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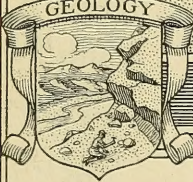
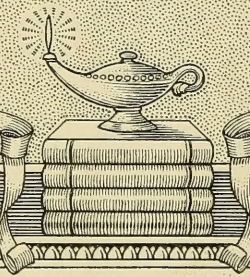
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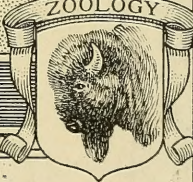


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PROCEEDINGS
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VOL. III.

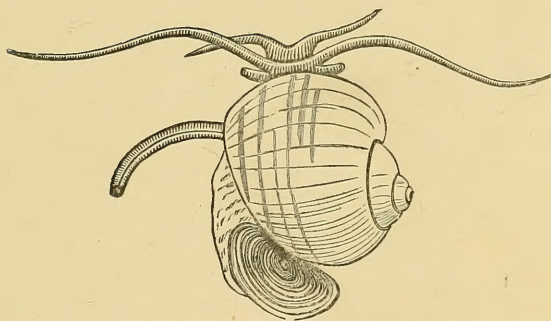
1898—1899.

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.

VOLUME III.

1898—1899.



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ERRATA.

- Page 190, line 11 from the bottom, for "*Chrysodomus antiquus*" read "*Buccinum undatum*."
- Page 201, bottom line, dele "South Africa" (cf. p. 334).
- Page 250, line 13 from the bottom, dele "(see Appendix)."
- Page 255, lines 3 and 6 from the bottom, for "*Microcystina*" read "*Microcystis*."

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PROCEEDINGS
OF THE
MALACOLOGICAL SOCIETY OF LONDON.

DESCRIPTION OF *STREPTAXIS GRACILIS*, n.sp., FROM CEYLON.

By OLIVER COLLETT, F.R.M.S.

Read 12th November, 1897.

STREPTAXIS GRACILIS, n.sp.

Testa parva, umbilicata, depresso-ovata, lævigata, nitidula, diaphana, cereo-albida. Spira depressa, parum exserta, apice obtuso, sutura parum impressa. Anfractus $4\frac{1}{2}$, convexi, penultimus postice rotundatus, ultimus eccentricus, antrorsum devians, subtus convexus, lævigatus, politus, regione umbilicari compressus. Apertura obliqua, semiovalis, lamella unica parietali intrante; peristoma tenue, album, expansum, reflexum; dente uno palatali in margine dextro. Diam. maj. 4·25, min. 3·20 mm.; alt. 2·5 mm.

Hab.—Prope Lémastota, provincia Uva (Ceylon).

The type has been deposited in the British Museum (Natural History).

This pretty little *Streptaxis* is readily distinguished from the two other species recorded from Ceylon, by its much smaller size. There is a distinct tooth present at the base of the aperture, and this feature, judging from the limited number of specimens that I have examined, appears to be constant.



Streptaxis gracilis, n.sp.

The animal, which is very shy, is pale yellow, with a rich orange-red colouring on its dorsal surface. The tentacles are bright vermilion, and these show conspicuously through the lower part of the shell when the animal is retracted.

All the specimens that I have seen of this shell were found in mould among rocks, near the village of Lémastota. The species appears to be quite local; it is also gregarious.

REVISION OF THE NEW ZEALAND RISSOIDÆ.

By HENRY SUTER.

Read 12th November, 1897.

Genus RISSOIA, Fréminville, 1814 (*em.*):

Subgen. RISSOIA, s.s.

Sect. TURBELLA, Leach, 1847.

1. RISSOIA HUTTONI, *nom. nov.*

Rissoia nana, Hutton: Cat. Marine Moll. New Zealand, 1873, p. 28;
 Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 941.
 (Non *R. nana*, Phil. = *R. dolium*, Nyst.)

Barleeia nana, Hutton: Man. New Zealand Moll., 1880, p. 81.

Shell minute, imperforate, white or yellowish-white, oval, spire short and blunt; whorls 5, swollen, longitudinally roundly ribbed, about 25 ribs on the penultimate whorl, becoming obsolete on the periphery of the body-whorl, base smooth; aperture ovate, lip somewhat thickened, continuous. Operculum unknown. Long. 2·5, lat. 1·25 mm.

Hab.—Stewart Island.

Type in the Colonial Museum, Wellington.

2. RISSOIA HAMILTONI, *n.sp.* Fig. IV. (p. 5.)

Shell minute, ovate, rimate, colour dirty-white or cinereous; whorls 6, convex, protoconch rufous, longitudinally striate, the succeeding whorls with distant, rounded, longitudinal riblets, about 14 on the body-whorl, the interstices there being slightly broader, base smooth. There is sometimes a rufous band encircling the upper whorls above the suture, and extending on the body-whorl to within a short distance from the mouth. Suture impressed, marked with a marginal thread which continues on the body-whorl below the periphery to the aperture, intercepting the longitudinal riblets. In

young specimens the riblets are continued below the spiral thread to the umbilical region. Aperture vertical, rotundly ovate, continuous, outer and basal margins sharp, columella somewhat thickened, rufous, rather concave, subtruncate at the base. Operculum not seen. Long. 2·5, lat. 1·5 mm.

Hab.—Lyall Bay, near Wellington. It was found by Mr. A. Hamilton of Dunedin, whose name I have much pleasure in uniting with the species.

Type in my collection.

Subgen. *SABANÆA*, Leach, 1847.

3. *RISSOIA INCIDATA* (Frauenfeld).

Sabanæa incidata, Frauenfeld: Novara-Exped., Zool. vol. ii, Mollusca, p. 12, pl. ii, fig. 29.

Rissoia (Sabanæa) incidata, Frauenfeld: Tryon, Man. Conch., ser. i, vol. ix, p. 339, pl. lxiii, fig. 65.

Shell conoidal, thick, smooth, brownish; whorls 5, flattened, suture and periphery channelled; lip thickened.

Hab.—Botany Bay (Frauenfeld).

I found several specimens of this interesting little shell on seaweeds at Te Onepoto, near Sumner. The length of my specimens is 1·25 mm.; Frauenfeld gives 1·4 mm.

4. *RISSOIA ANNULATA*, Hutton.

Rissoia annulata, Hutton: New Zealand Journ. Science, vol. ii (1884), p. 173; Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 940; Macleay Memorial Volume (1893), p. 65, pl. viii, fig. 67.

Shell ovate, smooth, brown, often with a paler band just below the suture; whorls 5, slightly rounded, suture well-marked; aperture rounded, continuous in the adult. The operculum is corneous and paucispiral, without any internal process. Specimens from Lyttelton measure: long. 2·25, lat. 1·25 mm.

Hab.—Auckland; Lyttelton, under stones between tide-marks; Pliocene of Wanganui and Petane (Hutton).

Type in the Canterbury Museum, Christchurch.

The species may be distinguished from *R. subfusca* by its shape and more strongly marked suture.

Var. *minor*, n.var.

Smaller than the typical form, suture more impressed, polished. Long. 1·5, lat. ·75 mm.

Hab.—Foveaux Strait (A. Hamilton).

Type in my collection.

Subgen. CINGULA, Fleming, 1828.

Sect. CINGULA, s.s.

5. RISSOIA SUBFUSCA, Hutton.

Rissoa subfusca, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 28;
Man. New Zealand Moll., 1880, p. 81.

Rissoa purpurea, Hutton: Cat. Mar. Moll. New Zealand, 1873,
p. 29; Man. New Zealand Moll., 1880, p. 80; Proc.
Linn. Soc. New South Wales, vol. ix (1885), p. 940.

Rissoia (*Cingula*) *purpurea*, Hutton: Tryon, Man. Conch., ser. I,
vol. ix, p. 344, pl. lxxi, fig. 89.

Rissoia (*Cingula*) *purpurea*, Hutton, var. *subfusca*, Hutton: Tryon,
Man. Conch., ser. I, vol. ix, p. 344.

Shell small, subulately elongated, smooth, not polished; whorls 6, flat, suture obscure, upper whorls purple, or purplish-red, with a white band below the sutures; last whorl yellowish, also with a white band below the suture. Aperture rounded, peristome continuous, thickened, and slightly expanded. Operculum unknown. Long. 2.5, lat. 1.25 mm.

Hab.—Stewart Island.

Type in the Colonial Museum, Wellington.

Var. *miconema*, n.var.

More cylindrical, protoconch purple, smooth, the rest of the shell is seen under a lens to be marked with strong and close incremental striae, crossed by numerous liræ. Operculum unknown. Long. 3, lat. 1.25 mm.

Hab.—Stewart Island (A. Hamilton).

Type in my collection.

Sect. ONOBA, H. & A. Adams, 1854.

6. RISSOIA AUSTRALIS (Tenison-Woods).

Cingulina Australis, Tenison-Woods: Proc. Roy. Soc. Tasmania, 1875
(1876), p. 146; and 1876 (1877), p. 151.

Shell minute, subulate, turreted, thin, shining, transparently white; whorls 7, furnished with elevated rounded spiral keels, with smooth interstices, there being 5 on the last whorl (then 4, 3, etc.), base convex, ornamented with two spiral, rounded, elevated liræ; suture deeply impressed; aperture oblong, entire, outer lip somewhat thickened. Long. 2, lat. .6 mm.

Hab.—Stewart Island (one young specimen collected by A. Hamilton); Tasmania.

Tryon does not mention this species in his monograph. *Rissoa Australis*, G. B. Sby., is a *Rissoina*, and Tenison-Woods' name may, therefore, be retained. There is also a *Rissoa* (*Setia*) *Australis*, Watson, but Tenison-Woods' name has priority.

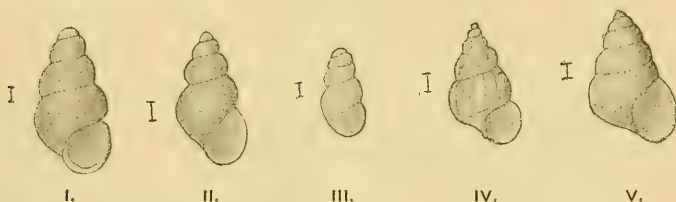
Sect. CERATIA, H. & A. Adams, 1854.

7. *RISSOIA FUMATA*, n.sp. Fig. I.

Shell minute, subcylindrical, thin, imperforate, dull; whorls 5, flatly convex, closely spirally striated, about ten striæ on the penultimate whorl, first three whorls blackish in colour, the others dark-brown; suture impressed; aperture ovate, lip sharp, slightly thickened, continuous; columella short, subvertical. Operculum unknown. Long. 2, lat. 1 mm.

Hab.—Te Onepoto, near Sumner; a single specimen (H. S.).

Type in my collection.



NEW AUSTRALIAN RISSOIDÆ.

- | | |
|------------------------------------|--|
| I. <i>Rissoia fumata</i> , n.sp. | IV. <i>Rissoia Hamiltoni</i> , n.sp. |
| II. ——— <i>Foveauxiana</i> , n.sp. | V. <i>Barleeia Neozelanica</i> , n.sp. |
| III. ——— <i>lubrica</i> , n.sp. | |

8. *RISSOIA FOVEAUXIANA*, n.sp. Fig. II.

Shell minute, ovate, rimate, white, semi-transparent; whorls 5, convex, with close spiral striæ, about 9 on the penultimate whorl, protoconch smooth; suture deep, not channelled. Aperture ovate, subvertical, peristome sharp, very little thickened, continuous; columella regularly arched, base of peristome slightly expanded. Operculum not seen. Long. 2·5, lat. 1·5 mm.

Hab.—Foveaux Strait, in about 10 fathoms; very rare.

Type in my collection.

Sect. SETIA, H. & A. Adams, 1854.

Subsect. CINGULINA, Monts., 1884.

9. *RISSOIA LUBRICA*, n.sp. Fig. III.

Shell minute, imperforate, pupiform, white, shining; whorls 5, convex, microscopically indistinctly costate; suture impressed, submarginate; aperture semirotund, lip continuous, thickened, expanded at the base. Operculum unknown. Long. 1·75, lat. ·6 mm.

Hab.—Stewart Island; a single specimen.

Type in Canterbury Museum, Christchurch.

Subgen. ALVANIA, Risso, 1826.

Sect. ALVINIA, Monts., 1884.

10. RISSOIA PLICATA, Hutton.

- Rissoa plicata*, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 29.
Rissoina plicata, Hutton: Man. New Zealand Moll., 1880, p. 80.
Eglisia plicata, Hutton: Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 939; Tryon, Man. Conch., ser. I, vol. ix, p. 86.
Rissoa (*Alvania*?) *cheilostoma*, Tenison-Woods: Proc. Roy. Soc. Tasmania, 1876 (1877), p. 152.
Rissoia (*Alvinia*) *cheilostoma*, Tenison-Woods: Tryon, Man. Conch., ser. I, vol. ix, p. 366, pl. lxviii, fig. 91.

Shell imperforate, solid, dull, yellowish, clathrated by longitudinal and spiral ribs, the former becoming obsolete at the periphery, the latter continued and more conspicuous on the base; whorls 7, with deep, lirate, suture; aperture conspicuously bilabiate. Long. 3 mm.

Hab.—Auckland (in Canterbury Museum); Stewart Island (A. Hamilton); Tasmania.

Var. *Lyalliana*, n.var.

Shell cinereous or rufous, occasionally yellowish-white, slightly shorter, less distinctly clathrated, the spiral ribs being more noticeable; the whorls are more shouldered, and the first spiral rib is at a greater distance from the suture.

Hab.—Lyal Bay, near Wellington (A. Hamilton).

Type in my collection.

Genus RISSOINA, D'Orb., 1840.

Sect. RISSOINA, s.s.

11. RISSOINA RUGULOSA (Hutton).

- Rissoa rugulosa*, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 28; Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 940; Macleay Memorial Volume (1893), p. 64, pl. viii, fig. 63.
Rissoina rugulosa, Hutton: Man. New Zealand Moll., 1880, p. 80.
Eulima Chathamensis, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 23; Man. New Zealand Moll., 1880, p. 73.

Shell elongated, conic, yellowish- or greyish-brown, apex white; whorls 7-8, flatly rounded, with longitudinal rounded ribs, 15-16 on the penultimate whorl, and numerous fine spiral striæ, most conspicuous on the body-whorl, on which the longitudinal ribs become obsolete on approaching the aperture, and at the base; aperture ovate, outer lip white, mouth purple inside, peristome continuous. Operculum unknown. Long. 7.5, lat. 3 mm.

Hab.—Throughout New Zealand and the Chatham Islands. Specimens from Auckland measure: long. 6–6.5, lat. 2.5–2.75 mm.

Type in the Colonial Museum, Wellington.

On comparison with specimens of *R. variegata*, Angas, from Tasmania, I find *R. rugulosa* is more elongate, only beach-worn specimens are white, and I have seen no examples with brown bands; the whorls are less rounded, the suture less impressed, and the outer lip less expanded. The two species are no doubt nearly allied, but, I think, specifically distinct.

Sect. SCHWARTZIELLA, Nevill, 1884.

12. RISSOINA FASCIATA, A. Adams.

Rissoina fasciata, A. Adams: Proc. Zool. Soc., 1851, p. 264; Hutton, Man. New Zealand Moll., 1880, p. 80.

Rissoina (Oina) fasciata, Angas [error for A. Ad.]: Reeve, Conch. Icon., *Rissoa*, fig. 119.

Rissoina (Schwartziella) fasciata, Angas: Tryon, Man. Conch., ser. I, vol. ix, p. 380, pl. lxviii, fig. 7.

Shell fulvous, with a peripheral chestnut band, visible on the upper whorls at the suture, and numerous flexuous ribs, about 20 on the penultimate whorl; whorls 7, slopingly convex; outer lip thick, columella short, almost truncate. Long. 6 mm.

Hab.—New Zealand (Angas, Sowerby); Auckland (C. Spencer); Sydney (Strange).

Two specimens, collected by Mr. C. Spencer, of Auckland, are in the Canterbury Museum.

Subgen. EATONIELLA, Dall, 1876.

13. RISSOINA OLIVACEA (Hutton).

Dardania olivacea, Hutton: Trans. New Zealand Inst., vol. xiv, 1882, p. 147, pl. i, fig. K, 1–4.

Rissoina (Eatonietta) olivacea, Hutton: Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 940.

Jeffreysia (Dardania) olivacea, Hutton: Tryon, Man. Conch., ser. I, vol. ix, p. 397, pl. lx, fig. 95.

Shell ovate, smooth, dark-brown; whorls 4, convex; lip not continuous. Operculum ovate, subspiral, with a long process from below the nucleus. Long. 2, lat. 1.5 mm.

Hab.—Lyttelton, Auckland, Stewart Island.

Type in the Canterbury Museum, Christchurch.

Genus BARLEEIA, Clark, 1855.

14. BARLEEIA IMPOLITA (Hutton).

Rissoa impolita, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 29; Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 941.

Barleeia impolita, Hutton: Man. New Zealand Moll., 1880, p. 81.

Shell conoidal, white, not polished; whorls 4, flattened, finely spirally striated; suture small; aperture ovate. Operculum unknown. Long. 2·5, lat. 1·5 mm.

Hab.—Stewart Island.

Type in the Colonial Museum, Wellington.

15. *BARLEEIA ROSEA* (Hutton).

Rissoa rosea, Hutton: Cat. Mar. Moll. New Zealand, 1873, p. 29; Proc. Linn. Soc. New South Wales, vol. ix (1885), p. 941.

Barleeia rosea, Hutton: Man. New Zealand Moll., 1880, p. 81; Tryon, Man. Conch., ser. i, vol. ix, p. 393, pl. lxxi, fig. 6.

Shell ovate, pink, polished, smooth; whorls 4, rather flat; aperture round; lip not continuous. Operculum unknown. Long. 1·75, lat. 1·25 mm.

Hab.—Stewart Island.

Type in the Colonial Museum, Wellington.

16. *BARLEEIA NEOZELANICA*, n.sp. Fig. V. (p. 5.)

Shell minute, ovate-conical, imperforate, subpellucid, white, thin, smooth, shining; whorls 5–5½, flatly convex, suture impressed, channelled, a faint indication of the sutural channel being sometimes seen continued on the periphery of the body-whorl, a few spiral striæ sometimes surround the umbilical area; aperture vertical, oval, lip sharp, rounded at the base, slightly thickened, columella concave, united to the outer lip by a thin callosity. Young specimens are rimate. Operculum unknown. Long. 2, lat. 1·5 mm.

Hab.—Stewart Island (Mr. A. Hamilton).

Type in my collection.

NOTE.

Rissoa flammulata, Hutton (Journ. de Conch., vol. xxvi, 1878, p. 28), has been transferred by Mr. Pilsbry to the genus *Phasianella*, and the specific name being preoccupied in that genus, he has changed it to *Huttoni* (Man. Conch., ser. i, vol. x, p. 174).

Rissoa limbata, Hutton (New Zealand Journ. Sci., vol. i, 1883, p. 477), I also class under *Phasianella*, to which genus it undoubtedly belongs. I have examined the operculum of one specimen and found it to be white and calcareous.

ON *MONODONTA QUADRASI*, n.sp., BELONGING TO THE SUBGENUS
AUSTROCOCHLEA, FROM THE PHILIPPINE ISLANDS.

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

Read 10th December, 1897.

THE subgenus *Austrocochlea* was founded by Fischer in 1885 to include a small group of Australian species of *Monodonta*, having *M. constricta*, Lam., for the type. These had previously been placed with *Trochocochelea*, Klein (= *Oscilinus*, Phil.), a section now restricted to the Mediterranean group, of which *Monodonta turbinata*, Born, is the type.

Pilsbry¹ admits only two species under *Austrocochlea*, viz., *Monodonta constricta*, Lam., and *M. zebra*, Menke, the latter with numerous synonyms relating to variations in colour and form. The group has hitherto been regarded as exclusively Australian, since South Australia and Tasmania furnish most, if not all, of the species. The new species from the Philippines, found by Mr. Quadras, after whom I have much pleasure in naming it, is manifestly distinct from the Australian species, though there can, I think, be no doubt as to its belonging to the same subgenus.



MONODONTA (AUSTROCOCHLEA) QUADRASI, n.sp.

Testa conica, elatiuscula, crassa, imperforata, griseo-lutescens, rufo-fusco strigata et minute maculata; spira leviter convexa, ad apicem acuta; anfractus 5, angulati, tricarinati, suboblique striati, liris numerosis angustis leviter granulosis rufo-fusco punctatis cingulati, supra angulum concave declives; sutura irregulariter impressa, vix canaliculata; basis convexa, leviter producta, liris 6 conspicue punctatis instructa; columella callosa, leviter obliqua, ad basim minute tuberculata, extus subconcavo expansa; apertura subquadrata, intus argentea, valde 7-lirata; peristoma acutum, maculatum. Alt. 11, maj. diam. 9 mm.

Hab.—Tablas Island, Philippines (Quadras).

In appearance somewhat like a miniature *M. zebra*. The tubercles at the base of the columella are rather more conspicuous than in that species; the numerous revolving liræ and the three keels are granulose; whilst the base is strongly ridged and brightly spotted.

¹ Man. Conch., ser. I, vol. xi, p. 90.

DESCRIPTION OF *AMPHIDROMUS INCONSTANS*, n.sp., FROM THE MALAY ARCHIPELAGO.

By HUGH FULTON.

AMPHIDROMUS INCONSTANS, n.sp.

Shell sinistral, oblong-conic, slightly umbilicated, polished; whorls $6\frac{1}{2}$, convex, with somewhat conspicuous, oblique lines of growth; earlier whorls whitish, lower yellow ornamented with two spiral bands of squarish brown spots, below which on the last whorl are two narrow, dark-brown bands, the upper just below the periphery, the lower about 2 mm. beneath the upper; columella white, erect, rounded; lip white, slightly expanded and depressed at the basal portion where it joins the columella; parietal callus quite thin and transparent. Long. 38, maj. diam. 19 mm.; aperture, long. 19 mm.

Hab.—Alor (= Ombai) Island, Malayan Archipelago (Everett).



The type and following varieties are in the British Museum (Natural History):—

- Var. A. Yellow, without any markings. Alor and Pantar Island.
- „ B. Yellow, with a single spiral band just beneath the periphery. Alor.
- „ C. Like B, but with two spiral bands. Alor.
- „ D. Yellow, lower whorls with oblique, waved stripes. Alor.

This species is near *A. Kalaoensis*,¹ but can be distinguished from it by its aperture being larger in proportion to the length of the shell, and by the absence of the pink colour on the parietal callus and at the umbilical area that appears in all the specimens collected of *A. Kalaoensis*. It is similar in coloration to *A. maculatus*,¹ but easily separated by its rounded columella, which in the latter is flatly expanded. It differs from both in having a marked depression at the base of the peristome.

¹ Ann. and Mag. Nat. Hist., ser. vi, vol. xviii (1896), p. 102.

ON *PHILALANKA*, A NEW SUBGENUS OF *ENDODONTA*, WITH DESCRIPTIONS OF TWO NEW SPECIES FROM THE INDIAN REGION.

By Lieut.-Colonel H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., etc.

Read 10th December, 1897.

PLATE I.

AMONG the sub-provinces into which the Molluscan fauna of the Indian region may be divided, the island of Ceylon is conspicuous for the many very distinct genera and species which have been found there, and which have not as yet been discovered elsewhere save in the neighbourhood of the gneissic mass of the Nilgiris. It is an indication that this region is one having a former history of its own, connecting it in some way with an area and a fauna of greater extent than at present, both of which were long ago diminished. It presents a field for speculation as to what the conditions were which enabled that land to receive its molluscan inhabitants and which finally restricted them to their present limited range. It is not a new subject for thought, because Mr. W. T. Blanford, so long ago as 1876, wrote an excellent paper in the *Annals and Magazine of Natural History*, entitled "The African Element in the Fauna of India," with a criticism of Mr. Wallace's views.

The present paper does not permit of entering into a subject of this nature; but I may point to the occurrence of such genera as *Acavus*, *Corilla*, *Cataulus*, and *Aulopoma*, that, as well as a more extended acquaintance with the indigenous Helicidæ, tends to support the same interesting fact in distribution.

The species I first describe is another instance of a similarly isolated genus, which I place in the family Endodontidæ. The genitalia in very few species of that family are known, and since this one cannot be placed in any of the subgenera mentioned by Pilsbry in his *Manual of Conchology*, I have considered it necessary to establish a new subgenus for these Indian forms, which I name *Philalanka*, from "Lank" or "Lanka," the well-known name for Ceylon.

PHILALANKA, n.subgen.

Jaw composed of numerous squarish plates. Basal plates of teeth of the radula square or oblong; central teeth tricuspid, laterals multicuspid. No mucous gland at extremity of the foot. Generative organs simple. No amatorial organ and no accessory organs. Shell small, many-whorled, pyramidal or trochiform with a single liration, unicoloured.

1. *PHILALANKA SECESSA*, n.sp. Pl. I, Figs. 1-5.

Shell (Figs. 1, 1a) pyramidal, base convex, narrowly umbilicated. Sculpture: fine, irregular, costulate transverse lines; a single lirate

band follows the angulation of the whorl throughout, with another on and above the suture; on the under side an exceedingly fine striation may be seen under a high power ($\times 60$). Colour pale ochraceous, with a greenish tinge. Spire conic, sides nearly flat; apex blunt. Suture shallow, with a thread-like liration. Whorls 8, narrow, sides very slightly convex below the liration, flat from that to the suture. Aperture semilunate, narrow, vertical. Peristome thin, slightly reflected on the columellar side, which is suboblique. Size: maj. diam. 7, alt. axis 6 mm.

Hab.—Ambegama, Ceylon, 3,000 feet (O. Collett).

This very interesting species was found among dead leaves in the forest, and to Mr. O. Collett is due the credit of being the first to collect a form, which enables me to show the occurrence in India of a group of shells not hitherto recorded from any part of that region. Nothing like it has been found to the east of the Bay of Bengal, on the north-east frontier, or in Burma, but the possibility of its being a casual introduction is removed by the discovery of another allied species in the south of the Indian Peninsula by Colonel Beddome.

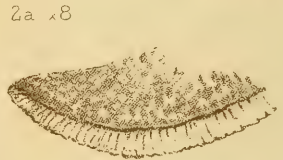
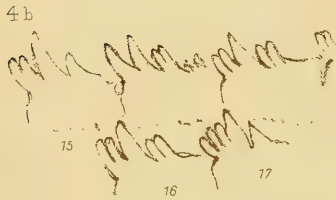
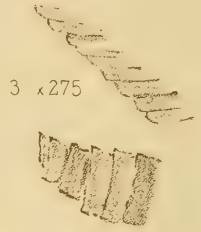
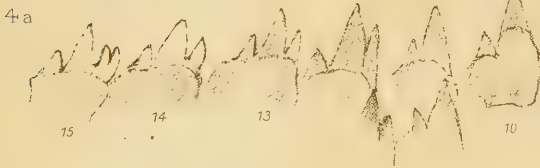
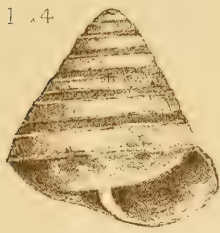
It is also possible that *Sitala tricarinata*, W. & H. Blanf., from the Nilgiris, and *S. subbilitata*, G.-A., from the Little Brother, Andaman Islands, may find a place in the Endodontidæ. *Helix mononema*, Benson, from Ceylon, is almost certain to belong to this section.

I have examined two specimens which were preserved in spirit.

The animal has a distinct peripodial groove and broad pallial margin (Figs. 2*a-b*) with a fringe-like structure, very colourless in contrast with the foot above, but it has no mucous pore. The right dorsal lobe (Fig. 2) is large, with a very pale, narrow outer margin, the left rather narrow, its widest portion being in the middle; both are darker than the foot of the animal, which is pale grey with a paler margin. The sole is not divided. The salivary glands, disposed in two long masses on either side of the œsophagus, are of a dark tint.

The generative system (Fig. 5) is simple, and devoid of accessory parts; the male organ is sharply bent on itself near the generative aperture, the retractor muscle being given off low down from the second bend. It thence narrows, becoming gradually whip-like, into the long vas deferens, forming a long loop in a backward direction, and returning, as usual, to pass between the retractor muscles of the eye-tentacles. The male organ, as far as the loop, is solid, pink in colour, and conspicuous on dissection. At the anterior end it terminates in a bluntish knob. The spermatheca is globose, with a thin stalk-like tube, which joins the vagina high up, and, connected with it, passes downwards into the common sheath of the vagina.

The jaw (Fig. 3) was only seen in the second specimen examined; it corresponds with that of the family Endodontidæ, and was exceedingly fragile, consisting of a number of thin, oblong plates, overlapping each other. This single jaw was not complete, and I could only get two drawings of separate portions, one being a side view, of eight or nine plates.



NEW LAND SHELLS, CEYLON & S. INDIA.

The odontophore (Figs. 4-4c) was equally interesting, and showed the same affinities. The plates of the central teeth are square in shape, the rhachidian being the narrowest; they increase outwards in breadth until the laterals are very broad, low, and oblong, whilst on the outermost ones the cusps are difficult to detect and very irregular. The centre tooth has a large pointed mesocone, with two basal cusps; the median teeth up to the eleventh are similar in shape, but with only one cusp on the outer side; the next, the twelfth, shows an inner side cusp. In the thirteenth and fourteenth the centre is smaller, with two equal-sized side cusps rising from the upper edge of the plate. In the succeeding teeth there is a good deal of irregularity in profile, but the side cusps are split into two, now and then three, the centre still remaining the longest or nearly the longest. The dental formula is—

$$20 : 2 : 10 : 1 : 10 : 2 : 20 \quad \text{or} \\ 32 : 1 : 32$$

2. PHILALANKA BOLAMPATTIENSIS, n.sp. Pl. I, Fig. 6.

Shell depressedly conoid, rounded and widely umbilicated below, keeled. Sculpture: a single liriation is situated about one-third the breadth of the whorl on the upper side, following the sutural thread, which commences on the keel; fine vertical irregular lines of growth. Colour pale horny. Spire depressedly pyramidal, sides flattened, apex flatly rounded. Suture well marked. Whorls 6, convex below the liriation, flat above it. Aperture narrow, semilunate. Peristome somewhat thickened, columellar margin reflected and very oblique. Size: maj. diam. 5.0, alt. axis 2.6 mm.

Hab.—Bolampatti Hills, Southern India (Colonel R. Beddome).

Animal not seen.

There is no doubt but that this is allied to the typical Ceylon species, possessing all its principal characteristics; it exhibits, however, a more depressed form.

EXPLANATION OF PLATE I.

- FIG. 1. *Philalanka secessa*. Shell. $\times 4$.
 ,, 1a. ——— Shell, showing umbilicus. $\times 8$.
 ,, 2. ——— Right and left dorsal lobes. $\times 24$.
 ,, 2a. ——— Foot, viewed from right side. $\times 8$.
 ,, 2b. ——— Extremity of foot from above. $\times 24$.
 ,, 3. ——— Portions of jaw. $\times 275$.
 ,, 4. ——— Odontophore. Central tooth and the three next.
 ,, 4a. ——— Lateral teeth, 10th to 15th.
 ,, 4b. ——— ——— still further from the centre.
 ,, 4c. ——— The four outermost teeth.
 ,, 5. ——— Generative organs. $\times 24$.
 ,, 6. *Philalanka Bolampattiensis*. Shell. $\times 8$.

- | | |
|----------------------------------|-------------------------------|
| <i>l.d.l.</i> Left dorsal lobe. | <i>r.m.</i> Retractor muscle. |
| <i>m.</i> Mantle edge. | <i>sp.</i> Spermatheca. |
| <i>p.</i> Penis. | <i>v.d.</i> Vas deferens. |
| <i>r.d.l.</i> Right dorsal lobe. | |

DESCRIPTION OF *MULLERIA DALYI*, N.SP., FROM INDIA.

By EDGAR A. SMITH, F.Z.S., etc.

Read 12th November, 1897.

HITHERTO this genus has been represented by a single species, *Mulleria lobata*,¹ which occurs in some of the rivers of Colombia. Its existence outside the South American continent, in a region so remote as India, is most remarkable and worthy of record.

The genus *Mulleria*, with *Bartlettia* and *Ætheria*, constitute the family *Ætheriidae*, the two first being South American forms and the last African. Considering, therefore, the geographical position, one would have expected to have met with the African rather than the South American type in India.

Two of the specimens about to be described were collected in the Mysore province of Southern India, probably near Mudgiri in the Kadur District, by Mr. W. M. Daly, a resident in that country. They have been placed in my hands for examination by Mr. H. Fulton.

Other examples, containing the animals, have also very kindly been submitted to me by Mr. E. L. Layard. He obtained them from a relative, Mr. Herbert Bonner, who found them in the river Budra, in Mysore. Mr. Bonner writes:—"I find them on a rock in the middle of a deep pool, and so far I have not found them on other rocks, though no doubt they are to be found. They adhere very firmly, and since the rock is smooth and well under water, they are hard to detach. The water is quite fresh, being more than 400 miles from the point where the river joins the sea, and only some thirty miles from its source in the Western Ghauts."

The shells exhibit the same irregularity of form which occurs in the South American species, and probably no two examples are precisely alike. None of the specimens clearly exhibit the characteristic embryonic shell, but the anterior end of the attached valves is more or less produced as in *Mulleria lobata*.

An examination of the animal shows that this genus is practically identical with *Ætheria* in respect to the soft parts, save in the absence of the anterior adductor. The mantle-lobes are free all round except just beneath the hinge-line, and posteriorly at the extremity of the branchiæ, where, however, the edges are free; above this connection is the anal opening. The lower or branchial opening extends from the hinder end of the gills as far as the hinge-line in front. The

¹ *Ætheria Novogranatensis*, Schaufuss (Sitzungs Ber. naturw. Gesell. Isis: Dresden, 1865, p. 10), is evidently the same species. The genus *Mulleria*, founded in 1823 and appearing in all textbooks since, seems to have been entirely overlooked by this author.

extreme margins of the lobes are of a dark-brownish colour, and very finely papillate within for a short distance ventrally from the posterior extremity.

The gills are unequal, the inner pair being somewhat larger than the outer. The mouth is large, and the labial palpi are united dorsally nearly their whole length. The body is produced into the branchial cavity, and has a foot-like appearance, whilst the anal tube is just above the large adductor as in *Ætheria*,¹ and, indeed, in all Pelecypoda.



MULLERIA DALYI, n.sp.

Testa irregulariter quadrata, sed postice producta et rotundata, compressa, inæquivalvis; valvæ mediocriter crassæ, intus margaritacææ, iridescentes, olivaceo plus minus maculatæ et ad marginem olivaceo-fusco limbatæ, extus sub periostraco subfibroso, nigro-fusco, fortiter concentricè striato, ex laminis albis calcareis et aliis corneis fusciscentibus constitæ; valva adhærens irregulariter planata, altera convexior, plus minus erosa; cicatrix musculi posterioris magna, elongata vel rotundata, mediocriter profunda, concentricè et radiatim striata; linea pallii irregularis, punctata, ad marginem superiori fere attingens; margo dorsi rectus, ligamento valido per totam longitudinem instructus. Long. 65, alt. 52, diam. 20 mm.

¹ Quoy in Lesson's *Illust. Zool.*, pl. lix; Rang & Cailland, *Mém. du Mus.*, ser. III, vol. III, p. 143, pl. vi; Deshayes, *Anim. sans Vert.*, vol. VI, pp. 591-6.

This species differs from *M. lobata* in the general tint of the internal nacre and the composition of the valves and the periostracum. In *M. lobata* the nacre is partly whitish and partly of an olive-greenish tint, and the border of the valves is a deeper green. In the present species the nacre exhibits an iridescent mixture of white, bluish, greenish, olive, and pinkish tints, whilst the margin is olive-brown. The exterior, also, is of a rich deep brown or blackish-brown in the present species, the periostracum being more fibrous. The structure of the valves is much less solid, and consists of alternating calcareous and chitinous layers. The solid valves of *M. lobata* are harder in substance, and the periostracum is not so conspicuous.

Two of the specimens of the present species have been attached by their right valves and three by the left, and, as in the South American species, these are more produced anteriorly than the respective free valves. At the extremity of the umbo in better preserved examples, the young shell would doubtless be visible. I have much pleasure in naming the species after Mr. Daly.

DESCRIPTION OF *RHAPHAULUS PERAKENSIS*, N.SP., WITH A LIST OF THE KNOWN SPECIES OF THE GENUS.

By EDGAR A. SMITH, F.Z.S., etc.

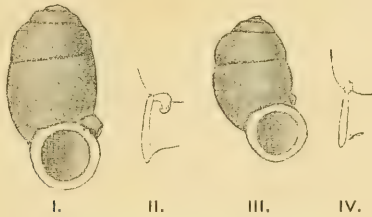
Read 12th November, 1897.

THE species about to be described formed part of a series of land and fresh-water shells from the Malay Peninsula sent to the British Museum (Natural History) by Mr. L. Ray, jun., the Curator of the Perak Museum. Most of the specimens were in poor condition, but several represented species new to the national collection.

RHAPHAULUS PERAKENSIS, n.sp.

Testa pupoidea, anguste umbilicata, fusco-purpurea, costulato-striata; spira superne conoidea, ad apicem obtusa; anfractus 6, convexi, penultimus gibbosus, ultimus minus convexus, pone oblique valde descendens; apertura intus purpureo-fusca; peristoma album, in-crassatum, anguste expansum et reflexum; tubulus albus, a sutura pone labrum deorsum curvatus. Long. 18·5, diam. 9 mm.; apertura intus 5 mm. lata.

Hab.—Maxwell's Hill, Larut, Perak.



I, II. *Rhabdaulus Perakensis*, n.sp.
III, IV. ——— *Lorraini*, Pfr.

This species is very closely allied to *R. Lorraini* of Pfeiffer, from Penang, but differs in the following respects:—

It is larger, and the body-whorl is rather longer and more obliquely descending behind. The chief difference, however, consists in the sutural tube being curved, longer, and directed downwards and away from the peristome, whereas in *R. Lorraini* it is shorter and directed upwards above the suture. At first I was inclined to think that possibly it might have been broken off short by accident, but a careful examination under the microscope seems to show that such is not the case. The peristome in both species, under a high power, has a very pretty appearance, being marked with minute wrinkled striæ.

LIST OF THE KNOWN SPECIES.

1. RHAPHAULUS BOMBYCINUS (Pfeiffer).

Anaxulus bombycinus, Pfeiffer: Proc. Zool. Soc., 1855, p. 105, pl. xxxii, fig. 10.

Rhaphaulus bombycinus, Pfeiffer: Mon. Pneumon., vol. ii, p. 91; vol. iv, p. 142; Sowerby, Conch. Icon., vol. xx, *Pupinidæ*, pl. x, fig. 93 (*bombazinus*!).

Hab.—Sarawak, Borneo.

2. RHAPHAULUS PFEIFFERI, Issel.

Rhaphaulus Pfeifferi, Issel: Ann. Mus. Civic. Stor. nat. Genova, 1874, vol. vi, p. 443, pl. vii, figs. 4–6; Pfeiffer, Mon. Pneumon., vol. iv, p. 142.

Hab.—Sarawak.

This species appears to be Pfeiffer's var. β of *R. bombycinus* and Sowerby's *R. similis* (Conch. Icon., vol. xx, pl. x, fig. 94, of *Pupinidæ*). It will probably eventually prove to be merely a short, small form of *R. bombycinus*.

3. RHAPHAULUS KUEKENTHALI, Kobelt.

Rhaphaulus Kuekenthali, Kobelt: Nachrichtsbl. Deutsch. Malak. Gesell., 1897, pp. 27, 140; Abhandl. Senck. naturf. Ges., vol. xxiv, p. 37, pl. iv, fig. 8.

Hab.—Baram, North Borneo.

4. RHAPHAULUS LORRAINI (Pfeiffer).

Anaxulus Lorraini, Pfeiffer: Proc. Zool. Soc., 1856, p. 36.

Rhaphaulus Lorraini, Pfeiffer: Mon. Pneumon., vol. ii, p. 91, vol. iv, p. 143; Sowerby, Conch. Icon., vol. xx, *Pupinidæ*, pl. x, fig. 96.

Hab.—The island of Penang (Pfeiffer).

5. RHAPHAULUS PERAKENSIS, n.sp.

Hab.—Perak.

6. RHAPHAULUS PACHYSIPHON, Theobald & Stoliczka.

Rhaphaulus pachysiphon, Theob. & Stol.: Pfeiffer, Mon. Pneumon., vol. iv, pp. 143, 411; Godwin-Austen, Land and Fresh-water Moll. India, vol. i, p. 200, pl. xlvii, figs. 3, 3a.

Hab.—Moulmain.

7. RHAPHAULUS ASSAMICA, Godwin-Austen.

Rhaphaulus Assamica, Godwin-Austen: Land and Fresh-water Moll. India, vol. i, p. 201, pl. xlvii, figs. 2–2b.

Hab.—Brahmakhund, Assam.

8. RHAPHAULUS CHRYSALIS (Pfeiffer).

Megalomastoma chrysalis, Pfeiffer: Mon. Pneumon., vol. i, p. 131; vol. ii, p. 92; vol. iii, p. 89; and vol. iv, pp. 143, 411, as *Rhaphaulus*.

Rhaphaulus chrysalis, Pfr.: Godwin-Austen, Land and Fresh-water Moll. India, p. 200, pl. xlvii, figs. 1, 1a; Sowerby, Conch. Icon., vol. xx, *Pupinidæ*, pl. x, fig. 95.

Hab.—Ava, Tenasserim (Pfeiffer); near Moulmain (Stoliczka).

9. RHAPHAULUS BLANFORDI (Benson).

Streptaulus Blanfordi, Benson: Pfeiffer, Mon. Pneumon., vol. ii, p. 92; vol. iii, p. 90; vol. iv, pp. 144, 411.

Rhaphaulus Blanfordi, Benson: Godwin-Austen, Land and Fresh-water Moll. India, p. 202, pl. xlvii, figs. 4-4c; Sowerby, Conch. Icon., vol. xx, *Pupinidæ*, pl. x, figs. 97a-b.

The genus *Streptaulus*, founded by Benson upon this species, has been shown by Godwin-Austen (l.c. supra) to be inseparable from *Rhaphaulus*,¹ a decision in which I am inclined to concur.

¹ A list of the known species is given by Kobelt and Möllendorff in the *Nachrichtsblatt Deutsch. malak. Gesell.*, 1897, p. 140. *R. similis* of Sowerby appears to have escaped their notice.

ON A SMALL COLLECTION OF MARINE SHELLS FROM NEW ZEALAND AND MACQUARIE ISLAND, WITH DESCRIPTIONS OF NEW SPECIES.

By EDGAR A. SMITH, F.Z.S., etc.

Read 10th December, 1897.

THE series of shells here referred to and described, were kindly placed at my disposal by Mr. Henry Suter, of Christchurch, New Zealand. Those from Macquarie Island, situated to the south-west of New Zealand, are of especial interest, since five out of the eight species are well-known Patagonian forms. The three others also, supposed to be new species, will probably eventually be found in Patagonia. They were collected by Mr. A. Hamilton, who thus writes respecting them:—"The shells collected by me at Macquarie Island were all from Lusitania Bay, on the north-east side of the island. The large red, or scarlet, bivalve¹ was attached to the large floating kelp by a strong fleshy foot adhering very firmly, sometimes three or four together. The small univalves, *Paludestrina*, and the small *Lascea* and *Modiolarca*, were obtained by scraping a small moss-like seaweed from the rocks (volcanic breccia) between tide-marks. The range of tide is not great—four or five feet—at that part. Unfortunately, I did not see the flat tidal reef in the north of the island below the Nuggets until the day I left. On these reefs much might be found. The currents set strongly from west to east at this place at the time of the year when I was there."

It is a fact well known to botanists that quite a considerable number of species of seaweeds are common to the Patagonian region and the shores of New Zealand, the wide distribution doubtless being caused by ocean currents. The shells from Macquarie Island are all such as either attach themselves to, or might be found living upon, floating algae. They evidently have been transported in this way, and the presence of some of them at Kerguelen and other localities between Patagonia and Macquarie Island would seem to indicate the direction in which the species have travelled, namely, from west to east, confirming Mr. Hamilton's statement with regard to the ocean currents. Already a few species of Mollusca have been quoted as common to the two regions, e.g., *Mytilus Magellanicus*, Chem., *M. chorus*, Molin., *Saxicava arctica*, L., and *Callochiton illuminatus*, Gray; also *Euthria antarctica*, Reeve, and *Patella Magellanica*, Gmel.,

¹ *Modiolarca trapezina*.

but the two last-mentioned are somewhat doubtful. There are other forms which, although not absolutely identical with South Patagonian species, are represented in that locality by very closely related forms. For instance, *Lotorium vexillum*, Sby., from Chiloe and Cape Horn, is scarcely separable from *L. tumidum*, Dkr.

Trophon spiratus, H. & A. Ad., and *T. cretaceus*, Reeve, are represented in the Straits of Magellan by *T. Geversianus*, Pallas. *Patella denticulata*, Martyn, is allied to *P. aenea*, Martyn; and the genus *Struthiolaria*, which was supposed to be restricted to New Zealand, has of recent years found a representative at Kerguelen Island, in *S. (Perissodonta) mirabilis*, Smith.

Some of the species already mentioned also occur at the Cape of Good Hope, namely, *Mytilus Magellanicus*, Chem., and *Saxicava arctica*, L.; whilst the *Lasæa rubra*, Mtg., is probably inseparable from the forms which occur in Patagonia and in Kerguelen and Macquarie Islands. Two species of *Lotorium* (*L. argus*, Smith, and *L. Murrayi*, Smith) occurring in South Africa have Patagonian representatives in *L. vexillum*, Sby., and *L. Magellanicum*, Chem., respectively. The islands of St. Paul and Amsterdam, in the Southern Indian Ocean, also appear to be affected slightly by the flow eastward of Patagonian forms. At all events, *Lasæa rubra*, Mtg., and *Lotorium vexillum*, Sby. (= *proditor*, Frfld.), have been quoted from there.¹ The conclusion seems to be that certain forms, whose metropolis at the present time is Patagonia, have been, through the agency of ocean currents, transported to quite distant localities. Patagonia, the Falkland Islands, Marion, Prince Edward, Crozet, and Kerguelen Islands have very similar faunas, and now Macquarie Island proves to some extent to belong to the same faunal region, to which, but in a less degree, also belong Tristan da Cunha, St. Paul, and Amsterdam Islands, a few of the Antarctic forms having also reached as far north as the Cape.

1. MITRA ALBOPICTA, n.sp. Fig. V. (p. 22.)

Testa breviter fusiformis, castanea, infra suturam strigis albis brevibus irregularibus picta, circa medium et ad basim anfractus ultimi albo maculata; spira conoidea, acuta; anfractus 7, paulo convexi, sutura medioeriter profunda sejuncti, superiores oblique et confertim costulati (costis in ultimo plus minus evanidis), striis spiralibus paucis infra suturam sculpti, ultimus ad basim oblique et tenuiter striatus; apertura intus fuscescens, longit. totius $\frac{1}{2}$ paulo superans; labrum superne leviter incrassatum; columella paululum obliqua, pallida, quadriplicata; canalis anterior brevis, vix recurvus. Long. 21.5, diam. 9.5 mm.

Hab.—Mokohinau Island.

In form and general proportions resembling *M. pica*, Reeve, but larger and differently coloured.

¹ Vélain, Arch. Zool. Expérim., 1877, vol. vi, pp. 100, 135.

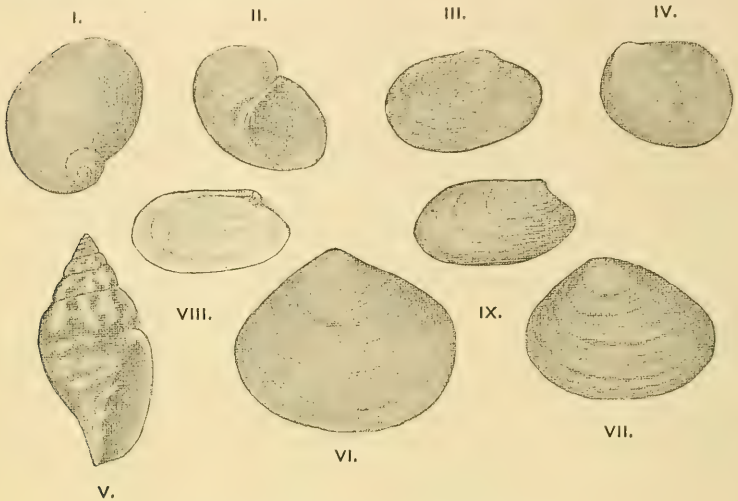
2. PALUDESTRINA CALIGINOSA (Gould).

Littorina caliginosa, Gould: U.S. Explor. Exped., Moll., p. 198, atlas, fig. 240; *Otia Conch.*, p. 53.

Hydrobia caliginosa, Smith: Phil. Trans. Roy. Soc., 1879, vol. clxviii, p. 173, pl. ix, fig. 8.

Hab.—Macquarie Island (A. Hamilton).

Previously recorded from Tierra del Fuego (Gould), Kerguelen (Smith, Studer, and Watson).



NEW SHELLS FROM NEW ZEALAND.

I, II. *Paludestrina Hamiltoni*, n.sp.

III. *Modiolarca bicolor*, n.sp.

IV. *Myrina minuta*, n.sp.

V. *Mitra albopicta*, n.sp.

VI. *Macoma Suteri*, n.sp.

VII. *Mactra ordinaria*, n.sp.

VIII, IX. *Cyamium oblongum*, n.sp.

3. PALUDESTRINA HAMILTONI, n.sp. Figs. I, II.

Testa subglobosa, anguste umbilicata, fuscescens, periostraco tenui olivaceo induta, lineis incrementi striata; spira brevis, obtusa; anfractus fere 3, convexi, perrapide accrescentes, sutura profunda subcanaliculata discreti, ultimus maximus, circa umbilicium leviter carinatus; apertura magna, rotunde ovata, fusca; peristoma tenue, continuum; operculum anfractibus $2\frac{1}{2}$ instructum. Diam. maj. 3, min. 2 mm.; alt. 3 mm.

Hab.—Macquarie Island (A. Hamilton).

A pretty little shell, recalling in some respects certain forms of the genus *Lacuna*.

4. *MACOMA SUTERI*, n.sp. Fig. VI.

Testa albida, paulo inæquilateralis, antice late rotundata, postice multo angustior, ad extremitatem acute arcuata, ad ventrem late curvata; margo dorsi anticus leviter obliquus, posticus magis obliquus; umbones prominentes, acuti; valvæ tenues, concentricè tenuiter striatæ, mediocriter convexæ; dentes duo cardinales divergentes in valva dextra, in sinistra unicus bifidus; pagina interna nitida, radiatim substriata; cicatrix antica parva, elongata, postica major, rotundata; sinus pallii profundus, rotundatus; ligamentum externum elongatum, parte antica prominente; internum (resilium) parvum, obliquum, postice declive. Long. 15, alt. 12, diam. 5.5 mm.

Hab.—Lyttelton Harbour, in 2–4 fathoms (Suter).

The presence of an internal ligament or resilium distinguishes this species from the typical form of *Macoma*, which is furnished with an external ligament only. The presence of an internal ligament in the British *Tellina donacina* and some other forms of *Tellinidæ* has already been pointed out by the writer in the Report on the "Challenger" Lamellibranchiata, p. 106; but what systematic value this character may possess has yet to be determined when the entire family is critically studied.

5. *MACTRA ORDINARIA*, n.sp. Fig. VII.

Testa triangulariter ovata, paulo inæquilateralis, alba, periostraco tenui griseo induta, concentricè tenuiter striata, supra dorsi aream utrinque sulcata; margo dorsi posticus arcuatus, declivis, anticus æque obliquus sed rectior, margo ventris minime curvatus; valvæ tenues, areis dorsi utrinque plus minus circumscriptis; pagina interna alba; cicatrix anterior parva, pyriformis, posterior major, rotundata; sinus pallii latus, haud profundus; cardo normalis. Long. 13, alt. 9.5, diam. 5.5 mm.

Hab.—Lyttelton Harbour, in 4 fathoms.

This species probably attains larger dimensions than those here given. It is of ordinary appearance, but somewhat straight along the ventral margin and rather pointed at both ends.

6. *SAXICAVA ARCTICA* (Linn.).

Hab.—Macquarie Island (A. Hamilton).

Two specimens about 7 mm. in length appear undistinguishable from the cosmopolitan *S. arctica* (Linn.). In the Report upon the Lamellibranchiata of the "Challenger" Expedition, p. 78, a list is given of the numerous localities cited for this polymorphous species. It occurs both in Patagonia and Kerguelen Island.

7. *LASÆA MILLIARIS* (Phil.), var.

Kellia miliaris, Philippi: Wiegmann's Archiv für Naturges., 1845, p. 51.

Hab.—Dunedin Harbour and Macquarie Island (A. Hamilton).

These specimens do not quite correspond with a series from the Straits of Magellan. They appear to be rather more solid, of a darker red colour, and perhaps a trifle more equilateral. This species, the British *L. rubra*, Mtg., and *L. consanguinea*, Smith, from Kerguelen, seem all to be slight modifications of one and the same form. *L. seminulum*, Phil. (= *rubra*, Mtg.), has been quoted by Sowerby as South African.

8. *CYAMUM OBLONGUM*, n.sp. Figs. VIII, IX. (p. 22.)

Testa elongata, valde inæquilateralis, mediocriter convexa, alba; pars antica brevissima, acute rotundata, postica longissima, latius rotundata; linea dorsi posterior vix arcuata, horizontalis, anterior declivis, ventris margo leviter arcuatus; valvæ tenues, lineis incrementi tenuibus striatæ; pagina interna alba, nitida; dentes duo inæquales in valva sinistra, in dextra unicus; ligamentum internum gracile, leviter obliquum; cicatrix antica mediocriter profunda, postica inconspicua. Long. 5, alt. 3, diam. 2·5 mm.

Hab.—Macquarie Island (A. Hamilton).

9. *MYRIÑA MINUTA*, n.sp. Fig. IV. (p. 22.)

Testa minuta, transversim ovata, valde inæquilateralis, pallide fuscescens vel rufescens; valvæ tenues, convexæ, lineis incrementi tenuibus striatæ, margine supero et infero intus fortiter denticulatis; umbones inflati, obtusi, longe antemediani, linea carinis recta, utrinque transversim striata, in medio ligamento interrupta; pagina interna haud margaritacea, lævis; cicatrices obscuræ. Long. 2, alt. 1·5, diam. 1 mm.

Hab.—“Lyttelton Harbour, in tide-pools on seaweeds” (Suter).

This species is remarkable for the strong denticulate upper and lower margins of the valves. The striæ on the hinge-line are only visible under a compound microscope.

10. *MODIOLARCA TRAPEZINA*, Lamarck.

For synonymy and references see Smith, Report Lamellibranchiata “Challenger” Exped., p. 279.

Hab.—Macquarie Island (A. Hamilton).

Only bright purple-red specimens, the largest 16 mm. in length. The species is common at South Patagonia, the Falkland Islands, Marion and Kerguelen Islands.

11. *MODIOLARCA PUSILLA* (Gould).

Mytilus (Modiolarca) pusillus, Gould: U.S. Explor. Exped., Moll., p. 455, atlas, figs. 585–585c; Otia Conch., p. 95.

Modiolarca pusilla, Smith: Phil. Trans. Roy. Soc., 1879, vol. clxviii, p. 191.

Hab.—Tierra del Fuego (Gould); Macquarie Island (A. Hamilton).

The specimens from New Zealand are identical in every respect with those from Patagonia. *M. minuta*, Dall, from Kerguelen Island, is a closely allied form.

12. *MODIOLARCA BICOLOR*, n.sp. Fig. III. (p. 22.)

Testa parva, oblonga, antice alba, angustata, rotundata, postice purpureo-rufescens, latior, rotunde subquadrata, valde inæquilateralis; umbones leviter prominentes, longe antemediani, ad apicem obtusi; valvæ tenues, mediocriter convexæ, lineis incrementi tenuibus striatæ; dens unicus in valva sinistra, in dextra duo; ligamentum internum parvum, obliquum; pagina interna antice alba, postice rufescens, nitida; cicatrices magnæ, antica posteriore profundior. Long. 3·5, alt. 2, diam. 1·5 mm.

Hab.—Macquarie Island (A. Hamilton).

Distinguished from *M. pusilla* and *M. minuta*, Dall, by its very different form, the anterior end being conspicuously produced and narrowed.

A LIST OF THE LAND-SHELLS OF THE ISLAND OF LOMBOCK,
WITH DESCRIPTIONS OF NEW SPECIES.

By EDGAR A. SMITH, F.Z.S., etc.

Read 14th January, 1898.

PLATE II, FIGS. 1-21.

THE collection upon which the present paper is based was made by Mr. A. Everett, and contains some new and interesting species. The large proportion of new forms constantly discovered by Mr. Everett shows how meagre is our knowledge of the insular faunas of the Malayan Archipelago. In the present instance, for example, out of the sixteen species obtained, as many as twelve were undescribed. In this case, however, before the publication of Dr. E. von Martens' paper¹ upon the specimens collected by Herr Fruhstorfer, only a very few forms were known from Lombok. Of the twenty-five species quoted, sixteen appear to be peculiar to the island, three are also Javanese, three Bornean, two Sumatran, two Moluccan, one occurs in Flores and the Philippine Islands, and one in Sumbawa.

Before enumerating the species, I wish to thank the authorities of the Berlin Museum for the loan of the unfigured types described by Dr. E. von Martens, and also for a very careful drawing by Miss Zglinicka of the type of *Stenogyra discernibilis*.

1. PARMARION INTERMEDIUS, Collinge. Pl. II, Fig. 1.

Parmarion intermedium, Collinge: Proc. Zool. Soc., 1897, p. 779, pl. xliv, figs. 5-11.

Hab.—Lombok (Everett).

Mr. Collinge has quoted Lombok as if it were in Borneo. This, however, is incorrect, for the specimens which he described came from the island of Lombok, with the other species enumerated in the present paper.

2. HELICARION LINEOLATUS, Martens.

Helicarion lineolatus, Martens: Preuss. Exped. Ost-Asien, Zool. vol. ii, p. 184, pl. xii, fig. 4.

Hab.—Sumatra, Java, Lombok (Martens).

Not found by Mr. Everett.

3. ARIOPHANTA (XESTA) NEMORENSIS (Müller).

Helix nemorensis, Müller: Reeve, Conch. Icon., fig. 474; Pfeiffer, Conch. Cab., 2nd ed., pl. xxxv, figs. 9-11.

Hab.—Lombok (Wallace, Fruhstorfer, Everett).

¹ Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, pp. 157-164.

Reeve's figure gives a good idea of the form of this species, but the uppermost of the bands in Mr. Everett's specimens is much narrower than the two others.

4. ARIOPHANTA (XESTA) COFFEA (Pfeiffer).

Helix coffea, Pfr.: Proc. Zool. Soc., 1855, p. 111; Mon. Helic., vol. iv, p. 23.

Hab.—Moluccas (Pfr.); Lombock (Wallace).

The locality of this species, founded on a single specimen in the Cuming Collection, requires confirmation.

5. ARIOPHANTA (HEMIPLECTA) RUFOLINEATA, n.sp. Pl. II, Fig. 2.

Testa tenuis, depressa, angustissime vel fere obtecte perforata, leviter carinata, fusco-cornea, infra carinam pallidam linea angusta rufa cineta; spira parum elata, ad apicem obtusissima; anfractus $4\frac{1}{2}$, celeriter accrescentes, lineis incrementi armatis striisque spiralibus minute granulati, leviter convexiusculi, ultimus vix descendens, subacute carinatus, infra inflatus, versus medium nitens, haud granulatus; apertura obliqua, ampla, late lunata, opalina, rufo unilineata; peristoma tenue, margine columellari ad insertionem lilaceo, anguste reflexo. Diam. maj. 30, min. 25 mm.; alt. 19 mm.

Differing from *A. Fruhstorferi* and *A. internota* in the granular sculpture, etc. The keel almost disappears anteriorly, so that the curve of the outer lip is not affected by it.

6. ARIOPHANTA (HEMIPLECTA) INTERNOTA, n.sp. Pl. II, Fig. 3.

Testa tenuis, depressa, subconoidea, leviter carinata, minute perforata, supra fusco-cornea, infra pallidior, nitida, striis incrementi arcuatis sculpta; spira convexe conoidea, ad apicem obtusa; anfractus 5, convexiusculi, ultimus antice levissime descendens, obtuse carinatus, carina aperturam versus fere evanida; apertura obliqua, late lunata, opalina; peristoma tenue, margine columellari ad insertionem paulo dilatato et reflexo. Diam. maj. 28, min. 24 mm.; alt. 17 mm.

In size and colour very like *A. Fruhstorferi*, Martens, but with a more elevated spire, rounder whorls, and much less strongly keeled.

7. ARIOPHANTA (HEMIPLECTA) FRUHSTORFERI (Martens). Pl. IV, Fig. 4.

Nanina (Hemiplecta) Fruhstorferi, Martens: Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, p. 158.

Hab.—Lombock (Fruhstorfer and Everett).

The specimen figured is in the British Museum (Natural History).

8. ARIOPHANTA (HEMIPLECTA) OXYCONUS (Martens). Pl. II, Fig. 6.

Trochonanina oxyconus, Martens: Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, p. 159.

Hab.—Lombock (Fruhstorfer).

Figured from the type kindly lent by the Berlin Museum.

9. ARIOPHANTA (HEMIPLECTA) PERINSIGNIS, n.sp. Pl. II, Fig. 5.

Testa imperforata, trochoidea, carinata, luteo-castanea, supra carinam fusco-nigro anguste zonata, et infra suturam zona latiore albo maculata picta, supra haud nitida, infra nitens, versus medium viridi-flavescentis; spira conica, ad apicem obtusiuscula, nigrescens; anfractus 7, leviter convexi, striis incrementi obliquis arcuatis sculpti, ultimus haud descendens, ad peripheriam acute carinatus, supra et infra æque convexus; apertura obliqua, angulato-lunata, opalina, in medio et ad suturam nigro fasciata; peristoma tenue, margine columellari ad insertionem pallide roseo, incrassato, reflexo, appresso. Diam. maj. 24·5, min. 22 mm.; alt. 19 mm.

Allied to *Trochonanina oxyconus*, Martens, but larger, not perforate, and differently coloured. The white blotches upon the dark infra-sutural band are hydrophanous, as in many species of *Cochlostyla*.

10. EVERETTIA (?) PERGLABRA, n.sp. Pl. II, Figs. 7, 8.

Testa parva, depressa, orbicularis, anguste umbilicata, fusco-cornea, subtus pallidior, pellucida, nitidissima, lineis incrementi tenuibus striata; spira parum elata, ad apicem obtusa; anfractus 5, lente accrescentes, convexiusculi, infra suturam depresso marginati, ultimus haud descendens, ad peripheriam rotundatus; apertura obliqua, lunata; peristoma tenue, margine columellari tenui, ad insertionem dilatato et reflexo. Diam. maj. 8·5, min. 7 mm.; alt. 4 mm.

Hab.—Lombok, 1,500 feet (Everett).

Until the soft parts are known, the generic position of this species must remain uncertain.

11. MICROCYSTIS DYAKANA, Godwin-Austen.

Microcystis Dyakana, Godwin-Austen: Proc. Zool. Soc., 1891, p. 37, pl. iv, figs. 4-4c.

Hab.—Busan Hills, Borneo, and Lombok, 1,500 feet (Everett).

Three specimens from Lombok agree in every respect, excepting size, with Bornean examples. The largest shell, which may not, however, be adult, is only 7 mm. in its greater diameter.

12. SITALA COLLINÆ, n.sp. Pl. II, Figs. 9, 10.

Testa trochoidea, angulata, anguste rimata, tenuis, cornea, pellucida, lineis incrementi tenuibus obliquis striis spiralibus minutis supra et infra decussatis sculpta, sericata; spira breviter conica, ad apicem mediocriter acuta; anfractus 5, convexiusculi, lente accrescentes, ultimus in medio acute angulatus, infra convexiusculus, antice haud descendens; apertura obliqua, angulato-lunata; peristoma tenue, margine columellari ad insertionem reflexo. Diam. maj. 3·5, min. 3 mm.; alt. 3 mm.

Hab.—Lombok, 1,500 feet.

It is only under the microscope that the beauty of the minute cancellation is observable. *S. angulata*, Issel, and *S. demissa*, Smith, both from Borneo, are allied species differing somewhat in form.

13. PUPISOMA PULVISULUM (Issel).

Helix (Fruticicola) pulvisulum, Issel: Ann. Mus. Civ. Genova, 1874, vol. vi, p. 406, pl. v, figs. 24-7.

Hab.—Borneo (Issel); Labuan (Everett); Lombock, 1,200 feet, on fruit-trees (Everett).

A second species common to Borneo and Lombock, possibly transported with orange- or other fruit-trees.

14. TROCHOMORPHA BICOLOR, Martens.

Trochomorpha bicolor, Martens: Preuss. Exped. Ost-Asien, Zool. vol. ii, p. 252, pl. xiii, fig. 2.

Hab.—Sumatra, Java, Borneo, Lombock (Martens).

15. HELIX (?) SMIRUENSIS, Mousson (*em.*).

Helix Smimensis, Mousson: Land- und Sussw.-Moll. Java, p. 21, pl. ii, fig. 10.

Helix Smiruensis, Mouss.: Martens, Preuss. Exped. Ost-Asien, Zool. vol. ii, p. 268; Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, p. 160.

Helix (Trichia) Smiruensis, Mouss.: Tryon, Man. Conch., ser. II, vol. iii, p. 184, pl. xl, figs. 44-6.

Hab.—Java (Mousson, Martens); Lombock (Martens).

In appearance resembling the smaller European forms of *Fruticicola*, but differing in the radula (Martens).

16. PLANISPIRA INFRACTA (Martens). Pl. II, Figs. 11, 12.

Helix infracta, Martens: Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, p. 160.

Helix porcellana, Pfeiffer (*non* Grateloup): Mon. Helic., vol. iv, p. 273.

Hab.—Lombock (Fruhstorfer).

Figured from the type, kindly lent by the Berlin Museum.

17. STENOGYRA LOMBOCKENSIS, n.sp. Pl. II, Fig. 14.

Testa elongata, vix rimata, luteo-grisea, strigis albis hydrophanis obliquis picta, lineis incrementi tenuibus confertis subgranulosis sculpta; spira elongata, ad apicem obtusissima; anfractus 8, superiores tres confertim fortiter costulati, convexi, cæteri convexiusculi, sutura obliqua sejuncti, ultimus elongatus, antice paulo angustatus; apertura elongata, superne acuta, longit. totius $\frac{1}{3}$ æquans; labrum tenue, arcuatim in medio prominens, marginibus callo tenui junctis, columellari recto, anguste reflexo. Long. 26, diam. 8 mm.

Differs from *S. discernibilis*, Martens, in sculpture, colour, etc. The fine costulæ on the protoconch exhibit a very pretty crenulated appearance at the suture.

18. STENOGYRA DISCERNIBILIS, Martens. Pl. II, Fig. 13.

Stenogyra discernibilis, Martens: Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, p. 162.

Figured from a drawing of the type by Miss Zglinicka, kindly sent by Dr. E. von Martens.

Hab.—Lombok (Fruhstorfer).

19. STENOGYRA (OPEAS) PANAYENSIS (Pfeiffer).

Bulimus Panayensis, Pfr.: Mon. Helic., vol. ii, p. 156; Reeve, Conch. Icon., fig. 76.

Stenogyra Panayensis, Pfr.: Martens, Preuss. Exped. Ost-Asien, Zool. vol. ii, p. 376, pl. xxii, fig. 8; Sitzungs Ber. Gesell. naturf. Freunde Berlin, 1896, p. 163.

Hab.—"Philippines, Moluccas, Timor, Flores, Lombok" (Martens).

20. SUBULINA (NOTHUS) SOROR, n.sp. Pl. II, Fig. 15.

Testa turrata, rimata, corneo-pellucida, nitida, striis incrementi obliquis flexuosis sculpta; spira subgradata, ad apicem obtusa; anfractus 7, perconvexi, lente accrescentes; apertura recta, inverse auriformis, longit. totius $\frac{1}{3}$ subæquans; peristoma tenue, margine externo arcuatim prominente, columellari reflexo, inferne oblique subtruncato. Long. 11, diam. fere 4 mm.

Very like *S. simplex*, Guppy, from Trinidad, in form, but not so strongly sculptured. *Stenogyra Semperi*, Hidalgo,¹ from Mindanao, is also an allied species.

21. SUBULINA (NOTHUS) BREVIOR, n.sp. Pl. II, Fig. 16.

Testa obtecte perforata, turrata, tenuis, pellucida, cornea, nitida, striis incrementi sculpta; spira mediocriter elongata, ad apicem obtusa; anfractus sex conspicue convexi; apertura inverse auriformis, longit. totius $\frac{1}{3}$ vix æquans; peristoma tenue, margine externo arcuatim prominente, columellari leviter incrassato, reflexo, inferne oblique vix truncato vel subtorto. Long. 9, diam. 4 mm.

Shorter and proportionally broader than *S. soror*, with a more indistinct columellar truncation or oblique basal fold or twist.

22. TORNATELLINA CITREA, n.sp. Pl. II, Fig. 17.

Testa minuta, imperforata, ovata, tenuis, fusco-cornea, parum nitida, lineis incrementi obliquis tenuibus striata; spira brevis, obtusissima; anfractus $3\frac{1}{2}$, perconvexi, ultimus subglobosus; apertura auriformis, longit. totius $\frac{1}{2}$ paulo superans, dente unico parietali minuto

¹ Journ. de Conch., 1888, p. 36, pl. vi, fig. 3.

instructa; labrum tenue, arcuatum; columella recta, incrassata, ad basim abrupte truncata. Long. 2, diam. 1.5 mm.

Hab.—On orange-trees.

Under the microscope the surface has a minutely frosted appearance, produced by excessively fine spiral striation.

23. *CYCLOTUS (PSEUDOCYCLOPHORUS) LOMBOCKENSIS*, n.sp.

Pl. II, Fig. 18.

Testa globoso-turbinata, anguste umbilicata, rufescens, lineis albis undulatis sutura radiantibus picta, et supra anfractum ultimum plus minus obscure albo notata; spira conoidea, ad apicem subobtusa; anfractus $4\frac{1}{2}$ –5, perconvexi, sutura profunda sejuncti, apicales nigro-purpurei, ultimus antice leviter descendens, incrementi lineis obliquis striis spiralibus decussatis sculptus; apertura rufo-fusca, albo variegata; peristoma duplex, continuum, subincrassatum, pallide carneum, margine externo interno magis prominente, subexpanso, sed haud reflexo. Diam. maj. 14, min. 11 mm.; alt. 13 mm.

Hab.—Rinjani Peak, 2,500 feet.

This species belongs to the same group as *C. politus*, Sby., *C. fulminatus*, Martens, etc.

24. *REGISTOMA OBLIQUUM*, n.sp. Pl. II, Figs. 19, 20.

Testa oblonga, compressa, irregularis, subpellucida vel pallide rufescens, polita; anfractus 5; superiores quatuor regulariter accrescentes, vix convexiusculi, spiram brevem conicam formantes, ultimus valde oblique distortus, supra aperturam planiusculus, conspicue oblique descendens, sed prope labrum subito ascendens; sutura pellucide anguste marginata; apertura parva, circularis; peristoma leviter incrassatum, albidum, margine columellari minute inciso. Diam. 3.6, alt. 6 mm.

Hab.—Sumbawa, 2,500–5,000 feet (Doherty); Lombok, 4,000 feet (Everett).

This species is distorted like certain forms of *Streptaxis*, the spire being regular and the body-whorl remarkably oblique, whilst the penultimate bulges out on the left side above the last. *Callianella Wallacei* (Pfr.) is very similar in form.

25. *DIPLOMMATINA LOMBOCKENSIS*, n.sp. Pl. II, Fig. 21.

Testa sinistrorsa, imperforata, pupoidea, cornea, pellucida, nitida; anfractus 6, perconvexi, apicales duo læves, cæteri lamellis tenuibus obliquis arcuatis subdistantibus (in anfractu penultimo circiter 20) instructi, ultimus penultimum latitudine æquans, supra aperturam contractus; apertura late auriformis; peristoma leviter incrassatum, expansum, continuum, margine superiore appresso, columellari intus prominente, vel rotunde subdentato. Long. 3.5, diam. 1.6 mm. Apertura cum perist. 1.5 longa.

