. Clausilia simillima. Pl. VII, Fig. 25.

Testa elongata, superne attenuata, saturate purpureo-fusca, oblique rugose striata, ad suturam denticulata; anfractus 10–11, leviter convexiusculi; apertura piriformis, intus sordide purpureo-fusca; peristoma expansum, reflexum, ad marginem pallidum; lamella superior tenuis, marginem attingens, inferior intus sæpe bifurcata, parte superiore lamellæ superiori adjuncta; lamella subcolumellaris nulla. Plicæ suturales duo, superior elongata, suturæ parallela, inferior leviter obliqua, multo brevior; plica palatalis unica obliqua, supra rimam umbilicalem sita. Longit. 20·5, diam. 4 mm.

Hab.—South Celebes, at 2,000 feet.

This species is very like *C. Moluccensis*, Martens, as regards form, but is more coarsely striated, strongly dentate at the suture, and of a much richer brown colour. The form and armature of the mouth are very similar.

18. Clausilia subpolita. Pl. VII, Fig. 26.

Testa parva, subpellucida, fusco-cornea, nitida, lineis incrementi tenuibus obliquis striata; anfractus 10, superiores 6–7 convexiusculi,

cæteri minus convexi; apertura inverse auriformis, concolor; peristoma tenue, pallidum leviter expansum; lamella superior tenuis, marginem attingens, inferior obliqua, subcolumellaris parva, tenuis, ad marginem labri vix producta; plica suturalis unica, supra aperturam visibilis, suturæ vix parallela; lunella nulla. Longit. 14, diam. 3 mm.

Hab.—South Celebes, at 2,000 feet.

The lines of growth are a little coarser behind the lip than upon the rest of the surface. The apex has a drawn-out appearance, the subapical whorls being somewhat long.

19. Clausilia usitata. Pl. VII, Fig. 27.

Testa *C. subpolitæ* similis, sed paulo major, saturate fusca, versus apicem pallida; apertura major; lamella subcolumellaris marginem attingens; plica suturalis unica, magis ad dextram; lunella distincta, in medio angulata, superne plica suturali conjuncta. Peristoma angustum, leviter expansum, margine externo (sinistro) pallide rufescente, dextro albescente. Longit. 16, diam. 3·5 mm.

Hab.—South Celebes, at 2,000 feet.

The slightly larger size, different colour, the presence of a lunella, and other characters, distinguish this from the preceding species.

20. Cyclotus fasciatus, Martens.

C. fasciatus, Martens, Preuss. Exped. Ost-Asien, Zool. ii, p. 118, pl. i, fig. 3; Mal. Blät. 1872, vol. xx, p. 158.

Hab.—South Celebes, at 2,000 feet (Everett); near Macassar (Martens).

21. Cyclotus politus, Sowerby, var.

Hab.—South Celebes, at 2,000 feet.

A comparison of the types shows that *C. politus* and *C. Amboinensis*, Pfr., are merely varieties of one and the same species; and I have a very strong belief that *C. fulminulatus*, Martens, is also conspecific. The elevation of the spire, the width of the umbilicus, and the thickness of the peristome, are variable. The specimens from South Celebes are of the same form as the var. *Amboinensis*, that is, are less elevated in the spire than the type shell of *politus*. They also generally have the peristome somewhat less thickened; but the columellar margin exhibits the internal thickening for the support of the operculum, which is present in all the forms.

22. Cyclotus pyrostoma. Pl. VII, Figs. 1–3.

Testa orbicularis, aperte et perspective umbilicata, solida, epidermide nigro-olivacea, plus minus detrita, induta, pallide rufescens, rufo indistincte flammulata et maculata, infra peripheriam zona lata nigro-olivacea picta; spira leviter elata; anfractus 5, convexi, celeriter accrescentes, superiores tres læves, lineis incrementi striati, ult. et penult. superne spiraliter lirati, striisque obliquis arcuatis fortiter sculpti, ultimus ad peripheriam subcarinatus, antice descendens, infra haud spiraliter striatus; apertura obliqua, saturate sanguineo-rufa;

peristoma incrassatum, pallidum, vix expansum, marginibus callo rufo junctis, inferiore valde recedente. Diam. maj. 26, min. 20, alt. 13 mm. Operculum testaceum, supra leviter concavum, infra in medio mucronatum, versus marginem corneum; anfractus circiter 8, ad suturam plus minus carinati, transversim striati, lentissime crescentes, ultimus ad marginem excavatus.

Hab.—South Celebes, at 2,000 feet.

In general form this species recalls *Cyclophorus Woodianus* of Lea. It is well characterized by the brilliant red aperture of the shell, and the somewhat strong spiral liræ upon the upper surface of the last two whorls.

23. Cyclotus Celebensis. Pl. VII, Figs. 4–6.

Testa orbicularis, aperte et perspective umbilicata, olivaceo-fusca, ad peripheriam zona lutea cincta, interdum superne et infra plus minus flavo maculata; spira breviter elata; anfractus 5, convexi, lineis incrementi tenuibus striati, ultimus antice descendens; apertura obliqua, intus fuscescens; peristoma duplex, margine externo expanso et reflexo, pallido, interno lutescente, continuo. Diam. maj. 20, min. 16, alt. 9 mm. Operculum multispirale, ad suturam insigniter acute carinatum, supra fere planum, ex laminis alternatim corneis et testaceis constitum, inferne omnino corneum, in medio mucronatum.

Hab.—South Celebes, 2,000–4,000 feet.

Two specimens are uniformly brownish, with the exception of the peripheral zone; the third exhibits a sprinkling of golden specks above and a dotting below.

B. List of the Known Species of Land-shells of Celebes.[1]

Helicarion (Otesia) flammulatus, Q. and G.
,, ,, viridis, Q. and G.
,, Celebensis, Pfr.
,, Idæ, Pfr.
,, Wallacei, Smith.
Xesta fulvizona, Mouss. (*var.*).
,, Wallacei, Pfr.
,, dimidiata, Smith.
,, vitellus, Shuttl.
,, Riedeli, Martens.
,, cincta, Lea.
,, trochus, Müll.
,, Stuartiæ, Sow. (?).
,, nemorensis, Müll. (?).
,, Sibylla, Tap.-Can.
Hemiplecta semisculpta, Martens.
,, ribbei, Bttgr.

[1] Species from the small island of Saleyer (Selayar, or Salayar), south of Celebes, are not included in this list.

Hemiplecta Bonthainensis, Smith.
,, Celebensis, Pfr.[1]
Rhysota rugata, Martens.
,, limbifera, Martens.
Macrochlamys fulvocornea, Martens.
,, indifferens, Smith.
Microcystina consors, Smith.
,, consimilis, Smith.
Trochomorpha planorbis, Lesson.
,, Gorontalensis, Martens.
,, ternatana (Guill.) (Böttger).
Ganesella leucophlœa, Martens.
Eulota similaris, Férus.[2]
,, suffodiens, Böttger.
,, (Plectotropis) Winteriana, Pfr. (Böttger).
Planispira flavidula, Martens.
,, (Trachia) pilisparsa, Martens.
Chloritis zodiacus, Férus.
,, tuba, Albers.
,, bulbulus, Mouss.
,, biomphala, Pfr.
,, Lansbergiana, Dohrn.[3]
,, Howesii, Smith.
,, plana, Godwin-Austen.
Obba Listeri, Gray.
,, marginata, Müll. (*var.*).
,, papilla, Müll.
,, heroica, Pfr.
Papuina euchroes, Pfr.
Camæna (Pseudobba) Quoyi, Desh.
,, ,, mammilla, Férus.
Cochlostyla (Corasia) leucophthalma, Pfr. ?
Amphidromus perversus, L. (and *vars.*).
,, sinistralis, Reeve.
,, Beccarii, Tap.-Can.
,, filozonatus, Martens (*var.*).[4]
,, contrarius, Müll. (*var.*).[4]
Calycia Everetti, Smith.
Buliminus (Rhachis) zonulatus, Pfr.
Opeas gracilis, Hutton.
Clausilia Moluccensis, Martens.
,, Celebensis, Smith.
,, usitata, Smith.
,, simillima, Smith.

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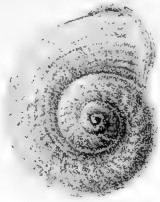
[1] Perhaps only a variety of *H. striata*, Gray (Martens).
[2] Bericht Senckenberg. nat. Gesell. 1891, p. 267.
[3] Nachrichtsbl. deutsch. Mal. Gesell. 1879, p. 69; Kobelt, Conch.-Cab., p. 598, pl. clxxv, figs. 1–3.
[4] Fulton, Ann. Mag. Nat. Hist. 1896, vol. xvii, p. 78.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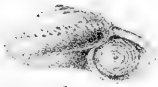
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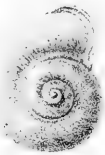
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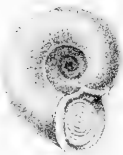
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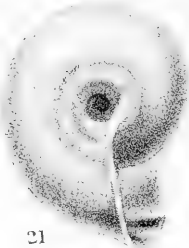
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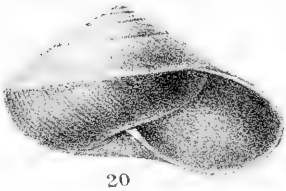
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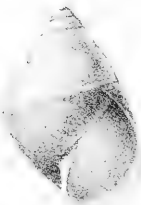
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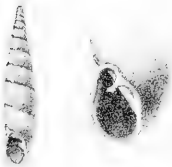
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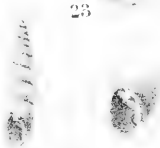
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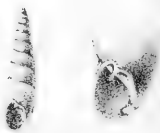
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J. Green del et lith.

Mintern Bros. imp.

NEW LAND SHELLS FROM CELEBES.

Clausilia subpolita, Smith.
Pupa Selebensis, Tap.-Can.
Veronicella graffi, Simroth.
Pterocyclus tenuilabiatus, Metcalfe (*var.*).
Cyclotus fasciatus, Martens.
,, fulminulatus, Martens (probably=politus).
,, politus, Sowerby (*var.* Amboinensis, Pfr.).
,, longipilus, Martens.
,, guttatus, Pfr.
,, Celebensis, Smith.
,, pyrostoma, Smith.
,, depictus, Tap.-Can.
Cyclophorus nigricans, Pfr.
Lagochilus ciliocinctus, Martens (*var.*).
,, bellus, Martens.
Leptopoma Moussoni, Martens.
,, vitreum, Lesson (Böttger and Wallace).
,, Manadense, Pfr.
Alycæus Jagori, Martens.
,, Celebensis, Martens.
Helicina parva, Sowerby.
,, oxytropis, Gray.

Prof. E. von Martens (Max Weber's Zool. Ergeb., ii, p. 256) gives the total number of species as 65[1]; but, deducting the seven species from Saleyer island and three synonyms (*Obba sororcula*, *Amphidromus interruptus*, and *A. Sultanus*), the actual number of indigenous species known to him amounted to 56. To this number fourteen new species, and thirteen others already described from Celebes and other localities, are now added, making a total of 83.

EXPLANATION OF PLATE VII.

Figs. 1, 2, 3. Cyclotus pyrostoma.
,, 4, 5, 6. ,, Celebensis.
,, 7, 8, 9. Helicarion Wallacei.
,, 10, 11, 12. Macrochlamys indifferens.
,, 13, 14, 15. Microcystina consimilis.
,, 16, 17, 18. ,, consors.
,, 19. Xesta dimidiata.
,, 20. Hemiplecta Bouthainensis.
,, 21, 22. Chloritis Howesii.
,, 23. Calycia Everetti.
,, 24. Clausilia Celebensis.
,, 25. ,, simillima.
,, 26. ,, subpolita.
,, 27. ,, usitata.

[1] This should be 66 according to his list of species quoted in the table on the previous pages.

ON SOME FRESH-WATER SHELLS FROM THE ISLAND OF KOLGUEV.

By Edgar A. Smith, F.Z.S., etc.

Read 13*th March*, 1896.

"As Kolguev Island lies but fifty miles off the coast of Arctic Europe it may fairly be regarded as European. A glance at the map will show that it is the only island in that part of the Arctic Ocean known as Barents Sea."

Mr. A. Trevor-Battye, from whose book, "Ice-bound on Kolguev," I have quoted the above paragraph, did not collect any terrestrial or fresh-water molluscs during his expedition in 1894, his attention being more devoted to botany, birds, and mammals. Colonel H. W. Feilden, the well-known Arctic naturalist, was, however, during his visit in 1895, successful in finding the following three species of fresh-water shells, the first recorded from the island. Although no land-shells have as yet been discovered, it is very probable that some species of Zonitidæ and Pupidæ may occur, such forms apparently being capable of enduring an Arctic climate.

Colonel Feilden also obtained a few marine forms. They are not, however, of any special interest, belonging to well-known boreal forms of *Buccinum*, *Littorina*, *Astarte*, *Cardium*, and *Mytilus*.

The three fresh-water species are—

1. Limnæa palustris, Müller.

Var. *terebra*. Westerlund, Fauna Paläarct. Region, Theil 2, p. 46.

Hab.—Kriva River (Feilden).

In these specimens the spire is often much produced, the whorls are very convex, and the surface, when cleaned, has a silky appearance. The lines of growth are fine and oblique, and interrupted by somewhat distant, impressed spiral lines, producing a more or less reticulated appearance. All the specimens have the apex eroded; and the largest, consisting of four remaining whorls, is 22 mm. in length.

2. Limnæa ovata, Draparnaud.

Limnæa ovata var. *Kolguevensis*.

"Var. nova.—Præcipue notabilis, spira elongata, crassa, contorta, sutura impressa, pone aperturam obliqua, anfractu antepenultimo tumido-convexo, ultimo ventroso, infra levissime attenuato, subrotundato." (Westerlund in litt.)

Hab.—Valley of the Gobista River (Feilden).

Mr. C. A. Westerlund, who kindly gave me his opinion upon these species, was unable to identify these specimens with any known form of this species; I therefore suggest the name *Kolguevensis* for this variety. It is very unlike the typical form, the greater length of the spire and the tumidity of the penultimate whorl being very remarkable.

3. Planorbis borealis (Lovén), Westerlund.

P. borealis, Lovén, Westerlund, Mal. Blät. 1874, vol. xxii, p. 112, pl. ii, figs. 23–5; Fauna Paläarct., Theil 2, p. 80.

Hab.—Kriva River (Feilden).

NOTES ON THE MOLLUSCA FROM A RAINWASH AT DARENTH, KENT.

By A. S. Kennard.

Read 13*th March*, 1896.

During the winter of 1894–5 extensive excavations were carried on in the parish of Darenth, resulting in the exposure of the remains of a large Roman building, which had been covered since its desertion by a rainwash varying in thickness from two to six feet. Out of this rainwash I have obtained fifteen species of Mollusca, viz.—

Amalia Sowerbyi, Fér.
Vitrea cellaria, Müll.
,, *nitidula*, Drap.
Pyramidula rotundata, Müll.
Helicella ericetorum, Müll.
,, *caperata*, Mont.
Hygromia hispida, Linn.
Vallonia pulchella, Müll.
Helicigona arbustorum, Linn.
Helix aspersa, Müll.
,, *nemoralis*, Linn.
Clausilia bidentata, Ström.
Cochlicopa lubrica, Müll.
Cæcilianella acicula, Müll.
Cyclostoma elegans, Müll.

With the exception of *Helix aspersa* and *H. nemoralis*, all the examples were obtained from one spot at the base of the deposit, and were mixed with fragments of bone and Roman pottery. *Helix aspersa* and *H. nemoralis*, however, were much more abundant, and always occurred at the very base; the upper portion of the rainwash contained no shells. There can be no doubt that the above list represents the molluscan fauna of the immediate neighbourhood at the period immediately subsequent to the Roman occupation, and on comparing it with the existing species a difference is at once seen. All the species enumerated are now living in the vicinity; but, on the other hand, there are four species which, though extremely abundant at the present time, are entirely absent in the deposit, viz., *Hygromia rufescens*, *Helix hortensis*, *Helicella cantiana*, and *H. virgata*. The absence of the first-named is due, probably, to local causes, since it occurs at Copford, Crossness, and elsewhere. *Helix hortensis* is not known to occur in any deposit, though often erroneously recorded, and in this case there is no possibility of confounding it with *Helix nemoralis*, because all the examples retain their coloration. The past distribution of *Helicella virgata* is rather puzzling. It is entirely absent from

all beds of the London district,[1] but occurs in the Pleistocene gravels of Barrington, Cambridge; and I have lately had examples sent me from a Neolithic rainwash at St. Catherine's Down, Isle of Wight. In all probability it is a very recent introduction into the Home Counties. The non-occurrence of *Helicella cantiana* fully bears out Mr. B. B. Woodward's view that this species is of post-Roman introduction into this country. *Helix aspersa* has been recorded from several Roman deposits, and has been considered to have been introduced at that time, but Mr. J. W. Flower notes[2] that it is constantly found in British barrows in Wiltshire, and it occurs in the St. Catherine's Down deposit. Mr. B. B. Woodward has also called my attention to the fact that it is recorded from deposits resembling "kitchen middens" on the shores of the Mersey, one mile from the present sea-shore,[3] so that its pre-Roman existence in this country must be admitted.

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[1] Since this was written, a specimen has been obtained by Dr. Corner from the Pleistocene deposit at Ilford.

[2] J. W. Flower, F.G.S., "The Prehistoric Sepulchres of Algeria": Transactions of International Congress of Prehistoric Archæology, 1868, p. 209.

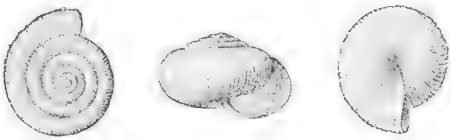
[3] C. Collingwood, Proc. Lit. and Phil. Soc. Liverpool, 1863, pp. 113–4.

ON *FLAMMULINA* (*ALLODISCUS*) *CHION*, A NEW HELICOID LAND-SHELL FROM NEW ZEALAND.

By E. R. Sykes, B.A., F.Z.S., etc.

Read 10*th April*, 1896.

The species about to be described formed part of the collection made by Mr. H. B. Preston, in the North Island of New Zealand, and is the second new species from that collection, the first having already been described.[1]



Flammulina (Allodiscus) chion, n.sp.

Testa parva, depresse conica, imperforata, tenuis, confertim costulata, omnino nivea; anfr. 5–5½, convexi, regulariter accrescentes, ultimus non descendens, costulis 82 approx. ornata, interstitiæ sub lente striatæ; basi medio impressus; apertura rotundato-lunaris; peristoma simplex, tenue. Diam. maj. 5, alt. 3 mm.

Hab.—Near Inglewood, Taranaki, North Island.

At first sight this species would suggest the idea that it is an albino form of some known shell: on examination, however, there seems to be no known form quite resembling it; and since it proved plentiful, and no coloured specimens were found, this idea may be abandoned. It is of a lovely, snowy white, and has spiral striations on the apical whorls. The nearest species appears to be *F. venulata* (Pfr.), from the South Island; from this, however, *F. chion* may be separated by the difference in the relative proportions of breadth and height, as also by the more distant and more elevated riblets. The entire absence of colour is also a remarkable feature. I have to thank Mr. Suter for kindly examining a specimen and giving his opinion.

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[1] Proc. Malac. Soc., Vol. I, p. 218, March 1895.

DESCRIPTIONS OF NEW SPECIES OF MINUTE MARINE SHELLS FROM BOMBAY.

By J. Cosmo Melvill, M.A., F.L.S., etc.

Read 10th April and 8th May, 1896.

PLATE VIII.

In November, 1892, conjointly with Mr. Alexander Abercrombie, of Bombay, I published[1] a Catalogue of about 320 species of marine Mollusca, that had been collected by the latter gentleman during three successive seasons on the shores of this favoured, specialized, and little explored centre. Specialized, Bombay is certainly proved to be in this particular, since many showy species would seem to have made her coasts their headquarters; and, besides, in the Catalogue just referred to, no less than twenty-five were signalized as novelties, many belonging to the more attractive genera, *e.g.*, *Purpura*, *Murex*, *Tellina*, and *Raëta*. At the same time a few of the "minutiora" were described and figured, and a far larger number set aside for future investigation. These have received welcome additions by an assortment of two further boxes of shell-shingle, kindly forwarded a year ago by Mr. Abercrombie; which, while yielding further specimens of nearly all the smaller species first enumerated, likewise provided fresh material in the way of many novelties.

The molluscan fauna of Bombay being, as already observed, well differentiated and specialized, it is rendered a simpler task than might be thought, to discriminate such forms as are now to be described. No dredgings, scientifically made, have been carried out here—indeed, I am informed, the configuration of these coasts is not satisfactory for the purpose—and no collections of the smaller species, excepting a few by the Rev. Mr. Fairbank, of Bombay, and Messrs. H. F. and W. T. Blanford, had been made, when a few species, e.g. *Irawadia trochlearis*, Blanf., and *Fairbankia Bombayana*, Blanf., were described. Mr. Geoffrey Nevill subsequently discovered a few, mainly Pleurotomidæ, and it is regrettable that his types are all in the Calcutta Museum, and therefore inaccessible to most British conchologists. Some, however, have been figured in the Journal of the Asiatic Society of Bengal.

The Ceylon fauna and that of Karachi, the latter now being assiduously explored by Mr. F. W. Townsend, differ widely from that of Bombay, though of course a few species are common to two or all three of the localities. We cannot think that, numerically, the Bombay list will exceed 500 species (exclusive of brackish-water forms such as *Neritina*, *Potamides*, etc.); and the publication of the following twenty-six new forms, mainly belonging to the families

[1] *Cf.* Memoirs Manchester Lit. and Phil. Soc., series iv, vol. vii, pp. 17–51.

Solariidæ, Scalariidæ, Pyramidellidæ, and Cerithiidæ, will swell up the total of those catalogued to 350 species.

I would tender my best thanks, not only to Mr. Abercrombie, for providing the material of which this paper is the outcome, but also to Mr. E. A. Smith and Mr. E. R. Sykes, for aid and advice. It is my intention to offer to place the types of all these small species in the Natural History Museum, South Kensington.

1. Bittium tenthrenoïs, n.sp. Pl. VIII, Fig. 1.

B. testa cylindrica, obesula, doliiformi, solida, ochracea, apice obtuso, apud apicem, simul ac ad basim pallidiore, anfractibus 7, in medio latioribus, tribus papillarum ordinibus transversim regulariter instructis, papillis parvis, gemmatis, interstitiis alveolatis, apertura ovato-rotunda, labro exteriore minime expanso. Long. 3, lat. 1·25 mm.

About twenty specimens of a small, tun-shaped, cylindrical shell, warm ochraceous in colour, with the extremities pale, almost white, ornamented with three rows of papilliform gemmæ on the whorls, the spaces between them being alveolate, whence the specific name, derived from τενθρηνώδης, 'honeycombed.' This species is slightly like *Cerithiopsis pulvis*, Issel, from the Red Sea, a very small species, which, with the present one, I should be inclined to class rather as a *Bittium*.

2. Cerithiopsis rubricincta, n.sp. Pl. VIII. Fig. 15.

C. testa fusiformi, solida, pallide ochracea, anfractibus 10 vel 11, tumidis, apud suturas impressis, binis gemmarum ordinibus transversim decoratis, longitudinaliter clathratis, interstitiis alveolatis, infra juxta suturas tenui rubra zona accinctis, apertura subrotunda, peristomate tenui, canali brevi. Long. 3·25 mm. sp. maj., lat. 1 mm.

Very beautiful, though minute. Of a pale ochraceous colour; the ventricose whorls are ornamented, just below the sutures, with a red band; the sculpture is, as is usual amongst the *Triforis*, *Bittium*, and *Cerithiopsis*, a double row of transverse gemmæ, crossed by lattice-forming riblets, the interstices being honeycombed and deep. The mouth is almost round, canal very short, lip simple. Several specimens.

3. Cerithiopsis Sykesii, n.sp. Pl. VIII, Fig. 8.

C. testa attenuato fusiformi, aciculata, ochracea, anfractibus 12 vel 13, rectis, minime ventricosulis, trinis gemmarum papilliformium ordinibus transversim cingulatis, apud suturas impressis, in uno specimine juveni duobus apicalibus anfractibus pellucidis, vitreis, apertura subquadrata, simplice. Long. 4·25, lat. 1·20 mm.

A tropical representative of the typical species of the genus, *C. tuberculariis*, Mont., from which this shell differs in being straighter, more attenuate, and regular. It comes nearer to the *C. diadema*, Watson, from Madeira, of which I have only seen a figure, but is smaller than that species. It is of a uniform pale ochraceous-brown, and the single young individual of the series possesses two vitreous apical whorls intact. I have much pleasure in connecting with this small *Cerithiopsis* the name of Mr. E. R. Sykes, our indefatigable Secretary.

4. Cerithiopsis pulcherrima, n.sp. Pl. VIII, Fig. 3.

C. testa tenui, multum attenuata, aciculari, albida, anfractibus 13, apud suturas canaliculatis, apud canales uno gemmularum ordine, cæterasque in partes anfractuum bino ordine similari instructis, apertura subquadrata, labro tenui. Long. 4, lat. 1·15 mm.

Seven specimens, mostly rather imperfect. The largest, from which this description is taken, is slightly distorted in one of the central whorls; it is in very good condition, being white, elongated, very attenuate, thirteen-whorled, ornamented with three rows of gemmules, one row being at the canaliculate depression, just below the sutures of each whorl, the other two on the normal whorl. The mouth is simple, aperture squarrose. It is a very beautiful little species.

5. Solarium (Torinia) homalaxis, n.sp. Pl. VIII, Fig. 12.

S. testa minutissima, depressa, profunde umbilicata, albescente, gemmulata, supra depresso-planata, anfractibus 4, ultimo rapide accrescente, ad peripheriam bicarinato, carinis regulari gemmarum ordine decoratis, simili bino ordine circa umbilicum, inter has, infra, simul ac supra, quatuor minorum gemmularum ordinibus instructis, apertura quadrato-rotunda. Long. 1, lat. 2 mm.

I alluded to this specimen when describing its congener, *S. delectabile*, also from the same locality.[1] This species differs in its more depressed form, the bicarinate angles at the periphery, and its smaller size. The shell is in juvenile condition, however, and may grow slightly larger, the apical whorls showing this. It is an exceedingly highly chased and sculptured little species.

6. Rissoina epentroma, n.sp. Pl. VIII, Fig. 23.

R. testa ovata, gradata, solidiuscula, candida, anfractibus 5, undique longitudinaliter crassicostatis, costis lævibus, interstitiis transversim tenuistriatis, apertura ovata, labro exteriore incrassato. Long. 2, lat. 1·15 mm.

Three specimens, one being juvenile, of a highly sculptured little species, which I have placed in *Rissoina* rather than in *Rissoia*, owing to the thickened base of the aperture, the general form being more in accordance with a species of the latter genus.

The shell is gradately turreted, five-whorled, the whorls being uniformly costate, the ribs very thick in proportion to the size of the shell, and the interstices between transversely finely striate. The name, from the Greek *ἐπέντρωμα*, signifying 'a delicacy,' is chosen on account of the extreme beauty of this little *Rissoina*.

7. Rissoina pachystoma, n.sp. Pl. VIII, Fig. 4.

R. testa solida, fusiformi, albo-cinerea, anfractibus 8, undique longitudinaliter recticostatis, costis regularibus, lævibus, nitentibus, interstitiis lævibus, apertura oblique ovata, labro exteriore multum incrassato, ad basim quasi-truncato, margine columellari obliquo, crasso. Long. 5, lat. 2 mm.

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[1] Mem. Manch. Lit. and Phil. Soc., vol. vii, p. 57.

The nearest approach to this species seems to be *R. conifera* (Schwartz). It is principally distinguishable by its straight, smooth ribs, and extremely incrassate outer lip, the base being somewhat truncate, and the thickening extending to the columellar margin.

8. Adeorbis vanikoroides, n.sp. Pl. VIII, Fig. 14.

A. testa profunde umbilicata, depresso-globosa, apice exserto, tenui, anfractibus 4, ultimo rapide accrescente, longitudinaliter obliquissime tenuicostatis, costis lævibus, interstitiis sub lente striatulis, ultimo circa umbilicum effosso, angulari, apertura ovata, labro exteriore simplice, paullulum incrassato. Long. 1·50, lat. 1 mm.

Extremely small, but very characteristic. Of the same character as *A. scaber*, Phil., a Central American shell, but differing entirely in form; the apex is conspicuously exserted so far as the first two whorls are concerned, the last whorl is large, and entirely longitudinally obliquely ribbed, the interstices between being very finely striate. The umbilicus is profound, angularly ridged above, and the aperture ovate. The specific name suggests a superficial resemblance in miniature to species of *Vanikoro*, Quoy and Gaimard, which name has precedence by several years over *Narica*, Recluz.

9. Aclis atemeles, n.sp. Pl. VIII, Fig. 10.

A. testa angusta, attenuata, fusiformi, delicatula, albido-cinerea, anfractibus 6, tumidis, apud suturas impressis, sub lente tenuissime transversim striatulis, apertura ovata, labro exteriore paullulum incrassato. Long. 3·25, lat. 1·25 mm.

A finely striolate species, with ventricose whorls, six in number, apex obtuse, mouth ovate, simple. The name suggested is the Greek ἀτημέλης, 'neglected,' from the inconspicuous appearance.

10. Aclis eoa, n.sp. Pl. VIII, Fig. 18.

A. testa oblongo-fusiformi, delicatula, semipellucida, lactea, apice obtuso, anfractibus 6, paullum ante apicem irregularibus, ventricosis, apud suturas multum impressis, fere lævibus, vix nitentibus; apertura ovata, peristomate simplice, tenui, margine columellari obliquo. Long. 3·50, lat. 1·25 mm.

A thin, semipellucid, milky shell, without any gloss, six-whorled, the whorls a little irregular and distorted, ventricose, and impressed at the sutures. The aperture is ovate, the outer lip simple, and the columellar margin somewhat oblique.

It does not yield in beauty to the other known species, nearly all of which are exquisite in form. The specific name is given from its Eastern habitat.

11. Eulima dens-columbi, n.sp. Pl. VIII, Fig. 19.

E. testa parva, politissima, attenuato-curvata, apud basim latiore, translucida, anfractibus 10, juxta, infra suturas zona lactea pellucente cinctis, apertura oblique oblonga, labro marginem apud columellarem paullum incrassato. Long. 5 mm. sp. maj., lat. 1·75 mm.

A small incurved species, ten-whorled, smooth, polished, but translucent, the basal portion being broader in proportion. This form is

allied to the European and British *E. incurva*, Renieri, *E. distorta*, Phil. (*non* Defrance), but the shell is much broader at the base, and the whorls are not so flattened. The mouth is obliquely oblong, and in full-grown specimens the shell is slightly thickened at the columellar margin. Many specimens.

Another small species of *Eulima* occurs, of which I have two specimens: it is straight, and in form like *E. polita*, L.; it may possibly be identical with *E. subangulata*, Somb., described as being an inhabitant of the Indian Ocean.

12. Syrnola metria, n.sp. Pl. VIII, Fig. 16.

S. testa elongata, fusiformi, solida, alba, nitida, anfractibus 10, apud suturas acute canaliculatis, rectis, apertura ovato squarrosa, peristomate tenui, simplice, marginem apud columellarem uniplicato. Long. 5, lat. 2 mm.

A shining, smooth species, deeply channelled at the sutures. Mouth squarely ovate, with one columellar plait. In form an *Obeliscus*, in mouth-process a *Syrnola*. The name is the Greek μέτριος, 'moderate,' 'modest.'

13. Oscilla Indica, n.sp. Pl. VIII, Fig. 5.

O. testa attenuata, fusiformi, delicatula, tenui, semipellucida, candida, anfractibus 9 vel 10, transversim undique spiraliter tricostatis, costis acutis lævibus, interstitiis sub lente tenuissime longitudinaliter striatis, apertura oblonga, labro simplice, marginem apud columellarem uniplicato. Long. 3, lat. 1·25 mm.

A very beautiful little form, of which only one specimen has so far occurred. It might easily be overlooked for the young of *Irawadia trochlearis*, Blanford, but this is a coarser shell, though of the same transversely carinate pattern and white colour. It is a most delicate species, and the columellar plait, though somewhat deep-seated, is very evident.

14. Myonia gavisa, n.sp. Pl. VIII, Fig. 26.

M. testa tenuissima, albida, subpellucida, elongato-attenuata, anfractibus 7, ventricosulis, undique transversim filostriatis, apertura oblonga, peristomate tenui. Long. 2·25, lat. 1 mm.

A very small, delicate species, with some appearance of an *Aclis*, but we consider rightly referable to *Myonia* (*Actæopyramis*, Fischer). The shell is white, subhyaline, whorls probably seven (but the sole specimen is a little broken at the apex), much ventricose, and uniformly transversely filostriate. The name is the Latin *gavisus*, 'that has given pleasure,' from the beauty and sculpture of this little shell.

15. Miralda idalima, n.sp. Pl. VIII, Fig. 6.

M. testa oblonga, gradatula, tenui, albida, subpellucida, anfractibus 6, ad suturas multum impressis, subcanaliculatis, turritis, infra suturas bino gemmarum ordine decoratis, partes ad cæteras anfractuum transversim costulatis, ultimo apud basim læviore, apertura oblonga, labro tenui, marginem ad columellarem uniplicato. Long. 2, lat. 1 mm.

A very small but well-marked shell, its sculpture being distinct. The whorls, six in number, of which two are very small and apical, one turreted, being much compressed—almost canaliculate—at the sutures. Below the sutures there is a double row of transverse gemmæ, and the rest of the whorls are ornamented with plain, transverse, raised lines or small costæ. The mouth is oblong, and the columellar plait is large and strong.

Only one specimen is in existence, one other, which was in all respects precisely similar, having, unfortunately, got mislaid.

Εἰδάλιμος is a Homeric adjective for 'comely,' the Latin *formosus*, and is well bestowed upon this little shell.

16. Odostomia antelia, n.sp. Pl. VIII, Fig. 22.

O. testa ovato-fusiformi, tenui, crystallina, lævi, nitida, anfractibus 6, apud suturas multum impressis, ventricosulis, sub lente spiraliter tenuissime calcario-lineatis, apertura ovato oblonga, margine columellari uniplicato, plica recta, conspicua. Long. 2, lat. 1 mm.

A typical *Odostomia*, with translucent, white, polished surface, six whorls, ventricose, deeply impressed at the sutures, giving a gradate appearance to the shell; under a lens in certain strong lights very indistinct, chalky, transverse lines are seen on the surface; the aperture is ovate-oblong, the lip simple, the columellar plait being straight and conspicuous.

The specific name is the Greek ἀντήλιος, 'eastern.'

It has some affinity with certain European species, e.g. *O. eulimoides* and *O. rissoides*, of Hanley.

Another species of *Odostomia* has, unfortunately, been mislaid. It is a very distinct form, a little larger than the preceding, with the whorls (seven) deeply channelled at the sutures, shape conically fusiform, columella with strong plait, aperture internally spirally striate.

17. Odostomia syrnoloides, n.sp. Pl. VIII, Fig. 13.

O. testa attenuata, fusiformi, alba, parum nitente, delicata, anfractibus 6, apud suturas impressis, apertura oblonga, labro fere continuo, marginem apud columellarem fortiter uniplicato. Long. 2·50, lat. 1 mm.

A smooth, dull white, six-whorled little shell, the apex vitreous, mouth ovate, with a strong straight plait on the columellar margin. Like a *Syrnola* in miniature, hence the specific name. Of the typical form of the genus, allied to *O. plicata*, Montagu.

18. Pyrgulina pyrgomella, n.sp. Pl. VIII, Fig. 24.

P. testa attenuata, fusiformi, gradata, candida, anfractibus 7, ad suturas subimpressis, longitudinaliter, ad medium anfractuum, costulatis, costis lævibus, papillosisque infra juxta suturas, apertura oblonga, labro exteriore simplice, paullum reflexo, columellari conspicue uniplicato. Long. 5 mm. sp. maj., lat. 1·25 mm.

Two specimens of a conspicuously beautiful species, of the same facies as *Turbonilla scalaris*, Phil., but white, whilst the columellar plait gives it generic distinction.

The longitudinal ribs begin at a little distance from the sutures, the immediate space between being quite smooth, and the ribs are also slightly papillose at the upper end, the papillæ merging into the rib. The specific name is derived from the Greek πυργῶμα, 'a tower,' from the turreted whorls. It may possibly be equally well placed in the genus *Mormula*, Ad.

19. Pyrgulina Edgarii, n.sp. Pl. VIII, Fig. 21.

P. testa angusta, fusiformi, gradatula, tenui, candida, anfractibus 6, ad suturas impressis, undique longitudinaliter crassicostulatis, costis scalariformibus, interstitiis transversim tenuissime striatis, apertura ovata, margine columellari fortiter uniplicato. Long. 2, lat. ·75 mm.

About twenty specimens. This species I venture to name after Mr. Edgar A. Smith, as a very small token of appreciation for his invariable kindness and assistance. The smaller size, turreted or graduate whorls, thick, longitudinal, scalariform ribs, and extremely fine transverse striations, differentiate this little species from *Pyrgulina interstriata*, Souverbie, and other allies.

Amongst the Bombay species of this genus, which is sometimes taken as a section of *Odostomia*, the following occur, in more or less plenty :—

P. callista, Melvill. Twelve of this most beautiful form in the second consignment of shell-sand; only four in the first.

P. casta, Adams. A few, not quite typical; may be a different species.

P. interstriata, Souverbie. I cannot separate the most abundant species at Bombay from this. I have specimens from the Gloyne Collection, from Upolu, precisely similar.

P. pyrgomella, n.sp.

P. Edgarii, n.sp.

20. Turbonilla Abercrombiei, n.sp. Pl. VIII, Fig. 7.

T. testa pergracili, attenuata, albida, nitida, anfractibus 11–12, subturritis, omnibus longitudinaliter recticostatis, costis interstitiisque æque lævissimis, anfractu apicali in specimine juvenali, heterostropho, vitreo, apertura subquadrata, peristomate simplice. Long. 4, lat. 1 mm.

Three specimens, of which two are juvenile, showing the apical nucleus, and the third mature, but not quite perfect. Conjecturally, the whorls would be eleven or twelve. The longitudinal ribs are straight, the whole surface is very smooth, and the mouth is square. I have much pleasure in associating with this species the name of my friend Mr. Abercrombie, to whose kindness I am indebted for the whole of the material descanted upon in this paper.

21. Turbonilla sororia, n.sp. Pl. VIII, Fig. 17.

T. testa gracili, attenuata, albido-ochracea, semipellucida, tenui, apice heterostropho, anfractibus 11–13, subventricosis, undique longitudinaliter recticostatis, costis, interstitiisque lævissimis, apertura ovata, peristomate simplice. Long. 6 mm. sp. maj., lat. 1 mm.

Several specimens, in various stages of growth; the younger shells

all showing the mammillate heterostrophe apex so distinguishing a trait of this family. In form resembling *T. acuticostata*, Jeffreys. The trivial name now imposed suggests such affinity.

22. Turbonilla terebrina, n.sp. Pl. VIII, Fig. 20.

T. testa gracillima, multum attenuata, candida, nitida, perlævi, anfractibus 11, longitudinaliter lævissimi-costatis, interstitiis omnino lævibus, apertura oblonga, peristomate simplice. Long. 6, lat. 1·15 mm.

About the same size as the preceding, but a more solid, shining shell, with smoothly rounded ribs, scarcely elevated, and the interstices also quite smooth; mouth oblong, lip simple. Five specimens. The superficial likeness to a species of *Terebra* suggested the trivial name. It belongs to the typical genus *Turbonilla* proper, and is nearly allied to some European species.

23. Turbonilla (Pyrgostelis) Emillæ, n.sp. Pl. VIII, Fig. 25.

T. testa minuta, oblonga, cylindrica, candida, apice mamillari heterostropho, anfractibus 6, undique longitudinaliter recticostatis, interstitiis transversim arcte tenuissimi striatis, apertura ovata, peristomate, paullum incrassato, margine columellari simplice. Long. 1·75, lat. 75 mm.

A very small, straightly-whorled, white, semipellucid species, of which many specimens occurred in the last consignments of shell-shingle, but which was not noticed in previous siftings. I am not quite satisfied with the location, though it seems to resemble in form such species as *Pyrgostelis flexuosa*, Jeffreys. Had a columellar plait been present, no doubt it would be relegated to *Pyrgulina*. I venture to associate with this little shell the christian name of Mrs. Abercrombie.

24. Cingulina Archimedea, n.sp. Pl. VIII, Fig. 2.

C. testa pyramidato-fusiformi, candida, concinna, solidiuscula, anfractibus 11, transversim spiraliter acute bicarinatis, interstitiis oblique rudi-lineatis, ultimo anfractu apud basim lævi, ad peripheriam angulato, apertura subquadrata, labro simplice. Long. 5, lat. 1·75 mm.

Three specimens, all precisely similar, of a pure white shell, with a slight bluish tinge in parts, spirally acutely twice keeled on the whorls, which would be in a perfect specimen eleven in number, but none of those before us have the apex complete; the keels are sharp and projecting. At the base the shell is smooth, the aperture is squarely angular, mouth simple. This species is the most sharply carinate of any Cingulinæ we have examined. The miniature screw-like appearance suggested the trivial name, after Archimedes, the celebrated Syracusan mathematician, inventor of the screw, who is reported to have taken for his model thereof the well-known Mediterranean shell *Turritella terebra*, L.

25. Phasianella minima, n.sp. Pl. VIII, Fig. 11.

P. testa minutissima, perforata, solidiuscula, alba, nitida, anfractibus 5, tumescentibus, ventricosis, lævissimis, rubro-punctatis et flammulatis, apud medium anfractus ultimi squarrose rubro-maculatis,

maculis transversis, paucis, apud basim multipunctatis, apertura ovato-rotunda, labro simplice. Long. 2 mm. sp. maj., lat. 1 mm.

A very minute shell, which I cannot exactly match with any pourtrayed and described in Pilsbry's exhaustive collaboration of the genus.[1] It comes near to *P. umbilicata*, D'Orb., from Cuba and Florida, but would seem even more tumid than that species, while it is entirely smooth, with no impressed lines; the shell is perforate, solid, white, shining, very smooth, with five whorls; whorls extremely tumid and ventricose, impressed at the sutures, painted with a sprinkling of minute red dots, these most profuse at the base of the shell; a little below the lower half of the last whorl there is a transverse row of a few somewhat square, dark-red spots; the mouth is oval, outer lip simple.

Ten specimens, but mostly not full-grown.

26. Tellina (Tellinella) thymares, n.sp. Pl. VIII, Fig. 9.

T. testa delicatula, tenui, alba, subtrapeziformi, compressa, concentrice multi-costulata, margine dorsali declivi, serrulato, latere antico expanso rotundato, postico truncatulo, margine ventrali latus ad posticum contracto, deflexo. Long. 13, lat. 20 mm.

A most delicate species, resembling in texture, but not in form, such species as *Tellina perplexa* or *T. lyra*, both of Hanley. The shell is trapezium-shaped, compressed, delicate white, thin, regularly concentrically closely ribbed, the dorsal margin sloping slightly, thus recalling the genus *Tellidora*, (e.g. *T. crystallina*), serrulate both posteriorly and anteriorly, the anterior side being roundly expansive, somewhat truncate posteriorly, the ventral margin contracted towards the posterior side.

The specific name is from the Greek θυμάρης, 'delicate.'

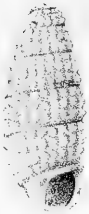
EXPLANATION OF PLATE VIII.

1. Bittium tenthrenoïs.
2. Cingulina Archimedea.
3. Cerithiopsis pulcherrima.
4. Rissoina pachystoma.
5. Oscilla Indica.
6. Miralda idalima.
7. Turbonilla Abercrombiei.
8. Cerithiopsis Sykesii.
9. Tellina thymares.
10. Aclis atemeles.
11. Phasianella minima.
12. Solarium homalaxis.
13. Odostomia syrnoloides.
14. Adeorbis vanikoroides.
15. Cerithiopsis rubricincta.
16. Syrnola metria.
17. Turbonilla sororia.
18. Aclis eoa.
19. Eulima dens-colubri.
20. Turbonilla terebrina.
21. Pyrgulina Edgarii.
22. Odostomia antelia.
23. Rissoina epentroma.
24. Pyrgulina pyrgomella.
25. Turbonilla Emiliæ.
26. Myonia gavisa.

[1] Man. Conch., ser. 1, vol. x, p. 162, etc.


7.


5.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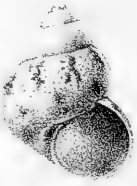
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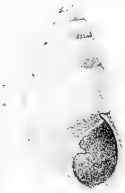
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J. Green del. et lith

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NEW MOLLUSCA FROM BOMBAY.

ON THE PROÖSTRACUM OF A BELEMNITE FROM THE UPPER LIAS OF ALDERTON, GLOUCESTERSHIRE.

By G. C. Crick, F.G.S., etc.

Read 8th May, 1896.

PLATE IX.

The shell of the extinct genus *Belemnites* consists fundamentally of—

1. A hollow cone, the *phragmocone* (with a thin shelly wall, termed the *conotheca*), divided by transverse septa, concave above and convex below, into chambers or loculi: the septa are perforated near the ventral margin by a *siphuncle*.

2. A *guard* or *rostrum*, more or less extensively enveloping the apical part of the phragmocone.

3. A *dorsal plate* or anterior shell, which is a very thin plate extending forwards on the dorsal side, and considerably beyond the chambered portion of the phragmocone. To this Professor Huxley, in his famous memoir on the structure of the Belemnitidæ, gave the name *proöstracum*.

The *guard* or *rostrum* is the portion of the shell which is usually preserved; frequently the phragmocone also is found; but the remains of the proöstracum are so seldom met with in anything like a perfect state of preservation, that it seems desirable to place on record a specimen which has lately been acquired by the British Museum. It formed part of the Rev. P. B. Brodie's collection, and is labelled, in (as I am informed) Mr. Brodie's handwriting—"Sepiaceous portion of perhaps a belemnite. Upper Lias: Alderton, Glostershire. /77." The words "a belemnite" have been erased in pencil, and the words "Like *Belotenthis*" have been added in ink.

The specimen is displayed on the two counterpart faces of a split slab of limestone, here designated A and B respectively.

It is not possible to determine the species of *Belemnites* to which the proöstracum belongs, since nearly the whole of the guard is missing; but that it belonged to a Belemnite is shown by some fragments of the anterior part of the guard which are associated with the remains of the phragmocone, and exhibit the characteristic structure of this portion of the shell.

The phragmocone is so much crushed that its exact form cannot be ascertained. Its fragments are associated with a dark-brown, almost black substance, evidently the fossilized contents of the ink-bag. On the one slab (A) this brown stain does not extend beyond the anterior part of the phragmocone, but on the other (B) the stain reaches quite to the anterior border of the proöstracum. Since this stain is

undoubtedly derived from the ink-bag, the side next the stain is considered to be the inner or ventral surface, and it is this surface which is well displayed on the slab marked A, and to which the following description chiefly applies.

The anterior portion of the phragmocone exhibits the broken edges of one or two of the septa, the anterior border being about 1 mm. in advance of the last septum, which was apparently incomplete. The phragmocone is of a brownish colour, while the proöstracum is much thinner, nearly white, and forms a layer external to the phragmocone. The anterior boundary of the latter is not distinctly marked; it is, as it were, spread over the proöstracum; and that it was a layer distinct from the latter, seems evident from the fact that the central rib of the proöstracum arises quite suddenly, as if it came up behind the phragmocone.

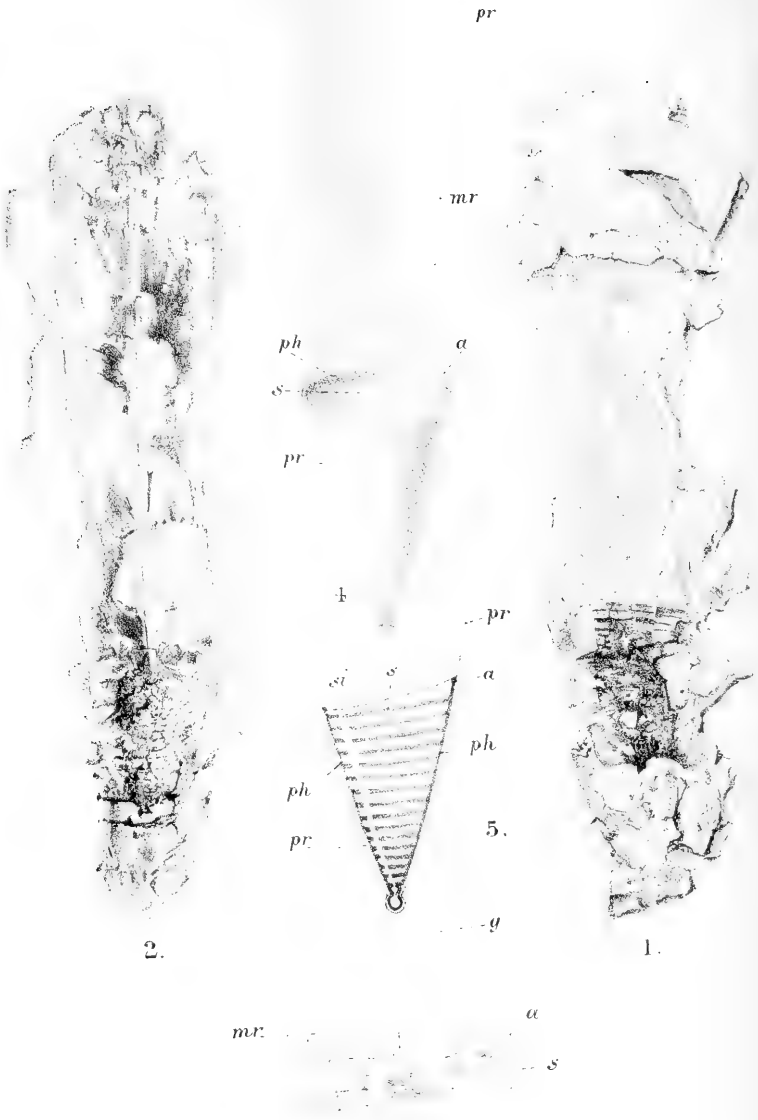
The proöstracum is a broad, spatuliform plate, of about the thickness of a piece of writing-paper, about four times as long as broad, somewhat contracted posteriorly, and somewhat expanded anteriorly. It is not possible to give the exact diameter of the anterior part of the phragmocone, but in its crushed condition its width is about 25·5 mm. The posterior part of the proöstracum is 19 mm. wide (about three-quarters of an inch); its length is 74 mm. (or rather more than $2\frac{7}{8}$ inches). Passing forwards from the anterior border of the phragmocone, it contracts slightly, so that at about 16 mm. from the border of the phragmocone it is only 17 mm. wide; thence expanding gradually, it attains its greatest width, viz. 23 mm., at about 5 mm. from the anterior extremity; it then narrows very rapidly, its antero-lateral boundaries being somewhat flattened, or even slightly concave. A small portion of the central part of the anterior extremity is wanting in the specimen, so that there appears to be a notch here in the median line: this may be accidental, and the anterior boundary may originally have been rounded and entire.

The proöstracum is bounded on either side by a longitudinally striated band, which is rather thicker than the rest of the proöstracum and is continued over the surface of the phragmocone, the impression of the longitudinal striæ being seen in one or two places where the phragmocone has been broken away. The outer boundary of each band is also thickened. At the anterior part of the phragmocone these bands (the dorsal processes of Mantell) are each 5 mm. wide; they gradually become narrower anteriorly, and disappear at the antero-lateral angles.

The median line of the proöstracum is occupied by a narrow, hollow rib, about 0·5 mm. wide, convex ventrally, and bearing a very narrow median groove. This central rib can be traced from the anterior border of the phragmocone, and is seen gradually to become wider and less distinct towards the anterior end of the proöstracum.

A narrow portion of the proöstracum on either side of the median rib is longitudinally striated; the rest of the area on each side is marked by lines which curve upwards and outwards.

As to the homologies of the Belemnite shell with the *sepion*, or



J. Green del et lith. Mintern Bros. imp

PROOSTRACUM OF BELEMNITE.

sepiostaire, the present specimen supports the view[1] that the phragmocone corresponds to the inner portion of the sepiostaire; that the epicuticula of the phragmocone, with its dorsal expansion, corresponds to the middle layer, or to the *gladius* of other forms; and that the rostrum or guard corresponds to the outer portion of the sepiostaire. Whether the dorsal expansion of the epicuticula of the phragmocone alone forms the proöstracum, or whether its dorsal surface was wholly or in part covered by a forward continuation of the guard, this specimen offers no evidence whatever; but it seems to show that the wall of the phragmocone did not enter into the formation of the proöstracum.

EXPLANATION OF PLATE IX.

FIG. 1. Ventral aspect of proöstracum displayed on slab marked A.
,, 2. Counterpart of Fig. 1 as seen on slab marked B.
,, 3. Lower portion of Fig. 1, somewhat enlarged.
,, 4. Restoration of proöstracum, the lower portion being the epicuticula of, and containing, the phragmocone: the guard is omitted.
,, 5. Median section of the lower part of Fig. 4, showing the relation of the phragmocone to the proöstracum.

a. anterior border of phragmocone; *g*. guard; *mr*. midrib of proöstracum; *ph*. wall of phragmocone; *pr*. proöstracum; *s*. last septum of phragmocone; *si*. siphuncle.

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[1] See Dr. E. Riefstahl, "Die Sepienschale und ihre Beziehungen zu den Belemniten": Palæontographica, vol. xxxii (1886), pp. 201–14, pls. xxvii, xxviii. See also A. Appellöf, "Die Schalen von *Sepia*, *Spirula*, und *Nautilus*": Kongl. Svenska Vetenskaps-Akademiens Handlingar, Bd. xxv, No. 7, 1893.

A LIST OF THE LAND-SHELLS OF THE ISLANDS OF BATCHIAN, TERNATE, AND GILOLO.

By Edgar A. Smith, F.Z.S., etc.

Read 8th May, 1896.

Herr Bruno Strubell recently sent me for identification a small collection of land-shells from the above islands, and among them occurred the two new species about to be described. In the course of examining the literature dealing with the fauna of these islands, I have brought together the following lists,[1] which it appeared useful to publish. Only those species which have been quoted from one or other of these islands are referred to. A number of forms have been assigned to the "Moluccas," among which a few may possibly occur at one or other of the islands under consideration, but at present we await further information regarding their special "habitats" to enable us to range them under their proper localities. I have not given references, since most of these may be obtained in the Manual of Conchology, second series, by Tryon and Pilsbry.

The following are the principal works and papers dealing with the subjects:—

1. Martens (E. von). "Die preussische Expedition nach Ost-Asien," Zool., vol. ii, pp. 99–415.
2. Böttger (O.). Berlin Senckenb. Gesell. 1891, pp. 241–318.
3. Strubell (B.). Nachrichtsbl. deutsch. mal. Gesell. 1892, pp. 41–50.
4. Tapparone-Canefri (C.). Ann. Mus. Civ. Genova, 1884, vol. xx, pp. 143–169.

(1) FROM BATCHIAN.

Lamprocystis subangulata, Bttgr.
Xesta sulfurata, Martens.
—— *luctuosa*, Beck.
—— *ignescens*, Pfr.
Trochomorpha Ternatana, Le Guil.
—— *planorbis*, Lesson.
[—— *Batchianensis*, Pfr. = *Ternatana*.]
Eulota (*Plectotropis*) *Winteriana*, v. d. Busch.
Planispira Kurri, Pfr.
—— *compta*, H. Ad.
—— *zonalis*, Fér.
—— *endoptycha*, Martens.
—— *loxotropis*, Pfr.
Planispira atrofusca, Pfr.
—— *Scheepmakeri*, Pfr.
—— *exceptiuncula*, Fér.
—— *aspasia*, H. Ad.
—— (*Cristigibba*) *corniculum*, Hom. and Jacq.
—— —— *expansa*, Pfr.
—— —— *Moluccensis*,[2] Pfr.
—— —— *lacteocincta*, Smith.
Albersia zonulata, Fér.
—— *pubicepa*, Martens.
Papuina Gaberti, Lesson.
—— *pileolus*, Fér.
—— *rhynchostoma*, Pfr.
—— *nodifera*, Pfr. (?).

[1] These do not include the few species of Auriculidæ recorded from these localities.

[2] This name was changed by Von Martens to *semirasa*, as he believed the species did not occur in the Moluccas. Specimens from Batchian, however, are in the collection of Herr Strubell.

Pyrochilus sulcocinctus, Martens.
—— *pyrostoma*, Fér.
—— *xanthostoma*, Herkl.
Pupina Pfeifferi, H. Ad. (*non* Dohrn).
Diancta torta, Bttgr.
Cyclophorus leucorhaphe, Martens.
Leptopoma globulosum, Pfr.
—— *vitreum*, Lesson.
—— *pellucidum*, Grat.
Leptopoma Papuanum, Dohrn.
—— *Manadense*, Pfr.
Cyclotus guttatus, Pfr.
—— *plicosus*, Martens.
—— *Batchianensis*, Pfr.[1]
Helicina electrina, Pfr.
—— *parva*, Sow.
Georissa crebrilirata, Bttgr.

(2) FROM TERNATE.

Lamprocystis subangulata, Bttgr.
Xesta aulica, Pfr.
Trochomorpha planorbis, Lesson.
—— *Ternatana*, Le Guil.
Planispira exceptiuncula, Fér.
—— *endoptycha*, Martens.
—— *quadrifasciata*, Le Guil.
—— *loxotropis*, Pfr.
—— *atacta*, Pfr.
Papuina vitrea, Fér. (=*albula*, Le Guil.).
—— *lanceolata*, Pfr.
Clausilia Cumingiana, Pfr., var. *Moluccensis*.
Opeas Panayensis, Pfr.
—— *Javanica*, Rve.
—— *clavulina*, Pot. et Mich.
—— *Ternatana*, Bttgr.
Diancta constricta, Martens.
Leptopoma vitreum, Less.
Cyclotus (*Eucyclotus*) *pruinosus*, Martens.
—— (*Pseudocyclophorus*) *guttatus*, Pfr.
—— (*Platyrhaphe*) *parvulus*, Martens.

(3) FROM GILOLO.

Lamprocystis subangulata, Bttgr.
—— *Ambonica*, Bttgr. (var.).
Xesta citrina, Linn.
—— *aulica*, Pfr.
—— *sulfurata*, Martens.
Trochomorpha planorbis, Lesson.
—— *Ternatana*, Le Guil.
Eulota (*Plectotropis*) *Winteriana*, Pfr.
Planispira zonaria, Linn.
—— *Halmaherica*, Strubell.
—— *Tietzeana*, Rolle.[2]
—— *quadrifasciata*, Le Guil.
—— *Thetis*, Pfr.
—— *loxotropis*, Pfr.
—— *atacta*, Pfr.
—— *zonalis*, Pfr.
—— *exceptiuncula*, Fér.
Planispira Phryne, Pfr.
—— (*Cristigibba*) *Gilolocnsis*, Smith.
Camæna (*Pseudobba*) *Brunonis*, Kobelt.[3]
Albersia pseudocorasia, Strubell.
—— *pubicepa*, Martens.
Obba calcar, Martens.
Papuina vitrea, Fér. (=*albula*, Le Guil.).
—— *chondrodes*, Strubell.
—— *lanceolata*, Pfr.
Pyrochilus pyrostoma, Fér.
—— *lampas*, Müll.
Clausilia Cumingiana, Pfr., var. *Moluccensis*, Martens.
Cyclophorus leucorhaphe, Martens.
Leptopoma vitreum, Lesson.

[1] The young of this species is figured by Reeve as a *Cyclotus*, Conch. Icon., fig. 46; the adult as a *Pterocyclos*, *op. cit.*, figs. 6*a*, *b*.
[2] Nachrichtsbl. deutsch. mal. Gesell. 1893, p. 33.
[3] Conch.-Cab., *Helix*, p. 681, pl. cxcv, figs. 1–3.

Leptopoma Halmahericum, Strubell.
—— *crenilabre*, Strubell.
—— *cinctellum*, Pfr.
Cyclotus pruinosus, Martens.
Cyclotus plicosus, Martens.
Omphalotropis Ceramensis, Pfr.
Helicina parva, Sow.
—— *zoæ*, Pfr.

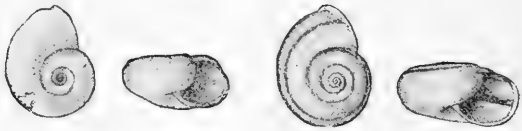
DESCRIPTION OF THE NEW SPECIES.

1. Planispira (Cristigibba) Giloloensis, n.sp. Figs. 1, 2.

Testa anguste umbilicata, orbicularis, alba, lineis incrementi tenuibus striata; spira concave depressa; anfractus 4, convexi, ultimus irregularis, pone aperturam gibbosus et inferne subinflatus, antice leviter descendens; apertura alba, oblique lunata; peristoma album, anguste expansum, marginibus conniventibus. Diam. maj. 14·5, min. 11·5, alt. 8 mm.

Hab.—Halmahera or Gilolo Island.

This species somewhat resembles *Helix leptocheila*,[1] as regards form. The colour and also the shape of the aperture, however, are different.



1. 2. 3. 4.

2. Planispira (Cristigibba) lacteocincta, n.sp. Figs. 3, 4.

Testa orbicularis, anguste umbilicata, sordide albida, fasciis rufo-nigris 1–2 et fascia mediana opaca lactea ornata, epidermide crassiuscula induta; spira plana, in medio leviter depressa; anfractus 4, convexi, ultimus antice breviter descendens, lineis incrementi leviter obliquis sculptus, inferne aperturam versus subinflatus, dein constrictus; apertura late lunata, intus concolor, zonis externis translucentibus; peristoma anguste expansum, albidum, marginibus conniventibus, columellari leviter reflexo. Diam. maj. 16, min. 13, alt. 8 mm.

Var. Testa pallida, zona opaca lactea ad peripheriam ornata. Diam. maj. 15, min. 11 mm.

Hab.—Batchian or Batjan Island.

Both the specimens of this interesting species have the opaque, cream-coloured zone at the periphery, but only one of them is ornamented with colour-bands. The upper zone is upon the upper surface of the body-whorl, the lower one being at the periphery and bordered below by the opaque, cream-coloured band. None of the bands reach to the peristome, and the whitish zone extends only about half-way round the whorl. The constriction and gibbosity of the body-whorl behind the lip are only observable upon the lower surface.

[1] Tapparone-Canefri, Ann. Mus. Civ. Genova, xx, 1884, pl. i, figs. 14–16. Pilsbry, Man. Conch., ser. II, vol. vi, pl. lxi, figs. 25–7.

ON THE APLACOPHOROUS AMPHINEURA OF THE BRITISH SEAS.

By Walter Garstang, M.A., F.Z.S.

Read 12th June, 1896.

PLATE X.

The remarkable worm-like Molluscs now associated with the Chitons in the order Amphineura, possess a high interest, owing to the unique way in which these animals combine great simplicity of appearance and structure with distinctively Molluscan features. Beneath their simple, worm-like guise, however, these creatures betray unmistakable signs of retrogression from a higher grade of organization. The ciliated furrow along the ventral surface of the body looks like a persistent elongated blastopore, or the ciliated ventral surface of an Archiannelid. There can be little doubt, however, that it is a relic of an ancestral mantle-cavity like that of a Chiton. The slender, razor-like fold enclosed within the groove is an heirloom from ancestors with a well-developed creeping foot. The pharynx, smooth in some forms, armed with a single tooth in others, is furnished with a typical radula in certain other types. The coat of fine spicules which envelops the body looks like a primitive form of exoskeleton. Yet Pruvot tells us that in one instance, at any rate, the larva has a series of well-developed Chiton-like plates along its back, which appear to be shed when the creature settles down to its typical mode of life. There seems to be ample reason, therefore, for regarding, with Simroth, the Aplacophorous forms of Amphineura as degraded from a more Chiton-like ancestral condition. Their residence in deep water, beneath the tidal zone and beyond the influence of waves and storms, has enabled these creatures—as compared with the littoral Chitonidæ—to dispense with their plate-like armature and suctorial foot, and to adopt new habits and assume new forms. Some burrow in mud; many, however, lead a semi-parasitic existence, creeping about on the surface of Alcyonarian corals or twining their flexible bodies round the stems of Hydroid Zoophytes.