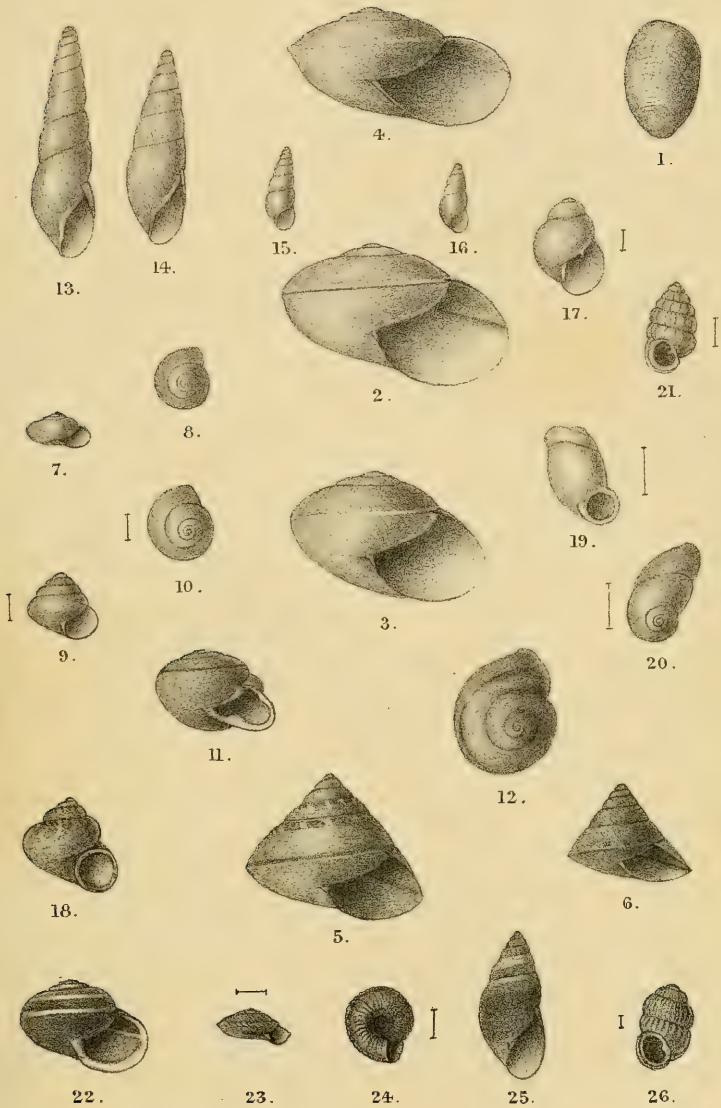
Hab.—Lombok (W. Doherty).

The last lamella on the body-whorl is well developed and situated close to the peristome, which consequently has a duplex appearance.

EXPLANATION OF PLATE II.

- FIG. 1. *Parmarion intermedius*.
 ,, 2. *Ariophanta (Hemiplecta) rufolineata*.
 ,, 3. _____ *internota*.
 ,, 4. _____ *Fruhstorferi*.
 ,, 5. _____ *perinsignis*.
 ,, 6. _____ *oxyconus*.
 ,, 7, 8. *Everettia perglabra*.
 ,, 9, 10. *Sitala collinæ*.
 ,, 11, 12. *Planispira infracta*.
 ,, 13. *Stenogyra discernibilis*.
 ,, 14. _____ *Lombockensis*.
 ,, 15. *Subulina (Nothus) soror*.
 ,, 16. _____ *(Nothus) brevior*.
 ,, 17. *Tornatellina citrea*.
 ,, 18. *Cyclotus (Pseudocyclophorus) Lombockensis*.
 ,, 19, 20. *Registoma obliquum*.
 ,, 21. *Diplommatina Lombockensis*.

 ,, 22. *Planispira dulcissima*.
 ,, 23, 24. *Charopa delectans*.
 ,, 25. *Rhachis Aldabræ*.
 ,, 26. *Diplommatina Whiteheadi*.
-



E.A. Smith del. et lith.

Mintern Bros. imp.

NEW LAND SHELLS FROM LOMBOCK,
NEW GUINEA AND BORNEO.

DESCRIPTIONS OF NEW SPECIES OF LAND-SHELLS FROM NEW GUINEA, NORTH BORNEO, AND ALDABRA ISLAND, INDIAN OCEAN.

By EDGAR A. SMITH, F.Z.S., etc.

Read 14th January, 1898.

PLATE II, FIGS. 22-26.

1. *CHAROPA DELECTANS*, n.sp. Pl. II, Figs. 23, 24.

Testa parva, depressa, orbicularis, acute carinata, aperte umbilicata, fusco-cornea; spira convexa, parum elata, ad apicem obtusa; anfractus $4\frac{1}{2}$, apicales duo convexi, vitrei, politi, læves, cæteri convexiusculi, suturâ profunda sejuncti, peroblique costulati, costis arcuatis, ad peripheriam, supra suturam et circa umbilicum validis, ultimus infra plus minus concentricè striatus; apertura parva, subquadrata; peristoma tenue, margine supero obliquo, recto, inferiore curvato, columellari vix reflexo. Diam. maj. 3·5, min. 3 mm.; alt. 2 mm.

Hab.—Kapaur, south-west coast of New Guinea (Doherty).

The excessively oblique costæ are very strong upon the periphery, and give the keel an exceedingly pretty crenulated appearance.

2. *PLANISPIRA DULCISSIMA*, n.sp. Pl. II, Fig. 22.

Testa depresso subglobosa, anguste umbilicata, saturate purpureo-nigra, zonis angustis tribus albis, et zona lata rufa supra cincta, haud nitida; spira depressa, ad apicem obtusissima; anfractus 4, convexi, sutura profunda sejuncti, superiores duo puncturati, cæteri lineis incrementi tenuibus striati, ultimus antice paulo descendens; apertura obliqua, irregulariter lunata, intus nigrescens, albo fasciata; peristoma album, leviter incrassatum, anguste expansum, subreflexum, margine columellari ad insertionem paululum dilatato. Diam. maj. 18, min. 14·5 mm.; alt. 12 mm.

Hab.—Kina Balu, North Borneo (A. Everett).

Well characterized by its style of coloration. Of the three white narrow bands, one is peripheral, another near but not quite at the suture, and the third intermediate. Between the two latter the surface is of a rich red colour, and not like the rest of the shell, a deep purplish-black.

3. *BULIMINUS (RHACHIS) ALDABRÆ*, Martens. Pl. II, Fig. 25.

Buliminus (Rhachis) Aldabræ, Martens: Mitteil. Zool. Samml. Mus. Naturk. Berlin, vol. i (1898), p. 28, pl. ii, figs. 15, 16.¹

¹ My description and figure being already in press when Dr. von Martens' paper reached me, I judged it best to let them stand and merely to substitute his name for the one I had proposed.

Testa ovata, superne acuminata, vix rimata, nitida, nigro-castanea, infra suturam zona pallida cincta, ad apicem nigra; spira elongata, conica, ad apicem rotundata; anfractus $6\frac{1}{2}$, superiores $2\frac{1}{2}$ convexi, cæteri minus convexi, lineis incrementi tenuibus striisque spiralibus exillissimis inconspicuis sculpti, ultimus antice vix descendens; apertura inverse auriformis, intus purpurascens, longit. totius $\frac{1}{2}$ paulo minor; labrum tenue, nigro-purpureo limbatum, haud expansum; columella in medio incrassata, reflexa, obliqua. Long. 20, diam. 9 mm.; apertura 9 longa, 5 mm. lata.

Hab.—Aldabra Island, north of the Comoro Islands.

“Very rare, only found in one spot about an acre in extent.” Allied to *B. Bewsheri*, Morelet, from Anjouan, Comoro Island, but differing in form, etc. The specimens described were presented to the national collection by the Rev. J. W. Horsley.

4. DIPLOMMATINA WHITEHEADI, n.sp. Pl. II, Fig. 26.

Testa minuta, sinistrorsa, pupoidea, alba, ad apicem rufescens; anfractus 4-5, apicales $1\frac{1}{2}$ rotundati, læves, cæteri perconvexi, costellis tenuissimis obliquis numerosis instructi, inter costellas microscopice confertim spiraliter striati, penultimus magnus, ultimo major, ultimus supra aperturam constrictus; peristoma duplex, margine interno continuo, leviter porrecto, externo anguste expanso, supra interrupto, columellari dente minuto in medio munito. Long. 1.25, diam. .75 mm.

Hab.—Kina Balu, North Borneo.

A very minute, but, under the microscope, very beautiful species. Although described as smooth, the apical whorls are in reality microscopically punctate. The costellæ become a trifle more remote upon the last than preceding whorls.

NOTES ON A SECOND COLLECTION OF MARINE SHELLS FROM
THE ANDAMAN ISLANDS, WITH DESCRIPTIONS OF NEW
FORMS OF *TEREBRA*.

By J. COSMO MELVILL, M.A., F.L.S., and E. R. SYKES, B.A., F.Z.S., etc.

Read 10th December, 1897.

PLATE III.

SINCE our first paper on the subject,¹ in which ninety-seven species, forwarded by Mr. G. H. Booley, of Port Blair, were enumerated, we have received several consignments from the same careful and enterprising collector, mostly containing specimens differing specifically from those in the earlier parcels: these we now proceed to enumerate. Mr. Booley has been directing his attention to particular genera, and it will be seen that *Oliva*, *Terebra*, and *Nassa* predominate in the present paper.

We put forward these lists on the supposition that any additions to the meagre details hitherto published of the exceptionally rich molluscan fauna of the Andaman Islands must prove of unusual interest, seeing that those islands are situated in the centre of the Bay of Bengal, and cannot fail to present an almost exhaustless field for research. This list includes 215 species, and of these, two species of *Terebra*, as well as marked varieties of *T. crenulata* and *T. nitida*, are considered new to science. We should add that a few of the species did not come from Mr. Booley, but were collected some years ago by Mr. J. R. Henderson, of Madras, and are now in the Manchester Museum, Owens College. We thought it a good opportunity to include these also in the present communication, in order that the records might be made as complete as possible, although the attainment of this desired end can only be reached by degrees.

We have further taken this opportunity of figuring the operculum of *Ancilla Booleyi*, Melv. & Sykes² (Pl. III, Fig. 7).

Having received additional specimens of *Turritella leptomita*, Melv. & Sykes,³ we think it right to call attention to the possibility of its eventually proving a variety of the *Eglisia tricarinata*, Adams & Reeve, described and figured in the Voyage of the "Samarang," and refigured here (Pl. III, Fig. 6) for comparison. While differing from the large and, presumably, type specimen in the British Museum (Natural History), closer affinity appears on comparison with two smaller specimens mounted on the same tablet. The "type" has five carinæ at least on the last whorl, and

¹ Proc. Malac. Soc., vol. ii, p. 164. ² T.c., p. 166. ³ T.c., p. 171.

“*tricarinata*” is therefore an inappropriate name. We may note that the type of *Eglisia* appears to be *E. spirata*, Sby.: some authors have transferred the genus to the Sculariidae.

By an error the *Natica Raynaudiana*, Récluz, appeared in our former list as *N. Raynoldiana*.

As in our previous paper, we have distinguished the species already recorded by Mr. E. A. Smith¹ by an asterisk. The initials J. R. H. stand for Mr. Henderson.

1. *FUSUS BLOSVILLEI*, Desh. These specimens possess their opercula, and are larger than examples from Manila. By some authors this species is included in the genus *Afer* (Conr.) with the African species *F. afer*, Gmelin, for the type.

2. *FUSUS LONGICAUDA*, Lam. A Ceylonese shell, which, therefore, now has its known range extended northwards. The species has always been credited to Bory de St. Vincent, but this is an error. (Vide Proc. Zool. Soc., 1893, p. 584.)

3. *FUSUS*, sp. A large, massive shell, much ribbed and tuberculate, broader than *F. Nicobaricus* or *F. laticostatus*. We await more examples before giving any further description.

4. *PLEUROTOMA ALBINA*, Lam. A small variety. Its headcentre lies in the Moluccas and Spice Islands.

5. *PLEUROTOMA MARMORATA*, Lam. A pretty, small form of this widely-distributed mollusc.

6. *CLAVUS UNIZONALIS*, Lam. Appears to be very closely related to, if not identical with, *C. vidua*, Reeve.

7. *MUREX FUSCUS*, Dunker. A specimen collected by Mr. J. R. Henderson has lately come to our notice.

8. *MUREX TRIQUETER*, Born. The variety *Cumingii*, A. Ad.

9. *AQUILLUS (SIMPULUM) GEMMATUS*, Reeve. Not particularly characteristic, but simulating the Philippine Island form very closely. One of us² has lately given reasons for the preference of the name *Aquillus* to *Lotorium* (both of Montfort) as superseding the old term *Triton*.

10. *AQUILLUS (GUTTURNIUM) EXILIS*, Reeve. Extends to Zebu Island.

11. *AQUILLUS (GUTTURNIUM) MONILIFER*, Ad. & Reeve. A variety. Extends to China, whence the type was described.

12. *AQUILLUS (GUTTURNIUM) PFEIFFERIANUS*, Reeve. Another Chinese and Philippine Island species, with wide range westward.

13. *AQUILLUS (GUTTURNIUM) SINENSIS*, Reeve. The type, as its name implies, comes from China.

14. *AQUILLUS (COLUBRARIA) BRACTEATUS*, Hinds. Superficially like one of the Pleurotomidae. It is a small species of wide distribution,

¹ Proc. Zool. Soc., 1878, pp. 804-821, pl. L.

² Journ. of Conch., vol. viii, p. 469, 1897.

occurring in most collections from the East which we have examined of late years. The Andaman Island form is large in proportion, and well marked with thick dots and dashes.

15. *AQUILLUS* (*COLUBRARIA*) *OBSCURUS*, Reeve. Received as Andamanese, from Mr. J. R. Henderson.

16. *AQUILLUS ENCAUSTICUS*, Reeve.

17. *GYRINEUM* (*APOLLON*) *BITUBERCULARE*, Lam. Two specimens, agreeing with individuals from the East Indies.

18. *GYRINEUM* (*BURSA*) *ELEGANS*, Beck. Also reported from the Nicobar Islands.

19. *BULLIA* (*DORSANUM*) *VITTATA*, L. This species having its headquarters in Ceylon, the present record constitutes a north-eastward extension of its range.

20. *NASSA* *ARCULARIA*, L. A well-grown form, but of smoother surface dorsally than is usual. The callosity round the lip is likewise not so pronounced. Another form also occurs, dark cinereous, with a single dorsal band.

21. *NASSA* *CORONATA*, L. Chiefly distinguished from the above species (*N. arcularia*) by the complete smoothness and polished condition of the upper whorls, and polished rounded nodules just below the suture on the (often white-flecked) dorsal surface of the last whorl. We consider these characters constant, and that the species is not conspecific with the nearly allied and commoner one, so often associated with it. *N. coronata* has its headquarters, perhaps, in Madagascar, but ranges far to the eastward, being reported from all the East Indian Islands, including, of course, the Philippines. We have also seen Andaman specimens collected by Mr. J. R. Henderson.

22. **NASSA* (*ARCULARIA*) *BIMACULOSA*, A. Ad. Very abundant, and quite constant. We do not agree with Tryon¹ that this should be merged in *N. Thersites* (Brug.), for, though gibbous, the smoothness, comparatively speaking, of the dorsal surface, and especially the twin spots just behind the outer lip, that suggested, no doubt, the specific name, are quite characteristic.

23. *NASSA* (*ARCULARIA*) *CALLOSA*, A. Ad. Not a very frequent form, somewhat resembling the preceding species in miniature. *N. callospira*, A. Ad., is synonymous.

24. *NASSA* (*ARCULARIA*) *IMMERSA*, Carp. There seems to be some confusion with respect to this species: Tryon unhesitatingly gives it as a variety of *N. bimaculosa*, A. Ad., which, as just observed above, he then merges in *N. Thersites*, Brug. The principal point of resemblance appears to us to consist in the twin dark spots behind the outer lip. These also occur in *N. callosa*. In Paetel's Catalogue, California is given as a locality for this, but surely in error.

¹ Man. Conch., ser. I, vol. iv, p. 25.

N. immersa seems to us unconnected by any exactly intermediate stage with *N. Thersites*, *N. bimaculosa*, or *N. callosa*, though, of course, coming next in sequence. The callosity extends, as in *N. gibbosula*, L., *N. circumcincta*, A. Ad., *N. Kraussiana*, Dunker, over the apex and lateral margins of the shell, and in our opinion it constitutes a good species.

25. *NASSA* (ALECTRION) CRENULATA, Reeve (an Bruguière?). We are not sure whether this specific name, as having been relegated to obscure synonymy three or four times over, should not be abandoned. Our specimens agree with those in the British Museum (Natural History) labelled *N. crenulata*, Brug. Comparisons with the figures in Reeve's Conch. Icon. and Tryon's Manual lead us to suppose a slighter form than our individuals, but at all events we think it best to leave them thus for the present.

26. *NASSA* (ALECTRION) NODIFERA, Powis. An allied form to the preceding, and merged as the above into *N. hirta*, Kiener, by Tryon.

27. *NASSA* (HEBRA) SUBSPINOSA, Lam. Typical. With this we observe Tryon¹ includes *N. sistroidea*, G. & H. Nevill, which found a place in our first list;² but Mr. Booley has now sent many freshly dredged specimens in a more mature condition, and we consider them sufficiently distinct.

28. **NASSA* (HEBRA) HORRIDA, Dunker. Considered by Tryon a variety only of *N. muricata*; but, though allied, we can always distinguish it.

29. **NASSA* (ZEUXIS) LURIDA, Gould (= *N. dispar*, A. Ad.). Placed under *N. picta*, Dunker, by Tryon.³ Though no doubt belonging to a very variable assemblage, we can always detect this form without difficulty. Taken collectively, this series of closely allied shells ranges throughout the whole Eastern tropics.

30. *NASSA* (ZEUXIS) LENTIGINOSA, A. Ad., var. PUNCTATA, A. Ad. Here, again, some difficulty as to limitation of forms prevails. Is *N. punctata* different from *N. lentiginosa*? We think not. Tryon, we observe,⁴ merges not only these, but a host of other smooth forms (even including *N. Marratii*, Smith, which is surely a distinct Andamanese shell), under *N. gaudiosa*, Hinds.

31. *NASSA* (HIMA) CONCINNA, Powis. A pretty variety. We have seen this species from many tropical Eastern localities. A remarkably large specimen from Lifu has just come under our notice, about twice the size usually seen.

32. *NASSA* (NIOTHA) FENESTRATA, Marrat.

33. *NASSA* (NIOTHA) LIVESCENS, Phil. Of wide distribution throughout

¹ T.c., p. 44. ² Proc. Malac. Soc., vol. ii, p. 169.

³ Man. Conch., ser. i, vol. iv, p. 36. ⁴ T.c., pp. 34, 35.

the Indian Ocean. As Tryon well observes, *N. livescens* "has the form of *albescens*, with the revolving sculpture of *cremata* and ribs of *concinna*."¹

34. *NASSA* (*NIOTHA*) *VENUSTA*, Dunker. In fine, live condition.

35. *ENGINA ZONATA*, Reeve.

36. *LATRUNCULUS* (*EBURNA*) *AMBULACRUM*, Sby. Extends to the Philippines.

37. *SISTRUM* (*MORULA*) *CHRYSOSTOMA*, Desh. Varies, having either yellow or a lilac interior to the mouth. The headquarters for this appears to be Ceylon. Another distinct species of *Sistrum* we have not determined at present, so covered are the examples with nullipores and *Melobesia*.

38. *OLIVA FUNEBRALIS*, Lam. (= *O. Labradorensis*, Bolten). Extends from Ceylon to the East Indies.

39. *OLIVA INFLATA*, Lam. The range of this species extends from the Red Sea and East African coasts to Ceylon and the Seychelles Islands.

40. *OLIVA IRISANS*, Lam. A bright pretty form of this common Olive; also the variety *Zeylanica*, Lam.

41. *OLIVA ISPIDULA*, L. As variable in the Andamans as elsewhere.

42. *OLIVA LUGUBRIS*, Lam. (= *O. episcopalis*, Lam.). Some of the specimens are small, but all have the characteristic violet interior.

43. *OLIVA LEUCOSTOMA*, Duclou. Originally described from Mauritian specimens.

44. *OLIVA MAURA*, Lam. Ranges through the whole Pacific Province, and may be considered the type of the genus, which was named from the dark unicolorous form of this species so precisely resembling the fruit of the *Olea Europæa*, L., the Olive of commerce.

45. *OLIVA NOBILIS*, Reeve. A fine variety. Some authors consider this, *O. tremulina*, Lam., and other allied forms, to be all varieties of *O. irisans*, Lam. Whether this be the correct way to dispose of them or not, our theory is, that specific variation amongst the *Olividæ* is more limited than might be conjectured, and where we can identify a shell with a name, without a shadow of doubt, we think such name ought to stand. It is never difficult to discriminate *O. nobilis* from *O. tremulina*, *O. Mazaris*, *O. ponderosa*, *O. Olympiadina*, or from *O. erythrostoma*.

46. *OLIVA PICTA*, Reeve. A very neat form, and in our estimation specifically distinct from *O. funebris*, Lam.

47. *OLIVA TEXTILINA*, Lam. (= *O. sericea*, Bolten). Another very distinct species, often considered a variety of *O. tremulina*, Lam. Our Andaman specimens are fine and quite typical.

¹ T.c., p. 54.

48. *OLIVA TODOSINA*, Duclos. Perhaps a variety of *O. sidelia*, Duclos. Many specimens, mostly of ochraceous colour, with obscure tessellated pattern, not exhibiting much variation.

49. *OLIVA* (*AGARONIA*) *GIBBOSA*, Born (*O. utriculus*, Gmelin). Ranging from West Africa and India eastward.

We are much indebted to Mr. J. M. Williams for having examined all these *Oliva*, and given us his notes thereupon.

50. *MITRA* (*TURRICULA*) *BRIONÆ*, Sby. A very handsome *Turricula*, with broad fuscous band on the body-whorl, the rest of the shell cinereous-gray. Three specimens were collected by Mr. Henderson.

51. *MITRA* (*TURRICULA*) *CINCTELLA*, Lam. A Molucca and Philippine species extending to the Andamans.

52. *MITRA* (*TURRICULA*) *CURVILIRATA*, Sby. Quite distinct from *M. melongena*, Lam. It is a rare species.

53. *MITRA* (*TURRICULA*) *PLICATA*, Klein. Typical forms, as also two young examples, showing brickdust-red banding, one sent by Mr. Booley, one by Mr. Henderson.

54. *MITRA* (*COSTELLARIA*) *DOHRNI*, A. Ad. One of the group in which *M. mucronata*, Swains., and *M. nodilirata*, A. Ad., are the most conspicuous. Only one example.

55. *MITRA* (*COSTELLARIA*) *INTERSTRIATA*, Sby. Two specimens probably belong to this species, which has no connection with *M. militaris*, Reeve, as Tryon opines.

56. **MITRA* (*COSTELLARIA*) *OBELISCUS*, Reeve. We have not seen G. and H. Nevill's *M. Andamanica*, which presumably is a variety of this, but the shell before us seems quite typical of *M. obeliscus*. It ranges throughout Polynesia.

57. *MITRA* (*COSTELLARIA*) *RECTILATERALIS*, Sby. (= *M. exquisita*, Sby.). A pretty form. Mr. Fulton and Mr. Edgar Smith agree in uniting *M. exquisita* with this species.

58. *MITRA* (*CALLITHEA*) *STIGMATARIA*, Lam. (J. R. H.)

59. *MITRA* (*CHRYSACME*) *TICAONICA*, Reeve. (J. R. H.)

60. *MITRA* (*PUSIA*) *AFFINIS*, Reeve. Perhaps a variety of *M. aureolata*, Swains., but the Andamanese specimens we have seen are very constant. Distributed throughout Polynesia.

61. *MITRA* (*PUSIA*) *VENUSTULA*, Reeve.

62. *MITRA* (*PUSIA*) *NUCLEOLA*, Lam. Considered by Tryon a mere variety of *M. aureolata*, but the dark transverse lineation is constant. We consider this form to be a distinct species.

63. *MITRA* (*CANCILLA*) *NEXILIS*, Mart. (= *M. filaris*, L.). (J. R. H.)

64. *MITRA* (*CANCILLA*) *CIRCULATA*, Kiener. (J. R. H.)

65. *MITRA* (*CANCILLA*) *INSCULPTA*, A. Ad. A well-marked local form, showing much elegance in its cancellated sculpture.

66. *MARGINELLA* (*GLABELLA*) *SCRIPTA*, Hinds. We are indebted to

Mr. Hugh Fulton for the record of this species, he having received the shell from Mr. Booley direct. Though not abundant, its distribution is wide throughout the Indian and Pacific Oceans.

67. MITRA (CYLINDER) FENESTRATA, Lam.
 68. MITRA (CYLINDER) CRENULATA, Chemn. (J. R. H.)
 69. MITRA (CYLINDER) UNDULOSA, Reeve. Very fine. (J. R. H.)
 70. MITRA (CYLINDER) DACTYLUS, L.
 71. FICULA FICOIDES, Lam.
 72. FICULA FICUS, L. (= *F. lævigata*, Reeve).
 73. NATICA (EUNATICA) ALA-PAPILIONIS, Chemn. (= *N. tæniata*, Mke.).
 A very beautiful form, of extremely wide range, being reported from both hemispheres.
 74. NATICA (NEVERITA) ALBUMEN, L. Small examples with opercula.
 75. NATICA (MAMILLA) MAMILLA, L.
 76. PYRAMIDELLA AURISCATI, L.
 77. *TEREBRA AFFINIS, Gray. A remarkably large example, nearly two inches long. The smallest specimens, on the other hand, that we have seen come from the New Caledonian region.

78. TEREBRA ANDAMANICA, n.sp. Pl. III, Fig. 3.

T. testa attenuato-fusiformi, nitida, carneo-rufa, anfractibus 15-16, supra paullum gradatulis, undique longitudinaliter costatis, costis nitidis, lævibus, curvatis, zona suturali conspicua, tumidula, irregulariter brunneo vel albido varipicta, interstitiis costarum spiraliter striato-sulcatis, ultimo anfractu recto, paullum prolongato, apertura ovata, labro extus tenui. Spec. max., long. 47, lat. 9 mm.; spec. min., long. 35, lat. 7 mm.

Through the kindness of Mr. Edgar Smith we are enabled to particularize this *Terebra* as being nearly allied to *T. alveolata*, Hinds, from Japan and the Straits Settlements, but differing both in form and coarseness of sculpture. It is the *T. specillata*, Reeve (1860); not that of Hinds (1843), figured in Sowerby's *Thesaurus Conch.*, pl. xlv, fig. 116. Fig. 96 of that work really illustrates *T. alveolata*, Hinds (*vide* Index, p. 190). In this confusion, a new name is required for the Andaman species. It has some points in common with both *T. pertusa*, Born, and *T. nebulosa*, Sby., more especially the former. One of the examples collected by Mr. Booley has the operculum, which is unguiform, rufous-brown, shining.

In comparison with *T. pertusa*, Born, the present species differs in form, being broader in proportion to its length, the whorls being more convex and the longitudinal sculpture more elevated; the infra-sutural band also stands out more from the shell, and the brown spotting is not so regular, and the spots are further apart.

79. TEREBRA BABYLONIA, Lam. A handsome *Terebra*, found commonly in the East.

80. TEREBRA CASTA, Hinds. Near *T. hastata*, Gmel., of which species the following named forms also occur: *T. albula*, Hinds, non Menke; *T. incolor*, Desh.

81. *TEREBRA CÆRULESCENS*, Lam. Abundant, well marked, and widely distributed.

82. *TEREBRA CHLORATA*, Lam. (= *T. Knorri*, Gray). Handsome, but frequent. Common in Mauritius, Lifu, Malacca, etc.

83. *TEREBRA CANCELLATA*, Quoy.

84. *TEREBRA CONFUSA*, E. A. Smith (= *T. aciculina*, Reeve, pars, non Lam.). Specimens from Singapore are in the British Museum (Natural History).

85. *TEREBRA CRENULATA*, L., var. *BOOLEYI*, n. var. (Pl. III, Fig. 5). A very beautiful variety of this shell we had at first imagined to be new. Warm fawn-colour, upon a flesh-coloured ground, its markings are in longitudinal dashes and flames, irregularly disposed. But little trace of crenulation is observable, the lower whorls being quite smooth, though painted in a tessellate fashion between the sutural bands. The upper whorls, however, are slightly noded.

86. *TEREBRA CELIDONOTA*,¹ n. sp. Pl. III, Fig. 2.

T. testa parva, nitida, multum attenuata, perlævi, omnino candida, anfractibus 12-13, aliquid gradatulis, quorum apicalibus quatuor, vitreis, tumidulis, lævibus, rufotinctis, cæteris albidis leniter longitudinaliter plicato-costulatis, transversim, paullum infra suturas, unisulculoso, sulculo punctato, ultimo anfractu dorsaliter una macula rufa solum decorato, apertura ovata, labro tenui, simplici. Long. 15, lat. 3 mm.

A small, shining, smooth, snowy-white species, conspicuous for a rufous-brown dorsal blotch on the last whorl. We have seen three specimens, all precisely similar. The whorls are slightly gradate, twelve or thirteen in number, with light longitudinal costæ, and a little below the sutures a spiral sulculus, dotted. It comes in the same section of the genus as *T. tenera*, Hinds, *T. nitida*, Hinds, *T. tantilla*, Smith, etc., but is quite distinct from all, as also from any of the numerous varieties of *T. hastata*, Gmelin.

87. *TEREBRA CINGULIFERA*, Lam. A variable shell, with many synonyms, and of wide range. Our specimens are very large. The form *T. lævigata*, Gray, also occurs.

88. *TEREBRA DESHAYESII*, Reeve. A handsome dark flesh-red coloured variety. We can always differentiate this from *T. Babylonia*, Lam., with which, however, Mr. Tryon elects to place it.

89. *TEREBRA LANCEATA*, L. A fine example of this well-known form.

90. *TEREBRA MONILIS*, Quoy & Gaim. Always to be recognized by the white nodules below the sutures.

91. *TEREBRA MYUROS*, Lam.

92. *TEREBRA POLYGYRATA*, Desh. A small species, reported hitherto from Japan and the Philippines.

¹ κηλῖς, 'a stain': νῶτος, 'the back.'

93. *TEREBRA RAPHANULA*, Lam. We think this distinct from the forms of *T. Senegalensis*, Lam. The only specimen in this collection is of a dark shining brown variety, most attractive in beauty. It is a rare inhabitant of the East Indian Archipelago, and a welcome addition to the Andamanese Fauna.

94. *TEREBRA SOLIDA*, Desh. This, which may be a variety of *T. hastata*, has been hitherto reported from Japan.

95. *TEREBRA NITIDA*, Hinds, var. *SIKYODES*,¹ n. var. Pl. III, Fig. 8.

T. testa aciculata, attenuata, nitida, læte fulvo-brunnea, anfractibus 18, apicalibus?, cæteris longitudinaliter arcte costatis, costis lævibus, nitidis, interstitiis planis, lævissimis, sed apud medium transversim profunde regulariter punctatis, ultimo anfractu recto, paullum producto, apertura angusta, obliqua, labro extus tenui, simplicii. Long. 37, lat. 6 mm.

A most interesting form, of a pleasing fulvous-brown colour, shining, longitudinally ribbed, both ribs and interstices quite smooth. Each interstice has a single, deep, ovate puncture placed exactly midway between the ribs and a little above the middle of the whorl. The mouth is narrow, oblique, outer lip simple. The shell is eighteen-whorled, very long and attenuate. The typical form of *T. nitida* is almost white, with a faint tinge of lilac; the apex is brownish.

It is not improbable that *T. cernica*, Sby., from the Mauritius, is also a variety of *T. nitida*.

96. *TEREBRA STRAMINEA*, Gray. A beautiful species, nearly allied to *T. monilis*, Quoy & Gaim., on the one hand, and *T. Babylonia*, Lam., on the other. The revolving striæ and sulcations are beautifully chased. When originally described in 1834, its habitat was considered to be China, but extending to the Philippine Islands; it now, however, proves to have a much wider geographical range. Both the varieties *T. acuta*, Desh., and *T. circumata*, Desh., occur in the Andamans.

97. *TEREBRA TIGRINA*, Gmelin. Beautiful examples, with operculum; but not showing any variation. A not uncommon Polynesian form: we have recently seen it from the Loyalty Islands, New Caledonia.

98. *TEREBRA TRICOLOR*, Sby. The yellow and carnation hue of this pretty shell, with orange-red transverse lines, always serves to distinguish it. It is not a common species.

We have not attempted to divide the species of *Terebra* into subgenera. The genus as a whole is a natural one, and we think the divisions proposed to some extent artificial and needless.

99. *SOLARIUM (HELIACUS) DORSUOSUM*, Hinds. A small shell, apparently having a wide range.

100. **CONUS ANDAMANENSIS*, Smith. An endemic little species.

¹ σικυώδης, 'like a gherkin or cucumber.'

101. *CONUS AULICUS*, L. One specimen with its operculum.
102. *CONUS NOBILIS*, L., var. The small, very beautiful form, with very clearly-cut markings, seems most prevalent in the Andamans. Some fifteen years ago one of the authors inspected at Oxford a large collection of the more showy Andamanese shells in the possession of Miss Milman, sister of the late Bishop of Calcutta, and there were several of this variety of *C. nobilis* amongst many commoner Cones. She then presented him with two beautiful varieties, which are as fine as any dredged by Mr. Booley. In our opinion, this is almost the most select of all the Cones.
103. *CONUS ZONATUS*, L. Another of the more interesting forms of the genus; dredged, though not in any great quantity.
104. *STROMBUS MAURITIANUS*, Lam.
105. *STROMBUS TEREHELLUM*, L. (J. R. H.)
106. *STROMBUS PULCHELLUS*, Reeve.
107. *STROMBUS FLORIDUS*, Lam. (J. R. H. and G. H. B.)
108. *STROMBUS AURIS-DIANÆ*, L., var. *LAMARCKII*, Gray. (J. R. H.)
109. *STROMBUS CANARIUM*, L.
110. *STROMBUS TRICORNIS*, Lam.
111. *STROMBUS VARIABILIS*, L.
112. *DOLIUM PINNATUM*. Mörch. Our specimen is slightly more globose in form, but appears to be a variety of this species.
113. *SERAPHS SUBULATUM*, Lam.
114. *CYPRÆA CLANDESTINA*, L.
115. *CYPRÆA CICERCULA*, L.
116. *CYPRÆA COFFEA*, Sby. (J. R. H.) Considered by some only a variety, though we would give it specific rank.
117. *CYPRÆA HIRUNDO*, L.
118. *CYPRÆA MICRODON*, Gray. In all probability, only a form of *C. fimbriata*, Gmelin, but it is characterized by its very fine, small teeth, and slightly more cylindrical shape.
119. *CYPRÆA NEGLECTA*, Sby. (J. R. H.)
120. *CYPRÆA CRIBRARIA*, L. (J. R. H.)
121. *CYPRÆA CAURICA*, L. Both the typical form and the variety *oblongata*, Melv. (J. R. H. and G. H. B.)
122. *CYPRÆA ASELLUS*, L. (J. R. H.)
123. *CYPRÆA NUCLEUS*, L. (J. R. H.)
124. *CYPRÆA EROSA*, L., and the variety *phagedaina*, Melvill, possessing no lateral spots. (J. R. H.)
125. * *CYPRÆA GANGRENOSA*, (Sol.) Dillwyn. (J. R. H.)
126. *CYPRÆA FLAVEOLA*, L. (J. R. H.)
127. *CYPRÆA CARNEOLA*, L. (J. R. H.)

128. *CYPRÆA STERCUS-MUSCARUM*. (J. R. H.)
129. *CYPRÆA TABESCENS*, (Sol.) Dillwyn. (J. R. H.)
130. *CYPRÆA ISABELLA*, L. (J. R. H.)
131. *CYPRÆA SCURRA*, Chemn. (J. R. H.)
132. *CASSIS ERINACEUS*. (J. R. H.)
133. *CANCELLARIA (MERICA) ELEGANS*, Sby.
134. *CERITHIUM TRAILLII*, Sby. A variety of this well-known shell; perhaps even better known by its var. *alternatum*, Sby., than by the typical form.
135. *CERITHIUM TUBERCULATUM*, L.
136. *CERITHIUM MORUM*, Lam.
137. *CERITHIUM PURPURASCENS*, Sby. One large specimen.
138. *CERITHIUM CORALIUM*, Dufr.
139. *TYMPHANOTOMUS FLUVIATILIS*, P. & M.
140. *PLANAXIS SULCATUS*, Lam. Large specimens of this ubiquitous Eastern species.
141. *RISELLA LUTEA*, Gould.
142. *TURRITELLA (ZARIA) DUPLICATA*, L., var. *acutangula*, L. A common Indian Ocean form.
143. *MONODONTA LABIO*, L. A common shore-shell.
- There are juvenile specimens of a *Turbo*, an *Astralium*, and *Trochus* (*Polydonta*) in the collection, that are best left unclassified at present.
144. *STOMATIA PHYMOTIS*, Helbling.
145. *ATYS NAUCUM*, Linn. (J. R. H.)
146. *HALIOTIS (TEINOTIS) ASININA*, L. We do not consider *Teinotis* to be other than a subgenus.
147. *RIMULA EXQUISITA*, A. Ad. The type, with which the one very beautiful example forwarded by Mr. Booley agrees precisely, came from the Philippines.
148. *DENTALIUM APRINUM*, L. Also from the Philippine Islands.
149. *DENTALIUM POLITUM*, L. (= *eburneum*, Desh.).
150. *DENTALIUM JAVANUM*, Sby.
- All three represented by fine examples.
151. *ARCA ZEBRA*, Sby. Juvenile examples.
152. *MODIOLA ALBICOSTATA*, Lam.
153. *SEPTIFER NICOBARICUS*, Chemn. (= *S. bilocularis*, L.). Fine and typical.
154. **PERNA SAMOENSIS*, Baird. Originally described from the Pacific Islands.
155. *AVICULA INQUINATA*, Reeve? We record this with doubt, as the specimens are very young.

156. *PECTEN ALBOLINEATUS, Sby. Typical specimens of this Philippine Island shell.

157. PECTEN CORALLINOIDES, D'Orb. One or two large specimens showing beautiful coloration. Its headquarters are East Africa.

158. PECTEN FRICATUS, Reeve.

159. PECTEN HISTRIONICUS, Gmel. Ranges from Singapore both east and west. Our specimens are very finely coloured and perfect.

160. PECTEN INÆQUIVALVIS, Sby. A curious and rare form, the valves, as the name implies, being very unequal. Quite typical: three or four examples.

161. PECTEN LENTIGINOSUS, Reeve. Our specimens agree with Reeve's description and figure; it is a Philippine Island form.

162. PECTEN PALLIUM, L. This species seems to have a very wide range throughout the tropical portion of the Eastern hemisphere.

163. PECTEN TESTUDINEUS, Reeve (Pl. III, Fig. 4). A lovely example, larger than the type in the British Museum, and measuring 30×25 mm. As illustrative of the danger in describing small Pectens, we may point out that the recently published¹ *P. Thomasi*, Sby., appears to be the adult form of the species of which smaller specimens were described as *P. corneus*, Sby. (1842), and *P. natans*, Phil. (1845).

164. PECTEN (VOLA) PYXIDATUS, Born. Only small specimens, but unmistakable.

165. PLICATULA IMBRICATA, Mke.

166. LIMA (MANTELLUM) ARCUATA, Sby. Young examples, agreeing better with this than with any other known species.

167. MYTILICARDIA DISTORTA, Reeve. Headquarters in the Red Sea. It seems nearly allied to *M. excavata*, Desh., from Australia.

168. MYTILICARDIA VARIEGATA, Brug. We have received also specimens from Mr. Townsend, from Karachi and the Mekran coast.

169. LAZARIA PICA, Reeve. Apparently a variety of this species, which is recorded from the Philippine Islands.

170. ISOCARDIA VULGARIS, Reeve. With headquarters in China, the range of the section *Meiocardia* extends in a south-westerly direction.

171. LUCINA (CODAKIA) EXASPERATA, Reeve. One perfect example. It is reported also from Honduras and Nicaragua, but this seems doubtful.

172. LUCINA (CODAKIA) SEMPERIANA, Issel (Pl. III, Fig. 1). One specimen in fine condition, measuring 11×10.5 mm.

173. TELLINA (TELLINELLA) HIPPOPOIDEA, Jonas (= *T. striatula*, Sby.). Common.

¹ Proc. Malac. Soc., vol. ii, p. 138, pl. xi, fig. 2.

174. TELLINA (TELLINELLA) PERNA, Spengler.
175. TELLINA (TELLINELLA) STAURELLA, Lam. Beautiful examples, showing much variety in colour-marking; some specimens are almost white. Its headquarters are in the Philippine Islands.
176. TELLINA (PERONÆODERMA) SOWERBYI, Hanley. Only young specimens. The distribution is from Australia north-westwards.
177. TELLINA (ARCOFAGIA) REMIES, L. Quite typical.
178. TELLINA (ARCOFAGIA) CAPSOIDES, Lam. Widely distributed in the Indian Ocean.
179. TELLINA (ARCOFAGIA) CARNICOLOR, Hanley. Appears to be identical with *T. corbis*, Sby., and *T. Strangei*, Desh., the latter from New Zealand.
180. DONAX (LATONA) CUNEATUS, L. (= *D. granosus*, Lam.).
181. DONAX (LATONA) COMPRESSUS, Lam. A large example.
182. MACTRA ACHATINA, Chemn. A common East Indian shell; our examples do not show the radiating colour-markings.
183. PAPHIA GLABRATA, Desh. Extends from Ceylon throughout the Indian Ocean.
184. LIOCONCHA PICTA, Lam. Several examples, showing some variation.
185. LIOCONCHA SULCATINA, Lam. Smoother than *L. trimaculata*, which occurred in the former consignment.
186. CRISTA DIVARICATA, Chemn. Common in the Red Sea, and generally distributed all round Indian coasts.
187. CRISTA GIBBIA, Lam. Large in size.
188. CARYATIS INFLATA, Sby.
189. TAPES DESHAYESII, Hanley.
190. TAPES INDICA, Sby. Only young specimens.
191. TAPES MALABARICA, Chemn. Its headquarters are, as the name implies, on the Malabar Coast; but we have found it in all the Indian and Persian gatherings that we have examined.
192. ANAITIS CALOPHYLLA, Hanley. Small, but highly-coloured examples of this species, whose range is throughout the Indian Ocean.
193. ANAITIS FOLIACEA, Phil.
194. CHIONE LAYARDI, Reeve. This occurs in Bombay (Abercrombie), Karachi (Townsend), Persian Gulf (Townsend), Ceylon, and we have also seen specimens from Aden collected by Commander E. R. Shopland.
195. CHIONE STRIATA, Chemn. Both juvenile and adult.
196. DIONE PHILIPPINARUM, Hanley. Only young examples.
197. DOSINIA HISTRIO, Gmel.
198. DOSINIA LAMINATA, Reeve.

199. *DOSINIA SALEBROSA*, Römer.
All three well known as East Indian forms.
200. *LIBITINA ANGULATA*, Lam.
201. *LIBITINA VELLICATA*, Reeve. Schumacher's genus was established 1817, two years before the Lamarckian *Cypricardia* was proposed (1819).
202. **CARDIUM AUSTRALE*, Sby.
203. *CARDIUM RUGOSUM*, Lam. This, allied to *C. flavosum*, L., from Ceylon, if not quite identical, is common in the Andamans.
204. *LEVICARDIUM PECTINATUM*, Lam. (= *L. æolicum*, Born). One highly-coloured and very beautiful example. We have heard of this shell being found in the South Atlantic, and believe it has a very wide range, though always considered rare.
205. *HEMICARDIUM CARDISSA*, L.
206. *HEMICARDIUM VIRGO*, Reeve. Small, but very perfect and characteristic. In our opinion, one of the most delicate of the Cardiidæ; and very rarely obtained.
207. *PSAMMOBIA PULCHERRIMA*, Desh. Described from the Philippines. A fine example.
208. *PSAMMOBIA ORNATA*, Desh.
209. *ASAPHIS DEFLOKATA*, L. An abundant, almost cosmopolitan, mollusc.
210. *CORBULA CRASSA*, Hinds. Also from Malacca, Singapore, etc.
211. *CULTELLUS CULTELLUS*, L.
212. *CULTELLUS CUMINGIANUS*, Dunker.
- Both of these nearly allied species occur, the latter being the larger and finer. Both have their headquarters in the Philippine Islands.
213. *SOLENOCURTUS (MACHA) PHILIPPINARUM*, Dunker.
214. *SOLENOCURTUS (AZOR) COARCTATUS*, Gmel.
215. *ANATINA LANTERNA*, Lam. Broken examples only. Common on all Indian coasts, especially at Bombay.

EXPLANATION OF PLATE III.

- FIG. 1. *Lucina Semperiana*, Issel.
 ,, 2. *Terebra celidonota*, n.sp.
 ,, 3. ——— *Andamanica*, n.sp.
 ,, 4. *Pecten testudineus*, Reeve.
 ,, 5. *Terebra crenulata* var. *Booleyi*, n.var.
 ,, 6. *Eglisia tricarinata*, Adams & Reeve.
 ,, 7. *Ancilla Booleyi*, Melv. & Sykes, operculum.
 ,, 8. *Terebra nitida* var. *sicyodes*, n.var.
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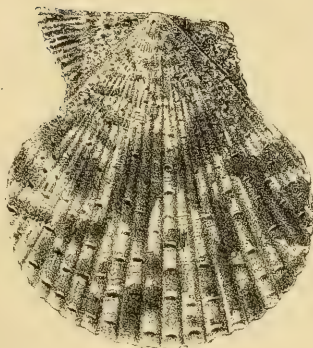
1.



2.



3.



4.



5.



6.



7.



8.

A RENO-PERICARDIAC PORE IN *AMPULLARIA URCEUS*, MÜLL.

By R. H. BURNE, B.A.,

Assistant in the Museum of the Royal College of Surgeons of England.

Read 14th January, 1898.

DR. VON ERLANGER, in the course of a criticism¹ of Bouvier's account of the renal organs of *Ampullaria*,² uses these words:—"It seems highly improbable to me that the lamellar renal organ should have no communication with the pericardium. . . . This point and the communication of the two renal organs ought certainly to be re-investigated in well-preserved specimens by the method of sections."

The following note, which is the result of the dissection of two specimens of *Ampullaria urceus*, Müll., and the examination of sections cut from fragments of another,³ responds to a certain extent to this expressed wish, although I should have been better satisfied if the material at my disposal for section-cutting had been slightly more abundant.

As regards the general anatomy of the renal organs, I may say at once that I have found Bouvier's description perfectly accurate, and hence need only abstract enough from his account to make my own addition intelligible.

The kidneys of *Ampullaria* (see Figure) are two in number. One, situated towards the right side of the body, close behind the portion of the gill that lies nearest the heart, is triangular in shape, with the base directed backwards to the left, and the apex forwards with an inclination to the right (*l.r.*). The interior of this triangular right kidney is occupied by a series of lamellæ disposed at right angles to its longer axis (hence the name "lamellar renal organ"); it communicates with the exterior by means of a large slit-like opening (*r.o.*), and with the second kidney by a much smaller one (*i.r.o.*), though even this exceeds 1 mm. in length. The second kidney is situated behind and to the left of the first, and is bounded in front by the pericardium. It is a capacious chamber, with no external outlet except through the right kidney; the roof (*v.r.*) is thick and extremely vascular, while the floor is so thin that the intestine (*int.*) and other organs covered by it appear to project freely into the renal cavity. Both kidneys are functional excretory organs, and each is

¹ Erlanger, "On the Paired Nephridia of Prosobranchs," etc.: *Quart. Journ. Micro. Sci.*, vol. xxxiii (1892), p. 608.

² Bouvier, "Étude sur l'Organisation des Ampullaires": *Mém. Soc. Philom.* (1888), p. 63*.

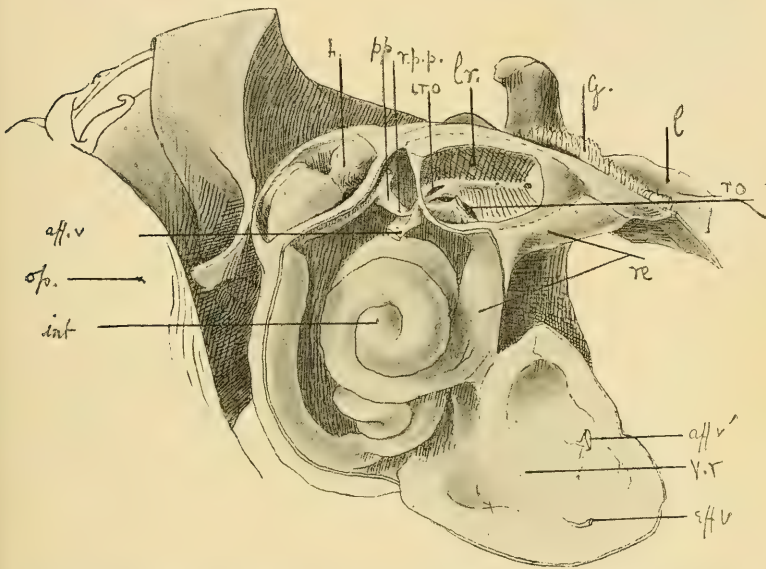
³ These specimens are the property of the Royal College of Surgeons. The dissection of the renal organs is No. 1,176, D, Phys. Series, in the Museum of that Institution.

provided with an independent system of circulation. Bouvier makes no mention of reno-pericardiac pores, although, as I will now show, a very conspicuous one is present. If, instead of reflecting the roof of the posterior or left kidney forwards, as done by Bouvier, we cut along its anterior and lateral margins and turn it backwards, a hollow finger-like process of the pericardium (*p.p.*), 1.5 mm. in length, will be seen projecting into the cavity of the kidney in the direction of the posterior corner of the lamellar organ. The process originates at a point between the right and middle thirds of the posterior wall of the pericardium, and its apex lies upon the main trunk of the afferent vessel (*aff.v.*) of the left kidney and vanishes towards the inter-renal opening. At the point where the pericardiac process meets the afferent vessel, its postero-dorsal wall is perforated by a small aperture with slightly thickened lips. This is the reno-pericardiac pore (*r.p.p.*). It is large enough to be plainly visible to the naked eye, and readily allows the passage of a fine hair from the pericardium into the left kidney. I was able to cut a series of sections of the pericardiac process transverse to its long axis, and observed that the pore was not situated at the extreme end of its cavity, but at a point slightly anterior thereto; after the obliteration of the cavity, the process is still to be traced upon the surface of the afferent vessel as a solid cord, which finally is continuous with one of the lips of the inter-renal opening.

With regard to the right kidney, I was unable to detect any communication between it and the pericardium, either by superficial examination of the walls of the pericardium or by means of sections. The latter I was only able to cut through the right anterior extremity of the pericardium, the point most nearly approximated to the right kidney. At this point there certainly was no pore, but with regard to the rest of the pericardiac wall, the most that I can say is, that no pore was apparent on superficial examination, and furthermore that the distance of these parts of the pericardium from the right kidney would render a direct communication between them well-nigh impossible.

In speaking of these two kidneys as left and right respectively, I have, merely for convenience sake, followed the description given by Bouvier based upon their general relations to each other and to the body. Whether Bouvier was really justified in regarding the triangular kidney as the right and the other as the left, homologous respectively to the right and left kidneys of the Diotocards, appears to be open to question. At least Erlanger, who, from considerations of comparative anatomy and embryology, holds the simple kidney of the Monotocards to be homologous to the left kidney of the Dioto- and Heterocards, concludes, from a comparison of *Ampullaria* with *Paludina* and *Bythinia*, that the lamellar kidney is the left, and thus the representative of the single kidney in other Monotocards, while the large, highly vascular kidney is the right; and he is further led, in consequence of his discovery that when a reno-pericardiac pore is present at all in the Dioto- and Heterocards it is present in the left kidney only, to prophesy that a pore would be found between

the lamellar kidney of *Ampullaria* and the pericardium. This surmise, as we have seen, is not borne out by the facts, so we must consider, I suppose, on Erlanger's hypothesis, that the vascular and not the lamellar kidney is the left, corresponding to the left kidney of Diotocard and Heterocards and to the only remaining kidney of Monotocards—thus restoring Bouvier's original arrangement. But since this view is opposed by the close similarity of structure between the lamellar kidney of *Ampullaria* and the only kidney of *Bythinia*, we should do well to pause before accepting it on the strength of the pore alone, and more especially when we observe the peculiar position of the pore. The pore, as already shown, is situated, not, as one



Dissection of *Ampullaria urceus*.—The mantle has been reflected to the right, and the renal organs and pericardium have been opened.

aff.v. cut end of afferent vessel of posterior kidney. *aff.v.* the corresponding vessel in the reflected roof of the kidney. *eff.v.* the efferent vessel of posterior kidney. *g.* gill. *h.* heart within the pericardium. *int.* coils of intestine protruding into cavity of posterior kidney. *i.r.o.* inter-renal opening. *l.* lung reflected to the right. *l.r.* lamellar renal organ. *op.* operculum. *p.p.* pericardiac process. *re.* rectum. *r.o.* opening from lamellar organ to exterior. *r.p.p.* reno-pericardiac pore. *v.r.* vascular roof of posterior kidney reflected backwards.

would expect, in the flat partition-wall between the kidney and the pericardium, but towards the apex of a curious figure-like process of the latter, that stretches across the cavity of the large vascular kidney, and loses itself, after assuming the form of a solid cord, on the margin of the inter-renal opening. Does not this dragging of

the pericardium towards the lamellar kidney, first as a tube, then as a solid cylinder, strongly suggest that the relation of the lamellar kidney to the pericardium may at some time have been more intimate than it is at present? May not, for instance, the reno-pericardiac pore have been originally situated in the lamellar kidney on a long diverticulum of the pericardium, and subsequently have undergone migration into the vascular kidney, accompanied by atrophy of the distal portion of the pericardiac process? Or, perhaps, there may have been two reno-pericardiac pores, one to each kidney, situated on a common pericardiac diverticulum, of which that belonging to the lamellar kidney has since been lost. However, apart from what may, or may not, have been the case formerly, the present features of the pore are sufficiently peculiar to warn one to be cautious in assigning too great weight to it in any attempt to determine which kidney of *Ampullaria* is the representative of the single kidney of other Monotocards.

ON SOME POINTS IN THE ANATOMY OF *SEPIA OFFICINALIS*, L.

By R. H. BURNE, B.A.,

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Read 14th January, 1898.

I. THE RELATION OF THE PERITONEAL SAC TO THE BODY-CAVITY.

GROBEN,¹ in a paper on the renal and reproductive organs of the Cephalopoda, calls attention to a curious peritoneal sac that surrounds the middle region of the genital duct of the male cuttlefish (*Sepia officinalis*, L.). It is true that Brock² was the original discoverer of this sac, but his description of it is so short that in reality Grobben is the chief source of our knowledge upon the subject.

The sac encloses the vesicula seminalis, prostate, and cæcum, and from near its anterior end sends forth a prolongation that encircles the apex of Needham's pouch in a loose spiral; it is an entirely closed chamber, with the exception of a communication with the genital duct by means of a short tube lying between the vesicula seminalis and prostate.

Grobben suggests, with regard to the morphology of this peritoneal sac, that it is a portion of the body-cavity pinched off from the rest, but connected with the exterior by the above-mentioned tube, which he regards as the remains of a second vas deferens. He holds this view for the two following reasons:—(1) The similarity of the epithelium lining the sac to that of the general body-cavity, and (2) the presence in *Philonexis carenæ*³ of two vasa deferentia, both of which open into the genital capsule (body-cavity).

In several male specimens of *Sepia officinalis*, L.,⁴ that I have dissected, the general anatomical features of the sac and surrounding parts are exactly as described by Grobben, with the addition, however, of what appears to be a very distinct rudiment of the lost connection between the peritoneal sac and the body-cavity. The rudiment has the following features:—Upon the left side of the body, close behind the fold that imperfectly separates the pericardial from the genital division of the body-cavity, there arises from the latter a forwardly directed peritoneal funnel. In form it resembles a cone some 10 mm.

¹ Grobben, "Morphologische Studien über den Harn und Geschlechtsapparat der Cephalopoden": Arb. Inst. Wien, tom. v (1884), p. 14.

² Brock, "Ueber die Geschlechtsorgane der Cephalopoden": Zeitschr. Wiss. Zool., Bd. xxxii (1879), p. 16.

³ According to W. E. Hoyle, this is a synonym for *Ocythoë tuberculata*, Raf.: Proc. Royal Phys. Soc. Edinb., vol. ix (1888), p. 213.

⁴ The property of the Royal College of Surgeons of England: No. 2,371, B, Phys. Series.

in height, prolonged at its apex into a narrow tube 5 mm. long by .5 mm. broad. The funnel lies close to the inner side of the peritoneal sac, with its apex and tubular prolongation upon the wall of Needham's pouch; the blind extremity of the tube is directed towards the anterior (ventral) end of the sac, but gradually dwindles away without reaching it.

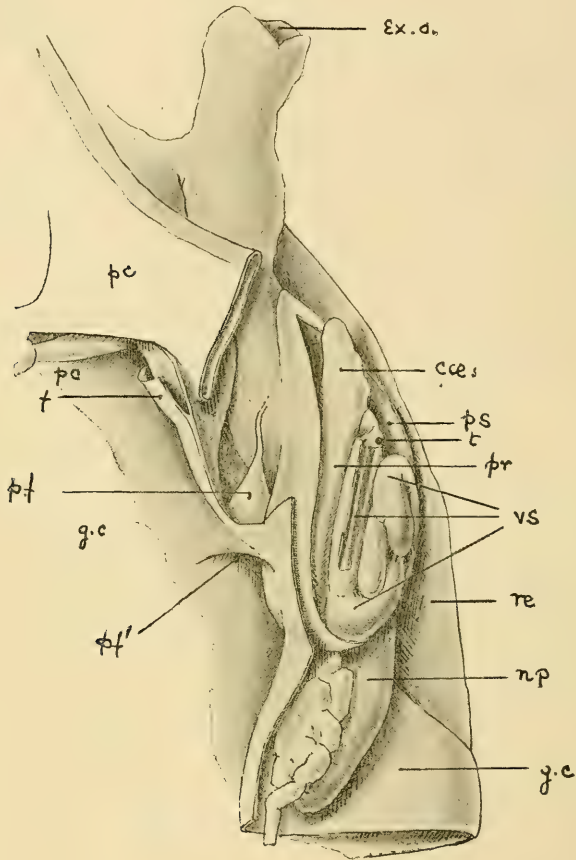


FIG. I.

FIG. I.—Genital duct and part of the body-cavity of a male Cuttlefish (*Sepia officinalis*, L.). $\times 1\frac{1}{2}$.

ca. caecum. ex.o. external orifice of genital duct. f. fold between pericardium and genital capsule. g.c. genital capsule. n.p. apex of Needham's pouch. pc. pericardium. p.f. peritoneal funnel. p.f'. its opening from the genital capsule. pr. prostate. p.s. peritoneal sac. r.e. dorsal (anterior) renal sac. t. opening of tube from peritoneal sac into genital duct. v.s. vesicula seminalis.

The position and general appearance of this funnel (present only in the male) seem clearly to indicate that it is the remains of a former channel of communication between the peritoneal sac surrounding the genital duct and the body-cavity, thus supplying an additional argument in favour of the cœlomic origin of the sac.

II. ON THE PRESENCE OF A SERIES OF CARTILAGES IN THE BRANCHIÆ.

The gill of a cuttlefish¹ is an elongated structure, tapering towards its apex and triangular in cross-section; it is attached to the inner surface of the mantle along the greater part of one of its sides, and covered on the other two by the closely-set branchial lamellæ arranged parallel to one another at right angles to its long axis.

In transverse section (Fig. II) it will be seen that as the lamellæ of opposite sides approach the base of attachment of the gill, they become

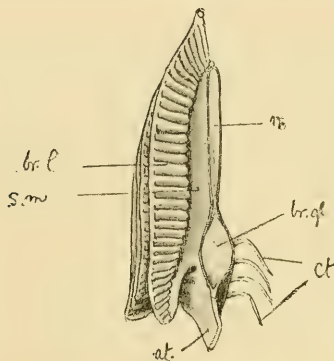


FIG. II.

FIG. II.—Portion of the gill of *Sepia officinalis*, L., seen in transverse section. $\times 1\frac{1}{2}$. The branchial lamellæ and their supporting membranes have been removed on the right side.

at. membrane for attachment of gill to mantle. *br.gl.* branchial gland. *br.l.* branchial lamellæ. *ct.* cartilages. *m.* muscle. *s.m.* supporting membrane of the branchial lamellæ.

pointed and widely separated from each other; the space between them is mainly occupied by a large glandular mass (the branchial gland) running from end to end of the gill. The inner margins of the lamellæ are not, however, attached directly to this; but indirectly, by means of an intervening membrane (the supporting membrane).

¹ The gill of the Cephalopoda has been very fully described by Joubin, Arch. Zool. Exper., tom. iii (1885), p. 75.

Two sides of this membrane are obviously attached to the branchial lamella and branchial gland respectively, but the third side, that extending from the branchial gland to the tip of the lamella parallel to the mantle surface, is free.

The skeleton with which this note is concerned consists of a series of slender rods of cartilage (one to each gill lamella), standing out from the branchial gland and stiffening the free edge of each supporting membrane. Each rod tapers gradually from its base, which is embedded in the covering of the branchial gland, till it reaches the tip of the lamella; it is accompanied on its outer side by a slender muscle. The cartilage of which the rods are composed agrees in structure with that forming the major part of the skeleton, i.e. branching cells embedded in an abundant hyaline matrix.

ON AN EXAMPLE OF *ACANTHOTEUTHIS FERUSSACII*, MÜNSTER,
FROM THE LITHOGRAPHIC STONE OF SOLENHOFEN, BAVARIA,
EXHIBITING THE BUCCAL MEMBRANE.

By G. C. CRICK, F.G.S., F.Z.S., etc.,
Of the British Museum (Natural History).

Read 14th January, 1898.

PLATE IV.

“THE genus *Acanthoteuthis* was founded by R. Wagner and G. Münster upon small hooklets, sometimes isolated, sometimes associated with more or less complete remains of the animal, which are found in the Lithographic Stone of Bavaria. Münster characterized three species chiefly upon the form of these hooklets, viz., *A. speciosa*, *A. Ferussacii*, and *A. Lichtensteinii*, and noticed the existence of a fourth. Subsequently Münster referred to this genus also a number of forms based principally upon the shape of the body and upon the form of the internal shell, but most of these were afterwards separated by A. Wagner as a new genus (*Plesioteuthis*). The genus *Acanthoteuthis* is therefore restricted to such forms as Münster described chiefly upon the form of the hooks.”¹

According to Münster's description of the three above-mentioned species, the hooklets in *A. speciosa* are compressed and both the margins on one side bevelled; in *A. Ferussacii* they are also compressed, but are smaller and the edge of the concave margin only is bevelled; whilst in *A. Lichtensteinii* they are both smaller than in *A. speciosa*, and more nearly circular in transverse section. D'Orbigny united these three species under the name *A. Ferussacii*; whilst Dr. A. Wagner regarded *A. speciosa* as a valid species, but seeing no essential difference between Münster's *A. Ferussacii* and *A. Lichtensteinii*, united these under the former name.

A. speciosa appears to be specifically distinct from *A. Ferussacii*, but we have not been able to examine sufficient material to enable us to express any opinion about the identity of *A. Ferussacii* and *A. Lichtensteinii*.

The specimen referred to in the present communication forms part of the British Museum Collection (No. 39,881), and is exhibited on the counterparts of a small split slab of Lithographic Stone (Upper Oolite) from Solenhofen, Bavaria. It is labelled “*Acanthoteuthis Ferussacii*, Münster,” and since the hooklets of the arms certainly have the form of those ascribed to that species, we adopt this name for the specimen. In Münster's type the arms were attached to a roughly-shaped elongated mass representing the head and body, the former

¹ G. C. Crick, Geol. Mag., 1897, p. 1.

being about two-thirds of the length of the arms, the latter being about four times the length of the head. In the present specimen eight arms can be seen (marked *a* to *h* in the figures, Pl. IV); each of these is furnished with a double row of hooklets, which are largest at about the mid-length of each arm. The arms can be grouped in pairs according to their size, although their exact order cannot be definitely ascertained. The pairs seem to be as follows: *a* & *h*, *b* & *g*, *c* & *f*, *d* & *e*; and so far as can be made out from this example, the arms appear to have been arranged in the order of the lettering. Each of the arms *a*, *h* is about 38 mm. long and 5 mm. wide, and furnished with two rows of hooklets, about nine or ten in each row. The pair *b*, *g* appears to have been the largest, nearly 85 mm. long and about 10 mm. wide, thickest at the proximal end, slowly tapering towards the distal

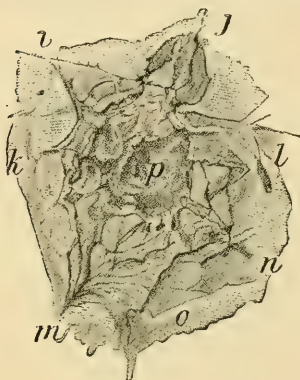


FIG. I.

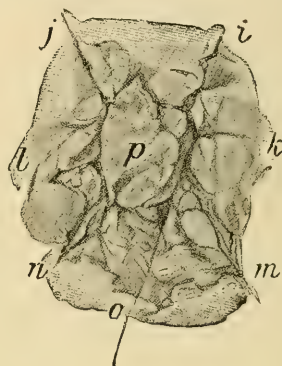


FIG. II.

Enlarged views of the central portions of the figures on Plate IV. The lettering is the same for all the figures.

extremity, and furnished with two rows of hooklets, of which there were probably fourteen or fifteen in each row. The pair *c*, *f* is rather short and broad, about 32 mm. long and 6 mm. wide, rather obtuse at the distal end, and somewhat thickly studded with hooklets, there being two rows of nine or ten hooklets in each. The pair *d*, *e* is about 55 mm. long, and 6 mm. in greatest thickness, which is at about the mid-length of the arm; each tapers gradually towards the distal extremity, and is provided with two rows of about twelve or thirteen hooklets apiece.

At the base of the arms the buccal membrane is well displayed. It is stellate in form, with six fairly prominent narrow radiating elevations (Pl. IV, Fig. 1), the central portion (*p*) being occupied by a mass of calcite which extends for a short distance into each radial elevation. These radial elevations are evidently the remains of the ligaments, by means of which the membrane was attached to the bases of the arms; they are unequal in size, the two which are directed backwards (on the slab), *m* & *n*, being the largest, the two lateral ones,



FIG. 1.

Acanthoteuthis Ferrussacii, Münster.

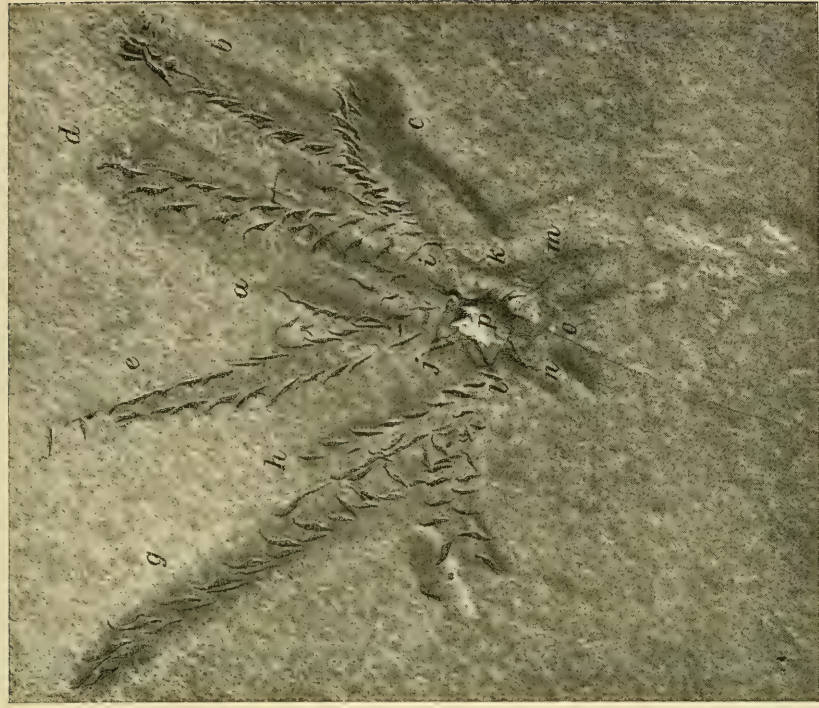


FIG. 2.

k & *l*, the smallest. Besides these six radial elevations, the counterpart (Fig. 2) shows that the membrane also projected somewhat about midway between the two backwardly-directed (on the slab) radial elevations, although this projection was not furnished with any sharp elevation like the rest. Thus the membrane seems to have been attached to the arms by seven ligaments. In some recent forms this membrane has also seven lines of attachment; it is not united with either of the tentacular arms, and the small connection between the two dorsal arms is frequently single at its base, although subsequently divided. The greatest diameter of the buccal disc, including its radial elevations, is 24 mm., the diameter of the central opening being about 12 mm. The two ligaments marked *i* & *j* respectively include between them the bases of the two arms *d* & *e*; the small ligament marked *l* appears to have been situated at the base of the arm marked *f*; the ligaments *m* & *n* seem to have been connected with the bases of the arms *b* & *g* respectively; whilst the arms *a* & *h* were probably attached to the extension of the membrane marked *o*. But, as we have already stated, the exact order of the arms cannot be definitely ascertained. A slight crumpling of the membrane is perceptible between the radial elevations. The line of symmetry appears to pass through *o* and midway between *i* & *j*. We have been able to recognize only eight arms, but we do not know that any recent Octopod possesses a buccal membrane such as has just been described, although in some species the bases of the arms are united by a membrane. In the recent ten-armed Cephalopoda, however, the presence of a similar membrane is by no means infrequent. Further, in some members of the Onychoteuthidæ (to which the present genus seems to be allied) not only is there such a membrane, but the ligament attaching the buccal membrane to the two dorsal arms is frequently, if not always, single at its proximal but bifid at its distal extremity. If the same condition of things existed in the genus *Acanthoteuthis* as in these recent Cephalopoda, the ligament marked *o* would be dorsal and pass to the two dorsal or first pair of arms, then *i* & *j* would be attached to the ventral or fourth pair, *k* & *l* to the ventro-lateral or third pair, and *m* & *n* to the dorso-lateral or second pair.

Immediately below the buccal membrane, and enclosed by an obscure, obtuse, slightly elevated ridge, there is a pear-shaped area about 33 mm. long and of about the same width; it is somewhat constricted at the base of the arms, being here only about 28 mm. wide, and attains its greatest width at about its mid-length; posteriorly it contracts suddenly, and the lateral ridges uniting together, combine with an obscure median ridge, which extends from the ligament marked *o*, into a feeble elevation about 11 mm. wide; this is continued backwards for a distance of about 12 mm., and terminates in an obtuse point. At its greatest width the margins of this area are slightly interrupted, and between this median line and the outer boundary on the left side there is an obscure oval area about 17 mm. by 13 mm., the longer axis being antero-posterior. The pyriform area is probably the remains of the head, the position of

the eyes being possibly indicated by the interruptions in the lateral margins; the oval area on the left may be the remains of one of the eyes;¹ whilst the posterior projection probably represents the remains of a cartilaginous structure at the back of the head, and immediately above the neck, such as occurs in the recent Squids; consequently it is most probably a dorsal aspect of the head that is presented, and if this be so, it confirms the opinion expressed above, that the ligament marked *o* was *dorsal* in position, and consequently attached to the dorsal arms. Assuming, therefore, the order of the arms to be as stated above, and that the ligaments *i* & *j* were attached, as they appear to have been, to the arms *d* & *e*, these would be the two ventral or fourth pair of arms, and consequently *e* & *f* the ventro-lateral or third pair, *b* & *g* the dorso-lateral or second pair, and *a* & *h* the two dorsal arms or first pair.

If our reading of the order of the arms be correct, the tentacular arms, if present, might be expected to be found between the arms *e* & *f* on one side, and *e* & *d* on the other side. Now it will be seen from Fig. 1 that between the arms *e* & *f* there is a rather wide space and the surface of the slab is somewhat prominent, whilst between the arms *e* & *d* the space, although not so wide, is very prominent and bears a rather confused mass of hooklets. Tentacular arms may therefore have been present, but we have not been able to detect any traces of them.

There are no other remains of the body preserved, the edge of the slab being only 5 mm. beyond the obtuse point at the back of the head.

As we have already stated, a buccal membrane is by no means infrequent among the living Decapodous Dibranchiates, a membrane somewhat similar to that here described being found among the Onychoteuthidæ, the members of which are provided with hooklets sometimes on all the arms, as in *Enoploteuthis*, and sometimes only on the tentacular arms, as in *Ancistroteuthis*.