In the hope of drawing the renewed attention of English malacologists to this inviting group of Molluscs, I give below a list of the forms which are at present known to inhabit British seas. Two of these have been recorded within the last fifteen months. This fact, when the number of forms now known from neighbouring seas is taken into consideration, renders it very probable that the British list of these Molluscs is far from completed.

The classification and nomenclature adopted is that of Simroth's recent revision (1893).

APLACOPHORA.

I. Fam. Chætodermatidæ.

Body constricted into three segments. Ventral furrow absent. Mantle-chamber reduced to a small posterior cloaca. Two gill-plumes in the cloaca. Radula in form of a single tooth.

Habits.—Burrow in mud. No British representatives.

II. Fam. Neomeniidæ.

Body uniformly elongated, without constrictions. A ventral furrow present. No true gill-plumes. Respiratory organs, when present, in the form of simple protuberant folds of the wall of the rectum. Radula present or absent.

Habits. — Creep on the surface of mud, or on water-plants (*Posidonia* ?); or live in a semi-parasitic manner on corals and Hydroid Zoophytes.

1. Neomenia, Tullberg, 1875.

Body 2–3 cm. long. Cloaca subterminal, continuous with the ventral furrow. A pedal ridge in the furrow. Spicules needle- or lancet-shaped, projecting far out of the cuticle. Ectodermal papillæ short, with broad stalks. No radula.

1. *Neomenia carinata*, Tullberg, 1875. Back keeled.

Distribution. — Shetland (A. M. Norman): Upper Loch Etive, 50–70 fathoms (Dr. J. Murray). [North Atlantic, west coast of Scandinavia.]

2. *Neomenia Dalyelli*, Kor. and Dan., 1877. ? *Vermiculus crassus*, Dalyell, 1853. Back not keeled. A large spicule on each side of cloaca.

Distribution.—Scotland? (Dalyell). [Norway.]

2. Rhopalomenia, Simroth, 1892–4.

Body worm-like, pointed in front and behind. Cloacal opening a long ventral slit, with which the ventral furrow is continuous. Pedal ridge present. Cuticle crowded with needle-like deciduous spicules, pointed at both ends. Ectodermal papillæ club-shaped, with slender stalks, reaching almost to the surface of the cuticle. Radula polystichous or absent. Length 6–60 mm.

3. *Rhopalomenia aglaopheniæ*, Kow. and Mar., 1887. Body elongated, up to 32 mm. in length, somewhat attenuated posteriorly. Radula absent.

Distribution.—Plymouth. (Two specimens, coiled round stems of *Aglaophenia myriophyllum*, dredged in 25–30 fathoms, April, 1896. W. G.) [Banyuls, Marseille.]

3. Myzomenia, Simroth, 1892–4.

Body elongated, worm-like, cylindrical. Anterior end thickened to form a knob-like head. Cloacal opening ventral. A short finger-like tail behind the cloaca. Ventral furrow smoothed out, forming a longitudinal streak. Spicules shield-shaped or leaf-like, imbricating. No respiratory folds of rectum. No radula.

4. *Myzomenia Banyulensis*, Pruvot, 1890. Length 30 mm. Colour bright crimson.

Habitat.—Coiled round the stems and branches of the Hydroid *Lafoëa dumosa*.

Distribution.—Plymouth. (April, 1895. Half-a-dozen specimens. E. J. Allen, W. G.) [Banyuls, Roscoff.]

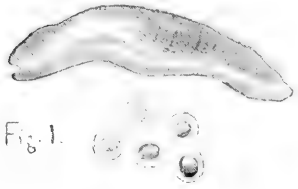


Fig. 1.

Fig. 2. B.

Fig. 2. A.

Fig. 4.

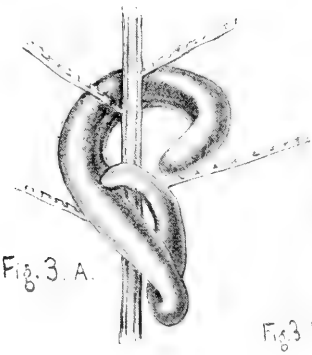


Fig. 3. A.

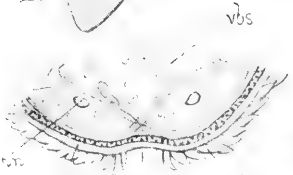


Fig. 4

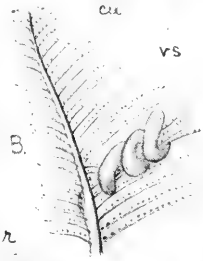
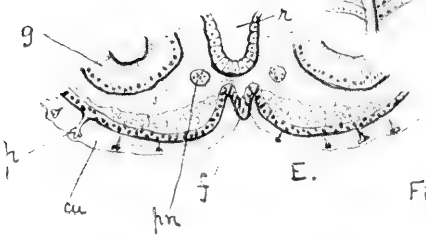
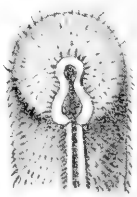


Fig. 3 B.



C.



D.

Fig 3.

APLACOPHOROUS AMPHINEURA OF THE BRITISH SEAS.

Bibliography.

1853.—Dalyell, J. "The Powers of the Creator," vol. ii, p. 88, pl. x, fig. 11.

1879.—Norman, A. M. "On the occurrence of *Neomenia (Solenopus)* in the British Seas": Ann. Mag. Nat. Hist., ser. v, vol. iv, pp. 164–6.

1887.—Kowalevsky, A. O., and Marion, A. F. "Contributions à l'Histoire des Solenogastres ou Aplacophores": Ann. Mus. Hist. Nat. Marseille, iii.

1891.—Pruvot, G. "Sur l'Organisation de quelques Néoméniens des Côtes de France": Arch. Zool. Exp. et Gen., sér. II, tom. ix, pp. 700–805, pls. xxv–xxxi.

1893.—Simroth, H. "Amphineura": Bronn's Klassen und Ordnungen des Thier-Reichs, Bd. iii [2nd ed.], pp. 133–233.

1895.—Allen, E. J. "Notes on Dredging and Trawling work during the later half of 1895": Journ. Mar. Biol. Ass., iv, 1896, p. 166.

EXPLANATION OF PLATE X.

Fig. 1.—*Neomenia Dalyelli*, Kor. and Dan. (?). A copy of Dalyell's figure of *Vermiculus crassus*, showing a group of ova.

Fig. 2.—*Neomenia carinata*, Tullberg. A. from below, after Hansen. *br.* branchial folds of rectum; *m.* mouth; *p.f.* pedal furrow. B. a contracted specimen, from above, after Tullberg.

Fig. 3.—*Rhopalomenia aglaopheniæ*, Kow. and Mar.

A. An individual twined round a stem of *Aglaophenia*, enlarged. (After Kowalevsky and Marion.)

B. An individual twined round the branches of *Aglaophenia myriophyllum*, nat. size. (After Pruvot.)

C. Dorsal view of anterior extremity: the sensory papillæ of the buccal cavity are seen projecting in front.

D. Ventral view of anterior extremity, showing the buccal aperture, the pedal gland, and the ventral furrow.
(C and D after Kowalevsky and Marion.)

E. Ventral half of a transverse section in posterior part of body, showing the foot lying in the ventral furrow. (Modified after Pruvot.)

cu. cuticle; *f.* foot; *g.* gonaduct (nephridium, mucilaginous gland); *p.* ectodermal papillæ, traversing the cuticle; *p.n.* pedal nerve-cords; *r.* rectum.

Fig. 4.—*Myzomenia Banyulensis*, Pruvot.

A. An individual coiled round a stem of *Lafoëa dumosa*. *n.s.* = nat. size.

B. Posterior extremity, ventral view, showing the cloaca widely open at the moment of egg-laying. *o.* ovum; *ts.* tuft of slender spicules in middle of ventral border of cloaca; *vs.* ventral streak.

C. Wing-like spicules, forming a double row for the protection of the ventral streak.

D. Shield-like spicules, arranged in an imbricating manner over the general surface of body.

E. Small spicules found here and there among the shield-like spicules.

F. Ventral part of a transverse section in middle region of body, showing the reduction of the ventral furrow and the absence of a foot.

cu. cuticle; *p.n.* pedal nerve-cord; *sp.* spicules; *v.bs.* ventral blood-sinus.

All figures of this species after Pruvot.

PRELIMINARY DIAGNOSES OF NEW SPECIES OF NON-MARINE MOLLUSCA FROM THE HAWAIIAN ISLANDS. PART I.

By E. R. Sykes, B.A., F.Z.S., etc.

Read 12th June, 1896.

During the past few years Mr. R. C. L. Perkins has been collecting natural-history specimens in the Hawaiian Islands, under the auspices of a joint committee of the Royal Society and the British Association for the Advancement of Science. Since Mr. Perkins may be still for some time in the Islands, the final report on the Mollusca must be delayed, and it therefore appears advisable to diagnose from time to time the new species as they are found in the fresh material sent home. It is hoped that the new forms will be fully illustrated in the final report.

1. Macrochlamys Perkinsi, n.sp.

Testa imperforata, tenuis, cornea vel fusco-cornea, nitida, superne sub lente indistincte striata; spira depresso-conoidea, apice obtuso; anfr. $4\frac{1}{2}$–5, regulariter et lente accrescentes, convexiusculi, ultimus paulo supra medium subangulatus; sutura subimpressa; apertura lunato-ovata, subobliqua; perist. simplex, tenue, rectum. Diam. max. 6·5, min. 6, alt. 3·5 mm.; alt. apert. 2·5 mm.

Hab.—Lanai (Perkins).

The difficulty of giving a serviceable description of these forms is very great, but perhaps *M. Perkinsi* may be best identified by its colour, which is darker than usual, by the narrowness of the last whorl, the slowness and regularity with which the whorls increase, and the striation on the upper surface.

2. Endodonta (Thaumatodon) ringens, n.sp.

Testa parva, late et perspective umbilicata, regulariter rugulosostriata, corneo-flavescens, rufo maculata; spira depressa, apice mediocri, lævi; anfr. 5–$5\frac{1}{2}$, tumidusculi, compressi, regulariter accrescentes, ultimus ad peripheriam rotundatus, basi convexiusculus; apertura rotundo-lunaris, lamellis duabus conspicuis parietalibus, supera majore; dentibus quatuoribus in labio. Diam. max. 4·5, alt. 1·5 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

This shell recalls in form *E. hystrix*, Mighels, but in lamellæ and teeth strongly resembles *E. rugata*, Pease. It may be separated

from this last species by the more depressed spire, the absence of keel on the last whorl, deeper suture, the absence of revolving striæ, etc.

3. Endodonta (Nesophila) Lanaiensis, n.sp.

Testa parva, late et perspective umbilicata, solidula, parum nitens, lutea, strigis brunneis subæqualibus picturata et radiata, confertim costulata costulis parvis, circa umbilicum magis approximatis et tenuioribus, basi sub lente indistincte spiraliter striata; spira depressa, apice lævi; sutura impressa; anfr. $4\frac{1}{2}$; apertura ovato-circularis, peristomate simplici, lamella unica volventi, parietali. Diam. max. 5, min. 4, alt. 1·5 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

In possessing only a single parietal lamella, this shell approaches *E. jugosa*, Mighels, *E. rubiginosa*, Mighels, and *E. decussatula*, Pease. From the last-named the absence of decussation, save for a few indistinct spiral striæ on the base, will at once serve to separate it. It may be distinguished from the two first-named by its smaller size, more depressed form, and more distinct colour-markings; the mouth is also more drawn out from the body-whorl of the shell.

4. Endodonta (Pterodiscus) Wesleyi, n.n.

While dealing with species of *Endodonta*, it may be of service to point out that the shell from the Hawaiian Islands made the type of a section of *Endodonta*, called *Tropidoptera*[1] by Mons. Ancey, and subsequently *Pterodiscus*[2] by Mr. Pilsbry, is not really the *Helix alata* of Pfeiffer. The true *H. alata*, Pfr.,[3] has a columellar plait, and will probably prove to be an *Amastra*, allied to *A. heliciformis*, Ancey. The shell figured by Mr. Pilsbry, therefore, requires a new name, and that of *Wesleyi* may be suggested, in honour of Wesley Newcomb, who has done such splendid work on the Hawaiian fauna.

5. Leptachatina impressa, n.sp.

Testa imperforata, dextrorsa, oblonga, pellucida, micans, pallide-cornea, striata; spira elongata, apice obtusa; sutura impressa; anfr. $7\frac{1}{2}$, convexiusculi, ultimus $\frac{1}{2}$ alt. testæ æquans; apertura sinuato-pyriformis; perist. simplex, tenue, margine dextro recto, arcuato, columellari angusto, adnato, parietali nullo. Alt. 7, diam. 2·5 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

An interesting little species belonging to the striate group of *Leptachatina*, principally from Kauai. There are only two specimens, which, although they do not quite agree, belong to one species. No

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[1] Preoccupied in Coleoptera.
[2] Man. Conch., ser. II, vol. ix, p. 36, pl. iv, fig. 44.
[3] Type in the British Museum.

species of this genus has previously been recorded from Lanai; Mr. Perkins found seven.

6. Leptachatina semipicta, n.sp.

Testa imperforata, dextrorsa, acuminato-ovata, tenuis, nitida, pellucida, fusco-cornea, leviter striatula, apice obtusula, pallidiore; sutura modice impressa; anfr. 6–6½, plano-convexi, primi striatuli, ultimus $\frac{5}{8}$ altitudinis testæ æquans, fere lævis, apertura ovato-pyriformis; peristoma margine dextro recto, incrassatulo, columellari angusto, adnato, parietali nullo. Alt. 8, diam. max. 4 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

There are, including young shells, about forty examples of this species. Most of them have the lower half of the last whorl of a lighter colour; some, however, are unicolorous.

7. Leptachatina Perkinsi, n.sp.

Testa dextrorsa, ovato-fusiformis, tenuiuscula, sub lente striatula, fuscescens, nitida, semipellucida, apice obtusulo, albido-corneo; sutura simplex, leviter impressa; anfr. 6–6½, plano-convexiusculi, ultimus $\frac{2}{3}$ altitudinis testæ æquans; apertura pyriformis; peristoma margine dextro leviter incrassato, intus albido-corneo, columellari angusto, parietali nullo. Alt. 10·5, diam. max. 5 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

This and the next species are very closely allied, and may be separated by the fact that *L. Smithi* is of a lighter colour, smaller size, and is a trifle wider in proportion to its length. In *L. Smithi* the last whorl is slightly longer in proportion to the total length of the shell.

8. Leptachatina Smithi, n.sp.

Testa dextrorsa, ovato-fusiformis, tenuiuscula, sub lente striatula, pallido-cornea, nitida, pellucida, apice obtusulo, albido-corneo; sutura simplex, leviter impressa; anfr. 6–6½, plano-convexiusculi, ultimus plus quam $\frac{2}{3}$ altitudinis testæ æquans; apertura pyriformis; peristoma margine dextro leviter incrassatulo, intus albido-corneo, columellari angusto, parietali nullo. Alt. 9·25, diam. max. 4·9 mm.

Hab.—Mountains of Lanai, above Koele (Perkins).

For remarks on this species see those on the preceding one.

9. Amastra longa, n.sp.

Testa dextrorsa, elongata, subperforata, solida, substriata, epidermide nigro-fusco induta, apice acutiusculo; sutura simplex; anfr. 7, modice plani, ultimus plus quam $\frac{1}{2}$ altitudinis testæ æquans; apertura sinuato-semiovalis, intus albida; columella superne parum plicata, tum lamina parva transversim munita; peristoma simplex, rectum. Alt. 11·75, diam. max. 6·5 mm.

Hab.—Lanai (Newcomb); windward side of Lanai, apparently extinct (Perkins).

This is one of those species which are fast disappearing from the fauna of the Hawaiian Islands, or are, indeed, already extinct. The two specimens found by Mr. Perkins have lost their periostracum, but others in the British Museum, collected forty years ago, are in far better condition. The species is, in form, of the group of *A. turritella*, Fér., and has the blackish periostracum usually found on the species of *Amastra* from Lanai.

10. Amastra fraterna, n.sp.

Testa sinistrorsa, ovato-turriformis, tenuis; sutura impressa; anfr. 6½–7, convexiusculi, longitudinaliter striati, epidermide fusco vel nigro-corneo induti; apertura ovata, mediocris; peristoma rectum, acutum, lamina mediocri. Alt. 10, diam. max. 5·5 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

This interesting species belongs to the group of *A. soror*, Newc., and *A. elongata*, Newc. It is clothed entirely with a dark-brown periostracum, and is a little more inflated than either of the two species mentioned. There are specimens in the Cumingian Collection which have been labelled *A. soror*, and possibly these were part of the series which induced Newcomb to give Lanai as one of the localities for that species. All later authors have given Maui only.

11. Amastra villosa, n.sp.

Testa elongato-turrita, sinistrorsa, subimperforata, crassula, pallide-cornea, epidermide brunneo induta; anfr. 7–7½, convexi, longitudinaliter et irregulariter valde striati; sutura bene impressa; apertura lunata, fere recta; peristoma rectum, acutum, albidum; lamina columellaris parva. Long. 20, lat. 7 mm.

Hab.—Molokai (Perkins).

This shell, nearly related to *A. Hutchinsonii*, Pease, from Maui, may be separated by its greater size, more elongate spire, and the shape of the last whorl, which is not so fusiform as in that species. The suture is also more deeply impressed.

12. Amastra citrea, n.sp.

Testa dextrorsa, imperforata, ovato-fusiformis, solidiuscula, nitidula, flavida, suboblique valde striata, apice resinaceo, acutulo; anfr. 6, plano-convexi, primi mediocriter plicati, ultimus ⅔ altitudinis testæ æquans, epidermide nigro-brunneo leviter indutus; sutura impressa; apertura ovato-lunata; columella contorta; lamina valida, alba; peristoma simplex, margine dextro recto, acuto. Long. 15, diam. max. 8 mm.

Hab.—Molokai (Hutchison, Baldwin).

Though not yet found by Mr. Perkins, I take the present opportunity of describing this form. It is noteworthy for its light straw-yellow colour; the periostracum is almost entirely lacking, save

on the last whorl, though traces may be seen on the earlier whorls. In shape it recalls *A. simularis*, Hartman, but is slightly more ovate and shorter; the difference in colour will at once separate them. The plications on the apices of the two species are about equally marked.

13. Amastra simularis, Hartman, var. roseotincta, n.var.

Differs from the type in the colour being of a very much lighter shade, the apex, however, being of the usual dusky tint; the shell is also more ovate and shorter, and the lamina is slightly more horizontal. I had proposed to describe this shell as a new species, but a few specimens of the variable *A. simularis* show a slight approximation, and it will, I think, only prove to be an extreme variety.

Hab.—Molokai Mountains (Perkins).

14. Newcombia Perkinsi, n.sp.

Testa sinistrorsa, anguste perforata, elongato-fusiformis, solida, cineraceo-fusca, striis vel strigis fuscis fulgurantibus eleganter picta; spira gracilis, apice obtuso, lævi; anfr. $6\frac{1}{2}$, planiusculi, ultimus $\frac{1}{2}$ altitudinis testæ subæquans; sutura marginata; columella subplicata; apertura parum obliqua, semiovalis, basi subangulata; peristoma simplex, margine columellari superne dilatato, adnato. Alt. 25, diam. max. 7·5 mm.; apert. alt. 7·5, lat. 4 mm.

Hab.—Molokai Mountains (Perkins); Molokai (Baldwin, Hutchison).

Specimens are to be found in some collections under the name of *N. Philippiana*, Pfeiffer. The present species, however, is larger, much more solid, the whorls are flatter, the colouring is lighter and different, the columellar lip is more reflexed, and the perforation more conspicuous.

One puzzling question of nomenclature requires consideration in connection with the small, unicolorous, polished, almost imperforate Zonitoid forms found in the Hawaiian Islands, and, indeed, scattered over all Polynesia.

They have been placed most usually in *Microcystis*, Beck, in which course M. Ancey and Mr. Baldwin, in their respective papers on the Hawaiian fauna, have concurred; the latter further making *Microcystis* a section of *Nanina*, Gray. To deal with the latter point first, it may be pointed out that Risso[1] had previously used *Nanina* for a Mediterranean marine Gastropod, and that the name therefore must be removed entirely from the nomenclature of land-shells. The other point, namely, whether these shells belong to *Microcystis* at all, requires far more consideration.

[1] Hist. Nat., vol. iv, p. 150, 1826.

Beck proposed *Microcystis* in 1837[1] as a section of *Nanina*, Gray, and he placed in it six species in the following order:—

1. *pellicula*, Beck. This appears to be of uncertain identity, but is most probably a Cape of Good Hope species near *Zingis Natalensis* (Pfr.).
2. *trifasciella*, Beck=*Helix Cubensis*, Pfr.
3. *pictella*, Beck=*Helix Cubensis*, Pfr.
4. *ornatella*, Beck.
5. *filiceti*, Beck=*Helix Adamsi*, Pfr.
6. *amœnula*, Beck=? *M. ornatella*, Beck, var.

We have first to settle whether *Microcystis* is worthy of retention in our nomenclature, and then what species should stand as its type. The principle which I would suggest should be applied is, that where a genus is put forward in an old catalogue of this kind, with no special named type, but a somewhat heterogeneous list of species, it should only be retained if one of two conditions be fulfilled, namely, that it has either been properly adopted by some subsequent author prior to any other name being suitably proposed, or where no other name at all has been given to the group. Further, the first identifiable species, not belonging to any other genus, should be the type; or, the first species, if the genus has been broken up, so placed by the author dividing the group, provided, of course, it be originally in the genus. Now, how do we stand with regard to *Microcystis*?

Albers,[2] in 1850, properly adopts this genus, placing as his first species one not included by Beck; his second, however, being *M. ornatella*, Beck.

Mörch,[3] in 1852, gives *M. ornatella* as his first species; he created at the same time the genus *Cysticopis* for *H. Cubensis*, Pfr. (=*trifasciella* and *pictella* of Beck).

Beck's first species being of uncertain identity, I would therefore suggest that *ornatella* be treated as the type of *Microcystis*. Now these small Zonitoids hardly fit into the same genus as this species, and therefore some other generic title is required for them.

It appears to me that *Macrochlamys*, Benson,[4] is the most suitable. The advantages and disadvantages of retaining this name in nomenclature have been so recently discussed by Colonel Godwin-Austen,[5] that I will not enter into the subject here, beyond saying that his reasons for its retention appear sufficiently convincing. The type is *M. Indica*, Benson, which has been sometimes improperly confused with the *Helix vitrinoides*, Deshayes, and is even now slightly uncertain specifically: there is no doubt, however, that it agrees with what is usually accepted as *Macrochlamys*. Whether our small forms are in accord with the typical group of this genus anatomically,

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[1] Index Moll., p. 2.
[2] "Die Heliceen," p. 59.
[3] Cat. Voldi, 1852, p. 2.
[4] Journ. As. Soc. Bengal, vol. i, 1832, pp. 13, 76.
[5] "Mollusca of India," vol. i.

remains to be proved; but, conchologically, they only appear to differ in size.

For the present, therefore, I would suggest the following as a convenient working classification:—

Genus *Macrochlamys*, Benson.

Section *Macrochlamys*, s.str.

Type *M. Indica*, Benson, to include all the highly polished, depressed, almost and quite imperforate species, which have no callosity in the aperture.

Section *Microcystina*, Mörch.

Type *M. Rinkii*, Mörch, to include the species which have a reflected columellar lip showing a sinus or notch.

Section *Lamprocystis*, Pfeiffer.

First species *L. excrescens*, Mousson, to include the species having a dentiform callosity on the columellar lip.

It has been already shown by Colonel Godwin-Austen[1] that the radula and jaw of *Microcystina* are similar to those of *Macrochlamys*; and he has formed a subfamily Macrochlaminæ to contain *Macrochlamys*, *Microcystina*, and *Hemiplecta*, giving *Helix Humphreysiana*, Lea, as the type of the latter genus.

The species grouped under *Microcystis* by Semper[2] would appear to fall in this grouping under *Macrochlamys*, his first species being *M. myops*, Semper and Dohrn.

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[1] "Mollusca of India," vol. i, p. 12.

[2] "Reisen im Arch. der Phil.," Landmollusken, 1870, p. 43.

ORDINARY MEETING.

Friday, 13th March, 1896.

Prof. G. B. Howes, Sec.L.S., President, in the Chair.

The following communications were read:—

1. "On some Fresh-water Shells from the Island of Kolguev." By E. A. Smith, F.Z.S., etc.

2. "Notes on the Mollusca from a Rainwash at Darenth, Kent." By A. S. Kennard.

3. "On the Aperture of a Baculite from the Lower Chalk of Chardstock, Somerset." By. G. C. Crick, F.G.S., etc.

4. "The Female Organs of *Neritina fluviatilis*, Linn." By Prof. G. Gilson.

5. "Report on a collection of Polyplacophora from Port Phillip, Victoria." By E. R. Sykes, B.A., F.Z.S., etc.

Mr. W. Crouch exhibited a specimen of *Pholas crispata*, Linn., and a living specimen of *Petricola pholadiformis*, Lam., both from the Crouch River.

Mr. H. Fulton exhibited a collection of the recent species of the genus *Amphidromus* containing five-sixths of the known species; also a specimen of *Extra extra*, Jouss., from the Red Sea.

Mr. A. Sich exhibited a living sinistral specimen of *Pyramidula rotundata*, Müll., which had been found in a garden at Chiswick on 24th August, 1895, and had since added one-eighth of an inch to its shell.

Specimens in illustration of their respective papers were exhibited by A. S. Kennard, E. A. Smith, and E. R. Sykes; the last-mentioned also exhibited forms of *Achatinella Mighelsiana*, Pfr., from Molokai, Hawaiian Islands.

The President laid on the table, and called attention to, the record by Mr. Haswell of the occurrence of a Neomenian off Sydney, N.S.W.

ORDINARY MEETING.

Friday, 10th April, 1896.

Prof. G. B. Howes, Sec.L.S., President, in the Chair.

The following communications were read:—

1. "On a collection of Land-shells from South Celebes." By E. A. Smith, F.Z.S., etc.

2. "Abstract account of Mons. Bernard's paper on the Morphology of the Hinge in Pelecypoda." By B. B. Woodward, F.L.S., etc.

3. "Descriptions of new species of minute Marine Shells from Bombay." By J. C. Melvill, F.L.S., etc.

4. "A new Helicoid Land-shell from New Zealand." By E. R. Sykes, B.A., F.Z.S., etc.

Mr. S. Pace exhibited the radula and shell of *Columbella sinuata*,

G. B. Sby., from California, and stated that the radula showed the species to be a true *Columbella*.

Mr. Da Costa exhibited the type of *Bulimus* (*Dryptus*) *Salteri*, G. B. Sby., and a variety from Peru; also *B. atramentarius*, Pfr., and *B. Adamsoni*, Gray?, from Bogota, *B. Powisianus*, Petit, from the River Cauca, and a variety from the Vallé de Magdalena, Colombia.

On behalf of Mrs. Kenyon were exhibited a specimen of *Voluta undulata*, Lam., having a thickened callus on the columella; a specimen of *Pirula ficoides*, Lam., having a notch in the outer lip; specimens of *Cypræa tigris*, Linn., showing parallel lines in the structure of the shell—all from South Australia.

Specimens in illustration of their respective papers were exhibited by J. C. Melvill, E. A. Smith, and E. R. Sykes; the last-mentioned also exhibited British marine shells, including *Defrancia Leufroyi*, Mich., from Herm, *Lepton squamosum*, Mont., from Guernsey, and the Brachiopod *Argiope decollata*, Chemn., from the Scilly Isles.

ORDINARY MEETING.

Friday, 8th May, 1896.

Prof. G. B. Howes, Sec. L.S., President, in the Chair.

The following papers were read:—

1. "On the Proöstracum of a Belemnite from the Upper Lias of Gloucestershire." By G. C. Crick, F.G.S., etc.

2. "List of the Land-shells of the Islands of Batchian, Ternate, and Gilolo." By E. A. Smith, F.Z.S., etc.

3. "Descriptions of four new species of Marine Shells from Bombay." By J. C. Melvill, M.A., F.L.S., etc.

4. "Note on the occurrence of *Petricola pholadiformis*, Lamk., at Shellness, Kent." By J. E. Cooper.

The author, while shore-hunting, at Easter, 1896, on Shellness, near Sandwich, Kent, found several specimens of *Petricola pholadiformis*, Lamk.; though none of them contained the animal, they were, with few exceptions, fresh and in good condition, so that there seemed to be every probability this species was now living in Pegwell Bay. The shells were scattered over at least two miles, and in most cases were associated with single valves of *Pholas candida*, to which they bore a strong external resemblance. The specimens collected showed considerable variation in breadth, and were more solid than North American examples in his possession.

Mr. W. Crouch exhibited specimens of *Petricola pholadiformis* from the River Crouch, Essex, and remarked that two living specimens had, to his knowledge, been taken in that river, both at Cricksea, a mile west of Burnham, in association with *Pholas crispata*. He contrasted the Essex forms with the descriptions and figures given by Gould of the North American ones. He considered the species, which he first noticed in July, 1890, had been introduced, and had "come to stay."

Specimens of the same shell were exhibited on behalf of Mr. A. S. Kennard, who wrote that he found the species at the beginning of April, living in abundance at Herne Bay, Kent. All the examples were collected between half-tide and low-water marks, and were found in burrows about six inches long. The only other mollusc he found living with it was *Pholas candida*, Linn., but this was by no means so abundant. As to the extent of its distribution, he could not speak definitely, but he traced it for at least two miles in an easterly direction, and it would probably be found in a westerly direction beyond Whitstable. From its abundance, and from the extent of the colony, there could be no doubt but that it had been established there for some time, whilst the proximity of Whitstable was very suggestive as to the means of its introduction. Its superficial resemblance to *Pholas candida*, Linne, was most probably the reason why it had previously been overlooked, and he suggested that search be made for it in similar localities.

Mr. W. Crouch further exhibited a portrait of Miss Jane Saul (*n.* 5 Dec. 1807, *ob.* 2 Sept. 1895), the last of the old shell-collectors, and the friend of many conchologists, in whose honour the following species (examples of most of which were shown) had been named: 1, *Schizodesma Sauliæ*, Gray (1838); 2, *Murex Sauliæ*, Sby. (1840); 3, *Cypræa Sauliæ*, Gask. (1843); 4, *Cistula Sauliæ*, Sby. (1843); 5, *Triton Sauliæ*, Rve. (1844); 6, *Helix Sauliæ*, Pfr. (1845); 7, *Marginella Sauliæ*, Sby. (1846); 8, *Nausitora Sauliæ*, Wright (1866); also the genus *Saulea*, Gray (1867), for *S. vitrea* (Born).

Mr. S. Pace exhibited specimens of *Columbella compta*, Lischke, and *C. pleurotomoides*, Pilsbry, both from Japan, and pointed out their specific identity.

Mr. B. B. Woodward exhibited a microscope slide of *Phyllirrhoë*.

Mr. A. Leicester exhibited photographs of Port Erin Bay, and of the Marine Biological Station there; also various British marine shells, including a species of *Pecten*, the specific identity of which was uncertain.

Mr. R. Bullen Newton exhibited, on behalf of Sir R. Rawson, the original coloured drawings of the shell and animal of *Pleurotomaria Quoyana*, F. and B., from which the figures in the "Mollusca of the Blake Expedition" were taken.

Mr. E. A. Smith exhibited specimens of *Helix hortensis*, Müll., of a thin, unicolorous form, with rather thick periostracum, from Brown Cow Island, in Casco Bay, near Portland, Maine; also specimens in illustration of his paper.

Mr. G. B. Sowerby exhibited a specimen of *Conus gloria-maris*, Chemn.; also specimens of *Spondylus aurantius*, Lamk., and *S. zonalis*, Lamk., to illustrate their specific identity; also a monstrosity of *Helicella cantiana*, Mont.

Mr. E. R. Sykes exhibited a specimen of *Amastra Knudseni*, Baldwin, from Kauai, Hawaiian Islands.

Specimens were exhibited by Messrs. J. E. Cooper and J. Cosmo Melvill in illustration of their respective papers.

ORDINARY MEETING.

Friday, 12th June, 1896.

Prof. G. B. Howes, Sec. L.S., President, in the Chair.

The following papers were read:—

1. "On the Aplacophorous Amphineura of the British Seas." By W. Garstang, M.A., F.Z.S., etc.
2. "Changes in Mineral Composition of Fossil Shells." By G. F. Harris, F.G.S., etc.
3. "Preliminary Diagnoses of new Non-marine Shells from the Hawaiian Islands." By E. R. Sykes, B.A., F.Z.S., etc.

Mr. E. A. Smith exhibited a specimen of the recently-described genus *Pugnus*, Hedley.

Mr. G. F. Harris exhibited specimens in illustration of his paper.

On behalf of Mr. Monckton were exhibited photographs of a collection of shells.

Mr. E. R. Sykes exhibited specimens in illustration of his paper.

ON THREE NEW SHELLS FROM THE COLLECTION OF MR. B. C. THOMAS, OF BREST.

By G. B. Sowerby, F.L.S., F.Z.S.

Read 13*th November*, 1896.

PLATE XI.

The collection of very choice shells formed by Mr. Thomas, in the course of many years and from many localities, contained numerous types described and figured in the Journal de Conchyliologie from 1861 to 1878, besides two figured and described by the writer in the Proceedings of the Zoological Society for 1881. Most of these types have recently been purchased for the National Collection.

I have now the pleasure of describing a *Lotorium* of somewhat remarkable character, also a *Pecten* and a *Cardium* new to science. Unfortunately Mr. Thomas neglected to preserve the records of the localities whence many of his shells were procured, although he found a considerable proportion himself, particularly at Tahiti and among the Marquesas Islands, so that only with regard to the *Cardium* can the habitat be relied upon. The *Lotorium* is probably from the same source; but Mr. Thomas could give me no information as to the locality of the *Pecten*.

Lotorium[1] armatum, n.sp. Pl. XI, Fig. 1.

Testa late-fusiformis, crassa, rugosa, rufo-fusca; spira pyramidata, subgradata; anfractus 6, primi rotunde convexi, spiraliter obsolete striati, sequentes angulati, longitudinaliter irregulariter et sparsim plicati, undique spiraliter sulcati, liris spiralibus 2–3 elevatis valde tuberculosis instructi, penultimus bivaricosus, varicibus crassis, acute tuberculatis, ultimus obtuse angulatus, valde et irregulariter tuberculatus et liratus, varicibus duobus crassis, latiusculis, tuberculis productis subspiniformibus armatus; rostrum breve, leviter contortum, lira crassa obliqua rugosa instructum; apertura ovata; labrum crassum, intus aurantium, duplicatum, tuberculis irregularibus dentiformibus munitum; columella nigro-fusco strigata, dense rugoso-plicata. Long. 70 mm.; diam. maj. 42, min. 34 mm.

Hab.—Marquesas Is.?

This remarkable shell bears no very close resemblance to any hitherto known species. In form it is somewhat like *L. cutaceum*,

[1] *Lotorium*, Montf., 1810, is prior to *Lampusia*, Schumacher, 1817, whilst *Triton*, Montf., and *Tritonium*, Link, are preoccupied.

Linn., and in colour it resembles *L. pyrum*, Linn. The liræ are produced on the varices into short blunt spines.

Pecten Thomasi, n.sp. Pl. XI, Fig. 2.

Testa rotundato-ovalis, tenuis, leviter inflata, æquivalvis, oblique subæquilateralis, costis numerosis (circa 30) irregularibus, lævibus planulato-rotundatis instructa, extus dilute purpurascens, flavo tincta, saturate purpureo-fusco late radiata, auriculis mediocris, inæqualibus, fere rectangularibus; pagina interna saturate purpureo-fusca, ad marginem maculis 5 flavis ornata. Long. 70, lat. 65 mm.

A shell of remarkably thin substance for its size, in form and character almost like one of the small hyaline species, such as *P. natans*, Philippi, but the prevailing colour is dark. The ribs are irregular, some narrow and close, others broader and more distant; the interior of the left valve is very intense purple-brown, relieved at the margin by five regular, well-defined yellow blotches.

Cardium Mendanaense, n.sp. Pl. XI, Fig. 3.

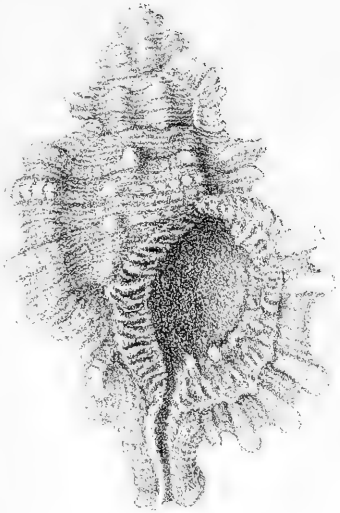
Testa subquadrato-ovata, gibbosa, crassa, straminea, et albida, fulvo-fusco variegata, radiatim costata; costis 40 confertiusculis, anticis rotundatis, crenatis, medianis complanatis, utrinque angulatis et serratis, posticis oblique squamatis; costarum interstitiis angustis profunde excavatis, transversim rugatis; pagina interna alba, ad marginem vivide purpurea. Long. 60, lat. 50 mm.

Hab.—Marquesas (or Mendaña) Is. (Thomas).

This shell, remarkable for the vivid purple margin of the interior, is distinguished by the number and peculiar formation of the ribs, which are nearly flat at the top, and angularly spread and serrated at the sides, partially overlapping the deeply excavated interstices.

EXPLANATION OF PLATE XI.

Fig. 1. Lotorium armatum, n.sp.
,, 2. Pecten Thomasi, n.sp.
,, 3. Cardium Mendanaense, n.sp.



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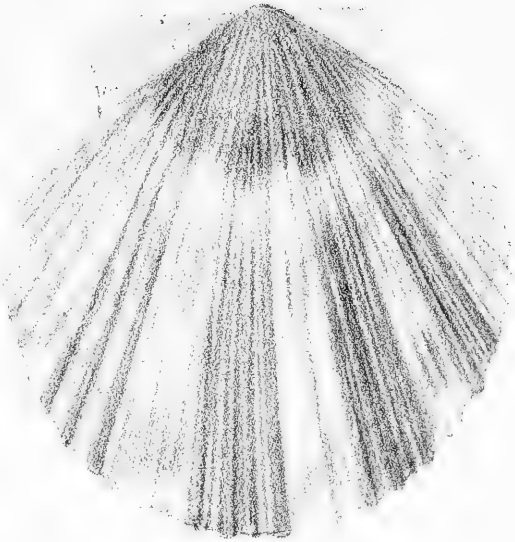

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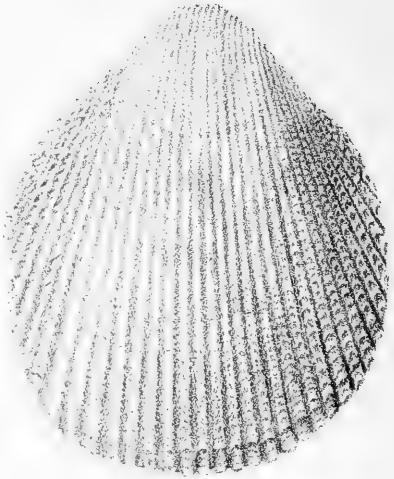


3

Hanhart imp.

NEW MOLLUSCA

THE POLYPLACOPHORA OF SOUTH AUSTRALIA.

By W. T. Bednall.

Read 13th November, 1896.

PLATE XII.

The late Mr. G. F. Angas contributed a paper to the Proceedings of the Zoological Society of London in January, 1865, on "The Marine Molluscan Fauna of South Australia," with a list of all the known species up to that time. The list included the following representatives of the Chitonidæ :—

Lophyrus muricatus, A. Ad.
Lophyrus tulipa, Quoy & Gaim.
Lepidopleurus longicymba, Quoy & Gaim.
Lepidopleurus variegatus, H. Ad. & Angas.
Lepidopleurus speciosus, H. Ad. & Angas.
Lepidopleurus liratus, H. Ad. & Angas [= *L. inquinatus* (Reeve)].
Chætopleura conspersa, H. Ad. & Angas.
Lorica Angasi, H. Ad. & Angas.
Plaxiphora ciliata, Sby.
Plaxiphora petholata, Sby.
Stenochiton juloides, H. Ad. & Angas.
Hanleya variabilis, H. Ad. & Angas.
Acanthochites scutiger, Ad. & Reeve.
Chitonellus Gunnii, Reeve.

A few years later I was able to add to this list, *Callistochiton antiquus*, Reeve, and *Lorica volvox*, Reeve (included in "A List of Species of Marine Mollusca found on the Coasts of the Province of South Australia," privately printed by me in 1875). A third species, formerly identified as *Chiton siculoides*, Carpenter, but now decided by Mr. Pilsbry to be new; and a fourth, referred to *Chiton concentricus*, Reeve, but which now proves to be Mr. Pilsbry's *Chiton Coxi*, are here added.

In 1893 Mr. D. J. Adcock published "A Hand List of the Aquatic Mollusca inhabiting South Australia," which contained all the above enumerated species, with the following additional ones: *Chiton Adelaidensis*, Reeve, *Chiton concentricus*, Reeve, *Acanthochites Zelandicus*, Quoy & Gaim., and *Cryptoplax Burrowi*, Smith.

The foregoing comprise all the species of Polyplacophora recognized up to within the last two years as living in our waters. As a group the Chitons have always greatly interested me, and it has been a long-cherished desire on my part to be able to satisfactorily identify the South Australian forms, especially those described by Adams and Angas. I was, however, able to make but little progress, partly owing to the fact that the literature at my command was limited, and partly because the shells had been overlooked in collecting. It was not

until the publication of Mr. Pilsbry's work on the Polyplacophora in the Manual of Conchology that the way was cleared for me. By a careful study of this work as a whole I was soon enabled to refer my specimens to their proper genera, and I further obtained a fair grasp of their specific value. Ascertaining, too, from the Manual, that some of our species were but little known in Europe and America, and others again quite unknown to Mr. Pilsbry, I submitted my material to him for inspection. Many of our shells were discovered to be quite new, and the number of South Australian Chitons is now considerably increased. The correspondence with Mr. Pilsbry has enabled me to compile the present list of species, and I may here tender my acknowledgment for the invaluable help he has rendered me. Moreover, without the co-operation of Mr. E. H. Matthews, of Yorke Peninsula, the work could not have been satisfactorily accomplished, for the bulk of the collecting has devolved upon him. To Professor Tate, Mr. D. J. Adcock, and Dr. J. C. Verco, I am also indebted for valuable aid.

The following is a detailed list of all the Chitons that are credited to the province of South Australia, the coast-line of which extends from Eucla in the west, to Cape Northumberland, near its eastern boundary, and includes Spencer and St. Vincent's Gulfs:—

Lepidopleurus inquinatus (Reeve).
Callochiton platessa (Gould).
Ischnochiton juloides, Ad. & Ang.
—— *Pilsbryanus*, Bednall.
—— *cariosus*, Pilsbry.
—— *Pilsbryi*, Bednall.
—— *ustulatus* (Reeve).
—— *crispus* (Reeve) [= *C. longicymba*, auct. *non* Blainv.].
—— *fruticosus* (Gould).
—— *contractus* (Reeve).
—— *variegatus* (Ad. & Ang.).
—— *decussatus* (Reeve).
—— *ptychius*, Pilsbry.
—— *Tateanus*, Bednall.
—— *smaragdinus* (Angas).
—— *virgatus* (Reeve).
—— *Thomasi*, Bednall.
—— *Novæ-Hollandiæ* (Gray).
Callistochiton antiquus (Reeve).
Chiton tricostalis, Pilsbry.
Chiton calliozona, Pilsbry.
—— *jugosus*, Gould.
—— *Coxi*, Pilsbry [= *C. concentricus*, Bedn. *non* Reeve].
—— *exoptandus*, Bednall.
—— *Bednalli*, Pilsbry.
Lorica volvox (Reeve).
Loricella Angasi (Ad. & Ang.).
Plaxiphora petholata (Sby.).
—— *conspersa* (Ad. & Ang.).
—— *glauca* (Quoy & Gaim.) [=*P. ciliata*, Ang. *non* Sby.].
Acanthochites asbestoides (Smith).
—— *Bednalli*, Pilsbry.
—— *granostriatus*, Pilsbry.
—— *speciosus* (H. Ad.).
—— *Matthewsi*, Bednall & Pilsbry.
—— *variabilis* (Ad. & Ang.).
Cryptoplax striatus (Lamk.), var. *Gunnii*.

Species whose Occurrence is Doubtful.

Ischnochiton Adelaidensis (Reeve).
Chiton limans, Sykes [= *C. muricatus*, Ad. *non* Tilesius].
—— *tulipa*, Quoy & Gaim.
Acanthochites Zelandicus (Quoy & Gaim.).
—— *scutiger* (Ad. & Reeve).
—— *Burrowi* (Smith).

With the exception of the doubtful species, authentic specimens of all the foregoing have passed through my hands. It will be seen that when Mr. Adcock's list was published in 1893 only twenty-two species were credited to our waters, and amongst these all the doubtful ones. In the short space of less than three years I have been enabled to augment the list to thirty-seven known, and six doubtful species, in fact to all but double the number, which it must be admitted is good evidence of the richness of South Australia in Polyplacophora.

1. Lepidopleurus inquinatus (Reeve).

Chiton inquinatus, Reeve: Conch. Icon., sp. 154.
Lepidopleurus liratus, H. Adams & Angas: Proc. Zool. Soc. 1864, p. 192; Pilsbry, Man. Conch., ser. I, vol. xv, p. 101.

A small elongate species, ornamented dorsally with fine, longitudinal, microscopically-closely-beaded riblets, which become coarser and somewhat divergent on the side slopes; and with the terminal and lateral areas concentrically sulcate, the lateral areas especially so. The colour is not constant, varying from dirty yellow to dark brown. The South Australian examples which have been taken do not exhibit the brown spots on the summits of the valves that are present in New Zealand ones, and as shown in the figure given in the Conch. Icon. Length 10, breadth 3 mm.

Hab.—East and west sides of Southern Yorke Peninsula, South Australia; Port Phillip, Victoria; Tasmania; also New Zealand (Suter, Nautilus, ix, p. 108).

A small Chiton obtained amongst a great number of specimens collected in company with Mr. E. H. Matthews in March, 1895, was forwarded to Mr. Pilsbry, with another and larger unnamed example that had been obtained from Hobson's Bay, Victoria. An examination of the shell had shown me that it was a *Lepidopleurus*, but I was not prepared for the discovery, by comparison with the types, that it was conspecific with Reeve's *C. inquinatus*, since I had concluded that a colour variety of *Lepidopleurus* [*Ischnochiton*] *variegatus*, Ad. & Ang., would prove to be synonymous with that species.

2. Callochiton platessa (Gould).

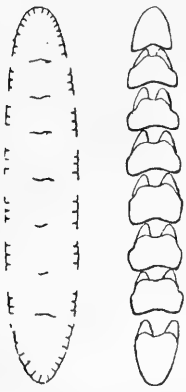
Chiton platessa, Gould: Proc. Boston Soc. Nat. Hist., vol. ii (1846), p. 143; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 49, pl. x, figs. 1–5.

A single specimen of this well-known New South Wales species was obtained at Port Willunga, St. Vincent's Gulf, by Mr. W. Kimber. The coloration of the South Australian specimen is ruddy brown, with cloudy patches of white on the margins of the valves, near the girdle; the umbones of the fifth, sixth, and seventh valves are bright orange-red, the same colour showing beneath the brown tint of the valves anterior to them, but not on the posterior valve: on this there are a few white spots.

3. Ischnochiton (Stenochiton) juloides, Ad. & Ang.
Pl. XII, Fig. 1.

Stenochiton juloides, Adams & Angas: Proc. Zool. Soc. 1864, p. 193; *op. cit.* 1865, pl. ii, fig. 15; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 55, pl. xvi, figs. 6–8.

A very peculiar and easily recognized form of Chiton, but one that does not often fall into the hands of the collector. In addition to the original description by Adams and Angas, the amplified one of the type-specimen by Dr. Carpenter is given in the Manual of Conchology, so it is unnecessary to repeat them here. Four specimens have come into my hands, all of which, besides one or two others that I know of, were found living on *Pinna* shells, below low-water mark. The very young ones 5–7 mm. in length are not uncommon in shell sand, but the full-grown shell is by no means easily obtained. Length of largest specimen 46 mm., breadth 8 mm.

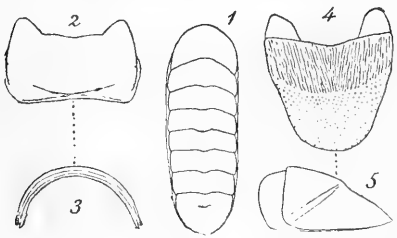


Ischnochiton juloides, Ad. & Ang.

Hab.—(Type) Holdfast Bay (Angas); Largs Bay (Adcock); Yorke Peninsula (Matthews).

4. Ischnochiton (Stenochiton) Pilsbryanus, n.sp.

Shell small, thin and delicate, narrow and elongated, evenly high-arched, and rounded dorsally. Surface glossy and smooth; under the lens seen to be closely dotted with white on the lateral areas and end valves, and with short longitudinal strokes on the central areas. Colour various: pale green, closely and indistinctly mottled with white, and with several brown dots along the posterior sutural margin of each valve, and marked with white, or sometimes pink, at each umbo, or of a dark chestnut shade blotched at each umbo with white. The girdle light, with dark bars. Anterior valve somewhat wider than long, the anterior slope straight or slightly convex. Intermediate valves over twice as wide as long; lateral areas well raised, but not with sharply defined anterior borders, and narrowly wedge-shaped, not extending to the outer-anterior angle of tegmentum.



Ischnochiton Pilsbryanus, n.sp.

1, dorsal view; 2, ventral view of median valve; 3, anterior view of same; 4, dorsal view of posterior valve; 5, lateral view of same.

Posterior valve slightly longer than wide, the central mucro but slightly projecting, posterior slope slightly convex. Interior white, or showing the brown in dark specimens. Sutural laminæ very small, and separated by a wide straight sinus. Insertion plates very short, little longer than the eaves. Anterior valve with 13, intermediate valves 2–2, posterior valve 14 slits. Girdle very narrow, clothed with smooth scales. Length 5·75, breadth 2 mm.

Hab.—Troubridge Shoal, St. Vincent's Gulf, on seaweed (? *Zostera*).

This minute species resembles *Ischnochiton juloides* in general features, but has much shorter valves. The megalæsthetes are conspicuous under the microscope, appearing as somewhat regularly arranged white dots on the lateral areas, head valve, and posterior portion of tail valve, and as short white longitudinal lines on the central areas.

5. Ischnochiton (Heterozona) cariosus (Pilsbry).

Heterozona cariosa (Carpenter MS.), Pilsbry: Man. Conch., ser. I, vol. xiv, p. 65, pl. xxiv, figs. 20–2.

An oblong shell, with rounded valves, of a dirty yellowish hue, sometimes spotted with brown. Finely reticulated on the summits of the valves, becoming coarsely divaricately striate on the side slopes. Lateral areas with several riblets, which are broken up into coarse uneven granules, and occasionally bifurcate. Anterior valve closely radiate; posterior valve concentrically pustulose. Girdle in the vicinity of the valves crowded with large flattened projecting scales, unequal in size, the marginal ones being very much smaller. The carious state of the valves of very many of the specimens of this species is a noticeable feature, hence the specific name. Length 52, breadth 19 mm.

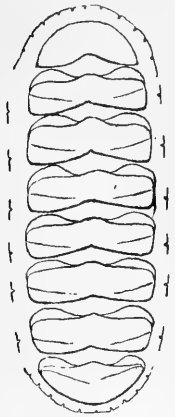
Hab.—Encounter Bay; and many stations in both St. Vincent's and Spencer Gulfs; also Port Fairy, Victoria, where the species attains a large size.

"Australia" is the country recorded for the species. Although plentiful under blocks of limestone at several places in St. Vincent's Gulf, it is not mentioned in Mr. Angas' List of South Australian Shells; nor does it appear to have been located by any collector prior to this.

6. Ischnochiton Pilsbryi, n.sp. Pl. XII, Fig. 2.

Shell oblong, elongated, with broadly arched rounded valves, not carinated. Colour, uniform ochraceous yellow. Anterior valve with about thirty-six closely-set, radiating, finely pustulose riblets, not extending to the apex, shorter riblets occurring occasionally between the others at the outer margin, the area around the apex granulose. Intermediate valves coarsely unevenly granulated on the dorsal area, the granules gradually transformed into coarse, uneven, slightly convergent and then divergent corrugations on the side slopes, the interspaces of the corrugations increasing in width towards the outer edges; lateral areas distinctly raised, narrow, and ornamented

with from three to five pustulose ribs, the outer ones being the more prominent, small granules studding the spaces between the ribs. Sutural plates rounded; sinus wide, somewhat inclined to convexity. Interior white. Posterior valve very indistinctly radiated, but irregularly concentrically granulated towards the margin and everywhere studded with smaller granules. Umbo antero-central, the slope behind it scarcely concave. The anterior valve has 11, the median 1, and the posterior 11 slits. Girdle densely covered with very small flattened, imbricating, striated scales, becoming smaller towards the outer edge. Length 38, breadth 12 mm.



Ischnochiton Pilsbryi, n.sp.

Hab.—Sultana Bay, Yorke Peninsula, at which locality only a few specimens have been obtained.

In reference to this shell Mr. Pilsbry writes that it is allied to *I. cariosus* in the sculpture of the central areas, but has the girdle of the typical Ischnochitons.

7. Ischnochiton ustulatus (Reeve).

Chiton ustulatus, Reeve: Conch. Icon., sp. 102; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 96, pl. xxiv, figs. 100, 1–4, 11, 12.

An elongate oval shell of a scorched brown hue, except upon the dorsal ridge of all the valves except the anterior one. On the summit of the last seven valves the dominant colour gives place to creamy white with longitudinal splashes of burnt brown. The surface of the valves is apparently smooth, but by the aid of a lens is seen to be minutely reticulated. The lateral areas are but slightly raised, and both they and the terminal valves are very indistinctly radiately and concentrically striated. The girdle is pale yellow, and the scales on it so minute as not to be discernible without the aid of the microscope. Interiorly the shell is tinged with purple, paling to bright pink at the junction of the valves, a characteristic that is constant and serves well as a means of identification. Old specimens are very much eroded on the dorsal ridge. Length 45, breadth 16 mm. Large specimen, l. 57 × 21 mm.

Hab.—Many stations in St. Vincent's Gulf, under blocks of limestone, at low-water mark. Fine specimens east and west sides of Southern Yorke Peninsula.

Not included in Mr. Angas' List of South Australian Mollusca, but recorded by him from New South Wales, where it does not appear to occur. I have received specimens of *I. divergens* under this name. The excessively small girdle-scales are diagnostic. In life this Chiton is a very conspicuous object, the deep dark-brown shell standing out in strong contrast to the brilliant orange-coloured girdle surrounding it.

8. Ischnochiton crispus (Reeve).

Chiton crispus, Reeve: Conch. Icon., sp. 120; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 89, pl. xxiv, figs. 98, 99.
Ischnochiton Haddoni, Pilsbry: Man. Conch., ser. I, vol. xiv, p. 88, pl. xxii, figs. 67–73.

This species, until its description by Mr. Pilsbry in the Manual of Conchology as *I. Haddoni*, was quoted by Mr. Angas in his List of South Australian Shells, and accepted by Australian conchologists, as *Lepidopleurus longicymba*, Blainville, and distributed by them as such. In shape it is elongately oval, and decidedly carinate on the dorsal ridge—*I. longicymba* being rounded—with finely decussated, striated central valves, concentrically granulate terminal valves, and longitudinally striated lateral areas: it attains to a length of about an inch. This species is extremely variable in coloration, and the remarks of Reeve with regard to *I. longicymba* are equally applicable to it. He says: "It would be vain to attempt to describe the variations which this species exhibits in colour and design of painting; in this respect it is of all Chitons the most variable, but the sculpture is uniform throughout." The most conspicuous form is black, with a broad white dorsal band.

Hab.—Encounter Bay, Rapid Bay, Port Willunga, Marino, Southern Yorke Peninsula, and many other localities in South Australia; Port Fairy, Victoria; New South Wales; Tasmania. It appears to occur generally along the southern coast of Australia from Port Jackson, in New South Wales, to Port Lincoln, in South Australia, including Tasmania, and to represent in Australia the New Zealand *I. longicymba.*

9. Ischnochiton fruticosus (Gould).

Chiton fruticosus, Gould: Proc. Boston Soc. Nat. Hist., ii, p. 142; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 91, pl. xxiii, figs. 78–80.

A specimen of this *Ischnochiton*, which is common in New South Wales, has very recently been obtained by Mr. E. H. Matthews on Southern Yorke Peninsula. It is of the normal size.

10. Ischnochiton contractus (Reeve).

Chiton contractus, Reeve: Conch. Icon., sp. 78; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 93, pl. xxiii, figs. 81, 82.
Chiton pallidus, Reeve: Conch. Icon., sp. 92; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 89, pl. xxiii, fig. 91.

The identification of this species has given me much trouble, because I could not satisfactorily assign it to either the description or figure of *C. contractus* in the Conch. Icon., while at the same time I seemed constrained to look upon *C. pallidus* as the representative of the shell. It is, however, accepted on the authority of Mr. Pilsbry, Nautilus, vol. viii, 1895, p. 129, where also it is stated that "Mr. Sykes considers *pallidus*, Rve., a synonym." Dr. Carpenter's notes on the British Museum specimens, as given by Pilsbry (Manual of

Conchology, vol. xiv, p. 89), fully describe this species, although I have not yet seen a South Australian specimen streaked with any other colour than olive. Length 42, breadth 18 mm.

Hab.—Encounter Bay; St. Vincent's Gulf (Rapid Bay, Willunga, Marino); Troubridge Shoal; east and west sides of Southern Yorke Peninsula, under stones, low-water mark; also Port Fairy, Victoria.

Not included in Angas' Molluscan Fauna of South Australia, Proc. Zool. Soc. 1865.

11. Ischnochiton variegatus (Ad. & Ang.).

Lepidopleurus variegatus, H. Adams & Angas: Proc. Zool. Soc. 1864, p. 192; Pilsbry, Man. Conch., ser. I, vol. xv, p. 102.

A small species attaining a length of two-thirds of an inch. It is oblong in form, and the coloration appears to be peculiar to it amongst the South Australian Chitons. Some are cream-coloured, with just a few dots of brown, especially along the dorsal ridge and the outer edge; others, again, are blotched with green and irregularly dotted with brown, and a large proportion are blackish-brown throughout, except for a pale longitudinal streak along the dorsal ridge, which is almost always maculated with the prevailing colour.

Not known to Mr. Pilsbry, who, however, on receipt of specimens from me, wrote that he had no doubt of the identification. The original description is, I think, sufficient to enable the student to recognize this species, if in his possession, but probably it is not to be found in many collections.

Hab.—Plentiful at Sultana Bay, Yorke Peninsula; also at Hardwicke Bay, Spencer Gulf.

12. Ischnochiton decussatus (Reeve).

Chiton decussatus, Reeve: Conch. Icon., sp. 107; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 93, as a synonym of *I. contractus*, Reeve.
Chiton castus, Reeve: Conch. Icon., sp. 145.
Lepidopleurus speciosus, H. Adams & Angas: Proc. Zool. Soc. 1864, p. 192.

Shell oval, full-grown specimens measuring nearly two inches in length by an inch in width. Colour greenish or yellowish white, painted on, and in the vicinity of, the summits of the valves with elongated triangular patches of brown, the apices pointing posteriorly. Some specimens dark brown throughout. The end valves and lateral areas are ornamented with concentric rows of closely-set but perfectly distinct granules, irregular in size; central valves carinate, finely decussately striate on the summit, thence to the outer margin divergently flexuously striated. Girdle brown, sometimes mottled with white, covered with small closely imbricating scales.

Hab.—Sultana Bay (fine specimens); Troubridge Shoal; Port Willunga, in St. Vincent's Gulf; also Port Lincoln (Angas), and Hardwicke Bay, in Spencer Gulf.

The distinct granular ornamentation of this species at once distinguishes it from any other South Australian Chiton. It is curious, therefore, that Mr. Angas, who collected it in this Colony, did not recognize its identity with the shells in the Cumingian Collection, described by Reeve as under the above name.

13. Ischnochiton ptychius, Pilsbry.

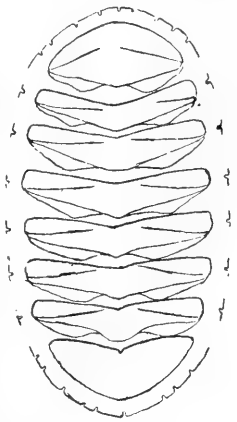
Ischnochiton ptychius, Pilsbry: Nautilus, vol. viii, p. 53.

It is a small oval pink-tinged shell, with wrinkled striations on the dorsal areas, and somewhat coarse concentric sulcations on the lateral areas, which are strongly serrated at the sutural margin. Length 11, breadth 8 mm.

Hab.—One specimen, St. Vincent's Gulf, in all probability at Port Willunga (Bednall). A second one has been obtained by Mr. E. H. Matthews at Sultana Bay.

14. Ischnochiton Tateanus, n.sp. Pl. XII, Fig. 3.

Shell oval, elevated, obtusely carinated, side slopes slightly convex; colour generally of a sordid grey, minutely mottled with brown or green, sometimes spotted with brown; in occasional specimens the second, third, and sixth valves are black. Interior whitish, tinged with purple green, yellow, or brown in different examples. Central valves finely decussated throughout, not excepting the summits, with very fine, even pustulose, striations, becoming a little coarser and more defined on the side slopes towards the margin; lateral areas somewhat raised, and having about five to seven somewhat indistinct, roughened riblets, the riblet on the posterior edge being double the width of the others, and cut up into transverse, backwardly diverging, short riblets or oblong pustules by concentric grooves, which strongly serrate the posterior edge of the valve. In some specimens the growth-lines are strongly marked. Anterior valve with numerous thread-like pustulose striæ, posterior edge serrated similarly to the central valves. The tail valve having the mucro central, and the posterior sharply defined from the central area. The former ornamented with riblets radiating as in the anterior valve; the central area being sculptured like the immediately preceding valve, the slope from the umbo is concave. Sinus very wide and shallow. Anterior valve 9 or 10, central 1, posterior 8 slits. Girdle narrow, composed of scales deeply grooved on the outer edge, very closely and irregularly set together, gradually diminishing in size towards the outer edge. Length 21, breadth 12 mm.



Ischnochiton Tateanus, n.sp.

Hab.—Dredged only in Sultana Bay (E. H. Matthews).

The chief characteristic of this species is the serrated posterior edges of the valves, and it answers very closely in several particulars to Carpenter's *Ischnochiton serratus* (Pilsbry, Man. Conch., ser. I, vol. xiv, p. 122, and xv, p. 78). Mr. Matthews tells me that the coloration of this species when living affects that of the object to which it may be attached. It is a beautifully sculptured species, but inconspicuous as regards colour. I have named it after Professor Ralph Tate in acknowledgment of my indebtedness to him for the loan of literature which was indispensable to me for the identification of the Chitons of this province.

15. Ischnochiton smaragdinus (Angas).

Lophyrus smaragdinus, Angas: Proc. Zool. Soc. 1867, p. 115, pl. xiii, fig. 28; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 137, vol. xv, pl. xv, fig. 27.

Hab.—Yankalilla, Port Willunga, Noarlunga, Marino, and Largs Bay, the last being near the entrance to the Port Adelaide River. It has been obtained recently by Mr. Matthews near Cape Spencer, Investigator Strait. Its type locality is Port Jackson, New South Wales, and it also occurs in North-West Tasmania.

This beautiful little Chiton was unknown as a South Australian species until the commencement of 1895, when, within the space of three months, it was discovered in several localities comprised in a distance of about thirty miles on the eastern shores of St. Vincent's Gulf. Specimens occur having the pattern of the variety *picturatus*, but more sombre in colour than the Port Jackson examples, with scattered blue spots somewhat as in *I. lentiginosus*. In several Port Jackson specimens examined the slits vary from 10–11 in the anterior, and from 9–12 in the posterior valve.

16. Ischnochiton virgatus (Reeve).

Chiton virgatus, Reeve: Conch. Icon., sp. 192; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 78, pl. viii, figs. 72, 73.

In form this species is rather long and narrow, and the girdle-scales are very small, much finer than in *I. smaragdinus*. The last character at once separates *I. virgatus* from the young *I. lentiginosus* or *I. smaragdinus*, which have relatively large girdle-scales. The type-specimens are recorded to be 5 mm. in length, and 2 in breadth. The average length of those in my collection is 8 to 9 mm., and breadth 4, but I have one example 11·5 mm. long and 4·5 wide.

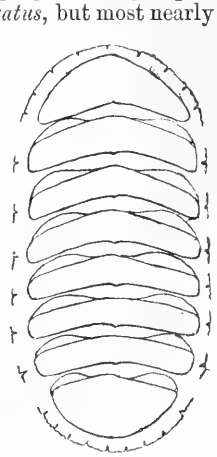
Hab.—Original locality "Port Lincoln," in all probability collected by Harvey. It is plentiful on both sides of Southern Yorke Peninsula; and I have it from Encounter Bay, Port Willunga, and Marino.

A very diminutive but most daintily painted shell, quite distinct from its allies—*I. lentiginosus*, Sby., and *I. smaragdinus*, Angas. Its essential distinguishing characters have been drawn by Dr. Carpenter from the type-specimens in the Cumingian Collection, and these are published in the Manual of Conchology; since as only two specimens

were at Dr. Carpenter's command, and those exceedingly small, I may be permitted to write more fully in regard to the coloration, having numerous examples to work from. The ground tint is grey, speckled with minute sky-blue, or emerald-green spots, sometimes intermingled with angular blotches of white, the spots and blotches often surrounded by a setting of golden brown, giving the surface a beautiful opalescent hue. On the summits of the valves the coloration is distinct and decided: in the majority of specimens the anterior valve is painted with a white blotch, the second, third, and fourth with black blotches, the fifth and sixth with broad white blotches, that on the sixth always the larger, in fact the largest of all of them, giving place on the seventh to a narrow white line, while on the posterior valve the white blotch increases in size again, and forks from the umbo into two divergent white streaks to the margin. The only variation from this style of painting is when the black blotches of the second, third, and fourth valves give place to white, in which case there is an irregular line of white on the summit from one end of the shell to the other. The girdle is white, painted at varying distances with narrow black stripes. *I. virgatus* should not be confounded with *I. lentiginosus*, which differs from it both in shape and markings and in the nature of the girdle-scales.

17. Ischnochiton Thomasi, n.sp. Pl. XII, Figs. 4 and 5.

This name is proposed for an *Ischnochiton* belonging to the group of *I. smaragdinus*, *I. lentiginosus*, *I. Mayi*, and *I. virgatus*, but most nearly allied to the first of these. The general contour is that of *I. smaragdinus*, or somewhat narrower; and the tail valve differs in having the slope behind the mucro notably concave, while in *I. smaragdinus* it is nearly straight. The colour-pattern is unlike any of the varieties of Angas' species, being closely mottled in rather chequered design with white, blue, and light-orange, mingled in varying proportions on different specimens; and there are usually olive clouds on each side of the ridge, accompanied by whitish streaks or spots, and on the tail valve these marks often diverge backward. Along each sutural margin there are two to four dark dots on each side. The general tone is a light greenish-yellow. Girdle light, tessellated with dark bars opposite the sutures, the scales smooth, as in *I. smaragdinus*. Valve i with 10, ii to vii with 1–1, viii with 9 slits. Length 10·5–14, breadth 5–7·5 mm.



Ischnochiton Thomasi, n.sp.

Hab.—Marino, St. Vincent's Gulf, in pools at high-water mark, on smooth pebbles; Cape Spencer, Investigator Strait, under similar conditions, within the influence of the surf (Matthews). It is named in honour of Mr. H. Thomas, who has executed excellent drawings of this and other South Australian Chitons.

Other specimens referable to this species are found under largish blocks of stone, near low-water mark, at Hardwicke Bay, Spencer Gulf. They are somewhat broader than the type. The colours are the same, except that they are paler throughout, with the whitish tints predominating more. The slits in one of these specimens stand: Anterior valve 8, intermediate valves 1–1, posterior valve 7.

I. Thomasi is undoubtedly very near to *I. smaragdinus*, but it seems proper to signalize by a new name the real differences between the two forms. It has much coarser girdle-scales than *I. virgatus*, Reeve.

18. Ischnochiton (Ischnoradsia) Novæ-Hollandiæ (Reeve).

Chiton Novæ-Hollandiæ (Gray MS.), Reeve : Conch. Icon., sp. 142 ; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 145, pl. xix, figs. 67–9.

Chiton (*Lophyrus*) *Australis*, Tenison-Woods: Proc. Roy. Soc. Tasmania, 1877, p. 46 (*non* Sby.).

This Chiton has only been recognized as a denizen of South Australian waters during the last two years, although it had been obtained at the Bluff, Encounter Bay, by two or three collectors some time previously. So far as I know it has not been found at any other station in this province. The Manual of Conchology gives Adelaide, South Australia, but this is an error, for the coast-line in the immediate neighbourhood of Adelaide is a long stretch of sandy beach, and quite unsuited to the habits of the species under notice. *I. Novæ-Hollandiæ* is apparently a common species in Tasmania, where it has been confounded with *I. Australis* (the New South Wales form) and distributed by collectors as such.

19. Callistochiton antiquus (Reeve).

Chiton antiquus, Reeve : Conch. Icon., sp. 169 ; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 274, pl. lix, figs. 29–35.

There can be no mistaking this beautifully sculptured Chiton, with its malleated upper surface, acutely ribbed side slopes, prominently costated end valves, and doubly costated lateral areas, all the costations being sharply cut into well-defined rounded nodules, small at their commencement and gradually increasing in size towards the margin. "Australia" is the habitat given by Reeve for the type-specimen, which in all probability was obtained at Port Jackson. It was not known as a South Australian species to Angas when listing our shells in 1864; but some three years later it was collected by myself at Marino, on the east side of St. Vincent's Gulf, and subsequently at Port Willunga. Mr. Matthews has lately collected it on Yorke Peninsula. It also occurs at Port Molle, Queensland (Coppinger). My largest New South Wales specimen measures 18 × 10 mm., in accordance with the dimensions given in the Manual of Conchology; but I have South Australian examples 22 mm. long. It must be admitted, however, that they are not so presentable as those from the eastern colony.

20. Chiton tricostalis, Pilsbry.

Chiton (*canaliculatus*, var.?) *tricostalis*, Pilsbry: Nautilus, vol. viii (1894), p. 54.

This is a handsomely sculptured shell, though somewhat sombre in hue. For many years I referred it to *C. muricatus*, Adams [i.e. *C. limans*, Sykes]; and under that name sent it to Mr. Pilsbry, who, however, found it to be a new species. Length of type 17, breadth 11 mm. I have since obtained examples 30 mm. long by 13 broad.

Hab.—Sultana Bay and Troubridge Shoal, at very low tides, under blocks of limestone; also dredged in St. Vincent's Gulf by Dr. Verco.

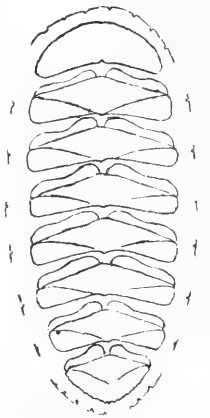
Mr. E. H. Matthews has a seven-valved specimen of the shell in his collection.

21. Chiton calliozona, Pilsbry. Pl. XII, Fig. 6.

Chiton [*aereus*, var.] *calliozona*, Pilsbry: Nautilus, vol. viii (1894), p. 55.

Of the true Chitons this is our largest species, and, moreover, exceedingly handsome. The description given by Mr. Pilsbry is exhaustive; but he appears to have had from me for the purpose but an ordinary-sized specimen—17 × 9 mm. One now before me is quite 45 × 23 mm.; and Mr. E. H. Matthews, who should be credited with the discovery of this fine species, is in possession of shells 50 × 25 mm. He has lately obtained specimens beautifully blotched in some of the valves with chocolate brown.

Hab. — Sultana Bay, at low-water, under blocks of limestone; also dredged in the same locality.



Chiton calliozona, Pilsbry.

22. Chiton jugosus, Gould.

Chiton jugosus, Gould: Proc. Boston Soc. Nat. Hist., ii (1846), p. 142.

Chiton concentricus, Reeve: Conch. Icon. (1847), sp. 95.

Two or three specimens of this Chiton were in the local collections credited to South Australia, but they could not be satisfactorily accounted for. However, during the Easter vacation 1896 several examples were obtained by Dr. W. G. Torr, at Port Willunga.

23. Chiton Coxi, Pilsbry.

Chiton Coxi, Pilsbry: Proc. Acad. Nat. Sci. Philadelphia, 1894, p. 85.

A specimen of this shell obtained by me many years ago from Kangaroo Island, remained in my collection as *C. concentricus*,

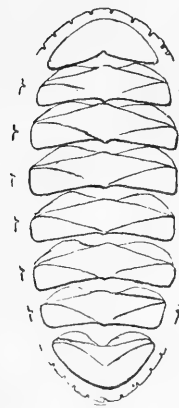
Reeve, and on this authority I believe that species is included in Mr. Adcock's list. A closer examination of specimens recently secured at Sultana Bay proves that they are conspecific with *C. Coxi*, from Port Jackson.

Hab.—Kangaroo Island and Southern Yorke Peninsula (South (Australia); Port Jackson (New South Wales).

It is a prettily-marked species, of a bronze-green colour throughout, and is allied to the preceding.

24. Chiton exoptandus, n.sp. Pl. XII, Fig. 7.

Oblong, strongly elevated with acute dorsal keel and straight side slopes. Cream or brownish-white, heavily blotched on some valves with reddish-brown, sparsely maculated with dots along the ridge, and more or less mottled with the same colour or with pinkish-brown on the other valves, the markings tending to form arcuate longitudinal streaks on the lateral areas and end valves. Girdle rose-purple or reddish-brown, with whitish narrower bars opposite the sutures. A whitish wedge or triangle spreads backward from the mucro on the tail valve. Median valves acutely beaked (when not eroded), the beaks but slightly projecting on the straight or concave posterior margins of valves, which at the sides are regularly and closely serrate. Central areas with a smooth wedge-shaped band along the narrowly rounded ridge (wider and triangular in valve ii); the pleura with about fourteen to eighteen strong, narrow, rounded, longitudinal ribs, about as wide as their intervals; six or eight inner grooves on each side, shorter, not extending to the anterior edge of valves (short grooves on valve ii more numerous); the grooves becoming smaller towards umbones. Lateral areas well raised, with some arcuate, coarse, irregular wrinkles in the direction of growth-lines, bipartite by a median radial sulcus, more or less interrupted into a series of triangular or long pits, whilst in some specimens the areas are trisulcate on some or all valves. Valve i, short, erect, the anterior slope straight and shorter than the sutural margins; apex free and erect; sutural margin emarginate; sculptured with eighteen to twenty radial, pitted grooves, the riblets more or less crenulated. Valve viii, small, with post-central decurved mucro, the posterior slope concave, sculptured with radial grooves and riblets. Interior pink, or purplish where marked outside with brown; sinus extremely narrow (1 mm. wide). Valve i with eight slits; ii to vii, 1–1; viii, ten slits. Girdle clothed with very convex, smooth, and polished scales, measuring slightly over ·5 mm. in width. Length 27–28, breadth 14–15 mm.; divergence 97 degrees.



Chiton exoptandus, n.sp.

Hab.—Dredged generally in St. Vincent's Gulf. Also taken under blocks of limestone, Sultana Bay.

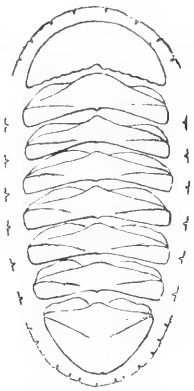
Most nearly allied to *C. Bednalli*, but the sulci of the pleura are more numerous, and many more of them are short, not attaining the anterior border of valve toward the beaks. The sulci of the pleura are continued and curved inward upon the slope of the diagonal line. The outer slope of each individual rib of the pleura is more abrupt than the inner, giving a somewhat imbricate effect. *Chiton Coxi* differs from this species in having fewer sulci on the pleura, unsculptured lateral areas, and non-serrate sutures.

25. Chiton Bednalli, Pilsbry. Pl. XII, Fig. 8.

Chiton Bednalli, Pilsbry, Nautilus, ix (1895), p. 90.

Hab. — Sultana Bay, Yorke Peninsula, one specimen.

This form is very closely allied to *C. exoptandus*. The latter differs, however, conspicuously in coloration.



Chiton Bednalli, Pils.

26. Lorica volvox (Reeve).

Chiton volvox, Reeve, Conch. Icon., sp. 31; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 237, pl. lii, figs. 14–21.
Chiton cimolius, Reeve, Conch. Icon., sp. 141.

This well-known New South Wales species occurs in South Australian waters at three localities in St. Vincent's Gulf, viz.: Port Willunga, Marino, and Sultana Bay, where it is obtained at low tides under blocks of stone.

It is not a scarce shell, and it is therefore curious that it is omitted from Mr. Angas' List; he, however, mentions it as occurring at Port Lincoln in a list of New South Wales shells published in the Proc. Zool. Soc.

27. Loricella Angasi (Ad. & Angas).

Lorica Angasi, H. Adams & Angas: Proc. Zool. Soc. 1864, p. 193; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 238, pl. li, figs. 9–13; Proc. Acad. Nat Sci. Philad. 1894, p. 87.

Hab.—Sultana Bay (Matthews); Rapid Bay (Angas); Holdfast Bay (Bednall); New South Wales (Cox, Brazier).

This form is by no means easily obtained, and for the reason, I believe, that it is located in deeper water I was fortunate on one occasion in getting a very fine specimen, which was on a large frond of fucus, thrown up on the beach after a heavy gale. The differences between this and the preceding species have been noted by Dr. Carpenter, and reproduced in the Manual of Conchology. The peculiar features of *L. Angasi* have subsequently been indicated in Pilsbry's paper on the Port Jackson Chitons.

28. Plaxiphora petholata (Sby.).

Chiton petholatus, Sby.: Mag. Nat. Hist., n.s., vol. iv (1840), p. 289; Conch. Illust., figs. 64, 65.

Plaxiphora petholata, Pilsbry: Man. Conch., ser. I, vol. xiv, p. 323, pl. lxviii, figs. 62–7.

This is the commonest Chiton of the rocky portions of the South Australian coast-line, and it may be taken in numbers at nearly high-water mark between the crevices of the rocks just as the incoming tide reaches them. *P. petholata* attains to a large size, specimens frequently measuring 95 mm. in length, by 55 in width.

29. Plaxiphora conspersa (Ad. & Ang.).

Chætopleura conspersa, Adams & Angas: Proc. Zool. Soc. 1864, p. 193.

Plaxiphora petholata var. *conspersa*, Pilsbry: Man. Conch., ser. I, vol. xiv, p. 324.

Although not a common species, many specimens have now been collected by me when in company with Mr. E. H. Matthews. They are quite distinct from *P. petholata* in any stage of growth, and, moreover, have a different habitat, for whereas *P. petholata* is only taken on rocky coasts on which the surf beats heavily, *P. conspersa* occurs in company with the Ischnochitons under blocks of stone in comparatively smooth water. The principal superficial differences appear to be that *P. conspersa* is more elevated, and the lateral areas, instead of having a narrow, finely corrugated, diagonal riblet, separating them from the pleural tract, are defined by two coarsely nodulous riblets, one on each side of the area, the intervening space having similar sculpturing to that on the body of the shell. Length (largest specimen) 30, breadth 18 mm.

Hab.—"Under rocks, Port Lincoln. A beautiful and rare species" (Angas); North Arm, Port Adelaide, on *Pinna* (Bednall); Sultana Bay, Yorke Peninsula (Matthews and Bednall). In none of these localities does *P. petholata* occur.

Under the heading Teratology, in the Introduction to vol. xiv of the Manual, p. xiii, Mr. Pilsbry writes:—"The occurrence of six- and seven-valved Chitons has been noted as early as the time of Linnæus. It is likely that the *six-valved were artificial fabrications*, although a certain number may perhaps be traced to incorrect drawings." Mr. Matthews is in possession of a veritable *six-valved* specimen of *P. conspersa*!

30. Plaxiphora glauca (Quoy & Gaim.).

Chiton glaucus, Quoy & Gaim.: Voy. Astrolabe, Zool. iii, p. 376, pl. lxxiv, figs. 7–11.

Plaxiphora glauca, Pilsbry: Man. Conch., ser. I, vol. xiv, p. 325, pl. lxviii, figs. 68–72.

It has been my good fortune at the last moment to become possessed of a specimen, although only a small one, of this species. It was

obtained at a part of the coast-line of Southern Yorke Peninsula that is very seldom visited. I ascertained that, although living in the same neighbourhood as *P. petholata*, it is easily distinguished by its bright green girdle and the different nature of the bristle, and also that it attains a larger size. When dried the girdles of both species assume the same appearance; but there is no difficulty in separating the species, for the valves of *P. glauca* are not corrugated as are those of *P. petholata*. I do not think there is any doubt that Mr. Pilsbry is right in his surmise that this "is probably the form Angas collected at Guichen Bay, South Australia, and listed as *P. ciliata*."

31. Acanthochites asbestoides (Smith).

Chiton (*Acanthochiton*) *asbestoides* (Cpr. MS.), Smith: Zool. Coll. H.M.S. "Alert," p. 83, pl. vi, fig. G; Pilsbry, Man. Conch., ser. I, vol. xv, p. 17, pl. ii, fig. 55.

Acanthochites asbestoides, Cpr.: Pilsbry, Proc. Acad. Nat. Sci. Philad. 1894, p. 79, pl. iii, figs. 16–20.

The description of the species is fully given by Mr. E. A. Smith, and the salient features of the shell have further been recapitulated by Mr. Pilsbry. One specimen in my collection, were it not curled, would measure 20 mm. in length.

Hab.—Southern Yorke Peninsula (common); Rapid Bay, east side of St. Vincent's Gulf; Port Molle (Queensland). I have also specimens collected in Hobson's Bay (Victoria), which should confirm the locality of the type-specimen in the British Museum.

32. Acanthochites Bednalli, Pilsbry.

Acanthochites Bednalli, Pilsbry: Proc. Acad. Nat. Sci. Philad. 1894, p. 81, pl. ii, figs. 7–11.

To the very full description of the above shell, Mr. Pilsbry adds the following:—"The species is closely allied to *A. granostriatus*, but the valves are more solid; *the dorsal areas are much more deeply striated longitudinally*; that of valve viii is largely broken into granules. The sutural laminæ in *A. Bednalli* are greenish; the pustules of the side areas are somewhat larger and rather less regularly arranged in longitudinal series. *A. Bednalli* differs from *A. Coxi* in having much more conspicuous and silky sutural tufts, in the colour of the interior and sutural laminæ, in the flat pustules, and in lacking the curved diagonal rib, which in *A. Coxi* extends from the apex of each median valve to its lateral slits." Length 13, breadth 6·5 mm.

Hab.—Occurs plentifully in company with *A. asbestoides* at Sultana Bay, Yorke Peninsula, under very small stones, near high-water mark. I do not yet know it from any other locality.

33. Acanthochites granostriatus, Pilsbry.

Acanthochites granostriatus, Pilsbry: Nautilus, vol. vii (1894), p. 119; Proc. Acad. Nat. Sci. Philad. 1894, p. 81, pl. ii, figs. 1–6, pl. iv, fig. 37.

This species was included amongst a number of Chitons submitted

by me to Mr. Pilsbry, who attached the following note: "Differs from Port Jackson types in colouring somewhat, but is the same thing in sculpture practically."

Hab.—Two examples were obtained in company with *A. asbestoides* and *A. Bednalli*, Pils., at Sultana Bay, Yorke Peninsula. Since obtained plentifully at Hardwicke Bay, Spencer Gulf. The type-specimens were collected at Port Jackson and Port Hacking, New South Wales, by Dr. J. C. Cox.

34. Acanthochites speciosus (H. Ad.).

Cryptoplax (*Notoplax*) *speciosus*, H. Adams: Proc. Zool. Soc. 1861, p. 385.

Acanthochites speciosus, H. Ad.: Pilsbry, Man. Conch., ser. I, vol. xv, p. 32, pl. i, figs. 23–6.

Acanthochites (*Notoplax*) *speciosus*, H. Ad.: Pilsbry, Proc. Acad. Nat. Sci. Philad. 1894, p. 83, pl. iv, figs. 31–3.

This species is scarce in collections, because seldom taken whilst shore gathering.

Hab.—St. Vincent's Gulf, fine specimens dredged alive by Dr. J. C. Verco, attached to sponges, etc.; Southern Yorke Peninsula, amongst rocks; also Flinders Island, Bass Straits; Tasmania.

35. Acanthochites (Notoplax) Matthewsi, Bedn. & Pilsbry.

Acanthochites Matthewsi, Bednall & Pilsbry: Nautilus, vol. vii (1894), p. 120; (*Notoplax*?) Pilsbry, Proc. Acad. Nat. Sci. Philad. 1894, p. 83, pl. iv, figs. 27–30.

A very beautiful and unique Chiton, sent me some four or five years ago by Mr. Matthews, who took it during an extremely low tide in Sultana Bay, Yorke Peninsula. I sent it to Mr. Pilsbry, who pronounced it to be new, with sculpture "extremely peculiar, and different from that of any previously known member of the family Acanthochitidæ." Length 26, breadth 8 mm. (a dried specimen).

36. Acanthochites (Loboplax) variabilis (Ad. & Angas).

Hanleya variabilis, Ad. & Ang.: Proc. Zool. Soc. 1864, p. 194; Pilsbry, Man. Conch., ser. I, vol. xv, p. 101.

Acanthochites (*Notoplax*?) *variabilis*, Pilsbry: Proc. Acad. Nat. Sci. Philad. 1894, p. 84.

A small oblong shell, the whole surface of which is ornamented with small pustules. Mr. Pilsbry, in 1893, placed it amongst "Insufficiently described Chitons" (Appendix II, vol. xv, of the "Manual of Conchology"); but in the following year, in his "Review of Australian Acanthochitidæ" (Proc. Acad. Nat. Sci. Philadelphia), included it as a probable *Notoplax*. I collected one specimen at Rapid Bay, and a second at Kangaroo Island. Visiting Mr. E. H. Matthews on Yorke Peninsula, I took them with me, and on looking through his material found several others, whilst our first excursion resulted in the capture of many more specimens. At my request, Mr. Matthews has

since made a careful microscopic examination of the species in order to ascertain its true generic position, and the following are his notes:—"Anterior valve has five broad ribs, and the insertion plate is one-third as long as the front slope, carrying five deep slits; central valves 1–1; posterior insertion plates short, with five oblique slits. Sinus wide, square, and very porous. Girdle narrow, corneous, densely covered with minute hyaline spicules, fringed with longer spicules on the edge. Sutural tufts of long horn-coloured spiculæ at valve sutures, seven on each side; four tufts on anterior valve alternately with ribs. There are two colour varieties of this species—one being creamy white, having the side slopes mottled with olive green, and a brown streak along the ridge from valves 1–7; the other variety is dark brown or black with whitish markings. Distinct from *Hanleya* by reason of slits and insertion plates, and from *Angasia* by the presence of slits in insertion plates of posterior valve, and girdle carrying minute spiculæ, not scales." Length 15, breadth 8 mm.

Hab.—(Type) Yorke Peninsula (Angas); Southern Yorke Peninsula (E. H. Matthews); Rapid Bay, Kangaroo Island (Bednall).

37. Cryptoplax striatus (Lamk.), var. Gunnii.

Chitonellus Gunnii, Reeve: Conch. Icon., sp. 5.
Cryptoplax striatus var. *Gunnii*, Pilsbry: Man. Conch., ser. I, vol. xv, p. 54, pl. viii, fig. 14.

This variety of Lamarck's *Chiton striatus* is exceedingly plentiful at all suitable localities on the South Australian coast-line, and attains a very large size. It also occurs in Tasmania.

SPECIES WHOSE OCCURRENCE IS DOUBTFUL.

38. Ischnochiton Adelaidensis (Reeve).

Chiton Adelaidensis, Reeve: Conch. Icon., sp. 123; Smith, Zoology H.M.S. "Alert," p. 79.
Ischnochiton Adelaidensis, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 136, pl. xxiv, figs. 7, 8.

Mr. W. H. Harvey, in the early days of the colonization of South Australia (1854–6), collected many natural-history specimens, which he transmitted to England, and presumably amongst them the present species, Reeve describing it three or four years later as from Port Adelaide. The opinion of Messrs. E. A. Smith and H. A. Pilsbry, however, is that, as with many other specimens in the Cumingian Collection, the labels had become mixed. The discovery in the early part of 1895 of a closely allied shell at several stations on the east side of St. Vincent's Gulf, induced me to communicate with Mr. Smith, and to suggest that the specimens, which I could not satisfactorily separate from *I. smaragdinus*, Angas, might possibly be *I. Adelaidensis*, and in that event the two species were probably identical. Mr. Smith identified my specimens, however, as *I. smaragdinus*; consequently we still need evidence that *I. Adelaidensis* is a denizen of South Australian waters.

39. Chiton limans, Sykes.

[=*muricatus*, Ad. *non.* Tilesius. For synonymy see ante, p. 93.]

Recorded by Mr. Angas, under the name of *Lophyrus muricatus*, as having been collected "under stones at low-water, Port Lincoln"; but it does not occur in South Australian collections as a local species. Can Mr. Angas have identified the shell lately described as *C. tricostalis* by Mr. Pilsbry as *C. muricatus*, Adams?

40. Chiton tulipa, Quoy & Gaim.

Chiton tulipa, Quoy & Gaim.: Voy. Astrolabe, Zool. iii (1834), p. 389, figs. 35, 36; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 185, pl. xxxi, figs. 43–9.
Lophyrus tulipa, Quoy: Angas, Proc. Zool. Soc. 1865, p. 186.

Hab.—"Under stones, low-water, Port Lincoln" (Angas). This South African species is not known to have been obtained subsequently, and Angas' identification may be regarded as probably incorrect.

41. Acanthochites Zelandicus (Quoy & Gaim.).

Chiton Zelandicus, Quoy & Gaim.: Voy. Astrolabe, iii, p. 400, t. lxxiii, figs. 5–8; Reeve, Conch. Icon., sp. 58.
Acanthochætes Hookeri, Gray: Dieffenbach's "Travels in New Zealand," vol. ii, p. 262.
Acanthochites Zealandicus, Hutton: Manual N.Z. Moll., p. 117; Pilsbry, Man. Conch., ser. I, vol. xv, p. 16, pl. xiv, figs. 9, 10.

It is exceedingly doubtful whether this species is an inhabitant of South Australian waters.

42. Acanthochites scutiger (Ad. & Reeve).

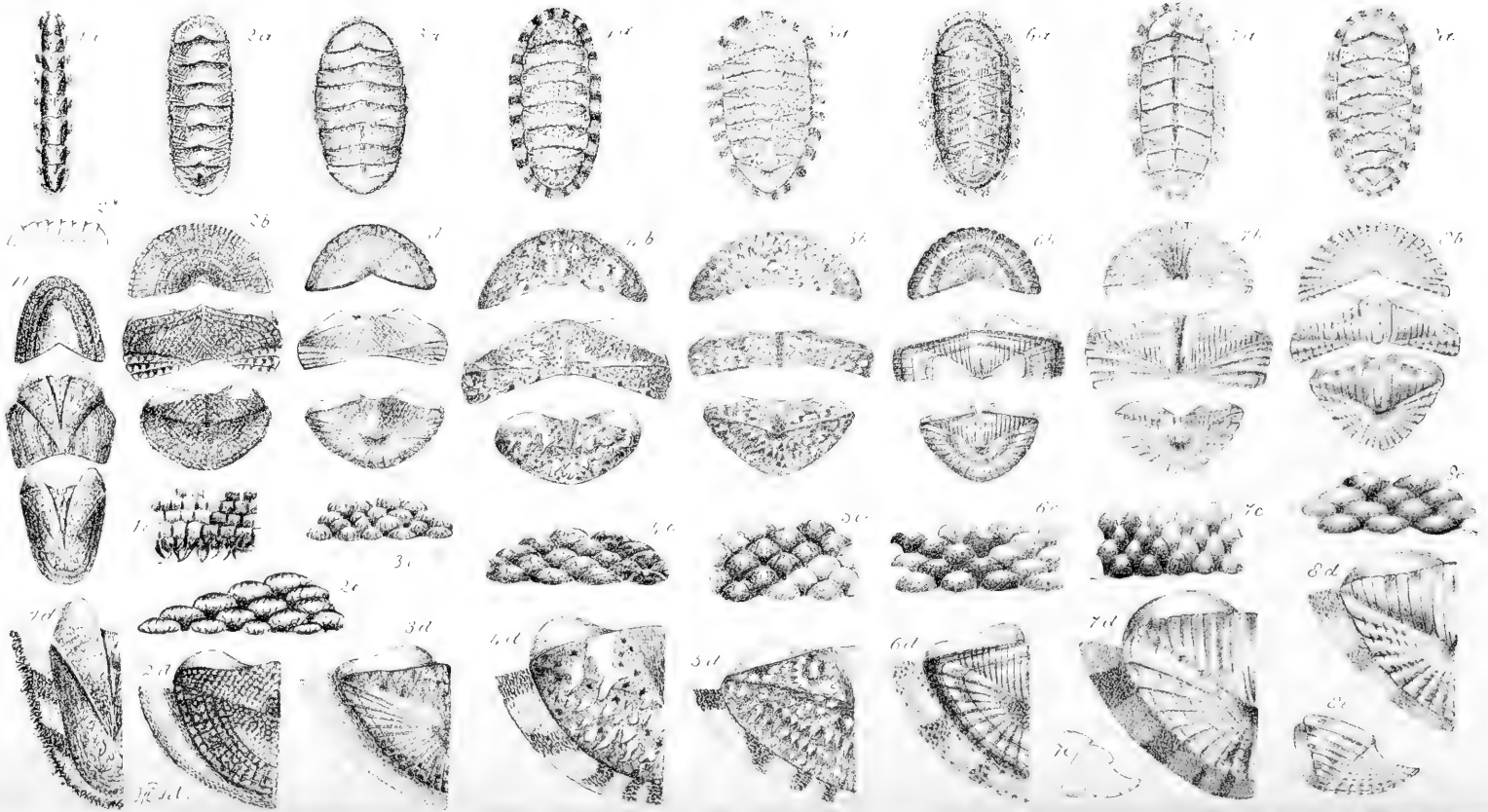
Chiton scutiger, Ad. & Reeve: Conch. Icon., sp. 178.
Acanthochites scutiger, Pilsbry: Man. Conch., ser. I, vol. xv, p. 20, pl. ii, figs. 51, 52.

I do not know this shell, and have not yet had an opportunity of visiting Port Lincoln, the locality from which it is recorded by Mr. J. F. Angas. Its occurrence in Australian waters is discredited by Pilsbry (Proc. Acad. Nat. Sci. Philad. 1894, p. 76).

43. Cryptoplax Burrowi (Smith).

Chitonellus larvæformis, Reeve: Conch. Icon., sp. 3.
Chiton (*Chitonellus*) *Burrowi*, Smith: Zool. Coll. H.M.S. "Alert," 1884, p. 85.
Cryptoplax Burrowi, Haddon: "Challenger," Polyplacophora, p. 42, pl. iii, figs. 11 *a–m*.
Cryptoplax Burrowi, Pilsbry: Man. Conch., ser. I, vol. xv, p. 54, pl. ix, figs. 6–10.

Hab.—Port Adelaide (Reeve).
Not known in South Australian collections.



EXPLANATION OF PLATE XII.

a. dorsal view of entire shell.
b. anterior, median, and posterior valves.
c. portion of girdle magnified.
d. portion of posterior valve enlarged.
e. lateral view of posterior valve.

FIG. 1. Ischnochiton juloides, Ad. & Ang.
,, 2. ———— Pilsbryi, n.sp. (2* lateral view).
,, 3. ———— Tateanus, n.sp.
,, 4. ———— Thomasi, n.sp.
,, 5. ———— ———— var.
,, 6. Chiton calliozona, Pilsbry.
,, 7. ——— exoptandus, n.sp.
,, 8. ——— Bednalli, Pilsbry.

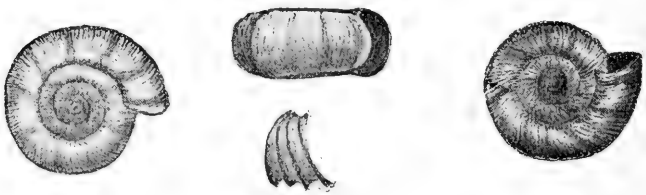
DESCRIPTIONS OF NEW SPECIES OF *ENDODONTA* AND *FLAMMULINA* FROM NEW ZEALAND.

By R. Murdoch.

Read 11*th December*, 1896.

1. Endodonta (Charopa) vortex, n.sp.

Shell minute, discoidal, concave above and below, colour whitish, with a few broad streaks of pale brown at irregular distances, somewhat shining, thin and semi-transparent. Whorls 5, slowly increasing, somewhat rounded, the first three very narrow, the fourth, much larger, rising to nearly the same level as the last whorl, the last, rising abruptly from its suture, curves a little outward to its summit, from thence to the base it is regularly arcuate, where it curves in to the large umbilical crater; closely ribbed, about 19 per millimetre, ribs directed slightly forward, interstices between the ribs ornamented with fine hair-lines, varying from four to seven; sutures very deep; in the penultimate and last whorls the ribs do not extend down into the deep sutures. Spire concave to about one-third of the height, embryonic shell of one and a half whorls, shining, sculptured with very fine concentric striæ. Aperture vertical, concentric, peristome straight, acute, margins convergent, columellar margin descending nearly vertically, not reflected, more widely arcuate than the upper margin. Umbilicus deep, large, nearly half the diameter, showing all the volutions. Diam. 1·6, height ·75 mm.



Endodonta vortex, n.sp.

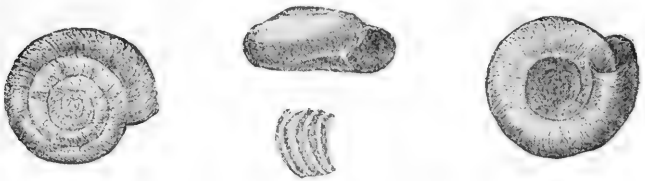
Type in my collection.

Hab.—Toko, near Stratford, North Island (R. M.).

This shell is very near to *E. subantialba*, Suter; it differs in being rather more depressed, the body-whorl not being so large in proportion to the rest of the shell, and in its coloration. From *E. Huttoni*, Suter, it may be distinguished by the gradually increasing whorls, their greater number, and the wide umbilicus.

2. Endodonta (Charopa) coma, Gray, var. multicostata, n.var.

Shell small, subdiscoidal, umbilicated, pale fuscous with a few pale-brown spots, dull, thin, and semi-transparent. Whorls $5\frac{1}{2}$, convex, slowly and regularly increasing, ornamented with slightly curved close ribs, about 11 per millimetre, curving slightly backward until they cross the periphery, straight on the base, interstices between the



Endodonta coma, Gray, var. *multicostata*, n.

ribs ornamented with fine growth-lines. Spire a little elevated, flatly convex, embryonic shell smooth; sutures not deep. Aperture oblique, lunately rotund, peristome straight, acute; umbilicus broad, conical, nearly half the diameter, showing all the volutions; base rounded. Diam. 4·3, height 2·16 mm.

Hab.—Wanganui, North Island (R. M.).

This shell may be distinguished from *E. coma*, Gray, and *E. pseudo-coma*, Suter, by the ribs being firm and much closer together. It may prove to be a distinct species, but, with only a single dead example for comparison, it seems better to unite it with *E. coma*, to which in many respects it is closely allied.

3. Flammulina (Phenacohelix) perplexa, n.sp.

Shell globosely depressed, umbilicated, pale brown, base occasionally darker, spotted and reticulated with brown, the reticulations frequently

Flammulina perplexa, n.sp.

extending over the whole shell, most developed on the upper surface, usually a few larger spots near the sutures, dull, thin, and semi-transparent. Whorls 5, convex, gradually increasing, body-whorl

rounded, higher than broad (slightly angulated in the young), not descending, closely ribbed, about 8 ribs per millimetre, sloping slightly backward on the upper surface, a little undulating at the periphery, straight on the base, interstices between the ribs ornamented with fine hair-lines, reticulated with fine striæ. Spire convex, embryonic shell smooth and shining; sutures impressed. Aperture oblique, rotundly lunate, columella descending, gradually arcuated, slightly thickened, and rather broadly dilated above, white; peristome simple, straight, margins slightly approaching. Umbilicus deep, about 1 mm. in diameter, usually whitish within the crater; base rounded. Diam. maj. 6·8, min. 5·5 mm.; height 4·5 mm.

Type in my collection.

Hab.—Wanganui, Cape Egmont, North Island (R. M.).

This shell has been confounded with *Phacussa hypopolia*, Pfr., a species which varies considerably. Mr. W. Moss has had examples compared with the type of *P. hypopolia* in the British Museum, and found they were not that species, from which it may be distinguished by the more rounded base, more dilated columella, and very different coloration. Recently I received from Mr. H. Suter examples of *P. hypopolia* from Pelorus Valley, South Island, a local variety, which in contour and coloration very closely resemble *F. perplexa*: the latter differs in the umbilicus being a little wider, the base somewhat more rounded, the body-whorl being proportionately a little greater in height to its breadth than in this variety, the aperture a little less oblique, and the shell half a whorl less. No well-marked characters separate the two forms.

4. Flammulina (Allodiscus) Mossi, n.sp.

Shell small, subdiscoidal, narrowly umbilicated, yellowish horny, dull, thin and semi-transparent, spotted and somewhat reticulated with rufous markings, usually a number of larger splashes near the sutures, extending to the periphery on the body-whorl, base with a few lighter-

Flammulina Mossi, n.sp.

coloured spots and streaks. Whorls 5–5½, rather convex, regularly increasing, the last not descending, rounded, closely ribbed, about 10 ribs per millimetre, sloping slightly backward on the upper surface, straight on the base; interstices between the ribs with fine growth-lines, reticulated with fine striæ. Spire convex, embryonic shell smooth and shining, sutures well impressed. Aperture very oblique, lunate; columella shortly descending, arcuate, a little thickened and reflected above; peristome thin, straight, margins slightly approaching.

Umbilicus deep, narrow, about ·5 mm. in diameter; base somewhat rounded, gradually impressed on approaching the umbilical crater. Diam. maj. 5, min. 4·25 mm.; height 2·8 mm.

Type in my collection.

Hab.—Wanganui, Cape Egmont, Toko near Stratford, Manawatu, North Island (R. M.).

In shell characters this species is intermediate between *Allodiscus* and *Phenacohelix*; the umbilicus and aperture agree well with the former section, whilst the ribbing and colour-markings call to mind the latter. It has been confounded with *Phenacohelix pilula*, Reeve: Mr. W. Moss has had examples compared with the type of that species in the British Museum, from which it was found to differ considerably in its smaller size, its more oblique and less broadly lunate aperture, and in its narrow umbilicus; the latter varies from ·25 to ·5 mm. The dentition is that of *Allodiscus*. I have much pleasure in connecting with this species the name of Mr. William Moss, of Ashton-under-Lyne, who has assisted in clearing up the position of this and the preceding species.

NOTES ON A COLLECTION OF MARINE SHELLS FROM THE ANDAMAN ISLANDS, WITH DESCRIPTIONS OF NEW SPECIES.

By J. C. Melvill, M.A., F.L.S., and E. R. Sykes, B.A., F.Z.S.

Read 11*th December*, 1896.

PLATE XIII.

Early in 1896, through the kind instrumentality of Mr. F. W. Townsend, of Manora, Karachi, we received from Mr. G. H. Booley, of Port Blair, two small Andamanese collections, the marine portion mostly having been dredged by himself, although no data or particulars of exact locality have come with the specimens. There were likewise a few *Helices*, *Melaniæ*, and other terrestrial or fluviatile species, which, however, are not enumerated in the present paper.

The Andaman Islands have been frequently searched for Mollusca, and the leading and more conspicuous species would seem now pretty well known to Malacologists; few attempts, however, at cataloguing the molluscan fauna have been made. Many new forms have been of late years described from this region by Mr. G. B. Sowerby, Messrs. Geoffrey and Henry Nevill, and others, whilst, among the smaller species, the Marquis de Folin has enumerated many novelties.

The most important contribution of recent years has, perhaps, been that of Mr. E. A. Smith,[1] in which seventy-five species, collected by Lieut.-Col. L. Worthington Wilmer, are catalogued, six of them being described as new. About twenty-five of these are here recorded as being in Mr. Booley's collection, including three of the six new species described by Mr. Smith, viz.: *Pleurotoma Wilmeri*, *Fusus abnormis*, and *Turritella infraconstricta*.

We hope to receive further consignments from Mr. Booley, and, in time, to be able to offer lists of productions of these prolific Islands to the members of the Malacological Society; in the meantime, we would mention that our catalogue contains over ninety species, six being considered new.

The species already recorded in Mr. Smith's paper are distinguished by an asterisk.

1. Hydatina (Aplustrum) aplustre, L. (= *Amplustre Thalassiarchi*, Mart.). Extends to Mauritius. One juvenile example.

2. *Atys cylindrica, Helbling. A large example.

3. Tornatina cf. olivula, A. Ad.

4. Terebra cinerea, Born. According to Tryon, a variable species, of which the name *cinerea* should be taken as the aggregate.

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[1] Proc. Zool. Soc. London, Nov. 5, 1878, pp. 804–821, 1 plate.

Amongst the Andaman Island forms may be enumerated, besides the type, *T. bacillus*, Desh., *lactea*, Desh., and *apicina*, Desh.

5. Conus capitaneus, L. Only in young condition.

6. Pleurotoma acutigemmata, Smith. The author of this species has examined our specimen, and considers it undoubtedly his shell. Tryon places this as a synonym of *P. jubata*, Hinds, but had never seen either an example or a figure.

7. Pleurotoma (Crassispira) nivea, Phil. A very pretty species, described originally from Formosa. Two specimens.

8. Pleurotoma tigrina, Lam. Two specimens, in juvenile condition, but fine.

9. Pleurotoma concinna, Dkr. A fine example, with operculum, of this very beautiful species. Dunker described it from China. Our specimen is 28 mm. in length, of pale-fawn colour, very elegantly spirally carinated, the canal and portion of the basal region suffused with pale carnation.

10. Pleurotoma (Drillia) Booleyi, n.sp. Pl. XIII, Figs. 6, 7.

D. testa fusiformi, eleganter attenuata, solidiuscula, anfractibus 10, ochraceo-brunneis, ad suturas impressis, ventricosulis, longitudinaliter obtuse rotundi-costatis (costis infra juxta suturas evanidis, apud medium anfractuum binodulosis), spiraliter liri-striatis, liris ad medium fortioribus, et apud basim numerosis, apertura ovato-oblonga, labro extus effuso, sinu lato, columella recte, canali parum producto. Long. 19, lat. 6 mm.

Though a shell of no particularly marked character, we cannot exactly match it with any other known *Drillia*. The colour is a pleasing ochraceous-brown, the spire graceful, attenuate in the upper whorls, the rounded ribs crossed with liræ, the two central ones becoming nodulous at the juncture with the ribs, the mouth is oval-oblong, sinus broad, outer lip effuse, columella straight.

11. Pleurotoma (Drillia) ochroleuca, n.sp. Pl. XIII, Figs. 4, 5.

D. testa attenuata, fusiformi, solida, læte ochracea, apice albo, anfractibus 9, supernis albidis simplicibus, cæteris ochraceis, infra suturas spiraliter unicarinatis, carina albo-gemmulata, infra hac, transversim canaliculatis, in penultimo et antepenultimo anfractu tri vel quatuor transversis gemmularum albarum nitidis ordinibus decoratis, ultimo undecim ordinibus, gemmulis rotundis, albidis, lævibus, apertura oblonga, angusta, labro extus paullum incrassato, valde ad suturam, sinu conspicuo, cuneato, margine columellari recto. Long. 22, lat. 6 mm.

A pretty, brightly-coloured species, with some affinity to *D. digitalis*, Reeve, and *D. granularis*, Smith. It is ochraceous-yellow, adorned with closely-arranged, spiral, white gemmules. The whorls are nine, the apical white and simple, the lower whorls impressed at the sutures, below which is a spiral keel, and this is followed by a transverse depressed sulcation. The first three rows of gemmules

following on the penultimate and last whorls seem almost confluent, producing the appearance of longitudinal riblets. The mouth is narrow, oblong, outer lip somewhat thickened, sinus conspicuous, and columellar margin straight.

12. * Pleurotoma (Drillia) variabilis, Smith. We have seen three or four specimens, larger than those figured by Mr. Smith, and somewhat differently marked.

13. * Pleurotoma (Drillia) Wilmeri, Smith. Two or three specimens, fine, and typical of this very beautiful species, figured in the paper already referred to (Proc. Zool. Soc. 1878).

14. Pleurotoma (Surcula) bijubata, Reeve. Quite typical.

15. Clathurella Hindsii, Reeve. A curiously sculptured species, described (Proc. Zool. Soc. 1843, p. 186) as from the Philippine Islands. It is nearly allied to *C. carinulata*, Souverbie, from New Caledonia.

16. Clathurella Reeveana, Desh. This, according to Tryon and Mr. Andrew Garrett, is the *C. concinna*, Dunker. One specimen only.

17. Daphnella Boholensis, Reeve. Almost typical. Apparently of extended distribution: we have seen specimens from very widely distant localities.

18. Cancellaria obliquata, Lam. In fine condition.

19. Cancellaria Wilmeri, Sby. A small but interesting species, discovered by Lieut.-Col. L. W. Wilmer, and described by Mr. G. B. Sowerby in Proc. Zool. Soc. 1881, p. 637. It is endemic, so far as at present known, in Andamanese seas.

20. Oliva Australis, Duclos.

21. Oliva paniculata, Duclos. Pl. XIII, Fig. 14. Mr. J. M. Williams, who has kindly compared our shell with specimens in his own fine collection, pronounces it to be "a small but very nice specimen of *paniculata*."

22. Ancilla Booleyi, n.sp. Pl. XIII, Fig. 13.

A. testa oblongo-fusiformi, tenui, parum nitente, anfractibus 6, apice mamillato, parvo, cæteris lævissimis, pallide cinereo-albis, infra suturas rufis flammis depictis, ultimo anfractu rufis flammis fulgetrinis ad $\frac{3}{4}$ diametri decorato, et apud basim rufo-strigato; apertura ovato-oblonga, paullum effusa, labro simplice, columella planata. Long. 14, lat. 5 mm. sp. maj.

An interesting *Ancilla*, though amongst the smaller species of this circumscribed genus. It somewhat recalls an *Agaronia* in the disposition of its markings, being oblong, thin, six-whorled, pale ashy-white, marked below the sutures and over the greater portion of the last whorl with rufous spots, or zigzag markings. The mouth is ovate-oblong, lip simple. We name it after its discoverer, Mr. G. H. Booley, of Port Blair.

23. Mitra (Chrysame) coriacea, Reeve. This species is very uncommon. It is distinguished by its deeply impressed sutures, and

strongly spirally beaded whorls, here and there stained with reddish-fawn spots. It is placed, but very erroneously, by Tryon as a synonym of *M. lugubris*, Swn.

24. Mitra (Cancilla) crenifera, Lam. A typical form of this widely distributed species.

25. Mitra (Cancilla) rufilirata, Ad. & Reeve.

26. Mitra (Swainsonia) ocellata, Swn. This pretty species is very nearly allied to *M. Mariæ*, Ad., long known from the Andaman Islands, though no specimen has as yet been sent by Mr. Booley. It is, however, always distinguishable from the latter both in form and the disposition of its markings. Our specimen is nearly typical. We consider it more than a mere variety of *M. fissurata*, as suggested by the late Mr. Tryon in his Man. Conch., ser. I, vol. iv, p. 131, where, placing this and *M. fissurata* rightly in *Swainsonia*, he relegates the nearly allied *M. incisa*, Ad. & Rve., and *M. Mariæ*, A. Ad., to the typical group *Mitra*, placing the latter as a mere synonym of the former. We cannot agree with him; and when he adds that both are probably the young of *M. variegata*, Reeve, we feel that any attempts at argument would be useless, so diametrically opposed are our views.

27. Mitra (Costellaria) arenosa, Lam. In juvenile condition only. We may mention that, having lately examined thousands of specimens from the Loyalty Islands of the form known as *M. exasperata*, Chemn., we found it to vary in every degree, and to pass from the distinct brown and white *M. Hadfieldi*, M. & S., with its transverse bands and paucity of ribs, into the typical and many-ribbed *M. arenosa*, Lam., so that no doubt was left on our minds but that these forms are really all one and the same species.

28. *Mitra (Callithea) acupicta, Reeve. A most beautiful variety, which seems to connect the typical Philippine form of this species with *M. Zebuensis*, Reeve, also from the Philippines, and *M. prætexta*, Sby., by some considered a variety of *M. Zebuensis*. The contrast in colour presented between the warm, brown painting and the white body of the shell is extremely attractive and characteristic.

29. Mitra (Costellaria) lubens, Reeve. We have this also from the Loyalty Isles, as well as the Philippines. Why Tryon considers it a variety of *M. militaris*, Reeve, and also introduces the distinct *M. compta*, A. Ad., as a synonym, it is impossible to say.

30. Mitra (Pusia) aureolata, Swn. A fine-coloured specimen.

31. Mitra (Pusia) crocata, Lam. Quite typical.

32. Mitra (Imbricaria) isomeres,[1] n.sp. Pl. XIII, Fig. 9.

I. testa cylindracea, apud apicem obesa, crassiuscula, dolioliformi, anfractibus 8, supernis, apicali incluso, arctis, compressis, subturritis,

[1] ἰσομέρης, 'having an equal share,' in allusion to its affinities.

pallidis, ad suturas impressis, infra, juxta suturas, spiraliter bi- vel triliratis, et longitudinaliter clathrato-striatis, ultimo anfractu versus basim attenuato, producto, spiraliter undique regulariter minuti-punctato, punctis arctis, superne pallide gilvo, ad medium et infra cinereo-brunneo, vel gilvo, delicatissime albo-fissurato lineis divaricatis, fulgetrinis, penultimo bino punctorum ordine, et, simul ac in ultimo, infra suturas rufi-maculato, ultimo apud medium spiraliter albo-maculato, maculis ad lævum rufo-marginatis, simili macularum ordine versus basim succincto, apertura angusta, oblonga, labro recto, paullulum incrassato, columella quadriplicata, plicis acutis, basi attenuata. Long. 18, lat. 8 mm.

This is one of the most puzzling species we have ever examined. Combining, as it does, the characters of *Mitra*, Lam., s.g. *Swainsonia*, H. & A. Ad., with the genus *Imbricaria*, Schum. (*Conælix*, Swn.), we hesitated for some time as to its location. We ultimately decided, on account of the following characters, to place it in the latter genus:—

(*a*) The shortly cylindriform shape.
(*b*) Straight outer lip.
(*c*) Columellar plications, precisely those of the *Imbricariæ*.
(*d*) Its close approximation especially to *I. Vanikorensis*, Reeve (Pl. XIII, Fig. 10), in form and upper whorls, and in regular spiral punctate markings.
(*e*) The base and slightly produced canal of *Imbricaria*.

On the other hand, the following characters more closely agree with *Swainsonia*:—

(*a*) Markings. Almost identical with those of *Mitra Mariæ*, A. Ad. (Pl. XIII, Fig. 8), and *M. ocellata*, both from the Andaman Isles, the latter occurring also at Singapore.
(*b*) Distance between the suture of the penultimate whorl and the commencement of the lip.

At first it occurred to us that it might possibly be a hybrid between *Mitra Mariæ* and *Imbricaria Vanikorensis*, but this is hardly likely. The latter, to begin with, has never been yet found in the Andaman Isles. Nor do we consider it a monstrosity. It remains to add a very beautiful form to an already circumscribed genus; though we have always been at a loss to entirely comprehend why the genera *Cylindromitra* and *Imbricaria* have been so completely separated from *Mitra*. We think it would be more reasonable to only allow them subgeneric rank, as formerly, and as such we venture to include this species.

[N.B. We may remind malacologists that in 1888 one of us described a *Cypræa* (*C. amphithales*), from South Africa, which exactly combined the characters of two subgeneric types — *Cypræovula Capensis*, Gray, with *Luponia Algoensis*, Gray. Several specimens, some in live condition, have come to hand in recent years, and it is impossible to say with certainty with which subgenus this interesting shell should be located; though we incline to *Cypræovula*. The

only question is, should these subgenera (or genera) not be united, when such links are found to exist between them?]

33. Latirus (Peristernia) pulchella, Reeve. One specimen, hardly full-grown.

34. Latirus (Peristernia) Marquesa, A. Ad. Quite characteristic.

35. Phos rufocincta, Smith. Not in very good condition.

36. *Phos textum, Gmel. Probably this species, but not full-grown.

37. *Nassa (Arcularia) globosa, Quoy. Of the variety known as *clathrata*, Kiener.

38. *Nassa (Alectrion) bifaria, Baird. Considered by some a variety of *N. hirta*, Kien.

39. *Nassa (Alectrion) elegans, Kien. Apparently distinct from *N. glans*, L.

40. *Nassa (Alectrion) monilis, Kien. A well-known species.

41. *Nassa (Zeuxis) Marratii, Smith. A remarkably pretty and distinct species; variably coloured, and more or less smooth.

42. *Nassa (Niotha) albescens, Dunker. Common and typical. Known by its darker apex and white body-whorls.

43. Nassa (Niotha) eucomista,[1] n.sp. Pl. XIII, Fig. 11.

N. testa ovato-fusiformi, concinna, pallide brunneo-ochracea, anfractibus 7, duobus apicalibus, pellucidis, cæteris undique decussatis, gemmulatis, apud suturas compressis, apertura ovato-oblonga, labro niveo, nitido, intus denticulato, margine columellari infra parietem uniplicato, duabusque plicis apud basim instructo. Long. 18, lat. 8·50 mm.

An extremely neat species, allied to *N. cremata*, Hinds, and *N. stigmaria*, A. Ad. The whorls are seven, two being apical and glassy, the remainder are small, with the exception of the last, which increases rapidly, the sutures are channelled, and the decussation over the whorls is extremely regular, close, and precise, presenting a turned or chased appearance of great beauty. The mouth is ovate oblong, lip white, shining, hardly callous, denticled within, and at the columellar margin once-plaited just below the suture, and also slightly two-plaited at the base.

44. Nassa (Niotha) margaritifera, Dunker. We have what is probably a variety of this species.

45. *Nassa (Niotha) stigmaria, A. Ad. A characteristic and very attractive Andaman species, which varies a good deal.

46. *Nassa (Hebra) sistroidea, Nevill. Perhaps a variety of *N. subspinosa*, Lam. Our two specimens are not mature. Mr. E. A.

[1] εὐκόμιστος, 'well-tended or groomed.'

Smith considers the peculiarities of the nodulous projections on the whorls to establish its specific distinction.

47. Columbella fabula, Sby. This shell is, according to Mr. Tryon, a variety of *Columbella pardalina*, Lam., which occurs throughout the Eastern Archipelago.

48. Columbella versicolor, Sby. One good-sized specimen. It is of remarkably wide distribution.

49. Columbella (Atilia) nympha, Kiener.

50. *Columbella (Atilia) puella, Sby. Remarkably brightly coloured, pure white, with ochraceous maculations.

51. Columbella (Conoidea) flava, Brug. A common species, but not in good condition. The distribution extends throughout the whole Indo-Pacific province.

We are indebted to Mr. S. Pace for having kindly examined the few Columbellidæ of this collection.

52. *Murex (Muricidea) cirrosus, Hinds. One or two very beautiful varieties, the length of the canal varying in individuals. We have compared the specimens dredged by Lieut.-Col. L. Wilmer, now in the British Museum, and they are identical.

53. *Murex (Muricidea) rusticus, Reeve. Figured by Mr. E. A. Smith (l.c.). Our specimens exactly agree with Lieut.-Col. Wilmer's, now in the National collection.

54. Sistrum concatenatum, Blvlle.

55. Sistrum fragum, Blvlle. Perhaps a variety of the preceding.

56. *Sistrum margariticolum, Brod. A variable shell, and one which much doubt has surrounded; nevertheless it is quite recognizable and well characterized. Of very wide distribution, from Lord Hood's Island and Mauritius to the extreme East Indies.

57. Sistrum musivum, Kien. A highly-coloured form.

58. *Rhizochilus abnormis, Smith. Described by its author as *Fusus*? *abnormis*, and its peculiarities well differentiated (l.c., p. 811). It is also figured. Probably an inhabitant of corals; all the specimens we have seen, however, are alike in form and in the very short aperture. The fine squamose liræ are very characteristic.

59. *Lotorium (Simpulum) Strangei, Ad. & Angas. Two specimens, well-coloured and characteristic.

60. Lotorium clavator, Lam.

61. Lotorium (Epidromus) nitidulum, Sby.

62. Ranella (Apollon) tuberculata, Broderip. Quite typical.

63. *Triforis sculptus, Hinds. The headquarters of this conspicuous species are the Malay Peninsula.

64. Cerithium rubus, Martyn (= C. eximium, Sby.). Extends from Ceylon along the Indian coast.

65. Vertagus attenuatus, Phil., 1848. This species, described subsequently by Adams and Reeve in the "Voy. 'Samarang,'" 1850,

as *V. longicaudatus*, is conspicuous for its elegant form and long canal. Its headquarters are the Philippine Islands.

66. *Vertagus Kochi, Phil. A species of wide distribution, extending from the East African coast to the Malay Archipelago.

67. *Turritella infraconstricta, Smith. Three or four specimens of this distinct form, described in 1878, from Lieut.-Col. Wilmer's collection.

68. Turritella leptomita,[1] n.sp. Pl. XIII, Figs. 12, 12*a*.

T. testa pergracili, attenuata, pallide cinerea, anfractibus 14, apud suturas multum constrictis, tricarinatis, una carina apud medium, duabus inter se proximis juxta supra suturas, anfractu ultimo quadricarinato, undique arctissime et tenuissime obliquiliratis, liris delicatissimis, fimbriatis, carinis anfractus ultimi contiguis, apud basim brunneo-ochraceo suffuso, spiraliter delicate lirato, interstitiis arcte clathratulis, fimbriatis, apertura rotunda, labro simplice. Long. 21·50, lat. 5·50 mm.

A most delicate shell, long, attenuate, slender, of a very pale ash-colour, with brown staining at the base, the whorls thrice keeled (the last whorl being furnished with four carinæ). The whorls are entirely surrounded with very close and delicately fimbriolate raised oblique striæ, the mouth is round, outer lip simple.

69. Littorina Mauritiana, Lam. Another species of wide range, including Mauritius and the Australian and New Zealand coasts.

70. Rissoina (Zebinella) cælata, A. Ad. Probably identical with *R. striata*, Quoy. A large and conspicuous species.

71. Capulus (Thyca) crystallina, Gould. One or two specimens. They are parasitic, mainly on Asteroids.

72. Natica Raynoldianæ, Récluz. This species extends from Ceylon to the Malay Peninsula, and as far east as the Fiji Isles.

73. Natica (Mamilla) Simiæ, Desh. The distribution of this shell is also very wide, it being found in New Zealand.

74. Scalaria alata, Sby.
75. Scalaria similis, Sby. } Both very scanty in material.

76. Obeliscus sulcatus, A. Ad.

77. O. terebellum, Müll.

78. O. teres, A. Ad.

79. Mormula rissoina, A. Ad. A curious species, rissoid in form, with the plait of an *Odostomia*.

80. Daronia subdisjuncta, H. Ad. Pl. XIII, Figs. 1–3. With some hesitation we unite the handsome specimen from the Andamans with this species, of which there is a single small dead specimen in the British Museum from the collection of H. Adams; there

[1] λεπτόμιτος, 'composed of superfine threads.'

being also an unnamed example from the Andaman Islands collected for Lieut.-Col. Wilmer. Our specimen measures, alt. 8 mm., diam. 15 mm., and is clothed with a brown epidermis.

81. Chrysostoma Nicobaricum, Gmel.

82. Liotia varicosa, Lam.

83. Thalotia elongata, Wood. New Caledonia seems to be the headquarters of this species, which evidently possesses a wide area of range.

84. *Forskalia pulcherrima, Sby. Very beautiful, and peculiar to the Andaman Isles. It also occurred in Lieut.-Col. Wilmer's collection.

85. *Clanculus microdon, Ad. On this species vide Mr. E. A. Smith's remarks (l.c.).

86. Monilea callifera, Lam. (= *M. Masoni*, Nevill). A very interesting form.

87. Euchelus alveolatus, Ad. A pretty form, though small.

88. Euchelus edentulus, Ad. In sculpture much resembling the large *E. indicus*, A. Ad.

89. Pecten senatorius, Gm. The headquarters of this species are the Red Sea.

90. Hemicardium unedo, L.

91. Venus (Dione) Philippinarum, Hanley.

92. Lioconcha trimaculata, Lam.

93. Circe pectinata, L.

94. Dosinia juvenis, Chemn.

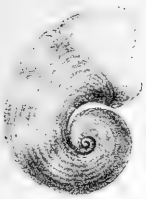
95. Tellina (Tellinella) vulsella, Chemn.

96. Tellina Blainvillei, Rve.

97. Macoma inflata, Sby. The Pelecypoda are very few in number, and none of them call for special remark.

EXPLANATION OF PLATE XIII.

Figs. 1–3. Daronia subdisjuncta, H. Ad.
,, 4, 5. Drillia ochroleuca, n.sp.
,, 6, 7. ,, Booleyi, n.sp.
,, 8. Mitra Mariæ, A. Ad.
,, 9. Imbricaria isomeres, n.sp.
,, 10. ,, Vanikorensis, Reeve.
,, 11. Nassa eucomista, n.sp.
,, 12. Turritella leptomita, n.sp.
,, 12*a*. ,, ,, (sculpture enlarged).
,, 13. Ancilla Booleyi, n.sp.
,, 14. Oliva panniculata, Duclos.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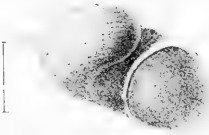
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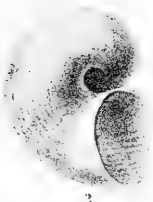
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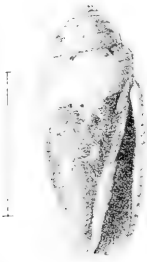
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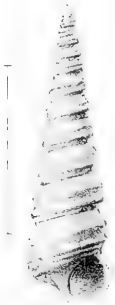
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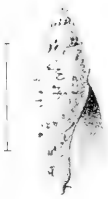
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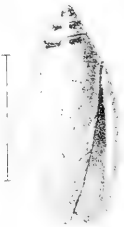
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J. Green del et lith

MOLLUSCA FROM THE ANDAMAN ISLANDS.