We think, then, that the presence of this buccal membrane in *Acanthoteuthis* confirms the Decapodous Dibranchiate character of this genus.

In conclusion, I desire to tender my sincere thanks to my colleague, Mr. Edgar A. Smith, who has afforded me every facility in the examination of the recent Cephalopoda under his charge.

¹ Or, as suggested in the discussion on this paper, of the buccal mass.

ORDINARY MEETING.

FRIDAY, 12TH NOVEMBER, 1897.

Dr. H. WOODWARD, F.R.S., etc., Vice-President, in the Chair.

Mrs. A. F. Broun was elected to membership of the Society.

The following communications were read:—

1. "Malacological Notes made during a Journey through Russia; with some account of Dredging in the Black Sea." By G. F. Harris, F.G.S., etc.
2. "Description of *Mulleria Dalyi*, n.sp., from India." By E. A. Smith, F.Z.S., etc.
3. "Description of *Rhaphaulus Perakensis*, n.sp., with a list of the known species of the genus." By E. A. Smith, F.Z.S., etc.
4. "Description of *Streptaxis gracilis*, n.sp., from Ceylon." By O. Collett, F.R.M.S., etc.
5. "Revision of the New Zealand Rissoiidae." By H. Suter.

Mr. E. R. Sykes exhibited and made remarks upon the shells and animals of two specimens of *Scalaria communis*, Lam., which he dredged in 20 fathoms off the east coast of Guernsey. He called especial attention to the purple dye secreted by these molluscs.

Mr. G. B. Sowerby exhibited and made remarks upon a fine example of *Buccinum Martensianum*.

Mr. G. F. Harris exhibited numerous specimens of both fossil and recent mollusca collected during his journey through Russia.

Mr. E. A. Smith exhibited the type of his new species of *Mulleria*.

On behalf of Mr. Collett, Mr. E. R. Sykes exhibited specimens of *Streptaxis gracilis*, n.sp., *S. Cingalensis*, Bens., and *S. Layardianus*, Bens., all from Ceylon.

ORDINARY MEETING.

FRIDAY, 10TH DECEMBER, 1897.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc., President, in the Chair.

The following were elected to membership of the Society: Lord Boston, J. Brooks Henderson, jun., W. L. May, Hermann Rolle, Commander E. R. Shopland, Dr. C. de la Torre.

The following communications were read:—

1. "On *Monodonta Quadrasi*, n.sp., from the Philippine Islands." By G. B. Sowerby, F.L.S., etc.
2. "Description of *Amphidromus inconstans*, n.sp., from the Malay Archipelago." By H. Fulton.
3. "On *Philalanka*, a new subgenus of *Endodonta*, with descriptions of two new species from the Indian region." By Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc.
4. "Notes on a second collection of Marine Shells from the Andaman Islands, with descriptions of new forms of *Terebra*." By J. Cosmo Melvill, M.A., F.L.S., etc., and E. R. Sykes, B.A., F.Z.S., etc.

5. "On a small collection of Marine Shells from New Zealand and Macquarie Island, with descriptions of new species." By E. A. Smith, F.Z.S., etc.

Mr. B. B. Woodward exhibited specimens of *Helix aspersa* from an undisturbed kitchen midden at Hastings; he regarded these as the only undoubted pre-Roman examples of this *Helix* on record.

Mr. E. R. Sykes exhibited and commented on varieties of *Achatinella cestus*, Newc., from Oahu. He also exhibited specimens of *Endodonta lamellosa*, Fér., from Oahu, and marine shells from the Andamans, in illustration of his paper.

Mr. G. B. Sowerby exhibited and remarked upon a series of *Ranella lampas*, showing the range in length of this species to be from $2\frac{1}{2}$ to $9\frac{1}{2}$ inches. He also exhibited specimens in illustration of his paper.

Mr. H. Fulton exhibited the type of his new *Amphidromus*.

Lieut.-Col. H. H. Godwin-Austen exhibited specimens in illustration of his paper.

ORDINARY MEETING.

FRIDAY, 14TH JANUARY, 1898.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc., President, in the Chair.

Dr. R. H. Perks was elected to membership of the Society.

Mr. W. Crouch and Dr. H. Woodward were appointed auditors of the accounts of the Society for the year 1897.

The following communications were read:—

1. "A Reno-Pericardiac Pore in *Ampullaria urceus*, Müll." By R. H. Burne, F.Z.S., etc.

2. "On some points in the Anatomy of *Sepia officinalis*, L." By R. H. Burne, F.Z.S., etc.

3. "On an example of *Acanthoteuthis Ferussacii*, Münst., from the Lithographic Stone of Solenhofen, Bavaria, exhibiting the Buccal Membrane." By G. C. Crick, F.G.S., etc.

4. "A List of the Land-Shells of the Island of Lombok, with descriptions of new species." By E. A. Smith, F.Z.S., etc.

5. "Descriptions of four new species of Land-Shells from New Guinea, North Borneo, and Aldabra Island, Indian Ocean." By E. A. Smith, F.Z.S., etc.

Mr. E. R. Sykes exhibited and remarked upon specimens illustrating the specific identity of *Hemiplecta bistrialis*, Beck, *H. Ceylanica*, Pfr., and *H. Taprobanensis*, Dohrn; also specimens of *Subulina octona*, Chemn., and two species of *Opeas*: all from Ceylon.

Mr. G. B. Sowerby exhibited extra fine examples of *Murex tenuispina*, *M. Saulie*, and *M. cervicornis*; also a specimen of *Pterocera aurantia*, unique on account of its large size, and a portion of a gigantic *Brechites*.

Mr. R. H. Burne exhibited dissections, Mr. G. C. Crick photographs, and Mr. E. A. Smith specimens, in illustration of their respective papers.

DESCRIPTIONS OF TWO NEW SPECIES OF *CLAUSILIA* FROM
THE PROVINCE OF CHE-KIANG, CHINA.

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

Read 11th February, 1898.

THE two species, which I now describe, are from Kiu-chau, in the Che-kiang Province.

The true *C. Cecillei*, Phil., and *C. Moellendorffiana*, Heude, were found with them; whilst of the latter a beautiful white specimen was obtained.

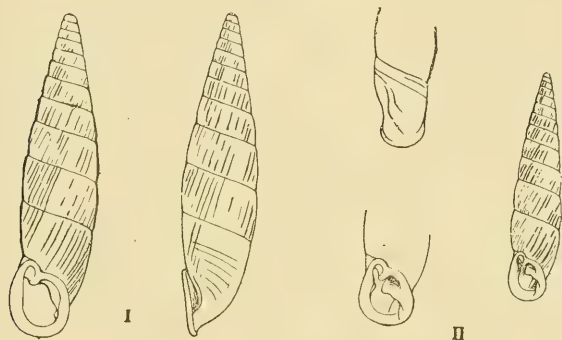


FIG. I. *Clausilia timalthea*, n.sp.

„ II. *Clausilia labyrinthoides*, n.sp., with enlarged outlines of mouth and back of body-whorl.

CLAUSILIA TIMALTHEA, n.sp.

Testa subrimata, elongato-fusiformis, solida, substriata, parum nitida, brunneo-castanea, apice pallidiore, obtuso; anfr. 12, planoconvexi, ultimus attenuatus; apertura quadrato-ovata, superne valde sinuata, subtus paullum recedens; peristoma continuum, solutum, expansum et reflexum, labio albedo lato munitum; lamella superior valida, obliqua, marginalis; l. inferior immersa, in profundo rapide ascendens; l. subcolumellaris vix emersa; plicæ principalis mediocris; plicæ palatales quinque aut sex, supera maxima. Alt. 30, lat. 7 mm.; alt. apert. 7, lat. apert. 5.5 mm.

Hab.—Kiu-chau, Che-kiang Province of China.

Its nearest ally appears to be *C. pacifica*, Gredler, from Hunan; but the present species is larger, the mouth is more quadrate, with a sharp sinus just above the lamella superior. Internally the lamella superior and lamella inferior do not so nearly approach one another, and the lamella subcolumellaris is a trifle more conspicuous; the shell is also somewhat broader.

CLAUSILIA LABYRINTHOIDES, n.sp.

Testa subrimata, sinistrorsa, gracilis, elongata, solidiuscula, sub lente dense striata, pallide flava vel ochracea, apice obtusulo; anfr. 12-13, plano-convexi, ultimus attenuatus; apertura piriformis, superne sinuata, subtus recedens; peristoma albidum, incrassatum, solutum, reflexiusculum, margine sinistro, denticulo obsoleto munito; lamella superior mediocris, obliqua, l. inferior magna, fere horizontaliter contorta, deinde abrupte ascendens, l. subcolumellaris conspicua, emersa; plica suturalis unica, mediocris, fere ad labium producta, p. principalis magna, plicæ palates tres, breves, supera principali approximata, media in fauce sita minima, infera in apertura conspicua, cum lunella obsoleta interrupta. Alt. 22, lat. 4·2 mm.; alt. ap. 4·3, lat. ap. 2·9 mm.

Hab.—Kiu-chau, Che-kiang Province of China.

An exceedingly interesting form, the armature of which it is most difficult to describe: it will be best gathered from the figures. The type is not quite adult, but shows the armature well. Another more adult specimen measures: alt. 21, diam. 4·2 mm.; alt. ap. 4·7, lat. ap. 3 mm.

LIST OF THE SPECIES OF *CATAULUS* FOUND IN CEYLON,
WITH DESCRIPTIONS OF SOME NEW LAND-SHELLS FROM
THAT ISLAND.

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

Read 11th February, 1898.

PLATE V.

SINCE my former paper was read a year ago,¹ a considerable amount of additional material has passed through my hands. In the process of identification, two or three points referring to the validity of species have occurred, that it will be well to deal with first.

Pfeiffer in 1853 described² *Helix Thwaitesi*, and Reeve gave a figure of it,³ drawn from an example in the original type series; Dr. Jousseume in 1894⁴ described *Microcystis suavis* from Nuwara-Eliya, and renamed Reeve's figure as *M. Nuwara*, stating that it was not the same as Pfeiffer's species, and that both occurred at Nuwara-Eliya. I have examined specimens said to have been identified as *M. Thwaitesi* and *M. suavis* by Dr. Jousseume, and also Pfeiffer's types, and come to the following conclusion: that Dr. Jousseume's *M. Thwaitesi* is not that species, but is my *Macrochlamys circumsculpta*, while his *M. Nuwara* is really *M. Thwaitesi*, as is also his *M. suavis*. This latter appears to be a variety with the spire a little more depressed, the umbilicus a trifle larger, and the mouth slightly different in shape; it may be of varietal, certainly not of specific rank.

I cannot trace sufficient distinction between *Helix bistrialis*, Beck, *H. Ceylanica*, Pfr., and *H. Taprobanensis*, of Dohrn, to warrant in my opinion their separation as independent species; they appear to be all forms of one species, varying somewhat in size, shape, and banding. Colonel Godwin-Austen, from anatomical considerations, has recently placed them in his genus *Nilgiria*.⁵

Helix verrucula was described by Pfeiffer⁶ from Cuming's collection; recently Dr. Jousseume has renamed the figure given by Hanley and Theobald⁷ as *Nigritella norva*: inasmuch as they state in the explanation of plates that "Cuming's type, now in the British Museum, is here represented," the new name seems an unnecessary expenditure of ink. The reference to the Proc. Zool. Soc. given by Dr. Jousseume refers to *H. hyphasma*, not the present species.

¹ Proc. Malac. Soc., vol. ii, pp. 233-7, pl. xvi.

² Proc. Zool. Soc., 1853, p. 125.

³ Conch. Icon., sp. 1,336.

⁴ Mem. Soc. Zool. France, vii, p. 10, pl. iv, fig. 3.

⁵ Land and Fresh-water Moll. India, vol. ii, p. 80.

⁶ Proc. Zool. Soc., 1854, p. 50.

⁷ Conch. Ind., pl. cl, fig. 9.

Helix biciliata, Pfeiffer, will, I think, prove to be a *Plectopylis* (*Sykesia*); palatal armature is present, but I have only a single dead shell, found by Mr. Preston at Patapolla (6,500 feet). Mr. Preston also found plentiful at Uda Pussellawa a species which appears to be a variety of *Helix Huttoni*, Pfr.; it is slightly smoother, and the colour is more of a reddish-brown: he also found *Pupa muscerda*, Bens., at Batticaloa, which is some distance from the original habitat.

Recently Herr Kobelt and Dr. Möllendorff have given¹ a list of the genus *Cyathopoma*; but so far as regards the Ceylon forms it is very imperfect. They have omitted *C. Mariae*, Jous., altogether; they have included *C. Dickoyense*, Nevill, which is only a manuscript name, and misspell it; moreover, they have recorded *C. atrosetosum*, Bedd., as coming from Ceylon, whereas it is a southern Indian species. In the same paper they have placed² the Ceylon forms frequently called *Leptopoma*, such as *L. conulum*, Pfr., *L. orophilum*, Bens., etc., in a genus "*Leptopomatoides*, Nevill, 1878." On referring to Nevill's work,³ we find that the word *Leptopomoides*—in which they have inserted a syllable—does occur, but in the following sentence: "subgenus doubtful (*Leptopomoides*)." By this Nevill simply meant, as will, I think, be obvious on an inspection, that they were of unknown subgenus, and near *Leptopoma*, and further, he did not have the word printed in the same type as the genera and subgenera of his list.

CATAULUS.

The genus *Cataulus* was founded by Pfeiffer in 1851⁴ upon the three following species: *Turbo tortuosus*, Chemn., *Cataulus Templemani*, Pfr., and *C. Layardi*, Gray; the first-mentioned, therefore, may stand as the type. I have endeavoured, by an examination of the series in the British Museum, the specimens preserved at Cambridge from Benson's collection, and specimens collected by Messrs. Collett and Preston, to arrive at an idea of the true specific limits of the species described from Ceylon. I have also to thank Col. Beddome and Mr. E. L. Layard, the former for permitting me to look over his specimens, the latter for the loan of several species. The following list, in which I have given references to the original description and to a figure, is the result of these investigations.

1. *C. AUREUS*, Pfr.: Proc. Zool. Soc., 1855, p. 188; Hanley and Theobald, Conch. Ind., pl. cxlvi, fig. 1, *non* pl. cvi, fig. 9.
- C. leucocheilus*, Ad. & Rve.: Sowerby in Thes. Conch., vol. iii, pl. cclxiv, fig. 14.
- C. leucostoma*, Fow.: Nevill in Enum. Hel. et Pneum. Ceylon.
- C. leucostoma*, Far.: Theobald in Cat. Shells British India, p. 41.

¹ Nachrbl. Deutsch. Malak. Ges., 1897, pp. 119, 120.

² T.c., p. 86.

³ Hand-List Mollusca Ind. Mus., pt. i, p. 273.

⁴ Zeitschr. für Malak., vol. viii, p. 149.

2. *C. AUSTENIANUS*, Benson: Ann. Mag. Nat. Hist., ser. II, vol. xii (1853), p. 95; Sowerby, Thes. Conch., vol. iii, pl. cclxiv, fig. 9.

Hab.—Heneratgodde (Layard).

The figure in the Conch. Ind. (pl. cvi, fig. 5) does not show the position of the notch in the lip quite correctly; it lies more to the left: the figure in the "Thesaurus" is good.

3. *C. BLANFORDI*, Dohrn: Proc. Zool. Soc., 1862, p. 202; Hanley and Theobald, Conch. Ind., pl. cvi, fig. 3.

Hab.—Bollegalle (H. F. Blanford).

Specimens from Watawala (Collett) which I refer to a variety, but which may prove to be new, are more elongated, more striated, and differ in the mouth, which is almost white, and more vertical. I have also a specimen similar to these, but of a yellowish colour, from an unknown locality. Mr. Collett found "on Cacao trees near Matale at 1,000 feet" some specimens which I refer at present to a variety of this species; they are smaller, with rich reddish peristome.

4. *C. DECORUS*, Benson: Ann. Mag. Nat. Hist., ser. II, vol. xii (1853), p. 96; Hanley & Theobald, Conch. Ind., pl. cvi, fig. 5.

Hab.—Ratnapoora (Layard).

The figure in the Conch. Ind. is a little too broad. The specimens preserved under this name at Cambridge do not agree with Benson's description or measurements, and are not this species. Mr. Layard has kindly lent me one of the original specimens.

5. *C. EURYTREMA*, Pfr.: Proc. Zool. Soc., 1852, p. 145, pl. xiii, fig. 5; Hanley & Theobald, Conch. Ind., pl. cxlvi, fig. 3.

Hab.—Maha Oya, Eastern Province (Mrs. Broun). It is given in the Conch. Ind. as from Travancore on the authority of Col. Beddome, but he informs me that this is an error. The figure in the last-named work hardly shows the notch in the upper outer edge of the lip. Pfeiffer's figure is very good.

6. *C. HÆMASTOMUS*, Pfr.: Proc. Zool. Soc., 1856, p. 391; Hanley and Theobald, Conch. Ind., pl. cvi, fig. 4.

7. *C. LAYARDI* (Gray) Pfr.: Proc. Zool. Soc., 1852, p. 160, pl. xiii, fig. 6; Sowerby, Thes. Conch., vol. iii, pl. cclxiv, fig. 7.

I cannot trace the reference to this species in Proc. Zool. Soc., 1851, given by Pfeiffer. Further, Baird in 1850 (Cat. Cycloph. Brit. Mus., p. 31) published the name, though without description; and his specimen proves, on examination, to be *C. marginatus*, Pfr. The figure in the Conch. Ind. on pl. cvi, fig. 8, represents, I think, a large *C. marginatus*, and fig. 9 (named *C. aureus*) may be a large elongate *C. Layardi*.

8. *C. MARGINATUS*, Pfr.: Proc. Zool. Soc., 1853, p. 52; Hanley and Theobald, Conch. Ind., pl. cxlv, fig. 6.

Hab.—Bandarawella (Mrs. Broun).

9. *C. NIETNERI*, G. & H. Nevill: Journ. As. Soc. Bengal, vol. xxxix (1871), p. 7, pl. i, fig. 7.

Hab.—Ambagamuwa (Collett).

Mr. Collett also found at Balangoda an interesting form, which is more elongated and crenulated, and has deeper sutures. The figure in the Conch. Ind. (pl. cxlvi, fig. 4) does not resemble this shell.

10. *C. PYRAMIDATUS*, Pfr.: Proc. Zool. Soc., 1852, p. 145, pl. xiii, fig. 4; Hanley & Theobald, Conch. Ind., pl. cxlvi, fig. 5.

11. *C. TEMPLEMANI*, Pfr.: Proc. Zool. Soc., 1852, p. 158; Hanley and Theobald, Conch. Ind., pl. cvi, fig. 1.

Hab.—Uda Pussellawa and Kurunegalla (Preston); Maturata (Simon).

Mr. Preston found a specimen with a pure white lip at Kurunegalla.

12. *C. THWAITESII*, Pfr.: Proc. Zool. Soc., 1852, p. 147; Hanley and Theobald, Conch. Ind., pl. cvi, fig. 6.

? *C. Cumingi*, Pfr.: Proc. Zool. Soc., 1856, p. 399; Novit. Conch., vol. i, p. 91, pl. xxv, figs. 16, 17.

C. gregarius, Nevill (MS.): Enum. Hel. et Pneum. Ceylon, p. 5 (*nom. nud.*).

C. duplicatus, Pfr.: Proc. Zool. Soc., 1854, p. 303.

Hab.—Balangoda (Collett).

The specimens of *C. Cumingi* now in the British Museum agree moderately well with Pfeiffer's description, but do not seem to tally with the figure he gives in the "Novitates." I have seen a specimen of Nevill's manuscript species, said to have been named by him, and I think it is only a squat form of *C. Thwaitesii*. I consider *C. duplicatus* to be only a variety. In conclusion, I may remark that the figures of the Conch. Ind. have chiefly been quoted here, since this work is the most accessible to students, and that, in the case of localities not previously recorded, I have myself verified the specimens.

The following two forms appear to be undescribed:—

13. *CATAULUS NEVILLI*, n.sp. Pl. V, Fig. 16.

Testa anguste et profunde rimata, pyramidata, solidula, eleganter costulato-striata, brunnea, spira elevata, apice obtusulo; sutura impressa; anfr. 8, convexi, ultimus non attenuatus; carina umbilicalis valida, compressa; periomphalum mediocre, costulato-striatum; apertura subcircularis; peristoma rubro-castaneum, continuum, incrassatum et valde reflexum, basi productum, canali mediocri perforatum. Alt. 23·6, diam. max. 9·5 mm.

Hab.—Ambepusse (O. Collett); Kegalla (H. B. Preston).

The nearest ally to this species appears to be *C. Austenianus*, Benson; the present one is more elongate, and has the whorls more convex, the lip is of a different colour and is attached to the shell at a different angle, while the notch is more vertical and not so much to the left as in *C. Austenianus*. A fair series of specimens has been examined, and they appear to be constant in character. I have named it after Hugh Nevill, who gave such special attention to the Ceylon fauna.

14. *CATAULUS COLLETTI*, n.sp. Pl. V, Fig. 15.

Testa breviter et profunde rimata, elongata-pyramidalis, solida, substriata, castanea; spira elongata, apice obtusulo; sutura submarginata; anfr. 8-8½, plano-convexi, ultimus parum attenuatus; carina umbilicalis valida, compressa; periomphalum latum, costulato-striatum; apertura subcircularis; peristoma incrassatum et reflexum, basi productum, canali mediocri perforatum. Alt. 23, diam. 8.2 mm.

Hab.—On stems of Kitool Palm, Matale, at 1,200 feet (O. Collett).

A species belonging to the same group as the last, but it is narrower, the whorls are flatter, the striæ almost obsolete, the base of the lip projects a little forward, and the notch lies a shade more to the right.

15. *DIPLOMMATINA (NICIDA) CATATHYMIA*, n.sp. Pl. V, Fig. 9.

Testa parva, dextrorsa, rimata, cylindrica, flavido-hyalina, spira sub-cylindrica, apice obtusulo; sutura bene impressa; anfr. 6½, valde convexi, regulariter crescentes, primi læves, reliqui (sub lente) regulariter obsolete spiraliter lirati, ultimus liris quinque (?) ornatus; apertura circularis, peristomate leviter incrassatulo et reflexo, albido. Alt. 2, diam. 1 mm.

Hab.—Uda Pussellawa (H. B. Preston).

This pretty little shell, specimens of which I noted previously¹ as possibly belonging to two species, appears to be variable in relative proportions of height and breadth. It is very cylindrical, with an exceedingly deeply-cut suture, and delicate spiral sculpture. Mr. Preston found a single sinistral specimen. I may add that *Diplommatina Pedronis*, Bedd., has been found by Mr. Collett.

16. *CYATHOPOMA LEPTOMITA*, n.sp. Pl. V, Figs. 8, 8a.

Testa elevata, conoidea, late et perspective umbilicata, cineracea, brunneo-ochraceo eleganter picta, apice protracto, acutulo; anfr. 5, primi læves, reliqui carinati, ultimus 10 carinis approx. ornatus, undique arcissime et tenuissime lirati, liris delicatissimis, fimbriatis; liris conspicuis 6 approx. in umbilico; sutura bene impressa; apertura ovato-circularis, labro tenui; operculum multispirale, concavum. Alt. 2.5, lat. 3 mm.

Hab.—Ambagamuwa (O. Collett).

This interesting little shell, which is the *Jerdonia Ceylanica* of

¹ Proc. Malac. Soc., vol. ii, p. 237.

Mr. Collett's paper,¹ may readily be separated from that species by its well-marked though closely-set lines crossing the carinations. It appears to belong to the group of *C. Deccanense*, W. Blfd.

17. *MICROCYSTINA LITA*, n.sp. Pl. V, Figs. 10, 11.

Testa subperforata, globose-conica, tenuis, polita, nitidissima; sutura bene impressa; anfr. 5, lente accrescentes, brunnei, primus pallidior, fere lævis, reliqui microscopice undique dense spiraliter striati et lineis incrementibus remotis sculpti, ultimus rotundatus; apertura lunata, margine columellari subreflexo, incrassatulo. Alt. 3·4, lat. 2 mm.

Hab.—Ambagamuwa (Collett).

Lieut.-Col. Godwin-Austen has kindly pointed out to me that the microscopic sculpture of this shell is similar to that of the *Microcystina* of the Andaman Islands, and I have thought it best to place it in that genus; though the strongly-marked notch of that group is not present, still the columella shows a trace of it. Under a microscope faint traces of spiral sculpture are also seen on the *Helix perfucata* of Benson.

18. *KALIELLA DELECTABILIS*, n.sp. Pl. V, Fig. 7.

Testa ovato-conoidea, anguste sed perspective umbilicata, cornea, nitida; anfr. 6, convexi, sub lente microscopice transversim striati, ultimus ad peripheriam carinatus, subtus inflatus; apice lævi, sutura impressa; apertura semilunata, peristomate columellari reflexo. Alt. 3, diam. max. 2·8 mm.

Hab.—Ambagamuwa, Ceylon (Collett).

An interesting little form, easily separated from *K. salicensis*, G.-Austen, by the greater inflation of the whorls and by its sculpture. I have a specimen, which I take to be the young of this species, collected at Uda Pussellawa by Mr. Preston.

19. *SITALA PYRAMIDALIS*, n.sp. Pl. V, Figs. 19, 20.

Testa parva, anguste sed perspective umbilicata, depresso-pyramidalis, pallide cornea, periostraco leviter induta, apice obtusiusculo; anfr. 7, plano-convexiusculi, primi læves, reliqui costulis spiralibus sculpti, ultimus 4-6 costulis, ad peripheriam carinatus, basi convexus, radiatim striatulus, nitidulus; sutura impressa; apertura angulato-lunata; peristoma simplex, rectum. Alt. 5, diam. max. 3·25 mm.

Hab.—Lower Ambagamuwa, Ceylon (Collett).

An interesting little species, depressed-conical in form, with fine revolving raised lines. They appear to vary in number, ranging on the last whorl from four to six, and gradually fade out on the upper whorls.

20. *SITALA OPERIENS*, n.sp. Pl. V, Fig. 12.

Testa pygmæa, elevato-conoidea, anguste perforata, brunneo-cornea, periostraco brunneo induta, apice acutiusculo; anfr. 6, sub periostraco

¹ Journ. R. Asiatic Soc. (Ceylon Branch), vol. xv.

microscopice pluribus lineis spiralibus sculpti, ultimus ad peripheriam carinatus, basi sub-convexus, radiatim striatus, nitidulus; sutura subimpressa, apertura ovato-lunata; peristoma simplex, rectum, margine columellari ad perforationem leviter reflexum. Alt. 2·5, diam. max. 2·5 mm.

Hab.—Uda Pussellawa, Ceylon (H. B. Preston).

The sculpture is not visible until the periostracum has been rubbed off, and at first I was under the impression that the species was smooth.

21. *EUPLECTA PRÆEMINENS*, n.sp. Pl. V, Figs. 5, 6.

Testa subperforata, depresso-conoidea, tenuiuscula, superne confertim costulata, lineis impressis spiralibus regulariter granulata, corneo-brunnea, versus apicem lineis spiralibus validioribus quam costulis sculpta; spira concava, apice elevato, acuto; anfr. 6-6½, plano-convexi, mediocriter accrescentes, ultimus non descendens, acute carinatus, basi convexus, radiatim striatulus, nitidus; apertura obliqua, angulato-lunaris; peristoma simplex, rectum, margine columellari ad perforationem subreflexo. Alt. 15, diam. max. 28·5 mm.

Hab.—Watawala, Ceylon (Collett).

This is the *Helix acuducta*, Benson, of Mr. Collett, in his interesting paper¹ on the land-shells of Ambagamuwa. From an examination of Benson's specimen, preserved at Cambridge, which agrees fairly well with his original description, I arrive at the following differences: *H. acuducta* is slightly lighter in colour, *does not possess the drawn-out apex*, the whorls do not increase so rapidly, the sculpture is not so strong, the protoconch is nearly smooth, and only shows the spiral lines very indistinctly. To sum up, the true *H. acuducta* is a shell in form, etc., rather of the group of *E. Isabellina*, Pfr., and *E. Colletti*, Sykes.

The shell figured in the Conch. Ind. (pl. iv, fig. 5) is very probably the present species. Another specimen, measured in a similar manner, gives alt. 14·5, diam. max. 25 mm.; it is slightly darker, and the spiral lines being weaker, does not appear so granular: this smaller shell is the one figured, the larger specimen having met with an accident.

Dr. Jousseume in 1894² described from Ceylon two species which he called *Plectopylis Eugeniei* and *P. Lamcabensis*; he makes no mention of any armature or teeth, and probably they really belong to *Sitala* or *Kaliella*; indeed, the former, judging from figures and descriptions, may be *Kaliella Leithiana*, Godwin-Austen,³ a species Dr. Jousseume does not mention in his list.

Mr. Collett found in Ambagamuwa typical examples of *P. clathratula*, and also the following interesting form.

¹ Journ. Roy. As. Soc. (Ceylon Branch), vol. xv.

² Mem. Soc. Zool. France, vol. vii, pp. 277, 278.

³ Moll. India, vol. i, p. 71, pl. xvi, fig. 6.

22. PLECTOPYLIS (SYKESIA)¹ CLATHRATULA, var. COMPRESSA, n. var.
Pl. V, Figs. 13, 14.

Shell narrower and more elevated than the type, spire more convex; umbilicus narrower, the last whorl being more convex at the base, and the descent into the umbilicus more abrupt; sculpture much as in the type, but the lower of the two conspicuous keels lies more in the suture; armature similar to the type, but the palatal denticles are more regular and horizontal. Alt. 2.4, diam. 5 mm.

Hab.—Ambagamuwa (O. Collett).

At first sight the raised ribs appear to be absent, but traces appear under a microscope; this may be due to the condition of the specimens. A typical specimen measures alt. 2.7, diam. 6.1 mm. A glance at the figure will show the difference in form. I have to thank Mr. Gude for kindly examining this species and the next.

23. PLECTOPYLIS (SYKESIA) CALIGINOSA, n. sp. Pl. V, Figs. 21, 22.

Testa mediocriter umbilicata, lenticularis, acute carinata, superne costulis obscuris remotis ornata, parum nitens, corneo-brunnea, apice magno, obtuso; sutura bene impressa, anfr. 5, plano-convexi, lente accrescentes, ultimus basi inflatus, radiato-striatus; apertura verticalis, angusta, angulato-lunaris; peristoma simplex, acutum; plicæ et dentes sicut (?) in *P. clathratula*, sed dentes palatales pauci. Alt. 2.9, diam. 6 mm.

Hab.—Ambagamuwa (O. Collett).

Shell slightly more elevated than *P. clathratula*, whorls a little flatter, base more inflated, the umbilicus being little more than half the size, colour more brown; the spiral liræ are absent, save for a faint trace above the suture of a single one, and the costæ almost obsolete; the armature appears to be very similar, save that the palatal denticles are only three or four in number.

24. THYSANOTA (?) EUMITA, n. sp. Pl. V, Figs. 17, 18.

Testa depresso-conica, anguste umbilicata, corneo-virescens, depresso-trochiformis, apice obtusulo; sutura impressa; anfr. 5-5½, plano-convexi, linea unica spiralis supersuturalis muniti, transversim subtiliter striati, sub lente undique spiraliter striati, ultimus carinatus, carina suturaque pilis elongatis ciliatis ornata, basi subinflatus; apertura angulato-lunaris; peristoma simplex, rectum. Alt. 2, diam. 4.2 mm.

Hab.—Ambagamuwa (O. Collett); Badulla (O. Collett), a variety.

A very interesting little species, of which I have seen a good number of examples. It recalls the young of *Thysanota Guerinii*, Pfr., but is more trochiform and not so convex. It appeared possible that it might be the young of *Plectopylis clathratula*, or an allied species;

¹ Mr. Gude recently proposed the name *Austenia* (Science Gossip, vol. iii, pp. 300, 332) for a new section of *Plectopylis*, having *P. clathratula*, Pfr., as its type, but finding that name preoccupied, he substituted *Sykesia* for it.

but the protoconch in the present form is spirally, and not radiately, striate, as in *P. clathratula*.

25. GLESSULA COLLETTÆ, n.sp. Pl. V, Fig. 1.

Testa elongata, tenuis, lævigata, obscure longitudinaliter striata, nitida, brunnea vel fusco-cornea, apice obtusiusculo; sutura impressa; anfr. 6-6½, convexiusculi, ultimus ½ altitudinis testæ æquans; apertura fere verticalis, lunato-ovalis, margine columellari calloso, pallidiore, oblique truncato. Alt. 8, lat. 2·8 mm.

Hab.—Ambagamuwa (coll. Mrs. Collett).

Allied to *G. Sattaraensis*, H. Ad. (= *G. fusca*, H. Ad., *nom. præocc.*), which is recorded from "Saharumpore, Ceylon," in the Conch. Ind.; but I do not know on whose authority. It was described and figured from "Sattara, Bombay," by Adams, and it may be remarked that the figure in the Conch. Ind. (pl. lxxviii, fig. 4) does not quite resemble that given by Adams (Proc. Zool. Soc., 1868, pl. iv, fig. 10). I expect that the *G. Sattaraensis* of Dr. Jousseau, cited from Nuwara-Eliya, is the present species, which is more elongate and slender than the true *G. Sattaraensis*.

26. OPEAS PRESTONI, n.sp. Pl. V, Fig. 4.

T. subperforata, elongato-cylindrica, translucida, tenuis, cornea vel cereo-cornea, apice obtusiusculo; anfr. 8½, plano-convexi, longitudinaliter lineis incrementibus striati, ultimus ¾ longitudinis subæquans, sutura bene impressa, apertura elongato-ovata; peristoma simplex, acutum, margine columellari ad basim breviter reflexo, perforationem fere tegente. Alt. 11, diam. 3·25 mm.; alt. ap. 3, lat. ap. 1·8 mm.

Hab.—Uda Pussellawa (Preston); also O. Collett, exact locality not stated.

Knowing how widely the species of this group are scattered, I have, with the kind help of Mr. Smith, been through the British Museum collection, but cannot quite identify my specimens with any known species. The apex is much more obtuse and the earlier whorls are broader than *O. gracilis*, and the shell generally is more cylindrical and not so needle-shaped: it appears to be variable in colour. I have given the dimensions of an average specimen; one found by Mr. Preston measures alt. 14, diam. 4 mm.

Till recently the only true *Opeas* recorded from Ceylon was *O. gracilis*, Hutton; this species was found by Mr. Preston at Galle, Colombo, and Trincomalie. In 1894 Dr. Jousseau described *O. Mariæ*; I have not had the advantage of examining a specimen, but from the description and figure it seems suspiciously near to *O. gracilis*.

27. CYCLOPHORUS (SCABRINUS) BROUNÆ, n.sp. Pl. V, Figs. 2, 3.

Testa late umbilicata, depresso conica, periostraco brunneo-fusco, scabro ornata, lineis elevatis spiralibus et costis remotis notata, in regione umbilicari lævior; spira subelevata, apice exserto, plicatulo,

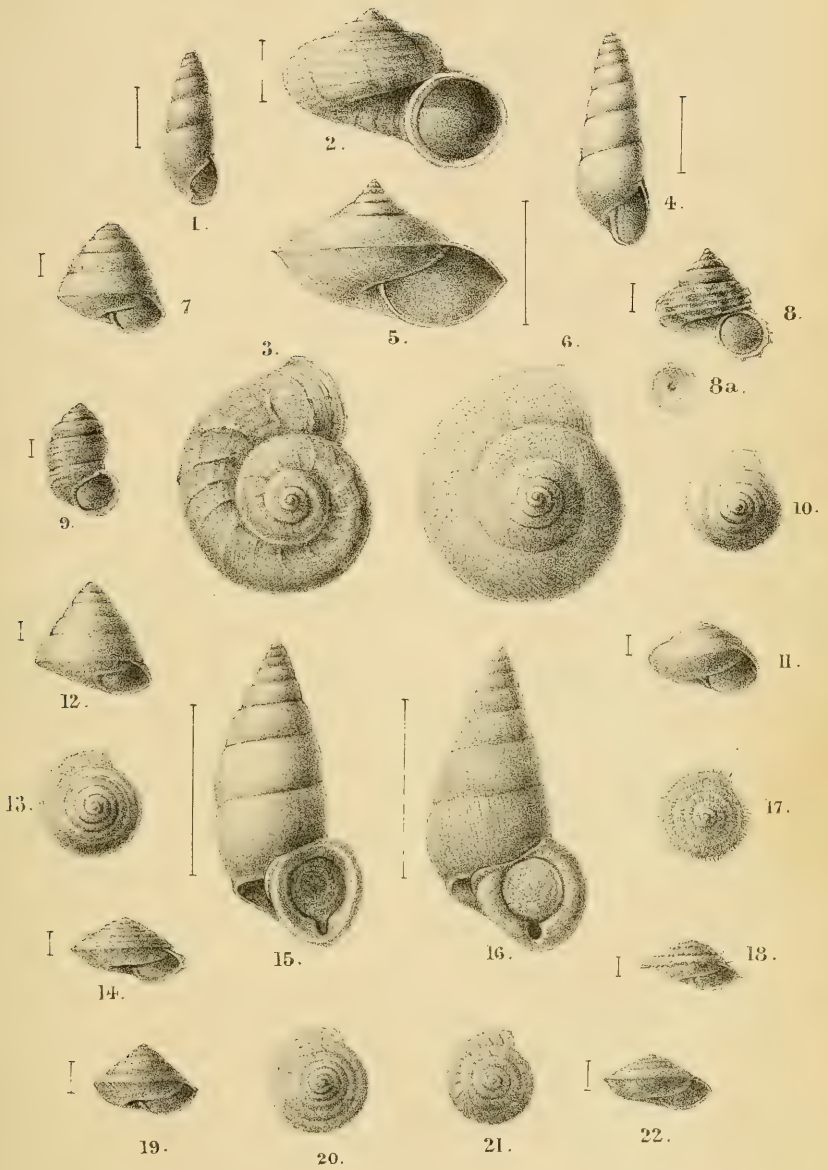
obtusum; sutura profunda; anfr. $4\frac{1}{2}$, convexi, ultimus versus aperturam parum descendens; apertura fere circularis, duplex, internum continuum, externum leviter expansum. Alt. 5.5, diam. max. 10.5 mm.

Hab.—Nuwara-Eliya (Mrs. Broun).

A specimen of this very interesting form was collected by Mrs. Broun, and given by her to Mr. Preston, who has placed it in my hands for description. It is noteworthy for its thick, rough periostracum, which forms distant radiating ridges, in addition to the spiral striation, common to so many of these forms. No other species described from Ceylon appears to really approach it.

EXPLANATION OF PLATE V.

- Fig. 1. *Glessula Colletteæ*, n.sp.
 ,, 2, 3. *Cyclophorus (Scabrinus) Brounæ*, n.sp.
 ,, 4. *Opeas Prestonii*, n.sp.
 ,, 5, 6. *Euplecta præminens*, n.sp.
 ,, 7. *Kaliella delectabilis*, n.sp.
 ,, 8. *Cyathopoma leptomita*, n.sp.
 ,, 8a. ————— (operculum).
 ,, 9. *Diplommatina (Nucida) catathymia*, n.sp.
 ,, 10, 11. *Microcystina lita*, n.sp.
 ,, 12. *Sitala operiens*, n.sp.
 ,, 13, 14. *Plectopylis (Sykesia) clathratula*, v. *compressa*, n.var.
 ,, 15. *Cataulus Colletti*, n.sp.
 ,, 16. ————— *Nevilli*, n.sp.
 ,, 17, 18. *Thysanota (?) eumita*, n.sp.
 ,, 19, 20. *Sitala pyramidalis*, n.sp.
 ,, 21, 22. *Plectopylis (Sykesia) caliginosa*, n.sp.
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NOTES ON THE GENUS *COXIELLA*.

By EDGAR A. SMITH, F.Z.S., etc.

Read 11th February, 1898.

THIS genus was founded by the writer¹ for the reception of certain brackish or salt-water mollusca occurring in the west and south of Australia. At the time I was under the impression that the two forms, hitherto usually known as *Blanfordia striatula*, Menke, and *B. pyrrostoma*, Cox, constituted a single variable species. The study of additional specimens, however, has induced me to alter that opinion, and it now seems advisable to keep them separate. At the same time I would point out that there appears to have been a mistake in the identification of the shell described by Menke from west Australia, the south Australian form having been supposed to represent that species. Three species of *Coziella* are now known.

1. *COXIELLA STRIATULA* (Menke).

Truncatella striatula, Menke: Moll. Nov. Holland, p. 9; Küster, Conch. Cab., p. 14, pl. ii, figs. 32, 33 probably.

Blanfordia pyrrostoma, Cox: Mon. Austr. Land-Shells, p. 95, pl. xv, figs. 14, 14a.

Hab.—"Ad litus occidentale sabulosum" (Menke); Sharks Bay (Cox); Cossacks, and from a dry salt-pan, twenty miles north-east of Esperance Bay, W. Australia (B. H. Woodward: coll. Brit. Mus.).

This I believe to be the true *Truncatella striatula*, Menke, for the following reasons. In the first place it occurs only in western Australia, the locality assigned by Menke. Secondly, the colour ("pallide carnea") is more applicable to the west coast than to the southern shell. The latter is pale brownish or "dull olivaceous," as described by Cox. On the contrary, specimens from the west coast, of the size described by Menke, are often of a pretty reddish or fleshy tint, others, generally the larger and more adult specimens, being dull white. The latter may be referred to by Menke in his note: "In emortuis tritisque specimenibus color et striæ evanescent et testa decolor et glabra apparet."

It might be urged that Menke would not have overlooked the bright red aperture in his description. In his specimens which were "pallide carnea," and possibly more or less faded, this characteristic may not have been so striking as in fresh examples. However this may be, it seems to me, that the identification must be determined by the locality, since Menke's description applies fairly well to both forms.

¹ Proc. Malac. Soc., vol. i, p. 98.

Although Menke in his work has assigned to west Australia other species of Mollusca which occur on the south coast, this is hardly a sufficient reason for concluding that he has done so in the present instance.

The specimens seen and figured by Küster were from the collection of Dr. Pfeiffer, who very likely obtained them from Menke himself; and three examples in the Cuming Collection, which belong to this west coast form, are labelled, in Pfeiffer's handwriting, "*Trunc. striatula*, Menke." It is not at all improbable that Cuming received these direct from Pfeiffer, and that they also form part of the original Menkean series.

Young shells, consisting of about six whorls, are of a rich brown colour, with the exception of the two apical volutions, which are pellucid white.

2. COXIELLA CONFUSA, nom. nov.

Blanfordia striatula (Menke): Angas, Proc. Zool. Soc., 1863, p. 523 (non Menke).

Pomatiopsis striatula (Menke): Adcock, Hand-List Moll. S. Australia, p. 7 (non Menke).

Blanfordia striatula (Menke): Cox, Mon. Austr. Land-Shells, p. 95, pl. xv, figs. 13-13b (non Menke).

Hab.—Adelaide, South Australia (Cox); salt lakes, Yorke's Peninsula (coll. Sykes); salt-water lake, Port Phillip and Sandridge, Hobson's Bay, Victoria (Brit. Mus.); Lake Corangmite, Geelong (coll. Sykes).

This species is less elongate than *C. striatula*, and differs also in colour and the slightly more convex whorls. The aperture is never so brightly coloured as in the west coast species, which at times attains dimensions never reached by the present form. The peristome is generally not so white, and usually more pronouncedly continuous, in some specimens being almost, and in others quite, free from the body-whorl.

3. COXIELLA GILESI (Angas).

Paludinella Gilesi, Angas: Proc. Zool. Soc., 1877, p. 170, pl. xxvi, fig. 2.

Blandfordia [sic] *Stirlingi*, Tate: Trans. R. Soc. South Australia, 1894, vol. xviii, p. 196.

Blandfordia [sic] *Gilesii*, Tate: op. cit., vol. xxi (1897), p. 42.

Hab.—Shores of Lake Eyre, South Australia (Angas); Lake Callabonna, South Australia (Tate). Var. *mammillata*: on the shore of a dry salt lake near Nannine, Murchison Goldfield, W. Australia; also Lake Callabonna (Tate).

The operculum is of concentric growth, as in *C. confusa*, not "paucispiral" as described by Angas. It is thin, horny, deeply concave, and marked with fine lines of increment.

NOTE ON *CYPRÆA CAPUT-ANGUIS*, PHILIPPI,
WITH THE
DESCRIPTION OF A NEW VARIETY OF *C. CAPUT-SERPENTIS*.

By MRS. A. F. KENYON.

Read 11th February, 1898.

IN 1849 Philippi¹ described this shell as follows:—

“C. testa oblongo-ovata, valde convexa, lateribus incrassatis angulatis; basi convexa, nigro-fusca, in dorso alboguttata, extremitatibus albidis; interstitiis dentium lacteorum aperturæ fuscis. Long. $11\frac{1}{2}$ lin., lat. $7\frac{1}{2}$ lin. Patria”

“Coloribus omnino cum *C. capite-serpentis* convenit, sed maculæ albæ ad extremitates vix conspicuæ, dentes aperturæ in utroque labio, sedecim, lactei, sulcis fuscis divisi, producti, incisura ad basin aperturæ, lata in sinistrum flexa, quibus notis forma oblonga, lateribus longe minus dilatata accedit.”

No reference to the species is made in the monograph in Sowerby's “Thesaurus” or Reeve's “Conchologica Iconica,” save the casual mention in the index to the former of “caput anguis, Phil., not identified.”

Mr. Melvill, in his “Survey of the genus *Cypræa*,”² after extracting the above description, remarks: “This species is said by Mr. Garrett, Mr. Brazier, and Mr. Angas (all of whom have collected it plentifully, the first in the Sandwich Islands, the others in Australia) to be quite distinct, and to differ mainly from *C. caput-serpentis* in the smaller size, less dilation of the sides, and more obscure markings. I apprehend all these specimens will be but varieties of the commoner form, distinguished by their greater convexity, and, if this surmise be correct, the true *C. caput-anguis* of Philippi is a lost species”

Mr. Raymond Roberts, in his monograph of the genus *Cypræa*, places the form in his list of unidentified species, and remarks:³ “*C. caput-anguis*, Philippi. An unfigured species without known locality, less than one-half inch in length, brown between the teeth, and white-spotted at the extremities. Said to present a dorsal surface similar to *C. caput-serpentis*, Linn., which has led authors to incorrectly place it in the synonymy of that species.” Further, when describing *C. caput-serpentis*, he says:⁴ “A more elongated variety of a uniformly darker color, and with margins less angular, has been wrongly identified by authors as the *C. caput-anguis*, Phil. Compared with *caput-serpentis*, Pease says it is smaller in size, and the spots are

¹ Zeitsch. für Malakozool., Jahrg. vi (1849), p. 24.

² Mem. Manchester Lit. and Phil. Soc., ser. iv, vol. i.

³ Tryon's Manual of Conch., ser. I, vol. vii, p. 206.

⁴ T. c., p. 173.

smaller, but specimens labeled *caput-anguis*, and sent to the Philada. Acad. Nat. Sciences by Mr. Brazier, who collected them at Ballenger River, N.S.W., are fully as large as the typical form."

Recently, I have come into possession of two adult specimens, which appear to me to belong to the true *C. caput-anguis*, and to prove its specific distinction. My specimens are slightly smaller than the type-specimen described by Philippi, but appear otherwise to exactly agree with the description: they are much more convex, oblong, and piriform in shape than *C. caput-serpentis*; the dorsal surface is not so depressed, nor the sides angulated. The smaller specimen has not quite completed the brownish tinting of the base, though otherwise adult, and the dorsal surface is very similar to that of *C. caput-serpentis*; it measures 16 by 9.5 mm. In the larger specimen the brownish tinting between the teeth and on the base is perfect. A young specimen measures 15 by 9 mm.

The specimens said to be wrongly referred to *C. caput-anguis* appear to belong to another form, quite separable from the typical form either

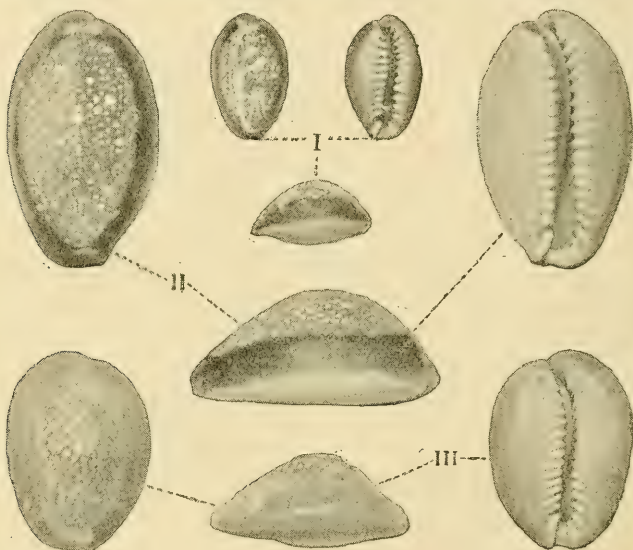


FIG. I. *Cypræa caput-anguis*, Phil.
 ,, II. *C. caput-serpentis*, Linn., variety usually mistaken for the preceding.
 ,, III. *C. caput-serpentis*, var. *caput-colubri*, n.

of this species or *C. caput-serpentis*. They are more oblong in form than the latter, sides not thickened or angulated, nor is the dorsal surface flattened or depressed, and the base is invariably white or cream-coloured, being very noticeable both in young and adult specimens. I have specimens from Western Australia and New South Wales.

A very fine colour variety of *C. caput-serpentis*, from the Hawaiian Islands, has been in my collection for some years, and I have recently seen a very fine live specimen from Lord Howe Island. Coming from such widely separated localities, they may, I think, be characterized as a variety under the name of

CYPRÆA CAPUT-SERPENTIS, var. CAPUT-COLUBRI, n.

Shell warm fawn or light cream colour, the spots on the dorsal surface having the appearance of snow-white specks of irregular size; extremities tipped with white; the base white; the rich fawn-colour of the margins extending about half-way across the convex base; teeth conspicuous, white; interior white, in contradistinction to the violet hue of the interior of *C. caput-serpentis*. Long. 27, lat. 20 mm.

Hab.—Hawaiian Islands and Lord Howe Island.

REMARKS ON SOME SPECIES OF *BULIMULUS*, SECT. *DRYMÆUS*,
AND DESCRIPTIONS OF NEW SPECIES OF LAND-SHELLS
FROM BOLIVIA, ECUADOR, AND THE U.S. OF COLOMBIA.

.By S. I. DA COSTA.

Read 15th April, 1898.

PLATE VI.

AMONG the large number of specimens of Bulimulidæ (principally belonging to the section *Drymæus*), which have reached me from the United States of Colombia during the last ten years, certain forms present so strong a resemblance one to another, that it becomes extremely difficult to determine whether they constitute distinct species, as held by some, or are merely varieties of one. Take, for instance, *Bulimulus felix*, Pfr., the typical form of which is figured in the Proc. Zool. Soc., 1861, t. xxxvii, fig. 2.

An examination of a long series of these shells shows that although in many instances the form and colour-markings of the individuals differ considerably, their general characters are the same, so we may fairly conclude that these differences are due to variation. There are many other analogous instances. If an extended series of examples of the following so-called species, *B. murrinus*, Reeve, *B. convexus*, Pfr., and *B. phryne*, Pfr., be examined, it will, I think, be manifest that any attempt to separate them would only end in confusion.

I propose, therefore, to reduce these three species to one, and to adopt the specific name of "*murrinus*" for all, it being the first in order of date, and given by Reeve, when describing the shell in the "Conch. Icon." (1848), pl. xliii, figs. 373 *a* and *b*. I would take fig. *a* as the type, and class the others as varieties.

On the other hand, there is in the British Museum a shell marked as a variety of *B. convexus*, which is, however, so different in character from that species that I describe the form as a new species, heading therewith the following series of descriptions:—

1. *BULIMULUS (DRYMÆUS) PLICATO-LIRATUS*, n.sp. Pl. VI, Fig. 1.

Bul. testa ovato-fusiforme, basi compressa, carinata, umbilicata; anfractibus 7, convexis, suturis compressis, longitudinaliter rude albo-plicatis, vel liratis, fulva, zonis angustis albis duabus cingulata, apice nigro; columella reflexa, apertura oblongo-ovale, inferne late canaliculata, intus purpureo-fusca, bizonata, labro albo subexpanso et reflexo. Long. 37, diam. 15.5 mm.; apertura cum perist., longa 17, lata 11 mm.

Hab.—Bogotá.

2. *BULIMULUS (DRYMÆUS) HIDALGOI*, n.sp. Pl. VI, Fig. 2.

Bul. testa ovato-fusiforme, compressa umbilicata, crassiuscula; anfractibus 7, convexis, lævibus, vel sub lente lineis spiraliter incis,

suturis impressis; alba, cæruleo-nigro longitudinaliter strigata; columella parum contorta et reflexa; apertura ovali, intus purpurascente, labro expanso, et reflexo, marginibus callo purpurascente junctis. Long. 39, diam. 13 mm.; apertura cum perist., longa 18, lata 12 mm.

Hab.—Ecuador.

This species bears a resemblance to both *B. felix*, Pfr., and *B. Membielinus*, Crosse, but differs from each in form and sculpture. Examples collected by the late Mr. Buckley during his travels in Ecuador are among those in the British Museum without a name.

3. BULIMULUS (DRYMÆUS) SMITHII, n.sp. Pl. VI, Fig. 8.

Bul. testa cylindræo-turrita, umbilicata; anfractibus 6, suturis impressis, lævibus, sub lente impresse transversim sculptis, striis in anfractibus apicalibus duobus subtilissime granulatis, ultimo oblique producto, livido fusciscente, irregulariter tæniato et undato, zonis tribus purpureo fuscis ornato, suprema maculis purpureis sagittatis notata, interrupta; columella purpurascente; apertura oblique ovata, labro pallide luteo, late reflexo, longit. totius $\frac{1}{2}$ æquante. Long. 29.5, diam. 15 mm.

Hab.—Bogotá.

This shell is also represented as an unnamed species in a drawer in the British Museum. I have named it after my esteemed friend Mr. Edgar A. Smith.

4. BULIMULUS (DRYMÆUS) ZICZAC, n.sp. Pl. VI, Fig. 5.

Bul. testa ovato-conica, tenuicula, umbilicata, basi sub-angulatim producta, lutea, nigricante-fusca, conspicue undulata; anfractibus 6, convexis, sub lente minute striatis; columella plano-reflexa, apertura ampla, effusa, intus violaceo-purpurea, labro reflexo. Long. 28, diam. 15 mm.; apertura cum perist., longa 15, lata 11 mm.

Hab.—Valley of the R. Cauca, Colombia.

This form has been lately received; the colour-markings remind one somewhat of those on *B. undulatus*, Guild., from the Island of St. Vincent, but its form is distinct.

5. BULIMULUS (DRYMÆUS) CAUCAENSIS, n.sp. Pl. VI, Fig. 3.

Bul. testa fusiforme-turrita, anguste umbilicata, albida, zonis tribus nigricantibus interruptis, albo punctatis; anfractibus 6, convexis, suturis impressis, longitudinaliter plicato-striatis, columella parum contorta et reflexa, apertura ampla, intus purpurascente, albo bifasciata, labro parum reflexo, albo, marginibus callo purpurascente junctis. Long. 35, diam. 16 mm.; apertura cum perist., longa 17, lata 11 mm.

Hab.—Valley of the R. Cauca, Colombia.

Another new species received with the last, and differing from any hitherto discovered, both in form and colour-markings.

6. *BULIMULUS (DRYMÆUS) MALLEATUS*, n.sp. Pl. VI, Fig. 7.

Bul. testa conico-ovata, solidiuscula, vix umblicata; anfractibus 5, ultimo ad suturam crenato, peculiariter corrugato, transversim obscure striato; columella callosa, apertura intus albidia, ovali, basi partim bisecta, marginibus callo luteo junctis, alba, cinereo-fuscescente varie strigata, labro roseo. Long. 34, diam. 15 mm.; apertura intus longa 14, lata 6 mm.

Hab.—La Paz, Bolivia, 3,600 metres.

A beautiful and interesting shell described from a single specimen. The curious malleation of the surface is very peculiar, and unique, I believe, in shells belonging to this section.

7. *BULIMULUS (DRYMÆUS) LUCIDUS*, n.sp. Pl. VI, Fig. 4.

Bul. testa ovata, tenui, imperforata, anfractibus 5 lævibus, nitidis, sub lente impressis transversim sculptis, apicalibus duobus subtilissime granulatis; alba, pura, nigricante-castaneo longitudinaliter strigata, columella breviter reflexa, apertura ampla, labro simplice parum expanso. Long. 19, diam. 11 mm.

Hab.—Ecuador (Buckley's Coll.).

This and the following species were collected by the late Mr. Buckley in Ecuador, and although they have been for many years in my collection, to the best of my knowledge they have never been described.

8. *BULIMULUS (DRYMÆUS) TIGRINUS*, n.sp. Pl. VI, Fig. 6.

Bul. testa pyramidato-oblonga, tenui, ampliter umblicata, anfractibus 6, subinflatis, transversim minute inciso-striatis, columella reflexa, labro simplici, expanso, pellucido; alba, lineis strigisque fuscis, longitudinaliter picta; apertura ovata. Long. 21, diam. 10 mm.

Hab.—Ecuador (Buckley's Coll.).

9. *STENOGYRA (SPIRAXIS) VIRESCENS*, n.sp. Pl. VI, Fig. 10.

St. testa oblongo-turrita, tenuissima, pellucida, nitida; anfractibus 8, convexusculis, suturis impressis, longitudinaliter creberrime elevato-striatis, columella pallida, reflexa, labro simplici, acuto, epidermide tenui virescente, apertura sub-elongata, tertiam partem longitudinis testæ æquante. Long. 37, diam. 12 mm.; apertura longa 14, lata 5.5 mm.

Hab.—Valley of the R. Cauca, Colombia.

This shell has been lately received by me, and appears to be quite distinct from any hitherto known, although it must occur plentifully in the district whence it came, judging from the number of specimens (mostly imperfect) which have come to hand.

10. *CYCLOPHORUS ROSENBERGI*, n.sp. Pl. VI, Fig. 9.

Cycl. testa ampliter umblicata, orbiculari-depressa, superne ustulato-castanea, inferne luteo-castanea, spira conico-depressa, vertice lævi,

anfractibus 5, juxta suturas planatis, superne tumide plicato-corrugatis, deinde rotundatis, spiraliter tenuiter liratis, anfractu ultimo ad peripheriam obtuse angulato, circa umbilicum lævi, apertura oblique circulari, peristomate simplice, ad suturam profunde sinuata; opereculo corneo, arctispirato, ad suturas et peripheriam laciniato. Diam. maj. 32, min. 25 mm.; alt. 20 mm.

Hab.—Cachabi, Ecuador.

A very interesting shell, distinguished from any other species of this genus, in that it has at the juncture of the aperture and the last whorl a deep sinuation, similar in character to that of *Pterocyclos*; the upper surface of the shell resembles that of *C. Vesconesi*, also from Ecuador, and described by M. Jousseume in *Le Naturaliste* for November, 1897, but it differs in the form of the umbilicus as well as in the sinuation, which forms a peculiar feature in the new species. I have much pleasure in naming it after Mr. Rosenberg, its discoverer.

11. STROPHOCHEILUS (EURYTUS) SUB-IRRORATUS, n.sp. Fig. II.

St. testa acuminato-oblonga, medio ventricosa, imperforata; anfractibus 6, sub lente striis subtilissimis impressis spiralibus sculptis,

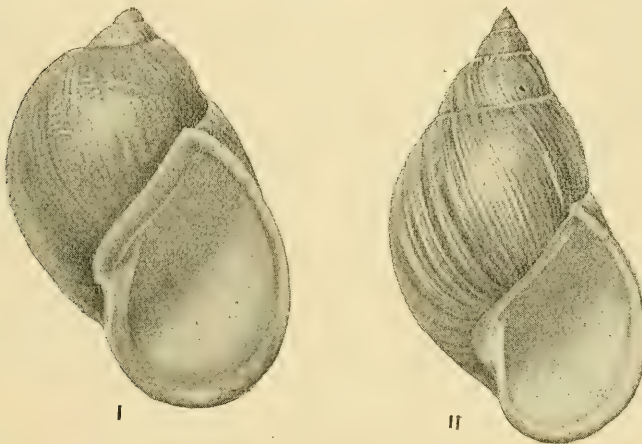


FIG. I.—*Strophocheilus doliarius*, n.sp.

„ II.—*S. sub-irroratus*, n.sp.

infra suturam tenuiter plicatis, columella simplici, castaneo-purpurea; cinereo-fusco longitudinaliter strigata; columella cærulescente-alba, labro reflexo, incarnato-roseo, apertura iridescente, lilacea. Long. 63, diam. 33 mm.; apertura cum perist., longa 34, lata 22 mm.

Hab.—Paramba, Ecuador.

This species presents a general resemblance in form to *S. irroratus*, Rve., but differs from it in the absence of the raised striæ which cover that shell and the peculiar crenulation beneath its sutures.

12. STROPHOCHEILUS (EURYTUS) DOLIARIUS, n.sp. Fig. I.

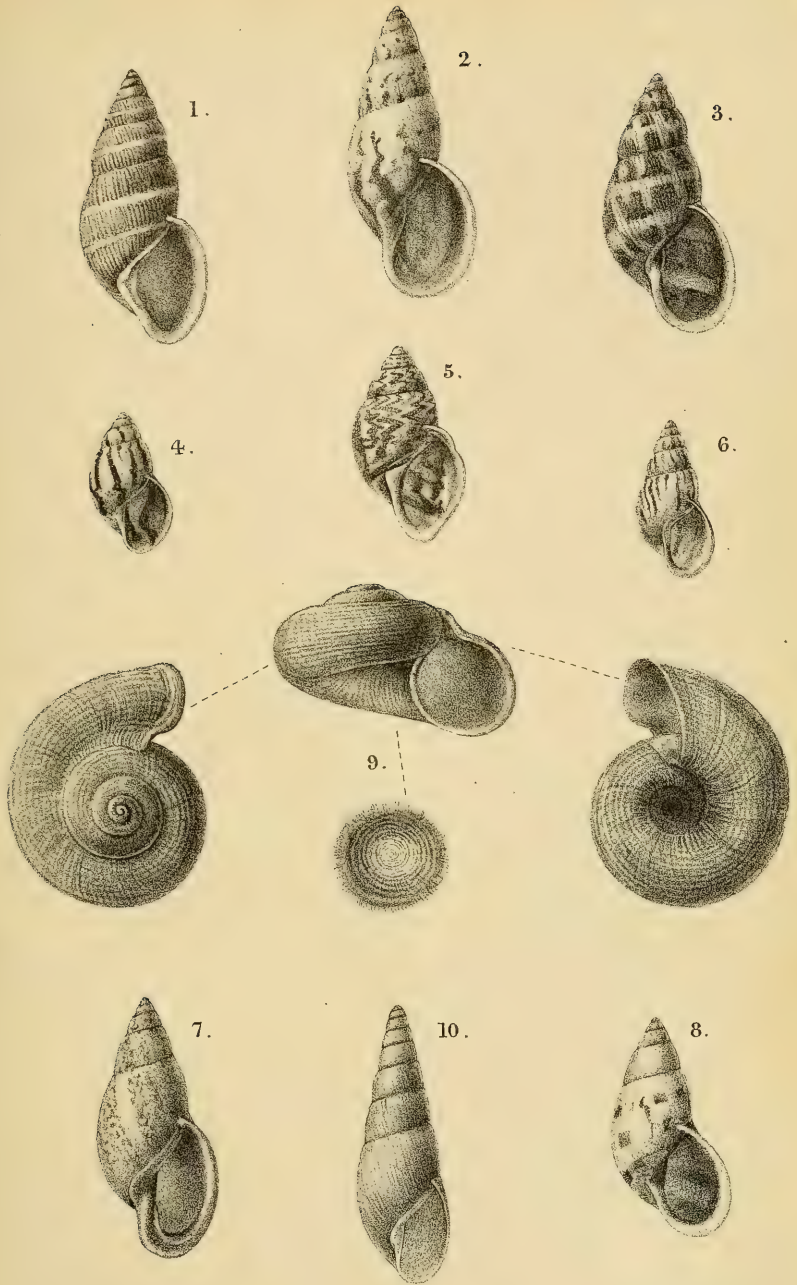
St. testa ovata, umbilicata, crassiuscula, ventricosissima; anfractibus 5, undique minute granulatis, transversim creberrime striatis, striis rugosis et minute undulatis, ad suturas subtiliter plicatis, anfractu ultimo peramplo, inflato, oblique descendente, columella sub-contorta, superne callosa, labro reflexo; fumeo-castanea; apertura et peritremate purpurascete-lilaceis. Long. 58, diam. 41 mm.; apertura longa 40, lata 26 mm.

Hab.—Paramba, Ecuador.

This shell, while it approaches in its character to both *S. gibbonius*, Lea, and *S. castaneus*, Pfr., differs from them in form and sculpture.

EXPLANATION OF PLATE VI.

- FIG. 1. *Bulimulus plicato-liratus*, n.sp.
 ,, 2. ,, *Hidalgoi*, n.sp.
 ,, 3. ,, *Caucaensis*, n.sp.
 ,, 4. ,, *lucidus*, n.sp.
 ,, 5. ,, *ziczac*, n.sp.
 ,, 6. ,, *tigrinus*, n.sp.
 ,, 7. ,, *malleatus*, n.sp.
 ,, 8. ,, *Smithii*, n.sp.
 ,, 9. *Cyclophorus Rosenbergi*, n.sp.
 ,, 10. *Stenogyra virescens*, n.sp.
-



J. Green del. et lith.

Mintern Bros. imp.

NEW SOUTH AMERICAN LAND-SHELLS.

NOTE ON THE ANATOMY OF *RESANIA*, GRAY, AND *ZENATIA*, GRAY.

By Dr. W. H. DALL,

Hon. Curator, Department of Mollusks, U.S. National Museum,
Washington.

Read 15th April, 1898.

I HAVE recently been able to examine alcoholic specimens of *Resania lanceolata* (otherwise known as *Vanganella Taylori*), Gray, and *Zenatia Deshayesii*, Reeve, from New Zealand. These were collected where they had been thrown up by the waves, and were so permeated with fine siliceous sand that thin sections could not be cut for fear of ruining the microtome. They were, however, otherwise perfect, and, since the anatomy of these forms has not been described, it seems desirable to give some account of the more conspicuous features of their structure.

RESANIA LANCEOLATA, Gray.

In this very inequilateral form the posterior part of the valves is disproportionately short, and the pallial sinus is short, extending forward only to the thickened ray which passes downward from the umbonal region of the valve. The siphons are naked, slender, closely united to their very tips, the orifices nearly in the same plane and surrounded by small papillæ, much retracted in the specimens.

The mantle has a thickened edge, smooth for the most part, but, near the ends of the shell, more or less papillose, with rather distant papillæ. The mantle is completely open, except in the central portion of the dorsal margin, not being united even where its margins pass around the adductors. The foot is compressed, sharp-edged, pointed, large and muscular, with no obvious byssal groove, and of a lanceolate outline. Its edges are entire. The palpi are large, narrow, long, smooth externally, plicate internally, adherent near the small circular mouth. They extend beyond the posterior edge of the visceral mass, becoming distally free and twisted at the ends. The body is connected with the siphonal septum by a Ω -shaped fleshy septum, from which, on each side, a smooth, fleshy, narrow flap, as long as the septum itself, hangs down into the branchial chamber. Outside these flaps, and seated on the lateral borders of the fleshy septum, are the gills. These present some peculiar features, the most obvious of which is that the gills of the two sides are not symmetrical; and, further, that on one side, and in some cases on both sides, the plicate laminæ are discontinuous.

The ctenidium of the left side is short and small, the outer lamina smaller than the inner, both dwindle to a point and cease before reaching the vertical of the visceral mass, and there is a distinct vacant space with no trace of a pendant lamina between the anterior termination of this part of the ctenidium and the sinus between the posterior parts of the palpi. Further forward, between the upper and lower palpi, a new lamina, corresponding to the inner direct and reflected lamina of the ctenidium, is developed and attains a respectable size, being wider than the palps and extended forward, diminishing in

size nearly to the front edge of the visceral mass. This was naturally taken to be a malformation, but examination of five adult specimens showed the arrangement to be similar in all of them.

The right ctenidium is continuous in all but one of the specimens. Its laminae are larger than those of the left side and extend forward, diminishing in size, between the palpi to a point opposite the middle of the visceral mass. In the exceptional specimen there is a discontinuity of the laminae, but the vacant space of the left side is not repeated on the right. The edge of the anterior segment of the inner direct and reflected lamina of the right side is bifurcate, in front of the anterior edge of the posterior segment.

The fleshy septum above described completely separates the anal and branchial chambers. The inhalent siphon opens into the latter by a circular opening capable of being closed by a sphincter muscle or arrangement of fibres. On either side, near this opening, is a large, long sensory lamina, situated on the mantle and extending forward, parallel with the thickened mantle-edge, nearly to the posterior edge of the foot, where the latter joins the visceral mass. The ligament is sunken, but not wholly internal; it is short and small. The resilium is not in contact with it, but is wholly internal, large, strong, and mesially constricted.

ZENATIA DESHAYESII, Reeve.

This species is as inequilateral as the preceding, but in a reverse direction, the longer end of the shell being the posterior, with a deep pallial sinus. The ligament is longer than in *Resania*, and the resilium rather smaller, but otherwise similar to that of *Resania*.

The siphons are naked, and completely united; but larger, laterally more compressed, and less cylindrical than in *Resania*. The siphonal openings are surrounded by conspicuous papillae.

The mantle-edges are thickened, smooth, and solidly united in front and forward on the ventral margin, half the length of the shell, to the pedal opening. The sensory laminae occur on the inner side of the mantle near the inner orifice of the inhalent siphon, but they are smaller, shorter, and more delicate than in *Resania*. The foot is quadrate, compressed, smooth, with entire edges; smaller, proportionally, than in *Resania*. The mouth is circular, and the palpi near it narrow and adherent to the surface of the body; they are long and large, their free ends extend behind the foot. The visceral mass and siphonal septum are connected, but in this case there is no fleshy septum between the ctenidia, but, as is more generally the case in Pelecypoda, the bases of the ctenidia join to form the partition between the anal and branchial chambers. The ctenidia are symmetrical, more coarsely plicate than in *Resania*, and extend forward, diminishing in size, a considerable distance between the palpi. There is no discontinuity; the discrepancy in size between the inner and outer laminae of each ctenidium is less marked than in *Resania*.

The heart, visceral organs, etc., do not present in either genus any distinctive peculiarities compared with other members of the Mactracea.

ON THE ANATOMY OF *MULLERIA DALYI*, SMITH.

By MARTIN F. WOODWARD,

Demonstrator of Zoology, Royal College of Science, London.

Read 15th April, 1898.

THE animals (two in number) upon which these observations are based were discovered by Mr. Hubert Bonner, a relative of Mr. E. L. Layard, C.M.G., and forwarded to Mr. E. A. Smith, who described them under the name of *Mulleria Dalyi*.¹ I have to thank both Mr. Layard and Mr. Smith for giving me the opportunity of examining this interesting Lamellibranch.

So far as I am aware, the anatomy of the type-species of the genus, viz. *M. lobata*, is quite unknown, and we are but little better acquainted with regard to that of the allied genus *Ætheria*. Our knowledge of the latter rests mainly upon the observations of Rang and Caillaud,² who described, among the macroscopic characters, the relations of the muscles, the mantle, the gills, and the foot. Deshayes³ also gives a brief account, which is evidently taken from that of Rang & Caillaud. Finally, Mr. Smith has briefly described the more obvious features in the external form of *Mulleria Dalyi*. Some important points, however, still remain for me to describe in its anatomy, notably the minute structure of the gills, upon which the classification of the Lamellibranchs is now generally based.

The Mantle and Muscular System.—The mantle folds are almost completely separated from one another, being united at two points only, viz., at the posterior attachment of the gills, thus separating an inhalent from an exhalent orifice, and dorsally from the posterior end of the hinge-line for about one-quarter of the distance between this point and the attachment of the gills. The margins of the mantle below the attachment of the gills are beset with small sensory papillæ for a space which occupies about one-quarter of the extent of the mantle-margin from the attachment of the gills to the anterior hinge-line. In *Ætheria* similar papillæ occur all round the margin of the branchial chamber, and the mantle lobes are said to be completely disunited.

The single adductor muscle (Fig. I, *p.a.*) of the adult corresponds to the *posterior adductor* of dimyarians, and is situated just below and well behind the centre of the animal. In the young individual, according to D'Orbigny, two adductor muscles are present, and the shell is said to be anodontiform.