NOTES ON THE GENUS *EUPLECTA* OF SEMPER, WITH DESCRIPTIONS OF SUPPOSED NEW SPECIES FROM CEYLON.

By Lieut.-Colonel H. H. Godwin-Austen, F.R.S., etc.

Read 8th January, 1897.

PLATE XIV.

Having had some small Ceylon Helices placed in my hands by Mr. E. R. Sykes, attention has been called to the genus *Euplecta* of Semper.[1] In 1880 Mr. W. T. Blanford[2] referred to Semper's work, pointed out the confusion that inevitably arises from describing two species as the type of a genus, and adopted the one that stood first, viz. *E. subopaca*. There are several marked differences between this and Semper's second species, *E. Layardi*. The jaw of the first has a central projection, while in *E. Layardi* there is none; in the radula the elongate form of the central teeth of the first species is very different to the shorter, blunter form of the second; the number of teeth in each row is as 100 to 140–160 respectively, this being the most striking difference, and pointing to a very dissimilar form of buccal mass, and one in which the radula is broad in comparison to its length. The genitalia of these two species are, however, very much alike: in both there is a short sessile spermatheca, perhaps a more important generic character and one less liable to change than the odontophore, which depends so much on the nature of the food consumed. Mr. W. T. Blanford was the first to examine this genus from an anatomical point of view, when treating of the position of other Indian species unknown at the time to Semper. Taking the form of the animal (which is without shell lobes) and the radula, he placed in *Euplecta* a number of Eastern Himalayan and Assam species, where it is correct they should remain until examination of the internal anatomy, especially the generative organs, should prove them something very different to that which Semper has shown *E. subopaca* to be.

Taking the shell characters, the species now included in the genus may be distinguished by the very well-marked filiform costulation, which in some shells is most regular and strongly developed. Semper's four described species are:—

Euplecta subopaca, Pfr. Ceylon.
—— *Layardi*, Pfr. Ceylon.
—— *rotundata*, Semper. Digollorin.
—— *bicarinata*, Semper. Luzon.

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[1] Reisen im Archipel der Philippinen, iii (1870), p. 14.
[2] Journ. Asiatic Soc. Bengal, vol. xlix, pt. 2 (1880), p. 191.

But he is doubtful concerning the correct generic position of the two last.

Blanford added the following:—

Euplecta pansa, Bs.: Burma.
—— *Sikrigullensis*, Nevill: Behar. [Since found to be a *Macrochlamys*.[1]]
—— *climacterica*, Bs.: Assam Hills.
—— *Austeni*, W. Blf.: Garo Hills. [In my field notes there is no reference to any shell lobes. It is thus described: "Animal of pale colour; head and tentacles very dark; foot rather short, with gland."]
—— *falcata*, W. Blf.: Garo Hills. [According to my notebook: "Animal of a pale orange tint, blending into redder colour near the head; this is brown above, with darkish, rather short tentacles; foot short, with glandular extremity." No shell lobes are alluded to here.]
—— *ornatissima*, Bs.: Sikkim.
? *serrula*, Bs.: Teria Ghat. [Writing from memory, the animal is similar to that of *Austeni* described above.]
?? *anceps*, Gould. [Is a *Macrochlamys*. As noted by Blanford and observed since by myself, the right and left shell lobes are well developed.]
?? *arata*, W. Blf.

Geoffrey Nevill, in his amended Hand List, which he left to me, includes a great many more. These I give here because it is only the combined work of conchologists and malacologists, past and present, placing on record their several views concerning the generic position of given species, and the expenditure of hours of labour devoted to investigation, that will in the end result in placing these forms in some satisfactory grouping. The MS. Hand List mentioned above is the outcome of the last work Nevill was able to do in the Indian Museum, Calcutta: it is, in fact, the catalogue of that collection, and its arrangement as left by him when he came back to Europe on sick leave. Had he lived a very short time longer, this revised catalogue would have been printed, and his views on the classification, especially of the Indian mollusca, published. As will be seen further on, he proposed a new section, founded on shell characters, to embrace a number of Ceylon and Southern Indian species. It is an excellent example of the method on which much of our present classification has been built up; it is as accurate as most of that now accepted, while it is all on the road to being made more so. I do not propose to follow my old friend Geoffrey Nevill and describe and establish this new subgenus; the species he placed in it, however, show how very much has to be learned of their anatomy, before they can be all satisfactorily located: some have already been transferred to other genera.

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[1] Animal figured in L. and F. W. Moll. India, pl. xix, pt. 3, figs. 3, 3*a*, from Stoliczka's set of drawings.

EUPLECTA. (Section I, Nevill MS.)

Euplecta subopaca, Pfr. = *corylus*, Reeve. Ceylon.
—— *partita*, Pfr. = *marcida*, Bs. Ceylon.
—— *subconoidea*, Pfr.
—— n.sp. No. 74, Hand List. Kandy.
—— n.sp. No. 77, Hand List. Kandy.
—— n.sp. No. 78, Hand List. Nuwara Eliya, Ceylon.
—— n.sp. No. 79, Hand List. Darjiling.
—— *pansa*, Bs. Burma.
—— *Sikrigaliensis*, Nevill (*Sikrigallensis*, type error). Near Calcutta and Sikrigali.
? *subkoondaensis*. Nevill MS. Myhendra, Travancore.
? *arata*, Blf. In all probability a *Macrochlamys*. Bhamao.
? *anceps*, Gould. Tenasserim. Is a *Macrochlamys*.
—— *climacterica*, Bs. Teria Ghat.
—— var. *nana*, Bs. = *geiton*, Theob. (Journ. Asiat. Soc. Bengal, 1864, p. 252). Never described. Teria Ghat. (= *vidua* var. *minor*, W. Blf. Same locality.)
—— *vidua*. W. Blf. MS.: Conch. Ind., pl. cxxx, figs. 2 and 3. Khasi Hills, 1870.
—— *vidua*, W. Blf.: Journ. Asiat. Soc. Bengal, 1880. Near Gola Ghat, Assam.
—— var. *convexior*. Nevill MS. Naga Hills.
—— *præmissa*. Nevill MS. Jezpur, Assam.
—— var. *citrius*. G.-A. MS. Naga Hills.
—— *Austeni*, W. Blf. Garo Hills.
—— *ornatissima*, Bs. Base, Darjiling Mountains.
—— *Frauenfeldi*, Zeleb. Nicobars.
—— *serrula*, Bs. Teria Ghat.
—— var. *nana*. Nevill MS. Sylhet. Probably from the "tilas" or low hills near Chatak and not on the Limestone of Teria Ghat.
—— *falcata*, W. Blf. Garo Hills.
—— *bijuga*, Stol. Penang. Is near *anceps*, Gould, which is a *Macrochlamys*.[1]
? *Roepstorffi*, Mörch (*Rotularia*). Nicobars.
? *Massoni*, Behn. (*Rotularia*: type). Nicobars.
? *Reinhardi*, Mörch. Nicobars.
? *semifusca*, Desh. (*Rotularia*). Mauritius.
? *Rodriguezensis*, Crosse (*Rotularia*). Rodriguez.
? *filocincta*, Pfr. Mindanao, Philippines.
? *bifilaris*, Semper. Luzon.

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[1] *M. Pataniensis*, De Morgan, from Perak, is placed in *Euplecta* by Dr. von Möllendorff; it is also allied to *M. anceps*.

(Section II, Nevill MS.)

Euplecta Layardi, Pfr. Ceylon.
—— *phidias*, Pfr. Ceylon.
—— *concavospira*, Pfr. Ceylon.
—— *bifasciata*. Nevill MS. Myhendra, Travancore. Ex Coll., Beddome.
—— *subgranulifera*. Nevill MS. Ditto Ditto
—— *hyphasma*, Pfr. Ceylon.
—— *verrucula*, Pfr. Ceylon.
—— *Emiliana*, Pfr. Ceylon.
—— sp. unnamed. No. 132, Hand List. Ceylon.
? *subdecussata*, Pfr. Madras.
—— *turritella*, H. Adams = *conulus*, H. Adams. Nuwara Eliya, Ceylon.
—— *convexiuscula*, Pfr. Ceylon.
—— *Baconi*, Bs. Benares, Moissaka, and Calcutta.
—— *cingalensis*, Bs. = *Emiliana*, Rv., *non* Pfr. Balapiti, Ceylon.—Note by Nevill: "Animal large and very active, yellow, here and there lightly mottled grey; small lobe above mucous gland, mucous gland indistinct."

Nevill was a conchologist, and had had no training in the study of anatomical details; but from association with Ferdinand Stoliczka and others, he was beginning to recognize the value of the outward form of the animal and the work that Stoliczka had initiated in India, and I owe much myself to this same gifted naturalist. It is quite apparent on what Nevill based his two sections. He was aware, from the paper by Blanford, of the differences between Semper's types *E. subopaca* and *E. Layardi*, and he placed in *Euplecta* proper the more globose, convex-sided shells, proposing the new section for the decidedly keeled ones, many of which partake in this respect of the character of the genus *Sitala*. Further anatomical study of Ceylon shells will solve the question as to the true position of *E. Layardi*, and what species are allied to it.

In one very small Ceylon shell sent me by Mr. Sykes, collected by Mr. H. B. Preston, the dried-up animal remained; and after soaking it well, I was able to make out the form of the foot, and to extract the radula in a complete state, with not a tooth lost. This radula agrees in every way with Semper's figure of that of the typical species *E. subopaca*.[1]

The costulation of the shell is so like that of several of the Ceylon keeled forms that there is every probability of many others belonging to the same generic stock; and I much wish to obtain a good number of species to examine, and so carry on the work Professor Semper so well began. I am glad to say there is every hope of doing this, since Mr. Collett has written to say he is now collecting the animals of all he can find and preserving them in spirits.

[1] Loc. cit., pl. vi, fig. 19.

Among other shells found by Mr. Preston is a *Kaliella* of the *K. Barrackpurensis* group, and a very small globose *Lamprocystis* (?). I also take this opportunity to describe a small Helicoid found by Dr. Leith at Nuwara Eliya, which I believe to be new.

1. Euplecta Prestoni, n.sp. Pl. XIV, Figs. 1–1*e*.

Shell depressedly conoid, keeled, scarcely perforate; sculpture, fine transverse filiform ribbing, each rib having a short white hair at intervals rising from it, giving it a decussate appearance to the unaided eye. There are nine rows of these hairs on the penultimate whorl. The shell is smooth and shining below, but under strong power is found to be crossed by transverse lines. Colour, bright sienna. Spire low; apex blunt; suture moderate, lirate. Whorls five, sides convex, rounded below. Aperture narrowly quadrate, peristome thin; columellar margin oblique, the columella then reflected. Size: maj. diam. 4·8; alt. axis, 2·25 mm. Animal dark-coloured, the pallial groove well seen; mucous gland with a small overhanging lobe.

The radula, which was extracted complete, is very minute, measuring 0·053 mm. long by 0·018 broad, the breadth of the large median teeth being 0·006 wide. The dental formula is—

38 : 1 : 38 *or*
28 : 10 : 1 : 10 : 28

The centre tooth is very long and spear-shaped, with two well-developed cusps low down at the base on either side; the succeeding admedian teeth also have long narrow points with a large cusp on the outer side; the laterals are bicuspid, the innermost being the longest, and they decrease in size towards the outer margin. This agrees with *subopaca* of Semper, but the number of teeth in the row is less. The jaw is rather straight, with a central projection. In *E. climacterica*, the teeth are of the same type, arranged—

\+ ? : 3 : 12 : 1 : 12 : 3 : + ?

the three outer ones being intermediate in form.

It was not to be expected that in such a specimen much could be seen of the generative organs, but what remains agrees with Semper's descriptions. The amatorial organ is long, with a sharp conoid point. The spermatophore is also preserved, and is long, narrow, and gutter-like, with spikelets at intervals along one side of the margin. The hairs of the periostracum are very beautiful objects under the microscope. The filiform rib is seen to have a white thread attached and lying on its upper surface, while the hairs themselves are seen to be formed by loops, as it were, in the thread, drawn up from the rib on which it rests. To put it another way, suppose short lengths of thread be taken, and the outer fourth of each to be drawn out to a fine point and turned up at right angles; if these threads be placed in a line and two fine ends united, hair-like points would be the result.

Hab.—Uda Pussellawa, Ceylon (H. B. Preston).

2. Kaliella Salicensis, n.sp. Pl. XIV, Fig. 3.

Shell perforate, conical; sculpture irregular, coarse, transverse ribbing; periostracum umber-coloured. Spire conic, flat-sided; suture very shallow; whorls 7; sides rather flat. Aperture quadrate, straight below; peristome suboblique; columellar margin reflected. Size: alt. 3, maj. diam. 2·8 mm.

The whorls of this species do not increase in breadth so much as in *K. Barrackpurensis*; the fine, regular, transverse sculpture is absent, rougher irregular ribs taking its place. The base of the Ceylon shell is not so broad, in proportion to the height of the spire, as in the Bengal species.

Hab.—Uda Pussellawa (H. B. Preston).

3. Lamprocystis? Sinhila, n.sp. Pl. XIV, Fig. 2.

Shell globose, solid for its size, scarcely umbilicated; sculpture smooth, with a strong periostracum; colour? (bleached). Spire low, depressedly conic, apex very blunt; suture shallow; whorls 5, closely wound, regularly increasing. Aperture narrowly lunate, vertical; peristome simple; columellar margin suboblique. Size: maj. diam. 3·6; alt. axis 1 mm.

Hab.—Uda Pussellawa, Ceylon (H. B. Preston).

This species very probably belongs to the Zonitidæ, but there is no certainty with regard to these small forms; it is very desirable to procure examples of the animal. It will be a long time before the micro-helices are better known. In some cases they are the young of larger species, but that does not detract from their interest.

4. Lamprocystis? Nuwaraensis, n.sp. Pl. XIV, Fig. 4.

Shell very depressedly globose, rather openly umbilicated; sculpture, very fine longitudinal striation, crossed by irregular lines of growth; colour pale horny-grey. Spire very low; apex flatly rounded; suture well impressed; whorls 5½, sides rounded. Aperture narrowly lunate, vertical; peristome simple. Columellar margin sinuate. Size: major diam. 4; alt. axis 1·9 mm.

Hab.—Nuwara Eliya, Ceylon (Dr. Leith).

This shell, which is a well-marked form, came into my hands by purchase from Mr. Geale, who, I believe, had all Dr. Leith's collection to dispose of.

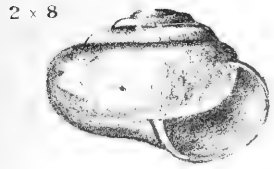
EXPLANATION OF PLATE XIV.

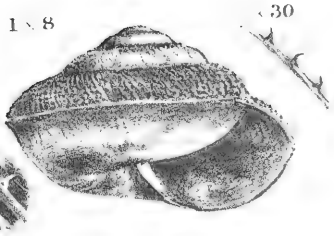
Fig. 1. *Euplecta Prestoni*, n.sp., × 8. Hair of periostracum, × 30 and 58. 1*a*, central teeth of radula; 1*b*, laterals; 1*c*, last on margin; 1*d*, jaw: × 58. 1*e*, part of generative organs, × 12·5.

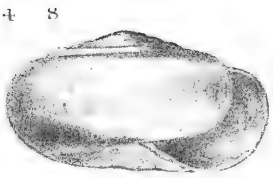
,, 2. *Lamprocystis? Sinhila*, n.sp. × 8.

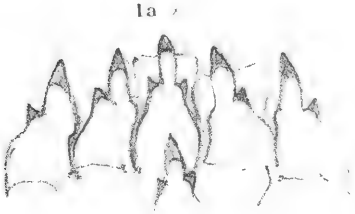
,, 3. *Kaliella Salicensis*, n.sp. × 8.

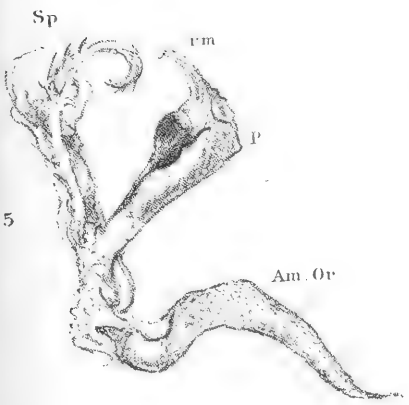
,, 4. *Lamprocystis? Nuwaraensis*, n.sp. × 8.

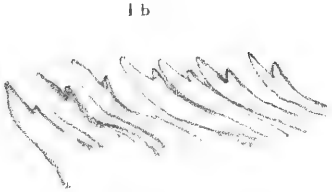


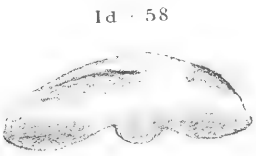










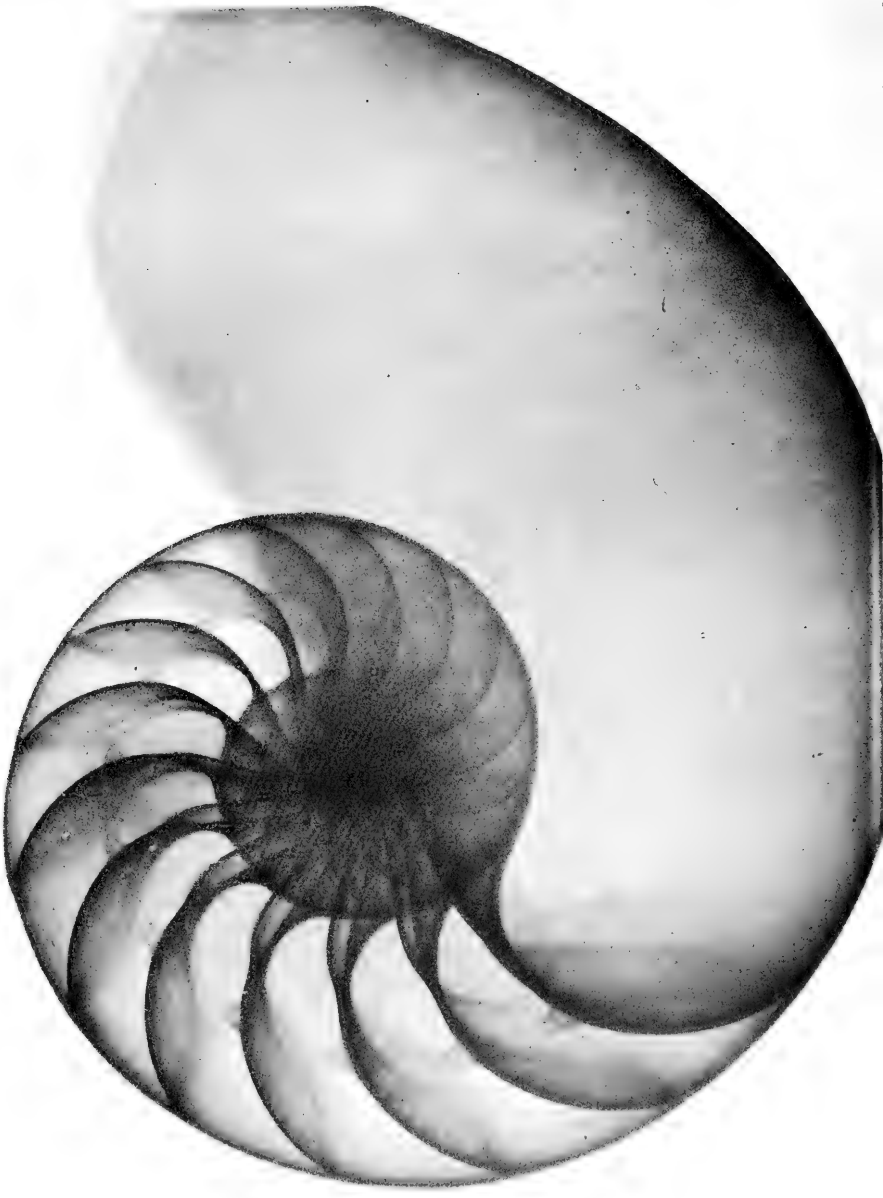


1e
12·5

NEW CEYLON LAND SHELLS.

H. Godwin-Austen. del. et lith.

Maclure & C°. Imp



SKIAGRAPH OF NAUTILUS POMPILIUS.

ORDINARY MEETING.

Friday, 13th November, 1896.

Dr. H. Woodward, F.R.S., etc., Vice-President, in the Chair.

Professor G. Gilson was elected a Member of the Society.

The following papers were read:—

1. "Descriptions of new species of Mollusca belonging to the genera *Lotorium*, *Pecten*, and *Cardium*, from the collection of M. Thomas, of Brest." By G. B. Sowerby, F.L.S., etc.

2. "The Polyplacophora of South Australia." By W. T. Bednall.

3. "Abstract account of the second and third parts of M. Bernard's paper on the Morphology of the Hinge in Pelecypoda." By B. B. Woodward, F.L.S., etc.

Mr. J. Green and Mr. J. H. Gardiner exhibited a series of skiagraphs of Mollusca taken by the Röntgen-rays, which were commented on by Mr. B. B. Woodward.

The examples shown were obtained by means of a Crookes tube (focus pattern), actuated by a powerful induction coil giving 8 in. sparks, and the exposures varied from a few minutes for a large *Clausilia* to a little more than an hour for *Nautilus pompilius*.

In all the Gastropods the columella was distinctly shown up to the very apex, with all twists and plaits on it, the latter being perfectly marked, even through the shelly pillar, as in *Voluta*; the clausium was indicated in *Clausilia*, as well as the various folds, and the notches in the margins of the plates of *Cryptoplax* were rendered visible through the substance of the girdle. A group of shells taken with fragments of calcite and aragonite made it clear, by the opacity of the minerals, even when thinner than the shells and far more transparent to ordinary light, that the passage of the X-rays through the shells must be due to the presence of the organic matter in their substance.

A close inspection of the skiagraphs revealed the fact that they faithfully reflected the different relative thicknesses of the shell substance interposed between the tube and the photographic plate. Hence the external ornamentation is reproduced, and even, as in the case of the *Nautilus* (selected for reproduction here, Pl. XV), the lines of growth; whilst in this instance, too, the varying degrees of solidity of the siphuncle, and the point of attachment of the shell-muscle, are well brought out.

Mr. G. B. Sowerby exhibited specimens of *Pinna saccata*, L., from South Africa; also a specimen of *Voluta Junonia*, Chemn., with its periostracum; and the types of the new species described in his paper.

On behalf of Mr. W. T. Bednall, specimens were exhibited in illustration of his paper.

Mr. E. R. Sykes exhibited various Polyplacophora from South Australia.

ORDINARY MEETING.

Friday, 11th December, 1896.

Mr. E. A. Smith, F.Z.S., etc., Vice-President, in the Chair.

The following were elected to membership of the Society: Charles E. Beecher, W. T. Blanford, F.R.S., etc., Oliver Collett, Alexis Pavlow.

The following communications were read:—

1. "On the discovery of a Recent Species of *Arcoperna*." By Professor R. Tate, F.L.S., etc.

2. "Descriptions of new species of *Endodonta* and *Flammulina* from New Zealand." By R. Murdoch.

3. "Notes on a collection of Marine Shells from the Andaman Islands, with descriptions of new species." By J. Cosmo Melvill, F.L S., etc., and E. R. Sykes, F.Z.S., etc.

Mr. J. Cosmo Melvill exhibited the type of *Cypræa Rashleighana*, Melvill, and also specimens in illustration of his joint paper with Mr. Sykes.

Professor Tate exhibited a specimen of a recent species of *Arcoperna*, for which he proposed the name *A. recens*.

Mr. Sykes exhibited a notebook that had been kept by the Rev. John Revett Sheppard; also specimens of *Nassa Kraussiana*, Dkr., showing the variations in the extinct and recent forms; as well as specimens in illustration of Mr. Murdoch's paper.

ORDINARY MEETING.

Friday, 8th January, 1897.

Prof. G. B. Howes, Sec. L.S., President, in the Chair.

The following were elected to membership of the Society: C. W. Johnson and H. A. Pilsbry.

Mr. W. Crouch and Dr. H. Woodward were appointed to audit the accounts of the Society.

1. "Notes on the genus *Euplecta* of Semper, with descriptions of supposed new species from Ceylon." By Lieut.-Colonel H. H. Godwin-Austen, F.R.S., etc.

2. "Revision of the New Zealand Polyplacophora." By H. Suter.

3. "A note on Nomenclature, with reference to the generic and specific name of the shell usually called *Achatinella lugubris*, Chemn." By E. R. Sykes, F.Z.S., etc.

Mr. H. Fulton exhibited specimens belonging to *Euplecta*, *Coneuplecta*, and allied genera; also *Cochlostyla lividocincta*, Semper, and other species of the genus, from the Philippine Islands.

Mr. Sykes exhibited Polyplacophora in formalin, from South Australia; also *Pholadidea* and various nudibranchs in spirit, from Plymouth; and specimens to illustrate Colonel Godwin-Austen's paper.

ON THE DISCOVERY OF A RECENT SPECIES OF *ARCOPERNA*.

By Ralph Tate,
Professor of Natural History in the University of Adelaide.

Read 11*th December*, 1896.

The genus *Arcoperna* was established by Conrad in 1865 (American Journal of Conchology, vol. i, p. 140) for an Eocene fossil (*A. filosa*) of the Mississippi basin. The definition of the genus is unsatisfactory, whilst its classificatory position is only implied as related to *Modiola*, the author considering *M. radiolata*, Deshayes, of the Parisian Eocene, as congeneric; however, in his "Catalogue of the Eocene Testacea of the United States," op. cit., p. 10, *Arcoperna filosa* is listed in the family Mytilidæ.

The generic name is evidently compounded of *Arca* and *Perna*, the latter being Adanson's name—the equivalent of *Modiola* of Lamarck.

Tryon, in his "Systematic Conchology," vol. iii, p. 264 (1884), places the genus next to *Modiolaria* in the subfamily Crenellinæ, and, for differential characters, relies upon the well-marked and comparatively large anterior adductor scar and the fine radiating striation. The former character seems to me to be valueless for generic diagnosis.

Cossmann (Cat. ill. Coq. foss. Eocene Paris, p. 161, 1887) redefines the genus, places it in juxtaposition to *Modiolaria*, and refers to it seven species and a doubtful eighth, which had previously been described by Deshayes and others under *Modiola*; one of these occurs also in the Hampshire basin, whilst an additional species is indicated in the Eocene of Belgium.

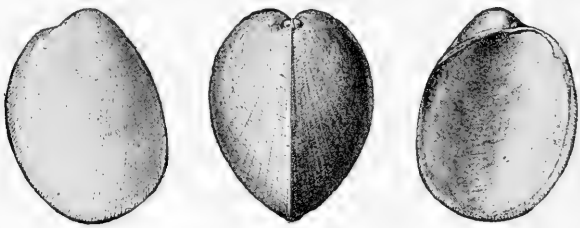
The receipt of recent specimens of a species of *Arcoperna* from Mr. May, dredged off the east coast of Tasmania, came to me as a great surprise, and it is only after confirmation of my determination by my friend M. Cossmann that I venture to make this announcement of a living species of a genus, hitherto only known as belonging to the Eocene of the Mississippi, Paris, Belgium, and Hampshire basins. A re-examination of the *Modiolaria*-like shells occurring in the Tertiaries of Australia has resulted in the reference of an undescribed species from the Eocene of the River Murray cliffs in South Australia to *Arcoperna*, but so far the wide hiatus, which separates the recent and fossil species, remains uncontracted.

Arcoperna, as known in a fossil state, may be briefly described as a *Modiolaria* with continuous radial ornamentation, not interrupted by a wide mesial, non-radiated area as in that genus. The living examples, however, furnish additional differential characters, namely, the vitreous lustre of the interior (although in dead shells a thin nacre is present, probably the result of disintegration) and the absence of a distinct periostracum.

ARCOPERNA RECENS, n.sp.

Shell thin, translucent, vitreous; obliquely oval, much inflated; rounded at the extremities, much more dilated behind than in front. Umbones very large, obliquely inclined forwards, cordiform and submarginal. Posterior hinge-line arched, six millimetres long, with a well-defined subinternal ligamental groove; anterior hinge-line nearly straight, about one-third the length of the posterior part.

Exterior surface ornamented with concentric folds and intervening striæ, and by radial costules; the intercrossing of the two sets of



Arcoperna recens, n.sp.

threads producing a fine recticulate ornament. The radial costules are subacute, serrated by the concentric striæ, and are a little wider than the intervening sulci; in the medial part of the ventral margin there are five costules to each millimetre of width; the costules sharply serrate the margin.

The adductor impressions are indicated by greater translucency of the test; the posterior one is large and rounded; the anterior one is smaller, but conspicuous, narrow-oblong, and situated close under the anterior margin of the hinge-line.

Dimensions.— Transverse diameter of closed valves, 15 mm.; umbo-post-ventral diameter, 19 mm.; antero-posterior diameter, 17 mm.; umbo-ventral diameter, 14 mm.

Locality.—Port Esperance, Tasmania; two perfect shells (one with contained animal) and a single valve dredged by Mrs. Harrison. My collection and that of Mrs. May.

Affinities.—In point of size the recent species approximates to *A. filosa*, but that shell, judging from Conrad's figure of it, has more projecting umbones and a different outline. *A. recens* finds a near relation in *A. radiolata*, Deshayes, but it differs in shape and in its finer ornamentation.

REVISION OF THE NEW ZEALAND POLYPLACOPHORA.

By Henry Suter, Christchurch, New Zealand.

Read 8th January, 1897.

Ever since the publication of Mr. H. A. Pilsbry's Monograph on the Polyplacophora, the collecting and studying of Chitons have been my special hobby. I have been fortunate enough to collect in different parts of New Zealand, and thus have brought together a good number of specimens. Other circumstances have also been favourable to the investigation of our Chitons. In 1894–5 Mr. T. F. Cheeseman, Curator of the Auckland Museum, commissioned me to rearrange the collections of shells, fossils, etc., in the Museum, and I had, of course, a good opportunity to collect and study the Chitons of the Auckland province. In December, 1895, I availed myself of a kind invitation from Mr. A. Hamilton, Registrar of the Otago University, Dunedin, and spent several weeks in the examination of his large conchological collection, and he kindly presented me with specimens, amongst which were some Chitons of special interest. Professor T. J. Parker, Curator of the Otago Museum, was good enough to send me all the New Zealand Polyplacophora in the Museum for investigation; Sir James Hector, Director of the Colonial Museum, Wellington, with great liberality lent me some of the type-specimens mentioned in Captain Hutton's paper on the New Zealand Chitonidæ (Trans. New Zealand Inst., vol. iv); and last, but not least, Captain F. W. Hutton, Curator of the Canterbury Museum, has always kindly allowed me to examine specimens in the Museum, and has greatly helped me in my studies with his large store of knowledge and experience. I wish here to express my gratitude to all these gentlemen for the help accorded me in this special work.

I must also say that this revision of the New Zealand Chitons would almost have been an impossibility without the elaborate monograph of Mr. H. A. Pilsbry. The identification of several of our Chitons, however, was not quite satisfactory, the occurrence of certain species in New Zealand waters was doubtful, and so on.

I hope that I have succeeded in this short paper in clearing up some of the dubious points, and in giving a reliable list.

Captain Hutton's list of the New Zealand Chitonidæ, published in 1872 (Trans. New Zealand Inst., vol. iv), contains twenty-one species, of which, however, one is a synonym and three are questionable for New Zealand. E. von Martens, in his "Critical List of the Mollusca of New Zealand" (1873), enumerates seventeen species; and Captain Hutton, in the "Manual of the New Zealand Mollusca," brings the list up to twenty-eight species, six of which, however, have to be omitted as being synonyms or doubtful for our colony.

The present list includes ten genera, with twenty-nine species, all of which I have seen, except *Plaxiphora obtecta*, *P. superba*, and *Spongiochiton productus*.

LEPIDOPLEURUS, Risso, 1826.

1. Lepidopleurus inquinatus (Reeve).

Chiton inquinatus, Reeve: Conch. Icon., t. xxiii, fig. 154 (May, 1847).
Ischnochiton inquinatus (Reeve): Pilsbry, Man. Conch., ser. I, vol. xiv, p. 90, pl. xviii, figs. 49, 50.

When collecting in Auckland Harbour, I found a number of examples of this little Chiton on the under-side of stones on a mudflat at low-water. Specimens were also in the Museum, labelled *Chiton sulcatus*, Quoy & Gaim. On examination I found it to be a *Lepidopleurus*, and thinking it to be a new species, I sent in May, 1895, a number of specimens in alcohol to Mr. H. A. Pilsbry, for further investigation. In January, 1896, Pilsbry published a note (Nautilus, vol. ix, p. 108) on this species, saying that it had been identified by Mr. E. R. Sykes as Reeve's *Chiton inquinatus* on comparing it with the type in the British Museum. Mr. E. R. Sykes also published a note on the species in our "Proceedings" (antea, p. 86).

Hab.—Auckland Harbour (H. S.); Brighton, Otago (A. Hamilton).

The species has also been found in Tasmania (Reeve's type), South Australia (Bednall), and Port Phillip, Victoria (Wilson).

CALLOCHITON, Gray, 1847.

Key to Species.

A. Entire surface delicately shagreened.	*platessa*.
B. Central areas with elevated, separate threads, parallel to jugum.	*illuminatus*.
C. A row of deep longitudinal pits in front of lateral areas.	*empleurus*.

2. Callochiton platessa (Gould).

Chiton platessa, Gould: Proc. Bost. Soc. Nat. Hist., vol. ii, p. 143 (1846); U.S. Expl. Exp., p. 320, atlas, figs. 434, 434*a*; Otia, p. 4.
Lepidopleura platessa, Gould: Otia (Rectifications), 1862, p. 242.
Callochiton platessa, Gould: Haddon, "Challenger" Report, p. 15; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 49, pl. x, figs. 1–5; Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, p. 71.
Chiton crocinus, Reeve: Conch. Icon., t. xxii, fig. 146 (1847).
Callochiton crocinus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 50, pl. x, fig. 7; vol. xv, p. 67.
Chiton versicolor, A. Adams: Proc. Zool. Soc., 1852, p. 92, pl. xvi, fig. 5.
Leptochiton versicolor, A. Adams: Angas, Proc. Zool. Soc., 1867, p. 223.
Lepidopleurus empleurus, Hutton: Sykes, Proc. Mal. Soc. London, vol. ii, p. 86, *pars*.

At the end of the description of his *Chiton empleurus*, Captain Hutton says: "Founded on two specimens in the Colonial Museum, locality not stated." Sir James Hector having kindly placed most of Captain

Hutton's types at my disposal, I found that on the glass tablet labelled "*Chiton empleurus*" there were not only two specimens, but also two species. One of them is Hutton's *C. empleurus*, but the larger specimen I found to correspond exactly with specimens of *C. platessa*, from Port Jackson, kindly given me by Dr. J. Cox. There is no doubt that both specimens were obtained from the same locality, and as *C. empleurus*, known only from the unique type-specimen, is very likely a New Zealand species, I include *C. platessa* in the New Zealand fauna, although it has not been found again by recent collectors. Captain Hutton told me that Captain Fairchild dredged largely, especially in Cook Strait, and that these specimens may have been obtained by him and presented to the Colonial Museum.

3. Callochiton illuminatus (Reeve).

Chiton illuminatus, Reeve: Conch. Icon., t. xxii, fig. 147 (1847).
Chiton (*Callochiton*) *illuminatus*, Reeve: E. A. Smith, Proc. Zool. Soc., 1881, p. 35.
Lepidopleurus illuminatus, Reeve: Rochebrune, Miss. Scient. Cape Horn, p. 141.
Callochiton illuminatus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 51, pl. ix, figs. 92–4.

A small specimen is in the Canterbury Museum, and was kindly submitted to me for examination by Captain Hutton. Since there is only one specimen I was not allowed to separate the valves; but, so far as examination was possible, I found it to agree perfectly with the description and figures of *Callochiton illuminatus* in Pilsbry's Man. Conch. The colour is not red, but greenish-grey; however, the same variability in colour is met with in *Chiton canaliculatus* and others. Central areas with eight separate threads on each side; end valves and lateral areas minutely granulose; median valves with one slit. Girdle-scales those characteristic of the genus, rather large. Interior greyish-white; sinus shallow. Length about 10, breadth 7 mm.; divergence 120°.

Hab.—Dredged off Kapiti Island, Cook Strait.

This is a most interesting addition to the fauna of New Zealand.

4. Callochiton empleurus (Hutton).

Chiton empleurus, Hutton: Trans. New Zealand Inst., vol. iv, p. 178 (1872).
Lepidopleurus empleurus, Hutton: Man. New Zealand Moll., 1880, p. 113.
Callochiton crocinus, Reeve: Pilsbry, Man. Conch., ser. I, vol. xv, p. 67.

The elongated form and the deep longitudinal pits along the anterior edge of the lateral areas, distinguish this species at once from *C. platessa*, with which it has been supposed to be identical. In Hutton's diagnosis the word "sometimes," that precedes "with a row of deep pits, etc.," must be struck out. There are 9–10 pits on

each side. *C. empleurus* seems somewhat to approach *Ischnochiton* (or *Callochiton*?) *puniceus*, Couth., which latter, however, I have not seen. I have nothing to add to Hutton's description, because the type-specimen could not be taken to pieces, and the classification of the species rests only on the character of the girdle-scales, which are very similar to those of *C. platessa*.

Hab. — Unknown; but, as already mentioned, most likely Cook Strait.

ISCHNOCHITON, Gray, 1847.

Key to Species.

Scales of girdle faintly striated, mingled with non-striated scales.	*longicymba*.
All scales of girdle deeply grooved, 3–4 grooves on a scale.	*Parkeri*.

5. Ischnochiton longicymba (Quoy & Gaimard).

? *Chiton longicymba*, Blainville: Dict. Sci. Nat., vol. xxxvi, p. 542.
Chiton longicymba, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 390, t. lxxv, figs. 1–18; Reeve, Conch. Icon., t. xix, fig. 125; t. xxiv, fig. 163*d*.
Lepidopleurus longicymba, Blainville: Angas, Proc. Zool. Soc., 1867, p. 222.
Chiton (*Lepidopleurus*) *longicymbus*, Blainville: Hutton, Trans. New Zealand Inst., vol. iv, p. 178.
Lepidopleurus longicymbus, Blainville: Hutton, Man. New Zealand Moll., p. 113.
Ischnochiton longicymba, Quoy & Gaim: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 87, pl. xxii, figs. 58–66.

The colour of this species seems to be even more variable than that of *Ischnochiton crispus*, from Tasmania and Australia. In the South the variation is less considerable, and large specimens are rare. Examples in the Otago Museum from Auckland Islands and Campbell Island are whitish, from Dunedin blackish.

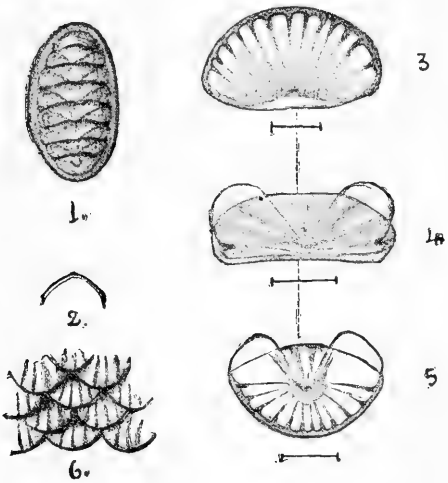
Hab.—The whole of New Zealand, but more abundant in the North.

6. Ischnochiton Parkeri, n.sp.

Lepidopleurus circumvallatus, Reeve: Hutton, Man. New Zealand Moll., p. 113 (*non* Reeve).

Shell oblong, highly and angularly arched. Colour very variable, from horny-yellow to chestnut-brown, mostly darker on the posterior margin of the valves, with more or less predominant black longitudinal stripes, assuming often a triangular shape, closer together or coalescing towards the girdle; the jugum with only a few or without black markings. Lateral areas distinct, raised, minutely granulated, and with three to four concentric, flat, impressed ridges, which are sometimes crossed by faint radiating riblets, their number being from 8–10.

Central area closely and finely quincuncially granulate, the anteriorly divergent rows predominating. End valves minutely decussate, with two concentric ridges, which are rendered granulose by numerous radiate riblets. Mucro of tail valve central, low, and obtuse, posterior slope slightly concave. Girdle of the same colour as the jugum, covered densely with small imbricating scales, all of about the same size; they are flatly convex and deeply grooved, 3–4 grooves on each. The margin of girdle beset with a fringe of minute spicules. Interior blue. Anterior valve with 11–13, central 1, posterior 12–13 slits; the teeth are sharp and smooth. The posterior margin of intermediate valves slightly beaked and denticulate; posterior tooth short, as in *Ischnochiton longicymba*. Eaves solid. Sinus broad, flat, smooth, channelled on each side on the inner surface of the sutural plates. Length 21, breadth 12 mm.; divergence 120°.



Ischnochiton Parkeri, n.sp.

1. Dorsal view of shell, nat. size.
2. Posterior view of central valve, nat. size.
3–5. Anterior, median, and posterior valves, enlarged.
6. Portion of girdle, magnified.

Hab.—Auckland Islands; Campbell Island.

Type in the Otago University Museum. Described from spirit specimens kindly sent me by Professor T. J. Parker, F.R.S., Dunedin, and I have much pleasure in associating his name with the species.

Specimens from Campbell Island, also in the Otago Museum, are of a light-brown colour, and were mistaken for *C. circumvallatus*, Reeve.

This species *may* be *Lepidopleurus melanterus*, Rochcb., one of the many insufficiently described species.

PLAXIPHORA, Gray, 1847.

Key to Species.

a. Valves exposed.
  b. Posterior valve not greatly reduced in size or altered in form.
    c. Central areas unsculptured save for growth-lines.
      d. Sutural pores or tufts distinctly developed.
        e. Lateral areas with subobsolete radiating riblets. *superba*.
        ee. Lateral areas with at least two distinct radiate ribs. *subatrata*.
      dd. Sutural pores absent, girdle densely covered with bristles. *Suteri*.
    cc. Central areas sculptured, at least at the sides.
      d. Large. Sutural pores with bifurcating bristles; girdle broad, reddish. *biramosa*.
      dd. Small. Sutural pores with more than two bristles; girdle narrow, white or white and black. *cælata*.
  bb. Posterior valve reduced to a narrow crescentic form, strongly arched upward. *ovata*.
aa. Valves partially immersed in the girdle, which encroaches at the sutures. *obtecta*.

7. Plaxiphora biramosa (Quoy & Gaimard).

Chiton biramosus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 378, t. lxxiv, figs 12–16.

Acanthochætes biramosus, Quoy & Gaim.: Hutton, Trans. New Zealand Inst., vol. iv, p. 181.

Plaxiphora biramosa, Quoy & Gaim.: Hutton, Man. New Zealand Moll., p. 116; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 319, pl. lxviii, figs. 51–4.

Young specimens I always found to be sculptured like *P. cælata*, only more grotesquely, but in adult specimens the sculpturing is generally more or less effaced. Sometimes there is a beautiful ornamentation with green, pink, white, and red-brown, but as a rule the valves are covered with coralline growth and seaweeds, which render it very difficult to distinguish the animals from their surroundings. The colour of the girdle varies very much with age; in young specimens it is sometimes of a dirty orange, whilst in adult forms it is dark red-brown. A feature that has hitherto been overlooked is the notch at the posterior end of the girdle; this, however, is not always very distinct. In some young shells I found it to be deep and broad, but in adult specimens mostly reduced to a more or less deep slit. I have met with a specimen measuring 60 by 40 mm., divergence 150°.

Hab.—Wellington (Otago Museum); near Lyttelton (H. S.).

P. biramosa is one of the very rare New Zealand species. The specimen in the Otago Museum from Campbell Island, labelled *P. biramosa*, is not that species, but *P. subatrata*.

8. Plaxiphora superba, Pilsbry.

Plaxiphora superba, Cpr. MS.: Pilsbry, Man. Conch., ser. I, vol. xiv (1893), p. 319, pl. lxviii, figs. 55–61.

I have not seen this species, but cannot share Mr. Pilsbry's opinion that it is identical with *P. biramosa*. The shape of the valves and sutural laminæ is very different; the divergence is only 110°, whilst it is 150° in *P. biramosa*. It is no doubt nearer *P. subatrata*, though specifically distinct from that also.

9. Plaxiphora cælata (Reeve).

Chiton cælatus, Reeve: Conch. Icon., t. xvii (1847), fig. 101.
Acanthopleura cælatus, Reeve: Hutton, Man. New Zealand Moll., p. 115.
Plaxiphora cælata, Reeve: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 328, pl. lviii, figs. 21, 22.
Tonicia ziczac, Hutton: Trans. New Zealand Inst., vol. iv (1872), p. 180; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 328.
Chiton (*Plaxiphora*) *terminalis* (Cpr. MS.), Smith: Voy. "Erebus" and "Terror," Moll. (1874), p. 4, t. i, fig. 13.
Plaxiphora terminalis, Smith: Hutton, Man. New Zealand Moll., p. 116; (Cpr.) Smith, Pilsbry, Man. Conch., ser. I, vol. xiv, p. 326, pl. li, fig. 14.

I have collected a fair number of this species, and on examining them carefully have come to the conclusion that Smith's *Chiton terminalis* is identical with Reeve's *C. cælatus*. I have two specimens "ornamented with green and pink," but in all other respects they agree with the very good description and figure given by Smith for *Plaxiphora terminalis*. With regard to Hutton's *Tonicia ziczac*, there is no possibility of examining the type, which is lost, but on reading his description one is forced to the conclusion that it, too, cannot be anything but *Plaxiphora cælata*. Moreover, Captain Hutton himself made his *Tonicia ziczac* a synonym of the latter in his Man. New Zealand Moll. In Von Martens's Critical List I cannot find any mention that *T. ziczac* is a synonym of *P. cælata*, as stated by Pilsbry (Man. Conch., ser. I, vol. xiv, p. 328).

In his paper on the Polyplacophora from Port Phillip, Mr. E. R. Sykes places *Plaxiphora terminalis* in the synonymy of *P. petholata* (antea, p. 90). There is no doubt that the two species show very much the same sculpture, but, omitting minor differences, I would point out that the girdle of *P. cælata* (= *terminalis*) has very distinct sutural pores with long horny bristles, which are not at all numerous, and the colour of the girdle is usually white, banded with black. The girdle of *P. petholata*, on the other hand, is dark-brown, and it is densely covered with corneous, or dark-brown bristles, not arranged in series or sutural pores. *P. cælata* is a much more elongated form, and very seldom attains such a large size as *P. petholata*.[1]

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[1] [Mr. Suter has very kindly sent me fresh specimens of *P. cælata*, and I am very glad to have the opportunity of correcting the error into which I fell. The three names for the Australian shells appear to belong to one species, *P. petholata*, and the three names for the New Zealand shells to another, *P. cælata*.—E. R. Sykes.]

We find the sculpture of the valves in *P. biramosa*, *P. cælata*, *P. ovata*, and *P. petholata* to be almost identical.

Hab.—From Auckland to the Bluff, but nowhere common.

10. Plaxiphora Suteri, Pilsbry.

Plaxiphora Suteri, Pilsbry: Nautilus, vol. viii (1894), p. 8.
Mopalia ciliata, Sowerby: Hutton, Man. New Zealand Moll., p. 116 (*non* Sowerby).

This handsome Chiton is in size and form not unlike *P. glauca*, Quoy & Gaim., and is only found in exposed situations on rocks, the valves mostly covered with calcareous growth. Young specimens are sometimes found on *Mytilus latus*.

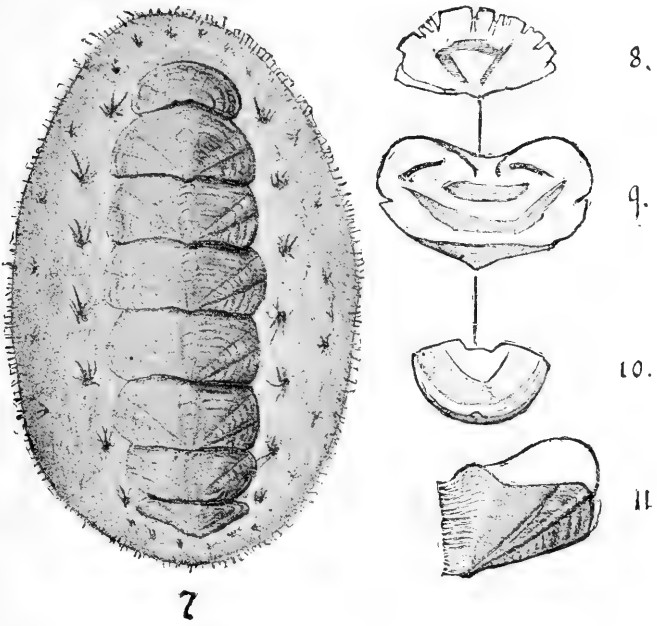
Hab.—From Manukan Harbour to Foveaux Strait; rather rare.

11. Plaxiphora subatrata (Pilsbry).

Tonicia atrata, Sowerby: Hutton, Man. New Zealand Moll., p. 114 (*non* Sowerby).
Tonicia subatrata, Pilsbry: Man. Conch., ser. I, vol. xiv (1893), p. 201.

Shell large, oval, moderately elevated; side slopes slightly arched; ridge rounded. Colour reddish-brown, dirty pink at the jugum. The head valve strongly concentrically ridged, and with eight radiate ribs, which, however, sometimes become obsolete. Central valves beaked anteriorly and posteriorly; the anterior beak is rather prominent, rounded, the posterior one pointed, forming an angle of about 120°, and is formed by the outer layer only. The whole surface of the median valves is strongly concentrically striated, following the outline of the anterior beak over the jugum. Lateral areas distinct, raised, with two ribs, which are sometimes flatly nodulous, owing to their being crossed by concentric lines; in some specimens the diagonal ribs are only very faint, or disappear altogether; on the other hand, their number may increase to four, but the anterior and slit-rib are always the more prominent. Posterior valve small, depressed, concentrically ridged, slightly beaked anteriorly; mucro inconspicuous, terminal. Interior white, tinged with light-blue. Sinus shallow, rounded. Sutural laminæ rather broadly rounded. Insertion plates low. Anterior valve with eight irregularly distributed slits; teeth sharp, striated on the outer side; the whole of the interior light-blue. Intermediate valves with one slit on each side; posterior tooth broad; a strong light-blue callosity extends between the two anterior teeth. Posterior valve with the insertion plate thick, rounded, without slits, a small sinus in the middle behind. In all valves the eaves are very narrow and spongy. Girdle wide, narrower at both ends, leathery, tan-colour, dark brown when dry; at each suture a pore with long corneous bristles, six in a tuft, and alternating with these pores a second row of smaller ones is situated near the margin. In front of head and tail valve six smaller pores with short bristles. The margin beset with horny bristles of varying size. Length 75, breadth 45 mm.; divergence 125° (spirit specimen).

A specimen from Campbell Island, belonging undoubtedly to the same species, is of olive-brown colour, the jugum horny-yellow. The anterior valve has well-pronounced radiating riblets, the concentric lines on all the valves are less distinct, and the posterior beak on the central valves is almost obsolete. The ribs on the lateral area of the intermediate valves do not run down to the margin, but are intercepted by a broad, smooth, concentric band, extending along the sides and anterior part of the valves. The valves are more depressed, divergence 135°.



Plaxiphora subatrata, Pilsbry.

7. Nat. size, from spirit specimen.
8–10. Ventral view of anterior, median, and posterior valves.
11. Portion of dorsal surface of fourth valve.

Hab.—Macquarie Island (A. Hamilton); Campbell Island.

The Macquarie Island specimens are mostly covered by a thick, white coralline growth, the Campbell Island specimen with Polyzoa.

The specimen from which the figure is drawn is in the Otago Museum; the valves are from specimens kindly given to me by Mr. A. Hamilton.

This *may* be the *Plaxiphora Campbelli*, Filhol (Compt. Rend., xci, 1880, p. 1095; Pilsbry, Man. Conch., ser. I, vol. xv, p. 107).

12. Plaxiphora (Guildingia) obtecta, Pilsbry.

Plaxiphora obtecta (Cpr.), Pilsbry: Man. Conch., ser. I, vol. xiv (1893), p. 330.

I have not seen this very interesting species, which is not in any of our Museums.

13. Plaxiphora (Fremblya) ovata (Hutton).

Acanthochætes ovatus, Hutton: Trans. New Zealand Inst., vol. iv, p. 182 (1872).

Acanthochites ovatus, Hutton: Man New Zealand Moll., p. 117.

Plaxiphora ovata, Hutton: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 332, pl. liv, figs. 34–40.

Hab.—This handsome but rare mollusc is found mostly in roots of *Durvillæa*. Type in the Colonial Museum, Wellington.

SPONGIOCHITON, Carpenter, 1873.

14. Spongiochiton productus, Pilsbry.

Spongiochiton productus (Cpr. MS.), Pilsbry: Man. Conch., ser. I, vol. xiv (1892), p. 26.

I have not seen this species.

ACANTHOCHITES, Risso, 1826.

Key to Species.

a.	Anterior valve without radiating ribs; not obviously lobed around the lower edge of tegmentum.	
b.	Tail valve with one slit on each side; girdle covered with spicules and having well-developed tufts.	*Zelandicus*.
bb.	Tail valve with several slits; girdle naked, leathery, covering the valves except for a linear band at the ridge; small tufts on tubercles.	*porosus*.
aa.	Anterior valve having five radiating ribs, its lower margin 5-lobed. Girdle with eighteen small pore tufts.	
b.	Girdle leathery, naked, except tufts.	*violaceus*.
bb.	Girdle covered with white spicules, especially at the margin.	*costatus*.

15. Acanthochites Zelandicus (Quoy & Gaimard).

Chiton Zelandicus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 400, t. lxxiii, figs. 5–8; Reeve, Conch. Icon., t. xi, fig. 58.

Acanthochites Zealandicus, Quoy & Gaim.: Hutton, Man. New Zealand Moll., p. 117.

Acanthochites Zelandicus, Quoy & Gaim.: Pilsbry, Man. Conch., ser. I, vol. xv, p. 16, pl. xiv, figs. 9, 10.

Acanthochætes Hookeri, Gray: Dieffenbach's "Travels in New Zealand," vol. ii (1843), p. 262; Hutton, Trans. New Zealand Inst., vol. iv, p. 182.

Hab.—Found almost everywhere along the coasts of New Zealand with *Chiton pellis-serpentis*. Very variable in colour of mantle and tufts. I found the largest specimens in Dunedin Harbour.

16. Acanthochites (Cryptoconchus) porosus (Burrow).

Chiton porosus, Burrow: Elements of Conchology (1815), p. 189, pl. xxviii, fig. 1.
Cryptoconchus porosus, Burrow: H. & A. Adams, Genera Rec. Moll., vol. iii, t. lv, fig. 4; Chenu, Manuel de Conch., vol. i, fig. 2884; Hutton, Man. New Zealand Moll., p. 118.
Acanthochites porosus, Burrow: Pilsbry, Man. Conch., ser. I, vol. xv, p. 36, pl. iii, figs. 57–62.
Chiton Leachi, Blainville: Dict. Sci. Nat., vol. xxxvi (1825), p. 554.
Chiton monticularis, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 406, t. lxxiii, figs. 30–5; Sowerby, Conch. Illust., fig. 129; Reeve, Conch. Icon., t. x, fig. 57.
Chitonellus Zelandicus, Gray: Dieffenbach's "Travels in New Zealand," vol. ii (1843), p. 246.
Cryptoconchus Zelandicus, Quoy & Gaim.: Hutton, Trans. New Zealand Inst., vol. iv, p. 183 (*non* Quoy & Gaim.).
? *Cryptoplax depressus*, Blainville: Dict. Sci. Nat., vol. xii (1818), p. 124.
? *Cryptoconchus Stewartianus*, Rocheb.: Bull. Soc. Philom. Paris, sér. VII, tom. vi, 1882, p. 194.

Hab.—From Auckland to Stewart Island, on rocks in sheltered situations. Not common.

The mantle sometimes beautifully variegated with orange and light-brown.

17. Acanthochites (Loboplax) violaceus (Quoy & Gaimard).

Chiton violaceus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 403, t. lxxiii, figs. 15–20; Gould, U.S. Explor. Exped. Moll., p. 331, fig. 420 (*non* Reeve, Conch. Icon., fig. 41).
Acanthochætes violaceus, Quoy & Gaim.: Gray, Dieffenbach's "Travels in New Zealand," vol. ii, p. 246.
Katharina violacea, Quoy & Gaim.: Hutton, Trans. New Zealand Inst., vol. iv, p. 182.
Acanthochites violacea, Quoy & Gaim.: Hutton, Man. New Zealand Moll., p. 118.
Acanthochites violaceus, Quoy & Gaim.: Pilsbry, Man. Conch., ser. I, vol. xv, p. 39, pl. iii, figs. 67–73.
Chiton porphyreticus, Reeve: Conch. Icon. (1847), t. x, fig. 56.
Acanthochites porphyreticus, Reeve: Hutton, Man. New Zealand Moll., p. 117.
Phacellopleura porphyretica, Carpenter MS.

Hab.—North and South Islands of New Zealand, but very rare in the South.

18. Acanthochites (Loboplax) costatus, Adams & Angas.

Acanthochites costatus, Ad. & Ang.: Proc. Zool. Soc., 1864, p. 194; Angas, op. cit., 1867, p. 224.

Macandrellus costatus, Ad. & Ang.: Dall, Proc. U.S. Nat. Mus, vol. i, p. 299, pl. iv, fig. 40 (dentition).

Chiton (*Macandrellus*) *costatus*, Ad. & Ang.: Smith, Zool. Coll. "Alert," p. 83, t. vi, fig. *F*.

Acanthochites costatus, Ad. & Ang.: Pilsbry, Man. Conch., ser. I, vol. xv, p. 40, pl. iii, fig. 74.

Tonicia rubiginosa (Swainson), Hutton: Trans. New Zealand Inst., vol. iv (1872), p. 180; Man. New Zealand Moll., p. 114; Pilsbry, Man. Conch., ser. I, vol. xv, p. 107.

On examining Hutton's type-specimen of *Tonicia rubiginosa*, which is in the Colonial Museum, Wellington, I found it to agree with the description of *A. costatus*, and two specimens I have, which were dredged in Foveaux Straits, also belong to the same species. The specimen in the Colonial Museum has lost its colour entirely, but of my specimens one is yellowish-pink, and the other, a young shell, is most beautifully ornamented with pink, white, light-brown, and blue. The dimensions of Hutton's type-specimen are: length 11, breadth 5 mm.

Hab.—The species has hitherto been found in Cook Strait and Foveaux Strait. In the latter locality it is found with *Chiton canaliculatus*. Very rare.

CHITON, Linné, 1758.

Key to Species.

a. Central areas having longitudinal riblets.	
b. Sides and ridge of central areas both sculptured.	
c. Lateral areas with numerous slightly crenulated threads.	
d. Intermediate valves carinated, divergence 120°.	*Quoyi*.
dd. Intermediate valves arched, divergence 100°.	*æreus*.
cc. Lateral areas with three or four rows of distinct tubercles.	*pellis-serpentis*.
bb. Central areas with a smooth band or triangle on ridge of each valve.	
c. Lateral areas with 4–6, pleura 16 or more, granose riblets.	*canaliculatus*.
cc. Lateral areas with 2–4, pleura 8–14, nodulose riblets.	
d. Girdle-scales mucronated.	*limans*.
dd. Girdle-scales not mucronated.	*Stangeri*.
aa. Central areas smooth, no longitudinal ribs.	*Sinclairi*.

19. Chiton Quoyi, Deshayes.

Chiton viridis, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 383, t. lxxiv, figs. 23–8 (*non Chiton viridis*, Spengler).

Chiton Quoyi, Deshayes in Lamarck, Anim. sans Vert., vol. vii (1836), p. 509; Reeve, Conch. Icon., t. xiii, fig. 68; Hutton, Trans. New Zealand Inst., vol. iv, p. 177; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 172, pl. xxxvii, figs. 6–8.

? *Chiton glaucus*, Gray: Spic. Zool., pt. i (1828), p. 5.
Chiton glaucus, Gray: Hutton, Man. New Zealand Moll., p. 112.
? *Lophyrus glaucus*, Gray: Angas, Proc. Zool. Soc., 1867, p. 222.

Hab.—Common everywhere. In the South mostly uniformly dark olive-green, sometimes brown.

20. Chiton æreus (Reeve).

Chiton æreus, Reeve: Conch. Icon. (1847), t. vii, fig. 36.
Chiton (*Leptochiton*) *æreus*, Reeve: Smith, Voy. "Erebus" and "Terror," Moll., p. 4., t. i, fig. 9.
Chiton æreus, Reeve: Hutton, Man. New Zealand Moll., p. 112; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 179, pl. xxxvi, figs. 96–7.
Chiton siculoides, Carpenter MS.

Carpenter's notes on the species, reproduced by Pilsbry, have enabled me to separate it from the nearly allied *Chiton Quoyi*. In addition to Carpenter's description I wish to point out that light-coloured specimens of *C. Quoyi* show the same bluish colour of the interior as *C. æreus*. Most of my specimens are covered with a blackish-green coat. I found the divergence to be nearly 100°, against 120° in *C. Quoyi*, and the jugum is not carinated, but angled, nor is it always smooth. In one specimen which I took to pieces, the anterior valve has 8, the posterior 15 slits; *C. Quoyi* has 9–10 and 13–14 slits respectively. The shell is also narrower than that of *C. Quoyi*, the proportion of breadth to length being 1 : 1·7 in *C. æreus* and 1 : 1·5 in *C. Quoyi*. The denticulation of the sinus and the crenulation of the teeth are the same in both.

Hab.—The only locality in which I have hitherto found the species is Manukan Harbour, North Island. I have not seen it in any of our New Zealand collections. My specimens are smaller than the type.

21. Chiton pellis-serpentis (Quoy & Gaimard).

Chiton pellis-serpentis, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 381, t. lxxiv, figs. 17–22; Deshayes in Lamarck, Anim. sans Vert., vol. vii, p. 508; Reeve, Conch. Icon., t. xv, fig. 84; Hutton, Trans New Zealand Inst., vol. iv, p. 176; Man. New Zealand Moll., p. 111; Haddon, "Challenger," Polyplacophora, p. 22; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 173, pl. xxxvii, figs. 14–18.

The colour varies from white to brown. I found recently a young specimen of a most beautiful bluish-green, with bands of the same colour on the girdle.

Hab.—This is the commonest of our New Zealand Chitons.

22. Chiton Sinclairi, Gray.

Chiton Sinclairi, Gray: Dieffenbach's "Travels in New Zealand," vol. ii (1843), p. 263; Hutton, Trans. New Zealand Inst., vol. iv, p. 177; Man. New Zealand Moll., p. 111; Reeve, Conch. Icon, t. xxii, fig. 143; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 174, pl. xxxvi, figs. 1–3.

Chiton (*Leptochiton*) *Sinclairi*, Gray: Smith, Voy. "Erebus" and "Terror," Moll., p. 4, t. i, fig. 17.

The white stripes or spots are not always present; uniformly brown-black specimens are often met with.

Hab.—North and South Islands of New Zealand, but very local and not common. I am not aware that it has ever been found in Tasmania. Very likely *C. pelis-serpentis* was taken for this species, since it is not always easy to separate them when the specimens are partly worn.

23. Chiton canaliculatus, Quoy & Gaimard.

Chiton canaliculatus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 394, t. lxxv, figs. 37–42.

Chiton (*Lophyrus*) *canaliculatus*, Quoy & Gaim.: Hutton, Trans. New Zealand Inst., vol. iv, p. 176.

Lepidopleurus canaliculatus, Quoy & Gaim.: Hutton, Man. New Zealand Moll., p. 112.

Chiton canaliculatus, Quoy & Gaim.: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 177, pl. xxxvi, figs. 4–6.

Chiton Stangeri, Reeve: Pilsbry, l.c. (*non* Reeve).

Chiton insculptus, A. Adams: Proc. Zool. Soc., 1852, p. 91, t. xvi, fig. 4; Hutton, Man. New Zealand Moll., p. 112.

Hab.—In deep water: Cook Strait, Dunedin, Foveaux Strait.

24. Chiton Stangeri, Reeve.

Chiton Stangeri, Reeve: Conch. Icon. (1847), t. xxii, fig. 150; Hutton, Man. New Zealand Moll., p. 111.

In size, shape, coloration, and sculpture very much like *Chiton limans*, but differing in the following points:—The ribs have *no acute, elevated grains*, but are flattened. The tail valve has very distinct, flatly nodulous ribs. The jugum is less acute, divergence 120°. The imbricating scales of the girdle are very small on both margins, larger in the middle, shining, *not mucronated*, and very faintly striated, the striæ being visible only under strong magnifying power. Length 13, breadth 8 mm.

This Chiton may be considered to stand in the same relation to *Chiton limans* as our *Ischnochiton longicymbus* to *I. crispus* of Tasmania and Australia. For comparison I had a specimen of *Chiton limans* from Port Jackson.

It is evident that this species ranks as very distinct from *C. canaliculatus*, with which it has been thought to be identical.

Hab.—I found a single specimen of this evidently rare Chiton in Lyttelton Harbour, under a stone at low-water.

25. Chiton limans, Sykes.

Chiton muricatus, A. Adams: Proc. Zool. Soc. 1852 (May, 1854), p. 91, pl. xvi, fig. 6 (*non* Tilesius, Mém. Acad. Sci. St. Petersburg, ser. V, vol. ix, 1824, p. 483); Pilsbry, Man. Conch., ser. I, vol. xiv, p. 175, pl. xxxvii, figs. 12, 13.
Lophyrus muricatus, Ad.: Angas, Proc. Zool. Soc., 1865, p. 186; l.c., 1867, p. 222.
Chiton (*Lepidopleurus*) *sulcatus*, Quoy & Gaim.: Hutton, Trans. New Zealand Inst, vol. iv, p. 178; Man. New Zealand Moll., p. 112 (*non* Quoy & Gaim.).
Chiton limans, Sykes, nom. nov.: Proc. Malac. Soc. London, vol. ii (1896), p. 93.

There are two specimens in the Colonial Museum from Kapiti, Cook Strait, which were considered by Captain Hutton to be *Chiton sulcatus*, Quoy & Gaim. The specimens are not in a very good condition, one is partly broken, and their original colour is gone. A close examination of them, as far as this was possible, proved them to be *C. limans*, the scales being mucronated. These are the only specimens known to have been found in New Zealand waters.

Hab.—Cook Strait.

EUDOXOCHITON, Shuttleworth, 1853.

Key to Species.

a. Shell elevated, divergence 100–110°, anterior valve with 30 slits, spinelets black. *nobilis*.
aa. Shell depressed, divergence 135–140°, anterior valve with 17 slits, spinelets brown. *Huttoni*.

26. Eudoxochiton nobilis (Gray).

Acanthopleura nobilis, Gray: Dieffenbach's "Travels in New Zealand," vol. ii (1843), p. 245.
Chiton (*Eudoxochiton*) *nobilis*, Gray: Shuttleworth, Mitth. Naturf. Gesell. Bern, 1853, p. 191.
Acanthopleura nobilis, Gray: Hutton, Trans. New Zealand Inst., vol. iv, p. 181.
Chiton (*Chætopleura*) *nobilis*, Gray: Smith, Voy. "Erebus" and "Terror," Moll., p. 4, t. i, fig 8.
Chætopleura nobilis, Gray: Hutton, Man. New Zealand Moll., p. 115.
Eudoxochiton nobilis, Gray: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 193, pl. xlvi, figs. 88–95.

This rare species attains sometimes a large size. I have a specimen measuring 62 × 110 mm.! It is the largest of New Zealand Chitons.

Hab.—North and South Islands, on rocks in exposed situations, sometimes together with *Plaxiphora biramosa* and *P. Suteri*.

27. Eudoxochiton Huttoni, Pilsbry.

Eudoxochiton Huttoni, Pilsbry: Man. Conch., ser. I, vol. xiv (1893), p. 194, pl. xlvi, figs. 96–100.

Hab.—North and South Islands, but very rare.

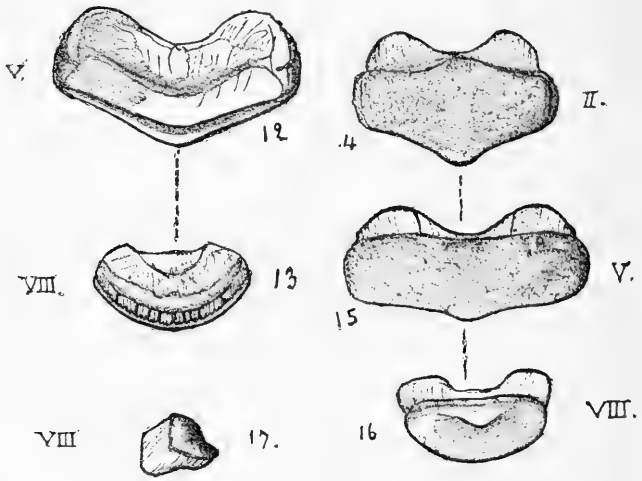
ACANTHOPLEURA, Guilding, 1829.

28. Acanthopleura (Maugeria) corticata (Hutton).

Tonicia corticata, Hutton: Trans. New Zealand Inst., vol. iv (1872), p. 180; Pilsbry, Man. Conch., ser. I, vol. xiv, p. 320.

Plaxiphora biramosa, Quoy & Gaim.: Hutton, Man. New Zealand Moll., p. 116 (*non* Quoy & Gaim.).

A specimen of a rather large Chiton was kindly given me by Mr. A. Hamilton, of Dunedin. I had not seen the species before, and I submitted it to Captain Hutton for examination, who declared it to be his *Tonicia corticata*. The specimen is in a bad condition, in so



Acanthopleura corticata, Hutton.

12–13. Ventral views of detached valves.
14–16. Dorsal views of detached valves.
17. Profile of posterior valve, nat. size.

far that the valves are separated from the girdle, the head valve is missing, and the girdle is much worn; it, however, is quite sufficient to make out the generic position with certainty, and to add a little to the diagnosis published by Captain Hutton twenty-four years back. The shell is broadly and roundly arched, the surface much eroded or covered with coralline growth. Colour yellowish-grey, with a brown stripe on the ridge of the valves, and one, much broader, on each side near the margin. The valves are beaked, thick, and solid, with the

lateral areas indistinctly raised. The margins of the lateral areas and pleura show distinct granules (surrounded by numerous eye-dots). The mucro seems to be central, but this is uncertain, since the surface of the terminal valve has been scraped with a knife. Interior lead-grey on posterior half of intermediate valves, white on anterior half and tail valve. Central valves with 1–1, posterior valve with 9, slits. Teeth rather long and very deeply pectinated outside in a forward direction. Tegmentum inflexed at the posterior margin of central valves. Teeth of end valve short, deeply pectinated on the edge and outside. On central valves a well-defined ridge runs across between the slits, following in outline the sinus and sutural laminæ. Sinus deep, rounded, almost straight in the tail valve; slightly notched at the sides. Girdle (dry) dark-brown. In one place I found five small calcareous spicules. The whole of the girdle is densely covered by small pits, in which the lost spines were inserted, imparting to it a somewhat spongy appearance.

It is difficult to give an exact measurement of this shell, but I estimate it at about: length 75, breadth 50 mm.

The central valves are more broadly arched than in *Acanthopleura granulata*, Gmel.

Hab.—New Zealand, exact locality not known.

ONITHOCHITON, Gray, 1847.

29. Onithochiton undulatus (Quoy & Gaimard).

Chiton undulatus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1835), p. 393, t. lxxv, figs. 19–24; Reeve, Conch. Icon., t. xvi, figs. 87, 90.

Onithochiton undulatus, Quoy & Gaim.: H. & A. Adams, Genera Rec. Moll., vol. i, p. 476, t. liv, fig. 3.

Tonicia undulata, Quoy & Gaim.: Hutton, Trans. New Zealand Inst., vol. iv, p. 179; Man. New Zealand Moll., p. 114.

Onithochiton undulatus, Quoy & Gaim.: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 245, pl. lv, figs. 14–16.

Tonicia lineolata, Frembly: Hutton, Man. New Zealand Moll., p. 114 (*non* Frembly).

Mr. H. A. Pilsbry was quite right when he expressed the opinion (Man. Conch., ser. I, vol. xv, p. 89) that *Tonicia lineolata* reported from Dunedin, Auckland Islands, and Campbell Island, was not likely to be the Chilian form described in vol. xiv, p. 198. The specimens from the localities mentioned are in the Otago Museum, and they show the colour pattern of *T. lineolata*, but I found them all to be undoubted *O. undulatus*. The colour variation in this species is greater than in any other Chiton I know. Sometimes the colour is uniformly purplish-black, and this form is more common in the South, especially in the Auckland Islands and Campbell Island.

Hab.—All the Southern New Zealand Islands. Often found in roots of *Durvillæa* with *Chiton Sinclairi* and *Plaxiphora ovata*.

SPECIES DOUBTFUL FOR NEW ZEALAND.

1. Chiton jugosus, Gould.

Chiton concentricus, Reeve: Hutton, Trans. New Zealand Inst., vol. iv (1872), p. 176; Man. New Zealand Moll., p. 111.

Some specimens in the Colonial Museum are correctly referred to this species, but their locality is not stated. I agree with Pilsbry that the species is probably incorrectly reported from New Zealand. It is not in the New Zealand collections in any of the other Museums, and I am not aware that it has ever been found in our waters by recent collectors.

2. Lorica volvox (Reeve).

Chiton (*Lepidopleurus*) *rudis*, Hutton: Trans. New Zealand Inst., vol. iv (1872), p. 179; Man. New Zealand Moll, p. 113.
Chiton rudis, Hutton: Pilsbry, Man. Conch., ser. I, vol. xiv, p. 238.

I have examined Hutton's type-specimen of *Chiton rudis* in the Colonial Museum, and found it, as suggested by Mr. Pilsbry, to be *Lorica volvox*. For the same reasons as those given in the case of the foregoing species, I think it advisable to place it amongst the species doubtful for New Zealand.

3. Ischnochiton contractus (Reeve).

Lepidopleurus contractus, Reeve: Hutton, Man. New Zealand Moll., p. 113.

The New Zealand habitat rests solely on Cuming's authority, and that is not always reliable. It is not in any of our Museums as coming from New Zealand, and I have no knowledge that it has ever been found here.

INSUFFICIENTLY DESCRIBED SPECIES.

1. *Lepidopleurus melanterus*, Rochebrune: Pilsbry, Man. Conch., ser. I, vol. xv, p. 107.
2. *Lepidopleurus Campbel'li*, Filhol: Pilsbry, l.c.
3. *Plaxifora Campbel'li*, Filhol: Pilsbry, l.c.
4. *Acanthochites jucundus*, Rochebrune: Pilsbry, t.c , p. 29.
5. *Tonicia Gryei*, Filhol: Pilsbry, t.c., p. 107.
6. *Acanthopleura complexa*, Hutton: Trans. New Zealand Inst., vol. iv, p. 181; Pilsbry, t.c., p. 108. Type lost.
7. *Onithochiton Filholi*, Rochebrune: Pilsbry, t.c., p. 106.
8. ,, *decipiens*, Rochebrune: Pilsbry, l.c.
9. ,, *neglectus*, Rochebrune: Pilsbry, l.c.
10. ,, *Astrolabei*, Rochebrune: Pilsbry, t.c., p. 107.

NOTE ON *MITRA OBSCURA*, HUTTON.

By Henry Suter.

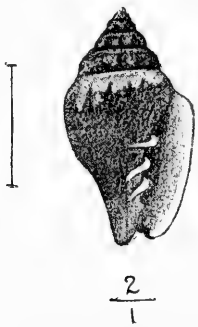
Read 12th March, 1897.

Sir James Hector, Director of the Colonial Museum, Wellington, with great kindness lent me Captain Hutton's type-specimen of *Mitra obscura*, which enables me to give here an emended description and a figure of the species.

Mitra obscura, Hutton.

Hutton, Catalogue of Marine Mollusca of New Zealand, 1873, p. 19.
Hutton, Manual of the New Zealand Mollusca, 1880, p. 60.

Shell ovate-conical, whorls shouldered, those of the spire longitudinally plicate, about twenty costæ on the penultimate whorl; on the body-whorl the plications become gradually fainter as they approach the peristome, whilst between them fine lines of growth are visible. Three to four distinct revolving lines below the suture on the last three whorls, extending indistinctly over the whole of the second to fourth whorl. Whorls seven. Base of last spirally striated. Aperture narrow, columella with four plaits, the basal one small; outer lip angled above, thick, smooth (basal part broken off); interior purplish. Colour blackish-brown, white spots predominating on the first five whorls; the last two whorls with large, sometimes confluent, white spots below the suture. The whole of the body-whorl is dotted with minute whitish spots. Base fuscous. Length 16, breadth 8 mm. Aperture: height 9, breadth 3·5 mm. Angle of spire 60°.



Mitra obscura, Hutton.

Hab.—Bay of Islands (Colonial Museum).
This species is nearest to *Mitra pica*, Reeve, from Tasmania,

Australia, and Cape of Good Hope; but in my opinion sufficiently distinct for specific rank.

It was omitted, with several other species of the genus, from the list of New Zealand Mollusca by Captain Hutton, in his revision of our rhachiglossate mollusca (Trans. New Zealand Inst., vol. xvi, p 226, footnote), because at that time there was no evidence, beyond this single dead specimen, to show that the genus *Mitra* really did occur in New Zealand waters; and its omission from the list may fairly be considered as a proof of Captain Hutton's carefulness when working out his revision of the group. Since then matters have changed, however. *Mitra melaniana*, Lam., has been found by recent collectors at Tauranga, and in the Hauraki Gulf, and there are specimens in several of our collections. Two species of *Mitra* have been found by the lighthouse-keeper of Mokohinou, east of Whangarei Bay, one of which is a variety of *M. obscura*. The occurrence, therefore, of *Mitra* on our shores no longer remains doubtful, and we are evidently fully justified in reintroducing Captain Hutton's species into the list of the New Zealand marine mollusca.

ADDRESS OF THE PRESIDENT,

Prof. G. B. Howes, Sec. L.S., etc.

Delivered 12th *February*, 1897.

Ladies and Gentlemen,

Since it is your wish that I once more appear as your attorney, permit me to offer a few remarks somewhat by way of development of the lines which I last year adopted, for there is no reason why Presidential Addresses should not be continuous, and let us ask what is the present position of our branch of science, and what the most fruitful field for its immediate development.

Our year opened full of promise for the Malacologist, for hardly had it dawned when there reached us a paper by Girard[1] on the remarkable 'bivalved pulmonate' (unfortunately so called) *Thyrophorella Thomensis*, in which he claims to have settled the systematic position of that animal. Be its 'lesser valve' what it may, a product of overgrowth of the peristome or a protective lid *sui generis*, it is clear that it presents us with a physiological condition for the counterpart of which we turn to the operculate Rugosa among Corals and the unique *Rhodosoma*[2] among Tunicates. Once again was the zoological mind turned to the part played by homoplasy; and while thus exercised there came before it the full monograph of our distinguished contemporary Paul Pelseneer, upon the "Air-breathing Prosobranchs and Gill-breathing Pulmonates,"[3] in which, suffice it to say, our knowledge of this important and fascinating subject is materially extended, and our author strengthens his conclusion that *Siphonaria* and *Gadinia* are pulmonates; whilst in reviewing this paper Simroth has shown good reason for suspecting[4] that *Ianthina* may be an 'air-breather.'

M. Félix Bernard, not content with the continuation of his epoch-marking work upon the Pelecypodan hinge, early in the year delighted us with a description[5] of the structure and development of a new Eulamellibranch (*Scioberetia australis*), which small organism he obtained off the ambulacra of a viviparous Spatangoid (*Tripylus cavernosus*), with which it is commensal, from Cape Horn. Its enclosed shell, its gills, and pallial chamber, are of much interest; and his promised discussion of its affinities has for us a special association,

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[1] A. A. Girard, Journ. Sci. Acad. Lisbon, ser. II, tom. iv, p. 28.
[2] *Chevreulins* of Lacaze Duthiers, Ann. Sci. Nat. (Zool.), ser. III, tom. iv, p. 293.
[3] P. Pelseneer, Arch. Biol., tom. xiv, p. 351.
[4] H. Simroth, Zool. Centralbl., Bd. iii, p. 214.
[5] F. Bernard, Bull. Mus. Hist. nat. Paris, tom. xxvii, p. 361.

in consideration of the views expressed in Mr. M. F. Woodward's excellent paper on *Ephippodonta* published in the first volume of our "Proceedings."

The year which opened thus sensationally, did not continue one of surprises for the Malacologist, but rather one of that steady work which marks real progress. Firstly, let me consider it as affecting our Society.

Our members now number 162. The addition to our roll of the names of W. T. Blanford, H. A. Pilsbry, C. E. Beecher, and A. Pavlov, is a guarantee of appreciation by those most competent to judge of our merits; and as our financial position has improved during the year, we have no cause for dissatisfaction with our worldly progress.

One familiar face has temporarily disappeared from our midst, in the removal of Mr. S. Pace to Torres Straits, to conduct during the next few years a series of experiments in pearl culture, and to develop the pearl fisheries.

We have published papers during the year by our distinguished foreign members Dr. H. Simroth and Mr. H. Suter, and by Professor Gilson, of Louvain, one of our latest recruits; and our main supporters, Messrs. Edgar Smith and E. R. Sykes, have given us liberally of the results of their labours.

Our most trustworthy member, Mr. G. C. Crick, has laid before us two short communications belonging to that class of which, to my mind, we want more; i.e. they are palæontological. Both are in every way worthy the material described, and of our glorious national collection of which it forms part. The consummate care with which the author has worked out his details, the skill of his reconstructions, the cautiousness of his generalizations, and the beauty of the accompanying illustrations, appear to me equally commendable. An author to whom trouble is a pleasure where truth is to be revealed, to whom order is second nature, and an artist who, if he will, can in some departments outrival his foreign contemporaries, under the guidance of our Editor, have given us a scientific treatise which, being also a finished work of art, realizes the ideal of Huxley, our great master of science and English composition, an ideal which he was never tired of upholding to his followers. Authors of such works, which take time, are nowadays voted slow; better, however, one such than a dozen of the slipshod, ill-conceived, oft-inflated 'papers,' begotten of mere ambition and desire for notoriety, that at times cover, but do not adorn, the pages of our scientific journals.

Nor have our exhibits been one whit behind.

We have been gratified by the sight of living *Petricola pholadiformis*, collected on our own coasts, the acumen of our members Messrs. Cooper, Crouch, and Kennard having shown us that the species is apparently becoming acclimatized in British waters. Mr. Bullen Newton has excited our interest and imagination, by laying before us, on behalf of our honoured member Sir Rawson Rawson, the

original coloured drawings of the shell and animal of *Pleurotomaria Quoyana*, from which the figures in the 'Blake' Monograph were drawn. Mr. Fulton has openly put upon our table collections of shells, notably of *Amphidromus*, of exceptional completeness and perfection, such as are only brought together under a labour of love; whilst, with his *Conus gloria-maris*, Mr. Sowerby has appealed to our æsthetic as well as to our common sense.

The exhibition of skiagraphs of shells and living molluscs by Mr. J. Green and Mr. J. H. Gardiner is especially noteworthy, as marking the most extensive and first systematic attempt to apply the latest epoch-marking discovery in physics to the study of our chosen class of animals. To be able to see the clausium through the shell-wall, and to determine the septal lines and muscular impressions of the *Nautilus* shell, prior to the removal of the animal contained within it; to be able to work out the valve-slits of a Polyplacophoran, while the plates are yet *in sitû* beneath the girdle; and to detect the folds on the columella of *Voluta* the whole way up, even on the further side of the shelly pillar, is to be in possession of a new and powerful method of observation, which must be productive of good results. Mr. Green and Mr. Gardiner, in having shown us how best to proceed with this, have done us a most useful service.

So long as we are in a position to maintain the present standard of our exhibits, we need have little fear of lack of interest in our meetings.

With extending influence, it is only reasonable to suppose that the sympathies of others will be accorded us; and I am very happy to inform you that the Rev. J. E. H. Thomson, who last year went into residence at Safed, has most willingly undertaken to dredge and collect for us during the next three or four years in Galilee and the neighbouring Lakes, the necessity for investigating the molluscan fauna of which was emphasized by the late Paul Fischer.

My friend and former pupil, Mr. J. E. S. Moore, has just returned from the African Lakes with a goodly dredging of Mollusca, including material for the study of development; and I am hopeful that ere long we may see some of them upon our table.

With a view to extension of our influence with explorers, our Council early in the year considered a scheme for the compilation of a series of directions for search, capture, and preservation of Mollusca. A small Committee was formed, with two members for each department of the work, and their notes are now in an advanced stage. In taking this step, your Council were encouraged by the success of the issue by the Anthropological Institute of Great Britain and Ireland of their "Notes and Queries," and were especially mindful of the necessity for securing accurate observations upon the Land-shell Fauna of the Oceanic Islands, before the disturbing influences of the settler and his flocks and herds render them for ever unattainable.[1]

[1] It is sincerely to be hoped that should the plea of the British Association Committee for the exploration of the Islands of the Pacific lead to action, the Land Mollusca will receive adequate attention.

During the year, the hand of death has deprived us of Dr. Auguste Brot, of Geneva, and of B. Schmacker, both members of our Society, and both contributors to our "Proceedings." Dr. Brot, well known in connection with the "Conchylien Cabinet" as the chief authority on *Melania* and allied genera, passed away on August 30, at the age of 75. Schmacker died at Yokohama, on March 26, at the early age of 44; and in him we lose an enthusiastic collector, who devoted special attention to Chinese and Japanese Land Mollusca, as his papers in collaboration with Dr. O. Boettger testify.

In the death of Professor G. A. Pirona, of Udine, we mourn the loss of a talented naturalist and philologist, who embraced within the sphere of his many occupations the study of the Land and Fresh-water Mollusca of his native district, and of the Hippurites; whilst by the decease of H. D. von Nostrand we have lost an enthusiastic collector and conchologist.

I cannot pass unnoticed the recent decease of the veteran "Naturalist of the Cumbraes," David Robertson, who died at Millport in his ninetieth year, respected by all earnest Zoologists, as one who made the most of his surroundings and developed that which he could command. He was a keen observer of nature, and the merits of his sixty years' work in science (in much of which he was materially assisted by his wife) were in 1895 recognized by the University of Glasgow, which bestowed on him the degree of D.C.L. When by many all but forgotten, he reappeared, in association with Dr. J. Murray, during his exploration of the Firth and West Coast of Scotland and the work of the familiar 'Ark.' His last public act was the cutting of the first sod on the site of the new Marine Station at Millport, now nearing completion, that owes its existence largely to his untiring energy and enthusiasm. He was of the old order of 'field-naturalists,' now, alas! but few in number, and was also a palæontologist. Since his death was in my hearing recently commented upon as that of 'another old fossil,' I am constrained to point out that some of our latest work in 'bionomics' has borne testimony[1] to the value and accuracy of observations made by him in 1861.

It would not be difficult to produce recent work in Malacology in which gross errors might have been avoided had more attention been paid to the published work of our predecessors. "Sire," perks the youth to his senior, "I proceed to swallow and digest thee with all thou knowest." Let it be added that he occasionally gets choked!

Turning now to consider progress at home, we note the discovery, by Mr. Garstang, of the Marine Biological Laboratory at Plymouth; of a new British *Doris*[2] (*D. maculata*); and of the Neomenian genera *Myzomenia* and *Rhopalomenia*, hitherto unrecognized in British Waters, with a description of which he has honoured our "Proceedings." Mr. Garstang's specimens were discovered in the English Channel at

[1] Cf. W. Garstang, Journ. Mar. Biol. Assoc. (N.S.), vol. iv, p. 225.
[2] W. Garstang, t.c., p. 167.

a depth of 25–30 fathoms; whilst about the same time Professor Haswell, of the Sydney University, recorded[1] a similar find in the harbour of that city. This welcome extension of our knowledge of the range of these remarkable animals was but a question of time; but, as concerning the British seas, it may be remarked that there have long been placed on public exhibition in the Molluscan galleries of the British Museum of Natural History, specimens of *Neomenia carinata* dredged by Dr. J. Murray during 1887–8 in 50–70 fathoms at Upper Loch Etive and Loch Hourn; and that in 1891 Professor Haddon recorded[2] the capture of a Neomenian on the west coast of Ireland at 80, if not also at 55, fathoms.

We note with pride that steps are being taken towards rearrangement of our matchless national collection of recent Mollusca. In this our Vice-President, Mr. E. A. Smith, and those who are helping and advising him, are performing a public service; and it is worthy of remark that, as the work progresses, Dr. H. Woodward, Mr. Crick, and their associates in the Geological Department, are giving us descriptions of fossil molluscs no less valuable and unique. Specimens such as those of the *Palæoctopus Newboldi* from the Cretaceous of Lebanon,[3] and of *Acanthoteuthis speciosa* from the Lithographic Stone of Eichstädt,[4] like so much that is preserved in our National Museum, may well arouse the envy of our foreign contemporaries. Co-operative action is the secret of their acquirement. During the present year the observant eye of Mr. C. Davies Sherborn was attracted, while walking with a friend (Dr. Rowe), by a monstrous Ammonite on the beach near Brighton. No time was lost in communicating with the authorities, who despatched our friend Crick and an assistant to the scene. Sufficient this for anyone familiar with the conduct of affairs of the Geological Department of our treasure-house; and, as the result, there now adorns the collection a 44-inch example of *Ammonites* (*Haploceras*) *leptophyllum*, which is an object to behold and live up to.

General progress in the study of our recent Mollusca has been during the year largely associated with the work of expeditions—conspicuously with those of the "Albatross" and "Princess Alice," of the German Plankton, and the Horn Expedition—of which I propose to treat in a more fitting portion of my Address. The voyage of the "Caudan" has furnished material for papers by Joubin and Locard, and the Mollusca collected by the Dutch Expedition to Central Borneo have been reported upon by Schepman.[5]

Of faunal papers on Land Mollusca, I would name those of our Vice-President, Mr. Edgar Smith, referring to Celebes, Batchian, Ternate,

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[1] W. A. Haswell, Journ. Sydney Univ. Medic. Soc. (Hermes Medic. Supplem.), vol. i, p. xxxi.

[2] A. C. Haddon, Proc. Roy. Dublin Soc. (N.S.), vol. vii, pp. 258 and 260.

[3] H. Woodward, Quart. Journ. Geol. Soc., vol. lii, p. 229; Geol. Mag., 1896, p. 567.

[4] G. C. Crick, Geol. Mag., 1897, p. 1.

[5] M. M. Schepman, Notes Leyden Mus., vol. xvii, p. 145.

and Gilolo, in our own "Proceedings"; and on Mollusca from Trinidad in the Journal of Conchology.[1] The Canaries have been dealt with in our own pages by Gude; and, subsequently to Smith, Von Möllendorff has written[2] upon the Mollusca of South Celebes; while, in conjunction with Quadras, he has briefly described[3] a number of species from the Philippines, whence several genera have been listed by Boettger,[4] with descriptions of new forms.

Dall has published an elaborate review of our knowledge of the terrestrial fauna of the Galapagos Islands,[5] not unmixed with doubtful speculation, in describing the collections made by Dr. G. Baur in 1890. Valuable critical reviews have been given by Fulton on *Amphidromus*, and Wagner[6] on *Daudebardia*; and Hidalgo has published some extensive critical notes on the species of *Cochlostyla*.[7] There has also appeared the first of what we hope may prove to be a series of papers on North American Land-shells, by Pilsbry and Vanatta, dealing both systematically and anatomically with *Ariolimax* and *Aphallarion*.[8] The same authors, too, have issued a Catalogue of the genus *Cerion*; whilst the armature of the various species of *Corilla* and *Plectopylis* has been worked out and figured by Gude.[9]

Central Asia has furnished new forms to Westerlund; East Africa to Von Martens; and Borneo and the Hawaiian Islands have received special attention. New forms from Bombay have been described by Melvill in our "Proceedings," and from the Loyalty Islands elsewhere, in conjunction with Standen. A number of new species of Pleurotomidæ have been recorded by Hervier[10] from New Caledonia; and in generic work, De Rochebrune on *Ceratosoma*,[11] and Lahille on the Volutes of Argentina,[12] call for comment.

A Catalogue of the marine fauna of the Pacific coast of Canada has been compiled by the Rev. G. W. Taylor, in which he enumerates 279 species, and to which he adds a faunal list of fresh-water forms.

Of the "Conchylien Cabinet" several parts have appeared, dealing with *Helix*, *Cerithium*, *Columbella*, and the *Bullacea*. The "Manual of Conchology" by Pilsbry has steadily progressed: in the Marine series the Gastropoda are finished; in the land, the Bulimoid forms have received attention; new subgenera have been described, and in separating genera the sculpture of the protoconch has been utilized. Simroth, in Bronn's "Thier-Reich," has commenced the Gastropoda. Our Editor has assisted in the English translation by H. and M. Bernard

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[1] E. A. Smith, Journ. Conch., vol. viii, p. 231.
[2] O. von Möllendorff, Nachr. Deutsch. Malak. Ges., 1896, p. 133.
[3] J. F. Quadras and O. von Möllendorff, t.c., p. 81.
[4] O. Boettger, t.c., p. 41.
[5] W. H. Dall, Proc. Acad. Nat. Sci. Philad., 1896, p. 395.
[6] A. J. Wagner, Denkschr. Akad. Wien, Bd. lxii, p. 609.
[7] J. G. Hidalgo, Journ. de Conch., tom. xliv, p. 5.
[8] H. A. Pilsbry and E. G. Vanatta, Proc. Acad. Nat. Sci. Philad., 1896, p. 339.
[9] G. K. Gude, Sci. Gossip (N.S.), vol. iii, p. 126 etc.
[10] R. P. J. Hervier, Journ. de Conch., vol. xliii, p. 141, and vol. xliv, p. 51.
[11] A. T. de Rochebrune, Nouv. Arch. Mus. Hist. Nat. Paris, ser. III, tom. vii, p. 119.
[12] F. Lahille, Rev. Mus. La Plata, vol. vi, p. 293.

of Arnold Lang's "Text-Book of Comparative Anatomy" so far as it applies to the Mollusca. Mr. J. W. Taylor has issued a further part of his work on British Land and Fresh-water Mollusca, devoting much attention to anatomy; and Mr. L. E. Adams has published a second edition of his "Collector's Manual." Last, but not least, our thanks are due to the Editor of the Journal of Malacology, and to our Secretary and Mr. S. Pace, for their enterprising "Bibliography," which we hope will continue a leading feature of that periodical.

For the student of fossil forms, the year has been noteworthy. Our Corresponding Members, Dr. R. J. Leehmere Guppy and Professor W. H. Dall, have written a joint work[1] entitled "Descriptions of Tertiary Fossils from the Antillean Region," the horizons whence they were obtained ranging from the Pliocene to the Eocene. A new genus, *Strombinella*, is described from the Oligocene of St. Domingo. It appears at first sight like a strongly sculptured *Terebra* of the section *Acus*; the aperture, however, is that of *Anachis*, and it doubtless has much the same relation to this as *Æsopus* has to *Astyris*.

Professor Sacco's stupendous work still progresses.[2] Part 20 has appeared during the year, and comprises the Cœcidæ, Vermetidæ, Siliquariidæ, Phoridæ, Calyptræidæ, Capulidæ, Hipponycidæ, Neritidæ, and Neritopsidæ. In this we have another appalling addition to the number of 'varieties' of divers species of fossil Mollusca. Fortunately, however, considerable revision has been effected with the species themselves; and the systematic position of many has been so carefully considered that, despite its faults, the work will constitute a standard of reference on Pliocene Mollusca for some time to come.

A paper by our member, Mr. G. B. Pritchard, on the fossil fauna of Table Cape beds, Tasmania, deals principally[3] with the Mollusca. The summary of species records one cephalopod, 153 gastropods, and 65 pelecypods; and the whole is an excellent piece of work, apparently based chiefly on the writings of Ralph Tate, but containing some welcome criticisms and addenda.

Dr. Paul Oppenheim, in a work entitled "Die Eocaenfauna des Monte Postale bei Bolca im Veronesischen," dealing largely with a Molluscan fauna which has often been partly described, and is of much interest from a geological point of view, records[4] some large Cerithidæ and Naticidæ. Large Lucinidæ are also described, which suggest those of the Eocene of North-Western Europe. The state of some of the fossils is unfortunately bad, and the nomenclature somewhat antiquated.

The volume of the Palæontographical Society contains four monographs of especial interest to us. That on the "Fauna of the

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[1] R. J. Guppy and W. H. Dall, Proc. U.S. Nat. Mus., vol. xix, p. 303.
[2] F. J. Sacco, Molluschi Terr. Terz. Piedmonte e Liguria. Turin.
[3] G. B. Pritchard, Proc. Roy. Soc. Vict. (N.S.), vol. viii, p. 74.
[4] P. Oppenheim, Palæontographica, xliii, pp. 125–221, 8 pls. Stuttgart, 1896.

Marwood and Pilton Beds of North Devon and Somerset," by our member, the Rev. G. F. Whidborne, is a useful epitome. The systematic position of most of the species of Mollusca described appears to us, however, doubtful, and this monograph will be of best use later on, when the field comes to be more thoroughly worked out.

Carbonicola, *Anthracomya*, and *Naiadites* form the subject of an appendix to his previous work by Dr. Wheelton Hind, also a member of our Society. There is given on p. 171 a geological section of the beds of the shore at Dalmeny, but its utility is seriously marred by the omission of any statement as to the thickness of the beds. Dr. Hind also devotes eighty pages to the "British Carboniferous Lamellibranchiata" (Part I), dealing with the Mytilidæ. The assignation of a systematic position to many of the species of *Lithodomus* depicted on pl. ii is, to say the least, bold. The greater part of this work is confined to the "Introduction" and "Bibliography," which latter we could well wish revised and materially extended.

Our member, Mr. W. H. Hudleston, F.R.S., contributes the ninth number of Part I of his work on the "Jurassic Gastropoda," concluding those of the Oolite. The monograph is accompanied by an alphabetical index, showing geographical distribution in England.

Our indefatigable Corresponding Member, M. Cossmann, has published the second livraison of his great work "Essais de Paléoconchologie comparée," comprising the Tubiferidæ, Icteriidæ (nov. fam.), and Nerineidæ, which the author elevates into a new suborder, Entomotæniata. The systematic description of the Prosobranchiata is also commenced, and includes the Terebridæ, Pleurotomidæ, and Conidæ. The work throughout bears evidence of very careful preparation. A number of new genera and subgenera are proposed; but we cannot say that the method of classification, though it follows in part the example set by the late Paul Fischer in his "Manuel," will be received with much satisfaction by English students. One of the most interesting features of the work is the careful manner in which the author cites examples of species occurring along definite geological horizons, whereby the reader is presented with a comprehensive review of the range in time of even the subgenera and 'sections.' The work is destined to become classical.

There has also appeared during the year, under the direction of M. Cossmann, a "Revue critique de Paléozoologie." It will appear every three months, and is intended to contain comprehensive reviews of current work. It to a certain extent takes the place of the palæozoological section of the recently defunct "Annuaire Géologique Universel," and it cannot fail to be of the greatest use to us all. M. Cossmann is to be congratulated on the undertaking.

The Memoirs of the Geological Survey of India ("Palæontologia Indica") of the year embody two important monographs on the Cephalopoda, by Professor W. Waagen and Dr. Carl Diener. Dr. Waagen deals with fossils of the Ceratite formation, which apparently represents the Trias of Europe, although "it is not yet possible to

say with certainty what parts of the Trias may be represented by the Ceratite formation of the Salt Range." The greater part of the work is devoted to the Cephalopoda, and many new genera and species are described. Dr. Diener's monograph describes the "Schlaginweit Collection in Munich, Griesbach's in the Geological Museum of Calcutta, with Blanford's and Stoliczka's type-specimens"; and last, but not least, the large number of fossils collected in 1892 by the expedition to Johár, Panikhanda, and Hundés, in which Griesbach, Middlemiss, and Diener took part. A new genus (*Buddhaites*) is described, besides a great number of new species; and the work, like that of Waagen beforementioned and all the volumes of the "Palæontologia Indica," is exceedingly well illustrated.

In the "Denkschrift"[1] of the Vienna Academy, Dr. E. Mojsisovics von Mojsvar, who has already done so much excellent work on the Cephalopod fauna of the Trias, particularly of Austria, describes in full that of the Upper Trias of the Himalayas. The material forming the basis of the work consists of the collections of Dr. Diener and Messrs. Griesbach and Middlemiss, made during their abovementioned expedition to the Himalayas. As was to be expected, the author describes many new species, and institutes new genera, subgenera, and large subdivisions. His descriptions are accompanied by numerous plates, executed in the finished manner to which we are accustomed in his writings on the Austrian Trias.

The work, I believe, is being translated, to appear subsequently in the "Palæontologia Indica," where it will probably form Part I of a series of monographs on "Himalayan Trias Fossils," of which Dr. Diener's work on the Muschelkalk of the same region forms Part II.

G. Holm has published a work on *Endoceras*, in which,[2] briefly reviewing the literature, he passes to the description of the apex. He recognizes two types, but considers a division of the genus impracticable, since the apical portion is known in but few examples, and not at all in the type-species. He groups the species exhibiting the conical apex into two subgenera, for one of which he adopts the name *Nanno*, previously used generically by Clarke, and afterwards adopted by Hyatt, and for the other he proposes *Suecoceras*.

One regrettable feature of the year's work has been the tendency towards reversion to the trinomial system and the too rigid adherence to rules of priority. When, in an age in which science is popular, *Aplysia* becomes *Tethys*, and *vice versa*, and, in one of overcrowding of literature, it is thought desirable to discriminate between 'types,' 'paratypes,' and other sorts of types, it were no wonder did the wayside naturalist turn from us in despair. For the purists *Ichthyosaurus* ought to go, *Troglodytes* becomes *Anthropopitheeus*. Convenience and the fitness of things must be considered. The effects of extreme specialization are here but too evident; one man describing as the result of a life's labours 'characters' which it requires the

[1] M. E. Mojsisovics von Mojsvar, Denkschr. Akad. Wien, Bd. lxiii.
[2] G. Holm, Geol. Fören. i Stockholm Förhandlg., Bd. xviii, p. 394.

experience of a life to appreciate. If this course is to continue, let us boldly replace *Homo sapiens* by *Mendax simplex*, and have done with it!

In the department of Marine Biology the year has witnessed an exceptional activity at all points of the compass. Our Japanese friends have described and worked out a new species of *Opisthoteuthis* (*O. depressa*),[1] and they continue to discover new and remarkable marine organisms.[2] Rumours are current of a South Australian Marine Station; and the attempt which is being made to develop the resources of the West Indies has met with considerable support at the hands of the Zoologists of the Johns Hopkins University, who during the season visited Port Henderson for purposes of systematic study.[3]

As a kindred new departure, the members of the Columbia University, New York, organized a summer expedition to Puget Sound, where a laboratory was equipped, and dredging, plankton collecting, and other modes of investigation were carried out; and their preliminary report announces, as a leading result,[4] the careful study of *Scutella* and *Entoconcha*, and the collection of numerous mollusca, the working out of which will be looked for with intense interest.

The North Pacific is this year more than ever to the front, and will keep our friends Mr. Edgar Smith and Mr. Sykes busily engaged for some time to come, since Mr. R. C. L. Perkins is still collecting, under the auspices of the Joint Committee of the Royal Society and British Association. More than this, however, for the extension to him of substantial support by the Trustees of the Bernice P. Bishop Museum in Honolulu, has been followed by the welcome announcement[5] of a proposal to erect a biological laboratory for the Hawaiian Islands at the princely cost of some £150,000, which Mr. C. R. Bishop would seem willing to defray. The allusion in the preliminary notice to the facilities which will be afforded to American and Japanese zoologists is a sure sign of the times; but we hope that distance will not deter British workers from visiting the locality, as seems to be anticipated.

At home, all eyes have turned northward, two important events having taken place across the border, viz., the laying of the foundation-stone of a new marine station at Millport on October 18, and the completion and opening of the "Gatty Marine Laboratory" at St. Andrews—the latter wholly, and the former largely, the outcome of voluntary bequest on the part of persons who have lived to appreciate the value of biological investigation. I need but remind you of the pioneer work in marine zoology of Professor W. C. McIntosh,

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[1] I. Ijima and S. Ikeda, Journ. Coll. Sci. Imp. Univ. Japan, vol. viii, p. 323. Cf. also Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 74.
[2] Cf. Zool. Anz., Bd. ix, p. 249.
[3] Cf. J. E. Duerden, Journ. Instit. Jamaica, vol. ii, p. 268.
[4] Cf. Zool. Anz., Bd. xx, p. 14.
[5] Cf. Rev. Sci., ser. IV, tom. vi, p. 631.

and of his untiring devotion to it for a period of over thirty years, to justify the remark that the munificent gift of the Gatty Laboratory is a fitting recognition of his labours, upon which he and his ancient university are alike to be congratulated. Investigator, raw student, and collector, have always received the greatest encouragement at his hands, and he has ever given unstintingly of his rich resources in the advancement of education.

The Millport Laboratory, now near completion, as I have already remarked, was the cherished ambition of the "Naturalist of the Cumbraes." Having secured its foundation, he lived intent on endowing it from his collections, the richness of which is known only to marine zoologists. Although the hand of death has intervened, we sincerely hope it will not have rendered it impossible in this manner to ensure him a fitting memorial. A commencement has already been made with a suggestive piece of work, in which Robertson himself had a hand,[1] upon hermaphroditism and the influence of nutrition on sex in the limpet.

Aberdeen follows in the wake, with the announcement that its Town Council, at the suggestion of Professor Alleyne Nicholson, have, as a wholly provisional arrangement, equipped an old bathing station as a Marine Aquarium.

Once again has private enterprise, a characteristically English method of procedure in the advancement of Science, come nobly to our aid. And, since even in scientific circles there are not wanting persons apparently unable to distinguish between the claims of a Marine Biological and a Chemical Institute, as concerning choice of locality, it may be opportune to remark that for work in economics which even they desire, involving, as a basis for observation and experiment, the determination of the habits, range, and causes of migration of marine organisms, there is demanded, as a first necessity, the girdling of our seas by a series of properly equipped observatories, as a means by which collated investigation should be possible for long periods over wide areas. Our requirements are essentially those of the seismographers, who are raising a similar outcry. It is only now that the possibility of such collective investigation is dawning; and we note with satisfaction that a biologically first attempt in the desired direction has just been made[2] by the able Director of the Plymouth Marine Station.

Briefly to consider the year's work of expeditions, as specially affecting our chosen class of animals, there stands foremost for recognition the Report by Messrs. Dautzenberg and H. Fischer on the Deep-sea Fauna dredged by the "Princess Alice" in 1889–90, at depths of from 40 to 4,000 metres in the Mediterranean and off the Azores. Of the 153 species of Gastropoda and Chitons recorded, 86 are described as new.

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[1] Cf. J. F. Gemmill, Anat. Anz., Bd. xii, p. 392.

[2] E. J. Allen, "Distribution of Marine Plankton": Journ. Marine Biol. Assoc. (N.S.), vol. iv, p. 408.

There reached us early in the year another important report,[1] by our zealous foreign member, Dr. W. H. Dall, upon the Mollusca collected in deep water near the Hawaiian Islands, during the cruise of the "Albatross" in 1891. A conspicuous feature is the working out of the anatomy of a new species of *Spergo* (*S. glandiniformis*) and of the author's genus *Euciroa*, concerning the structure of the gills and discussion of the affinities of which we await with much curiosity the comments of our Belgian contemporary Paul Pelseneer.

Our Vice-President, Mr. Edgar Smith, has given us an admirable report[2] on some new deep-sea Mollusca from the "Investigator" collection; and our respected foreign member, Dr. H. Simroth, has contributed a report upon the Acephala of the German Plankton Expedition, noteworthy for the description of a new and minute pelagic genus (*Planktomya*), and full of subsidiary matter of the greatest service to the student, but, alas! marred by a regrettable feature, to which I shall return.

From the pen of Dr. Rudolf Sturany there has come a monograph on the Mollusca dredged by the Austrian Deep-sea Expedition by the "Pola," during the years 1890–4, in which, on comparison of the Tertiary fossils of Sicily and Italy, the well-founded conclusions of Fischer and others as to the uniformity of the molluscan fauna of the deeper waters of the Mediterranean, and that the deep-sea fauna of the Mediterranean would appear to have had a Northern Atlantic origin, are confirmed.

At the Liverpool meeting of the British Association, the Committee for the study of the Marine Zoology, Botany, and Geology of the Irish Sea, of which I have the honour of being a member, presented its final report. I much fear my own part has been that of feeding the fishes and other sea-monsters rather than of assisting to work them out; but our friend Professor W. A. Herdman, and his well-organized band of Liverpoolians, have given us an exhaustive list of captures, which include numerous novelties. The controversy at Ipswich concerning that portion of the work which deals with the "zone of deep mud," is fresh in the minds of some of us. A special feature of the undertaking was the careful localization and study of the bottom deposits; and in the hands of Mr. Clement Reid, of the Geological Survey, results of the greatest interest to the student of molluscan chorology appear likely to accrue.

The Antipodes have this year been the centre of exceptional attention by explorers. The party headed by Professor W. J. Sollas sent out in H.M.S. "Penguin," under the joint auspices of the Royal Society and British Association, to investigate the structure of a coral reef by boring and sounding, were baffled in their main object, but we hope not beaten. Rich collections have, however, been made; and since Mr. Hedley, of the Sydney Museum, accompanied the expedition as 'Naturalist,' Malacologists would seem assured of a good

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[1] W. H. Dall, Proc. U.S. Nat. Mus., vol. xvii, p. 675.
[2] E. Smith, Ann. and Mag. Nat. Hist., ser. VI, vol. xviii, p. 367.

harvest. Thanks to Admiral Wharton, R.N., F.R.S., the soundings of this expedition have been placed in the hands of our able member Mr. W. H. Burrows, who is now working them out.

Dr. Willey has continued his observations upon *Nautilus*; and during a sojourn in Sydney he worked out and published details of considerable interest, not only upon Mollusca, but upon the enigmatical *Ctenoplana*, of which he has described[1] a new species (*C. rosacea*). He has left Sydney for New Caledonia, and carries with him our best wishes.

The impetus given to the study of the Polyplacophora by Pilsbry's revisionary monograph and the adoption of its newer methods have been most marked in their effects on the study of the Australian and Novozelandian forms. The papers by Pilsbry,[2] and those by Bednall, Suter, and Sykes read at our meetings, well-nigh cover the field; and when we reflect upon the discovery during the last few years of unique and engrossingly interesting Sponges and Crustaceans, to say nothing of Flat-worms and Echinoderms, by Dendy, Chilton,[3] Farquhar,[4] Thomson,[5] and others, we cannot but congratulate our New Zealand brethren on the result.

Finally, there are now before us the complete report and narrative of the expedition into the interior of Australia during 1894, which bears the name of W. A. Horn, who so liberally organized and endowed it, with the aid of the South Australian Government. Results of the greatest interest have been obtained in Zoology, Botany, Anthropology, and Geology; and, on consideration of the exceptional difficulties under which the little band of investigators were placed in working them out, they have merited our profound thanks. To Professor Baldwin Spencer, upon whom fell the task of general organization and editorship, we owe a debt of peculiar gratitude; for, shortly after the return of the expedition to civilization, on receipt of tidings of heavy rain in the interior, he packed bag and baggage and returned to collect whatever was afloat. Not only so, but he is now again on the spot. While, thus, the success of the expedition is largely due to his untiring energy and enthusiasm, we may hope for further results at his very competent hands; and we congratulate him on his determination to develop the knowledge of the indigenous fauna of his adopted land.

Professor Tate and Mr. Hedley are responsible for the work done upon some 2,000 mollusca, now preserved in the Australian Museum; and there has arisen good reason for believing that these are the survivors of a primitive fauna, and that many of them, under the effects of isolation and marked climatic changes, have acquired the habit of reproducing immediately the conditions are favourable. The

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[1] A. Willey, Quart. Journ. Micro. Sci. (N.S.), vol. clv, p. 323.
[2] H. A. Pilsbry, Proc. Acad. Nat. Sci. Philad., 1894, p. 69.
[3] C. Chilton, Trans. Linn. Soc. (Zool.), ser. II, vol. vi, p. 163.
[4] Farquhar, Journ. Linn. Soc. (Zool.), vol xxvi, p. 186. [Now in press.]
[5] G. M. Thomson, Trans. Linn. Soc. (Zool.), ser. II, vol. vi, p. 285.

land-shell fauna, but little known prior to the expedition, has been most considerably extended, and in its characters it is found to approximate that of Sub-Tropical West Australia.

The study of the Australian Mollusca, as you are aware, has played an important part in the recent revival of controversies concerning the history of the Australian continent, and notably in the delimitation of Tate's Larapintine or Central Eremian Region.

Mr. Hedley has contributed to the Report upon the Mollusca of the Horn Expedition, an appendix dealing with the anatomy of some few forms which were sufficiently well preserved for dissection, and has arrived at the instructive conclusion that in relying wholly upon salient superficial characters of shells and 'teeth,' we appear to be associating together species markedly distinct in the structure of their viscera. Mr. Hedley approaches the study of the Mollusca from the broader standpoint of Pilsbry, who has done so much for recent advancement of Malacology; and, since his work has thus a special value, I the more readily draw your attention to his ingenious theory[1] of instability of the 'Antarctica,' for in a combination of this with the theory of a South Pacific Mesozoic Continent, as originally conceived by Huxley, the nearest approach to the truth concerning that now vexed question appears to me to lie.

Progress in the study of minute anatomy and development during the year has borne good fruit; and foremost for recognition there stands the third part of F. Bernard's monograph[2] upon the hinge of the bivalved molluscs, to which I have already alluded, and upon which our Editor gave us, in the autumn, an instructive demonstration. Bernard's announcement that the ligament is invariably internal in origin, that the various types of cardinal teeth are due to irregularity in growth of a series of ridges, and that the ligament of the adult *Mytilus* is a secondarily formed structure which overrides the 'teeth,' is full of interest and importance. *Dreissensia*, in his hands, is removed from the Mytilidæ; and his discovery that, in respect to the retention of larval ('prodissoconch') crenulations and the non-development of true 'teeth,' the adult *Ostræa* and the Pectens are, as it were, persistently embryonic, is most luminous, seeing it comes at a time when the study of several of the great groups of animals is showing us that, as concerns individual organs, the lowest term is not unfrequently retained by the most generally specialized forms.

Since the publication of this most important monograph, Bernard has briefly announced the discovery,[3] among some mollusca collected by M. Filhol and others in the Islands of Stewart and St. Paul, of two new Pelecypoda, *Hochstetteria* and *Condylocardia*. For the latter he is compelled to create a new family; and the former excites

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[1] C. Hedley, Ann. and Mag. Nat. Hist., ser. VI, vol. xvii, p. 111.
[2] F. Bernard, Bull. Soc. Geol. France, ser. III, tom. xxiv, p. 412.
[3] F. Bernard, Bull. Mus. Hist. Nat. Paris, 1896, p. 193.

our interest greatly, for it appears to be a persistently embryonic Mytiloid with a wholly internal ligament.

It may be doubted if, in our superfluity of discussion upon animate nature as to what may have happened in the past, we are not prone to overlook that which may be happening to-day; and, for this reason, much interest appears to me to attach to a paper by Professor Brooks of Baltimore in which, returning to the study of an azygos, siphonal tentacle, which he described in *Yoldia* in 1874, he adduces reason for believing[1] that it is an organ "of late specialization. not thoroughly settled in position."

Continuing his work on the Pholadidæ, Sigerfoos, in a preliminary paper full of interest, has shown[2] that the larva of *Xylotrya fimbriata* is possessed of a long tongue-shaped 'foot' with a byssus organ, and of free mantle-lobes; and that burrowing is commenced by a conjoint mechanical action of the former and specially developed 'shell-teeth.' It is an interesting circumstance that during Sigerfoos' investigation Lloyd has advanced good reason for concluding[3] that in *Pholadidea penita* atrophy of the 'foot' takes place after that organ, by a muscular effort and the utilization of 'grit,' has excavated the burrow; and that in the case of the unfortunate oyster, Schiemenz has adduced facts which show[4] the opening of the valves by starfish, and Letellier[5] their excavation by the boring-sponge, to be due to the exercise of sheer force.

Had these discoveries been made in the teleological days of our forefathers, the need of protection against starfishes would probably have been accounted a sufficient explanation of the overgrowth of the molluscan shell by the mantle.

As our thoughts are thus directed to the shell-sac and the 'shell-gland,' it may be remarked that Schmidt claims[6] to have confirmed the observation of Gegenbaur, in 1851, that the shell of *Clausilia* lies originally in a closed sac. He asserts that the same is true of *Succinea*; and his investigation heightens our interest in a problematical organ of the young *Sepia*, which Hoyle in 1889 likened[7] to the 'shell-gland,' but which appears to me more nearly comparable to the aboral bursa of *Sepiella*.

The interest of Hoyle's observation is further increased by the recent discovery by Bather[8] that immediately after its liberation from the egg-capsule the young *Sepia* attaches itself by a sucker-like expansion of its mantle.

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[1] W. K. Brooks and G. Drew, Johns Hopkins Univ. Circ., vol. xv, p. 85.
[2] C. P. Sigerfoos, t.c., p. 87.
[3] F. E. Lloyd, Science (N.S.), vol. iv, p. 188. Cf. also Zool. Anz., Bd. xx, p. 14.
[4] P. Schiemenz, Mitth.-Deutsch. Seefischereiver., Bd. xii, No. 6. Transl. in Journ. Mar. Biol. Assoc. (N.S.), vol. iv, p. 266.
[5] A. Letellier, Bull. Soc. Linn. Normand., ser. IV, vol. viii, p. 149.
[6] F. Schmidt, Zoolog. Jahrb. (Anat. Abth.), Bd. viii, p. 318.
[7] W. E. Hoyle, Proc. Roy. Phys. Soc. Edinb., vol. x, p. 58.
[8] F. A. Bather, Journ. Malac., vol. iv, p. 33.

Early in the year our indefatigable foreign member, Dr. Dall, reviewing the "Challenger" monograph on *Spirula*, revived the belief in an adhesive function of the aboral disk of that animal, stating facts[1] which led him to regard it as a mechanical sucker-like organ. He suggests that the species is sedentary and that the exposure of the shell generally observed is due to the animal having been wrenched from its attachment, and seeks to thus explain its non-capture in the free state.

While writing this there reached me a monograph by Dr. Einar Lönnberg, of Upsala, reporting[2] upon the examination of a well-preserved *Spirula reticulata* in the Zoological Museum of that University, from which he has been able to supplement our knowledge of the anatomy of the genus. He attributes to the aboral papilla and its associated parts a sensory function; and, moreover, boldly challenges Pelseneer's association of the Spirulas with the Œgopsoids. Admitting them 'Œgopsoids' so far as their eyes are concerned, he formulates a remarkable argument for thinking them more closely related to the nearest ancestors of the *Sepia-Loligo* group, which he forsooth would seek among the Ammonites! Much curiosity attaches to the considerations upon which he reaches the conclusion that *Spirula*, *Spirulirostra*, *Belosepia*, *Sepia*, are not directly related to each other, but "a series of forms in which the development has pursued the same course."

'Aboral fixation' has been very much in the malacological air during the year; for, in addition to the foregoing, Ruedemann has referred to *Conularia*[3] an organism which attached itself by its 'apex'; and the limits of probability have been reached in a suggestion of Verrill's[4] that it may be a member of a primitive ancestral form of Dibranchiate Cephalopod, in which the initial secretion of the shell-gland of the veliger-like young served for attachment!

Concerning *Nautilus*, Willey only yesterday laid before the Royal Society a description of the mode of oviposition and of the ripe ova,[5] and has published further notes,[6] embodying more particularly interesting deductions from the study of the nepionic shell, and a recognition of variations which have led him to a belief in a new variety (*N. pompilius* var. *Moretoni*). Vayssière, too, has published[7] a lengthy memoir on the external characters of the genus; with especial reference to dimorphism and the spadix, unfortunately in apparent ignorance of Haswell's observations,[8] the full account of which has meanwhile appeared.

In December our eyes were startled by the appearance of a paper by

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[1] W. H. Dall, Science (N.S.), vol. iii, p. 243.
[2] E. Lönnberg, Lilljeborg Festskrift (Upsala, 1896), p. 99.
[3] R. Ruedemann, Amer. Geol., vol. xvii, p. 158.
[4] A. E. Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 80.
[5] Proc. Roy. Soc., vol. lx, p. 467.
[6] A. Willey, Quart. Journ. Micro. Sci. (N S.), vol. xxxix, pp. 145 and 227.
[7] A. Vayssière, Ann. Sci. Nat. Zool., ser. VIII, vol. ii, p. 137.
[8] W. A. Haswell, Proc. Linn. Soc. New South Wales, ser. II, vol. x, p. 544.

Dr. H. P. Blackmore, in which,[1] convinced of the invariable association of certain Aptychi and Belemnites, he would have us believe that *Aptychus leptophyllus*, *A. Portlockii*, and *A. rugosus*, were appurtenances of the Belemnite organism, homologous forsooth with the pro-ostracum! His arguments show complete disregard of a sense of proportion of the cephalopod body, and lack of knowledge of the elements of anatomy indispensable to the orientation of its parts. We wish we could accept them, but we cannot.

The details in development of the radula from an epidermal invagination have in *Paludina* been worked out by Bloch.[2] The investigations of Pelseneer, Brook and Drew, and F. Bernard, beforementioned, once again impress on us the importance of 'convergence'; and a result like Hedley's relegation of certain species of *Angasella*, *Chloritis*, and *Thersites* to Tate's genus *Xanthomelon*,[3] from a knowledge of their visceral as well as their conchological characters, once more emphasizes how indispensable is a knowledge of the anatomy of recent forms if truly scientific progress is to be made.

In the way of experimental work, popular interest centres on the oyster, upon which, in relation to typhoid and other diseases, official reports have appeared[4] during the year. The creature has proved itself a veritable arch-glutton of germs, sewage, and abominations generally. The discovery by Professors Herdman and Boyce that the typhoid bacillus does not flourish in clean sea-water, and (in conjunction with other investigators) that neither sewage nor fresh water are favourable media to its existence, is reassuring, and calls for a suspension of judgment on the luscious bivalve.

Boyce and Herdman,[5] Chatin,[6] De Bruyne,[7] and others, have considerably advanced our knowledge of the so-called 'greening' of the oyster, erroneously thought by some to be a secretory process. Special interest attaches to their discovery that it marks the removal of deleterious matter by the agency of migratory cells; and it is for us a cause of congratulation that the year which has seen Lister elevated to the peerage finds our Mollusca in the thick of the phagocytosis blood-gland inquiry, from which mankind has more to hope than from the armed forces of the world.

Nor are our chosen class of animals to be longer excluded from the field of experimental physiology, for they have creditably contributed to a recent comparative study of respiratory exchange with the outside world[8] at different periods of growth and under experimental influence.

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[1] H. P. Blackmore, Geol. Mag., 1896, pp. 529–33.
[2] I. Bloch, Jenaische Zeitschr., Bd. xxx, p. 356.
[3] C. Hedley, Rep. Horn Exped., pt. ii (Zool.), p. 224. Cf. also Summary, p. 153.
[4] "Oyster Culture in Relation to Disease": 24th Ann. Rep. by Medical Officer Loc. Gov. Board, 1896.
[5] R. W. Boyce and W. A. Herdman, Rep. Lancashire Sea Fish Lab., 1895, p. 6, and also Brit. Assoc. Rep., 1896, p. 663.
[6] M. J. Chatin, Comptes Rend., tom. cxxii, pp. 796 and 1556.
[7] C. de Bruyne, Arch. d. Biol., tom. xiv, p. 161.
[8] Cf. H. M. Vernon, Journ. Physiol., vol. xix, p. 28.

Interesting in its bearings upon the adaptability of the molluscan organism is some additional evidence that *Limax agrestis* may become carnivorous, and that it may eat dead earthworms and aphides.[1] Let it be remembered, however, that Hunter kept a sea-gull alive for a year on barley, that rabbits have been known to thrive on frogs, and that cows and horses have been for a considerable period fed on fish.[2]

This brings me to the consideration of the Mollusca in relation to the more advanced work in cytology, now occupying so much attention.

As the result of appreciation of the extent to which continuity between the protoplasmic constituents of the animal body may be observed, the extension of ideas opposed to the cell-theory, that were first put upon a broad basis by Heitzmann in 1883,[3] in the hands of Sedgwick,[4] Schuberg,[5] and others, has raised questions of serious modification in our conceptions of the Metazoon. On the other hand, the master minds of Von Kölliker, Retzius, and Y. Cajal, and their associates, as the result of perfection of improved methods of microchemical technique, have brought about the great generalization that that desperate complex, the central nervous and sensory epithelial apparatus, is composed of discontinuous cells and their derivatives, arranged after the manner of a felt and not as a net-work.

The challenging of the cell-theory, with all recent work on the minute structure of protoplasm, has concentrated attention on the nucleus; and of the extreme to which Hertwig, Weismann and their followers have carried their conceptions of the part played by that structure in heredity, I need but remind you.

In the progress of these vitally interesting lines of inquiry, the Mollusca have come to play no mean part. Their structural units are large; and so marked are their nuclear elements, that the so-called 'centrosphere'—the most debatable object among cytologists—may in some of them be readily seen without recourse to reagents. *Lymnæa* and *Succinea* were among the first animals the nuclei of which arrested the attention of Bütschli,[6] that pioneer in the study of nuclear division, in the early seventies; and the term 'amphiaster' was two years later applied by Fol[7] to one of the earliest established phases in the process, after observations upon Pteropoda. In the hands of Mark, *Limax campestris* becomes responsible for perhaps the most bulky treatise[8]

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[1] C. Oldham, Zoologist, ser. III, vol. xx, p. 264; and also F. V. Theobald, t.c., p. 307.

[2] Cf. W. H. Flower, *Medical Times and Gazette*, February, 1872, p. 217.

[3] C. Heitzmann, "Microscopical Morphology of the Animal Body in Health and Disease." New York, 1883.

[4] A. Sedgwick. Cf. Quart. Journ. Micr. Sci. (n.s.), vol. xxxvii, p. 87.

[5] A. Schuberg, Sitzb. Phys. Med. Ges. Würzb., 1893, p. 44. Cf. also J. A. Hammar, Arch. Mikr. Anat., Bd. xlvii, p. 14.

[6] O. Bütschli, Zeitschr. Wiss. Zool., Bd. xxv, p. 201.

[7] H. Fol, Arch. Zool. Exper., 1877, p. 147.

[8] E. L. Mark, Bull. Mus. Comp. Zool. Harvard, vol. vi, p. 173.

ever inspired by cytological investigation of the egg of a single animal; and in the researches of Barfurth,[1] which so far revolutionized our knowledge of the so-called 'liver' of the invertebrata as to early necessitate the abolition of that term, *Arion* and *Helix* rank foremost.