When a comparison is made between the single adductor muscle in *Mulleria* and in *Ostrea*, it is at once apparent that in the former it is very much smaller when compared to the size of the animal than in the latter, that it does not extend so far ventrally, and that it is

¹ Ante, p. 14.² Mem. Mus. Hist. Nat. Paris, sér. III, tom. iii (1834), p. 143.³ Lamarck, Anim. sans Vert., 2nd ed., tom. vi (1836), pp. 691-6.

not divided into two portions as it is in *Ostrea*, where we find one part composed of smooth, and the other of striated fibres.

A small *posterior pedal retractor* (*p.r.*) is present in *Mulleria*, situated immediately above, or anterior to the posterior adductor, and exhibiting

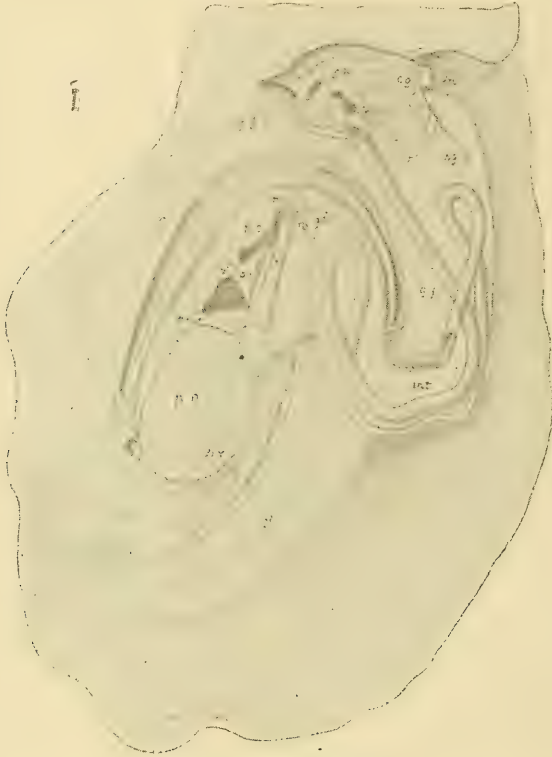


FIG. I.—General view, somewhat diagrammatic, of the anatomy of *Mulleria Dalyi*.

- a.* anus; *au.* left auricle; *c.g.* cerebral ganglion; *g.* gills; *g.d.* genital duct; *g.g.* genital gland; *int.* intestine; *k.* kidney; *l.* digestive gland; *l.p.* inner labial palp; *m.* mouth; *p.a.* posterior adductor muscle; *pc.* pericardium; *p.g.* pedal ganglion; *p.r.* posterior retractor pedis muscle; *p.v.* parieto-visceral ganglion; *r.* rectum; *r.o.* renal opening; *r.p.* reno-pericardial aperture; *st.* stomach; *t.* typhlosole; *v.* ventricle.

the typical relations of that muscle to the organ of Bojanus and to the nerve-cords.

The Mantle Cavity.—The branchial cavity is large and entirely open below. The supra-branchial (anal) chamber opens posteriorly by a wide slit: it consists of a large median chamber behind the posterior adductor muscle, where it receives the opening of the anus. Under

the adductor this chamber becomes divided into three by the union of the primary branchial filaments with the body-wall on either side. Still further forward, the middle of these three chambers becomes divided by the intervention of the visceral mass. In the relationship of this cavity to the surrounding parts, *Mulleria* resembles typical Eulamellibranchiata; there is, however, no communication, other than through the gill-slits, between the branchial and supra-branchial cavities, such as we meet with in a form like *Anodonta*.

The external apertures of the organ of Bojanus (*r.o.*), and of the genital gland, open into the innermost subdivision of the supra-branchial cavity.

The Foot and Visceral Mass.—The muscular foot present in most lamellibranchiata is entirely wanting in *Mulleria*, a condition which is correlated with the fixed mode of life of this form. *Ætheria*, on the other hand, although fixed, is stated to possess a large, thick, and powerful foot.¹ This form, however, still retains the two adductor muscles, and is evidently less modified than *Mulleria*.

The visceral mass is small and slightly bilobed posteriorly; it exhibits a few superficial muscular fibres mainly connected with the posterior pedal retractor.

The Labial Palps.—Two pairs of very small leaf-shaped labial palps are present; they are equal in size, and exhibit oblique ridges on the apposed surfaces. The inner pair unite below the mouth to form the lower lip, while the outer pair, which become slightly expanded anteriorly, unite above the mouth.

The Respiratory and Circulatory Systems.—The gills of *Mulleria* consist of two lamellæ on either side of the body; of these the outer is slightly the smaller. Their relations to each other, to the mantle

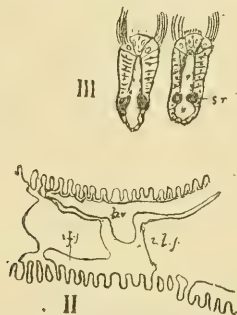


FIG. II.—Section across the gill lamella, cutting the gill filaments (*g.f.*) transversely; *b.v.*, blood-vessel; *i.f.j.*, interfilamental junctions; *i.l.j.*, interlamellar junctions.

„ III.—Transverse section across two gill filaments; *s.r.*, supporting rods.

¹ An examination of Rang & Caillaud's figure has caused some doubt to arise in my mind, whether *Ætheria* really possesses a muscular foot distinct from the visceral mass. S. P. Woodward, in his *Manual of Mollusca*, states (p. 276; 4th ed., p. 435) that there is no trace of a foot.

and to the body-wall, are those of a *typical Eulamellibranch*. The same is true of their more intimate structure, for an examination of sections under the microscope reveals the fact that the two halves of each gill lamella are connected together by vascular interlamellar junctions, and that the gill filaments themselves are further similarly united (Fig. II, *i.l.j.* and *i.f.j.*). In the individual filaments we find a supporting tissue, and firmer supporting rods (Fig. III, *s.r.*) are present. The whole structure recalls in its most minute details that of the gills of *Anodonta* or *Unio*.

The heart consists of a muscular ventricle (*v.*) and two thin-walled auricles (*au.*), the former giving origin to an anterior and a posterior aorta, the whole being enclosed in a fairly spacious pericardium (*pc.*). A mass of brown tissue forms the side walls of the pericardium anteriorly; this evidently represents Keber's organ.

The most striking feature seen in connection with the heart is the fact that the ventricle is not perforated by the rectum, but is situated some little distance below the latter, being separated from it by a portion of the genital gland. The pericardium, moreover, does not surround the rectum as in *Anodonta*, its roof being formed by the thick mass of the genital gland, within which the rectum lies embedded.

This non-perforation of the ventricle by the rectum is a very striking and peculiar feature, and one that is only met with elsewhere in such monomyarian forms as *Meleagrina*, *Ostrea*, *Anomia*, and *Pecten*; while among the dimyarians it is found in *Nucula*, *Arca*, and *Teredo*.

The fact that *Mulleria* is a sedentary monomyarian, and that it, at the first rough glance, recalls an oyster, suggests perhaps that the non-perforation of the heart by the rectum has some phylogenetic significance which further connects these two forms. A careful consideration, however, of the other anatomical features in the two genera, such as the structure of the gills, the relations of the kidney and genital ducts, shows that this cannot be the case. In this connection it is interesting to read the account given by Lang,¹ who, not knowing of the condition in *Mulleria*, explains the separation of the heart from the rectum as due to the increasing distance between the base of the gills and the original position of the heart, brought about by the shifting forwards of the enlarging posterior adductor muscle. The truth of this interpretation is rendered evident by an examination of such heteromyarians as *Pinna*, *Avicula*, and *Perna*, in which the consecutive stages in the separation of the heart from the rectum, leading up to the complete displacement found in *Ostrea*, may be seen.

One may, I believe, justly conclude that the same process has taken place in *Mulleria*, and thus regard the independently acquired monomyarian condition of this genus as responsible for the separation of the heart from the rectum. That the ventricle is not so distantly removed, nor the whole heart so much elongated, as in *Ostrea*, may be explained by the fact that in *Mulleria* the single adductor muscle is smaller, and has not migrated so far forward as in *Ostrea*.

¹ Lang, Text-Book of Comparative Anatomy, English edit., part ii, p. 206.

In conclusion, on this point we may safely state that the similar condition of the heart observed in *Ostrea* and *Mulleria* has been brought about by the action of similar causes possibly induced by a similar habitus, it being an example of what is known as convergence, and having no phylogenetic significance.

The Kidney or Organ of Bojanus.—The kidney calls for no special comment; it is essentially that of a typical Eulamellibranch, and closely resembles that of *Anodonta* in every detail.

The Genital Organs.—A large genital duct (*g.a.*) opens close to, but perfectly independent of, the external opening of the kidney in the supra-branchial chamber. The genital gland is extensive; it surrounds the coils of the intestine, and even extends round the rectum above the pericardium.

The Alimentary Canal.—The mouth practically leads direct into the stomach, an oesophagus, as such, not being present. The digestive glands are situated below and at the sides of the stomach, into which they open. There is no crystalline style or 'flèche tricuspid.' The intestine is fairly long and bent on itself several times: before leaving the visceral mass it enlarges abruptly; this point evidently represents the junction of the mid-gut with the hind-gut. The latter passes dorsally and continues to enlarge, becoming considerably dilated just in front of the heart; from this point it runs posteriorly, and gradually diminishes in size, finally opening into the supra-branchial chamber above the adductor muscle. The hind-gut is characterized by the possession of a longitudinal infolding of its ventral wall, forming what is known as a typhlosole (*t.*).

The Nervous System.—The only point of interest connected with the nerves is the presence of well-developed pedal ganglia; this, in face of the entire suppression of the foot, suggests that the latter has only recently been aborted. The cerebro-pedal commissures are, however, somewhat short. Owing to the great transverse width of the mouth, the cerebral ganglia are widely separated, and their transverse connective is consequently long.

Conclusions.—In the structure of its gills, of its kidney, and in the relationships of the urinary and genital ducts, *Mulleria* is a typical Eulamellibranch, but owing to its specialized mode of life it has undergone several striking changes. With the loss of locomotion the foot has atrophied, and apparently also in connection with the fixed habit the anterior adductor muscle, present in the young, has disappeared, and the posterior enlarged. This enlargement has brought about that Ostrean character, the separation of the heart from the rectum.

In its general organization, and especially in the details of the gills, the mantle lobes, and the kidney, *Mulleria* approximates to the Unionidæ; and the conclusion which I should arrive at from a study of the soft parts of this mollusc would be in entire accord with those already advanced by conchologists from a study of the shell, viz.: that *Mulleria* is closely related to the Unionidæ, but is extremely specialized in accordance with the fixed mode of life which it has adopted.

DESCRIPTIONS OF THE GENERA *BATHANALIA* AND *BYTHOCERAS*,
FROM LAKE TANGANYIKA.

By J. E. S. MOORE,

Zoological Laboratory, Royal College of Science, London.

Read 13th May, 1898.

AMONG the molluscs which I obtained in Lake Tanganyika there are two highly interesting gastropods, which are sufficiently distinct from all known forms to be worthy of at least generic rank. Such rank has been accorded to them in a paper read before the Royal Society,¹ in which these two forms were figured and briefly described under the names *Bathanalia Howesi* and *Bythoceras iridescens*. In two further papers,² additional questions concerning the distribution of these molluscs were considered, and the anatomy of *Bathanalia*, with a short diagnosis, was given. Since, however, in these three papers they were treated rather from a faunistic and an anatomical standpoint, than from that of the systematist, it has been deemed advisable to publish diagnoses of these genera in this journal, where they will be more accessible for the conchologist.

Both forms live only at very great depths, and were obtained from the southern half of the lake; they are essentially members of what I have termed the halolimnic³ fauna of Lake Tanganyika.

1. *BATHANALIA* *HOWESI*, MOORE. Fig. II.

Bathanalia Howesi, Moore: Proc. Roy. Soc., vol. lxii (March, 1898), p. 452, fig. 2; Quart. Journ. Micro. Sci., vol. xli (March, 1898), p. 192, pl. xii, figs. 29-31 and 33.

Shell conical, turreted; colour transparent white, with a faint trace of brownish periostracum upon the liræ; whorls 8, apical whorls missing, angular or carinated, the angulations being more acute in the upper whorls, while in the last whorl the shell becomes slightly convex both above and below the carina, carina from apex to mouth of shell bearing numerous short spinous processes, whorls strongly sculptured with numerous longitudinal spiral nodulous liræ, from 5-6 above and 8-10 stronger ones below the carina; mouth rotund-pyriform, last spine forming as a notch in the outer lip; columella open; operculum littorinoid.

Except in the possession of a more open columella, the genus *Bathanalia* is conchologically indistinguishable from the Jurassic genus *Amberlyia*.

Anatomically *Bathanalia* closely resembles the genus *Typhobia*, but differs from it somewhat in its radula⁴ and greatly in its shell; unlike the latter genus, the shells of *Bathanalia* are singularly devoid of variation.

Bathanalia was dredged living at a depth of 800 feet and upwards, near Mleroes, Lake Tanganyika.

¹ Proc. Roy. Soc. Lond., vol. lxii (1898), p. 452.

² Quart. Journ. Micro. Sci., vol. xli (1898), pp. 159-202 and 303-320.

³ ἅλας, 'salt,' and λίμνη, 'lake.' ⁴ Quart. Journ. Micro. Sci., loc. cit., p. 189.

2. BYTHOCERAS IRIDESCENS, Moore. Fig. I.

Bythoceras iridescens, Moore: Proc. Roy. Soc., vol. lxii (March, 1898), p. 452, fig. 1.

Shell ovato-fusiform, semi-solid; colour ochraceous-brown, last whorl darker; whorls $11\frac{1}{2}$, apical whorls smooth, second whorl with spiral liræ, no ribs, protoconch heterostroph, whorls strongly sculptured, bearing 15-17 nodulous spiral liræ, the 6-7 upper liræ being especially nodulous, nodulations of different liræ coinciding and forming transverse rounded ribs, the ribs in the younger whorls and in the upper part of the last whorl being very pronounced and obscuring the spiral liræ; sutures channelled; mouth in adult oval with continuous thickened whitish-iridescent lip, produced both anteriorly and posteriorly into a solid spine, the posterior spine is

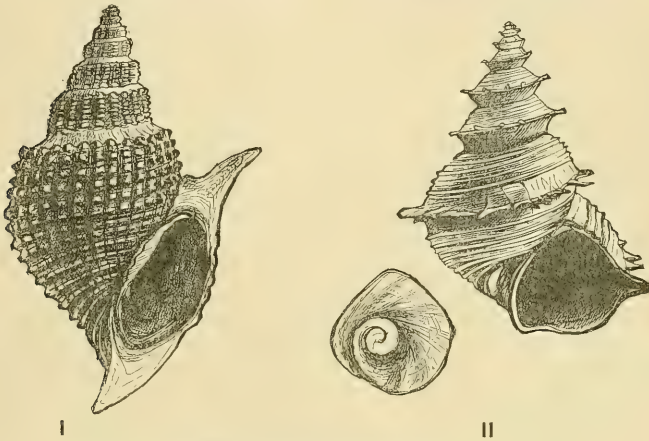


FIG. I.—*Bythoceras iridescens*, Moore.

„ II.—*Bathanalia Howesi*, Moore, with operculum.

especially strongly developed and may curve outwards, is triangular in section but slightly excavated on its lower surface, the anterior spine is less developed. In old specimens the oval lip is continued, and projects slightly beyond the plane of the spines, in young specimens both the spines and the thickened lip are wanting, and the mouth is then somewhat larger, thin-edged, and elliptical. The brownish periostracum is very thin, like that of *Nassopsis* and *Paramelania*; operculum as in *Paramelania* and *Typhobia*. It is, however, most remarkable that this form bears no anatomical resemblance to *Nassopsis*, being much more like *Tanganyicia rufofilosa*. The specific name was chosen from the peculiar yellowish pearly layer lining the mouth and interior of the shell.

Bythoceras was dredged living in 600-700 feet, near Sumbu, Lake Tanganyika.

PHYLOGENY OF THE GENERA OF ARIONIDÆ.

By HENRY A. PILSBRY,

Conservator of the Conchological Section and Professor of Malacology
in the Academy of Natural Sciences of Philadelphia.*Read 13th May, 1898.*

PLATE VII.

OUR literature has been enriched during the past decade by many admirable papers upon slugs of the family Arionidæ. In Germany and England the study of Slugs has become a speciality, claiming foremost place in the thoughts of some naturalists of large experience and considerable attainments, and enlisting the co-operation of many amateurs, without whom our investigations would be limited indeed.

For all this, we have as yet had no general survey of the family; no indication of the affinities existing between the genera, and consequently the reconstruction of their past history or phylogeny has not been attempted; there has been no clearly expressed estimate of the comparative value of their organic characters in classification;¹ and finally, no well-founded theory advanced accounting for the present distribution of the group.

With the data now accessible² it has seemed to me that the time for safe generalization and sound classification has arrived; the more because we have little or nothing to expect from palæontological discoveries, this source of so much valuable information being practically denied us in dealing with the phylogeny of slugs. We must depend solely upon comparative anatomy and embryology. The danger of misinterpretation from the occurrence of convergent development and other causes is great, and only to be guarded against by attention to all the characters of the organism.

For the primary division of the Arionidæ the modifications of the free muscles afford the most fundamental characters; and their arrangement also constitutes one of the most weighty differences between Arionidæ and other slugs. The free muscles of land snails belong to two groups: (1) Retractors of the foot, pharynx, and tentacles, and (2) retractors and other muscles of the genital organs. Muscles of the first group are very constant in form and position, those of the second group quite variable. The principal muscles are represented on Pl. VII, Figs. 1, 4, and are as follows:—Pharyngeal

¹ The general tendency has been to attach too much importance to the modifications of the genitalia. While these organs afford excellent specific and generic characters, they are of minor value in the larger classification of this family.

² The only genera upon which information essential to this inquiry is lacking, are *Letourneuxia* (Algeria), *Anadenulus* (California), and *Cryptostrakon* (Costa Rica). The last-mentioned may belong elsewhere.

retractor (*ph.r.*), ocular and tentacular retractors (*er.*), retractor of the penis (*p.r.*), retensor (*ret.*). The pharyngeal, pedal and tentacular retractors are inserted proximally upon the columella in snails, at or behind the posterior edge of the diaphragm upon the body-wall in slugs. Sometimes pharyngeal and ocular retractors unite posteriorly into one trunk (Limacidæ), sometimes remain separate throughout (Arionidæ, Philomycidæ). From loss of function the pedal retractor has degenerated in slugs, but the problematic muscle, called by Simroth the *retensor*, is supposed by Mr. Vanatta and myself to be perhaps the pedal muscle changed in position and function.

In the more primitive genera of Arionidæ, the pharyngeal and ocular retractors converge posteriorly and are inserted in a compact group (Pl. VII, Fig. 4, *Ariolimax*); in the more modified genera they are subparallel, with widely separated insertions (Pl. VII, Fig. 1, *Anadenus*). Other details will be found below.¹

Before proceeding to discuss the classification of Arionidæ, the presentation of some notes on little-known genera may be permitted, chiefly on account of the anatomy of *Anadenus*. This interesting Himalayan slug, rivalling the *Ariolimaces* in size, has been dissected by Lieutenant-Colonel Godwin-Austen; but since I am able to supplement his account by descriptions and figures of the digestive system and musculature, and since my observations upon some other points do not wholly correspond with his results, it has seemed worth while to give the anatomy as completely as I could work it out from the single specimen at my disposal.

Genus ANADENUS.

The specimen examined was collected by M. M. Carlton on "Beas River, thirty-five miles from the entrance of river into the plains, within the lower mountains, October 4, 1870."² It measures 80 mm. in length, the greatest breadth of its sole being 25 mm.

Twenty-eight years in alcohol have not left much colour, but what there is resembles Godwin-Austen's figure.³ The integument of this specimen is remarkably loose and sack-like, so relaxed that surface-markings are almost effaced. The foot-margin is narrower than in any other slug of the family; and no trace of longitudinal division can be seen on the sole. The stout calcareous shell is broken, but evidently was somewhat longer than the kidney. Semper's organ

¹ See also Pilsbry & Vanatta, Revision of American Slugs, II. The greater part of our knowledge of slug musculature has hitherto been due to Dr. H. Simroth, who in several papers has described and figured the muscles of various genera; and though he has not incorporated myologic characters in his generic diagnoses, still he treats them as of generic constancy. This estimate is fully supported by our own observations. The musculature shows but little variation within the limits of a genus, and even affords family characters of high value.

² This is not far from Simla, toward the north. I owe to Professor A. Agassiz, of the Museum of Comparative Zoology, the opportunity of dissecting this slug. The preparations are now in that museum.

³ Land and Fresh-water Mollusca of India, vol. i, pl. vi, fig. 1.

was not seen, and if present must be small. The suboral gland is long, and lies loosely attached to the sole wall, as in *Ariolimax*.

The genitalia (Pl. VII, Fig. 5) lie somewhat as in *Ariolimax*, mainly anterior, but the ovotestis is widely separated from the albumen gland, lying behind the end of the stomach, under G^3 (Fig. 3) and over G^4 , enclosed by but not imbedded in the liver. The penis is 20 mm. long, somewhat swollen below, contracted near the middle, and enlarged above, the retractor and epiphallus terminal. Epiphallus long, much convoluted. When pulled straight it measures 85 mm. from apex of penis to base of same.

Slitting the penis longitudinally (Pl. VII, Fig. 6), the lower portion of the cavity shows a peculiar system of slender acute fleshy processes, arranged on longitudinal rugæ. These probably secrete a calcareous organ, as described by Godwin-Austen. Above this it is fairly smooth, and then finely and densely rugose-reticulate longitudinally; in the swollen upper portion this passes into a coarse granular pattern, and the walls thicken. Attached distally in the lumen there is a large, bluntly conic papilla, granular on the exterior.

The vagina is short, with the usual longitudinal wrinkles inside. Spermatheca duct extremely short, abruptly widening into a very capacious, oblong, thin-walled spermatheca. The wrinkles of the spermatheca duct enlarge and become villose or arborescent just within the spermatheca. The latter contained a quantity of calcareous, amorphous granules in the specimen examined.

The free oviduct is long; albumen gland, of light chestnut colour, cut superficially into unequal lobules. The ovotestis is small, subglobose, of a bluish-black colour.

The digestive tract (Pl. VII, Fig. 3) resembles that of *Prophysaon*, thus differing widely from that of *Arion*. G^1 not differentiated into crop and stomach; G^2 and G^3 forming a long anterior loop, twisted through half a circle; G^3 and G^4 extending far below the stomach, and twisted one revolution.

Jaw arcuate, with about fourteen broad flat ribs with very narrow intervals. Each rib shows one, or several thickened lines, or incipient plaits.

Radula (Pl. VII, Fig. 7) with 57 : 1 : 57 teeth; rachidian teeth with rather long mesocones and well-developed ectocones; laterals similar except for lack of entocones; marginal teeth narrow, with longer cusps, the ectocone small and basal but distinct.

Musculature (Pl. VII, Fig. 1), Arionine. Buccal retractor bifurcate for two-thirds its length, inserted proximally in the middle of the posterior margin of the diaphragm. Ocular retractors inserted remote from it (the figure is drawn from measurements) on the same margin. Retractor of the penis short, inserted at the posterior edge of diaphragm to the right of the left ocular retractor. Tentacular branches not seen.

Pallial organs (Pl. VII, Fig. 2) substantially as described by Godwin-Austen for *A. altivagus*. The principal differences between our specimen and Godwin-Austen's *A. altivagus* are:—(1) In the genitalia, the penis is less enlarged below, contains no calcareous

spines or other processes; is less constricted mesially, and evidently is somewhat more swollen distally, with a larger papilla. The epiphallus is more kinked. The duct of the spermatheca is very much shorter, the spermatheca itself longer. (2) In the muscles, the pharyngeal retractor is not split to its base as Godwin-Austen's figure shows; the retractor of the penis is not inserted to the right, but to the left, of the pharyngeal retractor; and the ocular retractors are more widely separated.

These differences may be due to two causes: individual, or specific variation, and inaccuracy of the published figures. The divergence in proportions of the reproductive system I do not hesitate to attribute to individual variation. The lack of calcareous spines in the basal portion of the penis, as figured by Godwin-Austen, is probably due to the state of the specimen; mine being collected in October, when the organs were probably not functionally active. Perhaps the spines are broken off and lost during the period of reproduction, like the darts of *Helices*; although here the resemblance ceases, for I do not see the slightest reason for considering these spines homologous with true darts, as suggested by Godwin-Austen.

Regarding the different arrangement of the muscles, and especially the retractor of the penis, I can only suppose that Godwin-Austen wrongly identified them. In no slug known to me is the retractor of the penis inserted to the right of the pharyngeal retractor, as figured by him; and most assuredly this is not the case in the *Anadenus* before me.

With these matters explained, there is no reason against the reference of this slug to *A. altivagus*, Theob., as defined anatomically by Godwin-Austen. So far as I can see, *A. Schlagintweiti*, Heyn., has no differential characters, and is probably identical. *A. giganteus* differs conspicuously in dentition, in the obsolescence of the ectocones, and great length of the mesocones. *A. Jerdoni*, G.-A., *A. Blanfordi*, G.-A., and *A. modestus*, Theob., are still unknown anatomically.¹

Judged by the arrangement of its retractor muscles, *Anadenus* belongs to that division of Arionidæ in which *Arion*, *Geomalacus*, and *Prophysaon* are leading genera. It differs from all of these, however, in possessing a normal penis. *Arion* and *Geomalacus* are further removed from *Anadenus* and all other Arionidæ by the more posterior insertion of the pharyngeal retractor muscle, which has moved backward from its normal position at the posterior edge of the diaphragm, and by the arrangement of the intestinal tract, the first posterior loop being decidedly the longest, while in *Anadenus* and all other Arionidæ it is the second posterior loop, that formed by G³ and G⁴, which extends backward notably beyond the other.

Anadenus, then, is a much more primitive genus than any of the European Arionidæ. It resembles the American *Prophysaon* in its muscles and has the same type of intestine, though somewhat longer

¹ See Godwin-Austen's useful monograph, t.e., pp. 46-55, pls. vi, vii; and Cockerell, Ann. and Mag. N. H., ser. vi, vol. vi, p. 277.

and consequently more twisted; but it differs in having a penis. In this character, and the long cusps of the teeth, *Anadenus* resembles the less specialized American genera *Ariolimax* and *Hesperarion*.

In brief, *Anadenus* is more closely allied to *Prophysaon* than to any other known genus, but in the developed penis shows distinct affinity to *Hesperarion*. Clearly belonging to the Arioninæ, on account of the specialized condition of the retractor system, it is in a more primitive stage than any other known member of this subfamily.

Genus GEOMALACUS.

The elaborate treatment of this genus by Simroth,¹ Scharff,² and Godwin-Austen³ leaves little to be desired. It is essential, however; to correct one current error in the interpretation of the genitalia, so that an apparent anomaly may be explained, and the true affinities of the genus be made clearer.

Those who have dissected *Arion* have noticed that the spermatheca duct enters the atrium between the oviduct and the epiphallus, and that it is provided with a retractor muscle. Now in *Geomalacus* the atrium on the side where the epiphallus enters has been pulled out into a long sack, carrying with it the epiphallus and spermatheca, and simulating a penis so perfectly that it has generally been regarded as a penis carrying the spermatheca, and its retractor has been called a retractor of the penis; whereas this supposed penis is wholly secondary, being an elongated portion of the atrium, and its retractor is the exact homologue of the retractor of the spermatheca in *Arion*, the resemblance to a retractor of the penis being only one of analogy, not of homology. It is inserted far behind the diaphragm, not upon it or at its edge, as the true retractor of the penis is. In this genus, therefore, part of the atrium acts as a penis.

The objection to calling this secondary penial structure a penis is twofold: first, that its purely secondary and recent origin would be lost sight of; and second, that it is not morphologically equivalent to the original penis, because a greater portion of the atrium composes it, that part normally bearing the spermatheca being added to the portion primitively penial. It is, however, extremely interesting to find a Pulmonate in which the primitive penis, inherited from Tectibranch ancestors, has been lost, doubtless by gradual shortening, and in which the associated retractor mechanism has disappeared; whilst the penial function has been shifted to the atrium (as in some Arions, and probably the ancestor of *Geomalacus*), or even the vagina (*Prophysaon*) or oviduct (*Arion*); and a new "penis" has been formed by the elongation of a portion of the atrium, with a new retractor muscle, morphologically totally diverse from the original retractor of the penis, appropriated from the female side of the genital system.

¹ "Die Nacktschnecken der Portugiesisch-Azorischen Fauna": Nova Acta Acad. Cæs. Leop.-Carol. Germ. Nat. Cur., tom. lvi, p. 351.

² "The Slugs of Ireland": Trans. Roy. Dublin Soc., ser. II, vol. iv, p. 551.

³ Land and Fresh-water Mollusca of India, vol. i, pp. 60-64, pl. xii, figs. 1-8.

I would only add here that the musculature of the tentacles and pharynx, as well as of the intestine, is, according to Simroth, typically that of *Arion*, the buccal retractor being inserted well behind the diaphragm as it is in *Arion*, but in no other genus of the family.

Genus LETOURNEUXIA.

This Algerian genus, or subgenus of *Arion*, still awaits anatomic characterization. It seems to differ from *Arion* in the strong, thick "limacelle," and the peculiar tail, which according to Bourguignat has no caudal gland (doubtful!), but the integument, posteriorly, is laterally expanded, free along the pedal grooves, and overhangs the sole on each side. If the type of *L. Numidica* be normal and not pathologic, these special features give the slug generic rank, even though the genitalia may prove to be like those of *Arion*.

CLASSIFICATION.

A profound student of the slugs wrote in 1885 of *Arion* as follows: "Die Gattung hat niemals eine Schale gehabt, niemals eine höhere Stufe der Beschalung erreicht, als sie jetzt hat *Arion* trägt alle Merkmale ursprünglichen Unbeschaligkeit an sich seine Vorfahren aus anderen Wurzel dem Wasser entsprossen."¹ This startling conclusion was based largely upon the fact that in *Arion* the system of retractor muscles bears but little resemblance to that of the snails, or such slugs as *Limax*, *Urocyclus*, or the numerous other slug and semi-slug derivatives of the Zonitidæ. The concentration into one or two main muscle bands posteriorly has been quite lost in *Arion* and its immediate allies.

When the Ariolimacine genera are taken into account, however, the anomalous myology of *Arion* is explained; and that genus takes its place as the terminal member of a series of forms beginning with *Bimneya*, half slug, half snail, with nearly the musculature of the snails, and passing by numerous intermediate stages still existing, to the abnormal *Arion* type. As a whole, the Arionidæ not only do not possess the characters of primitive shell-less forms, "Unbeschaligkeit," but the series of recent genera unmistakably indicates their descent from a group with well-developed spiral shell. It is to the Endodontidæ, a group which earlier had thrown off the slug-family Philomyxidæ, that we look for the ancestral root of the Arionidæ; just as the Limacidæ came from Zonitid stock,² and all form a primitive Aulacopod branch.

The direction of evolution in the Arionidæ has been mainly (1) from forms with the tail solid, as in snails, to those with it excavated and

¹ Dr. H. Simroth: Zeitschr. f. Wissensch. Zool., Bd. xlii, pp. 251, 252.

² These latter statements stand at present unsupported, because while the evidence is largely worked out, I have not yet had time to elaborate it for publication.

invaded throughout by the body-cavity. (2) The original concentration of the retractor muscles posteriorly, gives way to the tendency toward separated, independent insertions. (3) The shell becomes flat, buried, and finally reduced to incoherent granules. (4) The penis degenerates, and its function is assumed by other organs.

The shortening of the kidney I regard as of less significance, since it is a mechanical result of the shortened lung by the reduction of shell and mantle.

The separation of the ocular retractor muscles is probably traceable to a mechanical cause; the degenerate shell no longer affords any better fulcrum than the rest of the integument, and the oblique stress on these muscles tends to pull them apart.

The degeneration of the penis, while a marked feature in Arionidæ, is not peculiar to the family, occurring also in Helicidæ and elsewhere. This modification, it is demonstrated, occurred independently in several genera of the family.

The ground having been thus cleared, so far as at present possible, it remains to construct a classification which shall express the ascertained relationships and phylogeny of the genera. To avoid repetition, the characters of the genera of Binneyinæ and Ariolimacinæ are here much abridged, because they have been given in full elsewhere;¹ the Arioninæ, comprising all known old-world genera of the family, being more fully exploited.

SYNOPSIS OF SUBFAMILY AND GENERIC CHARACTERS.

A. Retractor muscles of tentacles converging backwards, their posterior terminations with that of the pharyngeal retractor, contiguous, inserted in a group at the posterior edge of the diaphragm mesially. (Pl. VII, Fig. 4.)

b. Tail solid, the viscera crowded forward and elevated into a dorsal hump; shell partly or wholly exposed; penis present, with retractor muscle; ovotestis posterior in the body-cavity; a retensor muscle present.

Subfamily BINNEYINÆ.

c. Sole tripartite; shell *Vitrina*-shaped, wholly exposed, with differentiated nepionic whorl. *Binneya*.

c'. Sole undivided; shell a flat or convex, non-spiral plate, partially covered, etc. *Hemphillia*.

b'. True slugs, the foot excavated throughout, body-cavity and viscera extending to tail; shell flat, wholly buried; ovotestis anterior to posterior loop of intestine; intestine long, spirally twisted; main cusps of the side teeth lengthened.

Subfamily ARIOLIMACINÆ.

c. Retensor muscle present; ovotestis anterior to stomach; no appendicula on genitalia.

¹ Pilsbry & Vanatta, "Revision of the American Slugs": Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 227.

d. No penis, its function shifted to the vagina.

Aphallarion.

d'. Penis large, introverted apically, with large retractor.

Ariolimax.

e'. No retensor muscle; ovotestis behind stomach; an appendiculum on the atrium.

Hesperarion.

B. Retractor muscles of pharynx and tentacles running parallel, the posterior insertions of the latter widely separated on the posterior margin of the diaphragm (Pl. VII, Fig. 1). True slugs with a small, flat internal shell plate, or vestige, and long visceral cavity.

Subfamily ARIONINÆ.

b. Pharynx retractor inserted at the posterior margin of diaphragm; second posterior loop of the intestine extending far behind the first loop.

c. Penis well developed, with normal retractor; intestine rather long, twisted; foot-margin extremely narrow; no caudal gland; sole not distinctly tripartite.

Anadenus.

e'. No penis, its function assumed by the vagina; intestine but slightly twisted; caudal gland small or none.

d. Sole not in the least tripartite; end of tail subject to self-amputation; epiphallus more or less swollen, suddenly constricted before entering the atrium; both chambers of the heart exposed.

Prophysaon.

d'. Sole tripartite, the narrow median field defined by longitudinal grooves; tail normal; kidney concealing the auricle. (Genitalia unknown.)

Anadenulus.

b'. Pharyngeal retractor inserted decidedly behind the posterior margin of the diaphragm; intestine long, twisted, the first posterior loop extending well behind the second; no true penis; a small caudal gland.

c. Shell more or less incoherent; genital orifice posterior, below the breathing pore; epiphallus tapering; spermatheca duct inserted on atrium, the oviduct functional as a copulatory organ, with a retractor muscle.

Arion.

e'. Shell strong, thick; genital orifice anterior; integument laterally expanded, free and overhanging the sole posteriorly.

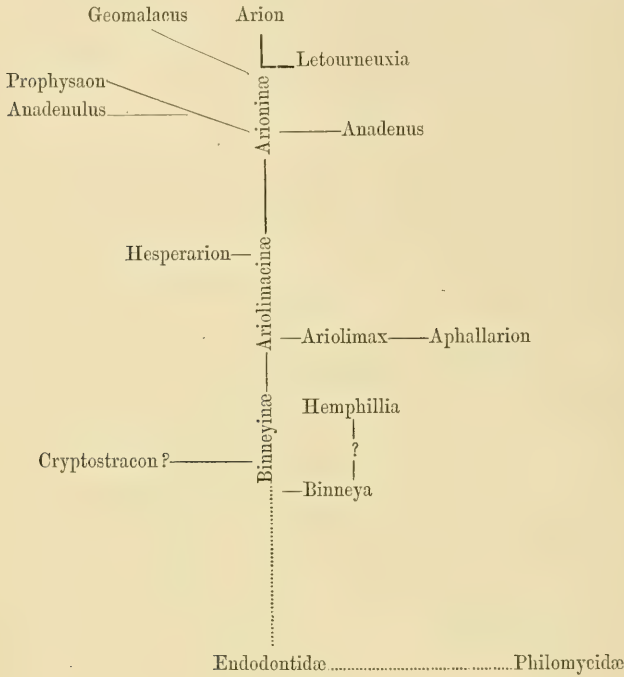
Letourneauxia.

e''. Shell strong, solid; genital orifice anterior; atrium pulled out into a long sack carrying the spermatheca and epiphallus, and functional as a copulatory organ.

Geomalacus.

The arrangement of genera proposed above is graphically represented in the following diagram, which is intended to represent the phylogeny of the group. As might be expected, none of the more primitive genera stand directly in the line of descent, although

Anadenus, *Hesperarion*, *Ariolimax*, *Hemphillia*, and *Binneya* are very near it, each being barred by some special modification which cannot reasonably be attributed to the ancestral forms, such as the extremely narrow foot-margin in *Anadenus*, the introverted penis in *Ariolimax*, the unusual insertion of the retractor of the penis in *Hemphillia*, etc.



Regarding the position here ascribed to *Philomyces*, further observations will be published before long. It need only now be said that the specialization of the muscles has followed much the same course as indicated in *Arion*, but has proceeded further. Simroth's conclusion that "die Mantelhöhle sich mit dem Mantel zusammen colossal erweitert hat, so dass sie diesen in ganzer Länge vom Körper trennt, denn bei einer Nacktschnecke kann unter Mantelhöhle wohl nur die Schalentasche verstanden werden," seems to require revision. The lung, or mantle-cavity proper, is not enlarged in *Philomyces*; but the empty shell-sack, which is separated from the lung-cavity by an imperforate membrane, is nearly coextensive with the mantle. The two cavities—that of the shell formed by invagination from the outer surface of the mantle, and that of the lung excavated beneath the mantle—are of totally distinct genesis, and, so far as my observations go, they never coalesce, although in many forms they lie in close proximity.

DISTRIBUTION OF ARIONIDÆ, PAST AND PRESENT.

The geographical range of the family Arionidæ is discontinuous, with three widely separated areas: the European, with its highest development in the West of Europe; the Himalayan; and the West American. These three centres have no genera in common, nor does any genus occur in more than one of them.

The West American centre supports the greatest number and variety of genera, including all known Binneyinæ and Ariolimacinae (five or six genera) and two of the six genera of Arioninæ. The Himalayan area has only the genus *Anadenus*, which, as we have seen, is the least differentiated genus of Arioninæ. The European centre has the three genera *Arion*, *Letourneuxia*, and *Geomalacus*, all decidedly more nearly related to each other than to any other genus, and forming the most modified group of the family.

It appears from these data that all the primitive genera are American, including one, *Binneya*, which in its spiral, external shell with sculptured nepionic whorl, its short body-cavity and solid tail, may reasonably be regarded as a connecting link with the Endodontidæ. All non-American genera belong to the most divergent subfamily of the group. An American genesis for the Arionidæ is therefore an extremely probable theory; and we may with good reason hold that all the more important modifications of the stock, including the differentiation of the three subfamilies, took place upon American soil. The emigration to Asia *via* an Alaskan land-bridge may well have been contemporaneous with the immigration of Belogonous Helicidæ into America by the same route. The Arionine incursion into the Palæarctic region was not spent until its western limit was reached; but the Asiatic immigrants have subsequently been exterminated, with the single exception of *Anadenus*, partly perhaps by the increasing rigour and dryness of Asiatic climate north of the Himalayas.¹ From the sole Asiatic survivor, which probably represents the most southern outpost of the incursion, it seems likely that at the time of the westward spread of Arioninæ from America, the group still was characterized by the well-developed penis of the early Arionidæ; and that the degeneration of the penis with the concomitant shifting of its function to the atrium, vagina, or oviduct, has been a later modification, undergone independently by American and European genera. Such a conclusion is based, not alone upon the morphology of the geographically intermediate genus *Anadenus*, but upon the fact that an appreciable diversity is apparent among the genera; in *Arion* the free oviduct having assumed the function of the lost penis, while in *Geomalacus* it is the modified atrium, in *Prophysaon* the vagina.² In the Arioninæ which reached Europe, as in the Belogonous

¹ It remains to be seen whether other Arionine slugs may not still exist in some part of this vast and little-known area.

² There are other instances in abundance of the loss of penis and assumption of its function of copulation by other organs: *Limax primitivus*, many species of *Cepolis*, some Papiunas, etc., etc.

Helices, various modifications ensued, resulting in the, structurally, most extreme forms of the family; the genitalia, intestinal tract, and shell all being affected. It has been the same with Helicidæ; the primitive East Asian *Belogona* of the *Eulota* type becoming modified in the west into the *Belogona Siphonadenia*, peculiar to the European faunal area.

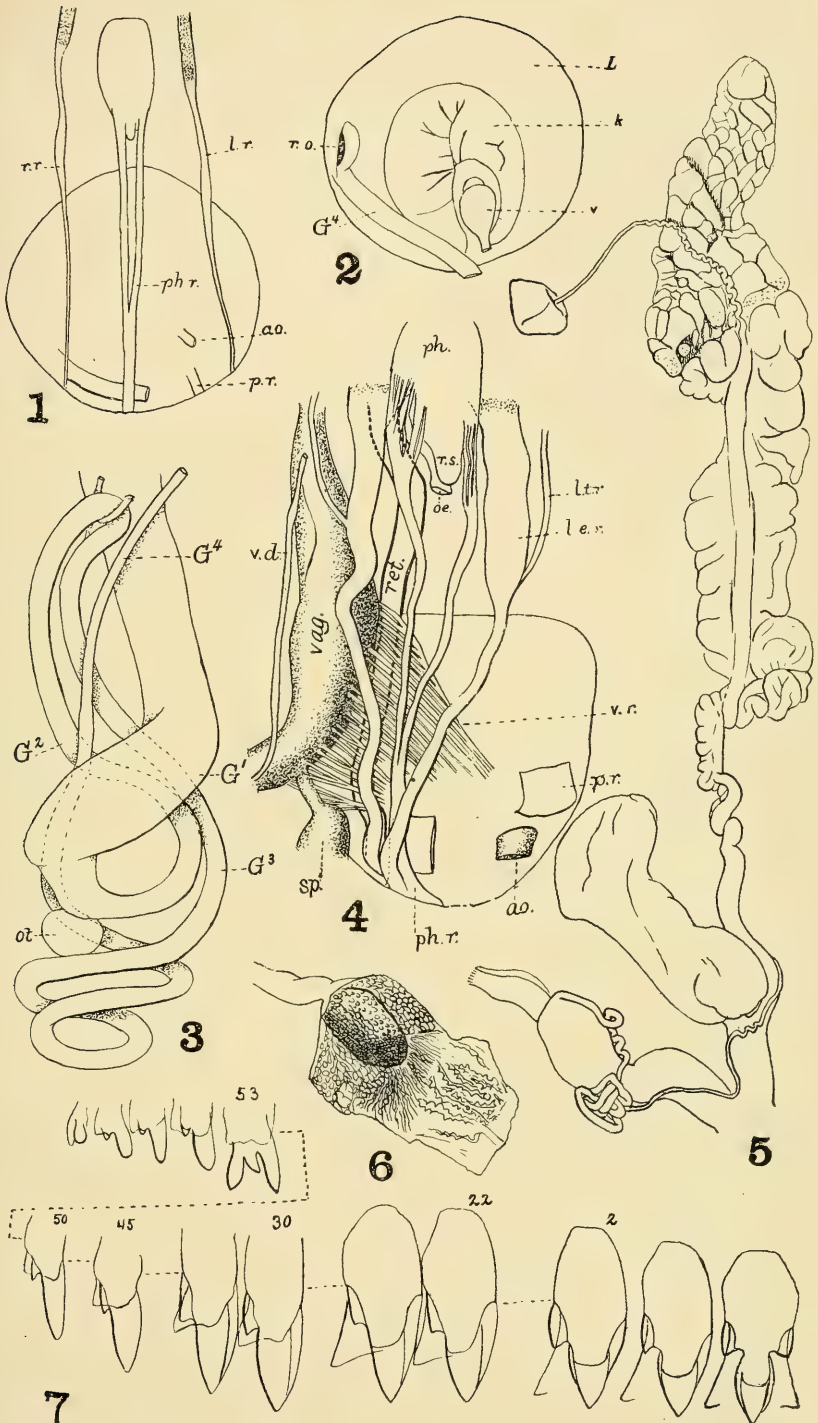
That the theories here outlined are the reverse of Dr. Simroth's opinion that the European Arionidæ had their centre of distribution in the extreme west of that faunal region, is largely due to the fact that he had not dissected the truly primitive American genera, and naturally drew his conclusions from the highly modified European forms.

EXPLANATION OF PLATE VII.

(Figs. 4, 5, and 6 drawn by E. G. Vanatta; the others by the author.)

- FIG. 1. *Anadenus altivagus* (Theob.): retractor muscles and outline of diaphragm.
 ,, 2. The same: pallial region from below, the diaphragm removed.
 ,, 3. The same: digestive tract.
 ,, 4. *Ariolimax columbianus* (Gld.): retractor muscles, from below.
 ,, 5. *Anadenus altivagus*: genitalia.
 ,, 6. The same: penis opened.
 ,, 7. The same: teeth. The 53rd tooth is abnormal.

ao. aorta; *G*¹⁻⁷, intestine, first, second, third, and fourth folds; *k.* kidney; *L.* lung; *l.e.r.* and *l.r.* left ocular retractor muscle; *l.t.r.* left tentacular retractor; *a.* œsophagus; *ot.* ovotestis; *ph.r.* pharyngeal retractor muscle; *p.r.* retractor of the penis; *ret.* "retensor" or cephalic retractor muscle; *r.o.* respiratory orifice; *r.r.* right tentacular retractor; *r.s.* radula sack; *sp.* spermatheca; *v.* ventricle; *vag.* vagina; *v.d.* vas deferens; *v.r.* vaginal retractors, inserted upon the diaphragm.



ANATOMY OF ARIONIDÆ.

MALACOLOGICAL SOCIETY OF LONDON.

INCOME AND EXPENDITURE FOR THE YEAR ENDING 31st DECEMBER, 1897.

Dr.	£ s. d.	Cr.	£ s. d.
To Balance from last year	29 4 1	By Cost of "Proceedings"—	
Annual Subscriptions—		Printing and Postages	£73 5 6
Ordinary Members	£37 5 6	Illustrating	25 15 0
Corresponding Members	15 16 6		99 0 6
Annual Subscriptions in arrear—	53 2 0	Printing Circulars, etc.	2 10 0
Ordinary Members	£2 2 0	Postages and Stationery	4 19 1
Corresponding Members	2 14 0	Gratuities to Attendants, etc.	2 10 0
Annual Subscriptions in advance—	4 16 0		
Ordinary Members	£3 13 6		
Corresponding Members	1 8 5		
Entrance Fees	5 1 11		
Life Membership Subscriptions	7 7 0		
Donations for Illustrations	12 12 0		
Advertisements in "Proceedings"	9 0 9		
Sale of "Proceedings"	5 15 0		
Dividends on £50 Metropolitan 2½% Stock	7 13 0		
	1 5 0	Balance in hand	26 17 2
	<u>£135 16 9</u>		<u>£135 16 9</u>

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.
15th January, 1898.

(Signed) { HENRY WOODWARD.
 { WALTER CROUCH.

ANNUAL GENERAL MEETING.

FRIDAY, 11TH FEBRUARY, 1898.

Professor G. B. HOWES, LL.D., F.R.S., etc., Vice-President, in the Chair.

Mr. A. S. Kennard and Mr. H. B. Preston were appointed Scrutineers. The following Report was read:—

“Your Council, in presenting their fifth Annual Report, have to chronicle a year of steady progress.

The Membership of the Society continues to increase, and the roll on December 31st stood as follows:—

Ordinary members	.....	.....	.....	.....	.....	96
Corresponding members	.....	.....	.....	.....	.....	77
				Total	.....	173

the totals for the two preceding years having been 162 in 1896, and 158 in 1895.

During the past year sixteen new Members have been elected, and five have resigned. It is pleasant not to have to record any death amongst the Members. One Member has been transferred from the Corresponding to the Ordinary list, while two candidates awaited election at the close of the year.

The finances of the Society are still in a flourishing condition. After payment of all liabilities there remains a balance of £26 17s. 2d. in the Treasurer's hands. In addition to the above, the sum of £50 still remains invested in Metropolitan 2½ per cent. stock.

The Presidential Address was delivered on February 12th, 1897, and twenty-seven communications by fourteen 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 completion of Vol. II, and comprising 182 pages, including the index, title-page, contents, and list of illustrations; and containing seven plates and numerous illustrations in the text.

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 drawings: Lieut.-Col. H. H. Godwin-Austen, W. T. Bednall, W. E. Collinge, J. Cosmo Melvill, R. Murdoch, H. M. Phipson, J. H. Ponsonby, E. A. Smith, 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.

Your Council have to regret the serious loss which the Society has sustained in the retirement of Mr. E. R. Sykes from the post of Honorary Secretary, which he has so ably filled since the foundation of the Society.”

On the motion of Mr. A. S. Kennard, seconded by Mr. H. B. Preston, the above was adopted as the Annual Report of the Society.

The following were elected Officers and Council for the year 1898:—

President.—Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc.

Vice-Presidents.—Professor G. B. Howes, LL.D., F.R.S., etc.; J. Cosmo Melvill, M.A., F.L.S., etc.; E. A. Smith, F.Z.S., etc.; Dr. H. Woodward, F.R.S., etc.

Treasurer.—G. F. Harris, F.G.S., etc.

Secretary.—M. F. Woodward.

Editor.—B. B. Woodward, F.L.S., etc.

Six other Members of Council.—H. W. Monckton, F.L.S., etc.; R. Bullen Newton, F.G.S., etc.; G. B. Sowerby, F.L.S., etc.; E. R. Sykes, B.A., F.Z.S., etc.; Rev. R. Boog Watson, LL.D., F.Z.S., etc.; Lieut.-Col. L. W. Wilmer.

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

ORDINARY MEETING.

FRIDAY, 11TH FEBRUARY, 1898.

Professor G. B. Howes, LL.D., F.R.S., etc., Vice-President, in the Chair.

Dr. Landis was elected to membership of the Society.

The following communications were read:—

1. "Descriptions of two new species of *Clausilia* from the province of Che-kiang, China." By E. R. Sykes, F.Z.S., etc.
2. "List of the species of *Cataulus* found in Ceylon, with descriptions of some new Land-Shells from that Island." By E. R. Sykes, F.Z.S., etc.
3. "Notes on the genus *Coxiella*." By E. A. Smith, F.Z.S., etc.
4. "Note on *Cypræa caput-anguis*, Philippi, with the description of a new variety of *C. caput-serpentis*." By Mrs. A. F. Kenyon.

Mr. A. S. Kennard exhibited and made remarks upon additional mollusca from the Ightham Fissure.

Mr. G. B. Sowerby exhibited a new and as yet unnamed Proso-branch from South Africa; he pointed out that the animal in its radula and protoconch resembled the genus *Voluta*, but in the general character of the shell it was quite unlike that form. Mr. M. F. Woodward made some remarks upon the anatomy of this animal, pointing out its great resemblance to *Voluta*.

Specimens were exhibited in illustration of the papers read.

ORDINARY MEETING.

FRIDAY, 11TH MARCH, 1898.

Lieut.-Col. H. II. GODWIN-AUSTEN, F.R.S., etc., President, in the Chair.

Mr. J. E. S. Moore opened a discussion upon the Mollusca of Lake Tanganyika, with especial reference to their affinities.

He pointed out that the problem of the nature, and especially of the origin, of the halolimnic fauna of Lake Tanganyika could be attacked from three distinct directions, or in three methods. These were:—firstly, the evidence afforded by the characters, i.e. the anatomy, of the halolimnic animals themselves, and this he regarded as the most important line of research; secondly, the results of an investigation into the geographical distribution of these forms; and thirdly, such evidence as could be gathered by a comparison of the halolimnic shells with fossil forms.

The results of a morphological examination of the halolimnic animals had made it evident that the fauna of Lake Tanganyika was to be regarded as composed of two series, each entirely distinct in its origin and nature from the other.

The anatomy of the genera *Typhobia* and *Bathania* showed that neither of these forms could be regarded as belonging to the Melaniidæ, but must rather be considered as something akin to a *Pterocera* with a foot that had not been specialized. In the same way the genera *Spekia*, *Tanganyicia*, *Paramelania*, *Nassopsis*, and *Bythoceras* all distinctly foreshadowed in their anatomy the characters of different living forms. Thus, *Tanganyicia* appeared to represent an older type of *Littorina*, with a Cerithoplanaxoid radula; *Spekia* was a Naticoid of a primitive type; while the Paramelianian group exhibited the nervous system of the Cyclophoridæ, but were at the same time indistinguishable conchologically from the old Jurassic marine genus *Purpurina*.

It would thus appear from morphological considerations that the halolimnic molluscs were to be regarded as a collection of extremely ancient oceanic forms.

The distribution of these animals showed that they were exclusively restricted to Tanganyika, and thus confirmed the view that they had nothing in common with the normal fresh-water forms distributed in all the other great African lakes.

It was thus rendered inconceivable that the halolimnic forms could have arisen under the action of ordinary conditions; whilst it was equally clear that they could not be regarded as the survivors of an old fresh-water stock: for were either of these suppositions accepted it would be necessary, on account of their distribution, to believe also that the halolimnic group of animals had been destroyed in every African lake but one; a supposition which might be ingenious, but which, when the number of lakes existing in the African interior was fully realized, became grotesque.

To the halolimnic animals there thus attached the unique interest that they themselves constituted the few surviving indications of an old sea which once extended into the interior of Africa, and which, judging from the singular identity of many of the halolimnic shells with those occurring in the Jurassic seas, must have been of a fairly ancient date.

In the discussion which ensued,

Dr. J. W. Gregory stated his belief that Tanganyika was the oldest of the great African lakes. He supposed that this halolimnic fauna had occurred in the other lakes, it being easy to imagine this fauna to have been exterminated in them by an application of the physical changes now observed to be taking place in certain of them, as for instance Lake Stephanie, which, since its discovery, had been observed to be at one time very salt and at another time very fresh. If such great changes could occur in one lake within a period of about seven years, it was easy to understand how a group of animals could have been exterminated from it. If, however, the whole facies of the fauna could be shown to be of a marine type, then perhaps it would be justifiable to regard this halolimnic fauna of Lake Tanganyika as a marine derivative.

Dr. W. T. Blanford said that one fact appeared to be most conspicuous, viz., that this fauna was a very old one, especially when it appeared that these forms commonly showed affinities between several very different marine forms, but did not directly resemble any individual living genus. Undoubted marine faunas found in inland waters did not differ from those of adjacent seas, e.g. the Caspian and the Black Sea. If Tanganyika had been recently separated from the sea, it ought to be possible to find the channel of communication, which at present was not the case: the Congo did not appear to represent such a channel, since it seemed to have only recently opened out; neither did the Rift Valley, which had been too recently formed.

Mr. W. H. Hudleston said that the comparison which had been instituted by Mr. Moore between these halolimnic gastropods and certain Jurassic forms, appeared to him perfectly justifiable, *Bathanalia* being in his opinion generically, if not specifically, identical with a species of *Amberlyia* from the Inferior Oolite. The same was true of the genera *Paramelania* and *Nassopsis*, which were almost indistinguishable from the Jurassic *Purpurina*; the halolimnic form *Limnotrochus* also closely resembled the Jurassic genus *Onustus*. He, however, drew attention to the fact that none of these Jurassic forms had a very wide range in time; *Purpurina*, which lasted longer than the others, apparently died out in the Callovian.

The following gentlemen also took part in the discussion: Dr. H. Woodward, H. W. Burrows, J. C. Melvill, S. I. da Costa, M. F. Woodward, and Lieut.-Col. Godwin-Austen.

Mr. J. C. Melvill exhibited a great variety of specimens of *Planorbis spirorbis*, Linn., which had been collected near Tenby, Pembrokeshire, in almost stagnant water, by Mr. A. Stubbs. By far the greater number were distorted, some assuming scalariform, some an evolute, others a turbinate shape. Assuming the species of this genus to be sinistral, it was astonishing to find but few monstrosities of the scalariform type possessing other than a dextral torsion. It is imagined that the aberration of form occurs most frequently in stagnant ditches or ponds choked with *Confervæ*, or with Duck-weed, so that the mollusc is thus able more easily to make progress through such obstruction.

Mr. E. R. Sykes exhibited one of Dr. Menke's exchange lists, which he believed to be the earliest exchange list extant.

Mr. Gude exhibited photographs of the types of *Plectopylis anguina*, Gould, *P. repercussa*, Gould, and *P. refuga*, G.-Aust., in the New York

State Museum, Albany, N.Y. These forms had never been figured, and the diagnoses being too vague, they had been misunderstood by most conchologists. *P. repercussa* had been considered by several eminent authorities to be synonymous with *P. achatina*, Gray, while *P. refuga* was thought to be the same as *P. leiophis*, Benson. The photographs, supplemented by sketches and notes, furnished by Dr. Merrell and Dr. Bagg, of the New York State Museum, established beyond doubt that all three forms described by Dr. Gould were distinct from their congeners. Specimens of all these forms, except *P. refuga*, were exhibited.

Mr. S. I. da Costa exhibited mollusca from the great African lakes; Mr. J. E. S. Moore exhibited mollusca from Lake Tanganyika.

ORDINARY MEETING.

FRIDAY, 15TH APRIL, 1898.

Dr. H. WOODWARD, F.R.S., etc., Vice-President, in the Chair.

J. R. Masefield was duly elected to membership of the Society.

The following communications were read:—

1. "On some new species of Land-Shells from South America." By S. I. da Costa.
2. "Note on the Anatomy of *Resania*, Gray, and *Zenatia*, Gray." By W. H. Dall.
3. "Note on the Anatomy of *Mulleria*." By M. F. Woodward.

Mr. E. A. Smith exhibited a specimen of *Pleurotomaria Beyrichii*, preserved in spirit with the animal intact and well extended. This he remarked was the only specimen with the animal, which had come into this country. The specimen was examined when alive by Professor Mitsukuri, who published a short description of its characteristics.

Mr. E. R. Sykes exhibited and made remarks upon a series of *Achatinella*, showing great colour variations.

Mr. M. F. Woodward exhibited and commented on a series of molluscs preserved in an extended condition. He further alluded to the various methods for killing and preserving molluscs in this condition.

Mr. S. I. da Costa exhibited specimens in illustration of his paper.

NOTE ON A VERY LARGE SPECIMEN OF *HIPPOPUS HIPPOPUS*
AND ON LARGE SPECIMENS OF *TRIDACNA GIGAS*.

By EDGAR A. SMITH, F.Z.S., etc.

Read 13th May, 1898.

WHAT may be regarded as full-grown specimens of this species usually average from 6 to 9 inches in length, and the largest hitherto recorded measured 10 inches. Küster,¹ in his Monograph of this genus, gives $6\frac{1}{2}$ inches as the length, whilst the Rev. J. E. Tenison-Woods² observed a specimen upon the reefs at Port Douglas, N.E. Australia, which was 10 inches long. The largest example in the British Museum is $9\frac{3}{4}$ inches in length, 19 in circumference, and weighs 4 lbs. 5 ozs., whereas a specimen recently acquired from the Philippine Islands is $13\frac{1}{4}$ inches long, 30 round, and 16 lbs. 9 ozs. in weight.³ Although only $3\frac{1}{2}$ inches longer than our largest specimen, the difference which is indicated by the contrast in the weight is very conspicuous. The shell itself does not differ materially from ordinary specimens, but is somewhat pointed and produced posteriorly, so that the position of the umbones is relatively less central, being $4\frac{1}{4}$ inches from the anterior extremity of the shell, that is, only $\frac{1}{2}$ inch more remote than in the $9\frac{3}{4}$ inch specimen. They are also unusually incurved, so that the tips are fully an inch from the hinge-line, whereas in ordinary specimens they almost touch it. Another feature noticeable is the shallower grooves within the valves that correspond to the external ribs, and the more feeble sulcation of the intervening spaces. The specimen is much incrustated with various marine growths, and more or less worm-eaten and water-worn, but the characteristic purple-red spotting is observable near the umbones.

Although quite small in comparison with the so-called *Tridacna gigas*, the present specimen, with the exception of some of the *Pinnas*, probably ranks next in size among living bivalves. A few examples of *Ostrea* and *Aetheria* may be longer, but then they are narrow and lighter.

¹ Conch. Cab., 1868, Monog. *Tridacna* and *Hippopus*, p. 8.

² Proc. Linn. Soc. N.S. Wales, 1880, vol. v, pp. 124-5.

³ Messrs. Sowerby & Fulton have another specimen $11\frac{1}{4}$ inches long.

In conclusion, it may be of interest to refer to some of the large examples of *Tridacna gigas* which have been recorded.

	Weight.	Length.
British Museum specimen	310 lbs. ...	36 inches.
Specimen mentioned by Linnæus ¹ ...	498 ,, ...	—? ,,
" " " Dillwyn ² ...	507 ,, ...	54 ,,
" " " Dall ³ ...	528 ,, ...	36 ,,
" " " Fischer ⁴ ...	550 ,, ...	34½ ,, ⁵

Although the quoted size of the specimen mentioned by Dillwyn seems remarkable, I should be inclined to believe it correct. The relatively smaller weight in proportion to the size is not important, for the specimen in the Museum, although as long as that mentioned by Dall, weighs 218 lbs. less.

Finally, I may mention that a specimen in the window of Rule's Restaurant, Maiden Lane, Covent Garden, is 40 ins. long and weighs 434 lbs.⁶ In this instance also, the weight, in proportion to the size, is much greater than that of the Museum specimen.

¹ Syst. Nat., ed. xii, p. 1,137.

² Cat. Recent Shells, p. 214; also Solander's MSS., vol. v, in Brit. Mus. (Nat. Hist.).

³ American Naturalist, vol. xvi, p. 698.

⁴ Man. Conch., p. 1,035.

⁵ This measurement has kindly been obtained for me by Mons. Ph. Dautzenberg.

⁶ Particulars kindly furnished by Mr. M. W. O'Brien, proprietor of the Restaurant.

ON THE LAND-SHELLS OF CURAÇOA AND THE NEIGHBOURING ISLANDS.

By EDGAR A. SMITH, F.Z.S., etc.

Read 10th June, 1898.

SOME years ago Dr. Ernst Hartert, whilst travelling in the West Indies, paid a short visit to Curaçoa and the neighbouring islands of Oruba and Buen Ayre, or Bonaire, and although occupied chiefly in bird-collecting, he also obtained a small collection of land and fresh-water shells, which have been very kindly submitted to me for identification.

The land-shells of those islands are very few in number, and with the exception of *Bulimulus elongatus*, are restricted in their distribution.

Six species are known from Curaçoa, viz. :

1. *Bulimulus elongatus*.
2. *Cerion uva*.
3. *Cylindrella Raveni*.
4. *Pupa longurio*.
5. *Cistula Raveni*.
6. *Tudora megacheila*.

In Bonaire the following occur :

1. *Pineria Bonairensis*, n.sp.
2. *Cylindrella Raveni*.
3. *Neosubulina Harterti*, n. gen. et sp.
4. *Tudora aurantiaca*.

In Oruba there are found :

1. *Bulimulus elongatus*.
2. *Cerion uva*.

Whilst at Los Roques we have :

1. *Ravenia Blandi*.

No fresh-water shells have hitherto been recorded from any of these islands. The two found by Dr. Hartert are *Paludestrina crystallina*, Pfr., from Buen Ayre, and a *Planorbis* from Curaçoa. Three rather young specimens of the latter do not offer any special characters, and at present must remain undetermined.

1. BULIMULUS ELONGATUS (Bolten).

Helix elongata, Bolten : Mus. Boltenianum, p. 107.

Helix virgulata, Férussac : Hist. Nat. Moll., pl. cxlii B, figs. 6, 7.

Bulimus virgulatus, Fér.: Reeve, Conch. Icon., pl. xlix, figs. 320 *a-b*.
Bulimus virgulatus, Fér.: Pfeiffer, Conch. Cab., 2nd ed., p. 161,
 pl. xlvi, figs. 9-12.

Hab.—Porto Rico and some of the Lesser Antilles as far south as Guadeloupe (Kobelt¹); Venezuela (Martens²); Oruba, Curaçoa, and Buen Ayre (Hartert); Curaçoa (Bland); Buen Ayre (Bland).

The majority of the specimens collected by Dr. Hartert are transversely banded and longitudinally striped with brown, as depicted in Férussac's figures 6 and 7, but a few are uniformly white or pale brown with faint oblique striping. They vary considerably in form, some being much more slender than others. They "often cover the *Cereus* (tall Cactuses) by thousands, giving them a very peculiar look" (Hartert).

2. CERION UVA (Linn.).

Turbo uva, Linnæus: Syst. Nat., 10th ed., p. 765.

Helix uva, Linn.: Férussac, Hist. Nat. Moll., pl. cliii, figs. 9-14.

Pupa uva, Linn.: Küster, Conch. Cab., p. 5, pl. i, figs. 3, 4.

Pupa uva, Linn.: Sowerby, Conch. Icon., vol. xx, pl. i, fig. 7.

Hab.—Curaçoa (Hartert and others); Oruba (Hartert).

Variable in form, some examples being much more slender than others.

Helix pentodon of Menke³ is the young shell of this species, when it is deeply umbilicated and consists of five whorls, the last being acutely carinate at the periphery.

3. PINERIA BONAIRENSIS, n. sp. Fig. I.

Testa parva, elongato-pyramidalis, vix rimata, fusco-cornea, strigis albidis obliquis obscure variegata; spira mediocriter acuminata, ad apicem obtusa; anfractus 8½, convexiusculi, lente accrescentes, striis



FIG. I.—*Pineria Bonairensis*, n. sp.

perobliquis confertis elatis sculpti, penult. ultimo paulo latior; apertura fere circularis; peristoma pallidum, mediocriter tenue, marginibus conniventibus, columellari reflexo. Long. 6, diam. 2.5 mm.; apertura 1.5 mm. lata.

Hab.—Buen Ayre (Hartert).

¹ Jahrb. Deutsch. malak. Gesell., 1880, pp. 278-282.

² Binnenmoll. Venezuela, in Festschrift Gesell. naturf. Freunde Berlin, 1873, p. 184.

³ Pfeiffer, Conch. Cab., 2nd ed., p. 198, pl. c, figs. 32-4.

The minute thread-like lines which cover the surface of the shell are very oblique and extend even to the apical whorls.

One specimen only was obtained. Allied to *P. Beathiana*, Poey, from the Isle of Pines, but more finely sculptured, with less convex whorls, a larger apex to the spire, a narrower body-whorl, and differs in the reflexion of the columella.

4. CYLINDRELLA RAVENI, Crosse.

Cylindrella Raveni, Crosse: Journ. de Conch., 1872, p. 157; 1873, p. 40, pl. i, fig. 4.

Hab.—Curaçoa (Crosse); Buen Ayre (Hartert).

5. PUPA LONGURIO, Crosse.

Pupa longurio, Crosse: Journ. de Conch., 1872, vol. xx, p. 158; 1873, vol. xxi, p. 42, pl. i, fig. 2.

Hab.—Curaçoa (Crosse).

6. RAVENIA BLANDI, Crosse.

Ravenia Blandi, Crosse: Journ. de Conch., 1873, vol. xxi, p. 69; 1874, vol. xxii, p. 69, pl. ii, fig. 4.

Hab.—Los Roques (Crosse).

A curious and very small shell, "intermediate between the true *Spiraxes* and *Pupæ*" as regards the peristome and the character of the aperture.

NEOSUBULINA, n.gen.

Testa aspectu *Subulinæ* similis, sed lamina parietali instructa et columella spiraliter contorta, basi haud subtruncata; radula haud discrepans. *Tornatellinæ* et *Leptinariæ* similis, sed radula diversa.

7. NEOSUBULINA HARTERTI, n.sp. Fig. II.

Testa elongata, cylindracea, superne angustata, cornea, parum nitida, lineis incrementi tenuibus, obliquis, curvatis striata; an-



FIG. II.—*Neosubulina Harterti*, n.sp.

fractus 8, apicales duo magni, convexi, mammiformes, cæteri convexi-usculi, sutura leviter obliqua haud profunda sejuncti, ultimus haud descendens; apertura parva, inverse auriformis, longit. totius $\frac{1}{4}$ haud

æquans; labrum tenue, simplex; columella leviter arcuata, superne reflexa, antice spiraliter torta; lamina parietalis valida, prominens, longe intrans. Long. 9, diam. 2·25 mm.; apertura 2 mm. longa.

Hab.—Buen Ayre (Hartert).

The mammillated apex is often slightly out of the perpendicular. I have much pleasure in associating Dr. Hartert's name with this very interesting and distinct form. On making a section of one specimen, the parietal lamella was found to extend about a whorl and a half inwards, the rest having been absorbed. The radula, kindly examined by Mr. W. Moss, is Stenogyroid.

8. CISTULA RAVENI, CROSSE.

Cistula Raveni, Crosse: Journ. de Conch., 1872, vol. xx, p. 159; 1873, vol. xxi, p. 43, pl. i, fig. 5.

Hab.—Curaçoa (Crosse).

9. TUDORA MEGACHEILA, POT. & MICH.

Cyclostoma megacheilos, Potiez et Michaud: Gal. Douai, vol. i, p. 237, pl. xxiv, figs. 9, 10.

Cyclostoma megachilum, Pot. & Mich.: Pfeiffer, Conch. Cab., 2nd ed., p. 66, pl. ix, figs. 15–19.

Cyclostoma simile, Sowerby: Thes. Conch., vol. i, p. 103, pl. xxiv, figs. 48, 49.

Hab.—Curaçoa (Pfeiffer, Bland, Hartert).

This species exhibits considerable variation in size. An average specimen, consisting of four whorls, is 16 mm. in length; a very large example, having the same number of volutions, is 19 mm. long, whereas the smallest specimen, which appears to be full-grown, is only 10 mm. Between these forms there are many intermediate specimens, so that a complete gradation in size is observable.

10. TUDORA AURANTIACA (WOOD).

Turbo aurantius, Wood: Index Test., Suppl., p. 19, pl. vi, fig. 23.

Cyclostoma aurantiacum, Sowerby: Thes. Conch., vol. i, p. 103, pl. xxiv, figs. 46, 47.

Cyclostoma versicolor, Pfeiffer: Conch. Cab., 2nd ed., p. 65, pl. ix, figs. 13, 14.

Hab.—Buen Ayre (Bland and Hartert).

Variable in colour, being uniformly white or flesh-colour, or transversely lined with brown, the lines more or less interrupted. The largest specimen is 17 mm. in length, the smallest only 10·5 mm. Wood's type, now in the British Museum (Natural History), is so much worn that the surface of the three last whorls is almost smooth. The two upper whorls exhibit the characteristic cancellated sculpture. *T. costata*, Pfr., is very closely related to this species.

DESCRIPTIONS OF NEW OR IMPERFECTLY KNOWN SPECIES OF
NAUTILUS FROM THE INFERIOR OOLITE, PRESERVED IN
 THE BRITISH MUSEUM (NATURAL HISTORY).

By G. C. CRICK, F.G.S., etc.,
 Of the British Museum (Natural History).

Read 13th May, 1898.

SEXUAL dimorphism has for a long time been recognized among the shells of the recent *Nautilus*, and it is interesting to find the same character exhibited by species which occur in a fossil state. In the recent *Nautilus* the body-chamber of the shell of the male is more inflated than that of the female, particularly at the sides, and hence the aperture of the former is wider and more obtuse than that of the latter. In the male the aperture of the shell is broad and more or less elliptical; in the female it is more or less oval, being somewhat compressed laterally, especially near the periphery. Similar differences in the form of the body-chamber and of the aperture are exhibited by the examples of some of the species described in the present paper; they are therefore attributed to sexual dimorphism, the forms having the relatively broader aperture being regarded as the males, and those with a narrower and more elongated aperture the females.

Moreover, in some specimens it has been possible to trace very clearly the position of the anterior boundary of the muscular attachment. In the shell of a recent *Nautilus* this boundary exists as a slightly raised line on the inside of the body-chamber, and hence on the internal cast of the body-chamber, such as would be preserved in a fossilized state, this boundary appears as a finely incised line.

1. *NAUTILUS BRADFORDENSIS*, n.sp. Figs. I & II.