Claiming, on your behalf, a leading consideration for the Mollusca in questions cytological, allow me to remind you of the interest attaching to the work of Kofoid and Castle, which I brought under your notice last year. It has been followed by an elaborate investigation into the cell-lineage of *Limax maximus*, by Meisenheimer,[2] while Pflücke would appear to be contemplating work with the molluscan nerve-cell.[3] Von Lenhossek has given us a study of the Cephalopod optic lobe and retina,[4] which for masterly treatment has never been surpassed. It suggests that in comparative histology the molluscan eye will play a rôle no less important than it has in anatomy in the hands of Grenacher, and in controversy in those of Huxley and Mivart.

In purely experimental cytology, Fujita has made some interesting observations upon the egg *Aplysia*, which appear to show[5] that its derivative embryo-cells may overcome the efforts of mutilation; and Crampton, dealing with *Ilyanassa obsoleta*, has for the first time succeeded in making an extended experimental study[6] of isolated blastomeres, which is full of interest.

Platner has already done excellent work with the molluscan nucleus; and, during the year, Auerbach,[7] De Bruyne,[8] Kostanecki and Wierzejski,[9] Bolles-Lee,[10] and McMurrich,[11] dealing with the 'astrosphere' and 'centrosome,' have involved *Fulgur*, *Helix*, *Paludina*, and *Physa* in what future historians will probably record as one of the most remarkable biological controversies of our time.

With advance of knowledge, the appearances expressed in the beforementioned terms have been held indicative of the existence of a supposed organ of the cell, equal almost in rank with the nucleus; and Kostanecki and Wierzejski (following Boveri, who attributed to the 'centrosome' the initiation of divisional activity) in lately studying *Physa* have gone further, and argued that the stimulus to division of the developing egg-cell depends mainly on the protoplasm and centrosomes, which they regard as physiologically complementary.

Excitement concerning these structures reached its highest pitch in

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[1] D. Barfurth, Arch. Mikr. Anat., Bd. xxii, p. 473.
[2] J. Meisenheimer, Zeit. Wiss. Zool., Bd. lxii, p. 415.
[3] Max Pflücke, op. cit., Bd. lx, p. 500.
[4] M. von Lenhossek, Arch. Mikr. Anat., Bd. xlvii, p. 45.
[5] J. Fujita, Zool. Mag. Tokyo, vol. viii, p. 47.
[6] H. E. Crampton, Arch. Entwick. Mech., Bd. iii, p. 1.
[7] L. Auerbach, Jenaische Zeitsch., Bd. xxx, p. 405.
[8] C. de Bruyne, Bull. Acad. Belge, ser. III, vol. lvi, p. 241.
[9] K. von Kostanecki and A. Wierzejski, Arch. Mikr. Anat., Bd. xlvii, p. 309.
[10] A. Bolles-Lee, "La Cellule," tom. xi, p. 225.
[11] J. P. McMurrich, Anat. Anz., Bd. xii, p. 534.

1891, in the assertion by Fol that in the sea-urchin (*Strongylocentrotus lividus*) he had observed a complicated metamorphosis, to which he gave the name "*quadrille des centres*"[1] and attributed paramount significance in heredity. Fol did not long survive this, but more recently a French Botanist, Guignard, professes to have observed a similar metamorphosis[2] in the lily, wherefore it might appear to be of prime importance in organic development.

Attention unprecedented has this 'attraction sphere' received within the last five years. It always lies in the focal point of radiations of the cell protoplasm, and it has accordingly appeared to some that it marks a centre of attraction of a convergent, and to others of origination of a radiate, activity. With extending inquiry, however, Fol's and Guignard's assertions have been found erroneous,[3] and a growing suspicion has arisen that the centrosome is no organ of the cell, but merely a condensation point, indicative of the passage of some energy within the cell, of the nature of which we know nothing.[4] Concerning the astrosphere, Morgan has lately shown,[5] by experiment on the egg of certain Echini and Tunicates, that under treatment with 1·5 per cent. salt solution, vital activities are set up within the egg which result in the appearance *ad hoc* of 'astrospheres' that closely resemble those of normal divisional activity, and may be induced during periods at which, according to prevailing deduction, their appearance ought to be impossible.

In view of this, it may be asked whether with the egg, as with the adult organism, we are not in error in generalizing upon this or that part considered alone. The entire form and habitus of both animal and cell are the expression of co-ordinate activity between its different parts, which must be studied collectively.

We are stimulated by ideas, but we live and advance by knowledge.

Returning to the Mollusca with this thought in mind, we note that during the year Verrill has well-nigh demolished the long-languished 'schematic mollusk,' building up[6] a plausible argument for the origin of the great groups of Mollusca from free-swimming forms similar to the present veligers and pro-veligers. As concerning the truth that the Polyplacophora are in respect to their bilateral symmetry primitive, but in respect to the terminal anus highly specialized, his reasoning is most forcible. Our conceptions of larval forms of invertebrates have become less stereotyped with advancing years; and it may be remarked that since the appearance of Verrill's paper a most beautiful study of the larvæ of marine annelids has

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[1] H. Fol, Arch. Sci. Phys. et Nat. Geneva, ser. III, vol. xxv, p. 393. Also Anat. Anz., Bd. vi, p. 266, and Comptes Rendus Acad. Sci. Paris, tom. cxii, p. 877.
[2] L. Guignard, Ann. Sci. Nat. Bot., ser. VII, tom. xiv, p. 163.
[3] Cf. Wilson and Mathews, Journ. Morph., vol. x, p. 319; J. B. Farmer, Ann. Bot., vol. vii, p. 393.
[4] Cf. J. B. Farmer, Sci. Progress, vol. i (N.S.), p. 141.
[5] T. H. Morgan, Arch. Entwick. Mech., Bd. iii, p. 339.
[6] A. E. Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 91.

appeared by Häcker,[1] revealing evidence of structural dissimilarity among the various forms which, by analogy, materially strengthens Verrill's case. The construction of archetypes, and the creation of recesses in our classificatory schemes and museums for the reception of hypothetical ancestral groups, are objectionable practices; and we, therefore, the more regret the presence in Simroth's volume on the Acephala of the German Plankton Expedition of a supposed 'hypothetical primitive mollusc'—said to have lived between tide-marks in the littoral zone, and to have had a hemi-pelagic larva!

Many bushels of apples had fallen to the earth before that which led Newton to consider gravitation, and every milkmaid was aware of the fact which, in Jenner's mind, laid the foundation of the science of preventive medicine. But there are ideas and 'ideas.' In human progress no one does you a greater service than he who demolishes a heresy; and the real worker in science is he who fairly and squarely records a fact. If he have an idea, let him cherish it; another will ere long intersect it, much to his advantage.

Among workers in science we now meet with signs of uneasiness concerning the biological outlook; while in the popular mind the notion seems to have arisen that with the historical establishment of the principle of evolution the field is exhausted. To the serious student, however, definitions of classes which sufficed for our immediate predecessors will not suffice in the extended state of our knowledge. The characters common to all living members of a group are not those of all that have become extinct. Palæontology has shown us that many a structural feature which, from the study of the living alone, we have long regarded as the late outcome of a long series of evolutionary changes, has been anticipated in early geological times; and we are prone to inquire whether many of our existing groups do not carry us back to an assemblage of ancestors (i.e. may not be polyphyletic) rather than to a single progenitor as is generally assumed. In a word, the field is widening, especially in the department of palæontology, and its real extent is but now becoming obvious.

The significance of larval forms among invertebrates has been much under discussion in recent years. No one now dreams of attaching to the 'gastrula' the far-reaching phylogenetic significance which Hæckel claimed for it in 1873. The claims of the plakula, planula, and other early larval differentiations have to be considered.[2] Concerning the later-formed types of larvæ, I wish especially to point out that while during recent years the idea has grown that the Nauplius may be wholly secondary, Verrill, on behalf of our chosen class of animals, has recently defended[3] the earlier notion that

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[1] V. Häcker, Zeit. Wiss. Zool., Bd. lxii, p. 74; and also Zool. Jahrb. (Anat. Abth.), Bd. viii, p. 245.

[2] Cf. E. B. Wilson, Journ. Morph., vol. vi, p. 368, and also J. P. McMurrich, Biol. Lect. Wood's Holl, 1890 (Boston, 1891), p. 79.

[3] A. E. Verrill, Amer. Journ. Sci., ser. IV, vol. ii, p. 91.

they are primitive, and indicative of stages in phylogeny. His action imposes on us the necessity for paying foremost attention to those characters in mollusca which may be of larval significance, and especially to such as both living and fossil forms may present.

During the last few years, much interest has attached to a consensus of opinion among specialists that the Phyllopoda lie near the base of the Crustacean series, and to the growing idea that they may be closely related to the Trilobites. Beecher, from the study of specimens of *Triarthrus Becki*, in which the appendages are preserved, has substantiated this; and shown us,[1] what to my mind is incomparably more important, that in the Trilobite, as in the Nauplius, the first pair of appendages are prostomial, antenniform, and uniramous, and that the two pairs which follow are peristomial and biramous. When we consider further that the Trilobite in its general characters most nearly combines those of Nauplius and the Phyllopod, which is developmentally a sort of expansion of the Nauplius; that segmentation and 'cephalization' of the arthropod body are secondary processes, which can be accounted for by growth and development; that many of our decapods themselves pass through a Nauplius stage; and that the 'median eye' of the Nauplius has been found attached to the brain, altogether hidden beneath the exoskeleton, in adults of even the more familiar decapods[2]; our interest in the larva and in all questions of Crustacean phylogeny is heightened, in a manner impossible by any but the comparative morphological method.

Tasmania has recently yielded us,[3] in the *Anaspides* of Thomson, an annectant crustacean type; and within the last three months Calman, minutely comparing this with the Palæozoic pod-shrimps so long anomalous, has left little room for doubting[4] that it carries the decapod type a stage lower than the lowest living schizopod.

As affecting our views of the phylogeny of the Crustacea, the observations which I have here brought together appear to me to have achieved a far-reaching result, impossible from the exclusive study of either the living or the extinct: and when we consider that specialization of recent years has given us a school of zoologists brought up in little short of contempt for palæontology, it behoves us to take the lesson to heart. The observations do more; they demand of us a more careful study of palæontology, as a branch of morphology—especially as it may bear upon larval characters, and such particularly as may be retained by the adult in a condition capable of fossilization. They show us that we are wasting too much time and energy on speculation as to what may have happened during the evolution of living organisms, to the ignoring of what *has* happened; for, whatever may have been the changes, they must have left their impress in the rocks. I would

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1 C. E. Beecher, Amer. Journ. Sci., ser. IV, vol. i, p. 251. Cf. also Amer. Geol., vol. xv, p. 93.

2 Cf. C. Bumpus, Zool. Anz., Bd. xvii, p. 176.

3 G. M. Thomson, Trans. Linn. Soc. (Zool.), ser. II, vol. vi, p. 3.

4 W. T. Calman, Trans. Roy. Soc. Edinb., vol. xxxviii, p. 787.

thus plead for palæontology, not alone considered, however, as a field which is most likely to yield us tangible results which shall be worthy the name of scientific; and would direct your attention to work which may yet be done upon the protoconch, nepionic shell, and shell-growth, to the work already achieved in this direction by Hyatt for the Cephalopoda, and by Jackson and Bernard for the Pelecypoda, and to a laudable attempt which during the year has been made by the Countess von Linden to deal in the manner indicated[1] with the phylogeny of shell-ornamentation.

The determination of the nature of things will ever be impossible to us, with our limited senses; we can seek but the true reason of phenomena.

You reply that our vocations and the necessities of life are so varied that we cannot all be palæontologists and embryologists. True: but we can all meet in this room for mutual interchange of ideas and comparison of notes, which is the next best thing; and co-operation becomes the more necessary as the field enlarges. When, in this year of our national rejoicing, we reflect upon the resources of the Malacologist of 1837—Scientific Societies and Journals in their infancy; for books, Blainville, the elder Sowerby, Hanley, Deshayes, Lamarck, costly and scarce; biological laboratories undreamed of; the deep sea unknown; India and Polynesia a sealed book; no Zoological Record; no Herrmannsens' Index of Genera; no Agassiz; no Marschall; no Scudder; the difficulties of transport; and, above all, the lack of facility for personal intercourse with our fellow-workers—we are overwhelmed in the realization of progress and our sense of gratitude that in this England of ours the ideal of the world's requirements is most nearly to be found. Without wishing to be disrespectful, I am bold to assert that, to my mind, we in London, living under conditions such as are not to be obtained elsewhere in the wide world, with the eye of the universe upon us, and looked up to for guidance and authority, are not making the most of our opportunities of intercommunication. Personal interest, which should be the *bête noir* of the man of science, enters too frequently into our considerations; and not a few of our scientific papers which oft appear in private journals would be the better, our progress the healthier, and our task as investigators the easier, for the refining influences of public discussion and the editorial jurisdiction of a learned society.

The earnest student of science leads a charmed life; and 'work' is to him something nobler than a compulsory adjunct to the tedium of a round of pleasure and selfishness, since he lives in and for the sacred duty of unravelling the pages of Nature. As a method in Zoology, the inductive is his most reliable; but so long as he continues to observe, compare, and confirm, rejecting the non-confirmable, remembering that zeal without knowledge is in science futile, and that random rhetoric is not argument, he need have no

[1] Countess M. von Linden, Zeit. Wiss. Zool., Bd. lxi, p. 261.

fear for the future, 'practical wisdom' and the simple addition table notwithstanding. But as the Zoologist's is of all branches of science the most humanizing, let him make the best of access to his fellow-workers.

I now leave you in the hands of one more competent than myself to direct your path. I am what is known as a 'vertebrate man'; and, in retiring, I must thank you for the privilege of having been compelled to devote as much of my time and energy as could be spared to fields somewhat off my beaten track—a discipline which I can confidently recommend to you all. Under the circumstances in which I have been placed, I have done my best to serve you rather as a teacher, upon whom it is incumbent that he should keep a watchful eye on the whole field in his department of science. Let me assure you of my fullest sympathy in the future; and recommend to your earnest consideration, as Malacologists, an inspiration we owe to the Pearly Nautilus—

"Build thee more stately mansions, O my soul,
As the swift seasons roll!
Leave thy low-vaulted past!
Let each new temple, nobler than the last,
Shut thee from heaven with a dome more vast,
Till thou at length art free,
Leaving thine outgrown shell by life's unresting sea!"

THE DENTITION OF THE PUPIDÆ.

By the Rev. Professor H. M. Gwatkin.

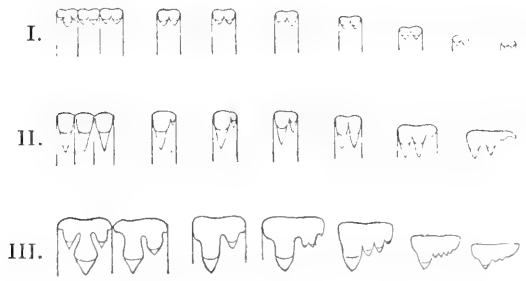
Read 12th March, 1897.

I am able to confirm Dr. Sterki's interesting discovery (Nautilus, vol. x, pp. 75–6) that *Vertigo edentula*, Drap., has the dentition of *Punctum*. I can add that it is the same with *Vertigo simplex*, Gld., if it be a distinct species. Dr. Sterki revives for these the generic name of *Sphyradium*.

The rest, however, of my Pupidæ are quite different. They are of two types—

(*A*) Central tooth uni- to bicuspid. Laterals bicuspid, inner cusp large. Outer teeth broad, multicuspid, inner cusp largest.

(*B*) Central tooth and laterals unicuspid, base longer than in *A*. Outer teeth bicuspid, occasionally approximating to the *A* type.



Series of teeth in radula of:

I. *Sphyradium edentulum*, Drap.
II. *Pupa megacheilos*, Jan.
III. *Pupa dolium*, Drap.

The list will stand thus:—

To *A* belong—*Pupa affinis*, Rossm.; *anconostoma*, Lowe; *armifera*, Say; *avenacea*, Brug.; *Braunii*, Rossm.; *Californica*, Rve.; *cinerea*, Drap.; *clausilioides*, Boub.; *contracta*, Say; *corticaria*, Say; *cylindracea*, Da C.; *dolium*, Drap.; *Eyriesi*, Drouet; *fallax*, Say; *frumentum*, Drap.; *Hunana*, Gredl.; *marginata*, Drap.; *milium*, Gld.; *Montserratica*, Fagot; *Mühlfeldtii*, Küster; *nana*, [?]; *pachygastra*, Ziegl.; *Pacifica*, Pfr.; *Partioti*, Moq.-Tand.; *procera*, Gld.; *Rhodia*, Roth; *ringens*, Jeffr.; *rugosula*, Sterki; *rupicola*, Say; *secalina*, Marts.; *Semproni*, Charp.;

umbilicata, Drap.; *unicolor* [?]; *variabilis*, Drap.; *Vertigo alpestris*, Ald.; *angustior*, Jeffr.; *antivertigo*, Drap.; *Bollesiana*, Morse; *Paradesii*, D'Orb.; *Rossiteri*, Braz.; *tridentata*, Wolf.

These are forty-one species in all, representing Europe, North America, Turkestan, Peru, China, and Australia.

To *B* belong—*Pupa Algesiræ*, Kob.; *amicta*, Parr.; *arenacea*, Brug.; *Bergomensis*, Charp.; *Bigorrensis*, Charp.; *Calpica*, Westerl.; *megacheilos*, Jan.; *quinquedentata*, Born; *scalaris*, Benoit; *secale*, Drap.; *similis*, Brug.

Eleven species of *Pupa*, all of them Mediterranean, except those of *P. avenacea*, Brug., and *P. secale*, Drap., range northward. The most typical of them are *Algesiræ*, Kob.; *amicta*, Parr.; and *megacheilos*, Jan.; which are strictly Mediterranean.

NOTES ON SOME TYPE-SPECIMENS IN THE BRITISH MUSEUM.

By Edgar A. Smith, F.Z.S., etc.

Read 12th March, 1897.

The British Museum has recently obtained from Mr. Sowerby the types of fourteen species of shells which formerly were in the collection of M. B. Thomas, of Brest. An examination of these, and a comparison with the collection of the British Museum, show that several of them had already been described, and were, in fact, merely old species with new names. It is hoped that the following notes will be useful in clearing up points which have probably appeared doubtful to those who may have studied the species in question. It is a very great advantage to have secured these types for the national collection, where they will always remain available to students and collectors. It is often quite impossible to estimate the validity of a species without seeing the actual type. So many incorrect identifications become disseminated, or the original descriptions or figures are so inadequate, that an examination of the type becomes necessary before we can properly estimate a species. Hence the importance of obtaining for our great national collection as many types as possible.

1. Conus Prevosti, Sowerby.

Proc. Zool. Soc., 1881, p. 636, pl. lvi, fig. 3.

Hab.—New Caledonia.

This very rare shell does not closely compare with any other known species. Perhaps it ranges nearer to *Conus convolutus* and *C. Neptunus* than to any other form.

2. Conus Crosseanus, Bernardi.

Journ. de Conch., 1861, p. 168, pl. vi, figs. 5, 6; Crosse, op. cit., 1878, p. 168, pl. iii, figs. 3, 3*a*; Bernardi, Monog. *Conus*, p. 13, pl. i, figs. 2, 6.

Hab.—New Caledonia.

This species is allied to *C. marmoreus*, but apparently distinct. The figures in Sowerby's Thesaurus and Tryon's Manual appear to represent a variety of that common species, "of which the triangular spots are more or less bluish and which is common at New Caledonia. That variety possesses neither the second veined network, nor the transverse rays of *C. Crosseanus*" (Crosse).

3. Conus fulvocinctus, Crosse.

Journ. de Conch., 1872, p. 214, and 1873, p. 248, pl. xi, fig. 3.

Hab.—West Africa.

This appears to be a good species, having no near ally. *Conus consanguineus*, Smith, has a similar fulvous band, but differs in form, being broader at the shoulder and consequently more narrowed anteriorly. The periostracum also is thicker than in the present species.

4. Murex Penchinati, Crosse.

Journ. de Conch., 1861, p. 351, pl. xvi, fig. 6.

Hab.—Nafu, Liou-Tcheou.

This species is identical in every respect with *Murex Huttoniæ*, Wright,[1] from New Caledonia. The latter is regarded by Tryon[2] as a "mere colour variation" of *M. adustus*, whereas *M. Penchinati* is allowed to stand as a distinct species. Having the advantage of comparing the type of the latter with specimens of the New Caledonian form, I have no hesitation in pronouncing them identical in every particular.

5. Murex Fournieri, Crosse.

Journ. de Conch., 1861, vol. ix, p. 352, pl. xvi, fig. 7.

Hab.—Japan.

Notwithstanding the slight differences pointed out by Lischke between this species and *Murex emarginatus*, Sowerby, 1840, I quite agree with Sowerby in uniting them. *M. unicornis* and *M. monoceros*, with which M. Crosse compares his species, belong to a different group, with which is also associated *M. Nuttallii*, Conrad, considered by Tryon practically the same as *M. Fournieri*.

6. Ricinula Reeveana, Crosse.

Journ. de Conch., 1862, p. 47, pl. i, fig. 3.

Hab.—Nouhiva, Marquesas Islands.

As pointed out by Tryon,[3] this so-called species is merely a variety of the well-known *Sistrum hystrix*, Lamk.[4]; indeed, beyond the fact of the spire being a little more elevated than usual, it does not differ from ordinary examples. It is quite distinct from the shell figured by Reeve[5] (a form of *Sistrum clathratum*), which M. Crosse supposed was the same as his *Reeveana*.

7. Cancellaria Semperiana, Crosse.

Journ. de Conch., 1863, p. 65, pl. ii, fig. 7.

Hab.—New Caledonia.

Quite distinct from all other forms.

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[1] Ann. Soc. Malac. Belgique, 1878, vol. xiii, p. 85, pl. ix.
[2] Man. Conch., vol. ii, p. 90.
[3] Man. Conch., vol. ii, p. 183.
[4] Küster, Conch.-Cab., *Purpura*, pl. xxxiii, fig. 1.
[5] Conch. Icon., pl. ii, fig. 9.

8. Cancellaria Angasi, Crosse.

Journ. de Conch., 1863, p. 64, pl. ii, fig. 8.

Hab. ?

Very different from the rest of the known recent forms.

9. Cancellaria Souverbiei, Crosse.

Journ. de Conch., 1868, p. 272, pl. ix, fig. 5.

Hab. ?

I cannot agree with M. Crosse in separating this shell from *Cancellaria crenifera*, the distinctions which he points out being very trivial, and in one particular inaccurate. He mentions the presence of a tooth at the upper part of the aperture, as if this were absent in *C. crenifera*, which is not the case.

10. Mitra Crouani, Crosse.

Journ. de Conch., 1868, p. 274, pl. ix, fig. 6.

Hab.—Gallapagos Islands.

I cannot accept M Crosse's decision with regard to the distinctness of this shell from *Mitra conica*, for in the Museum there are two full-grown specimens, of the same colour and same style of markings, that also have the characteristic transverse reddish lines, which, however, are much paler than in typical examples.

In the type of *M. Crouani*, which is only a young shell, the position of these lines is easily traceable upon the white markings, and the curious conical apices are similarly sculptured in all specimens. The locality "Gallapagos Islands" is probably erroneous.

11. Cerithium Gourmyi, Crosse.

Journ. de Conch., 1861, p. 171, pl. vi, figs. 1, 2.

Hab.—New Caledonia.

This remarkable shell is very distinct from all other forms of the genus. It varies in the amount of the brown colour-markings, a specimen in the Museum being plainer in this respect than the shell figured by Sowerby (Reeve's Conch. Icon., Mon. *Pyrazus*, fig. 3).

12. Clanculus Danieli, Crosse.

Journ. de Conch., 1862, p. 407, pl. xiii, fig. 5.

Hab.—New Caledonia.

This species does not belong to *Clanculus*, but has been correctly located in *Gibbula* by Pilsbry and Fischer. The apex of the spire is described by the three above-mentioned authors as purple-reddish, roseate, or rose-coloured, ignoring or overlooking the fact that the extreme tip of the spire, consisting of about two whorls, is always

whitish. It is the third whorl which exhibits the pink tint, the spiral liræ only being of this colour, and the interstices pale.

13. Monodonta Bourcieri, Crosse.

Journ. de Conch., 1863, p. 178, pl. vi, fig. 6.

Hab.—New Caledonia.

This species, which belongs to the genus *Euchelus*, has been described three times, Gould in 1849 having named it *Trochus* (*Monodonta*) *instrictus*, and A. Adams, in 1851, *Monodonta alveolata*. The latter appears to have escaped the notice of Mr. Pilsbry in his monograph of the Trochidæ in the eleventh volume of the Manual of Conchology, nor is it referred to by Fischer in the Icon. Coq. Viventes.

14. Trochus Fournieri, Crosse.

Journ. de Conch., 1863, p. 180, pl. vi, fig. 5.

Hab.—New Caledonia.

A very well-marked species of *Cantharidus*, distinguished by its elongate conical form and the very fine spiral striæ, visible only under the lens. The figure given by Fischer,[1] and copied by Pilsbry,[2] represents a coarsely granulated shell, totally unlike the type. Some mistake must have crept in, or the drawing is most faulty.

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[1] Kiener's Icon. Coq Viv. (*Trochus*), pl. cxix, fig. 1.
[2] Tryon's Man. Conch., vol. xi, pl. xlv, fig. 51.

DESCRIPTIONS OF SOME NEW SPECIES OF HELICOID AND OPERCULATE LAND-SHELLS FROM CEYLON.

By E. R. Sykes, B.A., F.Z.S., etc.

Read 12th March, 1897.

PLATE XVI.

The material on which the following pages are founded consists of some specimens collected by Mr. O. Collett and Mr. H. B. Preston: the number of new forms, exclusive of some not yet identified, is surprising, when the careful researches of Benson, Nevill, and others are borne in mind. Since both collectors are still at work, it is hoped that further discoveries await them, and that sufficient material for a faunal catalogue may eventually be obtained.

Save for one species (*Corilla anax*, Benson), the known forms of *Corilla* are confined to Ceylon, and are as follows:—

1. *C. Beddomeæ*, Hanley. Haycock Mountain (Beddome); near Watawala (Collett).
2. *C. Charpentieri*, Pfeiffer.
   C. Charpentieri var. *Hinidumensis*, Nevill.
3. *C. Colletti*, n.sp. Balangoda (Collett).
4. *C. erronea*, Albers. Kandy (Simon); Nuwara-Eliya (Simon); slopes of Pidrutalagala, at 7,000 feet (Preston).
   C. erronea var. *erronella*, Nevill.
5. *C. Fryæ*, Gude. Albion Estate, Lindula District (Mrs. Fry).
6. *C. Gudei*, n sp. Kurunegala, at 1,500 feet (Collett).
7. *C. Humberti*, Brot. Near Watawala, at 4,000 feet (Collett).
8. *C. odontophora*, Benson. Near Fort McDonald, Bandarawella, and Bibiligamua, at 4,500 feet (Layard); Alnwick and Kirklees Estates (Preston; very fine specimens).
9. *C. Rivolii*, Deshayes. Kandy (Nevill, Preston).

It will probably be most convenient for the purposes of recognition if the diagnoses of the two new forms of this genus are drawn up by means of comparisons instituted with their known allies.

1. Corilla Colletti, n.sp. Pl. XVI, Figs. 11–13.

Shape strongly recalling that of *C. Rivolii*, but the new species is much smaller in size. Sculpture also similar in nature, but finer and more closely set. The mouth in the present species not so much contracted and not quite so descending; the lip not nearly so reflexed or thickened. The palatal and parietal lamellæ are the same in number in both species, but in *C. Colletti* the former approach more nearly to the lip, especially the upper two. Of the parietal lamellæ, the upper and lower are more nearly parallel, and not so convergent, while the

middle one is much shorter than in *C. Rivolii*, and does not enter so far into the shell. Long. 21 to 21·25, lat. 14 to 15·5, alt. 6 to 5·75 mm.

Hab.—Balangoda, Ceylon (Collett).

2. Corilla Gudei, n.sp. Pl. XVI, Figs. 8–10.

Size and shape similar to those of *C. erronea*; the last whorl, however, more descending and more contracted at the spot where the lamellæ show most conspicuously through the shell. Sculpture nearly as strongly marked on the lower as on the upper surface; *C. Gudei* differing thereby from all other known Ceylon forms akin to it and recalling the Indian *C. anax*. Outer lip slightly more reflexed than in *C. erronea*; the mouth not so drawn out and slightly more rounded. Palatal and parietal lamellæ the same in number as in *C. erronea*, but somewhat shorter; differing also in situation by being more nearly parallel, especially (counting from above) the second and third palatal ones. Umbilical area more impressed in the present species. Colour a little lighter than in *C. erronea*; a few specimens have a rosy tint. Long. 23–22, lat. 16–17, alt. 7–6·5 mm.

Hab.—Kurunegala, at 1,500 feet, Ceylon (Collett).

As compared with *C. anax*, the present species differs in having one whorl more, the whorls being more flattened above, the lip more reflected, and the last whorl not so inflated or produced.

I have pleasure in dedicating the species to Mr. Gude, who has so recently reviewed the group.

3. Euplecta Colletti, n.sp. Pl. XVI, Figs. 5, 6.

Testa subperforata, tenuis, lineis incrementibus sculpta, sub lente obsolete minutissime granulosa, cornea, pellucida, infra ad basim, albotincta, pallidior; spira subdepressa, apice subprominulo, obsoletissime microscopice granulosa; anfr. 4½–5, subplani regulariter accrescentes, ultimus acute carinatus, antice non descendens, basi subinflatus; apertura quadrato-ovata; peristoma rectum, acutum, margine basali sub-arcuato. Diam. max. 21, min. 18 mm.; alt. 9 mm.

Hab.—Watawala, Ceylon (Collett).

This species is nearly related to the *Helix Isabellina* of Pfeiffer, of which I figure (Pl. XVI, Fig. 7), for the purposes of comparison, a specimen of about the same size as the new species, collected by Mr. Preston at Uda Pussellawa. The present species is smaller in size, and the apical sculpture is more obsolete. The whorls do not increase so rapidly, but with more regularity; whilst the almost entire absence of spiral striæ is noteworthy; the mouth is not so ovate, being more drawn out to one side. A fairly long series of this species has been examined.

4. Euplecta scobinoides,[1] n.sp. Pl. XVI, Figs. 1, 2.

Testa perforata, depresso-conoidea, superne confertim et arcuatim costulata, striis confertis spiralibus granulatim decussata, lutescenti-

[1] *Scobina*, 'a rasp.'

cornea, translucens, subtus nitidula, albido-cornea, fere lævis, radiatim striatula; spira subconoidea, apice obtusula, sutura marginata; anfr. 5–5½, plano-convexi, lente accrescentes, ultimus non descendens, ad peripheriam carinatus, carina marginata; apertura lunata; peristoma simplex, rectum, margine columellari ad perforationem breviter reflexum. Diam. max. 8·9, min. 8 mm.; alt. 4 mm.

Hab.—Watawala, Ceylon (Collett).

5. Polita notabilis, n.sp. Pl. XVI, Figs. 21–23.

Testa depresso-conoidea, striatula, nitida, grisco-cornea, tenuis, medioeriter et perspective umbilicata, apice acutula; anfr. 5, lente accrescentes, convexiusculi, sutura impressa; apertura lunato-ovalis; peristoma rectum, simplex. Diam. max. 5, min. 4·5 mm.; alt. 2·15 mm.

Hab.—Watawala, Ceylon (Collett).

It is almost hopeless to devise a description of a species of this form which will prove sufficient for its recognition, and the assistance of the artist must be called in if there is to be any hope of its identification by future workers. The genus *Polita*, although one would hardly expect to find it in Ceylon, appears conchologically quite suitable, and until we are acquainted with its anatomy the species may be placed there with *P. nitida*, etc.

6. Macrochlamys? circumsculpta, n.sp. Pl. XVI, Figs. 3, 4.

Testa perforata, convexo-depressa, nitida, cereo-hyalina; spira breviter conoidea, apice obtusa; sutura impressa; anfr. 5, convexi, arte convoluti, obsolete spiraliter lirati, ultimus non descendens, basi inflatus; apertura lunaris; peristoma rectum, acutum, margine columellari ad perforationem dilatato, subreflexo. Diam. max. 5, min. 4·7 mm.; alt. 3 mm.

Hab.—Watawala, Ceylon (Collett).

This species is nearly related to the *Helix Thwaitesi* of Pfeiffer (which is also obsoletely spirally lirate), but may be at once distinguished by the fact that its breadth is greater in proportion to the number of whorls. The umbilicus is also slightly smaller in the present species, the spire is not so much raised in proportion, and the nucleus is larger. The sculpture is stronger than in *H. Thwaitesi*, and a few of the stronger lines of growth intersect the revolving liræ, thus giving the shell a decussated appearance under a lens.

In 1871 Nevill recorded, under MS. names only, three species of *Cyathopoma* from Ceylon. Colonel Beddome, in 1875, described [1] one of these as *C. Ceylanicum*; and when describing another species from South India (*C. album*), recorded this latter doubtfully as from Dimbola, Ceylon. Dr. Jousseaume added *C. Mariæ* in 1894, which appears to be identical with Nevill's MS. *C. Dickoyense*; whilst the latter's third species is here described as *C. artatum*, so that all the manuscript names are now accounted for.

[1] Proc. Zool. Soc., 1875, pp. 442–53, pls. lii, liii.

Some specimens found by Mr. Preston at Uda Pussellawa appear to belong to *C. Mariæ*, which was described from Nuwara-Eliya.

I now describe three new forms.

7. Cyathopoma artatum, n.sp. Pl. XVI, Figs. 19, 20.

Testa dextrorsa, late et perspective umbilicata, depresso-turbinata, apice acutula, periostraco calcareo, deciduo, induta, sub hoc albido-cornea, polita; anfr. $4\frac{1}{2}$, regulariter accrescentes, spiraliter lirati, sub lente leviter transversim striati, ultimus carinis duabus supra peripheriam, unica ad peripheriam, et sex liris magis approximatis sub peripheriam et in umbilico, penultimus duabus carinis; apertura circularis, peristomate simplice, continue, intus leviter incrassato; operculum valde concavum, multispirale. Alt. 1·3, lat. 2 mm.

Hab.—Uda Pussellawa, Ceylon (Preston).

This minute species is noteworthy for being clothed with a periostracum of a very chalky nature, which, however, appears to be very easily rubbed off, and many specimens only fully exhibit it within the umbilical area. The three upper carinations are sharply edged, while those below the periphery and in the umbilicus are rounded and thread-like.

8. Cyathopoma Prestoni, n.sp. Pl. XVI, Figs. 17, 18.

Texta dextrorsa, elevata, pyramidalis, mediocriter et perspective umbilicata, periostraco brunneo leviter induta, apice obtusula; anfr. 5, regulariter accrescentes, leviter et obsolete spiraliter lirati, transversim striati, ultimus carinis obsoletis quinque (?), fere lævis in umbilico; sutura bene impressa; apertura fere circularis, continua, peristomate leviter intus incrassato. Alt. 2, lat. 1·5 mm.

Hab.—Uda Pussellawa, Ceylon (Preston).

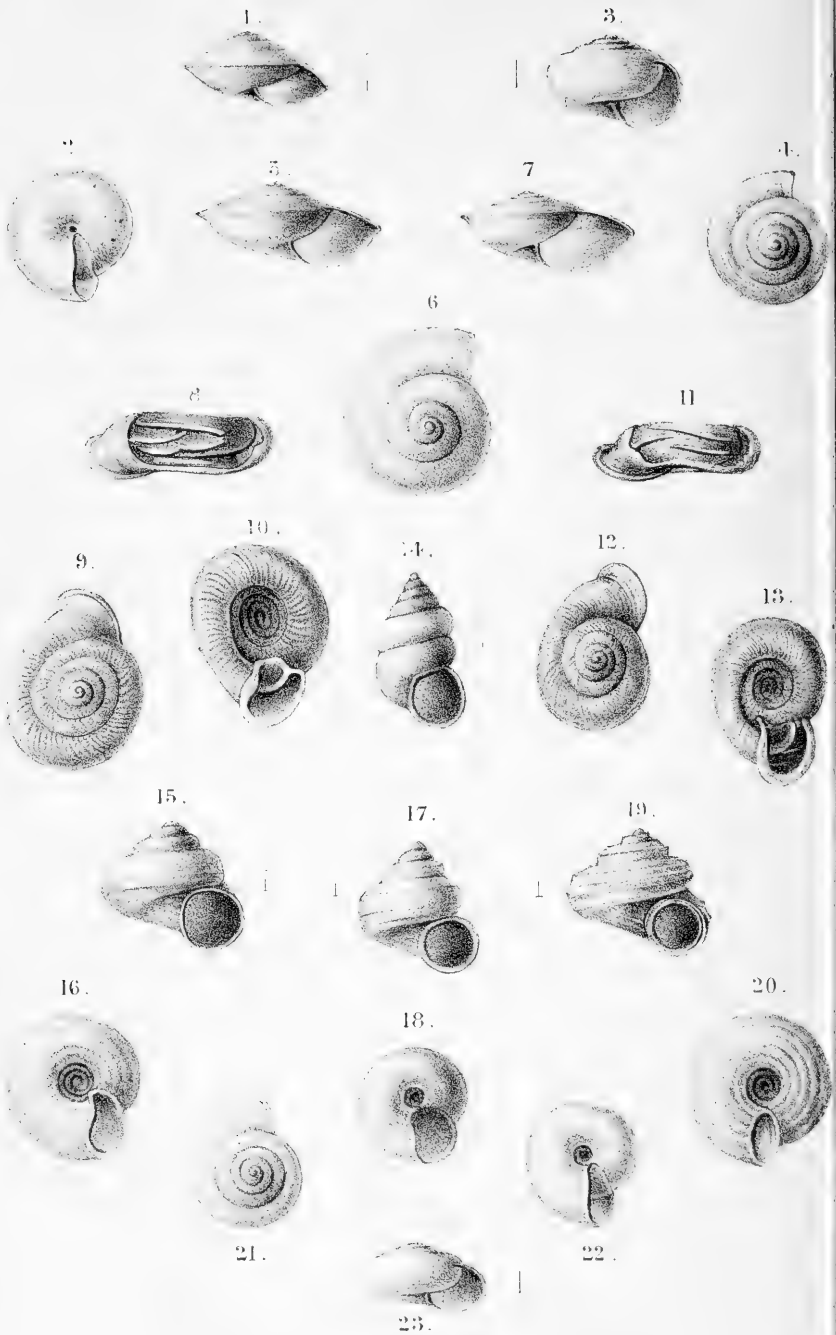
In form this species is intermediate between *C. Mariæ* and *C. artatum*, with a well-marked suture. The brown periostracum and nearly obsolete carinæ, with the almost smooth umbilical area, are its distinguishing features.

9. Cyathopoma turbinatum, n.sp. Pl. XVI, Figs. 15, 16.

Testa dextrorsa, depresso-pyramidalis, late et perspective umbilicata, periostraco brunneo levissime induta, apice obtusula; anfr. 5, celeriter accrescentes, leviter et obsolete spiraliter carinati, in umbilico lirati, ultimus carinis obsoletis quatuor, duabus supra et unica sub peripheriam, unica major ad peripheriam, liris sex (?) in umbilico; sutura impressa; apertura circularis. Alt. 2·2, lat. 2·5 mm.

Hab.—Uda Pussellawa, Ceylon (Preston).

At first sight this shell might be taken for a variety of *C. Shevaroyanum*, Beddome, from the Salem district, to which it is very nearly allied. It is, however, smaller, differs in the relative proportion of height to breadth (a specimen I have of *C. Shevaroyanum* measures: alt. 2·3, lat. 3 mm.), and is of a thinner texture. The carinations above are also not so strongly marked,



J. Green del. et lith. Mintern Bros. imp.

NEW LAND SHELLS FROM CEYLON.

while the liræ in the umbilicus are stronger and appear to be more numerous.

The *Diplommatina* of Ceylon are first mentioned under manuscript names by Nevill in 1871, and in 1875 Colonel Beddome described *D.* (*Nicida*) *Pedronis* and *D.* (*Nicida*) *Ceylanica*.

10. Diplommatina (Nicida) Prestoni, n.sp. Pl. XVI, Fig. 14.

Testa dextrorsa, vix rimata, elongato-ovata, glabra, hyalina, nitidula; spira conoidea, apice obtusula; sutura impressa; anfr. $5\frac{1}{2}$–6, convexi, primi regulariter crescentes, ultimus angustior quam antepenultimus, regione umbilicari impressa, basi subcarinata; apertura ovato-circularis, fere ovalis, peristomate incrassatulo, brunneo. Alt. 3·5, lat. 1·8 mm.

Hab.—Uda Pussellawa, Ceylon (Preston).

A handsome little hyaline species, with a brown peristome. It may be readily separated from *D. Pedronis*, its nearest ally, by its greater size and its difference in colour and shape. Traces of spiral sculpture may be seen on the last whorls.

Other examples of this genus were found by Mr. Preston, but since I am in doubt whether they belong to one or to two species, I forbear to describe them until further material comes to hand.

EXPLANATION OF PLATE XVI.

Figs. 1, 2. Euplecta scobinoides, n sp.
,, 3, 4. Macrochlamys? circumsculpta, n.sp.
,, 5, 6. Euplecta Colletti, n.sp.
,, 7. ,, Isabellina, Pfeiffer.
,, 8–10. Corilla Gudei, n.sp.
,, 11–13. ,, Colletti, n.sp.
,, 14. Diplommatina Prestoni, n.sp.
,, 15, 16. Cyathopoma turbinatum, n.sp.
,, 17, 18. ,, Prestoni, n.sp.
,, 19, 20. ,, artatum, n.sp.
,, 21–23. Polita notabilis, n.sp.

MALACOLOGICAL SOCIETY OF LONDON.

INCOME AND EXPENDITURE FOR THE YEAR ENDING 31st DECEMBER, 1896.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from last year	28	12	1	By Cost of "Proceedings"—			
,, Annual Subscriptions—				Printing and Postages £58 11 10			
Ordinary Members £43 9 6				Illustrating 24 9 10			
Corresponding Members 15 2 6					83	1	8
	58	12	0	,, Printing Circulars, etc.	3	12	6
,, Annual Subscriptions in arrear—				,, Postages and Stationery	4	1	8
Ordinary Members £1 1 0				,, Gratuities to Attendants, etc.	2	15	6
Corresponding Members 6 0 0				,, Purchase of £50 Metropolitan 2½ % Stock.	52	6	3
	7	1	0				
,, Annual Subscriptions in advance—							
Ordinary Members £4 14 6							
Corresponding Members 2 9 6							
	7	4	0				
,, Entrance Fees	3	13	6				
,, Donations for Illustrations	4	1	6				
,, Advertisements in "Proceedings"	7	6	6				
,, Sale of "Proceedings"	7	12	0				
,, Withdrawal from Deposit Account at Bankers	50	0	0				
,, Interest on Deposit Account and Dividends on £50 Metropolitan 2½ % Stock	0	19	1	,, Balance in hand	29	4	1
	£175	1	8		£175	1	8

We have this day examined the accounts of the Treasurer of the Malacological Society of London, and we find the above statement to be correct.

Geo. F. Harris, Hon. Treasurer.
29th January, 1897.

(Signed) { HENRY WOODWARD.
WALTER CROUCH.

ANNUAL MEETING.

Friday, 12th February, 1897.

Prof. G. B. Howes, Sec.L.S., etc., President, in the Chair.

Mr. F. Crawford and Mr. W. M. Webb were appointed scrutineers.

The following Report was read:—

"Your Council, in presenting their fourth Annual Report, have to detail a year of steady progress.

The Membership of the Society continues to increase, and the roll on December 31st stood as follows:—

Ordinary members	95
Corresponding members	67
Total	162

as against 158 in 1895, and 153 in 1894.

During the past year eleven new Members have been elected, five have resigned, and two, namely Mons. A. Brot and Herr B. Schmacker, have been removed by death. One Member has been transferred from the Ordinary to the Corresponding list; while two candidates awaited election at the close of the year.

Your Council think it may be of interest to place on record the Geographical Distribution of the Corresponding Members, which is as follows: Europe 20, Australasia 24, North America and West Indies 9, India and Ceylon 6, South Africa 5, and one each in Egypt, the Philippines, and the Hawaiian Islands.

The finances of the Society are still in a flourishing condition. After payment of all liabilities there remains a balance of £29 4*s*. 1*d*. in the Treasurer's hands. The sum of £50 placed on deposit at our Bankers, as announced in last year's Report, has been withdrawn, and the sum of £52 6*s*. 3*d*. expended in the purchase of £50 Metropolitan $2\frac{1}{2}$ per cent. stock.

The Presidential Address was delivered on February 14th, 1896, and twenty-seven communications by seventeen authors have also been made to the Society.

Since the last Annual General Meeting three more numbers of the 'Proceedings' have been issued, forming the first portion of Vol. II, and comprising 136 pages with ten plates and numerous illustrations in the text. Another part is in course of preparation.

Your thanks are due to the following gentlemen, who have borne a large proportion of the cost of the illustrations, or have assisted by furnishing the drawings: R. H. Burne, W. E. Collinge, G. C. Crick, W. Garstang, G. Gilson, G. K. Gude, J. C. Melvill, E. A. Smith, G. B. Sowerby, H. Suter, and E. R. Sykes.

Further, your thanks are specially due to the Council of the Linnean Society, through whose kindness the Society has, as in previous years, been permitted to hold its meetings in Burlington House."

On the motion of Mr. W. M. Webb, seconded by Mr. A. S. Kennard, the above was adopted as the Annual Report of the Society. The following were elected as the Officers and Council for the year 1897:—

President.—Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc.

Vice-Presidents.—Prof. G. B. Howes, Sec. L.S., etc.; J. Cosmo Melvill, M.A., F.L.S., etc.; Rev. R. Boog Watson, LL.D., F.Z.S., etc.; Dr. H. Woodward, F.R.S., etc.

Treasurer.—G. F. Harris, F.G.S., etc.

Secretary.—E. R. Sykes, B.A., F.Z.S., etc.

Editor.—B. B. Woodward, F.L.S., etc.

Six other Members of Council.—S. I. Da Costa; H. W. Monckton, F.L.S., etc.; R. Bullen Newton, F.G.S., etc.; E. A. Smith, F.Z.S., etc.; G. B. Sowerby, F.L.S., etc.; Lieut.-Col. W. Wilmer.

The retiring President delivered an address, in which he dealt with the progress of Malacology during the past year.

The following motion, proposed by Dr. Woodward, and seconded by Mr. Da Costa, was passed unanimously: "That a vote of thanks be given to the President for his address; and that the address be printed *in extenso* in the 'Proceedings' of the Society."

Votes of thanks were passed to the Retiring Officers, Auditors, and Scrutineers.

ORDINARY MEETING.

Friday, 12th February, 1897.

Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc., President, in the Chair.

The Rev. E. G. Alderson was elected a member of the Society.

ORDINARY MEETING.

Friday, 12th March, 1897.

Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc., President, in the Chair.

The following were elected to membership of the Society: R. A. Bullen, Adrien Dollfus, W. A. Herdman.

The following communications were read:—

1. "On the Dentition of the Pupidæ." By the Rev. Professor H. M. Gwatkin.

2. "Notes on some Type-specimens in the British Museum." By E. A. Smith, F.Z.S., etc.

3. "Note on *Mitra obscura*, Hutton." By H. Suter.

4. "Descriptions of some new Helicoid and Operculate Land-shells from Ceylon." By E. R. Sykes, B.A., F.Z.S., etc.

Mr. E. A. Smith exhibited specimens of *Sitala Barrakporensis*, Pfr., from Africa, and remarked that the species was originally described by Pfeiffer as *Helix Barrakporensis*, from Barrakpore. It had since been

quoted from other parts of India by Godwin-Austen and others; he himself had recorded its occurrence in the heart of Madagascar, whilst Melvill and Ponsonby had described it as a new species from the Transvaal under the name of *Helix* (*Trochonanina*) *Pretoriensis*, and the British Museum had received a single specimen from Ashanti collected by Mr. R. Austen Freeman. The specimens now exhibited came from Tomba in British Central Africa.

This would appear to be the only instance of a land-shell which was common to India and Africa, and therefore lends but very slight support to the theory of a former land connection between those parts of the world. Species, said to belong to the genus, have been described from China, Java, and the Philippine Islands, and certain Bornean and Australian species had been referred to it.

Mr. Smith also exhibited specimens in illustration of his paper.

Mr. G. B. Sowerby exhibited a large specimen of *Argonauta argo*, L., from the Moluccas.

Mr. E. R. Sykes exhibited specimens in illustration of his paper.

ORDINARY MEETING.

Friday, 9th April, 1897.

Dr. H. Woodward, F.R.S., etc., Vice-President, in the Chair.

Dr. T. H. May was elected a member of the Society.

The following communications were read:—

1. "The Mollusca of the English Cave-Deposits." By A. S. Kennard and B. B. Woodward, F.L.S., etc.
2. "Revision of the New Zealand Athoracophoridæ." By H. Suter.
3. "The Land Mollusca of Stewart Island." By H. Suter.

Mr. G. B. Sowerby exhibited a long series of land-shells from Cuba; also a large specimen of *Voluta mamilla*, Gray, from Tasmania.

Mr. A. S. Kennard and Mr. B. B. Woodward exhibited specimens in illustration of their joint paper, and *Pisidium milium*, Held., from the Holocene deposits in the Kennet Valley, near Newbury, Berks; Mr. Woodward also exhibited specimens of *Patula Cumberlandiana*, Lea, from the original habitat.

On behalf of Mr. E. H. Matthews were exhibited six- and seven-valved Chitons from S. Australia. (Cf. ante, p. 154.)

THE MOLLUSCA OF THE ENGLISH CAVE-DEPOSITS.

By A. S. Kennard and B. B. Woodward, F.L.S., etc.

Read 9th April, 1897.

Although the vertebrate remains from our caves have been most assiduously collected by numerous geologists, it has apparently never occurred to them that the accompanying mollusca were of any interest whatever; and though there can be no doubt that they have been found in the numerous caverns which have been explored, more or less thoroughly, with a pickaxe, it is only on one or two occasions that their presence has been noted, and then they have been dismissed with the remark that "numerous shells of *Helix* were found in the stalagmite." This absence of record would, nevertheless, be no loss, had the specimens been preserved, which, unfortunately, has not been the case. Recently, however, through the generosity of Mrs. Pengelly, the British Museum (Natural History) has acquired, amongst other cave specimens, a small series of shells from the Happaway Cavern, near Torquay. The only published notice of them is that by the late Mr. W. Pengelly[1]: "Shells of terrestrial mollusca were more numerous and varied, but those of *Helix* were the most prevalent."

The species are seven in number, viz.:—

Vitrea cellaria, Müll.
,, *alliaria*, Mill.
Pyramidula rotundata, Müll.
Helicella caperata, Mont.
Helix nemoralis, Linn.
,, *hortensis*, Müll.
Pomatias elegans, Müll.

Two examples of *Vitrea lucida*, Drap. (= *V. Draparnaudi*, Beck), were also in the collection, but they are obviously from the top soil.

By far the most important cave-deposit in this country is the well-known Ightham fissure, from which such a rich harvest of vertebrate and invertebrate remains has, with infinite labour, been obtained by Mr. W. J. Lewis Abbott, F.G.S., during the past few years. In his paper describing this deposit,[2] seventeen species of mollusca are recorded as having been found, but since then further material has come to light, and this Mr. Abbott has very kindly placed at our disposal, a kindness for which we would take this opportunity of cordially thanking him. Twelve fresh records have thus been added, bringing the total up to twenty-nine species, viz.:—

Limax maximus, Linn.
Agriolimax agrestis, Linn.
Vitrea crystallina, Müll.
,, *alliaria*, Mill.
,, *Helvetica*, Blum.
,, *nitidula*, Drap.
,, *radiatula*, Ald.
Vitrea cellaria, Müll.
,, *fulva*, Drap.
Pyramidula rotundata, Müll.
Helicella ericetorum, Müll.
,, *caperata*, Mont.
Hygromia hispida, Linn.
,, *umbrosa*, Partsch.

[1] Trans. Devon Assoc., 1886, vol. xviii, p. 165.
[2] Quart. Journ. Geol. Soc., vol. l, pp. 182–185.

Vallonia pulchella, Müll.
Helicigona lapicida, Linn.
,, *arbustorum*, Linn.
Helix nemoralis, Linn.
,, *hortensis*, Müll.
Pupa muscorum, Linn.
Vertigo minutissima, Hart.
Clausilia bidentata, Ström.
Clausilia laminata, Mont.
Cochlicopa lubrica, Müll.
Cæcilianella acicula, Müll.
Succinea oblonga, Drap.
Carychium minimum, Müll.
Pomatias elegans, Müll.
Unio, sp.

It will at once be noticed that the species from the Devon cavern also occur at Ightham, but their number is so small that a true comparison is not possible. It is interesting, however, to note that *Pomatias elegans* and *Vitrea alliaria* are unknown from any of the other Pleistocene deposits in this country, although present in the Holocenes of Essex. In a MS. of the late Dr. S. P. Woodward, the former shell is recorded from Kent's Cavern. This is probably correct, though no examples are known to exist. Many of the shells from both localities retain some of their coloration, but the Ightham examples are by far the better preserved. This fact has been used as an argument against their presumed age. The condition of a fossil does not, however, depend on its age (the Eocene shells of the Paris Basin being noteworthy examples), and the fine preservation of these fissure shells arises from the exceptional conditions under which they were preserved.

In the Happaway Cavern, *Pomatias elegans* is the commonest form, *Vitrea cellaria* coming second, whilst *V. alliaria*, *Helicella caperata*, and *Helix hortensis* are represented by single examples only. With the Ightham shells, *Vitrea cellaria* is the most abundant, several hundred examples of all ages having passed through our hands. Its prevalence is perhaps accounted for by the fact that at the present day it is largely a cave-dweller. *Agriolimax agrestis* and *Vitrea radiatula* are only known from solitary specimens.

Vitrea Helvetica, Blum., is the British shell commonly known as *V. glabra*, Stud. We have, however, Dr. Westerlund's authority for this change of name, and there can be no doubt that our shell differs from Studer's species. Two examples have been found. It has hitherto never been recorded fossil in this country.

Hygromia umbrosa, Partsch, is by far the most noteworthy form,

Hygromia umbrosa, Partsch. × $2\frac{1}{2}$.

since it has not been met with previously on this side of the Channel. Its present range is Southern Germany, Bohemia, Switzerland, Silesia,

and the Carpathians, and, according to Mörch, near Holstenborg in Denmark. In a fossil state it has only been recorded from the Middle Pleistocene of Leuben near Lommatzsch, and Robschütz near Dresden, and from the Upper Pleistocene of Weimar. Four examples have rewarded Mr. Abbott's labours, two of which are immature.

Helix nemoralis, Linn. The examples of this species are very fine, and exhibit those differences of coloration observable in recent examples. Several of the immature individuals had an open umbilicus, and in one instance this had persisted in the adult.

Carychium minimum, Müll. Two examples of this species differ so much from the type as to merit extended notice. They are much more slender in form, not exceeding ·75 mm. in width, but being quite 2 mm. in height. The whorls are six in number, more closely coiled, and consequently longer, and increase more gradually all through, so

Carychium minimum, Müll., var. × 12.

that the spire is higher and more tapering. The body-whorl is much less in proportion. The mouth is more rounded and not constricted at the outer tooth; on the other hand, the tooth itself is greatly reduced, and is represented by a mere thickening of the labrum. The columella-teeth are not more than one-third the size of those in recent examples, and occur far back inside the whorl, so as to be invisible when the shell is viewed obliquely. The peristome is more reflected and less thickened.

Limax maximus and *Clausilia laminata* are new records for the Pleistocene of this country, besides those already mentioned.

Unio is only represented by small fragments far too minute for specific determination.

Considerable difference of opinion still exists as to the true age of the Ightham fissure, and unfortunately the mollusca throw but little light on the question. That it is Pleistocene, is shown by the presence of *Hygromia umbrosa* and *Succinea oblonga*, as well as by the absence of all characteristic Holocene shells; but, at the same time, the almost total absence of fresh-water forms precludes a comparison with other Pleistocene deposits, in which the latter are so abundant. This absence of fresh-water mollusca has been used as an argument against the fluviatile origin of the contents of the fissure; it is noteworthy, however, that the stream flowing through the valley in which it is situate contains no mollusca.

Taken altogether, the shells from our cave-deposits are decidedly larger than recent examples; and there can be no doubt that there has been a marked diminution in the size of our indigenous mollusca, and probably also in their numbers, since Pleistocene times.

A REVISION OF THE NEW ZEALAND ATHORACOPHORIDÆ.

By Henry Suter.

Read 9th April, 1897.

During the last few years I have tried to get specimens of our native slugs from as many localities as possible, and the material thus brought together, comprising all the species known, enables me to attempt this revision. Since publishing the "Reference List of the Land and Fresh-water Mollusca of New Zealand,"[1] in 1893, Mr. W. E. Collinge has described *Janella maculata*[2] from specimens I sent him, collected in the Forty Mile Bush, North Island. As will be shown later on, I do not consider Mr. Collinge's species new; however, its creation has demonstrated that we have more distinct species than I was willing to admit in the "Reference List."

Then Cockerell's *Neojanella dubia*[3] required investigation, as well as Simroth's *Athoracophorus marmoratus*. The former I considered to be synonymous with *A. bitentaculatus*, Quoy & Gaim., the latter with *A. marmoreus*, Hutton, but in both cases I was wrong. Specimens are now in my possession, and on examining and dissecting them I convinced myself that my former conclusions were erroneous.

A new species, *A. Simrothi*, which exteriorly is very distinct from all the other species, has been described in these Proceedings (ante, p. 34), and with another interesting new species brings up the number of known species to eight, three only having been admitted in the "Reference List."

Mr. Collinge was no doubt quite right when, in concluding his paper (t.c., p. 530), he expressed the opinion that the whole family Janellidæ required revision, and that a series of coloured drawings taken from living specimens should be provided. Unfortunately my means are too limited to undertake the latter task; while with regard to the present revision of the New Zealand Athoracophoridæ I am fully aware that it is very far from being exhaustive, leaving many questions concerning the members of this very interesting family untouched, especially their more detailed anatomy.

The very peculiar and interesting structure of the eyes, as demonstrated by Dr. Simroth in *A. marmoratus*,[4] on which he based his

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[1] Proc. Linn. Soc. New South Wales, ser. II, vol. vii, pp. 613-665.
[2] Proc. Zool. Soc., 1894, p. 527.
[3] Proc. Zool. Soc., 1891, p. 217.
[4] Nova Acta Acad. Cæs. Leop. Carol., Bd. liv, p. 76, pl. iv, figs. 19, 20.

division of the Stylommatophora (t.c., p. 85) into Pleurommatophora (true land-pulmonata) and Mesommatophora (Athoracophoridæ), seems not to be generally known, though highly important.

One of our species, *A. marmoratus*, Mts., approaches the genus *Aneitea* in the situation of the anus close to the mantle-area. There is no diverticulum of the crop in *Athoracophorus*, such as occurs in *Aneitea Graeffei*, according to Keferstein and Bergh, the crop having been taken for the stomach. A renal duct is always present in *Athoracophorus*, but it seems to be wanting in *Aneitea*.

Key to Species.

A. Mantle-area not defined.

a. Colour dirty yellow, with darker spots and dashes.

b. Body semi-cylindrical, long and narrow, dorsal grooves slight, penis *narrowed abruptly* in the middle, thence convolute and thin. *dubius*.

bb. Back much more flattened, dorsal grooves more distinct, penis *narrowing gradually* towards its distal end. *bitentaculatus*.

aa. Colour dirty yellow, without spots. Penis short, no convoluted distal portion. *antipodarum*.

AA. Mantle-area well defined.

a. Anal opening near the foot margin, below the pulmonary orifice.

b. Back more or less strongly granulate and papillate.

c. A few slightly larger papillæ in each lateral area on the back, which are not very conspicuous. Free oviduct not dilated. *papillatus*.

cc. One, or usually two, large, conspicuous papillæ of lighter colour in each lateral area on the back, near the median dorsal groove. Free oviduct dilated. *Dendyi*.

ccc. The whole back covered with large, oval papillæ, giving it a grape-like appearance. *Simrothi*.

bb. Back smooth, or faintly granulate, colour dark, marbled. *marmoreus*.

aa. Anal opening outside the right anterior angle of mantle-area. Largest species. *marmoratus*.

Fam. ATHORACOPHORIDÆ,

Including the genera *Athoracophorus*, Gould; *Aneitea*, Gray; ? *Aneitella*, Cockerell.

Genus ATHORACOPHORUS, Gould.

Gould, U.S. Explor. Exped. Moll., vol. xii (1852), p. 1.

(*Janella*, Gray, 1850, *non* Grateloup, 1838.)

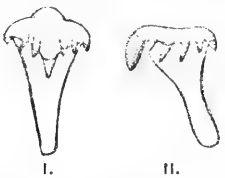
Sect. I. ATHORACOPHORUS, s.s.

1. ATHORACOPHORUS BITENTACULATUS (Quoy & Gaimard).

Limax bitentaculatus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. ii (1832), p. 149; Atlas, Moll. pl. xiii, figs. 1–3.
Janella maculata, Collinge, Proc. Zool. Soc., 1894, p. 527.

For all other references, see Journ. de Conch., vol xli (1893), p. 234.

Among some specimens of *Athoracophorus*, which I sent to Mr. Collinge as *A. bitentaculatus*, he found two differing from the rest in being much flatter, of dirty yellow ground-colour and with numerous black spots and dashes, and these he described as a new species, *Janella maculata*, giving a good account and figures of its anatomy. There is, however, not the least doubt but that the specimens I collected in the Forty Mile Bush, and of which I sent some to Mr. Collinge, consisted of *A. bitentaculatus* and *A. antipodarum*, at that time considered to be one species. Collinge, however, has shown that the two are quite distinct, and herein lies the great merit of his investigation. It is



Athoracophorus bitentaculatus (Quoy & Gaim.).

I. Central tooth of radula. II. Sixth lateral tooth of radula. Both × 720.

evident that the specimens referred by him to *Janella maculata* are in fact *Athoracophorus bitentaculatus* (Quoy & Gaim.). The authors distinctly mention[1] that their species has brown spots: "La couleur de ce mollusque est d'un jaunâtre sale tacheté de brun clair."

I have dissected a number of what I consider to be typical *A. bitentaculatus*, and found them to agree with Collinge's new species.

The mantle-area is not defined, and is bordered, in front only, by a lateral groove, which runs down to the anal orifice; sometimes a fine line is found outside the pulmonary orifice parallel to the median dorsal groove, but there is no posterior limitation. In front of the pulmonary orifice is a small triangular area of lighter colour, with the renal orifice, in the median dorsal groove; this was taken for the anal opening by Knight, and for a mucous pore by Captain Hutton. The outflow and distribution of the renal secretion over the whole back of the slug were well described by Knight.[2]

[1] Voy. Astrolabe, Zool. vol. ii, p. 148.
[2] Trans. Linn. Soc., vol. xxii, p. 381.

The exact dimensions of a medium-sized spirit specimen are: —

1. Length over back from head to tip of tail, 33 mm.
2. Length of sole, 31 mm.
3. Width of back, 10 mm.
4. Breadth of sole, 3·5 mm.
5. Breadth of groove between sole and back, 2·5 mm.
6. Distance of anus from right tentacle, 6 mm.
7. Distance of anus from pulmonary orifice, 5 mm.
8. Distance of pulmonary orifice from head, 8 mm.