Types.—British Museum Coll., Nos. C. 3177 and C. 4503.

Specific Characters.—Shell rather small, compressed, rapidly increasing; greatest thickness in the adult at about the middle of the lateral area, about three-fifths of the diameter of the shell; in the young nearer the umbilicus; height of outer whorl about three-fifths of the diameter of the shell. Whorls two and three-quarters; inclusion complete; umbilicus closed by a shelly callus, slightly depressed. Whorl oval in section, nearly as wide as high; indented to about three-tenths of its height by the preceding whorl; periphery rather broad, somewhat convex (in the less inflated form), sometimes slightly concave (in the more inflated form); sides of the body-chamber inflated, but more flattened in the septate part of the shell, gradually passing into the umbilical

depression without forming any inner area (or umbilical zone). Body-chamber occupying half a whorl; aperture oblique, oval, expanded near the periphery, somewhat contracted at the umbilicus, peristome slightly thickened and everted, especially near the umbilicus, hyponomic sinus wide and deep. Chambers rather deep, about sixteen or seventeen in a whorl; septa moderately convex, suture-line with a broad, shallow, lateral sinus, and nearly straight on the periphery.

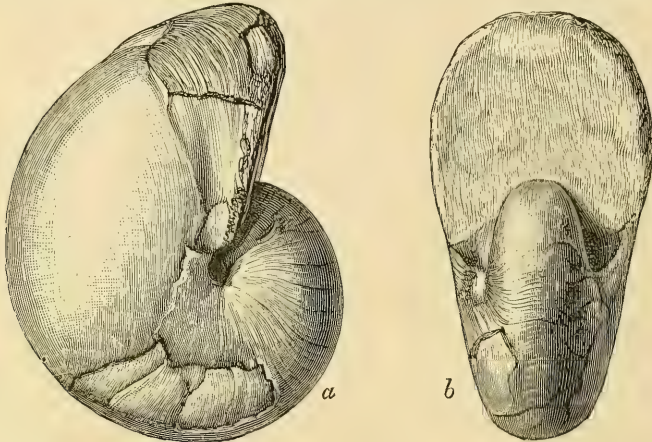


FIG. 1.—*Nautilus Bradfordensis*, n.sp. *a*, lateral view of an example of the less inflated form; *b*, front view of the same. Inferior Oolite (*concavus-zone*): Bradford Abbas, Dorset. Drawn from a specimen in the British Museum Collection [C. 4503]. About five-sixths natural size.

Siphuncle extra-medial. Test almost smooth, ornamented only with growth-lines, which form on the periphery a deep wide sinus corresponding to the hyponomic sinus of the aperture.

Dimensions.

	(i)	(ii)	(iii)
Diameter	70 mm.	64 mm.	42 mm.
Height of outer whorl	43 ,,	39 ,,	26 ,,
Height of outer whorl above } preceding whorl	31 ,,	26·5 ,,	
Thickness	43 ,,	41 ,,	27 mm.

Remarks.—This species is represented in the British Museum by the three examples the dimensions of which are given above; viz., Nos. C. 4503 (i), C. 3177 (ii), and C. 4256 (iii). In one of these specimens (No. C. 3177) the anterior border of the annulus and of one of the shell-muscles is shown on the internal cast of the body-chamber as a sharply incised line which crosses the periphery in a shallow sinus 13 mm. in advance of the last septum, and on reaching the lateral area turns forward and crosses that area in a bold strongly convex curve.

The same specimen exhibits also the 'black-layer' as a band enveloping the whorl immediately in front of the aperture, its greatest width (7.5 mm.) being at the middle of the periphery.

The largest specimen (No. C. 4503) has the last two septa much nearer together than the rest, and is probably an adult shell.

The peristome is well shown in the specimen No. C. 3177. This example is more robust than the others, but as all the specimens are from the same horizon and locality, this difference is probably merely sexual, the more robust form being the male, the others females. In the shell of the female the aperture is oval and the

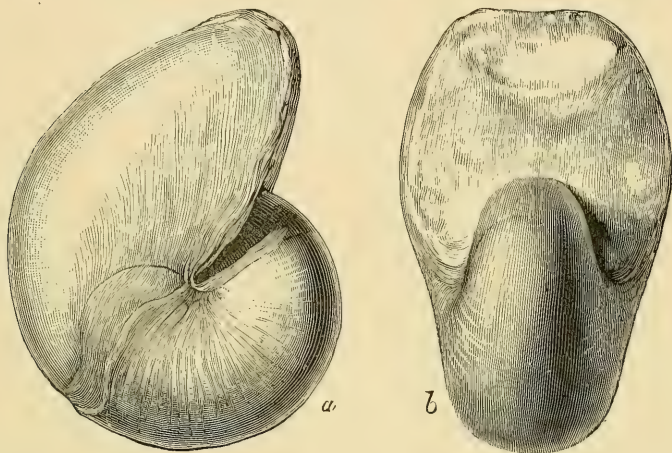


FIG. II.—*Nautilus Bradfordensis*, n sp. *a*, lateral view of an example of the more inflated form, showing the 'black-layer' immediately in front of the aperture, and the fine line indicating the course of the anterior boundary of the muscular scar and of the annulus; a portion of the test on the body-chamber is represented as having been broken away, in order to depict this line, which really exists on the opposite side of the fossil. *b*, front view of the same. Inferior Oolite (*concaus-zone*): Bradford Abbas, Dorset. Drawn from a specimen in the British Museum Collection [C. 3177]. About five-sixths natural size.

periphery convex, while the aperture of the shell of the male is relatively wider, and the periphery somewhat depressed or even slightly concave.

Affinities.—Compared with *N. lineatus*,¹ the present species is a smaller, more rapidly increasing shell, with deeper chambers, and more inflated sides.

¹ J. Sowerby. *Min. Conch.*, vol. i (1813), p. 89, pl. xli. The specimen figured as *Nautilus lineatus* by Mr. Foord and the present writer in *Ann. & Mag. Nat. Hist.*, ser. vi, vol. v (1890), p. 276, fig. 8, and by Mr. Foord in *Cat. Foss. Ceph. British Museum*, pt. ii (1891), p. 212, fig. 41, is really the specimen which we regarded as the type of *N. pseudolineatus*.

Form. and Loc.—Inferior Oolite (*concauus-zone*): Bradford Abbas, Dorset.

Mr. S. S. Buckman has examined these specimens and considers No. C. 4256 to be from “(probably lower part of) *concauum-zone*”; No. C. 3177, from the “fossil bed (probably *concauus-bed*)”; and No. C. 4503, from the “*concauum-zone* (probably *Hyperlioceras-bed*).”

2. NAUTILUS OBSTRUCTUS, E. Eudes-Deslongchamps. Fig. III.

Nautilus obstructus, E. Eudes-Deslongchamps: Jura Normand, Monog. vi (1878), pl. xi, figs. 1*a-d*, 2*a-c*.

Specific Characters.—Shell inflated, somewhat rapidly increasing, with broad periphery; greatest thickness (at the aperture) at about the commencement of the outer third of the lateral area, about three-quarters of the diameter of the shell; height of outer whorl about five-eighths of the diameter of the shell. Whorls (number unknown); inclusion complete; umbilicus closed. Whorl trapezoidal in section,

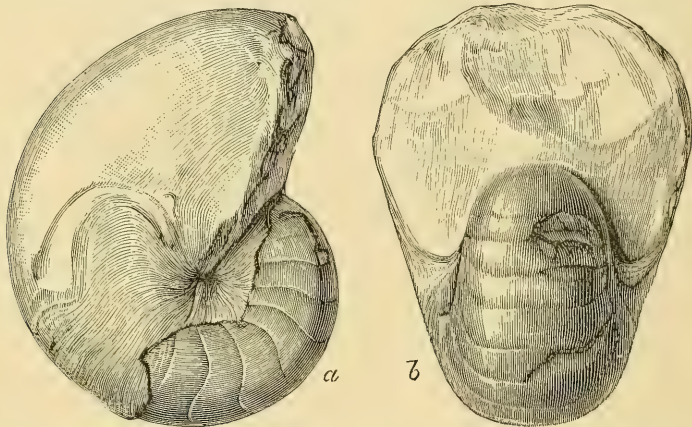


FIG. III.—*Nautilus obstructus*, Eud.-Desl. *a*, lateral view, showing on the natural internal cast of the body-chamber the anterior boundary of the muscular impression; *b*, front view of the same. Inferior Oolite (*Parkinsoni-zone*): Vetney Cross, Dorset. Drawn from a specimen in the British Museum Collection [C. 3187]. Two-thirds natural size.

its height five-sixths of its width, the widest part being near the umbilicus in the septate part of the shell, but near the periphery at the aperture; indented to about two-fifths of its height by the preceding whorl; periphery broad, flattened, slightly convex in the septate part, slightly concave on the body-chamber; sides feebly convex, except near the aperture, where they are more inflated; no inner margin. Body-chamber occupying rather more than one-third of the last whorl; aperture forwardly inclined, lateral portion of peristome convex orad, its peripheral portion with a deep wide

hyponomic sinus. Chambers rather shallow, eleven or twelve in the last half whorl of the septate portion; septa feebly concave; suture-line with a simple shallow curve on the side, and a broad, very shallow sinus on the periphery. Position of the siphuncle unknown. Test almost smooth, with very faint growth-lines, which are slightly waved and nearly direct on the sides, but form on the periphery a deep broad sinus corresponding to the hyponomic sinus of the aperture.

Dimensions.

Diameter	... ..	81	mm.
Height of outer whorl	... ..	53	,,
Height of outer whorl above preceding whorl	}	31	,,
Thickness	... ..	62.5	,, (near the periphery).
Width of periphery	... ..	about 43	,,

At a diameter of 70 mm., i.e. at about one-third of the depth of the body-chamber, the dimensions of the same specimen are:

Diameter	... ..	70	mm.
Height of outer whorl	... ..	40	,,
Thickness	... ..	48	,, (near the umbilicus).
Width of periphery	... ..	34	,,

Remarks.—At the aperture the shell is thickest near the periphery, but elsewhere its greatest thickness is close to the umbilicus.

This species is represented in the British Museum Collection by the example (No. C. 3187), the dimensions of which are given above; this is probably an adult shell, the last two septa being much closer together than the rest. On the internal cast of the body-chamber the impression of the anterior border of the shell-muscle and of the annulus is preserved as an incised line, which forms a bold broad orad-convex curve on the greater part of the lateral area, being in the centre of this area about 27.5 mm. in advance of the last suture line, and a very shallow orad-concave curve on the periphery, where it is only about 3 mm. from the last suture-line. The peripheral portion of the peristome with its deep hyponomic sinus is well preserved.

This is evidently the species figured by E. Eudes-Deslongchamps as *Nautilus obstructus* (Jura Normand, Monog. vi, pl. xi, figs. 1*a-d*, 2*a-c*, 1878). Unfortunately, owing to the death of the author, no description was published, but the figures are so good that the species can be readily identified.

It may be mentioned that in the explanation of the plate, Deslongchamps describes the specimen represented in figs. 2*a-c* as a "variété légèrement comprimée, peut-être femelle," from which it would appear that he regarded the more inflated shell as the male, and the more compressed as the female. This agrees with the most recent observations on the subject.

The British example agrees with the specimen which it would seem that Deslongchamps regarded as the male (figs. 1*a-d*).

Affinities and Differences.—This species differs by its less inflated lateral area and its closed umbilicus from *N. lineolatus*, Foord & Crick.

It is not so robust as the specimen of *N. clausus*, from the D'Orbigny Collection in the Museum of Natural History, Paris, which is figured in *Ann. & Mag. Nat. Hist.*, ser. vi, vol. v, p. 284, fig. 14, and *Cat. Foss. Ceph.* British Museum, pt. ii, p. 225, and its umbilicus is not closed by a shelly callus as in that example, but it has a broader and more flattened periphery than D'Orbigny's figure of the species in his *Pal. Franç. Terr. Jur.*, vol. i, pl. xxxiii.

Form. and Loc.—Inferior Oolite (*Parkinsoni*-zone): Vetney Cross, Dorset.

Deslongchamps' specimen came from the "zone à *Ammonites Murchisonæ* (couches de récif) de May."

3. NAUTILUS FUSCUS, n.sp. Figs. IV & V.

Types.—British Museum Coll., Nos. C. 4493 and C. 4494.

Specific Characters.—Shell rather small and robust, not very rapidly increasing, somewhat hexagonal in transverse section: greatest thickness—in the more inflated form, at about two-sevenths of the width of the lateral area from the edge of the umbilicus, about seven-tenths

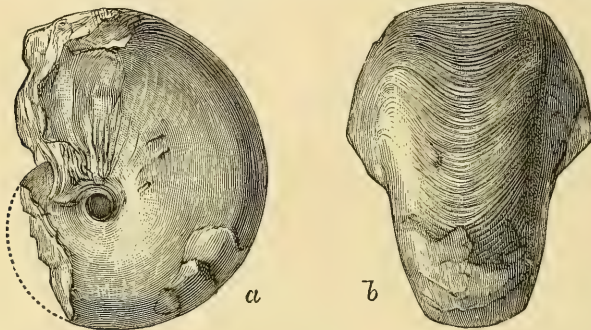


FIG. IV.—*Nautilus fuscus*, n.sp. *a*, lateral view of an example of the more inflated forms; *b*, peripheral view of the same, showing the distinct growth-lines on the periphery. Inferior Oolite: Burton Bradstock, Dorset. Drawn from an example in the British Museum Collection [C. 4493]. Natural size.

of the diameter of the shell; in the less inflated form, somewhat nearer the edge of the umbilicus, and about three-fifths of the diameter of the shell. Whorls few, exact number not known; inclusion nearly complete; umbilicus from about one eighth (in the more inflated form) to about one-seventh (in the less inflated form) of the diameter in width, with subangular margin, deep, exposing the edges of the inner whorls. Whorl trapezoidal in section, wider than high; indented to about one-third of its height by the preceding whorl; periphery broad, slightly convex in centre, feebly concave near each margin, about one-half of the diameter of the shell in width, with prominent subangular margins; sides feebly concave near the periphery, the rest rather convex; inner area (or umbilical zone) steep, almost perpendicular to the plane of symmetry of the shell. Body-chamber occupying

nearly one-half of the outer whorl; aperture not seen, but hyponomic sinus (judging from the direction of the lines of growth) wide and broad. Chambers not very deep, about nine in the last half whorl of the septate part; suture-line with a simple broad shallow sinus on the lateral area, and a broad shallow sinus on the periphery. Siphuncle (in the more inflated form) extra-medial, not seen in the less inflated form. Test varying in thickness, about 1 mm. thick at the edge of the umbilicus, but for the most part much thinner, surface almost smooth, with fine lines of growth which are very faint and almost direct on the lateral area, but are more distinct and form a deep broad sinus on the periphery. In the young shell, up to a diameter of about 16 mm.; the test is somewhat coarsely cancellated on the periphery, and the lines of growth relatively coarser and more waved on the lateral area than in the adult shell; the margins of the periphery are also much less prominent. In the adult there are only very faint longitudinal lines on the periphery.

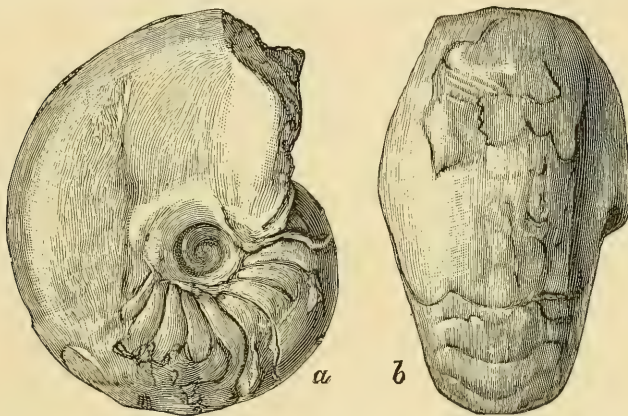


FIG. V.—*Nautilus fuscus*, n.sp. *a*, lateral view of a example of the less inflated form, showing the suture-lines; *b*, peripheral view of the same, showing fragments of the test with its ornaments. Inferior Oolite: Burton Bradstock, Dorset. Drawn from a specimen in the British Museum Collection [C. 4494]. Natural size.

Dimensions.	(i)	(ii)	(iii)
Diameter	41 mm.	24·5 mm.	53·5 mm.
Height of outer whorl	23 "	13 "	29 "
Height of outer whorl above } preceding whorl	16·5 "	9 "	19 "
Thickness	29·5 "	16·5 "	about 33 "
Width of umbilicus	5 "	4 "	7 "
Width of periphery at } greatest diameter	21 "	12 "	about 25 "

Remarks.—Three specimens in the British Museum Collection are referred to this species: one, No. C. 4494 (iii), is the less inflated form,

another, No. C. 4493 (i), the more inflated form, and a third, No. C. 4492 (ii), is probably a young shell of the latter. The amount of inflation is probably due merely to a difference in sex, in which case the more inflated form is the male, and the other the female. It may also be noted that the peripheral sinus of the suture-line is deeper in the less inflated than in the other form. The largest specimen (53·5 mm. in diameter) has the last two septa very approximate, and is probably an adult shell. All the specimens are from the same locality and horizon.

The British Museum Collection contains a specimen (No. 37,023) from the "Great Oolite, Ranville, Normandy," that may possibly belong to this species. It is larger than the British specimens, its dimensions being:—Diameter, 57 mm.; height of outer whorl, 34 mm.; ditto above preceding whorl, 28 mm.; thickness, 37 mm.; width of umbilicus, 5 mm.; width of periphery at greatest diameter, 31 mm. It is more inflated, and has a smaller umbilicus than the British compressed form, but its periphery is relatively narrower than that of the inflated form.

Form. and Loc.—Inferior Oolite: Burton Bradstock, Dorset. Mr. Buckman considers the three specimens referred to this species to have come from the "upper *Truellei*-beds of Burton Bradstock."

4. NAUTILUS SUBSINUATUS, D'Orbigny. Figs. VI & VII.

Nautilus sinuatus, J. Sowerby: Min. Conch., vol. ii (1818), p. 231, pl. exciv.

Nautilus sinuatus, J. Sby.: A. d'Orbigny, Pal. Franç. Terr. Jur., vol. i (1842), p. 157, pl. xxxii.

Nautilus subsinuatus, A. d'Orbigny: Prod. de Paléont. stratigr., vol. i (1850), p. 260.

Nautilus sinuatus, J. Sby.: E. Eudes-Deslongchamps, Jura Normand, Monog. vi (1877), pl. viii, figs. 1-3.

Specific Characters.—Shell compressed, somewhat rapidly increasing; greatest thickness close to the umbilical margin, a little less than one-half of the diameter of the shell; height of outer whorl rather more than four-sevenths of the diameter of the shell. Whorls three or four; inclusion nearly complete, about three-fourths in the outer whorl; umbilicus small, about one-eleventh of the diameter of the shell in width, with subangular margin and steep, slightly overhanging sides. Whorl subsagittate in section, rather higher than wide; indented to about three-elevenths of its height by the preceding whorl; periphery obtusely rounded; sides flattened, very feebly convex; inner margin distinct, convex, slightly overhanging the umbilicus. Length of body-chamber not seen. Chambers not very deep, their depth at the periphery being rather less than one-half of the corresponding height of the whorl; suture-line with a deep sinus on the lateral area, about one-third of the corresponding height of the whorl in depth, almost straight on the periphery. Test smooth on the lateral area, ornamented on the peripheral area with moderately fine longitudinal raised lines, which in the young shell extend a little over the lateral area; sides of the umbilicus also with concentric coarser longitudinal raised striæ.

Dimensions.

Diameter	148	mm.
Height of outer whorl	88	„
Height of outer whorl above preceding whorl ...	64	„
Thickness	73	„
Width of umbilicus	13.5	„

Remarks.—There seems to be in the Inferior Oolite more than one concentrically striated *Nautilus* with strongly sinuate septa, and it is by no means easy to determine which of these is Sowerby's species, for that author gives only a short description and a single figure

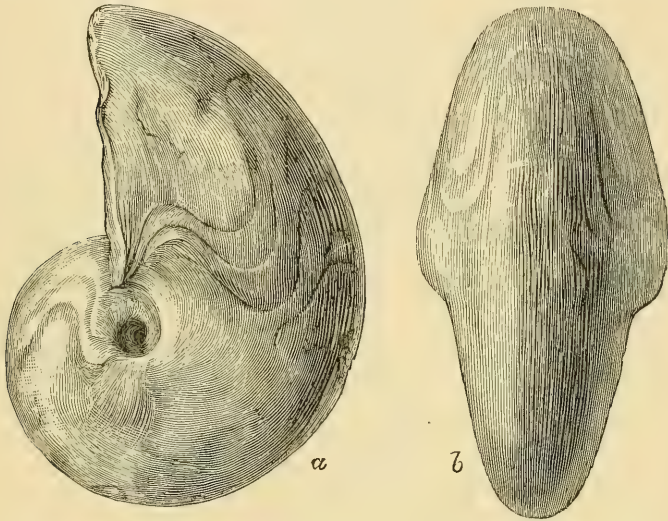


FIG. VI.—*Nautilus subsinuatus*, n.sp. *a*, lateral view, showing the ornaments on the periphery and the course of the suture-line; *b*, peripheral view of the same. Inferior Oolite: near Sherborne, Dorset. Drawn from a specimen in the British Museum Collection [C. 4495]. Rather less than one-half natural size.

of the type. Unfortunately the location of the type-specimen is not known to the writer. Sowerby's description is as follows:—*Sp. Char.*—Thick, umbilicate, concentrically striated; side depressed, conical; front convex; aperture obtusely sagittate, truncated; the septa have a large sinus on each side." He also remarks that "the striæ are nearly close together, moderately fine, and elevated; they gradually disappear towards the mouth"; and that "the greatest diameter is equal to twice the thickness." Two forms of *Nautilus* from the Inferior Oolite, resembling Sowerby's *N. sinuatus*, have come under the writer's observation; in one the thickness is a little less, and in the other a little more, than one-half of the diameter. The more compressed form is, however, also the more finely striated, and

has a suture-line almost identical with that of Sowerby's figure; hence it is here regarded as Sowerby's species.

Judging from D'Orbigny's figure (Pal. Franç. Terr. Jur., vol. i, pl. xxxii) the French specimen appears to be specifically distinct, but Deslongchamps' figure (Le Jura Normand. Monog. vi, pl. viii, figs. 1 *a-c*) of this same example shows that it belongs to Sowerby's species.

The adult form of this species is represented in the British Museum Collection by the specimen No. C. 4495, the dimensions of which are

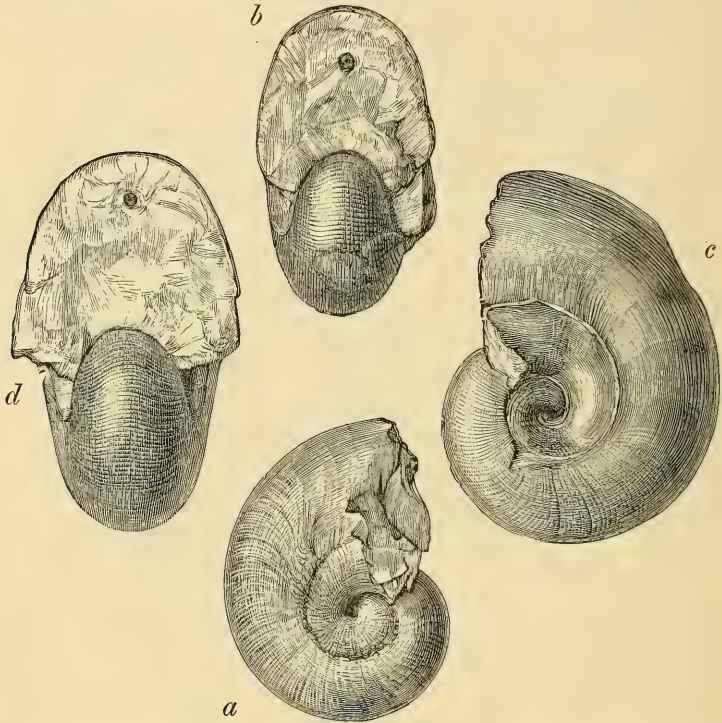


FIG. VII.—*Nautilus subsinuatus*, D'Orb. *a*, lateral view of innermost whorls, showing ornaments of young shell; *b*, front view of the same, showing ornaments, and the position of the siphuncle. Inferior Oolite: Dundry. *c*, lateral view of a somewhat larger example, showing the reticulated ornaments of the test up to a diameter of about 32 mm., passing into the longitudinal striæ which are confined to the peripheral area; *d*, front view of same, showing ornaments of test and position of siphuncle. Inferior Oolite: Halfway House, near Sherborne. Drawn from specimens in the British Museum Collection [67,909 and C. 4229]. Natural size.

given above; the younger stages being exhibited by the specimens Nos. 67,909 and C. 4229 in the same collection. The former has the following dimensions:—Diameter, 40 mm.; height of outer whorl,

23 mm.; ditto above preceding whorl, about 19 mm.; thickness, 23 mm.; width of umbilicus, 5 mm.; distance of centre of siphuncle from periphery, 6 mm. The dimensions of the latter are:—Diameter, 50 mm.; height of outer whorl, 28 mm.; ditto above preceding whorl, about 23 mm.; thickness, 28 mm.; width of umbilicus, 7 mm.; distance of centre of siphuncle from periphery, 7 mm. The example No. 67,909 agrees with the younger portion of the specimen No. C. 4229, and this in its turn agrees with the inner portion of the example No. C. 4495. The surface of the shell is reticulated up to the point at which it attains a diameter of about 32 mm.; after that it is ornamented only with longitudinal striæ, which are confined to the peripheral area. The young shells are more compressed than those of *N. ornatus*¹ and *N. Burtonensis*,² and they also lack the slightly sulcated periphery of the latter.

Sowerby's name *N. sinuatus* being preoccupied by Fichtel, D'Orbigny altered it to *N. subsinuatus*.

Affinities and Differences.—This species is closely allied to *N. crassisinuatus*, which is next to be described, and its different points will be alluded to under that species.

Form. and Loc.—Inferior Oolite: Dundry. [No. 67,909.] Inferior Oolite ("probably *Truellei*³ - bed."—S. S. Buckman): Halfway House, near Sherborne, Dorset. [No. C. 4229.] Inferior Oolite ("*Witchellia*-beds—bottom part of 'fossil-bed' of Sandford Lane, or just below that—matrix."—S. S. Buckman): near Sherborne, Dorset. [No. C. 4495.]

Sowerby states that the type, for which he was indebted to Mr. Parkinson, "was found somewhere near Yeovil, but Mr. Parkinson is not acquainted with the exact locality."

5. NAUTILUS CRASSISINUATUS, n.sp. Fig. VIII.

Specific Characters.—Shell compressed, somewhat rapidly increasing; greatest thickness close to the umbilicus, rather more than one-half of the diameter of the shell; height of outer whorl about three-fifths of the diameter of the shell. Whorls three or four; inclusion nearly complete, about three-fourths in the outer whorl; umbilicus small, about one-tenth or one-eleventh of the diameter of the shell in width, with subangular margin and somewhat convex slightly overhanging sides. Whorl trapezoidal in section, rather higher than wide, indented to about one-fourth of its height by the preceding whorl; periphery broadly rounded; sides flattened, feebly convex; inner area very distinct, somewhat convex, feebly overhanging. Length of body-chamber not seen. Chambers not very deep, their depth measured at the periphery not quite one-half of the corresponding height of the whorl; suture-line with a deep sinus on the lateral area having

¹ Foord & Crick: *Ann. & Mag. Nat. Hist.*, ser. vi, vol. v (1890), p. 273, fig. 7.

² Foord & Crick, *tom. cit.*, p. 288, fig. 17.

³ Mr. Buckman says the *Truellei*-beds of Halfway House are called the 'fossil-bed.'

a depth of rather less than one-third of the corresponding height of the whorl, almost straight on the periphery, with an annular lobe. Siphuncle small, near the periphery. Test smooth on the lateral area, but ornamented on the peripheral area with subangular longitudinal waved raised lines, which in the young shell extend on to the lateral area; sides of the umbilicus with coarser longitudinal ornaments crossed by distinct growth lines.

Dimensions.

	(i)	(ii)	(iii)
Diameter	159 mm.	136 mm.	about 145 mm.
Height of outer whorl ...	94 "	82 "	89 "
Height of outer whorl } above preceding whorl }	about 69 "	about 60 "	about 67 "
Thickness ... ..	... about 78 "	72 "	78 "
Width of umbilicus ...	14 "	13 "	14 "

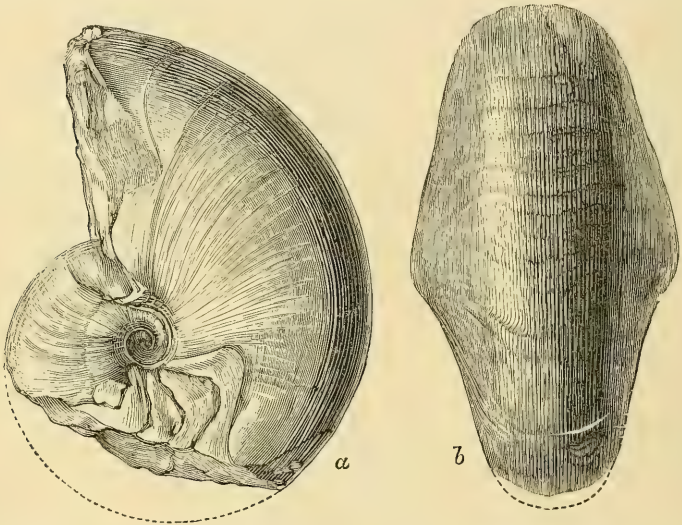


FIG. VIII.—*Nautilus crassisinuatus*, n.sp. *a*, lateral view of an imperfect but well-preserved example, showing the suture-line and the ornaments of the test; *b*, peripheral view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from an example in the British Museum Collection [C. 4501]. Rather less than one-half natural size.

Remarks.—This species is represented in the British Museum Collection by three specimens—No. C. 4112 (i), No. C. 4500 (ii), and No. C. 4501 (iii)—the dimensions of which are given above. They are all from the Inferior Oolite of Bradford Abbas, Dorset. Mr. S. S. Buckman has examined two of them, viz. C. 4500 and C. 4501, and considers them both to be from the “*concaus*-zone (probably *Hyperlioceras*-beds): Bradford Abbas,” a somewhat lower

horizon than that which has yielded the example (No. C. 4495) here referred to *N. subsinuatus*, D'Orb.

Affinities and Differences.—This species comes very near *N. subsinuatus*, D'Orb. (*N. sinuatus*, J. Sowerby), but it is more robust and has a slightly different suture-line. In what is here regarded as Sowerby's species the inner side of the lateral sinus of the suture-line is straighter, and the outer side more curved, than in the present one, so that in this the lowest part of the sinus is further from the umbilicus than in Sowerby's species; the saddle near the umbilical margin is also wider in the last named. If subsequent observations should prove that the two forms occur in the same beds, the differences are so slight that they may then perhaps more correctly be regarded as merely sexual.

Form. and Loc.—Inferior Oolite ("concaus-zone: probably *Hyperlioceras*-bed.")—S. S. Buckman): Bradford Abbas, Dorset.

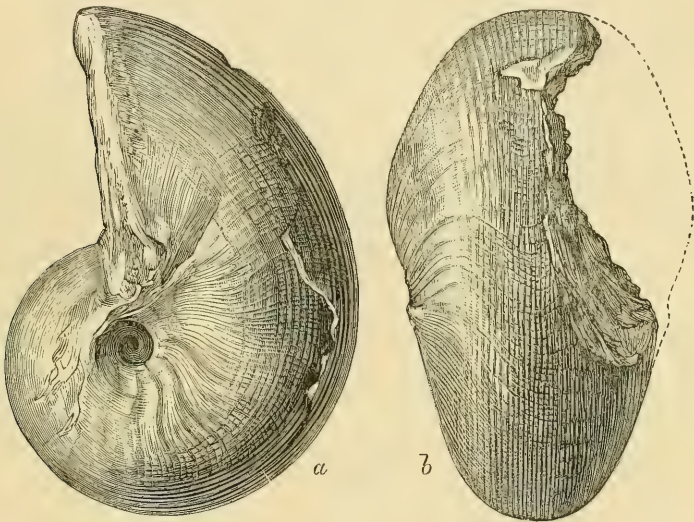


FIG. IX. — *Nautilus impendens*, n.sp. *a*, lateral view of the type-specimen; *b*, peripheral view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from the specimen in the British Museum Collection [C. 4502]. About one-half natural size.

6. NAUTILUS IMPENDENS, n.sp. Fig. IX.

Type.—British Museum Coll., No. C. 4502.

Specific Characters.—Shell compressed, somewhat rapidly increasing; greatest thickness near the umbilical margin, rather more than one-half of the diameter of the shell; outer whorl about seven-twelfths of the diameter of the shell. Whorls few; inclusion nearly complete; umbilicus narrow, about one-twelfth of the diameter of the shell in

width, with convex margin, and convex and overhanging sides. Whorl oval in section, the peripheral portion being the narrower; periphery broadly rounded, passing imperceptibly into the sides; sides convex, very slightly flattened; inner margin convex, not sharply marked off from the side, and overhanging the umbilicus. Length of body-chamber not seen. Chambers rather shallow, their depth at the periphery about two-fifths of the corresponding height of the whorl; septa slightly concave, suture-line with a broad and not very deep sinus on the lateral area. Siphuncle near the periphery. Test—on the lateral area nearly smooth, only with backwardly directed lines of growth; on the periphery with rather coarse longitudinal waved lines, which with age encroach somewhat on the lateral area, with much finer lines in the interspaces, the transverse lines of growth forming here a deep broad hyponomic sinus.

Dimensions.

Diameter	...	...	...	...	125	mm.
Height of outer whorl	...	...	...	...	77	„
Height of outer whorl above preceding whorl	...	...	...	...	57	„
Thickness	...	...	...	...	65	„
Width of umbilicus	...	...	...	...	10·5	„

Remarks.—There is only one example of this species. It came from Bradford Abbas, and Mr. S. S. Buckman, from an examination of the matrix, considers it to have come from the “*concavus*-zone (probably *Hyperlioceras*-bed),” a somewhat lower horizon than that containing the *N. subsinuatus*, but the same as that yielding *N. crassisinuatus*.

The name of the species is derived from the overhanging character of the inner portion of the whorl.

Affinities and Differences.—Its less sinuous suture-line at once separates this species from both *N. subsinuatus*, D’Orb. (*N. sinuatus*, J. Sowerby), and *N. crassisinuatus*; whilst the form of its umbilicus and the smoothness of the lateral area of the test distinguish it from *N. ornatus*.

Form. and Loc.—Inferior Oolite (“*concavus*-zone: probably *Hyperlioceras*-bed.”—S. S. Buckman): Bradford Abbas, Dorset.

7. NAUTILUS EXTREBRATUS, n.sp. Fig. X.

Types.—British Museum Coll., Nos. C. 3245 and C. 4498.

Specific Characters.—Shell inflated, rather rapidly increasing; greatest thickness sometimes (i.e. in the less inflated form) close to the edge of the umbilicus, sometimes (i.e. in the more inflated form) at a short distance from the edge of the umbilicus, about three-fourths of the diameter of the shell; height of outer whorl rather more than one-half of the diameter of the shell. Whorls few; inclusion nearly complete; umbilicus deep, about one-eighth or one-ninth of the diameter of the shell in width, with steep sides and subangular margin. Whorl subquadrate in section, its height about two-thirds of the width; indented to about three-eighths of its height by the preceding whorl; periphery broad, sometimes (i.e. in the less

inflated form) slightly convex, sometimes (i.e. in the more inflated form) flattened or even slightly concave, particularly on the body-chamber, passing imperceptibly into the sides; sides feebly convex; inner area almost perpendicular to the plane of symmetry of the shell, well-defined from the lateral area by a subangular ridge. Body-chamber occupying about one-third of the outer whorl; aperture with a wide and deep hyponomic sinus. Chambers not very deep, about ten in the last half whorl of the septate part, at the centre of the periphery not quite one-half of the corresponding height of the whorl

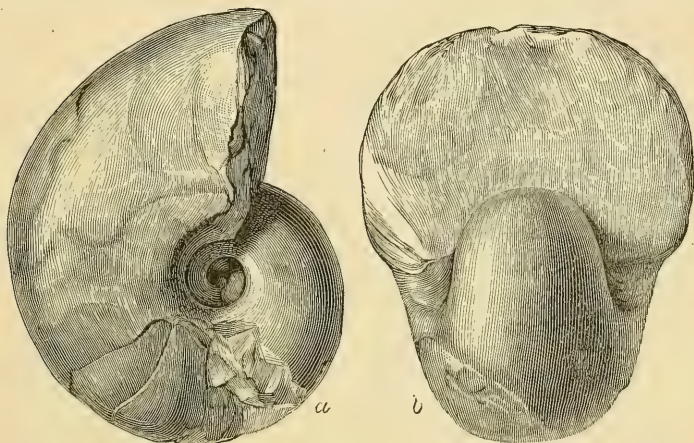


FIG. X.—*Nautilus exterebratus*, n.sp. *a*, lateral view of an example of the more inflated form; *b*, front view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from an example in the British Museum Collection [C. 3245]. About two-thirds natural size.

in depth; septa feebly concave; suture-line with a simple shallow curve on the lateral area, almost straight on the periphery. Siphuncle not seen. Test rather thick, much thicker at the umbilical margin, with apparently smooth surface, or with only very faint lines of growth.

Dimensions.

	(i)	(ii)
Diameter	96 mm.	123 mm.
Height of outer whorl	53	68
Height of outer whorl above } preceding whorl	36	43
Thickness	73	95
Width of umbilicus	12.5	13
Greatest width of periphery	...about 58	{ imperfectly defined.

Remarks.—There are two examples of this species in the British Museum Collection (Nos. C. 3245 and C. 4498); their dimensions are

given above. No. C. 3245 (i) is the more inflated, and C. 4498 (ii) the less inflated form. They are both from Bradford Abbas.

Affinities and Differences.—This species may be distinguished from *N. terebratus*¹ by its smooth shell, more inflated whorls, wider and flatter periphery, and the less prominent umbilical margin; and from *N. semiornatus*² by the more quadrate form of the transverse section of its whorls, its smaller umbilicus, and the absence of longitudinal ornaments.

Form. and Loc.—Inferior Oolite: Bradford Abbas, Dorset. Mr. Buckman has examined both specimens: he considers No. C. 3245 to have come from the “fossil bed (probably *concaus*-bed), Bradford Abbas”; and No. C. 4498 to have been derived from the “*concaus*-zone (probably *Hyperlioceras*-bed), Bradford Abbas.” Judging from their matrix they appear to have been obtained from the same bed.

8. NAUTILUS ROTUNDUS, n. sp. Fig. XI.

Type.—British Museum Coll., No. C. 3181.

Specific Characters.—Shell more or less subglobose, with small umbilicus; greatest thickness near the middle of the lateral area, about three-fourths of the diameter of the shell; height of outer

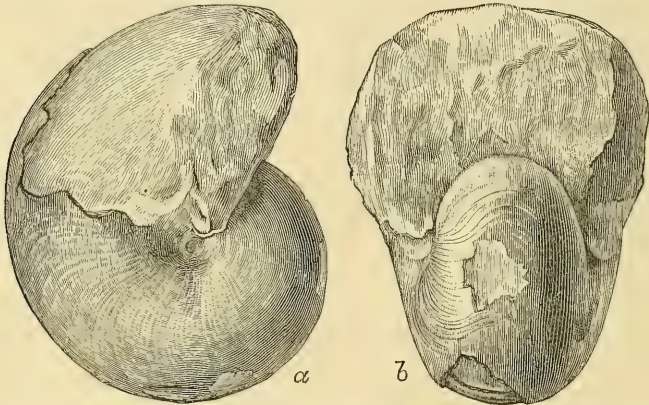


FIG. XI.—*Nautilus rotundus*, n. sp. *a*, lateral view of the type-specimen; *b*, front view of the same. Inferior Oolite: Sherborne, Dorset. Drawn from an example in the British Museum Collection [C. 3181]. Rather more than one-half natural size.

whorl about five-ninths of the diameter of the shell. Whorls three; inclusion nearly complete; umbilicus small, deep, with rounded margin. Whorl subtrapezoidal in transverse section, its height about three-fourths of its width; indented to about two-fifths of its height

¹ E. Dumortier, *Études Paléontologiques sur les Dépôts Jurassiques du Bassin du Rhône*, pt. iv (Lias Supérieur), 1874, p. 42, pl. vi, figs. 1-4.

² Vide infra, p. 135.

by the preceding whorl; periphery broadly convex, somewhat flattened, especially at the body-chamber; sides inflated and passing imperceptibly into the inner area; inner area convex, imperfectly defined. Body-chamber occupying about one-third of the last whorl; aperture with a deep and broad hyponomic sinus. Chambers rather deep, about eight in the last half whorl of the septate portion; septa feebly concave; suture-line with a simple shallow sinus on the lateral area, and only a very shallow sinus on the periphery. Siphuncle infra-central. Test 1 mm. thick, almost smooth, with faint lines of growth, which curve backward on the outer portion of the lateral area and form a deep wide sinus on the periphery.

Dimensions.

	(i)	(ii)
Diameter of shell	98 mm.	110 mm.
Height of outer whorl	59 ,,	62 ,,
Height of outer whorl above preceding whorl }	35 ,,	41 ,,
Thickness	about 72† ,,	84† ,,
Width of umbilicus	4 ,,	4 ,,

(† Not including the test.)

Remarks.—To this species we refer two specimens in the British Museum Collection—Nos. C. 3181 (i) and C. 4496 (ii); their dimensions are given above. In the example No. C. 4496 the last loculus is much smaller than the rest, being only 7 mm. in depth at the centre of the periphery, the adjacent one being 16 mm. deep. Probably, therefore, this is an adult specimen. In both examples the greatest width of the aperture is near the middle of the lateral area; the height of the aperture in proportion to its width is, however, greater in (ii) than in (i), and the periphery of the former is less depressed than that of the latter, but these differences are so very slight that they may be only individual variations.

There is also in the British Museum Collection another specimen (No. C. 4489) which for the present at least we would refer to this species. Its dimensions are as follows:—Diameter of shell, 93 mm.; height of outer whorl, 53.5 mm.; ditto above preceding whorl, 35 mm.; greatest thickness, 70 mm. (not including the test); width of umbilicus, 5 mm. It differs from the others in having a more quadrate and more expanded aperture, and a somewhat larger umbilicus. In this specimen the position of the anterior border of the shell-muscle and of the annulus is clearly indicated on the natural internal cast of the body-chamber by an incised line, which forms a bold anteriorly convex curve on the lateral area; in the centre of the periphery this line is only 5 mm. in advance of the edge of the last septum, but on the lateral area the most convex portion is as much as 32 mm. in advance of the corresponding part of the same septum.

Affinities and Differences.—Compared with *Nautilus subrotundus*,¹

¹ Vide infra, p. 134.

the present species has more inflated whorls and a more convex umbilical margin, while the convex and imperfectly-defined umbilical margin at once distinguishes it from *Nautilus Smithi*.¹

Form. and Loc.—The specimen No. C. 3181 is labelled “*Sauzei*-zone, Sherborne,” but Mr. Buckman, who has examined it, believes it to be “either from the *Sauzei*- or from the *Witchellia*-zone, Sherborne, the matrix being whitish with green grains.” The other examples (Nos. C. 4489 and C. 4496) are, in Mr. Buckman’s opinion, from “the bottom bed of the ‘fossil-bed’ of Sandford Lane with Ammonites of *fissilobatus* type.”

9. NAUTILUS SUBROTUNDUS, n.sp. Fig. XII.

Type.—British Museum Coll., No. C. 3183.

Specific Characters.—Shell subglobose, somewhat compressed; greatest thickness near the edge of the umbilicus, about two-thirds of the diameter of the shell; height of outer whorl about five-ninths of

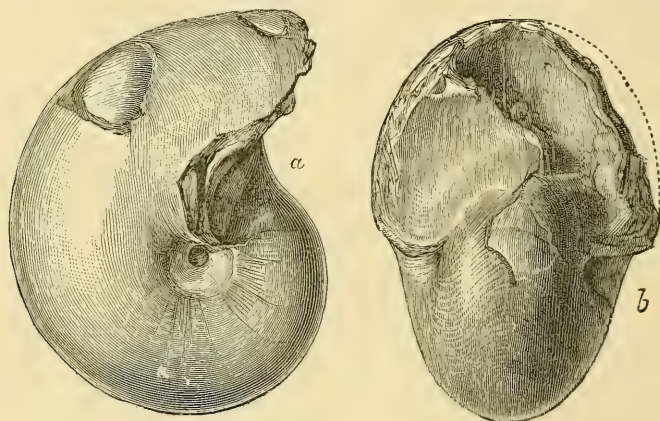


FIG. XII.—*Nautilus subrotundus*, n.sp. *a*, lateral view of the type-specimen; *b*, front view of the same. Inferior Oolite: Sherborne, Dorset. Drawn from the example in the British Museum Collection [C. 3183]. Rather more than one-half natural size.

the diameter of the shell. Whorls few (? number); inclusion nearly complete; umbilicus small, deep, with rounded margin. Whorl semi-elliptical in section, the height five-sixths of the width; indented to nearly two-fifths of its height by the preceding whorl; periphery broadly convex, continuous with the sides; sides feebly convex, passing imperceptibly into the inner area; inner area convex, imperfectly defined. Body-chamber not seen. Chambers rather

¹ A. H. Foord & G. C. Crick: Ann. & Mag. Nat. Hist., ser. vi, vol. v, p. 287, fig. 16.

deep; septa feebly concave, their inner (dorsal) portion projected considerably forward over the preceding whorl; suture-line with a shallow lateral sinus, and a very shallow peripheral sinus. Siphuncle extra-median, small. Test nearly smooth, with very fine growth-lines, which have a nearly radial direction on the lateral area, curve backward near the periphery, and on the latter form a fairly deep, obtusely V-shaped sinus.

Dimensions.

Diameter of shell	99	mm.
Height of outer whorl	58	,,
Height of outer whorl above preceding whorl ...	37	,,
Thickness	about 69	,,
Width of umbilicus	5.5	,,

Remarks.—This species is represented in the British Museum Collection by only one example (No. C. 3183), the dimensions of which are given above. This specimen lacks the body-chamber; but since the last loculus is shallower than those which precede, it is probably an adult example.

Affinities and Differences.—Compared with *Nautilus rotundus*,¹ the present species has less inflated whorls and a more prominent and subangular umbilical margin; this latter character is, however, much less pronounced than in *Nautilus Smithi*.²

Form. and Loc.—The type-specimen (No. C. 3183) is labelled “*Sauzei*-zone, Sherborne,” but, judging from the matrix, Mr. Buckman considers it to be “probably from the *Truellei*-bed at Burton Bradstock.”

10. NAUTILUS SEMIORNATUS, n.sp. Figs. XIII & XIV.

Types.—British Museum Coll., Nos. C. 3244 and C. 4499.

Specific Characters.—Shell inflated, rather rapidly increasing; greatest thickness almost close to the edge of the umbilicus, from about three-fourths (in the less inflated form) to about four-fifths (in the more inflated form) of the diameter of the shell; height of outer whorl a little more than one-half of the diameter of the shell. Whorls few; inclusion nearly complete; umbilicus deep, about one-seventh of the diameter of the shell in width in the more inflated form, a little smaller in the less inflated form, with steep sides and subangular margin. Whorl subquadrate in section, its height about two-thirds of its width; indented to about one-third of its height by the preceding whorl; periphery broad, feebly convex in the less inflated form, in the more inflated form flattened and even slightly concave, especially on the body-chamber, with obtusely angular margins; sides feebly convex; inner margin rather wide, almost perpendicular to the plane of symmetry, its inner half ‘undercut,’ well-defined from the

¹ Vide supra, p. 132.

² A. H. Foord & G. C. Crick: Ann. & Mag. Nat. Hist., ser. vi, vol. v, p. 287, fig. 16.

lateral area by a subangular ridge. Length of body-chamber not seen; aperture with a wide and deep hyponomic sinus. Chambers not very deep, measured at the centre of the periphery not quite one-half of the corresponding height of the whorl in depth; septa feebly concave; suture-line with a simple shallow curve on the lateral area and an extremely shallow curve on the periphery. Siphuncle median. Test rather thick, with distinct lines of growth, which are almost straight on the sides and form a deep and wide sinus on the periphery; the inner area of the whorl, the inner portion of the lateral area, and the periphery also with rather coarse spiral striæ, those on the periphery being rather obscure; towards the aperture all these spiral lines become obsolete.

Dimensions.

	(i)	(ii)
Diameter	95 mm.	80 mm.
Height of outer whorl	50 "	44.5 "
Height of outer whorl above } preceding whorl	37.5 "	30 "
Thickness	78 "	61 "
Width of umbilicus	13.5 "	10.5 "

Remarks.—Two forms of the species can be recognized. There is an example of each in the British Museum Collection; their dimensions

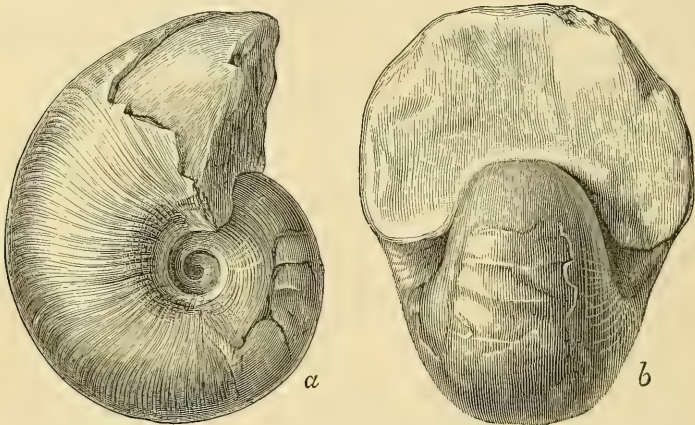


FIG. XIII.—*Nautilus semiornatus*, n.sp. *a*, lateral view of one of the type-specimens, an example of the more inflated form of the species; *b*, front view of the same specimen. Inferior Oolite: Bradford Abbas, Dorset. Drawn from an example in the British Museum Collection [C. 4499]. About three-fifths natural size.

are given above. The broad form, with a flattened or slightly concave periphery, is represented by the specimen No. C. 4499 (i), and the more compressed form, with a more convex periphery, by the example No. C. 3244 (ii). The latter specimen is entirely septate, and shows

the central position of the siphuncle; it probably was, when complete, quite as large as the broad form.

The larger specimen (C. 4499) exhibits the impression of the deep hyponomic sinus of the aperture.

Affinities and Differences.—This species is closely allied to *N. Smithi*,¹ but careful comparison with the type of that species shows that the present species increases less rapidly, and has a larger umbilicus than that species. In *N. exterebratus*² the whorl is more quadrate in section, the umbilicus smaller, and the test without longitudinal ornaments and nearly smooth.

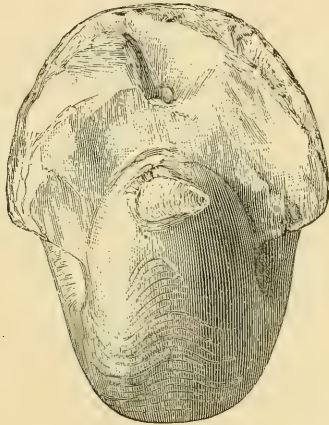


FIG. XIV.—*Nautilus semiornatus*, n.sp. Front view of an example of the less inflated form. Inferior Oolite: Bradford Abbas, Dorset. Drawn from a specimen in the British Museum Collection [C. 3244]. About two-thirds natural size.

Form. and Loc.—Inferior Oolite (*concavus*-zone): Bradford Abbas. Both specimens are labelled “*concavum*-zone, Bradford Abbas.” Mr. Buckman, after a careful examination of the matrix of the specimens, considers No. C. 4499 to be from the “*concavum*-zone (probably *Hyperlioceras*-beds), Bradford Abbas,” and No. C. 3244 from the “fossil-bed of Bradford Abbas (probably upper part with *Hyperlioceras*).”

11. NAUTILUS EXIGUUS, n.sp. Fig. XV.

Types.—British Museum Coll., Nos. C. 4233 and C. 4235.

Specific Characters.—Shell small, rather rapidly increasing, narrowly umbilicated; greatest thickness at the umbilical margin, about two-thirds of the diameter of the shell; height of outer whorl about four-sevenths of the diameter of the shell. Whorls few, exact number

¹ Foord & Crick: Ann. & Mag. Nat. Hist., ser. vi, vol. v (1890), p. 287, fig. 16.

² Vide supra, p. 130.

not seen; inclusion nearly complete; umbilicus small, deep, with subangular margin. Whorl subquadrate in section, wider than high; indented to about one-fourth of its height by the preceding whorl; periphery broad, flattened, feebly convex, with obtusely angular margins; sides flattened, convergent; inner area fairly well defined, rather wide, steep. Body-chamber occupying rather more than one-third of the outer whorl, aperture not seen, but judging from

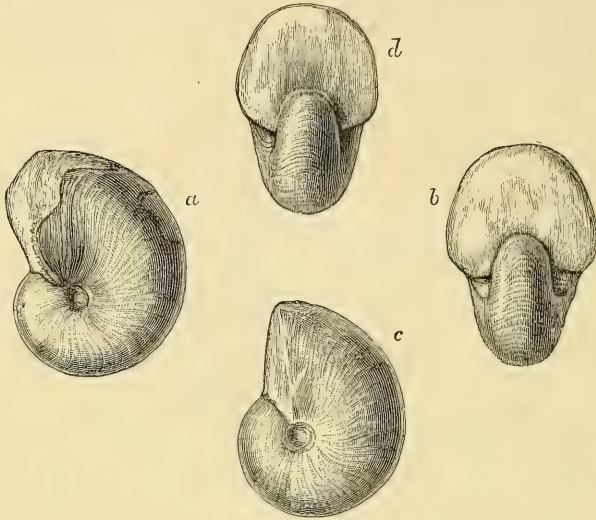


FIG. XV.—*Nautilus exiguus*, n.sp. *a*, lateral view of an example of the less inflated form; *b*, front view of the same; *c*, lateral view of an example of the more inflated form; *d*, front view of the same. Inferior Oolite: Bradford Abbas, Dorset. Drawn from the type-specimens in the British Museum [C. 4233 and C. 4235]. Natural size.

the lines of growth, with a deep hyponomic sinus; depth of chambers not seen; suture-line with a simple shallow curve on the lateral area and a very shallow curve on the periphery. Siphuncle not seen. Test with fine lines of growth, which are slightly sinuated on the sides, and form a deep broad sinus on the periphery; the whole of its surface with obscure waved longitudinal lines.

Dimensions.

	(i)	(ii)
Diameter	28 mm.	27 mm.
Height of outer whorl	15·5 "	16 "
Height of outer whorl above } preceding whorl	about 12 "	11 "
Thickness	18·5 "	19·5 "
Width of umbilicus	3 "	2 "
Approximate width of periphery	11 "	11 "

Remarks.—This species is represented in the British Museum Collection by the two examples—Nos. C. 4233 (i) and C. 4235 (ii)—whose dimensions are given above. They are clearly not the inner whorls of larger specimens, because in each fully one-third of the outer whorl is occupied by the body-chamber. As will be seen from the measurements given above, the specimen No. C. 4235 is slightly more inflated than the example No. C. 4233; its periphery is also more broadly rounded. These differences may possibly be of a sexual character, but they are so slight that it is not at all improbable that they are merely individual variations.

Affinities and Differences.—This species appears to be allied to *N. lineolatus*, but its peripheral margins are much less angular and its whorls increase in thickness more rapidly.

Form. and Loc.—Inferior Oolite: Bradford Abbas, Dorset. Mr. Buckman has examined these specimens, and is of opinion that they came from the “*concavus*-zone (probably *Hyperlioceras*-bed), Bradford Abbas.”

ON THE ANATOMY OF *ADEORBIS SUBCARINATUS*, MONTAGU.

By M. F. WOODWARD,
Demonstrator of Zoology, Royal College of Science, London.

Read 13th May, 1898.

PLATE VIII.

THE investigation of the anatomy of this minute Gastropod was undertaken at the suggestion of my friend Mr. E. R. Sykes, who drew my attention to the uncertainty prevailing as to the true systematic position of this mollusc, and kindly offered to obtain for me some living examples from Guernsey, his great experience in shore-collecting in that island enabling him to procure living specimens almost with certainty. Mr. Sykes also provided me with references to the principal works dealing with the anatomy and affinities of this form, and he has further kindly drawn up the following short account of its habitat.

Live examples of *Adeorbis* are only to be found under stones of large size, that are deeply embedded in the sandy mud close to low-water mark. The most likely stones are so large and firmly planted that one person unaided can barely lift them. The sand or mud beneath must not be too foetid. Generally it is stained yellow, and so too is that portion of the stone on which the *Adeorbis* is found; in fact, it is quite useless to look for live *Adeorbis* if the sandy mud under the stone be altogether black, as it so frequently is. The shells themselves are frequently stained yellow in places, and sometimes are partly blackened.

With *Adeorbis* occurs a very interesting fauna, consisting of *Lepidopleurus scabridus*, Jeff., *Rissoia cancellata*, Da C., *R. lactea*, Mich., *R. striatula*, Mont., and, occasionally, other species of *Rissoia*. *Adeorbis* is found in Jersey, Guernsey, and Herm.

Unfortunately the weather of last summer was not propitious for shore-collecting, and Mr. Sykes was only able to secure three living specimens, which he handed over to me. My own attempts to obtain *Adeorbis* in Sark were unsuccessful, the prevalence of strong westerly winds making collecting at low-water mark almost impracticable.

The three specimens which Mr. Sykes obtained, I was able to keep alive for some days, during which time I made a careful study of the external form of this little animal; they were afterwards preserved in alcohol, and two of them, after their shells had been decalcified, were stained, embedded, and cut into serial sections with a microtome; while from the third the radula was extracted. The small size of these animals rendered dissection almost an impossibility, so that it was deemed advisable to cut them into serial sections, in spite of the labour required in the reconstruction of the anatomy from the same.

Adeorbis is very easily kept alive for some days in a glass tube, provided that the water is changed every day or two. Here the

animal shows great activity, creeping about rapidly, and moving its snout from side to side in its search for food. Duprey [1] speaks of it swimming at the surface of the water, by which I presume he means creeping, as a pond snail does by breaking through the surface film, but this habit I never observed in *Adeorbis*.

The animal is represented in the extended condition in Fig. 1 (Pl. VIII), which drawing is constructed from my studies of the live animal.

Living specimens of *Adeorbis* were examined by Deshayes [2], who, however, gives no description of it. A live specimen was also studied by Marshall [3], who, according to Jeffreys, described it as "so red that it seemed to stain his fingers." None of my specimens, however, exuded any such colouring matter.

The two best accounts of the external form of *Adeorbis* are those of Duprey [1] in 1876 and Fischer [4] in 1885, and of these the former is by far the most complete. Since, however, my observations differ somewhat from those of both these investigators, I have thought it advisable to give a short description of the external characters as noted in my three living and active specimens.

External Characters of the Living Animal.—The foot, which is of a pale transparent flesh colour, is expanded and slightly notched in front, each of the antero-lateral angles being produced out into a lobe, recalling the condition seen in *Valvata* (Bernard [5]). These lobes, however, disappear when the foot is fully expanded, in which condition it is of oblong form, slightly narrowing posteriorly and ending in a bluntly rounded extremity; in front it exhibits that curious double margin (possibly the last trace of the propodium) so common among the Prosobranchiata. A pedal gland opens ventrally near the front of the foot. The operculum (Pl. VIII, Fig. 2) is thin, transparent, paucispiral, and littorinoid (see Jeffreys [6]), and borne on the posterior part of the foot (which does not exhibit an opercular lobe or tentacle such as seen in *Rissoia*), behind which it projects on the right side in Fig. 1, though when the animal is fully expanded the foot extends some distance behind the operculum.

The snout or proboscis is fairly long, club-shaped, and non-introvertible. Through its transparent walls the brick-red, muscular buccal mass can be seen. It is flexed downwards somewhat, much as in *Vivipara*, and the slit-like terminal mouth is consequently ventral in position. On either side of the snout is situated a very long, thin, and slightly club-shaped tentacle; these are attached to the head above the snout. Mr. Sykes, in a drawing which he made from the living animal, has indicated a series of hair-like processes covering the swollen end of the tentacle; these I was unable to observe in any of my specimens, but their occurrence even in a single specimen is of interest, because in *Rissoia parva* the tentacles are conspicuously clothed with such processes. The eyes, according to Fischer and Duprey, are very small, and situated at the outer base and somewhat behind the tentacles. Examination of the living animal led me to the belief that the eyes were wanting, but subsequently, on teasing out a specimen in glycerine and examining it under

the microscope, a most minute pigment spot was discovered on each tentacle in the position indicated above.

Projecting from the mantle cavity on the right side of the body, and even curving round the margin of the shell when the animal is fully extended and actively moving, is a large pectinate gill. This somewhat exceptional character was noted by Duprey, but Fischer neither figures nor describes it, his specimen being evidently in a moribund condition. The relations of the gill at first sight recall that of *Valvata*, but in this latter genus the gill does not extend posteriorly into the mantle cavity for any distance, whereas in *Adeorbis* the gill is well developed posteriorly on the dorsal wall of the mantle.

Two small tentacles are to be observed on the right side behind the gill (Pl. VIII, Fig. 1). These tentacular appendages of the mantle are in the position of a posterior siphon; they are not, however, grooved prolongations of the mantle margin, but solid, tentacular outgrowths. Both Fischer and Duprey appear to have overlooked these appendages, which strongly recall the single, similarly placed, tentacular thread of *Valvata* (Bernard [5]). Some species of *Rissoia* also possess such a structure which may be present on both sides of the body. Right and left tentacles in this same position also occur in *Oliva* and in the embryo of *Vivipara*. None of these forms, however, show two tentacles situated close side by side.

Internal Anatomy: The Alimentary Canal.—The mouth is armed laterally with a pair of little plate-like horny jaws, composed as in many *Tænioglossa* of minute chitinous tesseræ. The buccal mass is fairly large and muscular, and possesses a well-developed radula-sac.

The radula has been described and figured by Fischer [4], but as neither his figure nor his description is quite accurate, I have thought it advisable to refigure the same. The most striking feature (Pl. VIII, Fig. 3) is the lobate posterior border of the base of the central tooth. An examination of a very large series of radulæ, such as we find figured in Troschel's "Das Gebiss der Schnecken" [7], would suggest that this is a very uncommon character, only to be met with elsewhere among the *Rissoiidae*; and it is with *Rissoia* that Fischer compares the radula of *Adeorbis*. When comparing the central tooth of *Adeorbis* with that of *Rissoia*, if we were to restrict ourselves to Troschel's figure of the latter, we should be compelled to admit that Fischer's comparison was a very just one; but happening to procure a number of live specimens of *Rissoia parva*, for the purpose of instituting a comparison of the soft parts with those of *Adeorbis*, I made a preparation of the radula, and found that Troschel's figure of the central tooth was not quite accurate. The posterior border of the base of the central tooth in this form (Pl. VIII, Fig. 4) is not cleft, but entire, save for two slight indentations. It is, however, at once obvious where Troschel made his mistake: there are on the base of this tooth two pairs of small, upstanding, backwardly directed denticles, a larger inner and a smaller outer pair, very similar to those seen in *Bythinia* and *Paludestrina*; these Troschel seems to have mistaken for the posterior border of the tooth, which latter

structure he completely overlooked, whence his representation of the posterior border of this tooth as divided into five processes.

The most striking point of comparison between the radula of *Rissoia* and that of *Adeorbis* thus becomes one of dissimilarity, so that *Adeorbis* appears to stand alone in possessing the cleft base to the central tooth. Nevertheless, when we compare the whole radula of these two forms, we find that the general facies of the two are distinctly similar; this is especially noticeable in the character of the admedians and the laterals in the two forms (see Pl. VIII, Figs. 3 and 4). The admedians have in both genera somewhat long bases, and well-marked denticulate free margins, provided with one large cusp, on either side of which are a number of smaller ones. The laterals when turned outwards are seen to be flattened with a distal expansion terminating in a denticulate margin. On the whole, setting on one side the basal denticle of the central tooth in *Rissoia* and the lobed character of the base of the same tooth in *Adeorbis*, I find that the radula of the latter more nearly approximates to that of the former than it does to that of any other Tænioglossate genus with which I am familiar.

A short, narrow œsophagus (Pl. VIII, Fig. 5, *œs.*) leads from the buccal mass, but soon enlarges into a complicated glandular body (*o.g.*), where the lumen of the œsophagus becomes split up by a series of infoldings of the wall into what appear in section to be several distinct tubes uniting both anteriorly and posteriorly; the whole forms a glandular tubular organ and appears to be comparable to the "Vorderdarmdrüse" which Haller [8] has described in *Natica lineata* and in *Sigaretus*. A pair of small salivary tubes (*s.g.*) are situated just in front of this organ. From the latter a long tube (*œs.*) runs back to the stomach (*st.*), which is of considerable size and divided by two constrictions into three chambers; into the posterior of these open the œsophagus and the bile duct (*b.d.*). The intestine (*int.*) arises from the middle chamber, while the anterior chamber is a blind diverticulum (*cr.s.*), having all the relations of a crystalline style sac, and not unlike that described by Moore [9] in *Typhobia* and other forms. The intestine forms one or two loops in the substance of the liver, and finally crosses over to the right side opening near the anterior margin of the mantle.

Genital Organs.—Of the two specimens examined, one was a male and the other a female. The male possesses no penis, nor any accessory glands. The testis occupies the dorsal border of the visceral mass; it is a tubular gland communicating with the mantle cavity by a vas deferens, which opens high up and close to the external orifice of the kidney.

The female genital organs consist of an ovary, containing large ova, situated behind and above the stomach; a short, narrow duct originates from this and soon passes into a large glandular tube, which after running parallel to the rectum for a short distance opens into the mantle cavity.

The *excretory organ* is of fair size, and opens directly into the mantle cavity near its posterior limit, without the intervention of a long ureter.

The *heart* and *pericardium* call for no comment.

The *gill*, as already mentioned, is very large, for not merely does it occupy the usual position on the dorsal wall of the mantle cavity, but it also, when the animal is fully extended, projects beyond the mantle (Pl. VIII, Fig. 1) as a prominent pectinate appendage.

The Nervous System.—The nerve ganglia are well developed, and closely massed round the œsophagus (Pl. VIII, Figs. 6 and 7), above which latter we find a pair of large, fairly closely approximated, cerebral ganglia (*e.g.*), giving off nerves to the tentacles, and supplying a pair of small buccal ganglia (*b.g.*) in front; ventrally they give origin to a pair of delicate cerebro-pedal commissures, which join with the great pedal ganglia. These last are situated very close together, and each is divided into two (*pd.g.*), there being in *Adeorbis* a small antero-ventral lobe from which the anterior pedal nerves originate. This condition is highly suggestive of that seen in many Naticoids (Haller [8], i.e. in *N. lineata* and in *Sigaretus*). The pleural ganglia (*pl.g.*) are situated very close behind and below the cerebral ganglia, with which they are practically fused; each gives off in front a pleuro-pedal commissure. From the left pleural a short nerve is given off; this dips down under the œsophagus, and almost immediately enlarges into the sub-intestinal ganglion (*sb.g.*), which extends back for a short distance under the œsophagus, but the main mass of this ganglion remains on the left side of the middle line; from it a small commissure passes under the œsophagus round its right side to join the right pleural ganglion.

The supra-intestinal ganglion is also situated to the left of the middle line; it is innervated from the right pleural by a nerve which crosses over the œsophagus, but it is also connected with the left pleural by a still shorter nerve. Thus we see that the zygoneurous condition is attained on both sides. But this zygoneury is a peculiar one, on account of the shortness of the commissures, and is highly suggestive of the condition seen in *Lamellaria* (Bouvier [10], pl. ix, fig. 40), differing from that form mainly in the closer approximation of the sub-intestinal ganglion to the left pleural; in this latter respect *Adeorbis* closely resembles *Sigaretus*, which is also doubly zygoneurous (Haller [8], pl. xiii, fig. 1), only in the latter the commissures connecting the supra-intestinal ganglion with the two pleurals are very long. A comparison with the nervous system of *Rissoia* (Pl. VIII, Figs. 8 and 9) shows a somewhat similar condition, for here also there is a double zygoneury, but the sub-intestinal is close to the left pleural, while the supra-intestinal is close to the right pleural.

The condition of the visceral loop attained in *Adeorbis*, *Rissoia*, and *Lamellaria* suggests the culmination of the processes which have been apparently going on within the Naticoid series; we see there a tendency to a shortening of the commissures connecting the sub-intestinal with the right and left pleural ganglia, that on the left side being shortest in *Sigaretus*, while in *Crucibulum* that on the right is most contracted. All this tends to cause a great concentration of the ganglia around the œsophagus, a condition attaining its

maximum in *Adeorbis*, *Rissoia*, *Lamellaria*, and *Crucibulum* (the latter has, however, lost its left zygoneury). Slight differences are found in the three first-named genera in the position of the supra- and sub-intestinal ganglia in relation to the right and left sides of the body, this depending on the relative degree of contraction of the commissures connecting them with the pleural ganglia, but otherwise these three genera closely resemble one another in their nervous system.

A pair of well-developed otocysts are present, each situated at the postero-dorsal corner of one of the pedal ganglia, and each containing one otolith. I was unable to trace their innervation.

The eyes, as stated above, are extremely small, and an examination of sections shows that they are vestigial structures, being reduced to a minute mass of pigment devoid of all nervous and dioptric structures.

Affinities. — *Adeorbis subcarinatus* was originally described by Montagu under the name *Helix subcarinata*, the genus *Adeorbis* being founded in 1842 by Searles V. Wood, who placed it between the genera *Margarita* and *Natica*; Philippi in 1844 placed it in the Paludinacea, between *Fossarus* and *Skenea*. The most striking change, however, was introduced by Gray, who in 1847 placed this Gastropod with the Trochidæ. Gray's view was adopted by Adams, Chenu, Zittel, and S. P. Woodward; the last-named, however, placed *Adeorbis* nearer the Turbinidæ. Deshayes [2] in 1861 was the first observer to examine the living animal, and he states that it is certainly neither a *Trochus* nor a *Turbo*, but that it is either allied to the Rissoiidæ or constitutes a distinct type from all known forms. Gwyn Jeffreys, who was the first to examine the operculum, placed *Adeorbis* with the Solariidæ, a view which was accepted by Tryon (Man. Conch) in 1883.

It was not, however, till 1885, when Fischer [4] examined the radula, that *Adeorbis* was definitely proved to belong to the Tænioglossa, and he concludes that it has affinities with *Rissoia*, while in its conchological characters it approaches *Skenea*. In view of Fischer's work it is difficult to understand why Bucquoy, Dautzenberg, and Dollfus [11] still place the family Adeorbidæ between the Turbinidæ and the Haliotidæ, especially when they themselves state that Fischer has definitely shown *Adeorbis* to be Tænioglossate.

It will be seen from the above that there has been a considerable difference of opinion in the past regarding the systematic position of *Adeorbis*, the most generally accepted view being that it finds its nearest allies in the Rissoiidæ.

A comparison of the animal and its organs with other Prosobranchs brings us to the following conclusions:—*Adeorbis* is a typical Tænioglossate, as shown by its radula, which most nearly resembles that of *Rissoia*, while differing therefrom in the character of the median tooth, and which is totally unlike the Naticoid radula. The operculum is Littorinoid as in *Rissoia*, some Naticoids, and so many other Tænioglossa, but it is unlike that of *Skenea*; the characters of the foot, gill, and tentacular appendage suggest the similar organs

in *Valvata*; the œsophageal glandular swelling is distinctly Naticoid; the nervous system very closely approaches that of *Lamellaria*, *Sigaretus*, and *Rissoia*.

Thus we find that *Adeorbis* combines the characters of the Rissoiidae and certain of the Naticidae, but still it differs in several important respects from either of these families; consequently I should be inclined to retain the family Adeorbidae and place the same in a position between the two families mentioned, regarding it on account of its radula as somewhat more nearly allied to the Rissoiidae.

BIBLIOGRAPHY.