Median dorsal groove continued to the head. Anal opening close to foot margin. Genital opening close behind the right tentacle. Young specimens found near Auckland had only an oval space round the pulmonary orifice, coloured dirty yellow; the others lacked pigmentation, being semi-transparent, whilst some of the internal organs could easily be distinguished. In alcohol they became opaque like other specimens.

A. bitentaculatus is the most common species of the genus, and is more abundant in the North Island than in the South, where *A. papillatus* partially takes its place. It is said to occur also on the Chatham Islands, but I have not seen any specimens from that locality.

2. Athoracophorus antipodum (Gray, *em.*).

Janella antipodarum, Gray: Ann. Mag. Nat. Hist., vol. xii (1853), p. 414; and Proc. Zool. Soc., 1853, p. 112.
A. bitentaculatus, *auct.*, *non* Quoy & Gaimard.

The back is more rounded than in *A. bitentaculatus*, the colour brighter, and spots or dashes of brown or black are entirely absent. Its generative system was described and figured by Collinge[1] under the name of *Janella bitentaculata*, showing that *Athoracophorus antipodarum* is really distinct.

Gray does not give any special description of the species, but bases on it the diagnosis of his genus *Janella*. Cockerell, on examining the type-specimen in the British Museum, made it a *form* of *A. bitentaculatus*, saying "the variety differs from the type in being without spots."[2] This evidence shows that Collinge's *Janella bitentaculata* is really *Athoracophorus antipodarum*, and that his *Janella maculata* must be *Athoracophorus bitentaculatus*. There is only one other species of the section *Athoracophorus*, *A. dubius*, which has the same colour-markings as *A. bitentaculatus*. It differs from the latter, however, in several points, as will be shown further on.

A. antipodarum is distinguished from *A. bitentaculatus* by the absence of darker spots, the more highly rounded back, the long

[1] Proc. Zool. Soc., 1894, pp. 528, 529.
[2] Proc. Zool. Soc., 1891, p. 217.

tube-like position of the free oviduct, the much shorter penis, sharply distinct from the *vas deferens* (Collinge). The dentition shows no difference of any importance. Gray mistook the anus for the orifice of the reproductive organs, a mistake already corrected by Captain Hutton and P. Fischer, and does not say where he considers the anus to be situated. The dimensions and the openings of the different organs are almost the same as in *A. bitentaculatus*.

This species is rather rare, and I have not seen it from any other locality than the Forty Mile Bush, North Island, and Capleston, South Island.

3. Athoracophorus dubius (Cockerell).

Neojanella dubia, Cockerell: Proc. Zool. Soc., 1891, p. 217.
A. bitentaculatus, Suter, *non* Quoy & Gaimard.

The genus *Neojanella* was founded by Cockerell on the absence of a mantle-area and dorsal grooves. The former condition is common to the two species already mentioned, whilst the absence of dorsal grooves in a single spirit specimen is no proof that they are also absent in others. Heynemann has already pointed out[1] that the visibility of the dorsal grooves in Athoracophoridæ is dependent on the degree of contraction of the epidermis. I have many times had reason to confirm Heynemann's statement; it entirely depends on the mode of preservation whether the grooves will be very distinct or the reverse.

The specimen in the British Museum forming Cockerell's type is from the south side of Cook Strait, exact locality not stated. Judging from the description published by Cockerell, I took his *Neojanella dubia* to be only a large specimen of *Athoracophorus bitentaculatus*.[2] I have, however, been able to procure specimens of what I take to be his species from Pelorus Valley, also south side of Cook Strait, and the following data will help to show that it is distinct from *A. bitentaculatus* and a valid species.

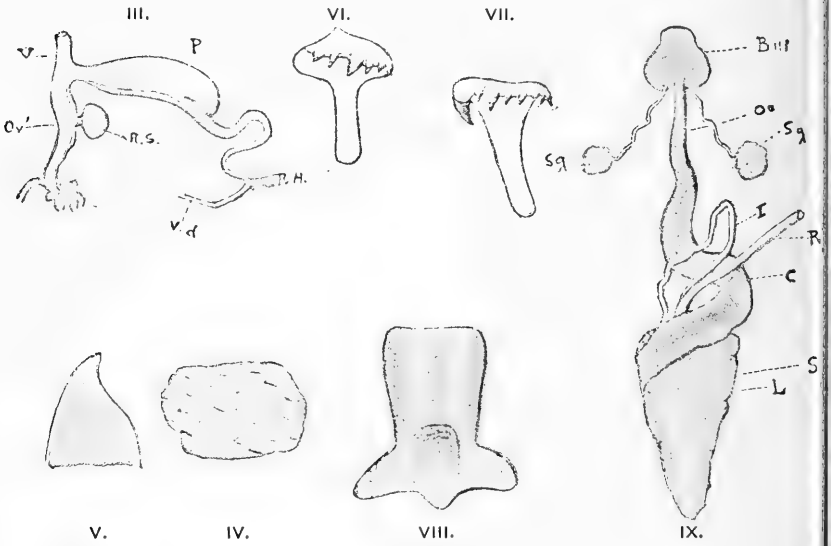
The colour-markings are the same as in *A. bitentaculatus*, usually with two darker bands on each side of the back; but the body is more elongate and more highly rounded, the dorsal grooves are finer; a black ring round the respiratory orifice is not always present; the median dorsal groove extends to the head. The movements of the animal are much brisker than in any other species I have seen, and when fully extended the body seems to be almost cylindrical. In specimens I preserved in alcohol, and in formalin, the dorsal grooves are always visible, as well as the fine granulation. What Cockerell took for the genital orifice is the anus. The openings of the different organs are in the same positions as in the two foregoing species. My specimens are not so large as the one described by Cockerell, which has a length (in spirit) of 53 and breadth of 11 mm. It very much depends on the locality whether our native slugs attain a large size or not, a fact I have often

[1] Jahrbuch Deutsch. malak. Ges., 1874, p. 196.
[2] Trans. New Zealand Inst., vol. xxvi, p. 125, etc.

had the opportunity of observing: the season also exercises some influence. My specimens were collected during winter and in the early spring. One living specimen measured 35 mm. in length by 5 mm. in breadth.

The dimensions of a good-sized spirit specimen are :—

1. Length over back from head to tip of tail, 33 mm.
2. Length of sole, 31 mm.
3. Width of back, 15 mm.
4. Breadth of sole, 5 mm.
5. Breadth of groove between sole and back, 2·5 mm.
6. Distance of anus from right tentacle, 6·5 mm.
7. Distance of anus from pulmonary orifice, 5 mm.
8. Distance of pulmonary orifice from head, 11 mm.



Athoracophorus dubius (Ckll.).

III. Anterior portion of genitalia: magnified. IV. Internal wall of penis, showing papillæ: magnified. V. Papillæ of penis wall: greatly magnified. VI. Central tooth of radula, × 720. VII. Sixth tooth of radula, × 720. VIII. Jaw, × 15. IX. Digestive system, enlarged.

LETTERING OF THE FIGURES.

alb.gl.	albumen gland.	v.d.	vas deferens.
h.d.	hermaphrodite duct.	B.m.	buccal mass.
h.gl.	hermaphrodite gland.	s.g.	salivary glands.
ov.	oviduct.	œ.	œsophagus.
ov'.	free oviduct.	c.	crop.
pr.	prostate.	St.	position of stomach.
p.	penis.	L.	liver.
r.m.	retractor muscle.	I.	intestine.
r.s.	receptaculum seminis.	R.	rectum.
v.	vestibule.		

The reproductive organs are distinguished from those of the two foregoing species as follows:—The penis (Fig. III) is about as long as in *A. bitentaculata*; its anterior portion is rather wide, but at about the middle it suddenly contracts, the slender second half being convolute with the retractor muscle. The size of the hermaphrodite gland, which is about twice that of those in the other two species, is especially noteworthy. The interior wall of the penis is covered with thorn-shaped papillæ (Figs. IV, V), very much like those described and figured by Bergh from *Triboniophorus Schuettei*.[1] I found similar papillæ present in the penis of *Athoracophorus bitentaculatus*.

Radula.—The rhachidian tooth (Fig. VI) is unsymmetrical, pointed in front, with six, sometimes seven, cusps, of which the median is the largest. The lateral teeth (Fig. VII) have eight cusps, the inner one being the largest. There is a considerable difference between the dentition of this species and that of *A. bitentaculatus*, the figures of two teeth (Figs. I, II) being given here for comparison. The jaw (Fig. VIII) is much the same as in the two species already enumerated, and there seems to be no chance of relying on it as a means for distinguishing the species, as often may be done in *Succinea*.

The digestive system (Fig. IX) does not differ much from that of the two other species. The crop is wide and long, extending to the liver, with no trace of a diverticulum; the stomach lies between the folds of the liver and the intestine, and forms a long anterior loop, returning to the liver, whence the rectum emerges.

Hab.—Pelorus Valley, Marlborough, South Island.

Sect. II. PSEUDANEITEA, Cockerell.

Cockerell, Proc. Zool. Soc., 1891, p. 217.

"Small slugs of New Zealand and the Auckland Is., resembling *Athoracophorus*, but showing a decided tendency towards the formation of a mantle-area like that of *Aneitea*. The *Janella papillata* of Hutton may be taken as the type."—*Cockerell*.

These slugs are not always small. Back usually finely granulate with larger raised tubercles or papillæ between the oblique grooves. Mantle-area distinct, triangular or quandrangular, enclosing the respiratory orifice. Anus below the latter and near the foot margin.

4. ATHORACOPHORUS PAPILLATUS (Hutton).

Janella papillata, Hutton: Trans. New Zealand Inst., vol. xi (1879), p. 332.

Athoracophorus verrucosus, Mts.: Simroth, Nova Acta Acad. Cæs. Leop. Carol., Bd. liv, p. 77, pl. iv, figs. 11–14.

For further references see Journ. de Conch., vol. xli, p. 235.

After carefully comparing Dr. Simroth's description and figures with my specimens, I am convinced that *A. verrucosus* is identical with

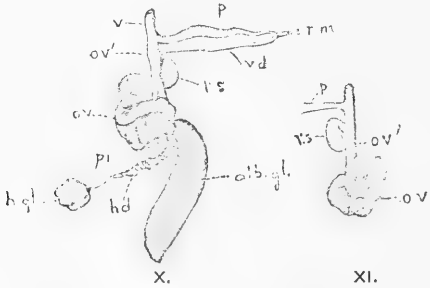
[1] Verhand. k. k. zool. bot. Ges. Wien, Bd. xx (1870), p. 853, pl. xiii, figs. 2–9.

A. papillatus. By way of addition to Simroth's description it may be mentioned that the colour of the back is yellowish-olive without spots; the sole being of a light-yellowish colour, and that fine granules cover the whole of the back, while in each lateral area there are from one to three larger papillæ of the same colour. The median dorsal groove extends to the head. The mantle-area is darker, mostly triangular, with the respiratory orifice nearly central. There is no area for the renal orifice, which is situated in the anterior left angle. The size of this species varies according to the locality. From the North Island I have seen only small specimens, but on the South Island large specimens occur.

The dimensions of a large spirit specimen are:—

1. Length over back from head to tip of tail, 60 mm.
2. Length of sole, 55 mm.
3. Width of back, 23 mm.
4. Breadth of sole, 10 mm.
5. Breadth of groove between sole and back, 4 mm.
6. Distance of anus from right tentacle, 10 mm.
7. Distance of anus from pulmonary orifice, 8 mm.
8. Distance of pulmonary orifice from head, 15 mm.

The reproductive organs (Figs. X, XI) agree with Dr. Simroth's description and figure of *A. verrucosus.* I dissected five specimens, and these organs were alike in all. The interior wall of the penis is densely beset with conical papillæ.



Athoracophorus papillatus (Hutton).

X. Genitalia: nat. size. XI. Anterior portion: magnified.
[For lettering, see ante, p. 250.]

The digestive system is normal, the crop very large, without diverticulum, the anterior loop of the intestine extending as far as the œsophagus.

Simroth concluded from the contents of the crop that these animals fed on ferns.[1] In a short note[2] I expressed doubts as to the correctness of this suggestion. I have had specimens of *Athoracophorus* in

[1] t.c., p. 80. [2] Journ. de Conch., vol. xl, p. 255.

captivity several times, but they would never touch a fern. The favourite hiding-place of Athoracophoridæ in New Zealand is beneath and within rotten logs and in the leaf-sheaths of *Phormium*, at the base of which plant there is always a large amount of moist, decaying vegetable matter. Examining the contents of the crop of *A. papillatus* found under a rotten log, I found it to consist of a pulp of the rotten wood. I never saw these molluscs feeding, since they are nocturnal, but I do not doubt that the majority of these slugs live on decaying vegetable matter, with which fungi, etc., are always largely mixed.

Hab.—North Island: Forty Mile Bush, small specimens only. South Island: Dunedin, Ashburton, Riccarton Bush, Pelorus Valley. Chatham Islands. Auckland Islands (Krone).

Var. *nigricans*, Martens, 1889.

Simroth, Nova Acta, etc., Bd. liv, p. 77.

This variety seems to be very rare. The original locality is Auckland Islands, but I have specimens from Dunedin and Pelorus Valley, South Island.

Var. *fasciata*, Von Martens, 1889, *em.* (*fuscata*).

Simroth, t.c., p. 79.

This is a more common form, which, however, I have not seen from the North Island. The arrangement of the dark-brown or black spots on the back is very variable, but usually they form three bands. It is sometimes as large as the typical form, but generally smaller.

Hab.—Auckland Islands; South Island; Dunedin; Hooker Valley; Pelorus Valley.

5. Athoracophorus Simrothi, Suter.

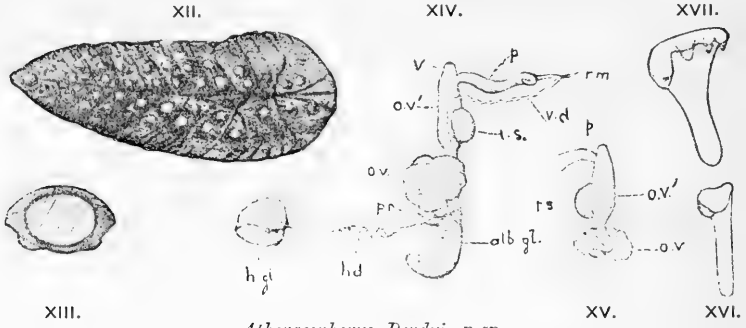
Athoracophorus Simrothi, Suter: Proc. Malac. Soc. London, Vol. ii (1896), p. 34, pl. iv, figs. 3, 4.

I have been unable to procure any more specimens of this interesting slug, and hence cannot add anything by way of supplement to my first communication.

6. Athoracophorus Dendyi, n.sp.

Body (Figs. XII, XIII) broadly elongate, anterior part very broad, narrowing gradually towards the tail. Back flatly rounded, with median and lateral grooves deep and conspicuous, median groove extending to the head, lateral grooves with one or two additional grooves near the margin. Colour dark-grey, darker along the middle. The whole of the back minutely granulate, between the oblique grooves one or two large raised round tubercles of much lighter colour, forming a single row on each side from the mantle-area to the head, double from the mantle-area to a short distance from the tail. Mantle-area triangular, sometimes quadrangular, granulose; the pulmonary orifice

in the middle near the right side, renal opening in the anterior angle, both orifices of a lighter colour. Anus below and a little in front of the respiratory orifice, near the foot margin. Foot with lateral grooves of yellowish-white colour; sole broad, smooth, with a lighter median



Athoracophorus Dendyi, n.sp.

XII. The animal; spirit specimen: nat. size. XIII. Transverse section of body. XIV. Genitalia: nat. size. XV. Genitalia, anterior portion magnified. XVI. Central tooth of radula, × 720. XVII. Sixth lateral tooth of radula, × 720.

[For lettering, see ante, p. 250.]

band. Distinct grooves between sole and back, showing distinctly the continuance of the dorsal oblique grooves. A thread-like line runs the whole length between sole and lateral groove. (Spirit specimen.)

The dimensions of a good-sized example are :—

1. Length over back from head to tail, 50 mm.
2. Length of sole, 40 mm.
3. Width of back, 23 mm.
4. Breadth of sole, 11 mm.
5. Breadth of groove between sole and back, 4 mm.
6. Distance of anus from right tentacle, 12 mm.
7. Distance of anus from pulmonary orifice, 9 mm.
8. Distance of anus from foot margin, 2·5 mm.
9. Distance of pulmonary orifice from head, 18 mm.

The reproductive organs (Figs. XIV, XV), which open close behind the right tentacle, are very much on the same plan as those of *A. papillatus*, but the following characters may be considered as of specific distinction. The free and rather large cylindrical oviduct is greatly dilated, and has the receptaculum seminis inserted at its posterior part. The penis is about the same shape as in *A. papillatus*, but somewhat longer and distally convolute. The hermaphrodite gland is larger and its duct longer than in *A. papillatus*. The interior wall of the penis is densely covered with oval papillæ, which sometimes terminate in a small sharp point.

The digestive system does not show any marked difference from that of *A. papillatus*; there is no diverticulum on the crop, and the jaw is

almost the same. The teeth of the radula (Figs. XVI, XVII), however, are very different. The rhachidian tooth is very slender, with a small irregularly-shaped cusp, bearing a single blunt denticle, usually on the left side, whilst the lateral teeth have a long and stout inner denticle and three, smaller, outer ones.

I have much pleasure in associating with this species the name of its discoverer, Dr. Arthur Dendy, Professor of Biology in the Canterbury College, University of New Zealand.

Type in my collection.

Hab.—Springburn, Mt. Somers; South Island (Dr. Dendy).

Sect. III. KONOPHORA, Hutton.

Hutton, Trans. New Zealand Inst., vol. xi (1879), p. 332.

Like *Janella*, but the eye-peduncles short and conical (Hutton). Back of body smooth, or faintly granulose. In spirit specimens the lateral grooves on the foot are present, but not very conspicuous, and there is no thread-like line between groove and sole. Mantle-area distinct, triangular, sometimes quadrangular. The median dorsal groove not always extending to the head. Renal opening a short distance in front of the mantle-area. Anus below the pulmonary orifice, near the foot margin.

7. ATHORACOPHORUS MARMOREUS (Hutton).

Konophora marmorea, Hutton: Trans. New Zealand Inst., vol. xi (1879), p. 332; vol. xiv, p. 158, pl. v, figs. 1–9.

A full description of this species and its anatomy has been given by Captain Hutton. The rhachidian tooth of the radula is very distinct, somewhat approaching that of *A. papillatus* in the emarginate anterior end, but there is no central denticle. The situation of the renal opening *in front of the mantle-area* is not met with in any other species, and is correctly reproduced in the figure given by Captain Hutton.[1]

This species attains a rather large size. The dorsal grooves in spirit specimens are sometimes very indistinct, and the back quite smooth.

The dimensions of a rather small specimen are:—

1. Length over back from head to tip of tail, 55 mm.
2. Length of sole, 45 mm.
3. Width of back, 21 mm.
4. Breadth of sole, 8 mm.
5. Breadth of groove between sole and back, 3 mm.
6. Distance of anus from right tentacle, 8 mm.
7. Distance of anus from pulmonary orifice, 9 mm.
8. Distance of anus from foot margin, 2·5 mm.
9. Distance of pulmonary orifice from head, 16 mm.

The genital orifice is close behind the right tentacle.

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[1] t.c., pl. v, fig. 1*e* (mucous pore).

Hab.—South Island: Dunedin; Greymouth; Pelorus Valley.

This is one of our rare species.

Cockerell's *A. marmoreus*, forma nov., from Dunedin,[1] is undoubtedly *A. papillatus* var. *fasciata*. "Depressed raised tubercles" are not met with in *Konophora*.

Subgen. Amphikonophora, n. subg.

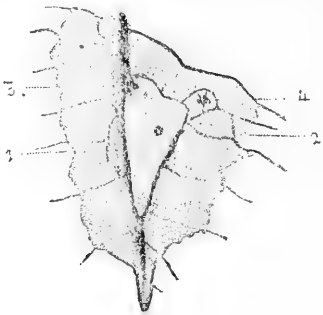
Large slugs with well-marked dorsal grooves. Mantle-area distinct, triangular, with the renal opening inside its anterior angle and the pulmonary orifice subcentral, nearer the right side. *Anus close to the outer angle of mantle-area.* The whole back finely granulate.

This is no doubt the most interesting group of *Athoracophorus*. It is unique in the situation of the anus close to the mantle-area, approaching thus the genus *Aneitea*, from which, however, it is distinct, especially in the absence of a diverticulum on the crop, the presence of a renal duct, the form of the teeth of the radula, etc.

8. Athoracophorus marmoratus, Simroth.

Athoracophorus marmoratus (Mts. MS.), Simroth: Nova Acta Acad. Cæs. Leop. Carol., Bd. liv (1889), p. 71, pl. iv, figs. 3–10.
A. marmoreus, Suter, *non* Hutton.

It is not very long since I obtained a specimen of this rare slug, which agrees perfectly with the description and figures published by Dr. Simroth. In Fig. XVIII the situation of the anus close to the



XVIII.

Athoracophorus marmoratus, Simroth.

XVIII. Portion of back with mantle-area: enlarged.

1. Mantle-area.
2. Pulmonary orifice.
3. Renal orifice.
4. Anus.

mantle-area, so characteristic of the species, is illustrated. Dr. Simroth's specimen was a very small one, 20 mm., but it may well be that these slugs do not attain a much larger size on the Auckland Islands. The

[1] Proc. Zool. Soc., 1891, p. 217.

specimen in my collection is 90 mm. long, foot 10 mm. broad, and was found on a birch-tree near Collingwood. It is thus evident that this species, in a genial, moist climate, attains to the largest size of all our native slugs.

Hab.—Auckland Islands (Krone); Collingwood, South Island.

Conclusion.—The geographical distribution of the species is not without interest. The North Island has only small, not much differentiated forms—*A. bitentaculatus*, *A. antipodarum*, and small forms of *A. papillatus*; whilst in the South Island, large, more differentiated, and generally darker-coloured species occur. Of the eight species all are found on the South Island, but the larger forms prevail, especially *A. papillatus*. Two species occur as far south as the Auckland Islands. We know nothing of any native slugs and very little about the other land mollusca from Stewart Island. There is no reason why *Athoracophorus* should not exist on this latter island, and it is even probable that new species may be found on it some day.

Like the unfortunately extinct Moa, *Athoracophorus* attains its greatest development and differentiation on the South Island. The comparison may seem somewhat peculiar, but it is quite in accordance with the facts.

The genus *Athoracophorus* is restricted to New Zealand, including the Chatham and Auckland Islands. The two other genera of the family are found: *Aneitea*, Gray, in East to North Australia, New Caledonia, and New Hebrides; ? *Aneitella*, Cockerell, on Wild Island, Admiralty Archipelago. The occurrence of members of the family in New Guinea is to my knowledge not quite certain yet, but they seem to be absent from the Kermadec, Norfolk, and Lord Howe Islands.

Mr. C. Hedley included *Hyalimax*, H. & A. Ad., in the family,[1] but according to Dr. Simroth this genus is much nearer the Succineidæ and has nothing whatever to do with the Athoracophoridæ.

[1] Trans. New Zealand Inst., vol. xxv, p. 161.

THE LAND MOLLUSCA OF STEWART ISLAND.

By Henry Suter.

Read 9th April, 1897.

In March of this year Mr. Aug. Hamilton, of Dunedin, paid a short visit to Halfmoon Bay, Stewart Island, when he collected a number of land-shells, which he kindly sent me for investigation.

Hitherto only four species of land-shells have been known from this island, viz.:

1. *Flammulina* (*Phacussa*) *fulminata*, Hutton;
2. *Flammulina* (*Pyrrha*) *cressida*, Hutton;
3. *Laoma* (*Phrixgnathus*) *celia*, Hutton;
4. *Rhytida australis*, Hutton;

of which the first and last mentioned are endemic.

Mr. Hamilton's collection comprised the following species:—

1. *Flammulina perdita*, Hutt. One dead and partly broken shell. This species is found over the whole of New Zealand, but is a rather rare shell.

2. *Flammulina Feredayi*, Suter. Two specimens, which correspond exactly with my type-specimen from the Forty Mile Bush, North Island. The species has also been found on the Hunua Range and in the Otaki Gorge, North Island. The var. *glacialis* I established on specimens found in the Hooker Valley, South Island.

3. *Flammulina* (*Phenacohelix*) *granum*, Pfr. Two specimens, which are not adult, having only four whorls and a diameter of 2·5 mm., but otherwise differing in no respect from specimens I have from the North Island. I have not seen it yet from the South Island. This is one of our very rare shells.

4. *Flammulina* (*Phacussa*) *fulminata*, Hutt. Five specimens, mostly bleached. Two of them exceed the dimensions given by Captain Hutton for this species.

5. *Flammulina* (*Thalassohelix*) *igniflua*, Reeve, var. *obnubila*, Reeve. Eight specimens, bleached. They are much smaller than the typical *F. igniflua*, with diam. 7, alt. 4·5 mm., whorls $4\frac{1}{2}$. I found similar living specimens near Dunedin, and hence I think it advisable to follow Pilsbry (Man. Conch., ser. II, vol. ix, p. 13), and to distinguish them as var. *obnubila*, although they differ from the type only in size. I have not seen this variety from any other part of New Zealand.

6. *Endodonta* (*Charopa*) *bianca*, Hutt. Two specimens only, which do not differ from the typical form. Occurring over the whole of New Zealand.

7. *Endodonta* (*Charopa*) *tapirina*, Hutt. One young specimen, in the colour-markings resembling specimens from Otago.

8. *Endodonta* (*Charopa*) *Sterkiana*, Sut., var. *Reeftonensis*, Sut. Five specimens, slightly larger than the type, but otherwise not distinguishable from it. This variety is very probably distributed over a great part of the South Island, since it has been found at Greymouth and Springburn; but it seems nowhere to be common.

9. *Laoma* (*Phrixgnathus*) *celia*, Hutt. Six specimens, typical.

10. *Laoma* (*Phrixgnathus*) *phrynia*, Hutt., var. *major*, n. var. Fourteen specimens of this new variety were found. They differ from the type principally in their much larger size, the diameter being 3·5 mm., as against 2·5; the periostracum is almost smooth, but the rather distinct radiate riblets are clearly visible near the suture, only rarely extending thread-like over the surface of the whorl to the periphery. The colour is darker than in most specimens of the type-form.

11. *Rhytida australis*, Hutt. Three bleached and broken shells.

Our knowledge of the land-molluscan fauna of Stewart Island has thus made some progress, eleven instead of only four species being now known. There is no doubt that a thorough exploration of this island would reveal many more species, and very likely several new forms.

REVISION OF THE NEW ZEALAND TROCHIDÆ.

By Henry Suter.

Read 14*th May*, 1897.

Fam. TROCHIDÆ.

Subfam. Trochinæ.

Genus. TROCHUS, Linné, 1758.

Subgen. Infundibulum, Montfort, 1810.

Sect. cœlotrochus, Fischer, 1880.

1. Trochus tiaratus, Quoy & Gaimard.

Trochus tiaratus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii (1834), p. 256, pl. lxiv, figs. 6–11; Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 358; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 42, pl. xii, figs. 72–4; pl. l, fig. 4 (radula).
Anthora tiarata (Quoy & Gaim.): Hutton, Man. New Zealand Moll., p. 94; Hutton, Trans. New Zealand Inst., vol. xiv, p. 165, pl. vii, fig. N (radula).
Trochus delicatulus, Philippi: Zeitsch. Malak., 1846, p. 105.
Polydonta elegans, Gray: Yates' "New Zealand," 1835, p. 309.

Five to five and a half whorls; 5–8 spiral liræ of oblique beads on the penultimate whorl. Columella with an obsolete fold above. Umbilical area smooth. Alt. 10, diam. 13·5 mm.

Hab.—On rocks near low-water mark from Auckland to Dunedin; common in the North, rare in the South Island.

2. Trochus Chathamensis (Hutton).

Polydonta Chathamensis, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 36.
Anthora Chathamensis, Hutton: Man. New Zealand Moll., 1880, p. 94.
Trochus Chathamensis, Hutton: Proc. Linn. Soc. New South Wales, vol. ix, p. 359; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 43.

Trochus Chathamensis (Hutton).

Six whorls, with 5–6 close, low, spiral cinguli between the upper and lower margins, which are strongly elevated. Upper edge of whorls nodulous, lower edge spirally striate and as a rule more prominent than the upper one. Longitudinal oblique markings of brownish-purple on

a white ground. Columella with almost imperceptible fold above. False umbilicus almost filled up, smooth. Alt. 7·5, diam. 9 mm.

Hab.—Chatham Is. only.

The specimens reported by Mr. T. W. Kirk as having been found near Wellington very likely do not belong to this species, but to *T. oppressus*, Hutton.

3. Trochus oppressus (Hutton).

Gibbula oppressa, Hutton: Journ. de Conch., 1878, p. 34; Man. New Zealand Moll., 1889, p. 102; Proc. Linn. Soc. New South Wales, vol. ix, p. 364; Trans. New Zealand Inst., vol. xv, p. 124, pl. xiv, fig. M (radula); Pilsbry, Man. Conch., ser. I, vol. xi, p. 232, pl. xl, figs. 4, 5.

Dark olive-brown, tessellated with darker markings. Beach specimens, having lost the periostracum, are white with fuscous markings. Whorls keeled above the middle. Body-whorl biangular. Entire surface closely, finely, spirally striate. Columella oblique, straight, inserted in centre of base. Alt. 5·5, diam. 6 mm.

The presence of a false umbilicus, quite exceptional in *Gibbula*, led me to re-examine the radula. I found the teeth to correspond with Hutton's description and figure, but the point of great importance is the absence of a jaw. It therefore cannot belong to the genus *Gibbula*, and its proper place is no doubt under *Trochus*.

Hab.—Under stones near low-water mark, scarce, Auckland, Lyall Bay.

Var. *Dunedinensis*, n.var.

Differs from the type in being larger and in the body-whorl being only faintly angular; the colour is rather darker, but the markings are the same. Whorls 5½, protoconch minute, distantly spirally striated. Spire-whorls not keeled in the middle or above it, but slightly convex, nodulous below the suture, with a well-developed cingulus above the nodules; 6–7 cinguli on the penultimate whorl. On the last whorl and the base the cinguli are crossed by very fine and dense lines of growth. In some specimens the cinguli of the base, 8–9, are coarser near the axis, in others they are of nearly equal size. Radula the same as in the type; no jaw. Alt. 7·5, diam. 7·5 mm.

Hab.—Dunedin Harbour, under stones; only a few specimens (H. S.).

Sect. Anthora, Gray, 1857.

4. Trochus viridis, Gmelin.

Trochus viridis, Gmel.: Syst. Nat., 13th ed. (1788), p. 3572, No. 34; Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 358; Pilsbry, Man. Conch., ser. I, vol. xi, p. 43, pl. iii, figs. 16, 17, and vol. x, pl. xl, fig. 21.

Anthora viridis (Gmel.): Hutton, Man. New Zealand Moll., p. 94.

Polydonta tuberculata, Gray: Dieffenbach's "New Zealand," vol. ii, p. 239.

Anthora tuberculata (Gray): Hutton, Trans. New Zealand Inst., vol. xv, p. 124, pl. xiv, fig. K (radula); Hutton, Man. New Zealand Moll., p. 93.

Trochus acinosus, Gould: U.S. Explor. Exped., Moll. p. 179, fig. 217.
Trochus fulvolabris, Hombr. & Jacq.: Voy. Pole Sud, Zool. vol. v, p. 56, pl. xiv, figs. 14–16.
Polydonta tritonis, A. Adams: Proc. Zool. Soc., 1854, p. 132.
Anthora tritonis (A. Ad.): Hutton, Man. New Zealand Moll., p. 94.

Seven whorls; five series of granulated spiral liræ on penultimate whorl. Columella with a deep fold above. Umbilical area with 3–4 spiral ribs. Alt. 20, diam. 19 mm.

Hab.—On rocky ground near low-water mark from Whangarei to Dunedin. Rather rare in the North, but attaining a larger size.

Subgen. Clanculus, Montfort, 1810.

5. Trochus ringens (Menke).

Monodonta ringens, Menke: Moll. Nov. Holl. Spec., 1843, p. 14, No. 53 (not *M. ringens*, Philippi, 1846).
Trochus ringens (Menke): Philippi, Conch. Cab., p. 235, pl. xxxvi, fig. 1; Fischer, Coq. Viv., p. 213, pl. lxxi, fig. 1; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 81, pl. xi, figs. 49, 50.

Shell perforate, conical; whorls 7, the first smooth, yellowish, following planulate, separated by canaliculate sutures, maculate with chestnut and white, spirally cingulate above with four elegantly granulate ridges, the upper and lower larger, last whorl acutely carinated; base slightly convex, ornamented with 8–9 granose cinguli; aperture rhomboidal, oblique, narrow; basal margin sulcate-denticulate; columella strong, oblique, terminating below in a large tooth, ringent above; columella callous, ringent, plicate. Alt. 10, diam. 11 mm. (Fischer). Sometimes the altitude exceeds the diameter.

My specimen from Mokohinau Island, which agrees in every respect with Fischer's excellent description, measures 12 × 10·5 mm.

Hab.—Cape Maria van Diemen (C. H. Robson); Mokohinau I. (caretaker of the lighthouse).

This is a new addition to the fauna of New Zealand. In Hutton's Man. New Zealand Moll. *Clanculus variegatus*, Adams, is mentioned, loc. Auckland (?), but in his revision (1884) it is omitted from the list of New Zealand mollusca. Whether *Trochus ringens* was erroneously taken for *T. variegatus* or not, I do not know.

Genus MONODONTA, Lamarck, 1801.

Subgen. Diloma, Philippi, 1845.

Sect. neodiloma, Fischer, 1885.

6. Monodonta Æthiops (Gmelin).

Trochus Æthiops, Gmelin: Syst. Nat., 13th ed., p. 3596, No. 32.
Trochus Zealandicus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii, p. 257, pl. lxiv, figs. 12–15.

Monodonta reticularis, Gray: Dieffenbach's "New Zealand," vol. ii, p. 238.
? *Labio concolor*, A. Adams: Proc. Zool. Soc., 1851, p. 180.
Diloma Æthiops (Gmel.): Hutton, Man. New Zealand Moll., p. 95; Hutton, Trans. New Zealand Inst., vol. xv, p. 125, pl. xv, fig. A (radula).
Monodonta Æthiops (Gmel.): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 365; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 98, pl. xix, figs. 99–100; pl. xx, fig. 19; pl. l, fig. 12 (radula).

With distant narrow spiral black grooves, the intervening tracts flat, black, articulated with white. Outer lip black-edged. Umbilical tract very broad, bounded on the outer, lower margin by a chocolate streak. Alt. 25–33, diam. 25–30 mm.

Hab.—On rocks near high-water mark; common throughout New Zealand, Chatham Is., Auckland Is.

7. Monodonta morio (Troschel).

Trochus morio, Troschel in Philippi: Conch. Cab., p. 142, pl. xxiv, fig. 3.
Monodonta melaloma var. *guttata*, Hutton: Proc. Linn. Soc. New South Wales, vol. ix, p. 367.
Monodonta morio, Trosch.: Pilsbry, Man. Conch., ser. 1, vol. xi, pp. 102, 105, pl. xxxv, figs. 26, 27.

Shell black, surface rough, apex almost always eroded, with irregularly scattered white dots, obsoletely spirally sulcate, 9–10 on the penultimate whorl. Umbilical tract broad, with a tongue-shaped pearly umbilical impression, bounded by dark-green. Outer lip edged with blackish-green, followed by a narrow silvery, lirate band, and inside this a broad band of opaque white, the prolongation of the columella lip, follows. Very variable in form. Alt. 12–20, diam. 14–19 mm.

Hab.—On rocks and under stones near low-water mark, from Auckland to Banks' Peninsula.

8. Monodonta atrovirens (Philippi).

Trochus atrovirens, Philippi: Conch. Cab., p. 148, pl. xxiv, fig. 12; Fischer, Coq. Viv., p. 373, pl. cxiv, fig. 1.
Monodonta atrovirens, Phil.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 110, pl. xxii, figs. 48–50.

Shell orbiculate, conoidal, shining, greenish-black, usually faintly marked with yellowish spots, spirally sulcate, sulci 7–9 on the penultimate whorl. Sutures submargined below. Last whorl much dilated, rounded at the periphery. Outer lip edged with green or blackish-green. Columellar callus broadly expanded, bounded by green or blackish-green, a distinct tongue-shaped pit at the place of the umbilicus. Alt. 9–17, diam. 14–23 mm.

Hab.—Tasman's Bay; Lyall Bay; Dunedin. Under stones above low-water mark.

Found mostly with the preceding species, from which it is not always easily separated.

9. Monodonta porcifera (Watson).

? *Labio porcifera*, A Adams: Proc. Zool. Soc., 1851, p. 179.
Trochus (*Diloma*) *porcifer* (A. Ad.): Watson, Rept. Challenger Exped., Gastropoda, p. 67, pl. iv, fig. 12.
Diloma nigerrima, Chemn.: Hutton, Man. New Zealand Moll., p. 96; ? Hutton, Trans. New Zealand Inst., vol. xv, p. 125, pl. xv, fig B (radula).
Monodonta nigerrima (Chemn.): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 366 [not *nigerrima* (Gmel.), Philippi].
Monodonta porcifera, Watson: Pilsbry, Man. Conch., ser. I, vol. xi, p. 102, pl. xxii, figs. 53, 54.

Shell depressed, globose, bluish-black, polished, superficially lirate, sometimes sparsely dotted with white. Suture margined below. Outer lip margined with black. Columella not dentate, broad, subconcave. Opaque substance of columella extending upon the base of the aperture, forming a strong ledge within. Alt. 10–13, diam. 13·5–16·5 mm.

My specimens do not show a trace of white spots, but otherwise agree with Watson's description. *Monodonta coracina* also occurs, with and without yellow spots.

Portion of radula of *Monodonta porcifera* (Watson).

The figures of the teeth of the radula of *Diloma nigerrima* published by Captain Hutton, and quoted above, are very likely those of another species (*Monodonta coracina* ?). I therefore give here the figures of the teeth of specimens which I consider to be typical, collected at St. Clair, near Dunedin.

Hab.—The only specimens I have seen and collected on rocks are those from St. Clair, Dunedin. Captain Hutton quotes the following localities: Banks' Peninsula to Dunedin, Chatham Is., Auckland Is.

10. Monodonta coracina (Trosch.).

Trochus coracinus, Troschel in Philippi: Conch. Cab., p. 148, t. xxiv, fig. 13.
Monodonta coracina (Troschel): Pilsbry, Man. Conch., ser. I, vol. xi, p. 103, pl. xix, fig. 94; pl. xxxi, fig. 28.

Shell orbicular-conoid, depressed, lustreless, purplish-black, with or without yellow spots. Suture more or less distinctly margined below. Spiral liræ of whorls distinct or almost obsolete. Last whorl angulate around the periphery; body-whorl sometimes biangulate. Outer lip black-edged, followed by a narrow opaque white band, which runs as

Portion of radula of *Monodonta coracina* (Trosch.).

a silvery stripe over the umbilical tract parallel to the columella, and unites again with the upper lip, thus forming a complete circle. Umbilical tract bounded on the outer, lower margin by green, grey, or brown. Alt. 10–13, diam. 11–18 mm. A large conic specimen from Lyttelton measures 17 × 17 mm.

Hab.—Wellington and Lyttelton Harbours, Sumner (H. S.). Under stones on sandy beaches above low-water mark.

11. Monodonta excavata (Adams & Angas).

Trochocochlea excavata, Ad. & Ang.: Proc. Zool. Soc., 1864, p. 37; Hutton, Man. New Zealand Moll., p. 97.

Diloma excavata (Adams): Hutton, Trans. New Zealand Inst., vol. xv, p. 126, pl. xv, fig. F (radula).

Monodonta excavata (Ad. & Ang.): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 368; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 109, pl. xxxv, figs. 1–3.

Trochocochlea constricta (Lamk.): Hutton, Journ. de Conch., 1878, p. 33. [Not of Lamarck.]

Shell small, depressed-conic, greyish-green, minutely maculated with dark-olive, apex but seldom eroded. Last whorl convex above, flattened beneath, and carinate at the periphery. Liræ distinct only on the base. Outer lip edged with black. Umbilical tract broad, concave, bounded by light-brown. Alt. 5, diam. 6 mm. Specimens from Greymouth measure 10 × 11½ mm.

Hab.—West coast of New Zealand; Manukau Heads; Cape Egmont; Greymouth.

12. Monodonta lugubris (Gmelin).

Trochus lugubris, Gmelin; Syst. Nat., 13th ed., p. 3583, No. 104.

Trochus cingulatus, Quoy & Gaim.: Voy. Astrolabe, Zool. vol. iii, p. 259, pl. lxiv, figs. 16–20 (not *cingulatus*, Brocchi nor Menke).

Monodonta angulatum [misprint for *cingulatum*] (Quoy & Gaim.): Gray in Dieffenbach's "New Zealand," vol. ii, p. 238.
Trochus Gaimardi, Philippi: Conch. Cab., p. 211, pl. xxxi, figs. 7–9.
Diloma Gaimardi (Phil.): Hutton, Man. New Zealand Moll., 1880, pp. 96, 201.
Trochus Bernardii, Recluz: Journ. de Conch., 1852, p. 166, pl. vii, fig. 5.
Trochus sulcatus, Wood: Index Test. Suppt., pl. vi, fig. 40.
Monodonta sulcata (Wood): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 367 (not *sulcatus*, Martyn nor Lamarck).
Trochus bicanaliculatus, Dunker in Philippi: Conch. Cab., p. 202, pl. xxx, fig. 6.
Monodonta lugubris, Gmel.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 100, pl. xix, fig. 93; pl. xxxv, figs. 24, 25.

Whorls strongly, spirally ridged, carinate, black, the ridges nodulous and dotted with white or yellow; three on the penultimate whorl, interstices spirally striate. Outer lip black-edged, then nacreous and lined with opaque white. Umbilical tract not very broad, bordered on the outer margin by greyish-white. Alt. 9–13, diam. 13–15 mm.

Hab.—From Auckland to Dunedin, under stones near low-water mark. Not common, but more abundant in Cook Strait than further north or south.

13. Monodonta subrostrata, Gray.

Monodonta subrostrata, Gray: Yate's "New Zealand," 1835, p. 308; Dieffenbach's "New Zealand," vol. ii, p. 238.
Trochocochlea subrostrata (Gray): Hutton, Man. New Zealand Moll., 1880, p. 96.
Diloma (?) *subrostrata* (Gray): Hutton, Trans. New Zealand Inst., vol. xv, p. 126, pl. xv, fig. G (dentition).
Monodonta subrostrata (Gray): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 367; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 101, pl. xix, figs. 89, 90.

Shell with subnodulose, spiral ribs, which are wider apart on the upper surface and closer on the base. Yellowish with undulating, longitudinal, purple lines. Outer lip edged with yellow and dotted with black, then a narrower band of opaque white; throat lirated, silvery. Umbilical tract rather broad, greyish or yellowish-grey on its outer lower margin. Alt. 11–14, diam. 13–15 mm.

Hab.—Auckland to Tauranga, abundant on *Zostera* beds.

14. Monodonta melanoloma, Menke.

Monodonta melanoloma, Menke: Moll. Nov. Holl., 1843, p. 14.
Trochus melanoloma (Menke): Philippi, Conch. Cab., p. 146, pl. xxiv, fig. 9.
Labio corrosa, A. Adams: Proc. Zool. Soc., 1851, p. 180; Hutton, Man. New Zealand Moll., p. 96.

Diloma corrosa (Adams): Hutton, Trans. New Zealand Inst., vol. xv, p. 126, pl. xv, fig. D (radula).
Labio Hectori, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 37.
Trochocochlea chloropoda, Tate: Zool. and Pal. Misc., p. 10 (*teste* Hutton).
Monodonta melaloma (Menke): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 366.
Monodonta melanoloma, Menke: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 104, pl. xxii, figs. 56, 57.

Shell globose, conical, roughened and eroded, purplish, body-whorl mostly yellowish; more or less distinctly lirate. Outer lip yellow-edged, followed by a black band. Columella arcuate, with a small tooth below the middle. Umbilical tract narrow, concave, bounded by dark-grey. Alt. 15, diam. 16 mm.

Hab.—On mud-flats of estuaries in brackish water, Heathcote Estuary, near Christchurch (H. S.).

Var. *undulosa*, A. Adams.

Chlorostoma undulosum, A. Adams: Proc. Zool. Soc., 1851, p. 182. For synonymy, see Pilsbry, Man. Conch., ser. 1, vol. xi, p. 105, pl. xxii, figs. 45–7.

Larger than the type, and the spiral striation more distinct; yellowish, with undulating lines of dark-purple. Alt. 18, diam. 20 mm.; alt. 17, diam. 22 mm.

Hab.—Sumner to Dunedin. On rocks: not common.

Var. *plumbea*, Hutton.

Diloma plumbea, Hutton: Trans. New Zealand Inst., vol. xv (1883), p. 126, pl. xv, fig. E (radula).
Monodonta melaloma var. *plumbea*: Proc. Linn. Soc. New South Wales, vol. ix, p. 367; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 105, pl. xxii, figs. 45–7.

Shell dull-purplish, spire mostly eroded, roughened, last whorl obsoletely lirate. Outer lip edged with black. Columella and umbilical tract as in the type, the latter sometimes of a greyish-green colour. Alt. 14·5–16, diam. 16–17 mm.

Hab.—Sumner, Lyttelton, Banks' Peninsula to Dunedin. Under stones near low-water mark; rather scarce.

Sect. CHLORODILOMA, Pilsbry, 1889.

15. MONODONTA CRINITA (Philippi).

Trochus crinitus, Philippi: Zeitschr. Malak., 1848, p. 103.
Trochocochlea mimetica, Hutton: Journ. de Conch., 1878, p. 32; Man. New Zealand Moll., p. 96.
Monodonta mimetica, Hutton: Proc. Linn. Soc. New South Wales, vol. ix, p. 368.
Monodonta crinita, Phil.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 111, pl. xxii, figs. 41–4.

Shell globose-conic, narrowly perforate, cinereous, spirally grooved, cinguli dark-purple with white spots at regular distance. Columella not very thick, obtusely dentate below, white-edged. Umbilico-columellar area bright-green with undulating narrow bands of purplish-brown. Alt. 17, diam. 16–18 mm.

The only specimen I have, measures 9 × 12 mm., having 3·5 whorls only; the apex is not eroded, protoconch smooth, dark-orange.

Pilsbry states that it is sometimes imperforate.

Hab.—Auckland, on *Zostera* beds; scarce (T. F. Cheeseman).

Genus CANTHARIDUS, Montfort, 1810.

Subgen. Cantharidus, Montf.

Sect. cantharidus, s.s.

16. Cantharidus iris (Gmelin).

Trochus iris, Gmelin: Syst. Nat., 13th ed., p. 3580, No. 86.
Cantharidus iris (Gmel.): Hutton, Man. New Zealand Moll., p. 99; Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 361.
Canthiridus Zealandicus, A. Adams: Proc. Zool. Soc., 1851, p. 169.
Cantharidus Zealandicus, A. Ad.: Hutton, Man. New Zealand Moll., p. 99.
Cantharidus iris (Gmel.): Pilsbry, Man. Conch., ser. 1, vol. xi, p. 122, pl. xxxiv, fig. 15.

Shell elevated, conical, obtusely angular at the periphery, whitish with longitudinally undulating purplish-red streaks; obsoletely lirate, about five separated narrow ridges on the base. The largest species of the genus. Alt. 40, diam. 30 mm.

I follow Hutton in placing Adams' *Cantharidus Zealandicus* as a synonym of this species, Pilsbry taking it as a synonym of *C. pruninus* (Gould), which I do not think to be correct.

Hab.—Auckland to Cook Strait; Chatham Is.

17. Cantharidus pruninus (Gould).

Trochus pruninus, Gould: Proc. Boston Soc. Nat. Hist., vol. iii (1849), p. 90; U.S. Explor. Exped., Moll. p. 180, fig. 205; Otia, p. 55.
Trochus capillaceus, Philippi: Zeitschr. f. Malak., 1848, p. 102.
Trochus episcopus, Hombr. & Jacq.: Voy. Pole Sud, Zool. vol. v, p. 55, pl. xiv, figs. 9–11.
Cantharidus episcopus (Hombr. & Jacq.): Hutton, Man. New Zealand Moll., p. 100.
Cantharidus pruninus (Gould): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 361.
Cantharidus pruininus (Gould): Pilsbry, Man. Conch., ser. 1, vol. xi, p. 122, pl. xlvi, figs. 60, 61.

Shell ovate-conical, deep purple, apex pink; surface nearly smooth, densely, finely, spirally striate all over. Last whorl rounded, or obtusely angular. Aperture less than one-half the length of the shell, iridescent within with finer dense folds. Columella subvertical, expanded in a callous pad over the umbilicus. Relative length of spire very variable. Alt. 22, diam. 16 mm.; alt. 19, diam. 16 mm.; alt. 30, diam. 19 mm.

Hab.—Auckland Is.; Campbell Is.

Var. *perobtusa*, Pilsbry.

Man. Conch, ser. 1, vol. xi (1889), p. 123, pl. xxxiv, fig. 1.

Spire short, very obtuse at the apex, whorls 5, the last large, descending anteriorly. Aperture as long as the spire; other characters as in *C. pruninus*—(Pilsbry). Alt. 20, diam. 19 mm.

Hab.—Auckland Is.; Campbell Is.; Macquarie Is.

Mr. A. Hamilton, of Dunedin, collected specimens on the latter island; some are dark-purple, others cinereous.

18. Cantharidus tenebrosus, A. Adams.

Canthiridus tenebrosus, A. Ad.: Proc. Zool. Soc., 1851, p. 170.
Cantharidus tenebrosus, A. Ad.: Hutton, Man. New Zealand Moll., p. 101; Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 361; (?) Hutton, Trans. New Zealand Inst., vol. xiv, p. 166, pl. vii, fig. L (radula); Pilsbry, Man. Conch., ser. 1, vol. xi, p. 123, pl. xxxiv, fig. 3.

Shell conical, elevated, bluish-black or cinereous, 6–7 spiral liræ on the penultimate whorl, 13–16 on the body-whorl, the latter bluntly subangular at the periphery. Columella covering the umbilicus. Alt. 11·5, diam. 9·5 mm.

Hab.—Throughout New Zealand. On seaweeds.

Var. *Huttonii*, E. A. Smith.

Trochus (*Cantharidus*) *Huttonii*, E. A. Smith: Journ. Linn. Soc., (Zool.) vol. xii (1876), p. 558, pl. xxx, fig. 20; Hutton, Man. New Zealand Moll., p. 100.
Cantharidus tenebrosus var. *Huttoni*: Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 362; Hutton, Trans. New Zealand Inst., vol. xiv, p. 165, pl. vii, fig. M (radula); Pilsbry, Man. Conch., ser. 1, vol. xi, p. 123, pl. xxxiv, fig. 2.
Gibbula plumbea, Hutton: Journ. de Conch., 1878, p. 33.

Shell short, conical, bluish-black, 8–11 spiral liræ on the penultimate-, 17–20 on the body-whorl. Columella covering the umbilicus. Alt. 9, diam. 7 mm.; alt. 14·5, diam. 10·5 mm.; alt. 15, diam. 13 mm. (specimen from Dunedin).

Hab.—The same as the type, but more plentiful.

19. Cantharidus purpuratus (Martyn).

Limax purpuratus, Martyn: Univ. Conch., pl. lxviii (1784).
Cantharidus purpuratus (Martyn): Hutton, Man. New Zealand Moll., p. 99; Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 361; Hutton, Trans. New Zealand Inst., vol. xv, p. 124, pl. xiv, fig. O (radula); Pilsbry, Man. Conch., ser. 1, vol. xi, p. 124, pl. xlv, fig. 44.
Trochus rostratus, Gmelin: Syst. Nat., 13th ed., p. 3580.
Trochus elegans, Gmelin, t.c., p. 3581.
Phasianella rubella, Menke: Syn. Meth. Moll., p. 51 (*teste* Hutton).
Trochus pallidus, Hombr. & Jacq.: Voy. Pole Sud, Zool. vol. v, p. 55, pl. xiv, figs. 12, 13 (not *pallidus*, Forbes).
Cantharidus pallidus (Hombr. & Jacq.): Hutton, Man New Zealand Moll., p. 100.
Trochus rostratus, Kiener: Spec. et Icon., pl. xlvi, fig. 1.
Trochus torosus (Quoy MS.): Kiener, op. cit., pl. xlvi, fig. 3.
Cantharidus purpuratus (Martyn): Pilsbry, Man. Conch., ser. 1, vol. xi, p. 125, pl. xlv, fig. 45.

Shell imperforate, acutely conical, first whorls reddish or reddish-green, the remainder whitish, sometimes ornamented with rosy oblique streaks; spirally cingulate, cinguli flat, five on the penultimate whorl, the narrow interstices lamellose-striate. Last whorl subangular, convex beneath. Aperture subtrapezoidal, lirate and highly iridescent within. Columella nearly vertical. Alt. 22, diam. 16 mm.; alt. 32, diam. 19 mm.; alt. 24, diam. 20 mm.

Hab.—Auckland to Banks' Peninsula; on rocks, but more often on floating seaweeds.

Var. *texturata*, Gould.

Trochus texturatus, Gould: Proc. Bost. Soc. Nat. Hist., vol. iii (1849), p. 90.
Cantharidus texturatus (Gould): Hutton, Man. New Zealand Moll., p. 99; Trans. New Zealand Inst., vol. xiv, p. 165, pl. vii, fig. I (radula); Pilsbry, Man. Conch., ser. 1, vol. xi, p. 125, pl. xlv, figs. 41–3.

The ribs with a secondary sculpture of fine spiral striæ, the whole surface covered by sharp incremental striæ.

Hab.—The same as the type.

20. Cantharidus pupillus, Hutton.

Cantharidus pupillus, Hutton: Proc. Linn. Soc. New South Wales, vol. ix (1884), p. 362 (not *Trochus pupillus*, Gould); Trans. New Zealand Inst., vol. xiv, p. 165, pl. vii, fig. K (radula); Pilsbry, Man. Conch., ser. 1, vol. xi, p. 130.

According to Pilsbry, the *T. pupillus*, Gould, is undoubtedly a species from the west coast of North America, and belongs to the genus *Margarita*.

Shell conical, imperforate, shining, solid, of very variable colour and markings. Specimens from the North Island are cinereous or white, with broad red spots on the upper whorls and below the suture on the last whorl, the remainder being adorned with red spots; sometimes the whole shell is pink, with broad oblique white bands running down the two last whorls to the periphery. The South Island specimens are much duller, the first three or four whorls are mottled with dark-grey and purple, whilst near the sutures white spots are found at regular intervals, 6–7 on a whorl, forming longitudinal bands

Cantharidus pupillus, Hutton.

on the second and third whorl. The last whorls are dark-purple or greenish-brown, with longitudinal, narrow streaks of yellow or yellowish-grey. The whorls, 5–6, are slightly convex, mostly a little shouldered, the last whorl angled at the periphery; all the whorls are cingulate, the cinguli being broad and flat, and the interstices narrow, 5–6 on the penultimate whorl, about 13 on the body-whorl, crossed by fine oblique striæ of growth. Below the sutures and on the periphery of the last whorl two cinguli are usually fused together; base convex; sutures impressed. Aperture oblique, subrhomboidal; outer lip thick, white inside, columella oblique, arched, slightly straightened in the middle, its reflection covering the umbilicus entirely, or leaving only a very narrow fissure. Alt. 8, diam. 7 mm.

Hab.—Heads of Manukau Harbour; Lyttelton; Banks' Peninsula to Dunedin. On seaweeds; not common.

Captain Hutton rightly remarks that this is a very variable shell. The character and number of the cinguli I found to be constant. North Island specimens especially are lovely shells; hardly two are alike in colour and pattern.

21. Cantharidus sanguineus (Gray).

Trochus (*Gibbium*) *sanguineus*, Gray: Dieffenbach's "New Zealand," vol. ii (1843), p. 238.

Gibbula sanguinea (Gray): Hutton, Man. New Zealand Moll., p. 102.

Cantharidus sanguineus (Gray): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 362; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 131, pl. xlvii, figs. 92, 93.

Shell conical, imperforate, spirally ribbed, ribs 5–6 on the penultimate- and 10–14 on the body-whorl; pinkish-white or light-grey with blood-red spots on the ribs, or with red flexuous longitudinal markings. Whorls 6, slightly convex, the last angled at the periphery, rather convex below. Suture distinct. Aperture oblique, outer lip thick,

Cantharidus sanguineus (Gray).

inside with a white opaque callosity; columella oblique, white, its expansion covering the umbilicus, leaving sometimes a small fissure. Alt. 9, diam. 7 mm.

Hab.—Auckland to Wellington; Chatham Is.

Like Captain Hutton, I have only seen dead specimens.

Var. *cælata*, Hutton.

Proc. Linn. Soc. New South Wales, vol. ix, p. 363; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 131.

Shell smaller, more deeply ribbed and the ribs narrower; 5–7 on the penultimate-, 15–16 on the body-whorl; they are sometimes rendered obsoletely granular by the lines of growth that cross them obliquely. Columella with an obsolete tooth in the middle; umbilicus completely closed up. Alt. 5·5, diam. 4·5 mm.

Hab.—Foveaux Strait (dredged).

Var. *elongata*, n.var.

Differs from the type in being narrower, the whorls of spire obsoletely shouldered, the riblets more numerous and finer, 10–11 on the penultimate-, about 18–19 on the body-whorl. Colour white or light-grey, ribs light-brown or reddish-brown, dissolved in spots on the base only. Outer lip edged with white and brown dots, followed by a broad white opaque band; interior pearly. Aperture quadrangular, columella nearly vertical, with an obsolete tooth in the middle, the expansion covering the umbilicus. Alt. 7·5, diam. 5 mm.

Hab.—Lyall Bay (A. Hamilton).

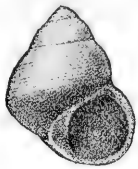
22. Cantharidus dilatatus (Sowerby).

Elenchus dilatatus, Sowerby: Proc. Zool. Soc., 1870, p. 251; Hutton, Man. New Zealand Moll., p. 101.

Cantharidus dilatatus (Sby.): Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 363; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 148.

Chrysostoma simulata, Hutton: Cat. Mar. Moll., 1873, p. 36.
Gibbula simulata, Hutton: Man. New Zealand Moll., p. 102.
Cantharidus simulatus, Hutton: Proc. Linn. Soc. New South Wales, vol. ix, p. 363.

Shell conical, imperforate, shining, cinereous, pink or pinkish-brown, usually with white markings near the suture or tessellated with white, sometimes a broad dark-brown band encircling the middle of the whorls, and one on the centre of base; finely, spirally striated. Whorls 6, slightly convex, the last obtusely angled at the periphery



Cantharidus dilatatus (Sby.).

and considerably expanded. Aperture oblique, subrotund; outer lip strengthened by an inner, white callosity, interior highly bluish-green, iridescent. Columella regularly arched, broadly expanded, and completely covering the umbilicus. Base slightly convex. Alt. 9, diam. 8 mm.

Hab.—Hokianga; Auckland; Cook Strait; Chatham Is. On sea-weeds near low-water mark; scarce.

By comparing specimens in the Canterbury Museum, I have satisfied myself as to the undoubted identity of *Elenchus dilatatus*, Sby., with *Cantharidus simulatus*, Hutton.

23. Cantharidus rufozona, A. Adams.

Canthiridus rufozona, A. Ad.: Proc. Zool. Soc., 1851, p. 170.
Cantharidus rufozona, A. Ad.: Hutton, Man. New Zealand Moll., p. 101; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 150.

Shell globosely conoidal, small, rather thin, imperforate, white or cinereous with distant rufous or pinkish-brown spiral ribs, 5 on the penultimate-, 13 on the body-whorl. Whorls 6, scarcely convex, the body-whorl rounded at the periphery. Suture impressed. Interstices between the ribs smooth. Aperture subquadrangular, outer lip slightly indented, sharp, articulated with pinkish-brown, with an inner opaque white band, interior iridescent. Columella vertical, white, slightly toothed in the middle; columellar expansion small, but perfectly filling up the umbilicus. Base convex. Alt. 6, diam. 5 mm.

Hab.—Near Auckland. The specimens in my collection were only lately collected and given to me by Mr. Charles Spencer, of Auckland. I have not seen this species before.

Pilsbry states, "Habitat unknown," but Captain Hutton (l.c.) states that he added the species to our list on the authority of Mr. E. A.

Smith, who says that specimens from New Zealand are in the British Museum, and kindly permits me to add that he agrees with my opinion, but considers the illustration here given to represent a young shell.

Cantharidus rufozona, A. Ad.

I can cordially endorse everything Mr. Pilsbry says about Adams' Monograph of the Trochidæ (t.c., p. 6).

Subgen. Bankivia (Beck), Krauss, 1848.

Sect. bankivia, s.s.

24. Cantharidus fasciatus (Menke).

Phasianella fasciata, Menke
Phasianella fulminata, Menke
Phasianella undatella, Menke
} Syn. Meth. Moll., 1830, p. 141.

Bankivia varians (Beck): Krauss, Südafrik. Moll., p. 105, pl. vi, fig. 1; Hutton, Man. New Zealand Moll., p. 101; Proc. Linn. Soc. New South Wales, vol. ix, p. 365.
Bankivia purpurascens, A. Adams: Proc. Zool. Soc., 1851, p. 171.
Bankivia major, A. Adams: t.c., p. 171.
Bankivia nitida, A. Adams: t.c., p. 172.
Cantharidus fasciatus, Pilsbry: Man. Conch., ser. i, vol. xi, p. 139, pl. xl, figs. 28–33.

Shell turreted, thin, shining, white, creamy or pink, plain or banded with pink, purple or brown. Last whorl rounded. Aperture ovate, outer lip acute, columella sinuous, obliquely truncate below. Alt. 19, diam. 8 mm.

Hab.—Waikanae, Cook Strait.

Sect. leiopyrga, H. & A. Adams, 1863.

25. Cantharidus picturata (H. & A. Adams).

Leiopyrga picturata, H. & A. Adams: Ann. & Mag. Nat. Hist., 1863, vol. xi, p. 19.
Cantharidus picturata, Pilsbry: Man. Conch., ser. i, vol. xi, p. 140, pl. xlv, figs. 46–8.

Shell turreted, narrowly perforate, shining, white, with longitudinal undulating or ziczac pinkish or purplish lines, sometimes with spiral bands at the periphery and around the umbilicus. Whorls more or less carinated at the periphery, the carina exserted above the sutures on the spire. Suture margined. Columella not truncate. Alt. 8–12, diam. 5–7 mm.

Hab.—Stuart Island (Stewart Island?), New Zealand.

I have not seen any New Zealand specimens.

Subgen. Thalotia, Gray, 1847.

Sect. thalotia, s.s.

26. Cantharidus conicus (Gray).

Monodonta conica, Gray: King's Survey Australia, vol. ii (1827), p. 479.

(?) *Trochus pictus*, Wood: Index Test. Suppt., pl. v, fig. 28.

Thalotia picta (Wood): A. Adams, Proc. Zool. Soc., 1851, p. 172.

Monodonta turrita, Menke: Moll. Nov. Holl., p. 15.

Trochus Lehmanni, Kiener: Species, genre *Trochus*, pl. xlvi, fig. 2 (not of Menke).

Thalotia Woodsiana, Angas: Proc. Zool. Soc., 1872, p. 611, pl. xlii, figs. 4, 5.

Trochus Troschelii, Philippi: Conch. Cab., p. 131, pl. xxiii, fig. 2.

Cantharidus rufozona, A. Ad.: Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 362 (not of A. Adams).