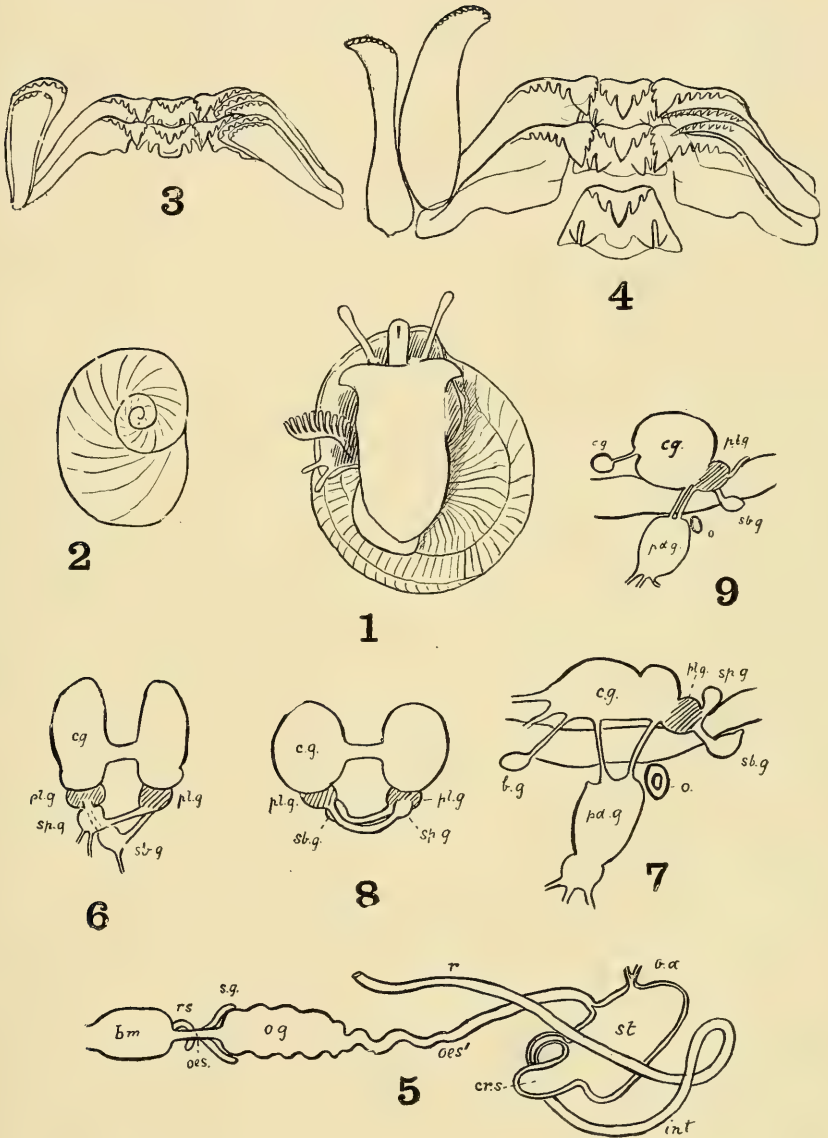
1. DUPREY, E., Shells of the Littoral Zone . . . in Jersey: Ann. & Mag. Nat. Hist., ser. iv, vol. xviii (1876), pp. 338 and 343.
2. DESHAYES, G. P., Animaux sans vertébrés dans le bassin de Paris, tom. ii (1864), p. 431.
3. MARSHALL, J. T., in Jeffrey's Brit. Conch., vol. v, p. 216.
4. FISCHER, P., Note sur l'Animal de l'*Adeorbis subcarinatus*, Montagu: Journ. de Conch., vol. xxxiii (1885), p. 166.
5. BERNARD, F., Recherches sur *Valvata piscinalis*: Bull. Sci. France et Belgique, tom. xxii (1890), p. 253.
6. JEFFREYS, J. G., Brit. Conchology, vol. iv, p. 230.
7. TROSCHEL, F. H., Das Gebiss der Schnecken, Bd. i, p. 126.
8. HALLER, B., Die Morphologie der Prosobranchier, III: Morph. Jahrb., Bd. xviii (1892), p. 451.
9. MOORE, J. E. S., The Molluses of the Great African Lakes: Quart. Journ. Micro. Sci., vol. xli (1898), p. 181.
10. BOUVIER, E. L., Système Nerveux des Prosobranches: Ann. Sci. Nat., Zool., ser. xvii, tom. iii, p. 1.
11. BUCQUOY, E., DAUTZENBERG, P., and DOLLFUS, G., Les Mollusques marins du Roussillon, tom. i (1882), p. 423.

EXPLANATION OF PLATE VIII.

FIG. 1. *Adeorbis subcarinatus*, as seen creeping on the side of an aquarium: not fully extended.

- „ 2. Operculum of *Adeorbis*.
 „ 3. Radula of *Adeorbis*.
 „ 4. Radula of *Rissoia parva*.
 „ 5. Alimentary canal of *Adeorbis* (diagrammatic).
 „ 6. Restoration of the nervous system of *Adeorbis*, from above.
 „ 7. Ditto, side view.
 „ 8. Ditto of *Rissoia*, from above.
 „ 9. Ditto, side view.

<i>b.d.</i>	bile duct.	<i>pd.g.</i>	pedal ganglion.
<i>b.g.</i>	buccal ganglion.	<i>pl.g.</i>	pleural ganglion.
<i>b.m.</i>	buccal mass.	<i>r.</i>	rectum.
<i>c.g.</i>	cerebral ganglion.	<i>r.s.</i>	radula sac.
<i>cr.s.</i>	crystalline style sac.	<i>sb.g.</i>	sub-intestinal ganglion.
<i>int.</i>	intestine.	<i>s.g.</i>	salivary glands.
<i>o.</i>	otocyst.	<i>sp.g.</i>	supra-intestinal ganglion.
<i>œs.</i>	œsophagus.	<i>st.</i>	stomach.
<i>o.g.</i>	œsophageal glandular swelling.		



ANATOMY OF ADEORBIS.

ON THE ANATOMY AND SYNONYMY OF THE GENUS
MARIELLA, GRAY.

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Read 10th June, 1898.

PLATE IX.

SOME time ago our member, Mr. Oliver Collett, F.R.M.S., sent a number of slugs from Ceylon to the writer for description. One species amongst these, however, can be identified as having been described before upon more than one occasion, while it, or a nearly allied form, has, three or four times over, had a new genus specially created for its reception.

A rough anatomical investigation of one of the specimens under consideration revealed its relationship to the members of the genus *Girasia*, Gray, the structure of which has been investigated by Lieut.-Col. Godwin-Austen¹; and a reference to a manuscript list of Cingalese slugs kindly furnished by Mr. E. R. Sykes showed the occurrence of *Tennentia Thwaitesii*, Humbert, and *Vega Nordenskioldi*, Westerlund, in the island. These two last forms, with *Dekhania Beddomei*, Godwin-Austen, from the south-west of India, are put by Cockerell, in his "Check-List of Slugs,"² into the genus *Mariella*, Gray, the type species of which is *Mariella Dussumieri* (Valenciennes MS.), Gray, from Mahi. In a note³ Cockerell gives his impression that all the forms alluded to belong to the same species, and he must also be credited with having previously⁴ placed them in Gray's genus, but without giving the reasons in detail.

The material belonging to the British Museum (Natural History), which was examined through the courtesy of Mr. Edgar Smith, consists of Gray's type-specimen of *M. Dussumieri* and two examples from Ceylon labelled *Tennentia Thwaitesii*, Humbert, by Cockerell. There is no record of the last two slugs, though it is probable from the date upon the bottle (and from the fact that the Museum acquired other specimens procured by Thwaites) that they were collected by the man whose name they bear and are really the fellows of those described by Humbert.

¹ Proc. Zool. Soc., 1880, pp. 289-299; Land and Fresh-water Mollusca of India, p. 220, pls. xxiv-xxvi.

² Conchologist, vol. ii (1893), p. 186.

³ Tom. cit., p. 204.

⁴ Ann. & Mag. Nat. Hist.; ser. vi, vol. vii (1891), pp. 103 & 104.

A comparison of the descriptions of *Mariella*¹ and *Tennentia*² with the specimens alluded to and with those sent by Mr. Collett, so far as the external characters and the shells went, was carefully made by the writer; but the opinion arrived at, with which Mr. E. A. Smith concurred, was that he could not conscientiously separate any one from the others. In like manner the figures and descriptions of *Vega Nordenskioldi*³ and *Dekhania Beddomei*⁴ were considered and compared with the forms already studied and with each other, and all were put down as generically, if not specifically, identical.

The only recorded point which could be taken as evidence against the idea that these should all fall into the same genus was the presence of a pinhole in the dorsal wall of the mantle in Godwin-Austen's species; this was also suggested by a tiny dark dot in Mr. Collett's specimens, while the presence of such an opening was either not mentioned, or stated to be not apparent, in the descriptions of the other 'genera.'

Against the supposition that all the forms belonged to the same species it might be objected (1) that Gray's species is recorded from "Mahi, near Sechelles," which is widely separated from Ceylon and southern India, where the other forms were found, and (2) that the size and general appearance of *Mariella Beddomei* suggest its possible distinctness.

The generic difficulty has been removed (except in the case of *Vega*), though it was only after the preserving fluid had been wiped off, and the minute spot focussed under a low power of the microscope, that a gentle squeezing of the body caused a tiny stream of liquid containing particles to issue from the dot and thus prove the existence of a pore in one of Mr. Collett's specimens; while a careful microscopical examination of the Museum specimens showed, to the satisfaction of Mr. E. A. Smith and the writer, the presence of a similar pore in the mantle of these slugs.

Since the greater part of this paper was written, a note by Mr. Cockerell has appeared,⁵ in which he points out that there is a place called Mahé, which is a French colony on the south-west (he says south-east) coast of India, not far from the Travancore Hills, whence came Godwin-Austen's species. The Seychelles are expressly mentioned by Gray, and further evidence must be forthcoming with regard to the travels of M. Dussumiers, who collected the type, before Mr. Cockerell's contention can be allowed. It might further be pointed out that the locality as given in the British Museum's register is simply Mahi. There is at least one place of that name to the north-west of India, and though the writer has not been able to trace M. Dussumiers to the Seychelles, the late Dr. Crosse kindly wrote to

¹ Catalogue of Pulmonata in Brit. Mus., pt. i (1855), p. 62.

² Rev. & Mag. Zool., 1862, p. 427, pl. xvii, figs. 1a & 1b.

³ Vega Exped., vol. iv (1887), p. 188, pl. ii.

⁴ Land and Fresh-water Mollusca of India, pt. vi (April, 1888), p. 242, pl. lviii.

⁵ Nautilus, vol. xii (1898), p. 9.

say that this traveller presented several living wild animals, including a tiger, to the Paris Museum, which points to his having visited India.

If Gray's locality were right, and any important points of difference could be made out between his species and the Cingalese forms, there might be some hesitation before placing *M. Thwaitesii* and *M. Nordenskioldi* as synonyms of *M. Dussumieri*, to which Mr. Collett's specimens must also be referred. But no differences of body or shell can be determined, and the internal organs of the unique original specimen cannot well be examined.

The occurrence of *Mariella* in Ceylon, southern India, and the Seychelles, that is, in the Cingalese district and the Malagasy region, seems to be regarded by Mr. Cockerell¹ as an anomaly in distribution, but it can be looked upon as one more point in favour of the theory now gaining ground² that a more or less uninterrupted land connection formerly existed between these various localities.

That a species may have remained undifferentiated even in places so far remote as Mahé and Ceylon, is possible; and under the existing circumstances the specific name *M. Dussumieri* must stand for both Cingalese and Seychelles forms; but if at some future time there be reason for separating the examples from Ceylon the name *M. Thwaitesii*, Humbert, must be retained for them.

Through the kindness of our President, Lieut.-Col. Godwin-Austen, the writer has been enabled to examine the original specimens and preparations of *M. Beddomei* and to dissect another example. Some differences in the genitalia, other than those of size, were made out, which will be alluded to later on, and which are considered sufficient to separate this as a distinct species.

BIBLIOGRAPHY AND SYNONYMY OF THE GENUS.

In 1855 Gray constituted the genus *Mariella*³ (*Clypeidella*, Valenciennes MS., non *Clypeidella*, Swainson), with the following characters and containing *M. Dussumieri* from Mahi:—

“Mantle or body convex, produced like a fleshy collar in front, swollen behind, and separated from the upper part of the foot, in a cavity of which it lies, fringed on the side. Foot compressed, truncated, and with an elongate perpendicular gland behind. Shell quite hidden by the mantle, half ovate, solid, with a thin, horny, more or less expanded edge.”

In the description of the type species it is further stated that “the mantle is smooth above, with three slight keels on the hinder part, the central one the largest and most distinct, back without the slightest appearance of a hole.”

It will be noted that there is no express statement in the generic description as to whether the term “fringed on the side” refers to the mantle or to the body, but a glance at the type at once shows that

¹ Nautilus, vol. xii (1898), p. 10.

² Cf. Günther, Proc. Linn. Soc. London, Oct. 1898, p. 22.

³ Cat. Pulmonata in Brit. Mus., pt. i (1855), p. 62.

if either be intended it is not the former: this is of interest with reference to Humbert's genus.

The shell of a specimen from the same locality was afterwards figured by Fischer in 1856,¹ and placed in the genus *Viquesnelia*, Deshayes (created for a fossil shell), under Valenciennes' manuscript name.

Humbert² next, in 1862, described a new genus *Tennentia* to contain a Cingalese slug *T. Thwaitesii*, practically identical with the first mentioned, on the strength of the fact that the mantle was "entire, not fringed." The description is much fuller than Gray's, being accompanied by figures of animal, shell, jaw, and radula, but the only further point of historical interest is the statement that the respiratory opening is in a notch "in the middle of the right side of the mantle."

The Vega Expedition brought home from Ceylon a slug which Westerlund³ in 1887 differentiated under the name of *Vega Nordenskiöldi*. The old fallacy about the "fringed mantle" again prevented the form described from being placed in *Mariella*; an additional reason for separating the new form from the latter being the absence of a fleshy 'collar.' From Humbert's *Tennentia* the Vega's slug differed, it was supposed, in having the respiratory orifice not in the middle, but anteriorly placed on the right side of the mantle. An examination of the figure brings out the fact that the free portion of the mantle which forms the collar is shown, but that it, as well as the head, is contracted, and hence it follows that the position of the respiratory opening must necessarily lie nearer to the anterior end of the body and mantle than when the slug is more extended.

The other differences between *Vega* and *Tennentia* are based apparently upon Semper's⁴ description of *Tennentia Philippinensis*, but since the anatomy of that animal differs very markedly from *Mariella*, in the spermatheca being sessile (showing a relationship to *Parmarion*) and in the central tooth of the radula being absolutely unlike that of the former genus, the arguments based upon it can have no weight in the present discussion.

In 1888 Godwin-Austen⁵ made a new subgenus of *Girasia*, Gray (= *Helicarion*), to wit, *Dekhania*, afterwards raised to generic rank,⁶ to contain a form (*D. Beddomei*) shown to be generically identical with *Mariella* by its external characters, jaw, and radula.

A brief description is given and allusions made for the first time to the anatomy of the soft parts, the genitalia being described as "like those of *Girasia* save that the amatorial organ (dart sac) is not so large." The anatomy of the latter genus was previously described by Godwin-Austen,⁷ therefore no detailed account is given

¹ Journ. de Conch., 1856, p. 290, pl. vii, fig. 18.

² Rev. & Mag. Zool., 1862, p. 428, pl. xvii, fig. 1.

³ Vega Exped., vol. iv (1887), p. 188, pl. ii, figs. 1a & 1b.

⁴ Reisen Archipel Philippinen, vol. ii (1870), pt. iii, p. 7.

⁵ Land and Fresh-water Mollusca of India, p. 242, pl. lviii.

⁶ Op. cit., p. 253.

⁷ Proc. Zool. Soc., 1880, p. 293, pls. xxiv, xxv.

in the "Land and Fresh-water Mollusca of India," though the genitalia of *Girasia Radha*, G.-A., are figured, and it is stated that those of *G. Hookeri* are, with certain restrictions, in every way similar to those of *Austenia gigas*. The anatomy of *Mariælla*, as made out in Mr. Collett's specimens, agrees with that of *Dekhania*, so far as indicated by Godwin-Austen.

It now remains to give revised descriptions of the genus *Mariælla* and its two valid species *M. Dussumieri* and *M. Beddomei*, with some account of their anatomy.

MARIÆLLA, Gray.

Mariælla, Gray: Cat. Pulmonata Brit. Mus., pt. i (1885), p. 62.

Tennentia, Humbert: Rev. & Mag. Zool., 1862, p. 427, pl.

Vega, Westerlund: Vega Exped., vol. iv (1887), p. 188, pl. ii.

Dekhania, Godwin-Austen: Land and Fresh-water Mollusca of India, pt. vi (April, 1888), p. 242, pls. lvii and lxii.

Animal limaciforme, antice convexum, crassum, semicylindricum; postice post medium angustum, valde compressum, dorso acute carinatum, ad finem pedis peroblique truncatum (truncatura superne verticali, deinde valde declivi) et glandula mucosa terminatum. Pallium ovatum, plus minusve tricarinatum, antice, liberum, postice, in loculamento pedis subquadrato depressum et ad medium perforatum; super carinam unam cicatrix a foramine parvo, ad scissuram in margine dextro currit ubi orificium respirationis ponitur: margo posterior scissuræ sub aliam productus. Pes canaliculo angusto et lineolis fuscis notatus. Solea obscure tripartita, orificium genitale commune post tentaculum dextrum positum.

Cochlea interna, subovata, superne convexa et cute protecta, inferne vel concava vel calce completa et convexa; apex posterior, in margine dextro et desuper versus.

Viscera in pedem post pallium non producta. Maxilla simplex, in medio elevata. Dens centralis et dentes radulæ laterales plus minusve tricuspidati, dentes marginales pæne æque bicuspidati. Genitalia—sacculus spiculi amoris præsens, oviductus liber, turgidus. Penis acute flexus ubi appendix retractorem portans emergit; epiphallus in flagellum breve productus.

This slug (Pl. IX, Figs. 1-1a) is characterized by having a more or less oval mantle, which is free and capable of some amount of extension in front and which covers the viscera behind. The posterior end of this mantle is tucked into a pocket (which has a somewhat square termination) beneath the keel on the hinder portion of the foot. The 'tail' is also laterally compressed, truncated, and bears a slit-like mucous gland at its extremity. Three keels are at some stage more or less strongly developed on the surface of the mantle, and a special feature is the tiny hole in the mantle wall in the middle line posteriorly, while a scar runs from this orifice

to a slit in the right border of the mantle, marking the line of junction between the right and left shell lobes which are still free in the genus *Macrochlamys*. The posterior margin of this slit extends forwards, and is overlapped by the anterior one. The common genital orifice is situated behind to the right tentacle. The foot has a narrow pedal groove, and is marked at its edge with dark lineoles, while the sole shows some slight traces of differentiation into three portions.

The shell (Pl. IX, Figs. 2-2*a*) is to all intents and purposes internal, and is somewhat oval in shape, with a light-coloured periostracum, it is convex above, while on the under side either the original hollow may remain or this may be filled up with shelly matter, even to the extent of rendering the under surface convex. The lines of growth are well marked, and the apex of the shell, which lies on the right side of the posterior end, is directed downwards. An important point is that the viscera are not carried behind the mantle into the foot. The jaw (Pl. IX, Fig. 3) is a simple structure, with a prominence in the middle; while the radula shows a central tricuspid tooth flanked by laterals, with large meso-cones, distinct ecto-cones, and ento-cones (Pl. IX, Fig. 4) that may be but barely distinguishable; the typical marginals (Fig. 4*a*) follow after a larger or smaller number of transitional teeth, and are bicuspid, the meso- and ecto-cones being practically equal in size.

The genitalia (Pl. IX, Fig. 5) seem to be very much like those of *Girasia* as described by Godwin-Austen. A dart sac is present, shown on the right-hand side in the figure; a swelling of the free oviduct takes place that appears to be characteristic; the penis, as in the last-named genus, is sharply bent at the point where an appendix bearing the retractor muscle is given off; an epiphallus follows which is prolonged as a blunt and short flagellum beyond the insertion of the vas deferens. The spermatophore (capreolus), so far as it could be made out in *M. Dussumieri*, is shown in Fig. 6; in the spermatheca there were some seven or eight of the shafts without projections; a bunch of these latter was, however, discovered attached to a broken head, and the two have been combined in Fig. 6, to give as correct a representation of the structure as possible.

This genus is evidently very nearly allied to *Girasia*, but differs in the following characters, as pointed out by Godwin-Austen when instituting the synonymous genus *Dekhania*. The depression in which the visceral hump is sunk is squarish, not V-shaped; the pedal grooves are not so deep nor so well shown, and the segmented margin is narrower; the orifice in the mantle is much smaller, as also is the shell, which is reduced, while the radula has a larger number of teeth in each row.

The question as to the dart sac being larger must, one would think, apply to girth,¹ since that of *Mariella Beddomei* seems comparatively larger than that of *Girasia Radha*, while that of *Mariella Dussumieri*

¹ During the reading of this paper Lieut.-Col. Godwin-Austen signified that this was what was meant.

is smaller in every respect. The teeth of the radula in the last-mentioned species resemble those of a typical *Girasia* rather than those of *Mariælla Beddomi*, which, on the whole, seems the more nearly related to *Girasia*.

MARIÆLLA DUSSUMIERI (Valenc. MS.), Gray. Pl. IX, Figs. 1-6.

Mariælla Dussumieri, Gray: Cat. Pulmonata Brit. Mus., pt. ii (1855), p. 63. (No fig.)

Viquesnelia Dussumieri, Gray: Fischer, Journ. de Conch., 1856, p. 290, pl. iii, fig. 18.

Tenmentia Thwaitesii, Humbert: Rev. & Mag. Zool., 1862, p. 42, pl. xvii.

Vega Nordenskiöldi, Westerlund: Vega Exped., vol. iv (1887), p. 190, pl. ii, fig. 1.

Animal lateribus corporis fulvis, antice unicolor, post pallium nigro-striatum; pallium flavidum nigro-maculatum, valde tricarinatum. Cochlea, non per foramen minutum pallii visa sed apex per pallium conspicuus. Solea pedis albida. Maxilla longitudinaliter et distincte striata. Dentes radulæ laterales valde tricuspidati, in marginales celeriter mutantes. Spermatheca sacculo spiculi amoris longior. Long. (in Formaldehyde) 26, diam. 9 mm.¹

Hab.—Mahi and Ceylon.

This is the type species, for one must exclude the *Limax infumatus* figured, but not described nor localized, by Férussac, which has been suggested as a possible member of the genus.

The ground colour is yellowish-brown, becoming more yellow on the surface of the mantle, which is marked with dark blotches, while dark lines occur upon the sides of the foot behind the mantle. The foot-sole is whitish, the pore in the mantle minute and not easily discovered in spirit specimens. The surface of the mantle bears three distinct keels, that on the foot being light-coloured. The shell in all the specimens and figures seen by the writer is thin and concave, but Fischer says that it becomes filled up as in the next species. The jaw is distinctly striated longitudinally; the central and lateral teeth of the radula have large meso-cones and well-developed, pointed ecto- and ento-cones; the last-named are soon lost, and the teeth, as one passes towards the edges, quickly change into typical bicuspid marginals, in which the ecto- and meso-cones are practically identical in size, so that each tooth much resembles a serpent's tongue.

The dart sac is much shorter than the spermatheca and comparatively small.

The localities for this slug are Mahi (Dussumiers) and the Botanic Gardens at Peradeniya, Ceylon, under stones with *Veronicella* (Thwaites); Point de Galle (Vega Expedition); Watawala, November, 1896 (with *Veronicella*), 3,600 feet; and Ambegamuwa District, Central Province

¹ The Mahi type is 26 × 7 mm. The largest of the Museum specimens labelled *M. Thwaitesii* is 21 × 6 mm., while the one from which the dissection was made was rather larger than that of which the measurements are given above.

(Collett). A specimen has also been received from Kegalla through the kindness of Mr. Hugh B. Preston.

MARIELLA BEDDOMEI, Godwin-Austen. Pl. IX, Fig. 7.

Dekhania Beddomei, Godwin-Austen: Land and Fresh-water Mollusca of India, p. 242, pl. lviii.

Animal corpore silaceo, unicolori, vel maculato (ut in specie priore) vel omnino nigro. Pallium adulti indistincte tricarinatum. Cochlea per foramen pallii (in exemplis spiritu conservatis) non per pallium visa. Solea pedis flavescens. Maxilla vix striata. Dentes radulae laterales vix tricuspидati, in marginales lente mutantes. Spermatheca sacculo spiculi amoris brevior. Long. (in spiritu) 51, diam. 13 mm.

Hab.—Travancore Hills, South-West India.

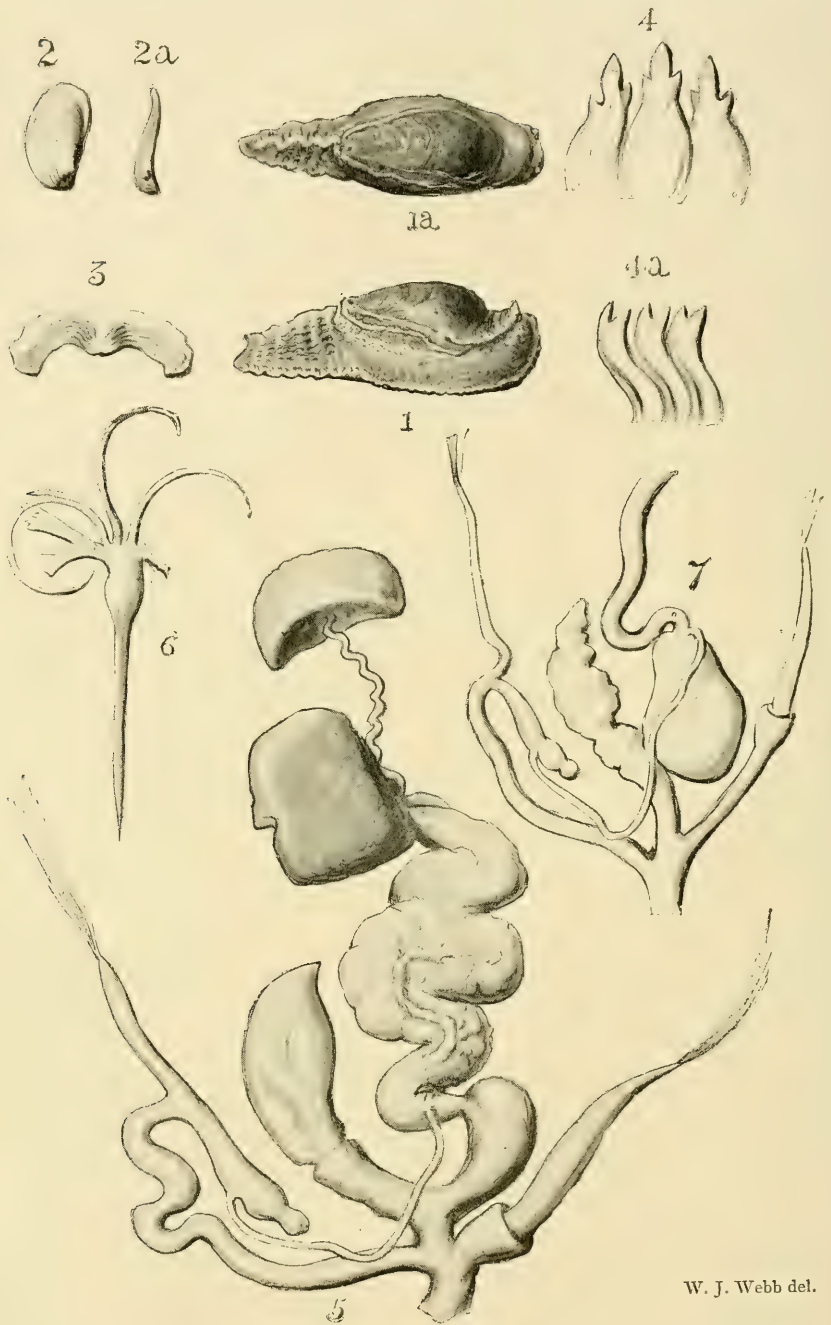
This may be differentiated from the previous species by its much greater size and the comparatively larger orifice in the mantle: the mantle keels, though present in the younger examples, become indistinct on the adults. The colour is either uniformly ochreous, or this is dotted with black blotches all over the mantle and on the sides behind it, while one wholly black specimen is recorded and figured by the original describer. The keel on the foot was found with one exception to be dark-coloured. The shell appears to be, comparatively, somewhat narrower than in *M. Dussumieri*, and is convex below, the original hollow being filled up; while the longitudinal striation of the jaw is not so well marked as in that form. The central tooth of the radula is tricuspид; the marginals have a step-like ecto-cone, a large meso-cone, and hardly any apparent ento-cone: the transition into typical laterals is much more gradual, as might be imagined from the fact that the ecto-cones are much less strongly developed to begin with than in the last species, and consequently it takes a larger series to reach the more uniformly bicuspid type; in fact, in but few of these does the ecto-cone exceed the meso-cone in size.

The dart sac (Pl. IX, Fig. 7) is more elongated than in the other species, and is longer than the spermatheca, while the swelling of the free oviduct is more marked.

With respect to the so-called *Tennentia Philippinensis*, Semper, already spoken of, and two other species recently described from the Philippines under the same generic name, viz., *Mariella carinata*, Mlldf., and *M. Quadrasi*, Mlldf., Mr. W. E. Collinge says that Dr. von Möllendorf writes to him — "I have my doubts if all three really belong to *Tennentia*."

Under these circumstances, and taking into consideration the fact that the two latter 'species' were described¹ in a dozen lines or so, without figures, from external examination of single specimens, the writer does not at present feel justified in including them in the list of valid species of *Mariella*.

¹ Nachr. Malak. Ges., 1894, p. 85.



W. J. Webb del.

EXPLANATION OF PLATE IX.

- FIG. 1. *Mariælla Dussumieri* (Valenc. MS.) Gray, after preservation in Formaldehyde, seen from the right side, and showing the right mantle keel with the scar above it.
- „ 1a. The same, seen from above. The median mantle keel is visible, and in its entirety, while the hinder end of the left one, which here follows the outline of the animal, is just visible.
 - „ 2. The shell ($\times 2$), seen from above.
 - „ 2a. The same ($\times 2$), seen from the left side.
 - „ 3. The jaw: much enlarged.
 - „ 4. The central and two adjacent lateral teeth from the radula: much enlarged.
 - „ 4a. Three marginal teeth: much enlarged.
 - „ 5. The genitalia ($\times 2$).
 - „ 6. A spermatophore: greatly enlarged.
 - „ 7. Genitalia of *Mariælla Beddomei*, G.-A.: somewhat enlarged.
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NOTE ON *ARIUNCULUS AUSTRIACUS*, n.sp., FROM THE ALPS IN AUSTRIA.

By J. F. BABOR, of Prague.

Read 10th June, 1898.

ARIUNCULUS AUSTRIACUS, n.sp.

Animal thick and short, obtusely pointed behind, of the form and size of *Ariunculus Isselii*, Bgt.; shield gibbose, minutely granulose; back finely rugose, the rugæ on the sides wide, depressed. Colour of the head-shield and back, dark brown, whilst the sides in the anterior portion of the body and the neck are light yellow, without bands or spots. Margin of foot reddish, but blackish posteriorly, transversely sulcate, and striped with brown, the stripes being alternately strong and faint (thus exactly resembling the foot-margin of *Arion empiricorum*, var. *marginatus*). Caudal gland well defined, triangular, fairly deep, surrounded by the dilated foot-margin. Genital orifice placed between the respiratory orifice (which is situated towards the anterior end of the shield) and the right tentacle. Foot-sole whitish, with greyish lateral zones. No shell present. Length (in alcohol) 32 mm.¹

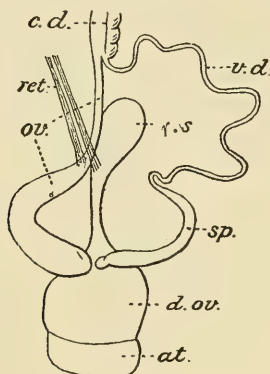
Hab. — Schneeberg, near Vienna (coll. Dr. A. Wagner). One specimen is in the collection of the K. K. Naturhistorisches Hofmuseum: no locality is given, but it probably comes from the Alps in the neighbourhood of Vienna.

Anatomy. — The pallial complex resembles that of *Arion* (the nephridium is horseshoe-shaped), to which genus there is besides a complete similarity in the form and arrangement of all the digestive organs (the jaw may be accounted aulacognath; the radula has not been examined) and of the nervous system. The retractors of the tentacles are symmetrical. The pedal gland is also like that in *Arion*. By the agency of the blood-vessels small calcareous concretions are formed.

Genitalia. — The hermaphrodite gland is deeply pigmented, pyriform, divided into two parts by the genital artery, small (in the second example very large). The hermaphrodite duct is long, thin, undulating, and without any diverticulum at the end. The albumen gland is voluminous, long, and tongue-shaped. The convolute common duct (*c.d.*) has numerous folds; the prostate portion is of a violet colour, the oviduct being white. The vas deferens (*v.d.*) is relatively long, the sperm duct (*Patronenstrecke*) (*sp.*) distinct, rather thick and cylindrical, having a globular termination, the inner surface of which is studded with copulatory papillæ. The receptaculum

¹ This new species, like *Ariunculus Isselii* (Simroth [3], p. 331), quite gives one the impression, at first sight, of being a dwarfed form of *Arion empiricorum*.

seminis (*r.s.*) possesses a spherical ampulla, its duct is thin and short, swelling out below till it assumes the shape of an inverted funnel at the point where it joins the dilated portion of the oviduct (*d.ov.*). The free portion of the oviduct (*ov.*) is very long, curved somewhat in the shape of an S, and furnished with internal folds. Its upper moiety is thin, narrow, and straight, but after the point of attachment of the retractor muscle it becomes stouter and increases perceptibly in size. All three ducts (male, female, and receptacular) enter a large rounded expansion¹ of the free oviduct (*d.ov.*), generally



Portion of the reproductive organs of *Ariunculus Austriacus*, n.sp.

at. atrium; *c.d.* common duct; *d.ov.* dilated portion of the oviduct; *ov.* free portion of oviduct; *r.s.* receptaculum seminis; *ret.* retractor muscles; *sp.* sperm duct; *v.d.* vas deferens.

but wrongly designated the 'upper atrium.' On laying open this structure the female copulatory lingula may be observed, coiled on itself in three folds, just as it is in *Arion Lusitanicus*.

Beyond the attachment of the retractor muscle (*ret.*) to the oviduct, and close to the point at which it is given off, a muscle passes to the stalk of the receptaculum seminis. It is a fact of some importance that the genital retractor muscle is shown by its remarkable breadth to consist of two separate muscle bands incompletely fused (another instance of paired genital retractors in a species of *Arion* has been cited by Collinge [6]). Its point of origin is posterior to the edge of the mantle. The atrium (*at.*)—generally called the 'lower atrium'—is distinctly glandular and folded inwards. There is no pigmentation of the terminal ducts.

The anatomy of the present species, when compared with that of other representatives of the genus, agrees most nearly with that of the

¹ This expansion was of enormous extent in the second of the two examples under observation, a condition which is well known to prevail when the animal is in its male phase.

Sardinian section *Ichnusarion*, Poll.; there is but slight difference in the sexual apparatus between *A. Isselii*, Bgt., and *A. Austriacus*, nevertheless its external characters and its habitat show the latter to be distinct. Were the structure of adult individuals of *Ariunculus*, Less. (Poll.), s.str., known (half-grown animals of *Ariunculus Mortilleti*, Less., were, it is true, dissected by Simroth [3]), better reasons for this contention would undoubtedly be forthcoming.

Our knowledge (small enough, certainly) of the anatomy of this group of Palæartic Arionidæ (founded on the descriptions of *Ariunculus* furnished by Lessona [1], Pollonera [4], and Simroth [3], and of *Letourneuxia* by Hesse [2], Pollonera [4], and Simroth [5]), tends to confirm the opinion of Simroth [5] that Pollonera [3] was wrong in assigning *Letourneuxia*, Bgt., to the genus *Geomalacus*, Allm., when it is manifestly much more nearly allied to *Ariunculus*, while *Geomalacus* stands apart amongst the Arionidæ.

BIBLIOGRAPHY.

1. LESSONA, M., & POLLONERA, D., "Monografia dei Limacidi italiani": Mem. Acc. Sci. Torino, ser. II, tom. xxxv (1884), pp. 49-128, 3 pls.
2. HESSE, P., "Nacktschnecken von Tanger und Gibraltar": Malakozool. Blätter, n.f., vol. vii (1884), pp. 9-17.
3. SIMROTH, H. R., "Über bekannte palæarktische Nacktschnecken": Jahrb. Deutsch. malak. Ges., Bd. xiii (1886), pp. 311-342, 2 pls.
4. POLLONERA, D., "Recensement des Arionidæ de la Région Paléarctique": Boll. Mus. Zool. Anat. comp. Torino, tom. v (1890), No. 87.
5. SIMROTH, H. R., "Über die Nacktschnecken der Azorisch-Portugiesischen Fauna": Nova Acta Acad. Cæs. Leop. Carol., tom. lvi (1891), pp. 201-424, 10 pls.
6. COLLINGE, W. E., "The Myology of some Pulmonate Mollusca considered as a distinctive feature in the discrimination of Genera, etc.": Proc. Malac. Soc. Lond., vol. i (1894), pp. 52-54.

[See also these Proceedings, ante, p. 94, PILSBRY, H. A., "Phylogeny of the Genera of Arionidæ."]

NOTES ON CEYLON LAND-SHELLS, WITH DESCRIPTIONS OF NEW SPECIES OF *CYATHOPOMA* AND *THYSANOTA*.

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

Read 10th June, 1898.

PLATE X.

THE species of *Cyathopoma* hitherto recorded from Ceylon are :

<i>C. Ceylanicum</i> , Beddome.	<i>C. album</i> , Beddome.
<i>C. Mariæ</i> , Jousseau.	<i>C. Prestoni</i> , Sykes.
<i>C. artatum</i> , Sykes.	<i>C. turbinatum</i> , Sykes.
<i>C. leptomita</i> , Sykes.	

The occurrence of *C. album* is doubtful. I am now able to add two more species, which owe their discovery to the energy of Mr. Collett, who has also found "among lichens, Lower Ambagamuwa, at 2,500 feet," a form, which I think it wisest, considering the little we know of the specific variation of the present genus, to regard for the present as a large variety of *C. Prestoni*. This new variety differs from the type in its greater size, having an additional whorl, more elevated form, and in the more strongly marked spiral sculpture, the liræ also being more numerous; the periostracum, too, is thicker, and, under a lens, gives an obsoletely decussated appearance to the shell.

1. *CYATHOPOMA CONOIDEUM*, n.sp. Pl. X, Figs. 3a-c.

Testa dextrorsa, valde elevata, trochoidalis, mediocriter et perspective umbilicata, periostraco brunneo induta, apice acutulo; anfr. 7, lente accrescentes, plano-convexi, primi læves, reliqui obsolete spiraliter lirati, ultimus liris duabus, unica in medio, altera infra, ornatus, fere lævis in regione umbilicari; sutura valde impressa; apertura subcircularis, basi recedens, continua, peristomate leviter incrassato. Alt. 2.6, lat. 1.5 mm.

Hab. — Among fern-roots and under rocks, Binoya, Watawala (O. Collett).

A very interesting form, remarkable for its trochoid shape (it is almost turreted in form, owing to the deeply impressed suture) and obsolete spiral liræ. Unfortunately the specimens are not in very good condition. A smaller specimen, in better condition than the type, is also figured (Fig. 3c).

2. *CYATHOPOMA COLLETTI*, n.sp. Pl. X, Figs. 1a-c.

Testa dextrorsa, elevata, pyramidalis, mediocriter et perspective umbilicata, cornea, strigis castaneis obliquis picta; anfr. 4½, convexi, regulariter accrescentes, primi læves, reliqui spiraliter lirati, ultimus

duabus liris, unica ad peripheriam, altera basali, ornata, in regione umbilicari lævi impressa; sutura impressa; apertura subcircularis. Diam. max. 1·1, alt. 1 mm.; spec. maj. diam. 1·5, alt. 1·2 mm.

Hab.—Amongst moss on Eton estate, Punduloya, at 4,000 feet (O. Collett).

This species may easily be separated from the other known species of Ceylon by the fact that it is smooth save for the two distinct spiral liræ on the last whorl, of which only one appears on the earlier whorls, and by the difference in its coloration.

The operculum is very remarkable: seen from without it appears as a ring of foliaceous laminæ standing up and surrounding a deep central pit.

This species may be the *Jerdonia trochlea* of Hanley & Theobald,¹ but not that of Benson,² figured by Pfeiffer³ from a specimen belonging to H. Benson. The two figures represent quite distinct species, and as Pfeiffer's was taken from a Bensonian specimen, it is the more likely one to be correct.

3. THYSANOTA HISPIDA, n.sp. Pl. X, Figs. 2a-c.

Testa trochiformis, periostaco fusco, rugoso, induta, basi impressa, umbilicus angustus, pervius; apex mediocris, applanatus; anfr. 6-6½, convexi, lira unica spiraliter sculpti, ultimus basi carinatus, lira carinaque pilis longis dense notatæ, apertura lata, lunaris; peristoma simplex, marginibus callo tenuissimo junctis. Diam. max. 8, alt. 5 mm.

Hab.—Hapatule, at 4,500 feet, Ceylon (O. Collett).

This species appears to be closely related to *Thysanota Guerini*, Pfr., from the Nilgherries, but differs somewhat in shape, as also in size; the single spiral thread clothed with club-shaped hairs (Fig. 2c) is specially noteworthy. The basal carination is continued, and marks the suture of the upper whorls.

4. *HELIX BICILIATA*, Pfr.—Practically all that we know of the *Helix biciliata*, Pfr., is contained in his original description;⁴ there are also the figures given by Hanley & Theobald.⁵ Pfeiffer records the habitat as 'Ceylon,' and refers to 'coll. Skinner.' As this collection passed into the hands of Miss Linter, I inquired if she possessed the species: she kindly informed me that no trace of it could be found in the catalogue of the collection.

Recently I have had from Mr. Collett two very interesting specimens, in good condition, which I refer to this species. Provided we assume that when Pfeiffer speaks of "carinis duabus," one may be almost in the suture, they agree fairly well with his diagnosis, save that on examining the base under a lens, I find palatal and

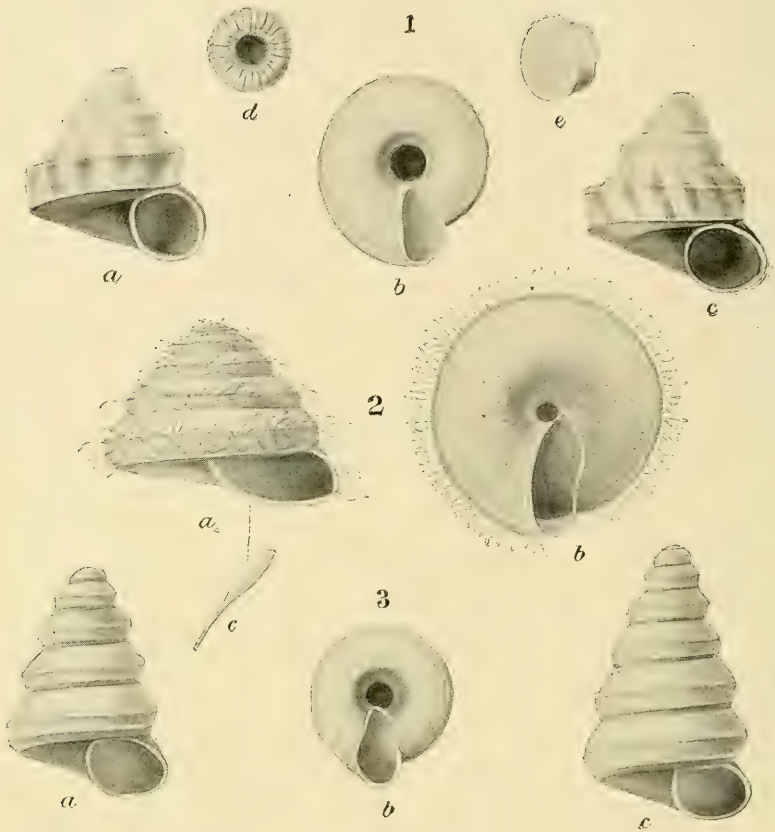
¹ Conch. Ind., pl. cxxxv, figs. 5, 6.

² Ann. & Mag. Nat. Hist., ser. II, vol. viii (1851), p. 189.

³ Conch. Cab., *Cyclostomacea*, p. 380, pl. xlix, figs. 29, 30.

⁴ Proc. Zool. Soc., 1855, p. 112 (cf. Mon. Helic. Viv., iv, p. 68).

⁵ Conch. Ind., pl. clx, figs. 1, 4.



J. Green del.

NEW CEYLON LAND-SHELLS.

- FIGS. 1a-c. *Cyathopoma Colletti*, n.sp.
 " 1d, e. " " operculum.
 " 2a, b. *Thysanota hispida*, n.sp.
 " 2c. " " one hair, magnified.
 " 3a-c. *Cyathopoma conoideum*, n.sp.

All figures magnified. Owing to an accident to the author's specimen, Figs. 1a-c are taken from specimens presented by Mr. Collett to the British Museum.

parietal armature of the *Plectopylis* (*Sykesia*) type. It may well be, however, that if his specimens were not in good condition this would not be apparent. The only other difficulty arises in the dimensions. Pfeiffer gives "Diam. maj. $7\frac{1}{2}$, min. $6\frac{1}{2}$, alt. $3\frac{1}{2}$ mill." for a shell of $4\frac{1}{2}$ whorls: one of mine, which has a whorl more, measures diam. 6, alt. 3.5 mm. It is frequently, however, difficult to reconcile measurements of small shells, and if he included the projecting hairs in his "diam. maj." all difficulties would vanish. I think, therefore, that it is wiser to refer these shells to Pfeiffer's species, which must be regarded as a *Sykesia*, than to describe them as new. Mr. Collett's specimens are from Haputale, at 5,000 feet; I have also a dead shell found by Mr. Preston at Patapolla at 6,500 feet.

5. *HELIX HUTTONI*, Pfr.—Recently I recorded from Ceylon a form which I was unable to separate specifically from the *Helix Huttoni* of Pfeiffer. Thinking it possible that the specimens might prove to be very closely allied to *Hygromia Radleyi*, Jousseau,¹ I sent one to that author for examination. He informed me that it was very closely allied to his species, but was smaller, the spire was less elevated, and the umbilicus larger. Examining several specimens I find that they vary as follows:—

Diam.	max.	11	mm.;	alt.	5	mm.
"	"	10	"	"	4.2	"
"	"	9.5	"	"	4.8	"
"	"	9	"	"	4.8	"
"	"	9.2	"	"	4	"

It will be seen, therefore, that the shell is variable, and I think both forms will prove to belong to *H. Huttoni*; the width of the umbilicus would naturally become larger in the more depressed form. Perhaps the Ceylon form may be distinguished as var. *Radleyi*, Jous.

¹ Mem. Soc. Zool. France, vol. vii, p. 284, pl. iv, fig. 6.

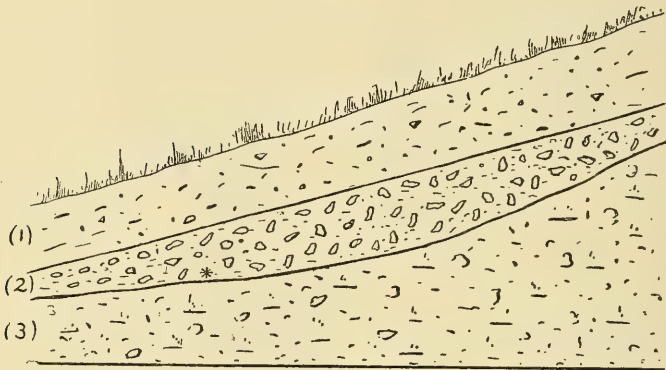
NOTE ON NON-MARINE MOLLUSCA OBTAINED FROM HOLOCENE
AND PLEISTOCENE DEPOSITS AT BUCKLAND, DOVER.

By the Rev. R. ASHINGTON BULLEN, B.A., F.G.S., etc.

Read 10th June, 1898.

THE object of this note is to draw attention to two very interesting sections of Pleistocene and Holocene deposits, containing the remains of Mollusca, that overlie the Head or Rubble Drift at Barton Court Estate, Buckland, Dover, on the northern side of the valley of the River Dour. The deposits are at a height of about fifty feet above the

FIG. I.



1. Surface soil with few angular flints, 2 feet.
2. Dissolved out flints unworn, 9 in. to 1 ft. 6 in. : *Helix aspersa* extremely abundant. * Roman pottery.
3. Chalk Rubble, 1 ft. to 2 ft. 6 in.

present river-bed, and probably 100 to 120 feet above O.D. Since contours of the hills contiguous to Government fortifications are not published, it is difficult to arrive at the exact level in reference to mean high-water mark.

The deposits are about a mile in a straight line from the nearest cliff, and about two miles from the mouth of Dover Harbour.

The estate is being rapidly developed for building purposes, and a new road, called Heathfield Avenue, has been made on the hill which terminates at Dover Castle. This road is partly made of the material on the spot, and in cutting a perpendicular face on its northern side the rubble drift deposit and overlying strata have been cut.

In the waste land between sections I and II living specimens of

H. Cantiana, *H. virgata* (two vars.), and a dark *H. aspersa* are very abundant. I found no *H. Carthusiana*.

The first section is at right angles to the new road, and runs with the slope of the hill: it exposes a hill-wash of a remarkable character.

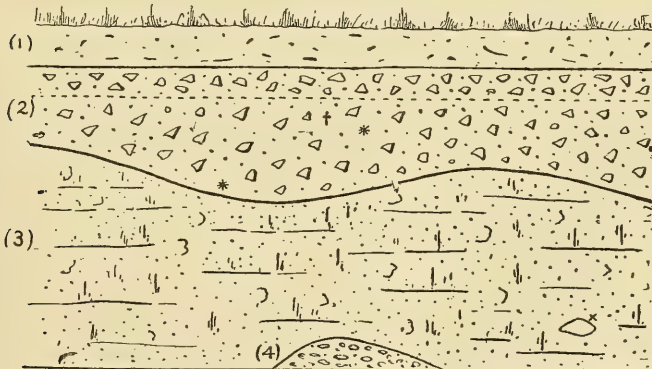
At the lower part *Helix aspersa* was exceedingly plentiful, from the youngest and most fragile shell to the massive adult specimen. Near the base of this deposit occurred a fragment of Roman tile. When these shells were living on the spot the flints must have been on the surface, for even the youngest shells are quite uninjured.

In this deposit occur:

- Vitrea cellaria*, Müll.
- „ *nitidula*, Drap.
- Pyramidula rotundata*, Müll.
- Helicella Itala*, Linn.
- „ *caperata*, Mont.
- „ *Cantiana*, Mont.
- „ *Carthusiana*, Müll.
- Hygromia hispida*, Linn.
- „ *rufescens*, Penn.
- Vallonia pulchella*, Müll. (1 specimen).
- Helix aspersa*, Müll.
- „ *nemoralis*, Linn.
- Cochlicopa lubrica*.
- Pupa muscorum*, Linn. (1 specimen).
- Clausilia laminata*, Mont. (1 specimen).

About 150 yards eastward another promontory has been cut away to form the road. Here for about 100 yards the face of the section may be generalized as follows:—

FIG. II.



1. Surface soil, 1 foot to 18 inches.
2. Chalky marl with angular flints, 2 to 3 feet. ** Neolithic pottery.
†† Neolithic flints.
3. Chalk marl and brickearth, 4 to 5 feet. * Small pocket of shells.
4. Boss of Rubble Drift.

It is very evident that we are here dealing with a more complex series of deposits, the lower portions of which are older than those of the first section. The surface soil contains few shells. *Helicella virgata*, Da C., was the only one which I noticed.

The next stratum (2) is really a double one in point of date. The upper part contains *Helix aspersa* (though far less abundantly than the other section) and *Helicella Cantiana*, and is probably of the same age as the deposit No. 2 of Fig. I. Towards the middle and at the lower part, however, Neolithic flints and Neolithic pottery occurred. One specimen of *H. aspersa* was found at the lowest horizon of the Neolithic pottery.

The lowest stratum (3) is pre-Neolithic, and is of the character of brickearth in some places, and of chalky loam in others. In this bed, towards the lower part and just above the chalk rubble, the following shells were found:—

Agriolimax agrestis, Linn. 5 feet from surface.

Helicigona arbustorum, Linn. 5 ft. 6 in. and 6 ft. from surface.

Pupa muscorum, Linn. 5 ft. 6 in. from surface.

These and *Vallonia pulchella*, Müll., occurred sparingly through the upper part of this stratum.

This lowest deposit corresponds to other Pleistocene deposits in lithological and faunal characters, and is to my mind a loam such as at Chesilton, Portland Bill, Sangatte, and elsewhere occurs in seams in the angular and subangular Rubble Drift, which at this section overlies it.¹

Reverting to Fig. II:—

Helicella Cantiana occurred at the upper part of (2).

Agriolimax agrestis throughout (2), but one specimen was found at a depth of 5 feet, well down in the Pleistocene loam.

Pupa muscorum was met with under and at the lower part of (2), at the upper part of (3), and a few specimens on the horizon of

Helicigona arbustorum.

Helicigona arbustorum in (3) only, 5 ft. 6 in. and 6 feet from surface.

Helix aspersa occurred generally, but sparingly, throughout (2), one specimen on the horizon of the Neolithic pottery at the base of (2).

The complete list of the shells found in the two sections is as follows:—

SURFACE SOIL.	HOLOCENE.
<i>Helicella virgata</i> , Da C.	<i>Agriolimax agrestis</i> , Linn.
POST-ROMAN.	<i>Vitrea cellaria</i> , Müll.
<i>Helicella Cantiana</i> , Mont.	,, <i>nitidula</i> , Drap.
<i>Helix aspersa</i> , Müll.	,, <i>pura</i> , Ald. (1 specimen).

¹ Prestwich: Quart. Journ. Geol. Soc., vol. xlviii (1892), pp. 271, 277, 278; vol. xxi (1865), p. 440.

HOLOCENE (*continued*).

- Vitrea nitida*, Müll. (1 specimen).
Helicella Itala, Linn.
 ,, *caperata*, Mont.
 ,, *Carthusiana*, Müll.
Hygromia hispida, Linn.
 ,, *rufescens*, Penn. (abundant).
Vallonia pulchella, Müll. (abundant).
Helix aspersa, Müll. (not very abundant).
Helix nemoralis, Linn. (2 specimens).
Cochlicopa lubrica, Müll.
Cæcilianella acicula, Müll.
Pupa cylindracea, Da C.

- Pupa muscorum*, Linn. (abundant).
Vertigo pygmæa, Drap. (abundant).
Clausilia bidentata, Ström. (1 specimen).

PLEISTOCENE.

- Agriolimax agrestis*, Linn.
Hygromia hispida, Linn.
Vallonia pulchella, Müll.
Helicigona arbustorum, Linn. (2 specimens).
Cochlicopa lubrica, Müll. (1 specimen).
Pupa muscorum, Linn.
 ,, *secale*, Drap. (1 specimen).

My sincere thanks are due to Mr. B. B. Woodward and Mr. A. S. Kennard, for their help in identifying critical specimens and in modernizing my nomenclature.

A CONTRIBUTION TOWARDS A CHECK-LIST OF THE NON-MARINE
MOLLUSCAN FAUNA OF SOUTH AFRICA.

By J. COSMO MELVILL, M.A., F.L.S., etc., and J. H. PONSONBY,
F.Z.S., etc.

Read 10th June, 1898.

SINCE the publication, fifty years ago, of Dr. Krauss' "Sudafrikanischen Mollusken," so many additions have been made to this fauna that the following list may, it is hoped, be found useful alike to students here and to collectors on the spot. As the northern limit of South Africa we have taken the line of the Tropic of Capricorn, or just above the 24th parallel, thus excluding all tropical species.

[A few days after the reading of this paper Dr. Sturany, of Vienna, announced¹ the issue in the near future of a complete and comprehensive work on this subject, dealing with the whole country south of the Zambesi. Meantime he has already described a number of species; such of them as come within our geographical limits have been added, within brackets, after the genus to which they belong.]

We have not at present seen any of those shells to the names of which an asterisk (*) is prefixed.

GASTROPODA.

TESTACELLIDÆ.

APERÆ.

Burnupi, Smith: Ann. Nat. Hist., vol. x (1892), p. 465.

Hab.—Natal.

Gibbonsi, Bin.: Bull. Mus. Comp. Zool. Harvard, vol. v (1879),
p. 331; Jahrb. Deutsch. malak. Ges., vol. xii (1885), pl. ii,
figs. 5-7.

Hab.—Natal.

TESTACELLA.

aurigaster, Layard [? ubi].

Hab.—Gardens in Capetown.

ENNEA.

Adamsiana, Pfr.: Mon. Helic. Viv., vol. v, p. 339; Novit. Conch.,
vol. i, pl. xxxii, figs. 9-11.

Hab.—Natal.

Albersi, Pfr.: Proc. Zool. Soc., 1854, p. 295; Novit. Conch.,
vol. i, pl. x, figs. 15-17.

Hab.—Natal.

aperostoma, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 93,
pl. vi, fig. 10.

Hab.—Natal.

¹ Anzeiger k. Akad. Wissensch. Wien, 1898, No. xvi.

ENNEA (*continued*).

- auris-leporis*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 25,
pl. viii, fig. 3. Hab.—Natal.
- Bowkera*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 92,
pl. vi, fig. 9. Hab.—Cape Colony.
- Burnupi*, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897), p. 634,
pl. xvii, fig. 2. Hab.—Natal.
- Cairnsi*, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897), p. 634,
pl. xvii, fig. 1. Hab.—Buffalo River.
- candidula*, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 12,
pl. ii, fig. 2. (*E. Layardi*, Ancey: Bull. Soc. Mal. France,
vol. vii, 1890, p. 159.) Hab.—Port Elizabeth.
- caryatis*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 24,
pl. viii, fig. 2. Hab.—Cradock, Cape Colony.
- cinolia*, Melv. & Pons.: Ann. Nat. Hist., vol. xvi (1895), p. 478,
pl. xviii, fig. 2. Hab.—Grahamstown.
- cionis*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 25,
pl. viii, fig. 4. Hab.—Port Elizabeth.
- Collieri*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 23,
pl. iii, fig. 13. Hab.—Pretoria.
- consobrina*, Ancey: Brit. Natural., 1892, p. 125; Ann. Nat. Hist.,
vol. i (1898), pl. viii, fig. 9. Hab.—Albany.
- crassidens*, Pfr.: Mon. Helic. Viv., vol. iv, p. 340; Novit. Conch.,
vol. i, pl. xxxii, figs. 6–8. Hab.—Natal.
- crassilabris*, Craven: Proc. Zool. Soc., 1880, p. 616, pl. lvii, fig. 5.
Hab.—Transvaal.
- Crawfordi*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 26,
pl. viii, fig. 5. Hab.—Port Elizabeth.
- Crossleyana*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 106, pl. iii, fig. 8. Hab.—Natal.
- delicatula*, Pfr.: Malak. Blatt., vol. iii (1856), p. 259; Novit.
Conch., vol. i, pl. xxxii, figs. 21–23. Hab.—Natal.
- distincta*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 22,
pl. iii, fig. 10. Hab.—Transvaal.
- docimasta*, Melv. & Pons. (*dokimasta*): Ann. Nat. Hist., vol. i
(1898), p. 27, pl. viii, fig. 7. Hab.—Natal.
- dolichoskia*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 86,
pl. vi, fig. 6. Hab.—Port Elizabeth.
- Drakensbergensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 107, pl. iii, fig. 10. Hab.—Natal.
- Dunkeri*, Pfr.: Malak. Blatt., vol. ii (1855), p. 173; Novit.
Conch., vol. i, pl. xx, figs. 11–13. Hab.—Natal.
- elliptica*, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 126,
pl. vii, fig. 2. Hab.—Natal.
- euthymia*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 107,
pl. iii, fig. 10. Hab.—Natal.
- eximia*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 28,
pl. viii, fig. 8. Hab.—Between Delagoa Bay and Barberton.
- Farquhari*, Melv. & Pons.: Ann. Nat. Hist., vol. xvi (1895),
p. 478, pl. xviii, figs. 3–5. Hab.—Grahamstown.

ENNEA (*continued*).

- formosa*, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 126,
pl. vii, fig. 3. Hab.—Natal.
- Gouldi*, Pfr.: Malak. Blatt., vol. ii (1855), p. 174; Novit. Conch.,
vol. i, pl. xx, figs. 7–10. Hab.—Natal.
- impervia*, Melv. & Pons.: Ann. Nat. Hist., vol. xviii (1896), p. 315,
pl. xvi, fig. 1. Hab.—Natal.
- infans*, Craven: Proc. Zool. Soc., 1880, p. 616, pl. lvii, fig. 6.
Hab.—Transvaal.
- infrendens*, Mts.: Malak. Blatt., vol. xiii (1866), p. 110, pl. iii,
figs. 10–12. Hab.—Natal.
- Kraussi*, Pfr.: Malak. Blatt., vol. ii (1855), p. 174; Novit. Conch.,
vol. i, pl. xx, figs. 14–16. Hab.—Natal.
- labyrinthea*, Melv. & Pons.: Ann. Nat. Hist., vol. xvi (1895),
p. 479, pl. xviii, figs. 7, 8. Hab.—Grahamstown.
- Margarettae*, Melv. & Pons.: Ann. Nat. Hist., vol. xvi (1895),
p. 479, pl. xviii, fig. 1. Hab.—Grahamstown.
- Mariae*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 92,
pl. vi, fig. 12. Hab.—Grahamstown.
- Maritzburgensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 107, pl. iii, fig. 11. Hab.—Pietermaritzburg.
- **Menkeana*, Pfr.: Mon. Helic. Viv., vol. iii, p. 551; Novit. Conch.,
vol. i, pl. xxxii, figs. 3–5. Hab.—Natal.
- minuta*, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 13, pl. ii,
fig. 3; (as *E. pusilla*) loc. cit., p. 200. Hab.—Port Elizabeth.
- munita*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 86,
pl. vi, fig. 5. Hab.—Griqualand East.
- Natalensis*, Craven: Proc. Zool. Soc., 1880, p. 619, pl. lvii, fig. 7.
Hab.—Durban.
- Nonotiensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894),
p. 95, pl. i, fig. 15. Hab.—Natal.
- obovata*, Pfr.: Proc. Zool. Soc., 1855, p. 9; Novit. Conch., vol. i,
pl. xvii, figs. 9–11. Hab.—Natal.
- pentodon*, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 11,
pl. ii, fig. 1; (as *E. Natalensis*) loc. cit., p. 200.
Hab.—Port Elizabeth.
- perspicua*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 23,
pl. iii, fig. 12. Hab.—Transvaal.
- **Pfeifferi*, Krs.: Küst., Conch. Cab., p. 87, pl. xii, figs. 17–19.
Hab.—Cape Colony.
- Planti*, Pfr.: Malak. Blatt., vol. ii (1855), p. 173; Novit. Conch.,
vol. i, pl. xx, figs. 5, 6. Hab.—Natal.
- polita*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 108,
pl. iii, fig. 12. Hab.—Cape Colony.
- pulchella*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 108,
pl. iii, fig. 13. Hab.—Pietermaritzburg.
- Queketti*, Melv. & Pons.: Ann. Nat. Hist., vol. xviii (1896), p. 315,
pl. xvi, fig. 2. Hab.—Natal.
- regularis*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 22,
pl. iii, fig. 11. Hab.—Pietermaritzburg.

ENNEA (*continued*).

- Rogersi*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 26,
pl. viii, fig. 6. Hab.—Cape Colony.
- scrobiculata*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 93,
pl. vi, fig. 8. Hab.—Natal.
- Socratica*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 109,
pl. iii, fig. 14. Hab.—Natal.
- Tharfieldensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 109, pl. iii, fig. 15. Hab.—Cape Colony.
- thelodonta*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 85,
pl. vi, fig. 6. Hab.—Port Elizabeth.
- Vandenbroeckii*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 110, pl. iii, fig. 16. Hab.—Natal.
- Vanstaadensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 110, pl. iii, fig. 17. Hab.—Cape Colony.
- Wahlbergi*, Krs.: Südafrik. Moll., p. 80, pl. v, fig. 5.
Hab.—Durban.
- Wottoni*, Melv. & Pons.: Ann. Nat. Hist., vol. xvi (1895), p. 479,
pl. xviii, fig. 6. Hab.—Grahamstown.
- [**ampullacea*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898,
No. xvi, reprint p. 3. Hab.—Near Durban.
- **Arnoldi*, Sturany (cum var. *elongata*): Anz. k. Akad. Wissensch.
Wien, 1898, No. xvi, reprint p. 6. Hab.—Near Durban.
- **differens*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 2. Hab.—Near Durban.
- **Durbanensis*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898,
No. xvi, reprint p. 4. Hab.—Near Durban.
- **Gouldi*, var. *excedens*, Sturany: Anz. k. Akad. Wissensch. Wien,
1898, No. xvi, reprint p. 2. Hab.—Near Durban.
- **ingens*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 3. Hab.—Near Durban.
- **instabilis*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 3. Hab.—Near Durban.
- **Isipingoensis*, Sturany (cum varr. *discrepans*, *simillima*, *cylindrica*):
Anz. k. Akad. Wissensch. Wien, 1898, No. xvi, reprint p. 5.
Hab.—Near Durban.
- **Leppani*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 5. Hab.—Albany District.
- **multidentata*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898,
No. xvi, reprint p. 4. Hab.—Near Durban.
- **Pentheri*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 6. Hab.—Near Durban.
- **perissodonta*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898,
No. xvi, reprint p. 4. Hab.—Delagoa Bay.
- **perspicuaformis*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898,
No. xvi, reprint p. 1. Hab.—Delagoa Bay.
- **sejuncta*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 3. Hab.—Near Durban.
- **separata*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 2. Hab.—Near Durban.

ENNEA (*continued*).

- **transiens*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 2. Hab.—Near Durban.]

RHYTIDA.

- Kraussi*, Pfr.: Symb. Hist. Helic., III, p. 70; Krs., Südafrik.
Moll., pl. iv, fig. 24. (*Sturmiana*, Pfr.: Proc. Zool. Soc., 1851,
p. 253; Rve., Conch. Icon., pl. clxviii, fig. 1, 132.)
Hab.—Cape Colony.
Schærfia, Pfr.: Malak. Blatt., vol. viii (1861), p. 73, pl. ii,
figs. 1-3; Chemn., Conch. Cab., clxxviii, figs. 1-6.
Hab.—Cape Colony.
vernica, Krs.: Südafrik. Moll., p. 76, pl. iv, fig. 23.
Hab.—S. Africa.

NATALINA.

- Beyrichi*, Mts.: Sitz. Ber. Ges. naturf. Berlin, 1890, p. 85,
pl. vi, figs. 1-3. Hab.—Pondoland.
cænotera, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 238,
pl. xiii, fig. 2. Hab.—S. Africa.
Caffra, Fér.: pr. 3, Hist., pl. ix A, fig. 8.
Var. *Wesseli*, Maltz.: Jahrb. Deutsch. malak. Ges., vol. iii
(1876), p. 149, pl. v, fig. 1. Hab.—S. Africa.
Caffrula, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 24,
pl. viii, fig. 1. Hab.—Cape Colony.
capsula, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 492.
Hab.—Cape Colony.
Chaplini, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 91,
pl. i, fig. 3; vol. xv (1895), pl. xii, figs. 5-5b.
Hab.—Cape Colony.
Coerneyensis, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 91,
pl. i, fig. 2. Hab.—Cape Colony.
cosmia, Pfr.: Zeitsch. f. Malak., 1852, p. 112; Rve., Conch. Icon.,
pl. clxxiii, fig. 1, 174. (*cerea*, Pfr.: Zeitsch. f. Malak., 1851,
p. 16 [*nec* Gould]. *munda*, Bens.: Ann. Nat. Hist., vol. vi,
1850, p. 253 [*nec* Adams]. *omphalion*, Bens.: Ann. Nat.
Hist., vol. xiii, 1864, p. 494.) Hab.—Capetown.
dumeticola, Bens.: Ann. Nat. Hist., vol. vii (1851), p. 106; Rve.,
Conch. Icon., pl. clxxiii, fig. 1, 172. Hab.—Capetown.
eumacta, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 237,
pl. xiii, fig. 4. Hab.—Natal.
Knysnaensis, Pfr.: Proc. Zool. Soc., 1845, p. 131; Chemn., Conch.
Cab., pl. cxxxiii, figs. 5, 6. Hab.—Cape Colony.
liparoxantha, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 238,
pl. xiii, fig. 3. Hab.—Natal.
Quekettiana, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 103, pl. iii, fig. 1. Hab.—Natal.
Somerssetensis, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893),
p. 19, pl. iii, fig. 2. Hab.—Cape Colony.
Trimeni, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 237,
pl. xiii, fig. 1. Hab.—Cape Colony.

NATALINA (*continued*).

- viridescens*, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891), p. 238;
vol. ix (1892), pl. iv, fig. 1. Hab.—Transvaal.

ZONITIDÆ.

ZINGIS.

- afra*, Pfr.: Vers., 119. (*Tollini*, Alb.: Malak. Blatt., vol. iv, 1857,
p. 94; Chemn., Conch. Cab., pl. clxxviii, figs. 13–15.)
Hab.—Cape Colony.
Arnotti, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 491.
Hab.—Cape Colony.
cotyledonis, Bens.: Ann. Nat. Hist., vol. v (1850), p. 216; Chemn.,
Conch. Cab., pl. cxli, figs. 3, 4. Hab.—Capetown.
Crawfordi, Melv. & Pons.: Ann. Nat. Hist., vol. vi (1890), p. 469,
vol. ix (1892), pl. iv, fig. 4. Hab.—Natal.
delicata, Melv. & Pons.: Ann. Nat. Hist., vol. xv (1895), p. 163,
pl. xii, figs. 1, 1a. Hab.—Cape Colony.
inclara, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 6, pl. i,
fig. 2; (as *inops*, Morel.) loc. cit., p. 200. Hab.—Natal.
lygæa, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 85,
pl. iv, fig. 7. Hab.—Natal.
minythodes, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 240,
pl. xiii, fig. 8. Hab.—Cape Colony.
Natalensis, Pfr.: Symb. Hist. Helic., III, p. 65; Chemn., Conch.
Cab., pl. xxix, figs. 30–32. Hab.—Natal.
phytostylus, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 492.
Hab.—Cape Colony.
pinguis, Krs.: Südafrik. Moll., p. 75, pl. iv, fig. 19. Hab.—Natal.
Trotteriana, Bens.: Ann. Nat. Hist., vol. ii (1848), p. 161; Chemn.,
Conch. Cab., pl. cxliii, figs. 1, 2. Hab.—Cape Colony.

HELICARION.

- chrysoprasinus*, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892),
p. 241, pl. xiii, fig. 11. Hab.—Pretoria.
cingulatus, Melv. & Pons.: Ann. Nat. Hist., vol. vi (1890), p. 466;
vol. ix (1892), pl. v, fig. 8. Hab.—Port Elizabeth.
corneus, Pfr.: Symb. Hist. Helic., III, p. 81; Chemn., Conch.
Cab., pl. ii, figs. 31–33. Hab.—Natal.
fuscicolor, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 240,
pl. xiii, fig. 10. Hab.—Natal.
Hudsonia, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 493.
Var. *rufoflosa*: Ann. Nat. Hist., vol. vi (1890), p. 467.
,, *meridionalis*: Ann. Nat. Hist., vol. vi (1890), p. 468.
,, *alocola*: Ann. Nat. Hist., vol. vi (1890), p. 468.
Hab.—Cape Colony.
Natalensis, Krs.: Südafrik. Moll., p. 74, pl. iv, fig. 17.
Hab.—Natal.
pellicula, Fér.: pr. 9, p. 21, Hist., pl. ix A, figs. 5–7.
Hab.—Cape Colony.

HELICARION (*continued*).

- phædimus*, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 241,
pl. xiii, fig. 12. Hab.—Natal.
Planti, Pfr.: Proc. Zool. Soc., 1856, p. 324. Hab.—Natal.
Poeppigi, Mke.: Symb. Hist. Helic., III, p. 81; Chemn., Conch.
Cab., pl. ii, figs. 13–15. Hab.—Natal.
symmetricus, Craven: Proc. Zool. Soc., 1880, p. 614, pl. lvii,
fig. 2. Hab.—Transvaal.
Transvaalensis, Craven: Proc. Zool. Soc., 1880, p. 615, pl. lvii,
fig. 3. Hab.—Transvaal.
Vandenbroeckii, Craven: Proc. Zool. Soc., 1880, p. 615, pl. lvii,
fig. 4. Hab.—Transvaal.
zonamydrus, Melv. & Pons.: Ann. Nat. Hist., vol. vi (1890), p. 467;
vol. ix (1892), pl. v, fig. 9. Hab.—Cape Colony.

LIMAX.

- **maximus*, L.: Syst. Nat., 12th ed., p. 108. Hab.—Capetown.
variegatus, Drap.: Tab. Moll., 1801, p. 103.
Hab.—Pietermaritzburg.

AGRIOLIMAX.

- **agrestis*, L.: Syst. Nat., 12th ed., p. 652. Hab.—Capetown.

AMALIA.

- **Capensis*, Krs.: Südafrik. Moll., p. 73. Hab.—Cape Colony.
gagates, Drap.: Hist. Moll. France, p. 122, pl. ix, fig. 1.
Hab.—Natal.

UROCYCLUS.

- flavescens*, Keferstein: Malak. Blatt., 1866, p. 70, pl. ii, figs. 1–8.
Hab.—Natal.
**Kraussianus*, Heynm.: (*Limax*, ? sp., Krs., Südafrik. Moll., p. 73)
Jahrb. Deutsch. malak. Ges., 1885, p. 327. Hab.—Cape Colony.
**pallescentis*, Ckll.: Ann. Nat. Hist., vol. vii (1891), p. 101.
Hab.—Natal.

OPELTA.

- **aterrima*, Gray: Cat. Pulmon., 1855, p. 55; Ckll., Ann. Nat. Hist.,
vol. vi (1890), p. 387. Hab.—S. Africa.
**nigropunctata* (Mörch), Heynm.: Malak. Blatt., vol. xiv (1867),
p. 191. Hab.—Cape Colony.

KALITELLA.

- Pretoriensis*, Melv. & Pons.: Ann. Nat. Hist., vol. vi (1890), p. 469;
vol. ix (1892), pl. iv, fig. 5. Hab.—Transvaal.

MARTENSIA.

- Mozambicensis*, Pfr.: Proc. Zool. Soc., 1855, p. 91, pl. xxxi, fig. 9.
Hab.—Near Delagoa Bay.

ENDODONTIDÆ.

PHASIS.

- Capensis*, Pfr.: Symb. Hist. Helic., I, p. 40; Rve., Conch. Icon.,
pl. xliii, fig. 202. (*littoricola*, Bens.: MS.) Hab.—Cape Colony.

PHASIS (*continued*).

- Menkeana*, Pfr.: Symb. Hist. Helic., II, p. 33; Rve., Conch. Icon., pl. cvi, fig. 591. Hab.—Cape Colony.
Namaquana, Mts.: Sitz. Ber. Ges. naturf. Berlin, 1889, p. 161, pl. vii, figs. 1-4. Hab.—Namaqualand.
paludicola, Bens.: Ann. Nat. Hist., vol. vi (1850), p. 253; Rve., Conch. Icon., pl. clxxiv, fig. 1,179. Hab.—Capetown.
 **tabulæ*, Chaper: Bull. Soc. Zool. France, 1885, p. 483, pl. xi, figs. 4, 5. Hab.—Capetown.
 **Uitenhagensis*, Krs.: Südafrik. Moll., p. 76, pl. iv, fig. 22. Hab.—Cape Colony.

TRACHYCYSTIS.

- actinotricha*, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 238, pl. xiii, fig. 5. Hab.—Natal.
anea, Krs.: Südafrik. Moll., p. 75, pl. iv, fig. 18. Hab.—Natal.
 **Africa*, A. D. Brown: Amer. Journ. Conch., vol. i (1865), p. 136; Chemn., Conch. Cab., pl. clxii, figs. 8, 9. Hab.—Cape Colony.
Alcocki, Melv. & Pons.: Ann. Nat. Hist., vol. xv (1895), p. 164, pl. xii, figs. 2, 2a. Hab.—Cape Colony.
aprica, Krs.: Südafrik. Moll., p. 77, pl. iv, fig. 26. Hab.—Natal.
aulacophora, Ancey: Bull. Soc. Malac. France, vol. vii (1890), p. 158; Tryon, Man. Conch., ser. II, vol. viii, pl. xliii, figs. 60, 61. Hab.—Cape Colony.
bathycaele, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 89, pl. v, fig. 4. Hab.—Cape Colony.
bisculpta, Bens.: Ann. Nat. Hist., vol. vii (1851), p. 103; Rve., Conch. Icon., pl. clxxiii, fig. 1,171. Hab.—Cape Colony.
Browningi, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 493; Tryon, Man. Conch., ser. II, vol. ix, pl. x, figs. 8, 9. Hab.—Cape Colony.
Burnupi, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 239, pl. xiii, fig. 6. Hab.—Natal.
Charybdis, Bens.: Ann. Nat. Hist., vol. xviii (1856), p. 436. Hab.—Cape Colony.
conisalea, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 239, pl. xiii, fig. 7. Hab.—Natal.
epetrina, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 84, pl. iv, fig. 3. Hab.—Cape Colony.
eratina, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 88, pl. v, fig. 3. Hab.—Cape Colony.
Glanvilleana, Ancey: Bull. Soc. Malac. France, vol. vii (1890), p. 157. Hab.—Cape Colony.
Hartvigiana, Pfr.: Malak. Blatt., vol. viii (1861), p. 167; Küst., Conch. Cab., pl. clxxviii, figs. 10-12. Hab.—Cape Colony.
Hottentota, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891), p. 239; vol. ix (1892), pl. iv, fig. 6. Hab.—Cape Colony.
lignicola, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 126, pl. vii, fig. 1. Hab.—Cape Colony.
liricostata, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891), p. 239; vol. ix (1892), pl. v, fig. 1. Hab.—Cape Colony.

TRACHYCYSTIS (*continued*).

- Loveni*, Krs.: Südafrik. Moll., p. 76, pl. iv, fig. 21. Hab.—Natal.
perplicata, Bens.: Ann. Nat. Hist., vol. vii (1851), p. 104; Rve.,
 Conch. Icon., pl. clxxiii, fig. 1, 173. Hab.—Cape Colony.
 **petrobia*, Bens.: Ann. Nat. Hist., vol. vii (1851), p. 105; Rve.,
 Conch. Icon., pl. clxxiii, fig. 1, 169. Hab.—Cape Colony.
Planti, Pfr.: Proc. Zool. Soc., 1854, p. 51 (*Platti*, ex err. typ.);
 Rve., Conch. Icon., pl. clxxxix, fig. 1, 325. Hab.—Natal.
 **prionacis*, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 493.
 Hab.—Cape Colony.
rariPLICATA (Bens.), Pfr.: Zeitsch. f. Malak., 1849, p. 71; Rve.,
 Conch. Icon., pl. clxxiv, fig. 1, 183. Hab.—Capetown.
rhysodes, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 88,
 pl. iv, fig. 2. Hab.—“S. Africa.”
rivularis, Krs.: Südafrik. Moll., p. 77, pl. iv, fig. 25.
 Hab.—Capetown.
sabuletorum, Bens.: Ann. Nat. Hist., vol. vii (1851), p. 105;
 Rve., Conch. Icon., pl. clxxiv, fig. 1, 180. Hab.—Capetown.
strobilodes, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 19,
 pl. iii, fig. 1. Hab.—Cape Colony.
teretiUScula, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897),
 p. 635, pl. xvii, fig. 5. Hab.—Natal.
trichostiroMa, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 84,
 pl. iv, fig. 9. Hab.—Natal.
turmalis, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 5, pl. i,
 fig. 1. Hab.—Cape Colony.
vorticialis, Bens.: Ann. Nat. Hist., vol. v (1851), p. 216; Rve.,
 Conch. Icon., pl. clxxiv, fig. 1, 181. Hab.—Capetown.

HELICIDÆ.

DORCASIA.

- Alexandri*, Gray: Alexander's Exped. . . . into the interior
 of Africa, vol. ii (1838), p. 268. Hab.—Great Namaqualand.
 Var. *minor*, Bttg.: Ber. Senckenb. naturf. Ges., 1886, p. 22,
 pl. ii, figs. 1a-c. Hab.—S. Kalahari.
 **bulbus* (Mke.), Pfr.: Zeitsch. f. Malak., 1848, p. 116; Chemn.,
 Conch. Cab., pl. cxxii, figs. 4-6. Hab.—Cape Colony.
 **cernua*, Mts.: Sitz. Ber. Ges. naturf. Berlin, 1889, p. 161, pl. vii,
 figs. 8-10. Hab.—Namaqualand.
 **coagulum*, Mts.: Sitz. Ber. Ges. naturf. Berlin, 1889, p. 160,
 pl. vii, figs. 11-14. Hab.—Namaqualand.
globulus, Müll.: Hist. Verm., vol. ii, p. 68; Chemn., Conch. Cab.,
 pl. iv, figs. 5, 6. Hab.—Capetown.
gypsina, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891), p. 238;
 vol. ix (1892), pl. iv, fig. 10. Hab.—Springbok.
Inhluzana, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 91,
 pl. i, fig. 4; vol. xv (1895), pl. xii, figs. 6, 6a.
 Hab.—Drakensberg Mountains.
lucana, Müll.: Hist. Verm., vol. ii, p. 75; Chemn., Conch. Cab.,
 pl. lx, figs. 1, 2. Hab.—Cape Colony.

DORCASIA (*continued*).

- Namaquensis*, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891), p. 237; vol. ix (1892), pl. iv, fig. 12. Hab.—Namaqualand.
porphyrostoma, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891), p. 238; vol. ix (1892), pl. iv, fig. 10. Hab.—Namaqualand.
rosacea, Müll.: Hist. Verm., ii, p. 76; Chemn., Conch. Cab., pl. lv, figs. 7, 8. Hab.—Cape Colony.

TULBAGHINIA.

- isomerioides*, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 28, pl. viii, fig. 10. Hab.—Cape Colony.

DOUBTFUL HELICOID SPECIES.

- **Congellana*, Krs. (*Helix*): ? MS. ubi. Hab.—Cape Colony.
dioryx, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 89, pl. v, fig. 2 (*Trochozonites*). Hab.—Robbe Bay.
Farquhari, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 240, pl. xiii, fig. 9 (*Helix*). Hab.—Port Elizabeth.
hypochlora, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 88, pl. iv, fig. 8 (*Nanina*). Hab.—“Cape of Good Hope.”
**microscopica*, Krs.: Südafrik. Moll., p. 76, pl. iv, fig. 20 (*Helix*). Hab.—Cape Colony.
**pisolina*, Gld.: Proc. Boston Soc. Nat. Hist., vi (1859), p. 423 (*Helix*). Hab.—? Cape of Good Hope.
**Roseri*, Krs. (*Helix*): ? MS. ubi. Hab.—Cape Colony.
tuguriolum, Melv. & Pons.: vol. ix (1892), p. 88, pl. v, fig. 5 (*Pella*). Hab.—“S. Africa.”

BULIMINIDÆ.

BULIMINUS.

- arenicola*, Bens.: Ann. Nat. Hist., vol. xviii (1856), p. 433; Rve., Conch. Icon., pl. lxii, fig. 430. Hab.—Natal.
Bowkeri, Sby.: Proc. Zool. Soc., 1889, p. 581, pl. lvi, fig. 5. Hab.—Cape Colony.
Burchelli, Gray: Proc. Zool. Soc., 1834, p. 66. Hab.—Kalahari.
**Calaharicus*, Bttg.: Ber. Senckenb. naturf. Ges., 1886, p. 24, pl. ii, figs. 3a-c. Hab.—S. Kalahari.
carinifer, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897), p. 637, pl. xvii, fig. 8. Hab.—Natal.
conulus, Rve.: Conch. Icon., pl. lxxviii, fig. 577. Hab.—Natal.
Drakensbergensis, Smith: Ann. Nat. Hist., vol. xx (1877), p. 538. Hab.—Transvaal.
jejunus, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 106, pl. iii, fig. 7. Hab.—Transvaal.

BULIMINUS (*continued*).

- Maritzburgensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 105, pl. iii, fig. 5. Hab.—Natal.
- meridionalis*, Pfr.: Proc. Zool. Soc., 1847, p. 231; Rve., Conch.
Icon., pl. lvi, fig. 370. Hab.—Port Elizabeth.
- Natalensis*, Krs.: Südafrik. Moll., p. 78, pl. v, fig. 1. Hab.—Natal.
- nuptialis*, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 92,
pl. i, fig. 5. Hab.—Cape Colony.
- **psammophilus*, Bttg.: Ber. Senckenb. naturf. Ges., 1886, p. 23,
pl. ii, figs. 2a-c. Hab.—S. Kalahari.
- spadicus* (Mke.), Pfr.: Symb. Hist. Helic., III, p. 87; Chemn.,
Conch. Cab., pl. lxi, figs. 13, 14. Hab.—Cape Colony and Natal.
- Transvaalensis*, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893),
p. 105, pl. iii, fig. 6. Hab.—Transvaal.
- Zuluensis*, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 127,
pl. vii, fig. 5. Hab.—Zululand.
- [**dubiosus*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 7. Hab.—Matolla.
- **Pentheri*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898, No. xvi,
reprint p. 7. Hab.—Matolla.
- **Movenensis*, Sturany: Anz. k. Akad. Wissensch. Wien, 1898,
No. xvi, reprint p. 8. Hab.—Movenene.]

PUPIDÆ.

PUPA.

- amphodon*, Melv. & Pons.: Ann. Nat. Hist., vol. xviii (1896), pl. xvi,
figs. 6, 7. Hab.—Port Elizabeth.
- Charybdica*, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 94,
pl. i, fig. 13. Hab.—Port Elizabeth.
- custodita*, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 94,
pl. i, fig. 9. Hab.—Pretoria.
- dadion*, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 495.
Hab.—Capetown.
- dysorata*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 20,
pl. iii, fig. 4; emend. vol. xii (1893), p. 111.
Hab.—Griqualand East.
- Elizabethensis*, Melv. & Pons.: Ann. Nat. Hist., vol. ix (1892), p. 91,
pl. v, fig. 13. Hab.—Port Elizabeth.
- Farquhari*, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 128,
pl. vii, fig. 7. Hab.—Cape Colony.
- fontana*, Krs.: Südafrik. Moll., p. 80, pl. v, fig. 6. Hab.—S. Africa.
- frustillum*, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 94,
pl. i, fig. 14. Hab.—Port Elizabeth.
- Fryana*, Bens.: Ann. Nat. Hist., vol. xiii (1864), p. 495.
Hab.—Cape Colony.
- Griqualandica*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893),
p. 22, pl. iii, fig. 9. Hab.—Griqualand East.
- haploa*, Melv. & Pons.: Ann. Nat. Hist., vol. xi (1893), p. 21, pl. iii,
fig. 7. Hab.—Pretoria.

PUPA (*continued*).

- iota*, Melv. & Pons. : Ann. Nat. Hist., vol. xiv (1894), p. 93, pl. i, fig. 10. Hab.—Pretoria.
- keræa*, Melv. & Pons. : Ann. Nat. Hist., vol. xiv (1894), p. 94, pl. i, fig. 12. Hab.—Pretoria.
- Layardi*, Bens. : Ann. Nat. Hist., vol. xiii (1864), p. 496. Hab.—Cape Colony.
- **Noltei*, Bttg. : Ber. Senckenb. naturf. Ges., 1886, p. 25, pl. ii, figs. 4a-c. Hab.—S. Kalahari.
- omicronaria*, Melv. & Pons. : Ann. Nat. Hist., vol. xiv (1894), p. 93, pl. i, fig. 11. Hab.—Pretoria.
- Pretoriensis*, Melv. & Pons. : Ann. Nat. Hist., vol. xi (1893), p. 21, pl. iii, fig. 8. Hab.—Pretoria.
- psichion*, Melv. & Pons. : Ann. Nat. Hist., vol. xiv (1894), p. 93, pl. i, fig. 8. Hab.—Pretoria.
- quantula*, Melv. & Pons. : Ann. Nat. Hist., vol. xi (1893), p. 20, pl. iii, fig. 5. Hab.—Port Elizabeth.
- Sykesi*, Melv. & Pons. : Ann. Nat. Hist., vol. xi (1893), p. 21, pl. iii, fig. 6; emend. vol. xii (1893), p. 111. Hab.—Griqualand East.
- tabularis*, Melv. & Pons. : Ann. Nat. Hist., vol. xi (1893), p. 20, pl. iii, fig. 3. Hab.—Capetown.
- [**Pentheri*, Sturany : Anz. k. Akad. Wissensch. Wien, 1898, No. xvi, reprint p. 8. Hab.—Natal.]

FAUXULUS.

- Capensis*, Kurr : Küst., Conch. Cab. (*Pupa*), p. 10, pl. i, figs. 19, 20. Hab.—Cape Colony.
- Var. *Kurri*, Krs. : Küst., Conch. Cab. (*Pupa*), p. 10, pl. i, figs. 16-18 (as *ovularis*, Kurr). Hab.—Cape Colony.
- Var. *Pottebergensis*, Krs. : Küst., Conch. Cab. (*Pupa*), p. 17, pl. ii, figs. 20-22. Hab.—Cape Colony.
- Glanvilleana*, Ancey : Le Naturaliste, 1888, p. 200. Hab.—Cape Colony.
- pamphorodon*, Bens. : Ann. Nat. Hist., vol. xiii (1864), p. 495. Hab.—Cape Colony.
- pereximia*, Melv. & Pons. : Ann. Nat. Hist., vol. xix (1897), p. 638, pl. xvii, fig. 3. Hab.—Buffalo River.
- Ponsonbyana*, Morel. : Journ. de Conch., vol. xxxvii (1889), p. 9, pl. i, fig. 5. Hab.—Port Elizabeth.

GÆLIAxis.

- Layardi*, Ad. & Ang. : Proc. Zool. Soc., 1865, p. 54, pl. ii, fig. 1. Hab.—Cape Colony.

VERTIGO.

- sinistrorsa*, Craven : Proc. Zool. Soc., 1880, p. 618, pl. lvii, fig. 8. (*thaumasta*, Melv. & Pons. : Ann. Nat. Hist., vol. viii, 1891, p. 239; and vol. ix, 1892, p. 94, pl. vi, fig. 7.) Hab.—Port Elizabeth.

STENOGYRIDÆ.

LIVINHACIA.

- Kraussi*, Pfr.: (*Bulimus*) Symb. Hist. Helic., III, p. 85; Rve.,
 Conch. Icon. (*Bulimus*), pl. lxiii, fig. 436. Hab.—Natal.
 Var. *Planti*, Pfr.: Novit. Conch., vol. ii, p. 160, pl. xliii,
 figs. 1, 2. Hab.—Natal.

ACHATINA.

- aurora*, Pfr.: Proc. Zool. Soc., 1854, p. 294. Hab.—Natal.
bisculpta, Smith: Journ. Conch., vol. i, p. 349. Hab.—South Africa.
Burnupi, Smith: Ann. Nat. Hist., vol. vi (1890), p. 393.
 Hab.—Natal.
Churchilliana, Melv. & Pons.: Ann. Nat. Hist., vol. xv (1895),
 p. 164, pl. xii, fig. 3. Hab.—Natal.
cinnamomea, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894),
 p. 92, pl. i, fig. 6. Hab.—Standerton.
Craefordi, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 8,
 pl. i, fig. 3. Hab.—Port Elizabeth.
dimidiata, Smith: Journ. Conch., vol. i, p. 348. Hab.—Transvaal.
Drakensbergensis, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897),
 p. 636, pl. xvii, fig. 7. Hab.—Natal.
granulata, Pfr.: Mon. Helic. Viv., vol. iii, p. 484. Hab.—Natal.
 (? and var. *A. semigranosa*, Pfr.: Proc. Zool. Soc., 1861, p. 25.)
immaculata, Lam.: Anim. sans Vert., vol. iii, p. 128; Fér., Hist.
 Nat. Moll., pl. cxxvii. Hab.—Delagoa Bay.
Linteræ, Sby.: Proc. Zool. Soc., 1889, p. 580, pl. lvi, fig. 11.
 Hab.—Port Elizabeth.
Livingstonei, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897),
 p. 636, pl. xvii, fig. 6. Hab.—Kuruman.
Natalensis, Pfr.: Proc. Zool. Soc., 1854, p. 294. Hab.—Natal.
ædgyra, Melv. & Pons.: Ann. Nat. Hist., vol. xiv (1894), p. 92,
 pl. i, fig. 7. Hab.—Cape Colony.
 **panthera*, Fér.: Prod., p. 349; Rve., Conch. Icon., pl. iii, fig. 12.
 Hab.—Inhambane.
penestes, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 104,
 pl. iii, fig. 3. Hab.—Pretoria.
rhabdota, Melv. & Pons.: Ann. Nat. Hist., vol. i (1898), p. 29,
 pl. viii, fig. 11. Hab.—S. Africa.
scævola, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 104,
 pl. iii, fig. 2. Hab.—Transvaal.
semidecussata, Mke.: Philippi, Abbild., vol. ii, p. 213, pl. i, fig. 1.
 Hab.—Natal.
simplex, Smith: Journ. Conch., vol. i, p. 350. Hab.—Natal.
Smithii, Craven: Proc. Zool. Soc., 1880, p. 617, pl. lvii, fig. 1.
 Hab.—Transvaal.
Transvaalensis, Smith: Journ. Conch., vol. i, p. 351.
 Hab.—Transvaal.
ustulata, Lam.: Anim. sans Vert., vol. ix, p. 130; Fér., Hist.
 Nat. Moll., pl. cxxv, figs. 1, 2. Hab.—Cape Colony.
varicosa, Pfr.: Malak. Blatt., 1861, p. 73, pl. ii, figs. 7, 8.
 Hab.—Cape Colony.

ACHATINA (*continued*).

vestita, Pfr. : Proc. Zool. Soc., 1854, p. 293 ; Novit. Conch., vol. i, pl. ix, figs. 8, 9. Hab.—Delagoa Bay.

zebra, Brug. : Ency. Meth., Vers vol. i, p. 357 ; Rve., Conch. Icon., pl. vii, fig. 23.

Var. *fulgurata*, Pfr. : Mon. Helic. Viv., vol. iii, p. 486 ; Chemn., Conch. Cab., 2nd ed. (*Bul.*), pl. xxvi, fig. 1.

Var. *Kraussi*, Rve. : Conch. Icon., pl. vi, fig. 21.

Var. *obesa*, Pfr. : Malak. Blatt., vol. i (1854), p. 224 ; Fér., Hist. Nat. Moll., pl. cxxxiii.

Hab.—S. Africa.

[**Pentheri*, Sturany : Anz. k. Akad. Wissensch. Wien, 1898, No. xvi, reprint p. 6. Hab.—Natal.]

OBELISCUS.

lanceolatus, Pfr. : (*Bulimus*) Proc. Zool. Soc., 1854, p. 292. (*micans*, Pfr. : Malak. Blatt., vol. iv, 1857, p. 156.) Hab.—Natal.

SUBULINA.

acus, Morel. : Journ. de Conch., vol. xxxvii (1889), p. 8, pl. i, fig. 6. Hab.—Natal.

cacuminata, Melv. & Pons. : Ann. Nat. Hist., vol. ix (1892), p. 85, pl. vi, fig. 2. Hab.—Cape Colony.

Crawfordi, Melv. & Pons. : Ann. Nat. Hist., vol. xii (1893), p. 105, pl. iii, fig. 4. Hab.—Cape Colony.

crystallina, Melv. & Pons. : Ann. Nat. Hist., vol. xviii (1896), p. 316, pl. xvi, fig. 4. Hab.—Natal.

glaucoocyanea, Melv. & Pons. : Ann. Nat. Hist., vol. xviii (1896), p. 317, pl. xvi, fig. 5. Hab.—Port Elizabeth.

laeocochlis, Melv. & Pons. : Ann. Nat. Hist., vol. xviii (1896), p. 316, pl. xvi, fig. 3. Hab.—Humansdorp, Cape Colony.

linearis, Krs. : Südafrik. Moll., p. 78, pl. v, fig. 3. Hab.—Natal.

Tugelensis, Melv. & Pons. : Ann. Nat. Hist., vol. xix (1897), p. 637, pl. xvii, fig. 9. Hab.—Natal.

turriformis, Krs. : Südafrik. Moll., p. 78, pl. v, fig. 2. Hab.—S. Africa.

[**Durbanensis*, Sturany : Anz. k. Akad. Wissensch. Wien, 1898, No. xvi, reprint p. 7. Hab.—Natal.]

CURVELLA.

catarractæ, Melv. & Pons. : Ann. Nat. Hist., vol. xix (1897), p. 635, pl. xvii, fig. 4. Hab.—Natal.

globosus, Melv. & Pons. : Ann. Nat. Hist., vol. ii (1898), p. 128, pl. vii, fig. 6. Hab.—Natal.

SUCCINEIDÆ.

SUCCINEA.

Bowkeri, Melv. & Pons. : Ann. Nat. Hist., vol. xii (1893), p. 110, pl. iii, fig. 18. Hab.—Natal.

Delalandei, Pfr. : Zeitsch. f. Malak., 1851, p. 28 ; Chemn., Conch. Cab., pl. iii, figs. 38–40. Hab.—Transvaal.

SUCCINEA (*continued*).

- exarata*, Krs. : Südafrik. Moll., p. 74, pl. iv, fig. 15. Hab.—Natal.
patentissima (Mke.), Pfr. : Zeitsch. f. Malak., 1853, p. 52 ;
 Chemn., Conch. Cab., pl. vi, figs. 26–28. Hab.—Natal.
piscinalis, Melv. & Pons. : Ann. Nat. Hist., vol. ii (1898), p. 127,
 pl. vii, fig. 4. Hab.—Fish River.
Planti, Pfr. : Proc. Zool. Soc., 1856, p. 326. Hab.—Natal.
 **putris*, L.
 Var. *Africana*, Krs. : Südafrik. Moll., p. 73 ; Bourg.,
 Rev. & Mag. Zool., 1856, p. 11. Hab.—S. Africa.
striata, Krs. : Südafrik. Moll., p. 73, pl. iv, fig. 16.
 Hab.—S. Africa.

VERONICELLIDÆ.

VERONICELLA.

- **maura*, Heynm. : Jahrb. Deutsch. malak. Ges., vol. xii (1885),
 p. 6, pl. i, figs. 6, 7. Hab.—Delagoa Bay.
 **Natalensis*, Rapp. : Krs., Südafrik. Moll., p. 73. Hab.—Natal.
 **Petersi*, Mts. : Monatsber. K. Preuss. Akad. Wissensch., 1880,
 p. 736. Hab.—Inhambane.
 **saxicola*, Ckll. : Conchologist, vol. ii (1893), p. 216.
 Hab.—Port Elizabeth.

AURICULIDÆ.

*AURICULA.

- pellucens*, Mke. : Syn. Meth. Moll., 2nd ed., p. 131 ; Küst.,
 Conch. Cab., pl. ii, figs. 16, 17. Hab.—Natal.
pusilla, H. & A. Ad. : Proc. Zool. Soc., 1854, p. 8 ; Pfr., Novit.
 Conch., vol. i, pl. x, figs. 10–12. Hab.—Natal.

CASSIDULA.

- Kraussi*, Küst. : Conch. Cab., p. 24, pl. iii, figs. 6–8.
 Hab.—Natal.

MELAMPUS.

- acinoides*, Morel. : Journ. de Conch., vol. xxxvii (1889), p. 14,
 pl. i, fig. 9. Hab.—Port Elizabeth.
 **Caffer*, Küst. : Conch. Cab., p. 36, pl. v, figs. 6–8. Hab.—Natal.
granifer, Mouss. : Jav. Moll., p. 46, pl. v, fig. 9, pl. xx, fig. 7.
 Hab.—Natal.
 **Kuesteri* (Krs.), Küst. : Conch. Cab., p. 34, pl. iv, figs. 10–13.
 Hab.—Natal.
 **lividus*, Desh. : Ency. Meth., Vers vol. ii, p. 91 ; Küst., Conch.
 Cab., pl. vi, figs. 21–26. Hab.—Natal.
Unlaasianus (Krs.), Küst. : Conch. Cab., p. 43, pl. vi, figs. 16–20.
 Hab.—Cape Colony.

ALEXIA.

- acuminata*, Morel. : Journ. de Conch., vol. xxxvii (1889), p. 15,
 pl. i, fig. 11. Hab.—Port Elizabeth.
pulchella, Morel. : Journ. de Conch., vol. xxxvii (1889), p. 15,
 pl. i, fig. 10. Hab.—Port Elizabeth.

LIMNÆIDÆ.

ANCYLUS.

- Caffer*, Krs.: Südafrik. Moll., p. 70, pl. iv, fig. 13.
Hab.—S. Africa.
Transvaalensis, Craven: Proc. Zool. Soc., 1880, p. 617, pl. lvii,
fig. 11. Hab.—Transvaal.

LIMNÆA.

- Natalensis*, Krs.: Südafrik. Moll., p. 85, pl. v, fig. 15.
Hab.—S. Africa.

PLANORBIS.

- Anderssoni*, Ancey: Bull. Soc. Malac. France, vol. vii (1890),
p. 161. Hab.—Durban.
Bowkeri, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 111,
pl. iii, fig. 19. Hab.—Transvaal.
costulatus, Krs.: Südafrik. Moll., p. 83, pl. v, fig. 8. Hab.—Natal.
Crawfordi, Melv. & Pons.: Ann. Nat. Hist., vol. xii (1893), p. 111,
pl. iii, fig. 20. Hab.—Cape Colony.
Natalensis, Krs.: Südafrik. Moll., p. 83, pl. v, fig. 9.
Hab.—Natal.
Pfeifferi, Krs.: Südafrik. Moll., p. 83, pl. v, fig. 7. Hab.—Natal.

SEGMENTINA.

- emicans*, Melv. & Pons.: Ann. Nat. Hist., vol. x (1892), p. 241,
pl. xii, figs. 13, 13a. Hab.—Cape Colony.
planodiscus, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897),
p. 638, pl. xvii, fig. 10. Hab.—Natal.

PYRGOPHYSA.

- Wahlbergi*, Krs.: Südafrik. Moll., p. 84, pl. v, fig. 13.
Hab.—Natal.

PHYSOPSIS.

- Africana*, Krs.: Südafrik. Moll., p. 85, pl. v, fig. 14.
Hab.—Natal.

PHYSIDÆ.

PHYSA.

- Algoensis*, Morel. ?
The species said to have been described by Morelet under this
name appears to have come from Damaraland.
**contorta*, Mich.: Compl. Hist. Nat. France, p. 83, pl. x,
figs. 38-40. Hab.—S. Africa.
cornea, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 16, pl. i,
fig. 8. Hab.—Port Elizabeth.
diaphana, Krs.: Südafrik. Moll., p. 84, pl. v, fig. 11.
Hab.—S. Africa.
gradata, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 129,
pl. vii, fig. 8. Hab.—Cape Colony.
virata, Craven: Proc. Zool. Soc., 1880, p. 617, pl. lvii, fig. 10.
Hab.—Transvaal.
Natalensis, Krs.: Südafrik. Moll., p. 84, pl. v, fig. 10.
Hab.—Natal.

PHYSA (*continued*).

- parietalis*, Mos.: Journ. de Conch., vol. xxxv (1887), p. 298,
pl. xii, fig. 8. Hab.—S. Africa.
Schackoi, Jick.: Moll. Nordafrika, p. 197, pl. vii, fig. 12.
Hab.—S. Africa.
sericina, Jick.: Nova Acta Acad. Cæs.-Leop., vol. xxxvii (1875),
p. 194, pl. iii, fig. 2; pl. vii, fig. 11. Hab.—S. Africa.
tropica, Krs.: Südafrik. Moll., p. 84, pl. v, fig. 12.
Hab.—S. Africa.
Verreauxii, Bgt.: Amén. Malac., vol. i (1856), p. 176, pl. xxi,
figs. 3, 4. Hab.—Cape Colony.

MELANIIDÆ.

MELANIA.

- Crawfordi*, Brot: Journ. de Conch., vol. xlii (1894), p. 473, pl. ix,
fig. 5. Hab.—Transvaal.
tuberculata, Müll.: Hist. Verm., vol. ii, p. 191. Hab.—Transvaal.

PALUDESTRINIDÆ.

PALUDESTRINA.

- alabastrina*, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 19,
pl. ii, fig. 5. Hab.—Cape Colony.
tristis, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 18, pl. ii,
fig. 4. Hab.—Cape Colony.

ASSIMINEIDÆ.

ASSIMINEA.

- **bifasciata*, Nev.: Journ. Asiatic Soc., vol. xlix (1880), pt. 2, p. 162.
Hab.—Natal.
fasciata, Krs.: Südafrik. Moll., p. 86, pl. v, fig. 18.
Hab.—Cape Colony.
**Knysnaensis*, Krs.: Südafrik. Moll., p. 86, pl. v, fig. 17.
Hab.—Cape Colony.
ovata, Krs.: Südafrik. Moll., p. 85, pl. v, fig. 16.
Hab.—Cape Colony.
Ponsonbyi, Morel.: Journ. de Conch., vol. xxxvii (1889), p. 17,
pl. ii, fig. 6. Hab.—Port Elizabeth.
tyttha, Melv. & Pons.: Ann. Nat. Hist., vol. xix (1897), p. 639,
pl. xvii, fig. 11. Hab.—Natal.

CYCLOPHORIDÆ.

CYCLOTUS.

- Natalensis*, Pfr.: Proc. Zool. Soc., 1861, p. 388; Rve., Conch.
Icon., pl. ix, fig. 54. Hab.—Natal.
[* ? *Cyclotus Isipingoensis*, Sturany: Anz. k. Akad. Wissensch.
Wien, 1898, No. xvi, reprint p. 9. Hab.—Durban.]

CYCLOPHORUS.

- alabastris*, Craven: Proc. Zool. Soc., 1880, p. 619, pl. lvii, fig. 9.
Hab.—Port Elizabeth.

CYCLOPHORUS (*continued*).

convexiusculus, Pfr.: Proc. Zool. Soc., 1856; Rve., Conch. Icon.,
pl. xix, fig. 92. Hab.—Cape Colony.

minimus, Melv. & Pons.: Ann. Nat. Hist., vol. ii (1898), p. 129,
pl. vii, fig. 9. Hab.—Pietermaritzburg.

HIJABIA.

Wahlbergi, Bens.: Ann. Nat. Hist., vol. x (1852), p. 271; Rve.,
Conch. Icon., pl. xvii, fig. 81. Hab.—Natal.

POMATIIDÆ.

POMATIAS.

foveolatus, Melv. & Pons.: Ann. Nat. Hist., vol. xv (1895), p. 164,
pl. xiii, figs. 4, 4a. Hab.—Cape Colony.

Hartvigianus, Pfr.: Novit. Conch., vol. i, p. 225, pl. lix, figs. 1, 2.
Hab.—Cape Colony.

insularis, Pfr.: Proc. Zool. Soc., 1852, p. 64; Rve., Conch. Icon.,
pl. viii, fig. 41. Hab.—Natal.

Kraussianus, Pfr.: Proc. Zool. Soc., 1852, p. 64; Chemn., Conch.
Cab., pl. xliii, figs. 17, 18. Hab.—Natal.

ligatus, Müll.: Hist. Verm., vol. ii, p. 181; Chemn., Conch. Cab.,
pl. iv, figs. 12, 13; pl. viii, figs. 3, 4.

Var. *affinis*, Sby.: Thes., p. 98, pl. xxiii, figs. 25, 26.

„ *Caffer* (Beck MS.), Rve.: Conch. Icon., pl. xi, fig. 67.

Hab.—S. Africa.

lineatus, Pfr.: Proc. Zool. Soc., 1852, p. 65; Rve., Conch. Icon.,
pl. viii, fig. 46. Hab.—Natal.

ochraceus, Melv. & Pons.: Ann. Nat. Hist., vol. xviii (1896),
p. 318, pl. xvi, figs. 8, 9. Hab.—Cape Colony.

sarcodes, Pfr.: Proc. Zool. Soc., 1856, p. 339; Rve., Conch. Icon.,
pl. x, fig. 61. Hab.—Cape Colony.

Transvaalensis, Melv. & Pons.: Ann. Nat. Hist., vol. viii (1891),
p. 237; vol. ix (1892), pl. v, fig. 6. Hab.—Transvaal.

TRUNCATELLIDÆ.

TRUNCATELLA.

teres, Pfr.: Proc. Zool. Soc., 1856, p. 336; Cox, Monog. Austr.
Land-Shell, pl. xv, figs. 9-9b. Hab.—Cape Colony.

TOMICHIA.

ventricosa, Rve.: Conch. Syst., ii, pl. clxxxii, fig. 2.

Hab.—Cape Colony.

HYDROCENIDÆ.

HYDROCENA.

noticola, Bens.: Ann. Nat. Hist., vol. xviii (1856), p. 349.

Hab.—Capetown.

NERITIDÆ.

NERITINA.

Natalensis, Rve.: Conch. Icon., pl. xvi, figs. 75a-b. Hab.—Durban.

PELECYPODA.

UNIONIDÆ.

MUTELA.

Wahlbergi, Krs. : Südafrik. Moll., p. 19, pl. ii, fig. 1.
Hab.—Natal.

UNIO.

Caffer, Krs. : Südafrik. Moll., p. 18, pl. i, fig. 14.
Hab.—S. Africa.
Verreauxi (Chp.), Küst. : Conch. Cab., p. 150, pl. xliii, fig. 6.
Hab.—Cape Colony.

CYRENIDÆ.

CORBICULA.

Africana, Krs. : Südafrik. Moll., p. 8, pl. i, fig. 8.
Hab.—Cape Colony.
Oliphantensis, Craven : Proc. Zool. Soc., 1880, p. 618, pl. lvii,
fig. 12. Hab.—Transvaal.

PISIDIUM.

Langleyanum, Melv. & Pons. : Ann. Nat. Hist., vol. viii (1891),
p. 237 ; Ann. Nat. Hist., vol. ix (1892), pl. v, fig. 7.
Hab.—Cape Colony.

SPHÆRIUM.

Capeense, Krs. : Südafrik. Moll., p. 7, pl. i, fig. 6.
Hab.—Cape Colony.
ferrugineum, Krs. : Südafrik. Moll., p. 7, pl. i, fig. 7.
Hab.—Cape Colony.

SPECIES INTRODUCED, AND APPARENTLY NOT INDIGENOUS.

<i>Zonitoides arboreus</i> , Say.	Port Elizabeth.
<i>Vitrea cellaria</i> , Müll.	Capetown.
„ <i>crystallina</i> , Müll.	„
<i>Eulota similaris</i> , Fér.	Natal.
<i>Vallonia pulchella</i> , Müll.	Port Elizabeth and Capetown.
<i>Helix aspersa</i> , Müll.	„
„ <i>Pisana</i> , Müll.	„
„ <i>lactea</i> , Müll.	Pondoland.
<i>Rumina decollata</i> , Linn.	Pondoland.
* <i>Pupa umbilicata</i> , Dp.	Capetown.
<i>Cæciliamella acicula</i> , Müll.	Cradoek.
<i>Limnæa truncatula</i> , Müll.	Natal.
<i>Alexia myosotis</i> , Dp.	Port Elizabeth.

ORDINARY MEETING.

FRIDAY, 13TH MAY, 1898.

Mr. E. A. SMITH, F.Z.S., etc., Vice-President, in the Chair.

The following communications were read:—

1. "Note on a very large specimen of *Hippopus hippopus*." By Edgar A. Smith, F.Z.S., etc.
2. "Description of new or imperfectly known species of *Nautilus* from the Inferior Oolite, preserved in the British Museum (Natural History)." By G. C. Crick, F.G.S., etc.
3. "On the Anatomy of *Adeorbis subcarinatus*, Montagu." By Martin F. Woodward.
4. "Phylogeny of the Genera of Arionidæ." By Henry A. Pilsbry.
5. "Description of the genera *Bathanalia* and *Bythoceras*, from Lake Tanganyika." By J. E. S. Moore.

Mr. B. B. Woodward exhibited and commented on some specimens and drawings of *Paludestrina obtusa*, Sandberger, and a new and as yet unnamed species previously confused with it, from the Norwich Crag.

Mr. E. R. Sykes exhibited and made remarks upon a collection of land-shells from Tenby, also a series of land-shells from Ceylon, and a number of marine Gastropods from the Channel Islands found associated with *Adeorbis subcarinatus*, Montagu.

Mr. M. F. Woodward exhibited a fine group of *Vermetus*, and specimens obtained from the Naples Zoological Station of *Aporrhais pes-pellicani*, killed in an extended condition.

ORDINARY MEETING.

FRIDAY, 10TH JUNE, 1898.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc., President, in the Chair.

The following communications were read:—

1. "On the Land-Shells of Curaçoa and the neighbouring islands." By Edgar A. Smith, F.Z.S., etc.
2. "On the Anatomy and Synonymy of the genus *Mariella*, Gray." By Wilfred M. Webb.
3. "Note on *Arunculus Austriacus*, n.sp., from the Alps in Austria." By J. F. Babor.
4. "Description of new Land-Shells from Ceylon." By E. R. Sykes, B.A., F.Z.S., etc.

5. "List of the Non-Marine Mollusca of South Africa." By J. Cosmo Melvill, M.A., F.L.S., etc., and J. H. Ponsonby, F.Z.S., etc.

The Rev. R. Ashington Bullen exhibited and read a note on a large series of mollusca from holocene and pleistocene deposits at Buckland, Dover.

Mr. B. B. Woodward on behalf of Mr. A. S. Kennard exhibited and commented upon mollusca from a rainwash near Otford, Sevenoaks.

Mr. S. I. Da Costa exhibited a new, and undescribed, species of *Cyclophorus* from Costa Rica.

A REVISION OF THE PLIOCENE NON-MARINE MOLLUSCA
OF ENGLAND.

By A. S. KENNARD & B. B. WOODWARD, F.L.S., etc.

Read 11th November, 1898.

ALTHOUGH the non-marine mollusca of the pliocene deposits of this country have received considerable attention, the state of our knowledge concerning them is nevertheless not very satisfactory. Much of our information is out of date, whilst the whole of it is so scattered through various journals that it entails a large amount of research to find the different records. Hence it has appeared desirable to collect all the data available, and by checking the various identifications, as far as possible, from the specimens themselves, to establish the record on a more satisfactory basis. The pliocene non-marine molluscan fauna is of great interest both to the geologist, endeavouring to restore a true picture of pliocene times, and to the malacologist, struggling with problems of distribution, because it is in the Red and Norwich Crags that the genesis of our present molluscan fauna is to be sought. It is a noteworthy fact that many of our existing species are met with for the first time in these beds, and are not known to have existed on the continent till a much later date. This may result from the imperfection of the geological record, or it may indicate that these forms have been derived from a region to the northward, and it is worthy of remark, as giving additional weight to this latter hypothesis, that there are forms in North America closely allied to the species under consideration. Some of the operculate aquatic forms also occur in the Congeria Beds, and are therefore presumably members of the old Aralo-Caspian fauna; whilst a few of the species are as yet totally unknown in the fossil state on the continent.

The finest series of pliocene non-marine mollusca is undoubtedly that comprised in the Searles V. Wood Collection now at the British Museum (Natural History); whilst there is a fair series in the general collection there, in addition to the unique specimens from Walton and Hollesley, formerly belonging to the late Mr. Robert Bell, that are now being arranged for public exhibition. The Canham Collection, preserved in the Ipswich Museum, also contains several interesting examples, whilst Mr. Reeve's specimens are in the Norwich Museum.

Before proceeding further, we would like to take this opportunity of returning our sincerest thanks to those gentlemen who so kindly permitted us to examine the specimens under their charge, or in their possession, as well as to those who have so freely rendered assistance in other ways in the compilation of this paper. We refer more particularly to Dr. Henry Woodward, Mr. R. Bullen Newton, and Mr. E. A. Smith, of the British Museum (Natural History); Mr. E. T. Newton and Mr. H. A. Allen, of the Museum of Practical Geology; Mr. James Reeve, of the Norwich Castle Museum; Mr. Woolnough, of the Ipswich Museum; Mr. H. W. Burrows, Mr. E. R. Sykes, and Mr. Clement Reid.

It may be as well to state that we have accepted the view that the Weybourn Crag and Forest Bed series are not pliocene, but pleistocene. This opinion is almost universally held on the continent, but it has not been widely adopted in this country, although the evidence is, we venture to think, all in favour of this conclusion.

In the determination of the species allowance has been made for variation in the past, and in this way unnecessary additions, as we deem them, to already overburdened lists are avoided. In those cases where it has been impossible to trace the specimens, and there is no inherent improbability of the correctness of their identification, the species are cited on the authority of their recorder.

Doubts have been expressed as to the true pliocene age of the land-shells from Butley, but these doubts, we consider, have no foundation; and it may here be mentioned that during a visit to the Neutral Farm pit by one of us last June, three examples of *Limnæa truncatula* and one of *Planorbis marginatus* were obtained, whilst more recently Mr. H. W. Burrows has also obtained these same species at that spot, and Mr. R. Holland has been fortunate enough to find a good example of *Hygromia hispida*. The records of foreign occurrences are mainly on the authority of the late Dr. C. L. F. Sandberger ("Die Land- und Süßwasser Conchylien der Vorwelt"), and are confined to those citations under the names employed in this paper.

The first notice of the occurrence of non-marine mollusca in the pliocene deposits of this country was by Samuel Woodward, the Norfolk geologist, who in 1833 figured four species from the Norwich Crag (1). In 1839 Sir Charles Lyell listed twenty-one species, on the authority of S. V. Wood, G. B. Sowerby and himself (2), these also being all from the Norwich Crag, with the note that one form, *Planorbis marginatus*, likewise occurred in the Red Crag. Mr. S. V. Wood in 1842 enumerated eleven species, of which two were from the Red Crag (3). The first part of that author's Monograph of the Crag Mollusca, containing the Gastropoda, was published in 1848, and seventeen species were there given (4). The volume containing the Pelecypoda was issued in three parts—the first appearing in 1851, the second in 1853, and the third in 1857 (5). Three additional species were listed, thus raising the total to twenty. Nineteen species from the Norwich Crag alone were next recorded by S. P. Woodward (6) in 1864. In 1869 Mr. Alfred Bell enumerated four species from the Red Crag of Butley (7), and in 1870 he added another, *Hygromia hispida* (8). In the following year he noted *Limnæa palustris* as also occurring there (9), and also recorded two forms from Waldringfield and one from Walton (10). In 1871, too, appeared the important papers by the late Sir Joseph Prestwich, and lists of the non-marine species from the Red and the Norwich Crags, on the authority of Gwyn Jeffreys, were given, the former containing nine and the latter twenty-one species, eight being common to both (11). In 1872 Alfred & Robert Bell published the result of their researches, giving a list of thirty species (12). The same year saw the issue of the first part of the supplement to Wood's Monograph of the Crag Mollusca, the completion not being published till 1874,

and in this nine species were enumerated which had not previously been recorded by him (13). In 1879 appeared the list of fossils from Bramerton by Mr. J. Reeve, embodying the result of many years' work at the sections there (14), and an additional list was published by him in 1881 (17), and in these lists twenty-two species were given. A few species were also recorded in 1879 from a well-section at Beccles by Mr. W. M. Crowfoot (15). S. V. Wood, also in 1879, published the second supplement to his monograph, adding six species to his previous lists (16). In 1884 Robert Bell recorded eleven species of land-shells from the Red Crag, and noted the occurrence of three species at Walton (18); and finally, in 1890, Mr. Clement Reid was able from the above sources to compile a list of thirty-nine species (19).

BIBLIOGRAPHY.

1. 1833.—WOODWARD, S., "An Outline of the Geology of Norfolk."
2. 1839.—LYELL, SIR C., "On the relative Ages of the Tertiary Deposits commonly called 'Crag' in the Counties of Norfolk and Suffolk": *Mag. Nat. Hist.*, ser. II, vol. iii, p. 313.
3. 1842.—WOOD, S. V., "A Catalogue of Shells from the Crag": *Ann. & Mag. Nat. Hist.*, vol. ix, pp. 455-462 & 527-544.
4. 1848.—WOOD, S. V., "The Crag Mollusca," Part I, Univalves. (*Palæont. Soc.*)
5. 1851-7.—WOOD, S. V., "A Monograph of the Crag Mollusca," Part II, Bivalves. (*Palæont. Soc.*)
6. 1864.—WOODWARD, S. P., "Shells of the Newer Pliocene, or Norwich Crag": reprinted from "White's History and Directory of the County of Norfolk."
7. 1869.—BELL, A., "Suffolk and Sussex Tertiaries": *Geol. Mag.*, vol. vi, p. 41.
8. 1870.—BELL, A., "On some new or little known Shells of the Crag Formation": *Ann. & Mag. Nat. Hist.*, ser. iv, vol. vi, p. 213.
9. 1871.—BELL, A., "The Butley Crag Pits": *Geol. Mag.*, vol. viii, pp. 452-3.
10. 1871.—BELL, A., "Contributions to the Crag Fauna": *Ann. & Mag. Nat. Hist.*, ser. iv, vol. vii, p. 351.
11. 1871.—PRESTWICH, SIR J., "On the Structure of the Crag Beds of Suffolk and Norfolk," Part II, The Red Crag: *Quart. Journ. Geol. Soc.*, vol. xxvii, p. 493. Part III, The Norwich Crag and Westleton Beds: *t.c.*, p. 493.
12. 1872.—BELL, A. & R., "On the English Crags": *Proc. Geol. Assoc.*, vol. ii, p. 185.
13. 1872-4.—WOOD, S. V., "Supplement to the Crag Mollusca," Part I, Univalves; Part II, Bivalves. (*Palæont. Soc.*)
14. 1879.—REEVE, J., "List of Fossils from the Norwich Crag at Bramerton": *Proc. Norwich Geol. Soc.*, vol. i, pp. 69-72.

15. 1879.—CROWFOOT, W. M., "On the Well-Sections at Beccles": t.c., pp. 76-79.
16. 1879.—WOOD, S. V., "Second Supplement to the Monograph of the Crag Mollusca." (Palæont. Soc.)
17. 1881.—REEVE, J., "Additional List, etc.": Proc. Norwich Geol. Soc., vol. i, p. 110.
18. 1884.—BELL, R., "Land-Shells in the Red Crag": Geol. Mag., vol. i, p. 262.
19. 1890.—REID, C., "The Pliocene Deposits of Britain," pp. 228-230. (Mem. Geol. Surv.)

1. SPHYRADIUM EDENTULUM (Drap.).

Vertigo edentula, Drap. : S. V. Wood, Crag Moll., Suppt. II, p. 37, pl. iv, fig. 6.

Form. and Loc.—Norwich Crag: Bramerton Common (Norwich Mus.); Blake's Pit, Bramerton (Norwich Mus.).

The only known examples of this species were found by Mr. Reeve. The typical form is as yet unknown from any pre-holocene beds of the continent, though the variety, considered there a good species and known as *Vertigo columella*, Mts., is found in the lower pleistocene of Mosbach and in more recent beds. In this country both the type and the variety are found in pleistocene deposits.

2. PYRAMIDULA RYSA (S. V. Wood).

Helix rysa, S. V. Wood: Crag Moll., vol. i, p. 4, pl. i, fig. 1.

Helix rufescens, Penn., var.?: J. Gwyn Jeffreys, Quart. Journ. Geol. Soc., vol. xxvii (1871), p. 493.

Patula (Janubus) rysa, S. V. Wood: C. L. F. Sandberger, Land- & Sussw. Conch. Vorwelt, p. 737.

Form. and Loc.—Red Crag: Walton (Saffron Walden Mus. type); Waldringfield (Ipswich Mus.).

The type of this species was found by Mr. G. S. Gibson inside the mouth of an example of *Chrysodomus antiquus*, Linn., from Walton; whilst a second example was obtained by Mr. Canham from the coprolite diggers at Waldringfield. No other examples have been met with.

3. PYRAMIDULA SUTTONENSIS (S. V. Wood).

Helix Suttonensis, S. V. Wood: Crag Moll., Suppt. I, p. 2, pl. i, fig. 2.

Form. and Loc.—Coralline Crag: Sutton (S. V. Wood Coll., British Museum).

The single example of this form found by Wood still remains unique. It is said by him to greatly resemble *Pyramidula calathus* (Lowe) and *P. bifrons* (Lowe) from Madeira, and a recent comparison

fully bears out this view. *Helix Suttonensis* can therefore be referred, with the preceding, to Lowe's section *Janulus*.

4. EULOTA FRUTICUM (Müll.).

Form. and Loc.—Red Crag: Hollesley.

The only known example of this species, now in the British Museum (Natural History), was formerly in the collection of the late Robert Bell. On the tablet to which it is affixed is the following note in his handwriting: "This shell was taken out of a pit near the road occupied as a barnyard, Page's Farm. It was in company with marine shells and *Limnæa*, and *Planorbis* was found with it. 1885." Although now extinct in Britain, it has been found in the pleistocene at Barnwell, Stutton,¹ and Ilford. Across the Channel it has been recorded from the lower pleistocene of Mosbach, and the middle pleistocene of Cannstadt, and Nussdorf, near Vienna.

5. HYGROMIA INCARNATA (Müll.).

Form. and Loc.—Red Crag: Walton.

The only known example of this species was found in 1882 by the late Mr. Groom (*alias* Groom-Napier, the *soi-disant* 'Prince of Mantua') at Walton, and is now in the British Museum (Natural History). (See Geol. Mag., 1884, p. 264.) It is not a perfect example, but no doubt can be entertained of this determination. On the continent the species has only been found in the middle pleistocene of Cannstadt, Württemberg.

6. HYGROMIA HISPIDA (Linn.).

Helix hispida, Linn.: S. V. Wood, Crag Moll., vol. i, p. 2, pl. i, figs. 3a-c.

Form. and Loc.—Red Crag: Butley. Norwich Crag: Bramerton Common and Blake's Pit, Bramerton; Thorpe, Norfolk; Horstead; Dunwich; Yarn Hill; Bulchamp; Coltishall (Prestwich).

This is by far the commonest helicoid in our pliocene beds, though it should be noted that all non-marine forms are rare. On the continent it is unrecorded from any bed older than the lower pleistocene of Mosbach, where it is not infrequent, and it is one of our commonest pleistocene fossils.

7. HYGROMIA RUBIGINOSA (A. Schmidt). Fig. I.

Form. and Loc.—Norwich Crag: Southwold.

In the S. V. Wood Collection at the British Museum (Natural History) is a *Hygromia* labelled "*Helix* sp." We have identified this

¹ The single example figured and described from this locality by Mr. S. V. Wood (Crag Moll., vol. ii, p. 308, pl. xxxi, fig. 19) is now in the Searles Wood Collection at the Norwich Museum.

specimen with examples of "*H. rubiginosa*, Zieg.," in the collection lately acquired by the Trustees of the British Museum from the Rev. R. Merle Norman. This species, as shown by A. Schmidt¹ (who adopted Ziegler's manuscript name), is distinct from, though nearly allied to, that usually known on the continent as *H. sericea*, Drap. (*H. sericea*, Müll., which is proved to be the young of another species predates this name, but we are not concerned with the correct name of this latter species at present). This is not the *Helix sericea*, Drap., of Jeffreys (Brit. Conch.), which should be known as *Hygromia granulata*, Alder. *Hygromia rubiginosa* has hitherto been unrecorded



FIG. I. *Hygromia rubiginosa* (Schmidt). Norwich Crag: Southwold.

from this country, either fossil or recent. Tryon is undoubtedly in error in placing it as a variety of *H. granulata*, Alder.² It has been recorded living from Scandinavia, North Germany, Jutland, Saxony, Bohemia, the Hartz, and the Carpathians.

8. VALLONIA PULCHELLA (Müll.).

Helix pulchella, Müll.: S. V. Wood, Crag Moll., vol. i, p. 3, pl. i, fig. 4.

Vallonia tenuilimbata, C. L. F. Sandberger, "Ein Beitrag zur Kenntniss der unterpleistocänen Schichten Englands": Palæontogr., 1880, p. 102, pl. xii, fig. 13.

Form. and Loc.—Red Crag?: Bawdsey (Brit. Mus.). Norwich Crag: Bramerton Common and Blake's Pit (Norwich Mus.); Beccles (W. M. Crowfoot).

The example from Bawdsey is stated by Mr. Wood to have been found in loose and disturbed Crag, so it is possible that that one may not be a true pliocene fossil; but the examples from Bramerton are undoubted as to their age. We cannot agree with Sandberger in separating the Crag and the Forest Bed examples from the recent form.

Judging from the figures and description, *Vallonia subpulchella*, Sandb.,³ from the middle miocene, near Steinham in Würtemberg, is

¹ Zeitschrift für Naturw., 1853, vol. i, p. 3.

² Manual of Conchology, ser. II, vol. iii, p. 178.

³ C. L. F. Sandberger, "Die Land- und Süßwasser Conchylien der Vorwelt," p. 544.

identical with this species. *V. pulchella* occurred in a boring at Amsterdam at a depth of 229 metres,¹ thus proving its existence on the continent in pliocene times, for the next earliest record is from the lower pleistocene of Mosbach.

9. HELICODONTA LENS (Fér.).

Form. and Loc.—Red Crag; Walton.

An example of this species is stated by Robert Bell² to have been found at Walton about 1881 by Mr. Larcher, of King's College. The shell was identified by Dr. Gwyn Jeffreys and Mr. J. H. Ponsoby; but we have been unable to trace the specimen. The species is not recorded in a fossil state on the continent.

10. HELICIGONA ARBUSTORUM (Linn.).

Helix arbustorum, Linn. : S. V. Wood, Crag Moll., vol. i, p. 3, pl. i, fig. 3.

Form. and Loc.—Red Crag: Butley (Ipswich Mus. and E. R. Sykes Coll.). Norwich Crag: Coltishall (Brit. Mus. and Mus. Pract. Geol.); Southwold (S. V. Wood); Postwick (Mus. Pract. Geol.).

All the examples seen differ somewhat from the normal form, but we have no doubt as to the determination. Its first recorded appearance on the continent is in the lower pleistocene of Mosbach; but in the middle and upper pleistocene it has been found at Lyons, Nussdorf near Vienna, Bruchsal in Baden, and numerous other localities.

11. HELIX LACTEA, Müll.

Form. and Loc.—Red Crag: Walton (Brit. Mus.).

A fine example, nearly perfect, was found in 1883 at Walton by Robert Bell, who states³ that it "resembles an Algerian form more than any other." The fragment belonging to the same species which he says he also found we have been unable to trace. *Helix lactea* is unrecorded in a fossil state on the continent. According to Hanley⁴ the correct name for this species is *Helix lucorum*, Linn., but that question lying beyond the limits of this paper Müller's better known name is here employed.

12. COCHLICOPA LUBRICA (Müll.).

Bulimus lubricus, Müll. : S. V. Wood, Crag Moll., Suppt. II, p. 38, pl. iv, fig. 10.

Form. and Loc.—Red Crag: Butley (two examples, Ipswich Mus.).

¹ Dr. J. Lorie, "Contrib. à la Géol. des Pays Bas": Bull. Soc. Belge Géol., tom. iii (1889), p. 435.

² R. Bell, "Land-Shells in the Red Crag": Geol. Mag., 1884, p. 262.

³ Geol. Mag., 1884, p. 264.

⁴ S. Hanley, "Ipsa Linnaea Conchylia," p. 378.

Two specimens found by Mr. Canham are the only ones known of pliocene age, its earliest records on the continent being from the lower pleistocene of southern Germany at Mosbach and the middle pleistocene of Cannstadt, Weimar, and Mulhausen in Thuringia. It is a common English pleistocene fossil, and is, of course, extremely abundant at the present day.

13. PUPA CYLINDRACEA (Da C.).

Form. and Loc.—Norwich Crag: Blake's Pit, Bramerton (Norwich Mus.); Yarn Hill (R. E. Leach).

The geological record of this species is indeed very incomplete. A single example was found by Dr. Frank Corner in the upper pleistocene of Ilford, and it was common at Copford, but the age of this latter deposit is uncertain. On the continent it is as yet unrecorded. We have only seen a single example from the pliocene, and this was found by Mr. J. Reeve.

14. PUPA MUSCORUM (Linn.).

Pupa muscorum, Müll.: S. V. Wood, Crag Moll., Suppt. I, p. 3, pl. i, fig. 7.

Pupa marginata, Drap.: J. Gwyn Jeffreys, Quart. Journ. Geol. Soc., vol. xxvii (1871), p. 493.

Form. and Loc.—Red Crag: Butley (Brit. Mus. and Ipswich Mus.). Norwich Crag: Blake's Pit, Bramerton (Norwich Mus.); Yarn Hill (R. E. Leach).

The example figured by S. V. Wood, which was found by Mr. A. Bell, is now in the British Museum (Natural History), and there is an immature specimen from the same locality in the Canham Collection at the Ipswich Museum. Specimens of undoubted pliocene age occurred in a boring at Amsterdam at a depth of 230 metres.¹ Elsewhere on the continent it is unknown in any bed of earlier age than the middle pleistocene, it having been found at Wiesbach, Cannstadt, and Wiesbaden.

15. CLAUSILIA PLIOCENA, S. V. Wood.

Clausilia pliocena, S. V. Wood: Crag Moll., Suppt. I, p. 188, addendum pl., fig. 22.

The single immature example now in the British Museum (Natural History), from which this species was described, still remains unique. It certainly cannot be referred to any living English form. Dr. J. Loricé has recorded² two examples from a boring at Diermerbrug, Holland, at a depth between 230 and 234 metres, but not having seen the examples it is impossible to say if this determination be correct or not.

¹ Dr. J. Loricé, "Contrib. à la Géol. des Pays Bas": Bull. Soc. Belge Géol., tom. iii (1889), p. 436.

² Tom. cit., p. 435.

16. *SUCCINEA ELEGANS*, RISSO.

Succinea oblonga, Drap.: S. V. Wood, Crag Moll., vol. i, p. 6, pl. i, fig. 6.

Form. and Loc.—Norwich Crag: Coltishall (Norwich Mus.); Bulchamp (Brit. Mus.).

This form, though so abundant in the pleistocene beds of this country, is very rare in the pliocene. It is another of those species for a knowledge of existence of which on the continent in pliocene times we are indebted to Dr. Lorié, who has noted it as occurring in the borings at Gorkum, Utrecht, Diermerbrug, and Amsterdam. Elsewhere its earliest recorded appearance is in the lower pleistocene of Mosbach.

17. *SUCCINEA PUTRIS* (Linn.).

Succinea putris, Linn.: S. V. Wood, Crag Moll., vol. i, p. 5, pl. i, fig. 5.

Form. and Loc.—Red Crag: Butley (Ipswich Mus.). Norwich Crag: Bramerton Common and Blake's Pit, Bramerton (Norwich Mus.).

This is a rare form in the Crag, and is unrecorded from any continental pliocene beds, making its first appearance there in the lower pleistocene of Mosbach, while in the middle and upper pleistocene it has been found in many localities.

18. *SUCCINEA OBLONGA*, DRAP.

Form. and Loc.—Norwich Crag: Southwold; Bulchamp.

We have only seen one example of this species, and that an imperfect one, in the S. V. Wood Collection at the British Museum (Natural History). It differs somewhat from the typical form of *S. oblonga*, but we do not think sufficiently so to warrant its separation. Although extremely rare in this country at the present day, it was in pleistocene times a widely distributed and common form, both here and on the continent.

19. *LIMNÆA AURICULARIA* (Linn.).

Limnæa auricularia, Linn.: S. V. Wood, Crag Moll., Suppt. II, p. 36, pl. iv, fig. 3.

Form. and Loc.—Norwich Crag: Bramerton Common (Norwich Museum).

The only known example of this species is an immature specimen, and may be referred to the "var. *acuta*, Jeff." This is apparently a rare form on the continent in a fossil state, since it is only recorded from the middle pleistocene near Potsdam.

20. *LIMNÆA PEREGER* (Müll.).

Form. and Loc.—Red Crag: Butley (A. Bell). Norwich Crag: Bramerton Common; Southwold; Bulchamp.

It is quite hopeless to attempt to unravel the synonymy of the pliocene forms of *Limnæa pereger*, *L. palustris*, or *L. truncatula*, since

it is impossible to trace all the specimens figured by Wood; but with the exception of a solitary example of *L. auricularia*, all the representatives of this genus that we have seen from the Crag are referable to these three polymorphic species, and consequently the identifications of *L. Pingelii*, Möll., *L. Holbölli*, Möll., and *L. elodes*, Say, seem unreliable. *L. pereger* is common on the continent in beds of pleistocene age, and it is also known from the upper pliocene of Castellarquato, near Piacenza, northern Italy.

21. LIMNÆA PALUSTRIS (Müll.).

Limnæa Pingelii?, Möll.: S. V. Wood, Crag Moll., Suppt. I, p. 3, pl. iv, fig. 4.

Form. and Loc.—Red Crag: Butley. Norwich Crag: Coltishall; Bramerton Common; Blake's Pit, Bramerton; Yarn Hill; Bulchamp (Prestwich).

This well-known form was apparently as variable in pliocene as it is in recent times. It is first recorded on the continent from the lower pleistocene of Mosbach, and it has also been noted from the upper pleistocene of Vinograd, near Buczak in Ukraine, and Kilianstadt near Hanau, as well as numerous other localities in France, Germany, and Austria.

22. LIMNÆA TRUNCATULA (Müll.).

Form. and Loc.—Red Crag: Butley. Norwich Crag: Bramerton Common; Thorpe, Norfolk.

The species is by no means rare at Butley, but it is apparently very scarce in the Norwich Crag, since we have seen only three examples from that deposit. Wood states¹ that he has never seen the true form of this species from any English pliocene deposit, and considers that the specimens so called should be referred to *L. Holbölli*, Möll.; but *L. truncatula* is an extremely variable form, and all the Crag variations can be matched with recent English examples. Its earliest recorded appearance on the continent is from the lower pleistocene of Mosbach. It is also known from the upper pleistocene of Oberissigheim near Hanau, of Russia and Algiers.

23. PLANORBIS CORNEUS (Linn.).

Planorbis corneus, Linn.: S. V. Wood, Crag Moll., vol. i, p. 10, pl. i, fig. 12.

Form. and Loc.—Norwich Crag: Southwold (Brit. Mus.); Bulchamp (S. V. Wood).

A single example, and that immature, is the only evidence of the existence of the present species in pliocene times in England that we have seen. This is yet another of those forms which are first recorded fossil on the continent from the lower pleistocene of Mosbach.

¹ Crag Moll., Suppt. I, p. 3.

24. *PLANORBIS MARGINATUS*, Drap.

Planorbis complanatus, Linn.: S. V. Wood, Crag Moll., vol. i, p. 9, pl. i, fig. 10.

Form. and Loc.—Red Crag: Butley. Norwich Crag: Norwich; Bramerton Common; Blake's Pit, Bramerton; Southwold; Bulchamp; Coltishall.

This species has been found in three pits at Butley, viz.: the Neutral Farm pit, commonly known as the Oyster pit, the pit near Butley Mill, and another on Butley Common. All the examples we have seen are immature. It has been recorded from the lower pliocene of France¹ (Molasse d'eau douce du Lyonnais et du Dauphiné).

25. *PLANORBIS SPIRORBIS* (Linn.).

Planorbis spirorbis, Linn.: S. V. Wood, Crag Moll., vol. i, p. 9, pl. i, fig. 11.

Form. and Loc.—Red Crag: Butley; Hollesley. Norwich Crag: Norwich; Bramerton Common and Blake's Pit, Bramerton; Bulchamp (S. V. Wood).

This is a common pleistocene fossil in this country, not only in the upper beds but also in the lower (Forest Bed). On the continent its earliest record is from the middle pleistocene of Cannstadt and Weimar.

26. *PALUDESTRINA STAGNALIS* (Bast.).

Paludestrina ulvæ, Penn.: S. V. Wood, Crag Moll., vol. i, p. 109, and Suppt. I, p. 71, pl. iv, fig. 23 (as *Hydrobia ulvæ*).

Hydrobia ulvæ, Penn.: J. Gwyn Jeffreys, Quart. Journ. Geol. Soc., vol. xxvii (1871), p. 490.

Form. and Loc.—Red Crag: Walton (A. Bell). Norwich Crag: Norwich; Aldeby; Thorpe, near Aldeburgh; Yarn Hill; Bramerton Common; Beccles; and Dunwich.

The examples from Gedgrave (see Crag Moll., vol. i, p. 109) are certainly post-pliocene in age, and cannot be considered as of Coralline Crag age. The species is very abundant at Thorpe, Aldeburgh, and is by far the commonest shell of the genus in the English pliocene beds. The earliest record from elsewhere than in this country, that we have been able to trace, is from the lower pliocene (Congeria Beds) at Mauer near Vienna, and Bizenz in Moravia.

27. *PALUDESTRINA VENTROSA* (Mont.).

Paludestrina subumbilicata, Mont.: S. V. Wood, Crag Moll., vol. i, p. 108, pl. xi, fig. 2.

Hydrobia ventrosa, Mont.: J. Gwyn Jeffreys, Quart. Journ. Geol. Soc., vol. xxvii (1871), p. 490.

¹ A. Locard, "Variations Malac. de bassin de Rhone," vol. ii, p. 226.

Form. and Loc.—Pliocene of St. Erth, Cornwall. Red Crag : Walton ; Butley ; Felixstowe. Norwich Crag : Norwich ; Bramerton Common ; Blake's Pit, Bramerton.

This species is by no means a common form in the Crag. The example now in the national collection (S. V. Wood Coll.), said to come from the Coralline Crag of Sutton, is, judging by its condition, certainly not a Coralline Crag fossil, and it is noteworthy that on the tablet to which it is affixed the pliocene age of the specimen is queried in Wood's own handwriting. It is a very ancient form, occurring as it does in the lower miocene of Wiesbaden, the middle miocene of Manthelan, near Tours, and the lower pliocene (Congeria Beds) at Mauer near Vienna, Bizenz in Moravia, and elsewhere. *Turbo minuta*, S. Woodward,¹ may be either this species or *Paludestrina stagnalis*.

28. PALUDESTRINA REEVEI, n.sp. Fig. II.

Hydrobia obtusa, Sandb. : S. V. Wood, Crag Moll., Suppt. I, p. 30, pl. iv, fig. 7.

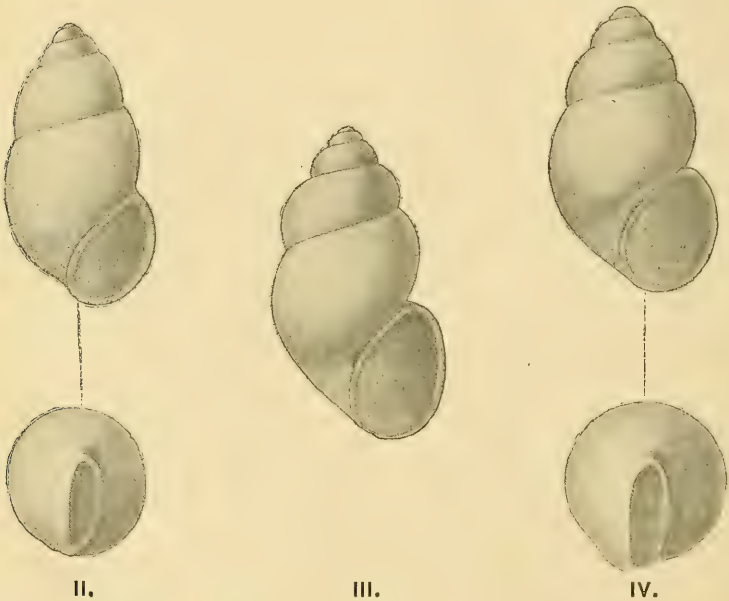


FIG. II. *Paludestrina Reevei*, n.sp. Norwich Crag.
 ,, III. ————— *obtusa*, Sandb., var. Lower Miocene : Frankfort-on-the-Maine.
 ,, IV. ————— type. Upper Oligocene : Kleinkarben (Wetterau).

¹ S. Woodward, Outline of the Geology of Norfolk, 1833, p. 44, pl. iii, fig. 20.

Testa parvula, ovato-conica, apice perobtusio, basi oblique rimata; anfractus 4, leviter convexiusculi, læves, sutura impressa, ultimus vix inflatior et paulo deflexus circa $\frac{2}{3}$ partem altitudinis totius adæquans. Apertura obliqua, ovalis, superne acuminata, marginibus continuis, simplicibus, columellari subrecto, subreflexo. Operculum ignotum. Long. 2, diam. 1 mm.

Form. and Loc.—Norwich Crag: Blake's Pit, Bramerton (Brit. Mus. and Norwich Mus.).

This, although it bears some resemblance to the figures of *P. obtusa* given by Sandberger, proves on comparison with specimens kindly sent for the purpose by Dr. Boettger to be a different shell. The latter is 3 mm. long by about 1.25 mm. in diameter, and its last whorl is much larger than the preceding one, whereas in the present species they are nearly equal in size. *P. Reevei*, too, has a far blunter spire, less convex whorls, a more oblique aperture, and no similar thickening on the outer lip. It is by no means a common shell, only about a dozen specimens being known; all of these have been found by Mr. Reeve, after whom we have great pleasure in naming this form, since by his persistent work he has greatly extended our knowledge of the molluscan fauna of the Norwich Crag.