Thalotia conica (Gray): Hutton, Man. New Zealand Moll., p. 97.

Cantharidus conicus (Gray): Pilsbry, Man. Conch., ser. i. vol. xi, p. 141, pl. xlvi, fig. 73; pl. xlvi, figs. 67, 68 (*T. Woodsiana*).

Shell elevated, conical, imperforate, pinkish or greyish white with crimson apex and numerous close longitudinal dark reddish-brown stripes, often cut into tessellations. Whorls of spire with 5 or 6 granose liræ, 13–14 on the last whorl. Peristome thick, plicate within. Columella straight, denticulate, with a strong basal truncation. Alt. 20, diam. 13 mm.

Hab.—Rangitoto Channel, near Auckland; scarce (T. F. Cheeseman).

The species was omitted from the list of New Zealand mollusca by Captain Hutton in his revision (Proc. Linn. Soc. New South Wales, vol. ix, p. 357, footnote). From his description of *Cantharidus rufozona* there is no doubt that it is not that species, but *C. conicus* (Gray). Two specimens from Auckland in my collection agree perfectly with typical specimens from Tasmania. There are also specimens in the Auckland Museum, marked as coming from Auckland.

It is evident that Adams' short description of *C. rufozona* does not refer to *C. conicus*, since he described that species under the name of *Thalotia picta* (Wood).

Subfam. Gibbulinæ.

Genus GIBBULA, Risso, 1826.

Sect. calliotrochus, Fischer.

27. Gibbula Tasmanica, Petterd.

Gibbula Tasmanica, Petterd: Quart. Journ. Conch., vol. ii (1879), p. 103; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 236, pl. xl, fig. 20.

Shell small, perforate, conical, lustreless, whitish tinged with yellow, unicoloured, or marked with a few angular, radiating maculations of brown. Sutures impressed. Whorls 6, convex, finely, spirally lirulate, last whorl bluntly subangular, convex beneath, impressed round the umbilicus. Aperture oblique, angular above, broadly rounded below. Umbilicus narrow, funnel-shaped. Alt. 6, diam. 5·5 mm. My specimen with six whorls has alt. 8, diam. 7 mm.

Hab.—Lyall Bay.

Specimens collected by Mr. A. Hamilton of Dunedin correspond with the diagnosis and figure given by Pilsbry. I have not seen any Tasmanian specimens.

Sect. cantharidella, Pilsbry.

28. Gibbula fulminata (Hutton).

Chrysostoma fulminata, Hutton: Cat. Mar. Moll., 1873, p. 36.
Margarita fulminata, Hutton: Man. New Zealand Moll., p. 103; Proc. Linn. Soc. New South Wales, vol. ix, p. 364.
Gibbula fulminata, Pilsbry: Man. Conch., ser. 1, vol. xi, p. 216, pl. xliii, figs. 14–16.

Shell narrowly perforate, globose-conoidal, shining, smooth, except for a few striæ round the umbilicus. Colour pink or pinkish-brown, generally with a series of white blotches alternating with darker ones below the sutures, a girdle of white blotches along the periphery and often around the umbilicus; intervening spaces with ziczac streaks. Whorls 5, convex. Aperture rounded-quadrate, lip white-margined, columella arcuate; umbilicus white. Alt. 7·5, diam. 8 mm.

Hab.—Auckland to Wellington; Chatham Is.

29. Gibbula rosea (Hutton).

Chrysostoma rosea, Hutton: Cat. Mar. Moll., 1873, p. 36.
Margarita rosea, Hutton: Man. New Zealand Moll., p. 103; Proc. Linn. Soc. New South Wales, vol. ix, p. 364.
Gibbula rosea (Hutton): Pilsbry, Man. Conch., ser. 1, vol. xi, p. 216.

Shell small, globose-conoidal, narrowly umbilicated, pink with a few longitudinal white streaks or narrow spiral bands and purplish spots

on the last whorl; spirally, closely striate. Whorls 3½, convex, the last rounded at the periphery; protoconch white, smooth. Aperture circular, thickly margined with a white callosity all round, columella subtruncate below. Umbilicus narrow but open, its margin slightly crenulate by radial folds. Base convex. Alt. 3·5, diam. 6 mm. Specimens from Bounty Island measure 2·25 × 3 mm.

Hab.—Stewart I.; Bounty I.; Campbell I.

30. Gibbula antipoda (Hombron & Jacquinot).

Margarita antipoda, Hombr. & Jacq.: Voy. Pole Sud, Zool. vol. v (1854), p. 58, pl. xiv, figs. 26–8; Hutton, Man. New Zealand Moll., p. 103; Proc. Linn. Soc. New South Wales, vol. ix, p. 363.

Gibbula antipoda, Pilsbry: Man. Conch., ser. 1, vol. xi, p. 217, pl. xxxiii, figs. 102–4.

Shell small, perforate, depressed-conoidal, yellowish-green, iridescent, with 4–5 green or blackish spiral bands above, and sometimes below, the periphery. Whorls 3, the last very large, faintly spirally striated and with rather strong growth-lines, periphery rounded. Aperture large, round, margined by a white callus. Umbilicus almost closed up by the columellar reflection. Alt. 8, diam. 8 mm. A specimen from Antipodes Island measures 4·5 × 6 mm.

Hab.—Auckland Is.; Antipodes I.

31. Gibbula nitida, Adams & Angas.

Gibbula nitida, Ad. & Ang.: Proc. Zool. Soc., 1864, p. 36; Hutton, Man. New Zealand Moll., p. 102; Proc. Linn. Soc. New South Wales, vol. ix, p. 364; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 217, pl. xxxvii, figs. 25–7.

Chrysostoma inconspicua, Hutton: Cat. Mar. Moll., 1873, p. 36.

Margarita (?) *inconspicua*, Hutton: Man. New Zealand Moll., p. 102; Trans. New Zealand Inst., vol. xv, p. 124, pl. xiv, fig. N (radula).

Shell small, conical, narrowly umbilicate, olive-yellow or bluish-grey, marked with numerous, continuous, thread-like, white, spiral lines, generally broken up in tessellations; spire elevated, with convex outlines; last whorl obtusely angular around the periphery; base with 7–8 concentric liræ. Aperture rounded-quadrate, outer lip finely crenulated, within brilliantly iridescent; columella arcuate. Umbilicus funnel-shaped, yellowish within. Alt. 6·5, diam. 5·5 mm.; alt. 7, diam. 6·5 mm.

Specimens from Dunedin are bluish-black, shining more or less distinctly, spirally striate, umbilicus half covered by the columellar expansion. Alt. 8, diam. 7 mm.

Hab.—East and west coasts of both the North and South Islands; on stones near low-water mark.

32. Gibbula scamnata (Fischer).

Trochus (*Gibbula*) *scamnatus*, Fischer: Journ. de Conch., 1878, p. 66; Coq. Viv., p. 394, pl. cxvii, fig. 4.
Gibbula scamnata (Fisch.): Pilsbry, Man. Conch., ser. 1, vol. xi, p. 220, pl. xxx, fig. 6.

Shell small, subperforate, conoidal, cinereo-olivaceous, with spiral blackish bands; whorls 6, somewhat convex with 5–6 elevated liræ on the penultimate whorl; last whorl subangulate, base convex with 7–8 concentric liræ, the interstices narrow. Aperture subrhomboidal, sulcate within; columella arcuate, a little reflexed and almost covering the umbilicus. Alt. 7, diam. 7·5 mm. (Fischer).

Hab.—Brighton, Otago; Oceanica (Fischer).

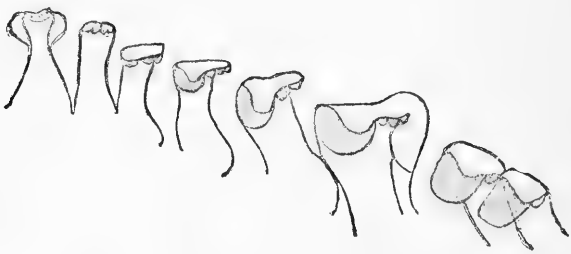
Specimens collected by Mr. A. Hamilton undoubtedly belong to this species, for which no definite locality was given by Fischer.

The species closely resembles *Cantharidus rufozona*, A. Ad., from which, however, it may at once be distinguished by its partly open umbilicus, its arcuate columella without any indication of a tooth, its larger size, and darker colour.

This is perhaps the undescribed form of *Cantharidus* mentioned by Pilsbry under *C. tenebrosus* (t.c., p. 124).

33. Gibbula Suteri (E. A. Smith).

Photinula Suteri, E. A. Smith: Proc. Malac. Soc., Vol. i (1894), p. 58, pl. vii, Fig. 3.



Portion of radula of *Gibbula Suteri* (E. A. Smith).

Shell small, turbinate, imperforate, uniformly black or grey, cinereous, pink, etc., longitudinally variegated and tessellated with white. Whorls 5, convex, rapidly increasing, faintly spirally striate. Last whorl angled at the periphery. Aperture rounded, outer lip sharp, columella arcuate, its expansion completely covering the umbilicus, leaving only a slight pit; umbilical tract white, impressed. Base slightly convex. Alt. 4, diam. 4 mm.

Hab.—Lyttelton Harbour (H. S.); Lyall Bay (A. Hamilton).

On examining the animal I found that a jaw is present and the radula is decidedly that of the genus *Gibbula*. A figure of the teeth

is here given. According to Fischer, *Photinula* has no jaw. The character of the radula and presence of a jaw induce me to class this species under *Gibbula*.

Type in the British Museum.

34. Gibbula micans, n.sp.

Shell minute, subperforate or imperforate, conical, iridescent, shining, light-yellow with radiate oblique broad streaks of dark-brown, the intervals with a few dots of light-brown; base tessellated with yellow and brown. Whorls 6, the first two minute, smooth, reddish-brown, the others finely spirally striate, about 15 striæ on the

Gibbula micans, n.sp.

penultimate whorl; spire conic, scarcely convex, last whorl carinate. Aperture subquadrangular, oblique, outer and basal lip sharp, margined with a white band; interior lirate, iridescent; columella subvertical, slightly arched, subdentate in the middle. Umbilicus partly or completely covered by the columellar expansion. Base convex, umbilical tract slightly impressed, white. Alt. 4, diam. 3–5 mm.

Hab.—Resolution I. (A. Hamilton).

Type in my collection.

Genus MONILEA, Swainson, 1840.

35. Monilea egena (Gould).

Solarium egenum, Gould: Proc. Bost. Soc. Nat. Hist., vol. iii (1849), p. 84; U.S. Explor. Exped., Moll. p. 196, fig. 226.
Monilea Zealandica, Hutton: Cat. Mar. Moll., 1873, p. 40.
Margarita Zelandica (Hutton): Sowerby, Conch. Icon., fig. 17.
Torinia egena (Gould): Marshall in Tryon's Man. Conch., ser. 1, vol. ix, p. 22, pl. vi, figs. 22, 23.
Monilea egena (Gould): Hutton, Man. New Zealand Moll., p. 102; Proc. Linn. Soc. New South Wales, vol. ix, p. 365; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 253, pl. xxxvii, fig. 13.

Shell small, low, ovate-conic, umbilicated, ashy-white, pearly beneath. Whorls 6, each with four sharply compressed spiral ribs,

the two uppermost beaded. Umbilicus one-third of base, tunnel-shaped, penetrating to the apex, its sides excavated on each whorl, the verge of which is crenulated. Aperture nearly circular. Alt. 5·5, diam. 7 mm.

Hab.—Bay of Islands; near Auckland, in sandy places, below low-water mark; not common (T. F. Cheeseman).

Genus CALLIOSTOMA, Swainson, 1840.

36. Calliostoma spectabile (A. Adams).

Ziziphinus spectabilis, A. Adams: Proc. Zool. Soc., 1854, p. 37, pl. xxvii, fig. 7; Hutton, Man. New Zealand Moll., p. 98; Proc. Linn. Soc. New South Wales, vol. ix, p. 360.
Calliostoma spectabilis, Pilsbry: Man. Conch., ser. 1, vol. xi, p. 332, pl. xvi, fig. 12.

Shell large, imperforate, conical, flesh-coloured or yellowish, dotted with pink on the spiral ribs, which are coarsely granose, about 7 on the penultimate whorl, about 8 on the base. Whorls 6, nearly flat, the last obtusely angled at the periphery; base rather flattened. Aperture rounded-quadrangular. Columella pearly, arcuate. Umbilical region without any callus. Alt. 35, diam. 37 mm.

Hab.—Auckland; Auckland Is. (*fide* Von Martens); Chatham Is. (*fide* Pilsbry). A rare shell.

37. Calliostoma tigris (Martyn).

Trochus tigris, Martyn: Univ. Conch., vol. ii (1784), pl. lxxv; Gmelin, Syst. Nat., 13th ed., p. 3585, No. 128.
Granatum, Chemnitz: Conch. Cab., vol. v, p. 100, figs. 1654, 1655.
Ziziphinus granatum (Chemn.): Hutton, Man. New Zealand Moll., p. 98; Proc. Linn. Soc. New South Wales, vol. ix, p. 360.
Calliostoma tigris, Pilsbry: Man. Conch., ser. 1, vol. xi, p. 333, pl. xli, fig. 30.

Shell large, conical, imperforate, light-yellowish, longitudinally painted with numerous irregular reddish-chestnut stripes. Delicate finely beaded spiral liræ, 16–20 on the penultimate whorl, 18–25 on the upper surface of the body-whorl. Spire elevated, concave above. Whorls 10–12, the last convex, rounded at the periphery. Aperture rhomboidal, columella arcuate, a small callus on the umbilical region. Alt. 59, diam. 58 mm.; alt. 45, diam. 45 mm.

Hab.—Auckland to Cook Strait; Chatham I.

38. Calliostoma punctulatum (Martyn).

Trochus punctulatus, Martyn: Univ. Conch., pl. xxxvi (1784).
Trochus diaphanus, Gmelin: Syst. Nat., 13th ed., p. 3580.
Turbo grandineus, Valenc.: Voy. "Venus," atlas Moll., pl. iv, fig. 4.

Ziziphinus punctulatus, Hutton: Man. New Zealand Moll., p. 98; Proc. Linn. Soc. New South Wales, vol. ix, p. 360; Trans. New Zealand Inst., vol. xiv, p. 165, pl. vii, fig. H (radula).

Calliostoma punctulatum, Martyn: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 334; vol. x, pl. lxv, fig. 75.

Shell conoidal, imperforate, light fawn-colour, with narrow, conspicuously beaded, spiral ridges, 8–12 on the penultimate whorl. Sutures impressed. Whorls 8–9, the last rounded at the periphery. Columella arcuate. Umbilical region without any callus. Alt. 36, diam. 36 mm.

Hab.—Cook Strait to Stewart I.

39. Calliostoma pellucidum (Valenciennes).

Trochus pellucidus, Valenc.: Voy. "Venus," Moll. (1846), pl. iv, fig 2.

Ziziphinus granatus (Chemn.): Reeve, Conch. Icon., fig. 2 (not *Trochus granatum*, Chemn. = *C. tigris*, Mart.).

Calliostoma pellucidum, Valenc.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 334; vol. x, pl. xli, fig. 36.

Shell conical, imperforate, yellowish with a few brown obliquely longitudinal streaks. Close and numerous beaded spiral liræ dotted minutely with brown and white, 8–10 on the penultimate whorl; they are closer and smaller just below the periphery. Sutures slightly impressed. Last whorl subangular at the periphery. Aperture rhomboidal, columella arcuate, with a slight tubercle at the base. Umbilical region with a slight callus. Alt. 30, diam. 30 mm.

Similar to *C. tigris*, but differently coloured, more carinated, with fewer series of granules.

Hab.—Whangarei, Auckland; Cook Strait.

40. Calliostoma selectum (Chemnitz).

Trochus selectus, Chemnitz: Conch. Cab., vol. xi (1795), p. 168, pl. cxcvi, figs. 1896, 1897.

Trochus Cunninghami, Gray: Griffith's "Cuvier's Anim. Kingd.," vol. xii (1834), pl. i, fig. 7.

Ziziphinus selectus (Chemn.) and *Cunninghami* (Gray): Hutton, Man. New Zealand Moll., p. 98.

Ziziphinus decarinatus, Hutton: Proc. Linn. Soc. New South Wales, vol. ix, p. 359 (not *decarinatus*, Perry).

Trochus torquatus, Anton: Philippi, Conch. Cab., p. 261, pl. xxxviii, fig. 13.

Calliostoma selectum, Chemn.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 335, pl. lxv, figs. 73, 74, 78.

Shell large, imperforate, pale fawn-colour, elongated brown dots on the spiral riblets, which are closely granulose, 10–11 on the penultimate whorl. Spire conical, concave on the upper part. Whorls 8–9,

flat, the last slightly convex above, obtusely angular at the periphery, somewhat convex beneath. Aperture subrhomboidal, columella arcuate. Umbilical region with a large callosity. Alt. 50, diam. 57 mm.; alt. 37, diam. 47 mm.

Hab.—Auckland to Cook Strait.

*** *Calliostoma Lessonæanum*, Tapp.-Can.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 402, is *not* a New Zealand shell.

Genus EUCHELUS, Philippi, 1847.

Sect. EUCHELUS, s.s.

(=*Huttonia*, T. W. Kirk: Trans. New Zealand Inst., vol. xiv, p. 282.)

41. EUCHELUS BELLUS, Hutton.

Euchelus bellus, Hutton: Cat. Mar. Moll., 1873, p. 37; Man. New Zealand Moll., p. 95; Proc. Linn. Soc. New South Wales, vol. ix, p. 357; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 435, pl. lxvii, fig. 80.

Huttonia bella, Hutton: Trans. New Zealand Inst., vol. xv, p. 123, pl. xiv, fig. I (operculum and radula).

Shell small, globose-conic, pinkish-white varied with darker markings, imperforate, with granose spiral liræ, 7–8 on the penultimate whorl, 10 on the body-whorl. Whorls 5, convex, the last globose. Aperture rounded, columella concave, terminating in a tooth, below it a narrow notch, and another tooth on the basal lip. Alt. 6·5, diam. 6·5 mm.

Hab.—Chatham I.

Var. *iricolor*, T. W. Kirk.

Huttonia iricolor, T. W. Kirk: Trans. New Zealand Inst., vol. xiv (1882), p. 282; Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 358.

Euchelus bellus var. *iricolor*, Pilsbry: Man. Conch., ser. 1, vol. xi, p. 436.

Granules coarser; dirty chocolate, interior bluish-green.

Hab.—Auckland to Waikanae.

42. EUCHELUS HAMILTONI (T. W. Kirk).

Huttonia Hamiltoni, T. W. Kirk: Trans. New Zealand Inst., vol. xiv (1882), p. 283.

Euchelus Hamiltoni, T. W. Kirk: Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 358; Pilsbry, Man. Conch., ser. 1, vol. xi, p. 436.

Shell perforate, spiral granular ribs very fine, white or pinkish-white with darker spots in diagonal lines. Inside white.

Hab.—Wellington.

Pilsbry thinks this may prove to be the same as *E. Tasmanicus*, Ten.-Woods. I have seen neither species.

Subfam. Umboniinæ.

Genus ETHALIA, Adams, 1853.

43. Ethalia Zelandica (Hombr. & Jacq.).

Rotella Zelandica, Hombr. & Jacq.: Voy. Pole Sud, Zool. vol. v (1854), p. 53, pl. xiv, figs. 5, 6; Hutton, Man. New Zealand Moll., p. 92.

Rotella Neozelanica, Hombr. & Jacq.: Hutton, Proc. Linn. Soc. New South Wales, vol. ix, p. 357.

Globulus anguliferus, Philippi: Conch. Cab. (1853 ?), p. 51, pl. viii, fig. 3.

Umbonium chalconotum, A. Adams: Proc. Zool. Soc., 1853, p. 188.

Ethalia Zelandica, Hombr. & Jacq.: Pilsbry, Man. Conch., ser. 1, vol. xi, p. 459, pl. lviii, figs. 9, 32, 33; pl. lix, fig. 66.

Shell depressed, imperforate, solid, yellowish or pinkish, radiately streaked with chestnut-brown or red above, base with a reddish or purple zone around the central callus, the outer part white. Surface smooth, shining; spire low, conoidal; sutures linear. Last whorl concave above. Umbilical area covered by a thin, radiately rugose, purple and white callus. Aperture rounded-quadrate. Columella short, very thick, inserted in a pad of white callus on the body over the axis. Alt. 11, diam. 19 mm.

Hab.—Auckland to Dunedin.

NOTES ON SOME NEW ZEALAND *FLAMMULINA*, WITH THE DESCRIPTION OF *F. PONSONBYI*, n.sp.

By Henry Suter.

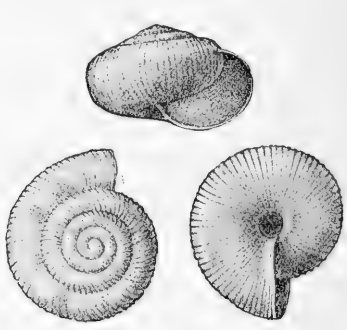
Read 11*th June*, 1897.

1. Flammulina (Phenacohelix) pilula (Reeve).

Helix pilula, Reeve: Conch. Icon., sp. 809 (1852).
Helix iota, Pfeiffer: Mon. Hel. Viv., vol. iii (1853), p. 69; Proc. Zool. Soc., 1852 (1854), p. 57.
Helix (*Charopa*) *iota* (Pfr.): Hector, Cat. Land Moll. New Zealand, 1873, p. viii.
Patula iota (Pfr.): Hutton, Man. New Zealand Moll., 1880, p. 6.
Charopa (*Thalassia*) *iota* (Pfr.): Tryon, Man. Conch., ser. II, vol. ii, p. 212, pl. lxii, fig. 43 (copy of Reeve).
Phenacohelix granum (Pfr.): Hedley & Suter [*non* Pfr.], Proc. Linn. Soc. New South Wales, ser. II, vol. vii, p. 642.

To Mr. E. A. Smith I am indebted for the following additions to the diagnosis of the species, as observed on the type-specimen, drawings of which, kindly sent by Mr. J. H. Ponsonby, are here reproduced:—"Protoconch, one and a half whorls, minutely spirally striated, no riblets. Nine riblets or eight furrows to a millimetre. The entire

Flammulina pilula (Reeve).



Flammulina Ponsonbyi, n.sp.

surface between the riblets, as seen under an inch objective, is very minutely decussated. In some lights the longitudinal striæ are more noticeable, and *vice versâ*. The ribs are slender, subequidistant, and of equal size. Diam. maj. 3·5, min. 3·25 mm.; alt. 2·5 mm."

On examining the specimens in my collection, I found them to agree in the characters pointed out by Mr. E. A. Smith. The number of riblets, of course, is slightly variable. In most specimens I found them to be 9, in some 8, and in one 7 only, per millimetre. The umbilicus is sometimes a little narrower than in the type, but always perfectly open. In adult specimens the diameter is 4, whilst the altitude varies from 2·5 to 3 mm.

Hab.—North Island:—Whangarei; Mt. Wellington Lava Fields, near Auckland; Hunua Range; Wanganui; Waimarama; Forty Mile Bush. Stewart Island:—Halfmoon Bay.

In the nearly allied *F. chordata*, Pfr., I found the same microscopical structure as in *F. pilula*, but the riblets are stouter, cord-like, still less equidistant, from 6 to 8 per millimetre, never more. The very narrow perforation is partly or entirely covered by the columellar reflection. Diam. 4, alt. 3 mm.

2. Flammulina (Phenacohelix) Ponsonbyi, n.sp.

Patula pilula (Reeve): Hutton, Trans. New Zealand Inst., vol. xvi, p. 161, pl. ix, fig. K; pl. xi, fig. M (radula and jaw).

Fruticicola pilula (Reeve): Hutton, Trans. New Zealand Inst., vol. xvi, p. 194.

Phenacohelix pilula (Reeve): Hedley & Suter, Proc. Linn. Soc. New South Wales, ser. II, vol. vii, p. 641.

Flammulina (*Phenacohelix*) *pilula* (Reeve): Pilsbry, Man. Conch., ser. II, vol. ix, p. 16, pl. iii, fig. 13 (the spire is usually more depressed than here shown); also pl. ii, figs. 6, 7 (jaw and radula).

Shell small, depressed-globose, moderately umbilicated, obtusely angled at the periphery, pale horny with irregular radiate dashes and spots of rufous on the upper surface, passing over in zigzag lines at the base, sometimes imparting a tessellated appearance to it, and extending to the umbilicus; thin, dull. Whorls 4½, regularly increasing, flatly convex, sculptured with numerous arcuate, subequidistant, thread-like riblets, about 8, rarely 7 or 6, per millimetre. Protoconch with numerous fine, microscopic, spiral striæ, interstices between the riblets microscopically decussated. Suture impressed; spire scarcely elevated. Last whorl obtusely angled above the middle, not descending in front. Aperture oblique, lunate. Peristome thin, sharp, slightly reflexed near the umbilicus, which is quite open, slightly perspective, and about one-fifth of the greatest diameter. Base convex. Diam. maj. 6, min. 5·25 mm.; alt. 3·25 mm.

Hab.—North Island:—Whangarei; Auckland; Mt. Wellington Lava Fields and Hillyer's Creek, near Auckland; Hunua Range; Ohaupo; Mt. Taupiri; Otaki Gorge; Forty Mile Bush; Wanganui; Napier.

The type, from Mt. Wellington Lava Fields, is in my collection. The specimen figured is in the British Museum (Natural History).

Mr. J. H. Ponsonby, in whose honour the shell is named, was the first to point out that the shell which we in New Zealand took for *F. pilula*, Reeve, did not correspond with the type in the British Museum, and I am greatly indebted to him for his kind assistance in settling the question.

A nearly allied species is *Flammulina* (*Allodiscus*) *Mossi*, Murdoch (ante, p. 162), in which, however, the umbilicus is much narrower.

Var. *unicolor*, Suter.

Phenacohelix pilula (Reeve) var. *unicolor*, Suter: Trans. New Zealand Inst., vol. xxvi (1894), p. 134.

Hab.—North Island; Mt. Taupiri.

DESCRIPTIONS OF NEW SPECIES OF LAND-SHELLS FROM NEW GUINEA AND NEIGHBOURING ISLANDS.

By Edgar A. Smith, F.Z.S., etc.

Read 14*th May*, 1897.

PLATE XVII.

Most of the specimens about to be described form part of collections made by Mr. William Doherty in 1892. They have been placed in my hands for examination by our President, who has not had time to work them out himself. The whole collection contains thirty-three species in all, which are quoted in the following list, with the special locality, when known, of each.

In addition, descriptions are given of a new *Rhytida* from Trobriand Island and a new *Chloritis* from Woodlark Island; both these, with *Hadra Forsteriana*, also referred to, were received by Mr. Sowerby from a collector who had been travelling in New Guinea and the neighbouring islands.

LIST OF SPECIES.

1. *Veronicella prismatica*, Canefri.
2. *Macrochlamys Dohertyi*, n.sp. Andai.
3. *Ariophanta* (*Hemiplecta*) *Andaiensis*, n.sp. Andai.
4. *Ariophanta* (*Xesta*) *fraudulenta*, Smith. Biak Island.
5. *Chloritis circumdata*, Férus. Andai.
6. *Chloritis dinodeomorpha*, Canefri.
7. *Chloritis cheratomorpha*, Canefri (a small variety). Island of Ron, Geelvink Bay.
8. *Chloritis* (*Sulcobasis*) *Rohdei*, Kobelt. Humboldt Bay.
9. *Planispira* (*Cristigibba*) *corniculum*, H. & J. (var. β of Canefri). Wandesi.
10. *Planispira* (*Cristigibba*) *tortilabia*, Lesson (form β var. δ of Canefri).
11. *Trochomorpha planorbis*, Lesson. Andai.
12. *Sitala anthropophagorum*, Hedley. Humboldt Bay.
13. *Papuina rufo-purpurea*, n.sp.
14. ,, *molesta*, n.sp. Andai.
15. ,, *multizona*, Lesson. Andai.
16. ,, *lituus*, Lesson. Andai.
17. ,, *Taumantias*, Canefri, var.
18. ,, *grata*, Michelin. Mansinam.
19. ,, *Lintschuana*, Kobelt.
20. ,, *Tayloriana*, Ad. & Rve. Zamna.
21. ,, *Tuomensis*, Ancey, var.
22. ,, *Blanfordiana*, H. Ad. (var. *Poirieri*, Canefri). Andai.
23. *Albersia zonulata*, Férus. (a small form). Andai.

24. *Perrieria clausiliæformis*, Canefri.
25. *Cyclotus distomellus*, Sow. (var. passing into *guttatus*, Pfr.). Andai.
26. *Leptopoma Gianellii*, Canefri. Andai.
27. *Bellardiella Martensiana*, Canefri.
28. *Pupina Papuana*, n.sp. Andai.
29. *Pupina nasuta*, Smith. Humboldt Bay.
30. *Helicina sphæroconus*, Mölldff.
31. *Helicina parva*, Sow., var. (one specimen). Island of Jobie, Geelvink Bay.
32. *Helicina Jobiensis*, Canefri. Ron and Jobie Islands, Geelvink Bay.
33. *Truncatella gracilenta*, n.sp. Andai.

DESCRIPTIONS OF SPECIES.

1. Rhytida Trobriandensis, n.sp. Pl. XVII, Figs. 1–3.

Testa depressa, orbicularis, aperte umbilicata, tenuis, olivaceo-flavescens, lineis obliquis sinuosis olivaceo-rufescentibus gracilibus remotis picta, nitens, lineis incrementi obliquis exilibus striisque spiralibus microscopicis confertis sculpta; spira fere plana, apice obtuso, vix elato; anfractus $4\frac{1}{2}$, celeriter crescentes, leviter convexiusculi, ultimus latus, haud descendens; apertura obliqua, late lunata, intus cæruleo-albida; peristoma tenue, simplex, marginibus conniventibus; umbilicus perspectivus, diam. totius basis $\frac{1}{4}$ adæquans. Diam. maj. 17, min. 15, alt. 9 mm.; apertura 8 mm. longa, 6 lata.

Hab.—Trobriand Island.

Flatter than *R. Franklandiensis*, Forbes, and less distinctly striated. More deeply umbilicated and with a less sunken spire than *R. veronica*, Pfr., from the Solomon Islands.

2. Macrochlamys Dohertyi, n.sp. Pl. XVII, Figs. 4–6.

Testa anguste perforata, orbicularis, supra depresse conoidea, nitidiuscula, subpellucida, pallide fusco-cornea, infra polita; anfractus $5\frac{1}{2}$, lente accrescentes, convexiusculi, infra suturam linea angusta pellucida marginati, striis incrementi tenuissimis obliquis arcuatis sculpti, ultimus in medio postice obtuse angulatus (angulo antice evanescente), haud descendens; apertura oblique lunata; peristoma intus costa pallida conspicua incrassatum, margine columellari anguste reflexo. Diam. maj. 12·5, min. 11 mm.; alt. 7·5 mm.

Hab.—Andai, New Guinea.

Smaller than *M. Papuana*, Smith, with a slightly more conical spire, and angulated body-whorl, and a distinct rib-like thickening within the peristome, which is seen externally through the substance of shell.

3. Ariophanta (Hemiplecta) Andaiensis, n.sp. Pl. XVII, Figs. 7, 8.

Testa depresse conica, acute carinata, angustissime umbilicata, dilute fuscescens, infra carinam pallidam zona angusta rufa cincta, supra sericata, infra polita; spira depresse conoidea, ad apicem leviter obtusa; anfractus 6, lente crescentes, superiores tres convexiusculi,

cæteri minus convexi, lineis incrementi tenuissimis obliquis arcuatis striisque spiralibus exilissimis obsoletis sculpti, ultimus acute sed haud compresse carinatus, nec descendens, nec subtus concentrice striatus; apertura securiformis, pallide roseo-fuscescens, in medio carina pallida et zona rufa translucentibus; peristoma supra mediocriter tenue, infra incrassatum, pallidum, supra umbilicum paulo reflexum. Diam. maj. 31·5, min. 26·5 mm.; alt. 14 mm.

Hab.—Andai, New Guinea.

Like *H. exilis*, Müller, in colour, but much more sharply keeled, the form of the aperture being consequently very different. The spire in *H. exilis* is curved in outline, whereas in *H. Andaiensis* it is rectilinear, or even feebly concave. *H. inclinata*, Pfr., is much more sharply keeled, the body-whorl being concavely depressed both above and below the keel, beneath which there is no reddish line as in the present species.

4. Thersites (Hadra) Forsteriana, Pfr.

Pilsbry, Man. Conch., ser. II, vol. vi, p. 127.

Hab.—Ferguson Island.

The localities known for this species are "Barrow, Howick, and Percy Islands" (Pilsbry).

The specimen from Ferguson Island is 26 mm. in its greatest diameter. Mr. Sowerby, from whom it was obtained for the Museum, has no reason to doubt the correctness of the habitat, since he received the shell with others from a collector who had been travelling in New Guinea and the adjacent islands.

5. Chloritis fusco-purpurea, n.sp. Pl. XVII, Figs. 12–14.

Testa depresse globosa, semiobtecte umbilicata, purpureo-fusca, periostraco piloso induta; spira depressa, supra anfractum ultimum vix elata, ad apicem obtusa; anfractus $4\frac{1}{2}$ convexiusculi, sutura subprofunda discreti, undique tenuiter granulati, ultimus antice subito descendens, circa umbilicum obtusissime angulatus; apertura oblique lunata; peristoma tenue, fusco-purpureum, mediocriter expansum et reflexum, margine columellari superne dilatato, umbilicum semiobtegente. Diam. maj. 24, min. 19 mm.; alt. 16 mm.

Hab.—Woodlark Island.

This species differs from *Chloritis Leei* of Cox, which also occurs on Woodlark Island, in its general form, narrower umbilicus, smaller aperture, closer granulation, etc. It may perhaps be Mr. Hedley's var. *Woodlarkensis* of that species: see Proc. Linn. Soc. New South Wales, ser. II, vol. vi (1891), p. 83.

6. Papuina rufo-purpurea, n.sp. Pl. XVII, Fig. 9.

Testa perforata, trochiformis, saturate purpureo-rufa, striis incrementi obliquis tenuibus sculpta; spira elongata, conica, anfractus 7, lente accrescentes, superiores tres convexiusculi, cæteri minus convexi, ultimus ad peripheriam obtuse angulatus, antice vix descendens,

infra medium leviter convexus, nitens; apertura obliqua, intus rufo-purpurea, submargaritacea; peristoma rufo-purpureum, late expansum et leviter reflexum, margine basali paulo incrassato, supra umbilicum reflexo. Diam. maj. 30, min. 24 mm.; alt. 34 mm.

Hab.—New Guinea.

The upper surface is dull, the base being glossy. Besides the fine lines of growth, there are faint traces of spiral striation. *P. lenta*, Pfr., and *P. euchroes*, Pfr., are allied forms as regards shape.

7. Papuina molesta, n.sp. Pl. XVII, Figs. 10, 11.

Testa brevita conoidea, acute carinata, umbilicata, dilute fuscescens, lineis incrementi obliquis striata, undique minutissime granulata; spira brevis, recte conica, ad apicem acutiuscula; anfractus 5, subceleriter accrescentes, superiores tres convexi, penultimus minus convexus, ultimus supra planiusculus, infra convexior, in medio acute carinatus, ad labrum breviter descendens; apertura oblique angulato-lunata, intus concolor; peristoma albidum, margine superiore leviter expanso, inferiore latius dilatato et reflexo, columellari etiam latius expanso. Diam. maj. 19, min. 16 mm.; alt. 12 mm.

Hab.—Andai, New Guinea.

The peripheral keel forms a carinate sutural line between the last and penultimate volutions.

8. Pupina Papuana, n.sp. Pl. XVII, Fig. 15.

Testa subovata, polita, flavescens, spira convexe conoidea, ad apicem mediocriter acuminata; anfractus sex, convexiusculi, sutura inconspicua, linea angustissima rufescenti marginata, sejuncti, ultimus elongatus, obliquus, supra aperturam leviter complanatus, valde descendens, sed ad labrum paulo ascendens; apertura aurea, valde lateralis, fere circularis, longitudinis totius $\frac{2}{5}$ adæquans; peristoma leviter incrassatum, margine superiore subsinuato; fissura columellaris angusta, curvata, sursum tensa, lobo anfractus ultimi semiobtecta; callus columellaris porrectus, postice lamella acuta terminans. Long. 11, diam. 6 mm.; apertura 4 mm. longa.

Hab.—Andai, New Guinea.

Larger than the *P. aurea*, Hinds, with a differently coloured peristome and differently formed anterior slit.

9. Truncatella gracilenta, n.sp. Pl. XVII, Figs. 16, 17.

Testa elongata, gracilis, sordide albida, confertim et tenuissime costellata, costellis in anfr. ultimo aperturam versus magis distantibus lamelliformibus paulo infra medium subangulatis; anfractus 16, lente accrescentes, supremi 2–3 læves, convexi, ad apicem plani, cæteri (quarum 7–8 permanentes) convexiusculi, ultimus haud descendens; apertura irregulariter ovata, alba, polita; peristoma continuum, haud solutum, margine dextro late expanso et reflexo, columellari angustius reflexo. Long. 23, diam. anfractus ultimi 3, long. anfractum septem permanentium 13 mm.

Hab.—Andai, New Guinea.

Remarkable for its long slender form, and the fine close-set thread-like lamellæ, which become more remote and prominent on the body-whorl, especially around its base.

EXPLANATION OF PLATE XVII.

Figs. 1–3. Rhytida Trobriandensis.
,, 4–6. Macrochlamys Dohertyi.
,, 7, 8. Ariophanta (Hemiplecta) Andaiensis.
,, 9. Papuina rufo-purpurea.
,, 10, 11. Papuina molesta.
,, 12–14. Chloritis fusco-purpurea.
,, 15. Pupina Papuana.
,, 16. Truncatella gracilenta (enlarged).
,, 17. ———— Apical whorls (magnified).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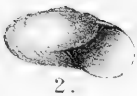
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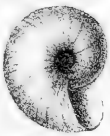
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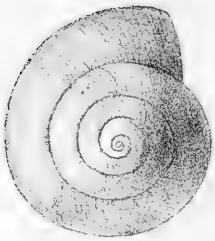
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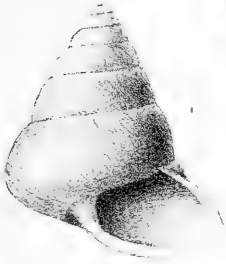
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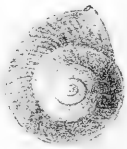
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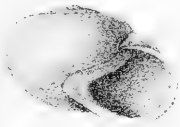
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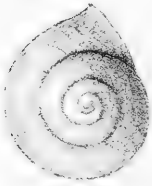
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E.A.Smith del. et lith. Mintern Bros. imp

NEW LAND SHELLS FROM NEW GUINEA.

DESCRIPTION OF *ACHATINA STUDLEYI*, n.sp., FROM OLD CALABAR, WEST AFRICA.

By J. Cosmo Melvill, M.A., F.L.S., and J. H. Ponsonby, F.Z.S., etc.

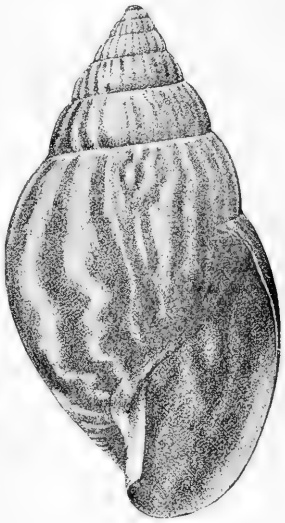
Read 14*th May*, 1897.

Achatina Studleyi, n.sp.

A. testa ovata, tumidula, apud apicem paullum attenuata, tenui, anfractibus 8, apicali incluso, unicolore, simplice, cæteris ventricosulis, minute sed regulariter granulosis, pallide stramineis, flammis zebrinis castaneo-brunneis longitudinaliter depictis, ultimo anfractu infra medium lævi, eleganter castaneo-suffuso, ad medium, ut apud anfractus superiores, granuloso, et flammis longitudinalibus decorato, apertura oblonga, labro extus tenui. Long. 63, lat. 31 mm.

Hab.—Old Calabar. Coll. T. Studley, Comm. E. L. Layard, C.M.G.

This is a most distinct and beautiful species, though in many ways similar to the Natalese *A. semigranosa* and *A. granulata*, Pfr. It is thin, ovate, slightly attenuate towards the apex, eight-whorled, the upper whorls, and upper half of the lowest, being minutely granular, these granules being very small and regular; below the middle the last whorl is smooth, and beautifully suffused with bright chestnut-brown; the ground-colour of all the whorls is pale-straw, but they are ornamented with longitudinal dark-brown zebra-like markings. The aperture is oblong, within bluish, outer lip thin.



Achatina Studleyi, n.sp.

Mr. E. L. Layard says it must be common in the district whence it came, since it is sold in the markets and largely eaten by the natives. We hope before long to obtain a full-grown specimen; and fully anticipate that when seen in its finest condition this will rank as one of the most striking species in the genus.

At the request of Mr. Layard, we name it in honour of Mr. T. Studley, its discoverer.

DESCRIPTION OF *PLECOTREMA SYKESII*, n.sp., FROM KARACHI.

By J. Cosmo Melvill, M.A., F.L.S., etc.

Read 11th June, 1897.

Plecotrema Sykesii, n.sp.

P. testa parva, rimata, solidula, ochraceo-cornea, lævi, anfractibus 6 vel 7, infra, juxta suturas, transversim binis sulculis superficialiter scalptis, aliter omnino lævibus, ultimo anfractu cæteros late conjunctim superante, apertura oblonga, peristomate extus paullum incrassato, intus quinque dentibus plicisve albidis munito, videlicet; duobus dentibus labialibus, tribusque plicis columellaribus. Long. 4, lat. 1·75 mm.

Hab.—Karachi (F. W. Townsend).

A small horny-yellow *Plecotrema*, of which we have seen a few specimens, all precisely similar. The shell is solid, rimate, six- or seven-whorled, with the surface entirely smooth (thus differing from

Plecotrema Sykesii, n.sp.

most of its congeners), with the exception of two, very superficial, thin, spiral sulculi, more like scratches than furrows, just below the sutures. The last whorl is much the largest. Mouth oblong, peristome somewhat thickened exteriorly, and within provided with two labial teeth and three columellar plaits; both teeth and plaits are whitish.

I am much indebted to Mr. E. R. Sykes for having assisted me in the discrimination of the species of this genus, and have unusual pleasure in connecting this very interesting little new form with his name. He desires me to take this opportunity, since no suitable occasion has presented itself to him, to point out that, by an oversight, *P. mucronatum*, Möllddf. (Nachr. Deutsch. Malak. Gesell., 1894, p. 116), from Bohol, was omitted from his paper on the genus (Proc. Malac. Soc., Vol. i, p. 241).

The other *Plecotrema*, brought by Mr. Townsend from Karachi, is *P. concinnum* (H. & A. Ad.).

ON A FURTHER COLLECTION OF SLUGS FROM THE HAWAIIAN (OR SANDWICH) ISLANDS.

By Walter E. Collinge, F.Z.S., etc.,

Assistant Lecturer and Demonstrator in Zoology and Comparative Anatomy, Mason University College, Birmingham.

Read 11*th June*, 1897.

In the early part of 1896 I communicated a paper[1] to this Society upon a collection of slugs made by Mr. R. C. L. Perkins in the Sandwich, or Hawaiian Islands, for a Joint Committee of the Royal Society and British Association. A further collection has recently been received and handed to me for identification.

In the present collection there is a far larger number of specimens of each species, and they are all in a much better state of preservation than those previously described.

In my earlier paper I briefly reviewed the literature and gave a list of the species of slugs that have been recorded from these islands. I am now able to supplement the same by the addition of three species, two of which are new.

For some time I was undecided whether or not to separate *Amalia Babori* from *A. gagates*, Drap.; and *Agriolimax Bevenoti* from *A. lævis*, Müll. In all probability the former developed from *Amalia gagates*, and the latter from *Agriolimax lævis*. Each has become modified in certain features, due probably to isolation and habitat, but as these features will in all probability become more and more pronounced and permanent in the race occupying the Sandwich Isles, it is better, I think, to separate them as distinct species.

In my previous paper (t.c., p. 49) I called attention to, and figured, some slight differences in specimens of *Amalia gagates*, from Maui (cf. Figs. III, IV, and V, p. 48). An examination of the present collections from Haleakala convinces me that there are three distinct groups of this form in these islands, viz.:

Amalia gagates, Drap.
Amalia gagates, var. (as figured), from Maui.
Amalia Babori, n.sp.

The specimens of *Agriolimax* here described, which have probably all originated from *A. lævis*, Müll., exhibit a similar variability. Thus, in a collection from Kauai (2,000 feet) most of the specimens may be regarded as *A. lævis*, Müll., those from Kauai (4,000 feet) as *A. Bevenoti*, n.sp., while others from Haleakala (5,000 feet), mountains

[1] Proc. Malac. Soc., Vol. ii (1896), pp. 46–51.

near Honolulu (2,000 feet), and some collected between Olaa to Kilauea (2,000 to 4,000 feet), exhibit numerous minute variations in the form and position of the generative organs, which tend to make identification a very difficult matter. Some of these variations I have figured (Figs. 2, 3, and 8), and in all probability there are many more.

In dealing with these small specimens of *Amalia* and *Agriolimax*, I have been much impressed with the little value that can be attached to external features, especially in these two particular genera. Anyone examining the material I have had, and relying upon purely external features, will be able to endow the Sandwich Isles with numerous new "species" of both *Amalia* and *Agriolimax*, since forms in which the generative organs are almost identical exhibit differences in the colour, markings, length and breadth of the mantle, nature of the sulci, and form of the rugæ, to such an extent that any diagnosis based solely on these features would be worthless. So closely allied are many species of these two genera, while others are connected by intermediate forms or subspecies, that I have come to the conclusion that in addition to descriptions and figures of the generative organs, which are sufficient for specific determination in most genera, it is very desirable that some other organs should be figured and described—the alimentary or nervous systems, I would suggest—in addition to the form, origin, and insertion of the buccal, penial, and tentacular retractor muscles. These, and all other features, would be of much greater value if described from freshly-killed animals; for the specialist, who very often is compelled to examine only material which has for many months been in alcohol, works at considerable disadvantage, especially in the case of these minute forms.

1. Amalia Babori, n.sp.

Animal.—Anterior portion of head, mantle and dorsum, dark sepia, sides of body nearly as dark posteriorly, much lighter anteriorly, also in the region bordering the front and sides of the mantle; portion beneath the mantle yellowish-brown; mantle (Fig. 5) longer than broad, with distinct groove; foot-fringe yellowish-brown, darker posteriorly; foot-sole yellowish-brown, with median and lateral planes sharply marked. Rugæ large. Keel prominent. Length (in alcohol) 20 mm.

Shell very fragile, consisting of a series of small calcareous particles indefinitely arranged, the general form being as shown in Fig. 6. Length 3, breadth 2 mm.

Hab.—Haleakala, Maui, 5,000 feet, and Olaa to Kilauea, 2,000 to 4,000 feet (one specimen).

Anatomy.—The free-oviduct is a short tube, from one side of which there is a small oval-shaped diverticulum. The penis commences as a thin tube, expanding into a globose sac, beyond which it exhibits a number of constrictions, and terminates abruptly, giving place to the vas deferens, which passes off as a short fine tube. There is a large bilobed accessory gland (Fig. 4, *ac.gl.*) attached to the commencement of the free-oviduct by seven fine ducts, immediately above which the pyriform receptaculum seminis opens; its duct is short,

and the head expanded. The oviduct is short and bent upon itself, thus ∽ (Fig. 4, *ov.*). The albumen gland is very large. The hermaphrodite duct and gland are both small.

Externally the species is not unlike a small example of *A. ater*, Cllge., and differs only from dark forms of *A. gagates*, Drap., in its prominent keel.

I have much pleasure in associating with this species the name of Mr. J. F. Babor, of the Institute of Comparative Embryology, in the University of Prague.

2. Agriolimax lævis, Müll.

Small collection from Lihue, Kauai (2,000 feet), and from Haleakala (5,000 feet).

3. Agriolimax Bevenoti, n.sp.

In a collection of specimens from Kauai (4,000 feet), Honolulu (2,000 feet), and another from Haleakala (5,000 feet), Mr. Perkins sends a large number of small specimens of *Agriolimax*. I have dissected a number of these, and for some time was very doubtful whether or not to remove any of them from *A. lævis*. Dr. Simroth has very kindly examined some of these and given me his opinion upon them: he thinks the species is scarcely distinguishable, and that these specimens are nearly related to *A. lævis*, Müll., and *A. campestris*, Binney, from North America, *A. hyperboreus*, Wstr., from Behring Strait, and *A. agrestis*, L., from Northern Siberia.

I have made a careful examination of this material, and, as previously stated, I think there are sufficient reasons for separating some of these specimens from any of the above-mentioned forms. I have, therefore, named those from Kauai (4,000 feet) *A. Bevenoti*, after my colleague Professor Clovis Bévenot, to whom I am much indebted for the assistance he has so often given me with regard to Italian malacological literature.

Animal not unlike *A. lævis*, Müll., but slightly darker in colour. Length (in alcohol) 16 mm.

Anatomy.—The only parts of the reproductive organs which I have been able to clearly make out are the form of the free-oviduct and receptaculum seminis. In the three specimens dissected this latter organ was always folded, as shown in Fig. 9, *r.s.*, and the free-oviduct showed two small pouch-like diverticula. The reproductive organs were, unfortunately, not in a very mature condition.

4. Tebennophorus striatus, Hasselt.

There are numerous examples of this species collected at Honolulu (2,000 feet), and Lihue, Kauai (2,000 feet).

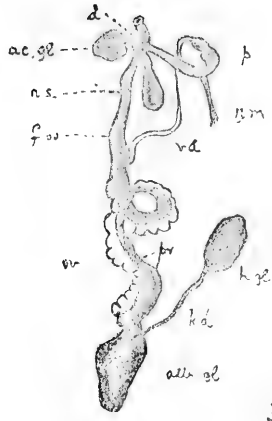


Fig 1

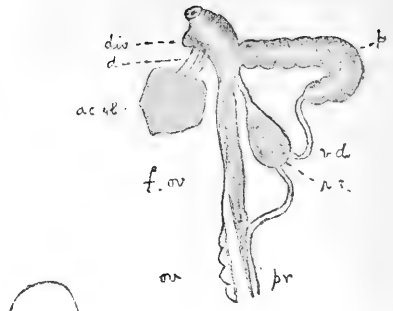


Fig. 2

Fig 5

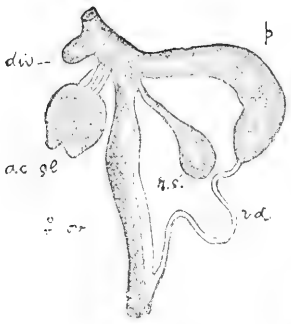


Fig 3

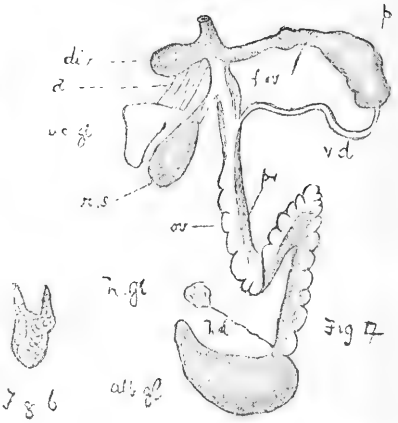


Fig 4

Fig 6

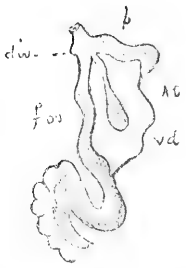


Fig. 7

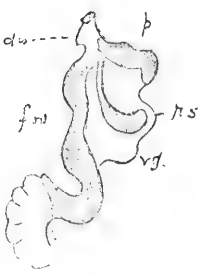


Fig. 8.

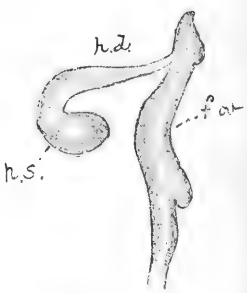


Fig 9.

FIG. 1. *Amalia gagates*, Drap. Generative organs.
,, 2. } *Amalia gagates*. Showing variations in the form of the terminal ducts,
,, 3. } particularly the gradual lengthening of the penis.
,, 4. *Amalia Babori*, n.sp. Generative organs.
,, 5. *Amalia Babori*. Mantle.
,, 6. *Amalia Babori*. Shell.
,, 7. *Agriolimax levis*, Müll. Portion of the generative organs.
,, 8. *Agriolimax levis*. Showing variation in the form of the receptaculum seminis, *r.s.*
,, 9. *Agriolimax Bevenoti*, n.sp. Terminal ducts of the generative organs.

LETTERING.

ac.gl.	accessory gland.	ov.	oviduct.
alb.gl.	albumen gland.	p.	penis.
d.	ducts of accessory gland.	pr.	prostate.
div.	diverticulum.	r.d.	receptacular duct.
f.ov.	free-oviduct.	r.m.	retractor muscle of penis.
h.d.	hermaphrodite duct.	r.s.	receptaculum seminis.
h.gl.	hermaphrodite gland.	v.d.	vas deferens.

PRELIMINARY DIAGNOSES OF NEW SPECIES OF NON-MARINE MOLLUSCA FROM THE HAWAIIAN ISLANDS. PART II.

By E. R. Sykes, B.A., F.Z.S., etc.

Read 11*th June*, 1897.

Since the first of these papers appeared (Oct. 1896, v. ante, p. 126), Mr. Perkins has finished his exploration and returned from the Hawaiian Islands, so that the work of preparing the final report can now be proceeded with; nevertheless, I have thought it advisable to issue these few diagnoses, drawn out prior to his return, and thereby to conclude the very brief series of descriptions here issued without illustrations.

1. Vitrea (?) Molokaiensis, n.sp.

Testa depressa, albido-hyalina, tenuis, late et aperte umbilicata (umbilicus circa 1 mm. latus), omnino sub lente eleganter regulariterque costulato-striata, nitida; spira perdepressa-conoidea, obtusula, apice lævigata; anfr. $4\frac{1}{4}$, regulariter accrescentes, sutura impressa, ultimus rotundatus, subdepressus; apertura subobliqua, ovato-lunata, relative ampla; peristoma simplex, tenue. Diam. max. 4·6, min. 4 mm.; alt. 2 mm.

Hab.—Forest above Pelekunu, Molokai (Perkins).

For remarks, see under the next species.

2. Vitrea (?) Lanaiensis, n.sp.

Testa V. Molokaiensi similis sed minor, umbilico profundiore et minore (circa ·5 mm. lato), striis magis approximatis et levioribus, infra fere obsoletis. Diam. max. 3·2, min. 3 mm.; alt. 1·2 mm.

Hab.—Mountains of Lanai, behind Koele (Perkins).

M. Ancey has placed[1] *Helix Sandwicensis*, Pfr., *H. pauxillus*, Gould (=*pusillus*, Gould *non* Lowe), and a new species, *H. Baldwini*, in *Hyalinia*. The first species will, I think, eventually prove not to really come from the Hawaiian Islands, but to be the young of some South American *Systrophia*. M. Ancey has kindly lent me the type of his new species, and from a comparison of it with the figures and description of Gould's *Helix pauxillus*,[2] I think they are only two forms of the same species. Both come from the same island (Maui); both have four whorls; one measures diam. 4·5, alt. 2 mm., the other diam. 5, alt. 2·125 mm.; both are striate above and smoother below; one is "pertenuis," the other "tenuis"; both are "depressa"; one is "aperte umbilicata," "umbilicus mediocris," the other "umbilicus

[1] Bull. Soc. Malac. France, vol. vi, p. 192.

[2] U.S. Explor. Exped., Moll. p. 40, pl. iii, fig. 46.

angustus, pervius": in short, I can trace no material differences between them. There appears, therefore, to be a compact little group of three species—one from Maui, one from Molokai, and one from Lanai. *Vitrea Molokaiensis* may be at once separated from *V. pauxillus* by its wider and more open umbilicus, and by the fact that the sculpture is strongly continued over the base; while *V. Lanaiensis* is intermediate in the umbilical perforation, and is a more compressed shell than *V. pauxillus*.

3. Kaliella Konaensis, n.sp.

Testa conico-pyramidalis, brunnea, subtenuis, subimperforata, supra sub lente dense et obsoletissime lineis incrementibus sculpta, infra lævior, nitida; spira bene elevata, apice obtusa, lævi; anfr. $5\frac{3}{4}$, convexiusculi, lente regulariterque accrescentes, sutura valde impressa, ultimus ad peripheriam carinatus, basi inflatus; apertura securiformis; peristoma simplex, tenue, acutum, margine columellari leviter reflexo. Diam. max. 3·5, min. 3·2 mm.; alt. 2 mm.

Hab.—Mt. Kona, Hawaii, at 3,000 feet (Perkins).

A remarkable little shell which seems to fall into *Kaliella*; it may, however, possibly be placed, when we are acquainted with the anatomy, near the Japanese forms of *Trochoconulus*.

4. Succinea Konaensis, n.sp.

Testa elongato-ovata, rugoso-striata, pellucida, pallide succinea, rare rufescenti-succinea, spira elongato-conica, apice papillata, sutura valde impressa; anfr. $3\frac{1}{2}$, rapide accrescentes, ultimo magno; apertura ovata, fere verticalis, columella subarcuata, peristomate acuto, basi expansiusculo. Alt. 9·5, lat. 5 mm.

Hab.—Mt. Kona, Hawaii, at 4,000 feet (Perkins).

The large number of unfigured species described from the Hawaiian Islands, renders the identification of specimens a somewhat difficult task, but the present form does not appear to quite agree with any named species.

ORDINARY MEETING.

Friday, 14th May, 1897.

Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc., President, in the Chair.

The following were elected to membership of the Society: Miss J. Donald, Henry Woods.

The following communications were read:—

1. "Descriptions of new species of Land-shells from New Guinea and neighbouring islands." By E. A. Smith, F.Z.S.

2. "Description of *Achatina Studleyi*, a new species from Old Calabar, West Africa." By J. Cosmo Melvill, M.A., F.L.S., and J. H. Ponsonby, F.Z.S.

3. "Revision of the New Zealand Trochidæ." By H. Suter.

On behalf of Mr. Sowerby was exhibited a brightly coloured specimen of *Pecten islandicus*, Chemn., supposed to be from Iceland.

Mr. E. R. Sykes exhibited the types of thirteen species of non-marine Hawaiian Mollusca, kindly lent for exhibition by Mons. Ancey.

Specimens in illustration of the papers read were also exhibited.

A note, illustrated by figures, was read on behalf of Mr. E. W. Bowell, calling attention to the variation in the dart, mucous glands, and radula, of the so-called *Helicella virgata*, Da Costa, and pointing out the possibility of the specific distinction of this species from *H. variabilis*, Drap.

ORDINARY MEETING.

Friday, 11th June, 1897.

Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc., President, in the Chair.

The following communications were read:—

1. "On a further collection of Slugs from the Hawaiian Islands." By W. E. Collinge, F.Z.S., etc.

2. "Description of *Plecotrema Sykesi*, a new species from Karachi." By J. Cosmo Melvill, M.A., F.L.S.

3. "Notes on some New Zealand *Flammulina*, with the description of *F. Ponsonbyi*, n.sp." By H. Suter.

4. "Preliminary Diagnoses of new non-marine Shells from the Hawaiian Islands." Part II. By E. R. Sykes, B.A., F.Z.S., etc.

Mr. J. E. S. Moore exhibited a series of Mollusca collected by himself in Lake Tanganyika.

Specimens were also exhibited in illustration of the communications made to the Society.

INDEX TO VOL. II.

A † is prefixed to the names of fossil species.

A

B

C

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All corrections or alterations of address are to be sent to Martin F. Woodward, Royal College of Science, South Kensington, London.

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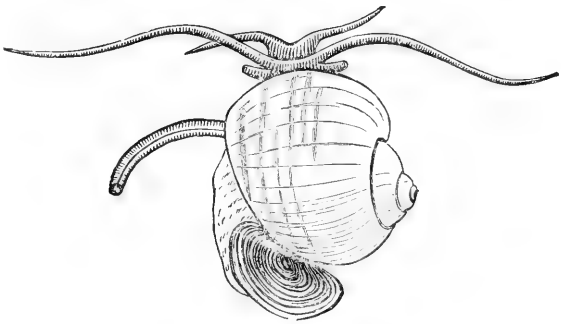
PROCEEDINGS

OF THE

MALACOLOGICAL SOCIETY

OF LONDON.



EDITED BY

B. B. WOODWARD, F.L.S., F.G.S., Etc.

Under the direction of the Publication Committee.

CONTENTS.

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(Founded 27th February, 1893.)

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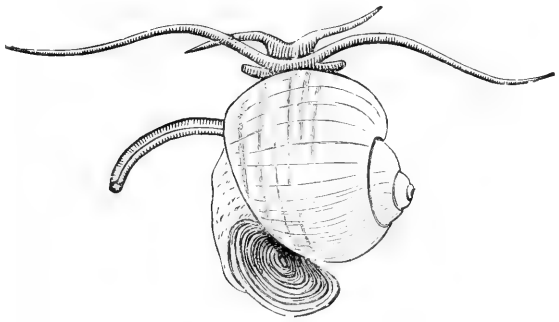
OF LONDON.



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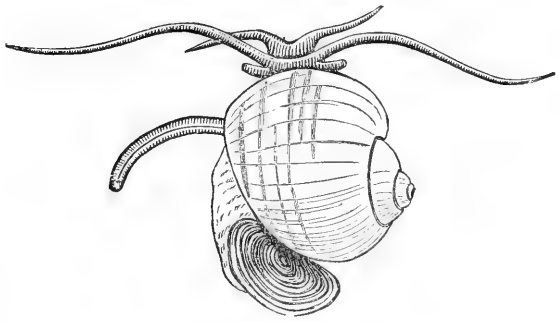

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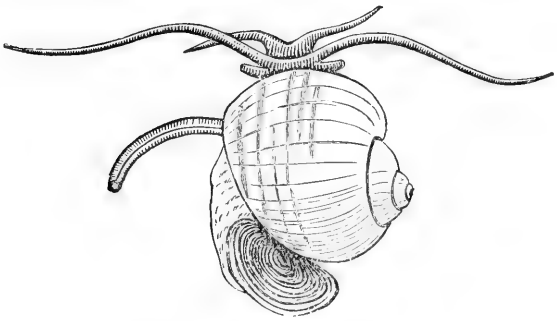

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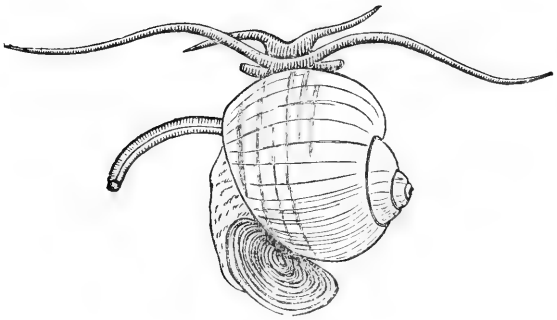

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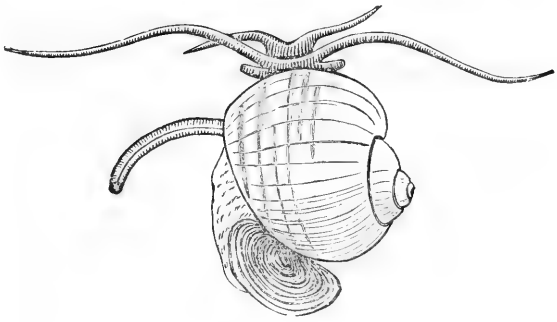

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