29. BYTHINIA TENTACULATA (Linn.).

Paludina tentaculata, Linn.: S. V. Wood, Crag Moll., vol. i, p. 111, pl. xii, fig. 2.

Form. and Loc.—Norwich Crag: Norwich; Bramerton Common and Blake's Pit, Bramerton (Norwich Mus.); Southwold (Brit. Mus.); Bulechamp (S. V. Wood).

This is a very rare form in the Crag, although so abundant at the present time. On the continent it is first known from the lower pliocene (Congeria Beds) of Bruchstück, and it is also recorded from the middle pliocene of Hauterive, France.

30. VIVIPARA GLACIALIS (S. V. Wood).

Paludina glacialis, S. V. Wood: Crag Moll., Suppt. I, p. 68, pl. iv, fig. 14, and pl. vii, fig. 25.

Form. and Loc.—Norwich Crag: Coltishall (S. V. Wood).

The only evidence of the occurrence of this form in the pliocene of England is the statement by Mr. S. V. Wood that a single example was found by Mr. H. Norton in the Norwich Crag of Coltishall. This example we have been unable to trace. There are three specimens in the Searles Wood Collection at the British Museum (Natural History), all of which are of pleistocene age, two being from Belaugh and one from Hopton. One of the Belaugh specimens is figured (Crag Moll., Suppt. I, pl. iv, fig. 14), and this should be considered the type. The example from Hopton (also figured, t.e., pl. vii, fig. 25) differs so much from the Belaugh specimens that it may even be a new form, but it is undesirable to create a new species on a single imperfectly preserved specimen. Those in the Museum of Practical Geology from the Weybourn Crag of East Runton are also of pleistocene age.

According to Sandberger,¹ *V. glacialis* is allied to *V. pachya*, Bourg., from the Amoor.²

31. VIVIPARA MEDIA (S. Woodw.).

Paludina media, S. Woodward: Outline of the Geology of Norfolk, 1833, pl. iii, figs. 5, 6.

Paludina rotundata, S. Woodward: op. cit., pl. iii, fig. 7.

Paludina obsoleta?, S. Woodward: op. cit., pl. iii, fig. 4.

Paludina lenta, Brander: S. V. Wood, Crag Moll., vol. i, p. 110, pl. xii, fig. 1.

Paludina parilis, S. V. Wood: Crag Moll., vol. ii, p. 320.

Paludina media, S. Woodw.: S. V. Wood, Crag Moll., Suppt. I, p. 69.

Paludina unicolor, Oliv.: G. von Frauenfeld, Verh. k.k. Zool. Bot. Ges., 1864, p. 153.

Paludina lenta (Brander?): J. G. Jeffreys, Quart. Journ. Geol. Soc., vol. xxvii (1871), p. 493.

Paludina unicolor, Swainson: J. G. Jeffreys, Quart. Journ. Geol. Soc., vol. xxvi (1870), p. 282.

Paludina vivipara, Linn.: S. V. Wood, Crag Moll., Suppt. I, p. 70, pl. i, fig. 5 (*non* Linn.).

Form. and Loc.—Red Crag: Waldringfield (A. Bell). Norwich Crag: Bramerton Common; Thorpe, Norfolk; Bulchamp; Thorpe, Aldeburgh; Dunwich; Yarn Hill; Horstead?; Postwick (S. Woodward).

Few shells in the Crag have caused more difference of opinion as to their identification than this. There can be no doubt that *Paludina media* and *P. rotundata* of S. Woodward are the same species, but it is not so certain with regard to *P. obsoleta*. The figure more resembles *Vivipara glacialis*, but in any case it is not desirable to substitute for the well-established name *media* that of *obsoleta*, because the latter is fig. 4 and the former fig. 5. There is probably an error as to the locality of the specimen in the British Museum (Natural History) labelled "Hasleworth."

The immature example figured by Wood as *Paludina vivipara*, Linn., undoubtedly belongs to this species, as a careful comparison shows. With regard to the locality of this specimen, too, a mistake has probably been made. In the text it is stated that an example of *Paludina vivipara* was found by Mr. Cavell at Easton Bavent, but that the example figured is from the lower glacial beds at Rackheath; whilst in the explanation of the plate the figured specimen is said to be from the Chillesford Beds, Horstead. The shell in the national collection labelled as the figured specimen is marked as coming from Horstead. *Vivipara media* is recorded with a query by Dr. J. Lorié³ from a boring at Gorkum, Holland, at a depth of 92 and

¹ C. L. F. Sandberger, "Beitrag zur Kenntniss der unterpleistocänen Schichten Englands": Palæontographica, 1881, p. 85.

² J. Bourguignat, "Spicileges Malacol.," p. 9, pl. vii, figs. 1, 2.

³ "Contrib. à la Géol. des Pays Bas": Archives Musée Teyler., ser. II, vol. II, p. 163.

120 metres. *V. media* is considered by Sandberger to be related to *V. laeta*, Martens, from Japan.¹ We cannot agree with Frauenfeld that this species is identical with *P. unicolor*, Oliv, the latter having a much more pointed apex and rounded mouth; whilst the whorls are more scalariform than in *V. media*, and slightly carinate.

32. VALVATA CRISTATA, Müll.

Valvata cristata, Müll.: S. V. Wood, Crag Moll., Suppt. II, p. 36, pl. iv, fig. 8.

Form. and Loc.—Norwich Crag: Bramerton Common (Norwich Mus.).

No further examples of this species have been found since it was first noticed by Wood. The lower pleistocene of Mosbach is the earliest record for this form on the continent, though it is noted from several localities of more recent age.

33. VALVATA PISCINALIS (Müll.).

Valvata piscinalis, Müll.: S. V. Wood, Crag Moll., vol. i, p. 112, pl. xii, fig. 3.

Form. and Loc.—Norwich Crag: Bramerton Common and Blake's Pit, Bramerton (Norwich and Brit. Mus.).

All the examples we have seen of this species are typical, the "var. *antiqua*" being unknown. It has also been found in the lower pliocene (Congeria Beds) at Moosbrunn, near Vienna, and St. Leonhards, in West Slavonia.

34. CORBICULA FLUMINALIS (Müll.).

Cyrena trigonula, S. V. Wood: Lyell, Mag. Nat. Hist., 1839, ser. II, vol. iii, p. 329.

Cyrena consobrina, Caill.: S. V. Wood, Crag Moll., vol. ii, p. 104, pl. xi, fig. 15.

Corbicula fluminalis, Müll.: S. V. Wood, Crag Moll., Suppt. I, p. 119.

Form and Loc.—Red Crag: Waldringfield (A. Bell). Norwich Crag: Belough; Aldeby; Dunwich; Yarn Hill; Thorpe, Aldeburgh; Bulchamp; Bramerton; Postwick; Wangford (S. V. Wood).

It is indeed remarkable how enormous has been the decrease in the area of distribution of this species since pleistocene times. In this country it occurs in beds of every age from the Red Crag to the upper pleistocene. It is first noted on the continent from the upper pliocene of Bligny, near Dijon, France, and it occurs abundantly in pleistocene deposits of that country, as well as in those of Belgium, Germany, and Austria, whilst it has been met with in similar beds as far east as Omsk, in Siberia. In modern days it is confined to Asia Minor, the Euphrates, the Nile, South Africa, and Kashmir.

¹ C. L. F. Sandberger, "Beitrag zur Kenntniss der unterpleistocänen Schichten Englands": Palæontographica, 1881.

35. SPHERIUM CORNEUM (Linn.).

Cyclas cornea, Linn. : S. V. Wood, Crag Moll., vol. ii, p. 107, pl. xi, fig. 2.

Form. and Loc.—Norwich Crag : Norwich ; Bramerton Common ; Thorpe, Norfolk ; Bulchamp.

A very rare form in the Crag, though extremely abundant in beds of later age. Its earliest recorded appearance on the continent is in the middle pleistocene near Potsdam. It is a common fossil in the upper pleistocene of the valley of the Somme.

36. PISIDIUM AMNICUM (Müll.).

Pisidium amnicum, Müll. : S. V. Wood, Crag Moll., vol. ii, p. 109, pl. xi, fig. 1.

Form. and Loc.—Norwich Crag : Bramerton Common ; Thorpe, Norfolk ; Bulchamp ; Southwold (S. V. Wood) ; Beccles (W. M. Crowfoot).

All the examples we have seen are small, and fall far short of the dimensions to which this form attained during pleistocene times. Alfred & Robert Bell have recorded¹ *P. amnicum*, var. *sulcatum* (= *P. astartoides*, Sandb.), from the "Upper Crag" (= Red Crag of Butley and Norwich Crag), but we have been unable to confirm this. It should be noted that the examples figured by Wood are from the pleistocene of Grays. *P. amnicum* is recorded by Dr. J. Lorié² from a boring at Gorkum, Holland, at depths of 92, 94·5, 103·5, 108·5, and 120 metres, all being of pliocene age. It is also known from the upper pliocene of Bligny, near Dijon, France.

37. PISIDIUM FONTINALE (Drap.).

Form. and Loc.—Norwich Crag : Bramerton Common (Norwich Museum).

Two valves only of this species are all that we have seen, and it has hitherto been unrecorded from the English pliocene beds, whilst on the continent it has not been detected in any deposit of that age, its earliest appearance being in the lower pleistocene of Mosbach.

38. PISIDIUM PUSILLUM (Gmel.).

Form. and Loc.—Norwich Crag : Bramerton Common (Norwich Museum).

The examples found by Mr. Reeve are the only ones known of pliocene age. It first makes its appearance on the continent in the middle pleistocene of Cannstadt.

¹ A. & R. Bell, "On the English Crags" : Proc. Geol. Assoc., vol. ii (1872), p. 215.

² "Contrib. à la Géol. des Pays Bas" : Arch. Musée Teyler., ser. II, vol. ii, p. 163.

We have thus a total of thirty-eight species. Of these, two forms, *Pyramidula Suttonensis* and *Clausilia pliocena*, are only known from the Coralline Crag. There are six species which are recorded from the Red Crag only. Of these one, *Pyramidula rya*, is extinct; four are no longer found in this country, though living on the continent, viz., *Eulota fruticum*, *Hygromia incarnata*, *Helicodonta lens*, and *Helix lactea*; whilst one, *Cochlicopa lubrica*, is still a common form in this country. Of the fourteen species common to both the Red and the Norwich Crag, one only, *Vivipara media*, is extinct; one other, *Corbicula fluminalis*, is no longer British; but the remaining twelve are still resident with us, viz., *Hygromia hispida*, *Vallonia pulchella*, *Helicigona arbustorum*, *Pupa muscorum*, *Succinea putris*, *Paludestrina stagnalis*, *P. ventrosa*, *Limnæa palustris*, *L. pereger*, *L. truncatula*, *Planorbis marginatus*, and *P. spirorbis*. Of the sixteen species known only from the Norwich Crag two are extinct, *Paludestrina Reevei* and *Vivipara glacialis*; one, *Hygromia rubiginosa*, is extinct in this country, though living on the continent; the remainder are all British, viz., *Sphyradium edentulum*, *Pupa cylindracea*, *Succinea elegans*, *S. oblonga*, *Bythinia tentaculata*, *Limnæa auricularia*, *Planorbis corneus*, *Valvata cristata*, *V. piscinalis*, *Pisidium annicum*, *P. pusillum*, *P. fontinale*, and *Sphaerium corneum*.

Twelve recorded species are rejected by us, viz. :—

Planorbis vortex (Linn.), first given by Lyell (2), and afterwards by

Wood (3). This is probably an error for *P. spirorbis*.

<p><i>Ancylus lacustris</i>, Müll. <i>Limnæa stagnalis</i> (Linn.). <i>Planorbis albus</i>, Müll. <i>Pisidium astartoides</i>, Sandb. (= in part <i>P. annicum</i>, var. <i>sulcatum</i>).</p>	}	<p>All recorded by Alfred & Robert Bell (12), but no examples have been traced, and it should be noted that <i>L. stagnalis</i> was originally given with a query.</p>
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<p><i>Vivipara vivipara</i> (Linn.). <i>Limnæa elodes</i>, Say. ——— <i>Holböllii</i>, Möll. ——— <i>Pingelii</i>, Möll.</p>	}	<p>For reasons stated ante, p. 196.</p>
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Carychium minimum, Müll., was first cited by Prestwich, and the specimen stated to be in the Norwich Museum, but it cannot be traced.

Assiminea Grayana, Leach, though listed and figured by Wood (Crag Moll., Suppt. II, p. 35, pl. iii, fig. 18), is admitted by him to be doubtful, and the specimen cannot now be traced.

Unio tumidus, Retz.: Wood states (Crag Moll., Suppt. I, p. 118) that in 1864 he found an imperfect specimen of *Unio* at Bramerton, which appeared to resemble *U. tumidus*. Since we have also failed to trace this specimen it is advisable to delete it from the list. The three valves of this species formerly on view in the Natural History Museum and labelled "Red Crag: Sutton" are obviously not pliocene fossils at all, as also is the case with the example of *Pyramidula rotundata* (Müll.) in the Robert Bell Collection labelled "Coralline? Crag: Boyton," and still retaining some of its coloration.

TABLE OF THE DISTRIBUTION OF THE PLIOCENE NON-MARINE MOLLUSCA OF ENGLAND.

× Occurrence in England.

* Extra-British.

NAME OF SPECIES.	Recent.	Post-Pliocene.	Norwich Crag.	Red Crag.	Coralline Crag.	Older Beds.
1. <i>Sphyradium edentulum</i> (Drap.)	×	×	×			
2. <i>Pyramidula rysa</i> (S. V. Wood)				×		
3. ——— <i>Suttonensis</i> (S. V. Wood)					×	
4. <i>Eulota fruticum</i> (Müll.)	*	×		×		
5. <i>Hygromia incarnata</i> (Müll.)	*	*		×		
6. ——— <i>hispidus</i> (Linn.)	×	×	×	×		
7. ——— <i>rubiginosa</i> (A. Schmidt)	*	*	×			
8. <i>Vallonia pulchella</i> (Müll.)	×	×	×		?	* ?
9. <i>Helicodonta lens</i> (Fér.)	*			×		
10. <i>Helicigona arbustorum</i> (Linn.)	×	×	×	×		
11. <i>Helix lactea</i> , Müll.	*			×		
12. <i>Cochlicopa lubrica</i> (Müll.)	×	×		×		
13. <i>Pupa cylindracea</i> (Da C.)	×	×	×			
14. ——— <i>muscorum</i> (Linn.)	×	×	×	×		
15. <i>Clausilia plicosa</i> , S. V. Wood					×	
16. <i>Succinea elegans</i> , Risso	×	×	×			
17. ——— <i>putris</i> (Linn.)	×	×	×	×		
18. ——— <i>oblonga</i> , Drap.	×	×	×			
19. <i>Lymnaea auricularia</i> (Linn.)	×	×	×			
20. ——— <i>pereger</i> (Müll.)	×	×	×	×		
21. ——— <i>palustris</i> (Müll.)	×	×	×	×		
22. ——— <i>truncatula</i> (Müll.)	×	×	×	×		
23. <i>Planorbis corneus</i> (Linn.)	×	×	×			
24. ——— <i>marginatus</i> , Drap.	×	×	×	×		* ?
25. ——— <i>spirorbis</i> (Linn.)	×	×	×	×		
26. <i>Paludestrina stagnalis</i> (Bast.)	×	×	×	×		*
27. ——— <i>ventrosa</i> (Mont.)	×	×	×	×		×
28. ——— <i>Reevei</i> , Ken. & B. B. W.			×			
29. <i>Bythinia tentaculata</i> (Linn.)	×	×	×			*
30. <i>Vivipara glacialis</i> (S. V. Wood)		×	×			
31. ——— <i>media</i> (S. Woodw.)			×	×		
32. <i>Valvata cristata</i> , Müll.	×	×	×			
33. ——— <i>piscinalis</i> (Müll.)	×	×	×			*
34. <i>Corbicula fluminalis</i> (Müll.)	*	×	×	×		
35. <i>Sphaerium corneum</i> (Linn.)	×	×	×			
36. <i>Pisidium amnicum</i> (Müll.)	×	×	×			
37. ——— <i>fontinale</i> (Drap.)	×	×	×			
38. ——— <i>pusillum</i> (Gmel.)	×	×	×			
Total	32	30	30	20	2	6
Non-British	6	1		1	2	5
Extinct			3			

ON SOME MOLLUSCA FROM BERING SEA, WITH DESCRIPTIONS
OF TWO NEW SPECIES OF TROCHIDÆ.

By EDGAR A. SMITH, F.Z.S., etc.

Read 11th November, 1898.

THE specimens here described were collected at the Commander Islands in 1896 by Mr. G. E. H. Barrett-Hamilton, who, with Professor D'Arcy Thompson, had been instructed by the Government to investigate the natural history of the Northern Fur-Seal, at the fur-seal islands of the North Pacific. Some account of the Mollusca of these islands, which are situated in the Bering Sea, has been given by Dr. W. H. Dall.¹ Although Mr. Barrett-Hamilton collected but five species of Mollusca, it is curious to find that only one of these appears in Dr. Dall's list, viz., *Valvatella Beringensis*, which he catalogues as a form of *Margarita helicina*, but this, for reasons hereafter given, is, I think, sufficiently distinct to be entitled to specific rank. In using the generic name *Valvatella* in preference to *Margarita*, I follow the course adopted by Mr. Melvill in his presidential address to the Conchological Society in 1896.² Dall and Pilsbry, on the other hand, prefer the use of *Margarita*, because, although a synonym, it had been commonly in use for many years.³ The whole question of the employment of such names rests upon the application of the rules of nomenclature being made retrospective or not. For my own part I think the former the best course to adopt; for, although it may cause temporary inconvenience, such alterations soon become established, especially when incorporated in some recognized manual. Many of the Lamarckian names, for instance, universally employed during the first half of the present century—e.g., *Ricinula*, *Ancillaria*, *Cassidaria*, *Navicella*, *Rotella*, *Tornatella*, *Aspergillum*, etc., etc.—have now disappeared from recognized nomenclature, and it will be the same with others, such as *Margarita*, the one in question, if the alterations pointed out are noted and followed. The species in the present collection are:—

1. OMMATOSTREPHES, sp.

A small species about two inches in length.

¹ Proc. U.S. National Museum, vol. vii (1884), pp. 340-349; vol. ix (1886), pp. 209-219.

² Journ. Conch., vol. vii, p. 472.

³ Bearing this in mind, it is somewhat surprising to find that Mr. Pilsbry has made use of the name *Tethys* for the sea-hares, instead of the generally accepted term *Aplysia* (Man. Conch., ser. I, vol. xvi, p. 65).

2. COLUMBELLA (ASTYRIS ?) ROSACEA, Gould.

Columbella rosacea, Gould : Invert. Massachusetts, 2nd ed., p. 357, fig. 627 ; Tryon, Man. Conch., ser. I, vol. v, p. 160, pl. lvi, fig. 78 ; Sars, Moll. Reg. Arct. Norveg., p. 251, pl. xvi, fig. 1 (*Pyrene rosacea*).

Mangelia Holbölli (Beck), Möller : Nat. Tidskrift, Bd. vi (1842), p. 85.

Pleurotoma viridula, Reeve : Conch. Icon., vol. i, fig. 306 (*non* Möller).

Hab.—Norway, Spitzbergen, Greenland, east coast of United States.

A single specimen only, but interesting as proving a much wider range for this species than previously known.

3. VALVATELLA BERINGENSIS, n.sp. Fig. I.

Testa anguste umbilicata, depressa, olivaceo-lilacea vel pallide rufo-lilacea, nitida, lineis incrementi obliquis curvatis sculpta ; spira brevis, ad apicem nigrescens ; anfractus 5, celeriter accrescentes, perconvexi, sutura profunda sejuncti, ultimus magnus, paulo dilatatus, antice leviter descendens ; apertura pulcherrime iridescens, subrotundata ; peristoma haud continuum, margine externo tenui, columellari incrassato, albo, reflexo. Diam. maj. 11, min. 8·5 mm. ; alt. 8 mm.

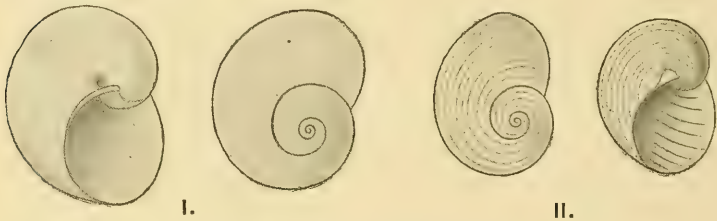


FIG. I. *Valvatella Beringensis*, n.sp.
,, II. ——— *albolineata*, n.sp.

This species is closely allied to *V. helicina* (Fabr.), from Northern seas, and, indeed, might be regarded as a large variety of it. It is, however, very much larger, more solid, with a thicker superficial layer of carbonate of lime and more distinct lines of growth. The white and more thickened columellar margin is another distinguishing feature, the aperture is larger and more patulate, the lower surface of the body-whorl has only the faintest indication of concentric striæ, and the umbilicus is slightly more contracted.

4. VALVATELLA ALBOLINEATA, n.sp. Fig. II.

Testa depressa, suborbicula, imperforata, rosacea, lineis albis filiformibus volventibus numerosis picta, tenuis, nitida ; spira brevis ; anfractus 5, celeriter accrescentes, convexi, lineis incrementi obliquis

tenuissimis indistincte striati; apertura magna, rotundata, intus pulcherrime iridescens; peristoma tenue, margine columellari albo incrassato reflexo, umbilicum quasi obtegente. Diam. maj. 8, min. 6 mm.; alt. 4.5 mm.

Readily distinguishable by its style of coloration and imperforate base. In form very like *V. Beringensis*. Although this shell is imperforate in the adult state, it scarcely falls into *Photinula*, the character of the umbilical callus in that genus being rather different. Young examples of the present species are narrowly umbilicated.

5. *ACMÆA SYBARITICA* (Dall).

Collisella (?) *sybaritica*, Dall: Amer. Journ. Conch., vol. vi, p. 257, pl. xvii, fig. 34; Pilsbry, Man. Conch., ser. I, vol. xiii, p. 22, pl. ix, figs. 22-4 (*Acmaea*).

Hab.—Prybiloff Is., Aleutian Is., Japan.

A single specimen from Copper Island is apparently a variety of this species. It lacks the radiating colour-markings.

DESCRIPTIONS OF THREE NEW SPECIES OF MARINE SHELLS
FROM NORTH-WEST AUSTRALIA.

By EDGAR A. SMITH, F.Z.S., etc.

Read 9th December, 1898.

THE specimens now described form part of collections made in 1890 and 1891 by Mr. J. J. Walker, chief engineer of H.M.S. "Penguin," during surveying operations off the north-west coast of Australia. The land-shells collected at the same time have already been reported on in these Proceedings.¹

1. MARGINELLA WALKERI, n.sp. Fig. I.

Testa ovato-fusiformis, albida, nitida; spira conica, ad apicem obtusa; anfractus 5, superiores planiusculi, sutura callosa sejuncti, ultimus elongatus, ad labrum breviter ascendens; apertura angusta, longit. totius $\frac{7}{12}$ adæquans; labrum incrassatum, intus denticulis numerosis munitum; columella plicis quatuor validis, subæqualibus instructa. Long. 12, diam. 5 mm.



FIG. I. *Marginella Walkeri*, n.sp.
 ,, II. ——— *Baudinensis*, n.sp.
 ,, III. *Astele stenomphala*, n.sp.

Hab.—Baudin Island and Holothuria Banks, North-West Australia (11–34 fathoms).

The denticles upon the labrum, about twelve in number, do not extend to the top, a fourth of its length being smooth within. The species is remarkable for its narrow fusiform shape and prolonged spire.

¹ Vol. i, pp. 84–99.

2. MARGINELLA BAUDINENSIS, n.sp. Fig. II.

Testa brevissime fusiformis, albida, nitida; spira obtuse conoidea; anfractus 4-5, convexiusculi, ultimus irregulariter triangularis, antice contractus, supra convexus, ad labrum breviter ascendens; apertura angustissima; labrum subrectum, superne angulatum, valde incrasatum, intus denticulis numerosis munitum; columella plicis quatuor validis instructa. Long. 6, diam. 3.25 mm.

Hab.—Baudin Island and Holothuria Banks, N.W. Australia (34-53 fathoms).

The three upper columellar plaits are strong, and project directly across the narrow aperture, the basal one being not quite so strong and oblique. The denticles within the lip are very close together, about eighteen to twenty in number, and extend along the whole length. In form this species is very like *M. Metcalfei*, Angas, from Port Jackson, but is larger, and has the outer lip more angled above and more strongly denticulate within. *M. debilis*, Pease, known only by a very inadequate description, must be a closely allied form. *M. Metcalfei*, which is considered by Tryon to be the young of *M. australis* of Hinds, is quite distinct from that species, not only on account of its different form, but also on account of a difference in the columellar plicæ.

3. ASTELE STENOMPHALA, n.sp. Fig. III.

Testa acute conica, carinata, anguste umbilicata, cerea, seriebus pluribus granulorum ornata, supra suturam carina valida, obtusa, pallide maculata, cincta; anfractus 9, primus lævis, politus, globosus, cæteri convexiusculi, in medio subangulati, ultimus infra angulum planiusculus, liris concentricis circiter 14 (paucis gracilioribus intercalentibus) cinctus; umbilicus angustus, perspectivus, albus; apertura irregulariter quadrata; columella vix perpendicularis, rectiuscula, ad basim obsolete tuberculata. Diam. maj. 14.5, min. 13 mm.; alt. 16 mm. Operculum extus concavum, pluri-annulatum.

Hab.—Holothuria Banks, N.W. Australia (15 fathoms).

The obtuse keel which ascends the spire above the suture is ornamented with close-set elongate tubercles, and the granules upon the slight angulation at the middle of the whorls are somewhat larger than those above and below.

DESCRIPTION OF *TRIDACNA OBESA*, n.sp., FROM THE
PHILIPPINES.

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

Read 11th November, 1898.

AMONGST a large quantity of marine shells collected many years ago in the Philippine Islands, that has recently come to light, are several species of *Tridacna*, including one which appears to be new to science. The collection contains many *T. squamosa* (Lamk.), of various sizes, one specimen of which, exceeding a foot in length, has the large vaulted scales, well preserved throughout, thus clearly distinguishing the species from *T. gigas* (Linn.). There are also specimens, in various stages of growth and development, of *T. elongata* (Lamk.), and *T. crocea* (Lamk.), as well as two shells of *T. serrifera* (Lamk.) and three of a very distinct form, which I propose to call—

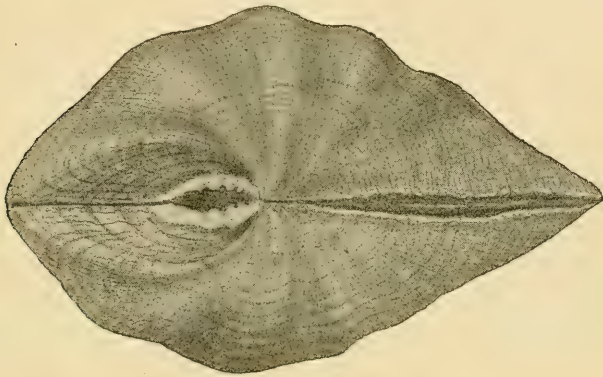
TRIDACNA OBESA, n.sp.



Testa ovata, gibbosa, ponderosa, sordide luteo-albida, antice truncata, postice acuminata, undique confertim concentrice striata, costis 4-5 latis, paulo elatis, levissime rotunde convexis, haud squamosis instructa, interstitiis amplis, radiatim striatis; margo dorsalis posticus elongatus, rectiusculus, anticus brevior, recte declivis;

lunula concave depressa; hiatus parvus; umbones incurvati, contigui, ante medium siti. Long. 16, lat. 12, crass. 10 cm.

This species is remarkable for its smoothness and obesity, the smallness of the byssal opening, very low ribs, and peculiar form. In all the hitherto known species the umbones are situated either in the centre or towards the posterior end of the dorsal line, whereas in *T. obesa* they are nearer to the anterior.



Of the three specimens, I have chosen the one of medium size as the type, since it is the most characteristic and regular in form. The largest shell (21 cm. in length) is similar in essential characters, but somewhat distorted; whilst the smallest (14 cm. long) differs but little from the type.

A LIST OF THE SPECIES OF LAND MOLLUSCA COLLECTED BY
MR. W. DOHERTY IN THE MALAY ARCHIPELAGO; WITH
DESCRIPTIONS OF SOME SUPPOSED NEW SPECIES AND
VARIETIES.

By HUGH FULTON.

Read 11th November, 1898.

PLATE XI.

THE shells dealt with in this paper were part of a collection made by Mr. William Doherty some three or four years ago. The duplicates having come into my hands (the first set having been acquired by the British Museum), I take this opportunity of giving a list of the species I have succeeded in identifying, and of describing some new forms. Several species still remain to be worked out. In the comparison of the new forms I have been greatly assisted by Dr. O. von Möllendorff, especially with the minute and, therefore, more difficult ones. To Mr. Edgar A. Smith, Assistant Keeper of Zoology at the British Museum, I am also indebted for much valuable aid.

LIST OF SPECIES.

PULO LAUT ISLAND, S.E. BORNEO.

Ariophanta Mindaiensis, Bock. *Diplommatina (Paxillus) levis*,
Clausilia Dohertyi, Aldrich. n.sp.

SOUTH CELEBES.

Streptaxis planus, n.sp. *Cyclotus semiliratus*, Mdff.
Xesta Wallacei, Pf. *Diplommatina (Palaina) Moellen-*
,, *dimidiata*, Smith, var. *dorffi*, n.sp.
Obba heroica, Pf. *Diplommatina (Palaina) tumens*,
Planispira flavidula, Marts. n.sp.
Cyclotus fasciatus, Marts. *Lagochilus pachystoma*, Mdff.

BALI ISLAND.

Kaliella angigyra, Mdff., var. *Diplommatina Baliana*, n.sp.
Carychium Balianum, n.sp. *Pupina (Moulinsia) obliqua*,
Diplommatina auriculata, Mdff., var. Smith.

SUMBAWA ISLAND.

Xesta nemorensis, Müll. *Clausilia recondita*, Sykes.
Hemiplecta adolescens, Smith. *Cyclotus politus*, Sby.
,, *Sumbawana*, Smith. *Pupina Dohertyi*, Smith.
Planispira infracta, Marts. ,, (*Moulinsia obliqua*, Smith.
Trochomorpha discreta, Smith.

SUMBA ISLAND.

Xesta cochlostyloides, Schepmann. *Diplommatina Baliana*, n.sp.
Chloritis conjector, Smith.

ADONARA ISLAND.

Xesta rareguttata, var. *sparsa*, MOUSS. *Chloritis argillacea*, Fér.
Planispira Adonarana, n.sp. *Leptopoma vitreum*, Less.

PURA OR POERA ISLAND.

Xesta rareguttata, var. *crebriguttata*, *Bulinus Selayarensis*, Smith.
 Marts.
Amphidromus inconstans, Fulton,
 vars. A, B, & D.

ALOR OR OMBAI ISLAND.

Xesta rareguttata, var. *crebriguttata*, *Chloritis argillacea*, Fér.
 Marts. *Amphidromus inconstans*, Fulton.

OINAINISA, S.W. TIMOR.

Xesta Dammaensis, Smith. *Amphidromus contrarius*, Müll.
 „ *Peaseana*, Pf. „ „ var. *crassa*, n.
Chloritis argillacea, Fér. *Cyclotus reticulatus*, Marts.
Trochomorpha tricolor, Marts. *Omphalotropis tenuis*, n.sp.

TENIMBER ISLAND.

Xesta Micholitzii, Mdff. *Corasia Tenimberica*, Mdff.
Chloritis eurychasma, Bttg. *Amphidromus columellaris*, Mdff.
Eulota biteniata, Mdff. *Hypselostoma Dohertyi*, n.sp.
 „ *hemisphaerica*, Mdff. *Pupa (Leucochilus) Niobe*, n.sp.
Plecteulota goniosstoma, Mdff. *Adelomorpha Dohertyi*, n.sp.

AMBOINA.

Xesta Strubelli, Bttg.

BURU ISLAND.

Pfeifferia Najas, Pf. *Cyclotus Amboinensis*, var. *elator*,
Xesta Peaseana, Pf. Marts.
Macrocyclus lutea, Marts. *Diplommatina Strubelli*, Bttg.
Chloritis mima, n.sp. *Pupina (Callianella) fulgida*, n.sp.
 „ *selenitoides*, n.sp. „ „ *Wallacei*, Pf.
 „ *unguiculina*, Marts. *Omphalotropis ceramensis*, Pf., var.
Planispira zonaria, Linn. *Helicina idæ*, Pf.

BATCHIAN ISLAND.

Trochomorpha Ternatana, Le Guill. *Leptopoma Massena*, Less.
Papuina pileolus, Fér. *Pupina (Porocallia) mirabilis*,
Planispira endoptycha, Marts. n.sp.
 „ (*Cristigibba*) *anozona*, Marts.

GILOLO OR HALMAHERA ISLAND.

<i>Trochomorpha Ternatana</i> , Le Guill.	<i>Leptopoma leucorhapse</i> , Marts.
<i>Albersia pubicepa</i> , Marts.	<i>Pupina olitaria</i> , Marts.
<i>Clausilia Moluccensis</i> , Marts.	,, (<i>Moulinsia</i>) <i>cylindrica</i> , n.sp.

SANGIR ISLAND.

<i>Crystallopsis leucophthalma</i> , Pfr.	<i>Cyclophorus Dohertyi</i> , n.sp.
<i>Obba Tirmaniana</i> , Ancey.	<i>Pupina</i> (<i>Porocallia</i>) <i>mirabilis</i> , n.sp.
<i>Cyclotus atratus</i> , Ancey.	

TALAUT ISLAND.

<i>Obba marginata</i> , Müll., var.	<i>Diplommatina</i> (<i>Asinia</i>) <i>Talautana</i> ,
<i>Corasia</i> (<i>Crystallopsis</i>) <i>lais</i> , Pfr.	n.sp.
<i>Cochlostyla</i> (<i>Calocochlea</i>) <i>Tukanensis</i> , Pf.	<i>Leptopoma vitreum</i> , var.
<i>Clausilia Moluccensis</i> , Marts. ?	<i>Pupina</i> (<i>Callianella</i>) <i>Wallacei</i> , Pfr.

DESCRIPTIONS OF NEW SPECIES.

1. STREPTAXIS PLANUS, n.sp. Pl. XI, Fig. 2.

Shell dextral, subdiscoidal, depressed, glassy, semi-transparent, concave above and below; smooth except for indistinct lines of growth; whorls 4, regularly increasing, the last rounded below, angular above; aperture somewhat L-shaped, depressed above, armature consisting of three short lamelliform projections situated on the parietal wall, right and basal margins of the peristome forming a triangle; peristome thickened and slightly reflected. Diam. maj. 5.5 mm., alt. of body-whorl 2 mm.

Hab.—South Celebes.

A remarkable species, quite unlike any other of the genus, and very interesting as being the first recorded from Celebes; in fact, except for a young specimen found in Borneo by Dr. von Martens,¹ it appears to be the first recorded from the Malayan Archipelago.

2. CHLORITIS MIMA, n.sp. Pl. XI, Fig. 7.

Shell discoidal, dark brown, almost flat above, somewhat excavated below, umbilicus open to about the width of 2.5 mm.; whorls 4 $\frac{3}{4}$, convex, slightly channelled at the suture; peristome slightly expanded, margins joined by a raised and somewhat thickened callous ridge. Diam. maj. 23, alt. 11 mm.

Hab.—Buru I., Moluccas.

This species, save for several slight differences, is a miniature of the large *C. Gruneri*, Pfr.: the aperture in the latter descends very

¹ Preus. Exped. Ost-Asien, Bd. ii, p. 387.

low, whereas it is only very slightly descending in our species; there are also differences in the parietal callus, that of *C. Gruneri* being much thicker in the upper portion, whereas it is of equal thickness in *C. mima*; the latter has the spire very slightly depressed, that of the former is flat. From *C. unguiculastra*, Marts., it can be separated by its smaller size, its raised callus, and its narrower umbilicus.

3. CHLORITIS SELENITOIDES, n.sp. Pl. XI, Fig. 9.

Shell depressed, subglobose, openly unbilicated, dark brown; whorls 5, convex, gradually increasing, first three almost flat, last two gradually descending, with obtuse but conspicuous oblique plicate striæ; peristome white, slightly expanded, margins joined by a somewhat thickened callus. Diam. maj. 26, alt. 14 mm.

Hab.—Buru I.

A distinct species, easily distinguished from others of the genus by its zonitoid form. This and *C. mima* belong to the hairless forms of *Chloritis*.

4. PLANISPIRA ADONARANA, n.sp. Pl. XI, Fig. 12.

Shell depressed, globose, thin, smooth, light horn-colour, umbilicus open to about 2 mm. at its widest part, somewhat constricted behind the aperture; whorls $3\frac{1}{2}$, slowly increasing, convex, last half-whorl descending about 2 mm.; peristome subcircular, *continuous*, broadly expanded, equal to half the width of the shell, very oblique, a spiral fold just above the periphery for one-third of a whorl behind the aperture, an indication of another is faintly seen on the basal portion of the peristome. Diam. maj. 12, alt. 7 mm.

Hab.—Adonara I., Moluccas.

Easily distinguished from *P. eudoptycha*, Marts., by its continuous peristome and fewer whorls.

5. AMPHIDROMUS CONTRARIUS, Müll., var CRASSA, n. Pl. XI, Fig. 8.

This is similar in shape to the typical form, but is a much more solid shell; the columella is thick and round, not thin and expanded as in the type; whilst the aperture is somewhat higher in proportion to the height of the shell, and the interrupted oblique colour-stripes of the type are absent on the last whorl of this species. Diam. maj. 20, alt. 40 mm.

Hab.—Timor I.

Numerous examples of the typical form were also collected at Timor by Mr. Doherty.

6. HYPSELOSTOMA DOHERTYI, n.sp. Pl. XI, Fig. 17.

Shell dextral, triangular, umbilicus deep and moderately wide, almost smooth; whorls 4, first three small, convex, body-whorl large, somewhat depressed in the centre and keeled above and below, slightly ascending; interior of aperture armed with five teeth, two on parietal wall, two palatal teeth, and one on the columella side of

the aperture; peristome subcircular, expanded, continuous. Diam. maj. 2·75, alt. 2 mm.

Hab.—Tenimber I.

Allied to *H. Everetti*, Smith, from Kalao Island, but this species is narrower, the aperture does not project so far from the body-whorl, it is more closely coiled below, and is not perspectively umbilicated.

7. PUPA (LEUCOCHILUS) NIOBE, n.sp. Pl. XI, Fig. 10.

Shell elongate-oval, rimate, smooth, dirty white; whorls 5, convex; peristome oval, thin, continuous, expanded; internal armature of the aperture consists of five plaits, two, rather long entering folds on the parietal wall, one on the columella side, and two on the basal portion of aperture. Diam. maj. 1, alt. 2 mm.

Hab.—Tenimber I.

This has kindly been compared by Dr. von Möllendorff, who says that the species has some affinity with *P. recondita*, Tapp.-Can., from the Aru Islands, but is smaller and more cylindrical in form.

8. CARYCHIUM BALIANUM, n.sp. Pl. XI, Fig. 11.

Shell elongate, rimate, smooth, glassy, semi-transparent; whorls $5\frac{1}{2}$, convex, regularly increasing; aperture oval, somewhat oblique; peristome thin, slightly expanded, continued over the parietal wall; a fold on upper part of columella. Diam. maj. 0·75, alt. 1·75 mm.

Hab.—Bali I.

I am indebted to Dr. von Möllendorff for a comparison of this species. He writes: "Differs from *C. Javanum*, Mölldff., from Java, in being of a more slender form, smaller, and with a narrow aperture."

9. DIPLOMMATINA BALIANA, n.sp. Pl. XI, Fig. 16.

Shell dextral, thin, oval, transparent white, tinted with a golden colour, spire acuminate; whorls $6\frac{1}{2}$, first five increasing slowly, penultimate slightly broader than the last, sculptured with close-set, thin costæ, which are wider apart on the latter part of the last whorl; a slight constriction above the aperture; aperture circular, erect; peristome somewhat expanded, continuous. Diam. maj. 1·25, alt. 2·5 mm.

Hab.—Bali and Sumba Is.

In general form and sculpture very near *D. concolor*, Quad. & Mdff., from the islands of Luzon and Palawan; but readily separated therefrom by its almost circular aperture and the absence of a columella fold. Dr. von Möllendorff informs me that he knows of no Javan species that approaches this.

10. DIPLOMMATINA (PALAINA) MOELLENDORFFI, n.sp. Pl. XI, Fig. 18.

Shell dextral, ovate, slightly rimate, either pale yellow or suffused with a pinkish colour; whorls 6, very convex, obliquely striate, penultimate, slightly broader than body-whorl, the latter shortly ascending; constricted just above the aperture, with a prominent

bulge or protuberance to the left of it; aperture circular; peristome white, thin, broadly expanded, and continued over the parietal wall of the last whorl. Diam. maj. 2·5, alt. 5 mm.

Hab.—Macassar, Celebes.

In addition to *D. (Arinia) Minahassæ*, Kobelt,¹ this and the next are the only species of *Diplommatina* recorded from Celebes. The nearest allied species is *D. (Palaina) chrystoma*, Smith, but *D. Moellendorffi* is distinctly separated by its less oblong form and its remarkable broadly expanded peristome.

11. DIPLOMMATINA (PALAINA) TUMENS, n.sp. Pl. XI, Fig. 4.

Similar to *D. Moellendorffi*, but shorter, the penultimate whorl smoother, compressed and bulging out beyond the body-whorl; peristome larger in proportion to size of shell than in *D. Moellendorffi*. Diam. maj. 3·5, alt. 4·75 mm.

Hab.—Macassar, Celebes.

This curious form, of which only a single specimen was obtained, may possibly prove to be but an abnormal form of *D. Moellendorffi*.

12. DIPLOMMATINA (ARINIA) TALAUTANA, n.sp. Pl. XI, Fig. 13.

Shell dextral, oval, thin, rimate, semi-transparent, white shading to golden above, closely and delicately costate; whorls 5, rapidly increasing, last three almost equal in width; aperture circular, erect; peristome thin, continuous, with an outer flange or rim. Diam. maj. 1·5, alt. 2·75 mm.

Hab.—Talaut I.

A very pretty and distinct species, readily distinguished from the S. Flores species, *D. blanda*, Smith, by its having a less number of whorls and by its finer sculpture.

13. DIPLOMMATINA (PAXILLUS) LEVIS, n.sp. Pl. XI, Fig. 14.

Shell dextral, oblong-conic, dirty white, smooth except for traces of fine oblique striæ on front of body-whorl, non-rimate; whorls 7, first five almost flat, last two convex; aperture almost vertical, subauriform; peristome double, inner portion slightly raised above the outer rim, continued over the body-whorl by a thin transparent callus; two folds on columella, lower one alone visible from the exterior, upper one beginning about half a whorl from the exterior margin of aperture, and continued interiorly; on the interior side of outer wall, and situated just above the peristome, are two short transverse plaits, which can be seen from the exterior if the shell be wetted, whilst on the parietal wall above there is a similar longitudinal fold, which can only be seen by breaking the shell open; above and to the left of the columella there is a remarkable tear-shaped protuberance. Diam. maj. 2·25, alt. 4 mm.

Hab.—Pulo Laut, S.E. Borneo.

¹ Abhandl. Senckenburg. Gesell., Bd. xxiv (1897), p. 36.

This is the first recorded dextral species belonging to the section *Paxillus*. On breaking open a *D. (Paxillus) adversus*, Ad., for comparison, I found that in addition to the two plaits on the interior of the outer wall, there is a strong lamelliform plait hanging, as it were, from the parietal wall. I am not aware that this interesting fact has ever been recorded before.

14. *CYCLOPHORUS DOHERTYI*, n.sp. Pl. XI, Fig. 5.

Shell globose-conic, moderately thick, umbilicus almost, or entirely covered by the peristome, dark reddish-brown, with oblique growth-lines crossed by microscopical spiral striæ, causing a somewhat granular appearance; whorls $6\frac{1}{2}$, convex, last slightly keeled at the periphery; suture somewhat deep; aperture subcircular; peristome oblique, double, continuous. Diam. maj. 18, alt. 18 mm.

Hab.—Sangir I.

A very distinct species, with a *Choanopoma*-like peristome.

15. *PUPINA (MOULINSIA) CYLINDRICA*, n.sp. Pl. XI, Fig. 1.

Shell oblong-ovate, thin, polished, semi-transparent; whorls 5; suture distinctly margined; aperture subcircular, almost vertical; peristome slightly thickened, a semicircular notch on left margin. Diam. maj. 3, alt. 5.5 mm.

Hab.—Dodinga, Gilolo I.

Also a very distinct species, unlike anything I am acquainted with from the Moluccas.

16. *CALLIANELLA FULGIDA*, n.sp. Pl. XI, Fig. 3.

Shell imperforate, polished, ovate-oblong; suture margined; spire oblique; whorls $3\frac{1}{2}$, rapidly increasing, smooth, two only are visible from the front; aperture circular; peristome oblique, continuous, slightly thickened. Diam. maj. 3.5, alt. 5.5 mm.

Hab.—Buru I.

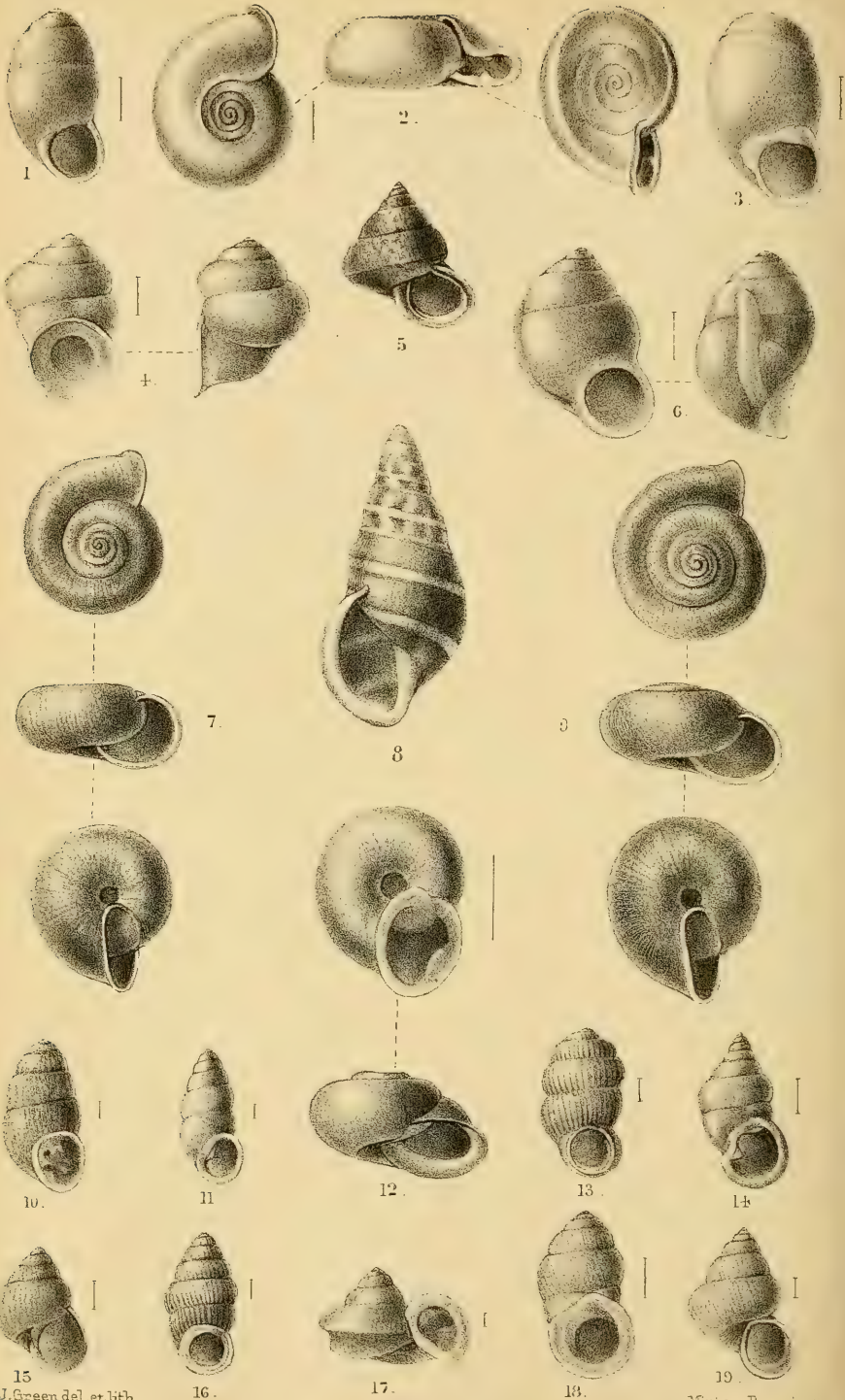
In form very like *C. Wallacei*, Pf., but much larger, not so compressed, broader, and with larger aperture in proportion to size.

17. *PUPINA (POROCALLIA) MIRABILIS*, n.sp. Pl. XI, Fig. 6.

Shell acuminate-oval, smooth, shining, imperforate; whorls 5, rapidly increasing, last almost equal in height to two-thirds of whole shell; suture margined; aperture circular, almost erect, peristome thickened, a tube behind the left margin of aperture just below point of insertion, generally short but rarely continuous across the body-whorl towards the apex. Diam. maj. 4, alt. 5.75 mm.

Hab.—Sangir and Gilolo Is.

In all the numerous specimens found on Gilolo I. the tube is short; of the eight specimens found on Sangir I., three have the long tube extending over and above the body-whorl, and five have the tube short. The direction of the tube in those examples where it is short varies: in some the tube turns upwards, in others it lies more or less at right angles to the spire.



J. Green del. et lith.

Mintern Bros. imp.

NEW LAND SHELLS FROM THE MALAY ARCHIPELAGO.

18. *ADELOMORPHA DOHERTYI*, n.sp. Pl. XI, Fig. 19.

Shell conoidal, perforate, dirty white, with fine close-set, almost vertical costæ; whorls $5\frac{1}{2}$, very convex, regularly increasing; aperture subcircular, vertical; peristome thin, simple; operculum typical. Diam. maj. 2, alt. 2.5 mm.

Hab.—Tenimber I.

Much smaller than any other known species of the genus.

19. *OMPHALOTROPIS (SELENOMPHALA) TENUIS*, n.sp. Pl. XI, Fig. 15.

Shell perforate, globose, acuminate above, thin, semi-transparent, almost vertically striate; whorls $5\frac{1}{2}$, very convex, last equal in height to two-thirds of whole shell; aperture D-shaped, somewhat oblique; peristome thin, angled and slightly expanded at the base of the columella, the latter oblique. Diam. maj. 3, alt. 4 mm.

Hab.—Timor I.

Allied to *O. Dohertyi*, Aldrich, from Sumatra, but it is thinner, more openly umbilicated, and has more convex whorls.

EXPLANATION OF PLATE XI.

- FIG. 1. *Pupina cylindrica*, n.sp.
 ,, 2. *Streptaxis planus*, n.sp.
 ,, 3. *Callianella fulgida*, n.sp.
 ,, 4. *Diplommatina tumens*, n.sp.
 ,, 5. *Cyclophorus Dohertyi*, n.sp.
 ,, 6. *Pupina mirabilis*, n.sp.
 ,, 7. *Chloritis mima*, n.sp.
 ,, 8. *Amphidromus contrarius*, Müll., var. *crassa*, n.
 ,, 9. *Chloritis selenitoides*, n.sp.
 ,, 10. *Pupa Niobe*, n.sp.
 ,, 11. *Carychium Balianum*, n.sp.
 ,, 12. *Planispira Adonarana*, n.sp.
 ,, 13. *Diplommatina Talautana*, n.sp.
 ,, 14. ————— *lævis*, n.sp.
 ,, 15. *Omphalotropis tenuis*, n.sp.
 ,, 16. *Diplommatina Baliana*, n.sp.
 ,, 17. *Hypselostoma Dohertyi*, n.sp.
 ,, 18. *Diplommatina Moellendorffi*, n.sp.
 ,, 19. *Adelomorpha Dohertyi*, n.sp.

NOTES ON A THIRD COLLECTION OF MARINE SHELLS FROM
THE ANDAMAN ISLANDS, WITH DESCRIPTIONS OF THREE
NEW SPECIES OF *MITRA*.

By J. COSMO MELVILL, M.A., F.L.S., etc., and E. R. SYKES, B.A.,
F.Z.S., etc.

Read 9th December, 1898.

SINCE the appearance of our former papers on this subject,¹ we have heard with the greatest regret of the sudden death (in April or May, 1898) of Mr. G. H. Booley, of Port Blair, to whom we have been indebted for the carefully selected examples that form the foundation of this and our preceding contributions towards a Molluscan Fauna of the Andamans.

Had he lived, it was his intention to forward certain generic and specific forms at one special time, and thus, as much as possible, keep to one Order till worked out. In two or three years we should in this way have been able to give a very full geographical summary of the marine molluscan fauna of these prolific islands. Imperfect, therefore, though the researches are now, unfortunately, compelled to remain, there can be no doubt that they will prove of some service to the future malacological geographer, who would essay a complete catalogue of the Andamanese fauna.

In the present paper, no less than three new species of *Mitra* are added to our lists, and two marked varieties of known species of *Nassa* and *Natica* respectively have been thought worthy of differentiation and figures.

As before, species that have been recorded by Mr. Smith are distinguished by an asterisk.

1. *PLEUROTOMA VARIEGATA*, Kien. Allied to *P. tigrina*, Lam., already recorded from these islands; but less acutely keeled, and with wider canal. Reported from Japan, the East Indies, and Ceylon, but not very abundant anywhere.

2. *AQUILLUS* [= *TRITON*] *PILEARIS*, L. Fine examples. An abundant Eastern species.

3. *AQUILLUS GALLINAGO*, Reeve. Also widely distributed, from the Philippines south-westward.

4. *NASSA* (*NIOTHA*) *GEMMULATA*, Lam. Large specimens, typical. Its range also extends from the Philippines both south-westward and south-eastward.

¹ Proc. Malac. Soc., vol. ii, p. 164, and vol. iii, p. 35.

5. *NASSA* (*ALECTRION*) *PAPILLOSA*, L. The largest of the genus, connected with other, smoother, species through *N. seminodosa*, A. Ad. Distributed widely throughout the Eastern tropics.

6. **NASSA* (*ALECTRION*) *BIFARIA*, Baird. Considered by Tryon (Man. Conch., ser. I, vol. iv, p. 28) to be a "stumpy variety" of *N. hirta*, an abundant East Indian and Polynesian species.

7 *NASSA* (*HIMA*) *CRIBRARIA*, Marrat. A prettily painted *Nassa*, white, zoned with fulvous-brown. Three examples, exactly agreeing with specimens before us, authenticated by Mr. Marrat. Allied to *N. concinna*, Dunker, but smaller. We should not be inclined to follow Tryon (Man. Conch., ser. I, vol. iv, p. 51) in considering it a variety of *N. sinuigera*, Ad.

8. *NASSA* (*PHRONTIS*) *ZAIENSIS*, Sby. Proc. Malac. Soc., vol. i, p. 160.
Var. *ANDAMANICA*, nov. Fig. IV (p. 222).

Nassa ovata, solida, stramineo-ochracea, apud apicem acuminata, anfractibus 8, longitudinaliter costatis, costis papillois, spiralter lirato-sulcatis, papillis obtusis, parum nitentibus, anfractu ultimo juxta suturam papilloso, infra profundi spiralter sulcoso, deinde longitudinaliter costato, costis papillois, ut supra, apertura ovato-rotunda, nigro-fasciata, canali brevi, labro politissimo, extus trimaculato, maculis fusco-nigris, intus denticulato, columella recta, paullum plicata. Long. 18, lat. 10 mm.

We have given a full description of this shell, at present deemed a variety, since it is not improbable that in time to come, when extensive suites, in various stages of growth, of both this and *N. Zailensis*, Sby., have been gathered, the new form may prove worthy of specific rank.

The examples before us are of a thickened fusiform shell, spire much attenuate towards the apex, upper whorls thickly ribbed, and these ribs thrice sulcate, transversely, thus appearing gemmuliferous, the last whorl is longitudinally ribbed, and obscurely spirally sulcate, outer lip shining, very polished, enamelled callosity extending over the columellar area to the sutures, not very thick, but white and much glazed, the outer lip possessing, as in the type (*Zailensis*), two or three black or fuscous bands, giving a very distinctive appearance. Superficially it resembles *N. venusta*, Dunker, var.

9. *NASSA* (*ZEUXIS*) *CANALICULATA*, Lam. One most magnificent specimen, much larger than usual, and with the outer lip in very perfect condition, which we have placed in the National Collection. It also occurs in the Pacific from the Philippines to Fiji.

10. *NASSA* (*ACICULINA*) *MACULATA*, A. Ad. Perhaps this would be better included in *Amycla*, H. & A. Ad. The type came from the Philippine Islands.

11. *ENGINA ELEGANS*, Dunker, 1845 (= *Ricinula pulchra*, Reeve, 1846). Reeve probably altered the trivial name of this species on account of the *Ricinula elegans*, Brod & Sby. (Zool. Journ., iv, p. 376). This latter species, however, still remaining in *Sistrum*, it no longer

affects the question of nomenclature under *Engina*. There has been more confusion as to the synonymy and arrangement of this very beautiful and distinct mollusc than one could have supposed possible. Reeve in 1846 described a *Buccinum pulchrum* (Conch. Icon., fig. 80) from the Gallapagos Isles. This has been, unwarrantably, mistaken for a western representative of this eastern species, and in consequence the erroneous idea arose, of a shell possessing a cosmopolitan range in the Tropics of both hemispheres. The *Buccinum pulchrum*, Reeve, which is perhaps a *Sistrum*, or, more probably, an *Engina*, is of quite special configuration, and perfectly distinct from *E. elegans*, Dkr. The Cumingian type of the latter species came from Capul Island, Philippines. From the Andamans we have only seen the white-mouthed variety, in which the body of the shell is of a pale straw colour.

12. *SISTRUM RICINUS*, L. (= *Ricinula arachnoidea*, Lam.). This species, represented in the collection by fine typical specimens, is extensively distributed throughout the East Indies.

13. *OLIVA EMICATOR*, Meusch. Better known by the later name of *O. guttata*, Lam. A variable species, very widely diffused throughout the East.

14. *LATIRUS (PERISTERIA) NASSATULUS*, Lam. Brilliantly coloured and quite typical. Ranges northward to the Philippines, and southward to Ceylon.

15. *MITRA RUBIGINOSA*, Reeve. One example. Recorded from Ticao Island.

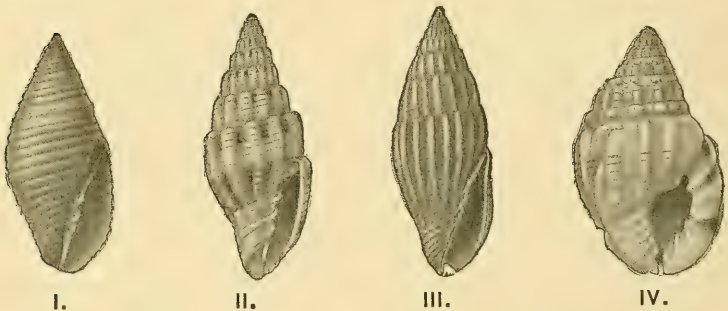


FIG. I. *Mitra Buryi*, n.sp.
 ,, II. — *dilectissima*, n.sp.
 ,, III. — *Georgii*, n.sp.
 ,, IV. *Nassa Zailensis*, Sby., var. *Andamanica*, n.var.

16. *MITRA (CHRYSAME) BURYI*, n.sp. Fig. I.

Mitra testa ovata-oblonga, solida, crassiuscula, apice obtuso et sæpius eroso, anfractibus 7-8, nigro-brunneis, parum nitentibus, arcte spiraliter rotundi-liratis, liris duabus infra, juxta suturas, conspicuis et paullum acutis, cæteris apud medium obtusioribus, sed ad basim magis acutis

et paullulum excavatis, in uno specimine liris ultimum apud anfractum plus minus obliteratis, apertura angusta, oblonga, labro crassiusculo, intus nitente, brunneo, crenulato, columella triplicata. Long. 15, lat. 8 mm.

Shell ovate-oblong, thick, with obtuse and very frequently eroded apex, whorls seven to eight, not very shining, blackish-brown, solid, closely spirally roundly lirate, the two liræ contiguous to and just below the sutures are more conspicuous and acute, the remainder, towards the centre of the last whorl, are more obtuse and often obscure, those at the base are, again, clearer and excavately acute. In one specimen the liræ on the last whorl are not well defined. The mouth is oblong, narrow; outer lip thickened, crenulate within, brownish, shining, columella thrice-plaited.

Allied to *M. pediculus*, Lam., *M. rotundilirata*, Reeve, *M. tabanula*, Lam., and *M. Caledonica*, Petit, all four being considered by Tryon (Man. Conch., ser. I, vol. iv, p. 146) to be forms of one species, but, we think, on insufficient data. From all of them it differs in the ovate-oblong shape, the character of the revolving liræ, and the peculiarity of outer lip. We have much pleasure in connecting with this species the name of our friend Mr. Herbert Bury.

17. MITRA (CHRYSAME) NANA, Reeve. A few examples. We consider this species to be more nearly allied to *M. crassa*, Swm., than to *M. aurantia*, Gmel., but it is difficult to draw a hard and fast line.

18. MITRA (CHRYSAME) PROCISSA, Reeve. A large form of a handsome *Chrysame*, which we have received not uncommonly from Mauritius.

19. MITRA (CHRYSAME) TIARELLA, A. Ad. Common throughout the East. We have especially fine examples from Lifu, New Caledonia (Hadfield). Tryon (Man. Conch., ser. I, vol. iv, p. 149) considers this to be "only a small form of *M. coronata*, Lam.," but we think it quite distinct, and never have any difficulty in recognizing it, nor have we ever noted any intermediate forms.

20. MITRA (STRIGATELLA) PAUPERCULA, Lam., var. ? ZEBRA, Lam. Some confusion exists between this species and *M. virgata*, Reeve; and, to make matters worse, *M. zebra*, Lam., having been considered the variety which linked them together, Garrett described a new species under the name of *M. zebra* (Journ. Conch., vol. iii, 1880, p. 35), which, from the description, no figure being given, most probably comes into the synonymy of this species.

21. MITRA (STRIGATELLA) AMPHORELLA, Lam. Perhaps, as suggested by Tryon (Man. Conch., ser. I, vol. iv, p. 155) a variety of *M. scutulata*, Lam., but, if so, it is a very constant form, and at present our idea is to keep it distinct. Both the style of its coloration and its form are peculiar, and the like is the case with *M. decurtata*, Reeve, which Tryon (loc. cit.) also merges in *M. scutulata* with other forms, in rather a wholesale manner. *M. amphorella* occurs commonly in the Philippines, and ranges through the Pacific. Our examples are fine, varying from 23 to 35 mm. in length.

22. MITRA (STRIGATELLA) LITTERATA, Lam. Exceedingly abundant, but not in much variety. Very widely distributed throughout the Eastern tropics.

23. MITRA (ZIERLIANA) ROBUSTA, Reeve. A few, well-marked and characteristic specimens. We should hardly, like Tryon (Man. Conch., ser. I, vol. iv, p. 157) rank this with *M. Woldemarii*, Kiener, and *M. solidula*, Reeve, as a variety of the much rarer and curiously formed *M. Ziervogeliana*, Gmelin. At all events our experience is that we have never seen intermediate forms. *M. robusta* is more fusiform than the last-named species, its sculpture finer, and longitudinal liræ more frequent, outer lip not so effuse nor incrassate, columella with plicæ far less strongly marked. *M. Woldemarii*, Kiener, a more abundant form, has the outer lip less developed than *M. robusta*, and the surface of its whorls nearly smooth. The shell is not infrequent throughout the Pacific, and its occurrence in the Andaman Islands shows a northern extension of range that is of great interest.

24. MITRA (TURRICULA) REGINA, Sby. One remarkably fine example of what is rightly named the Queen of Mitridæ. We have seen examples from the Moluccas and Philippines.

25. MITRA (TURRICULA) MELONGENA, Lam. Distribution much the same as the last.

26. MITRA (TURRICULA) GRUNERI, Reeve. An extremely distinct species, and one of the best defined of the smaller forms of *Turricula*. We have seen it from the Philippines, collected by the late Mr. Hugh Cuming, and have also met with examples from the Pacific islands.

27. MITRA (COSTELLARIA) CRUENTATA, Reeve. A subulate form, not typical, of which a considerable series came to hand. Widely distributed in the Eastern tropics.

28. MITRA (COSTELLARIA) DILECTISSIMA, n.sp. Fig. II (p. 222).

Mitra testa fusiformi, albida, spira versus apicem attenuata, solida, gradata, anfractibus 9-10, longitudinaliter undique costatis, costis crassis, lævibus, nitidis, interstitiis transversim multisulcatis, infra, juxta suturas, ochro-castaneo maculatis, ultimo anfractu versus medium albo-zonato, zona tenuissima, et usque ad basim castaneo, suffuso, apertura angusta, labro simplici, columella recta, quadriplicata. Long. 18, lat. 7 mm.

Beautiful both in form and coloration. The nearest approach would appear to be *M. discoloria*, Reeve, from Fiji, New Caledonia (Hadfield), and Solomon Isles (Brazier). This species is usually classed as a *Pusia*, a section the main characteristics of which are an ovate outline and curt contour of form. Our species differs entirely in its lengthened attenuate whorls, and in a peculiarity of coloration, which we have described above. To recapitulate, the shell is fusiform, white, spire tapering towards the apex, whorls gradate, impressed at the sutures, solid, nine or ten in number, longitudinally costate, the ribs being thick, shining, whitish, smooth, with interstitial transverse deep sulcation. Painted with chestnut-ochre spotting at the interstices, just

below the sutures, the lower part of the upper whorls being plain, the last whorl has a white band towards the middle, the chestnut-ochre suffusion extending thence over the base, which is attenuate. Aperture narrow, oblong, outer lip simple, columella straight, four-plaited.

29. MITRA (COSTELLARIA) GEORGII, n.sp. Fig. III (p. 222).

Mitra testa fusiformi, nigra, apice acutissimo, anfractibus 11, ad suturas paullum impressis, longitudinaliter arcte costatis, costis rectis, lævibus, nitidis, interstitiis spiraliter sulculosis, interdum evanidis, colore omnino nigro, zona angusta albida superiores apud anfractus infra medium, ultimo anfractu centraliter accincta, apertura oblonga, intus spiraliter striata, labro recto, nitido, nigro, columella triplicata. Long. 17–20, lat. 6–9 mm.

Five examples of a fusiform *Costellaria*, with extremely acuminate apex, rather solid, hardly shining, whorls eleven, slightly impressed at the sutures, and longitudinally, regularly and closely, ribbed, the ribs straight, smooth, rather shining, interstices spirally grooved, in some specimens obsolete. The colour is entirely black, relieved by a very narrow white band, which in the upper whorls is situate below the centre, and in the last whorl at the periphery; aperture oblong, outer lip rather straight, shining, black or blackish-brown; columella having three plaits; lip internally striate near the aperture.

M. (Costellaria) armillata, Reeve, is allied to this, but of totally different form. We have carefully compared it with the whole of the variable '*Cruentata*' section, and do not doubt its distinctness.

Since the name *Mitra Booleyi* has been employed by Wood-Mason, though we have failed to trace his description of the species, we give to this interesting Andamanese form the Christian name of the late Mr. G. H. Booley.

30. MITRA (COSTELLARIA) LAYARDI, A. Ad. Nearly allied to *M. crebrilirata*, Reeve: it ranges from Ceylon to the Philippines.

31. MITRA (COSTELLARIA) SEMIFASCIATA, Lam. A well-marked form, which is distributed across the Arabian Sea, and Indian Ocean, to the Polynesian Islands.

32. MITRA (COSTELLARIA) MUCRONATA, SwN. The distribution of this variable shell is the same as the last. We think Tryon (Man. Conch., ser. I, vol. iv, p. 174) errs in sinking several well-marked species as mere varieties of this one; such, for instance, as *M. nodilirata*, A. Ad.

33. MITRA (COSTELLARIA) SPICATA, Reeve. A rare species, admirably figured by Sowerby (Thes. Conch., pl. xii, fig. 190; pl. xix, fig. 383). Described as from the Moluccas. We should consider this distinct from *M. fusiformis*, Kien., the smooth and shining lower whorl being characteristic.

34. MITRA (PUSIA) AFFINIS, Reeve. Only one, but that a beautiful example, came in the collection. It is a Polynesian species, and nearly akin to *M. aureolata*, SwN.

35. *NATICA AREOLATA*, Récluz. Distinguished by its conspicuous rounded callus. It occurs from Australia to the Moluccas, and has lately been sent from the Arabian Sea by Mr. F. W. Townsend, thus considerably extending its range.



FIG. V. *Natica strongyla*, Melv., var. *Andamanica*, n.var.
 ,, VI. ———— Melv., typical form.

36. *NATICA STRONGYLA*, Melv., var. *ANDAMANICA*, n. Fig. V.

Natica testa a typo differente solum apud umbilicum, callo magis prominulo, et, colore, pallide stramineo, maculis brunneis transversis omnino absentibus. Long. 13, lat. 12 mm.

The type, described recently from the Townsend collections,¹ came from the Persian Gulf, and was not so large or fully grown as subsequent specimens (Fig. VI) received this year from the same locality. The accompanying figure (Fig. V) will show at a glance the slight differences as expressed above between the type and the Andamanese variety. The beautifully multisulcate operculum is the same in both, and alone would separate the species from any form of the protean *N. Marochiensis*, Gmel.

37. * *TEREBRA EXIGUA*, Desh. A fine example 40 mm. long. This rare *Terebra* occurs sparingly in the Andaman Isles, but is reported also from the east coast of Australia.

38. *CERITHIOPSIS HINDUORUM*, Melv. Described from Karachi (F. W. Townsend), where it occurs in great abundance. The Andaman specimen, though not exactly typical, cannot be distinguished from it.

39. *SOLARIUM (PHILIPPIA) CINGULUM*, Kiener. A beautiful, fawn-coloured and white, variegated species, perfectly distinct from the allied *S. hybridum*, L., having its headquarters in the Sandwich Isles, and ranging throughout Polynesia.

40. *CONUS (CORONAXIS) HEBRÆUS*, L. One of the most widely distributed of the genus. Specimens from the Andaman Isles are quite normal.

¹ Mem. Manchester Soc., vol. xii (1897), No. 7, p. 11.

41. *CONUS* (*HERMES*) *SCABRIUSCULUS*, Chemn. Allied to *C. glans*, Swn. Reported from New Caledonia, and widely distributed throughout Polynesia.

42. *CYPRÆA* (*LUPONIA*) *HELVOLA*, L. Showing no variety. One of the most abundant Eastern cowries.

43. *CERITHIUM* (*VERTAGUS*) *OBELISCUS*, Brug. A beautiful form, straw-coloured, mottled with vivid grey at the sutures. Ranges throughout the Eastern tropics.

44. *CERITHIUM ROBUSTUM*, Sby. According to Tryon (*Man. Conch.*, ser. I, vol. ix, p. 135), this is a variety of *C. Traillii*, Sby., which we have already recorded from these islands.

45. *TRIFORIS RUBER*, Hinds. One specimen, very richly coloured. Reported from Bourbon I. and Mauritius, to Tahiti and the New Hebrides.

46. *SCALARIA LATIFASCIATA*, Sby. A closely lamellate form, with broad spiral brown banding. Allied, perhaps too closely, to *S. Clementina*, Grateloup, of which *S. trifasciata*, De Haan, may be only a variety. It ranges from Mauritius to the Philippines.

47. *ONUSTUS INDICUS*, Reeve. Ranges throughout the Indian Ocean.

48. * *XENOPHORA SOLARIOIDES*, Reeve. A small and very distinct species, whose headquarters are the Philippine Isles.

49. *MITRULARIA EQUESTRIS*, L., var. *DORMITORIA*, Reeve. One of the most variable of shells, and also one of the most widely distributed, occurring in both hemispheres in one or other of its forms.

50. *MITRULARIA TECTUM-SINENSE*, Lam. A concentrically laminated, conical species, perhaps not specifically separate from the foregoing, but less widely distributed, not having been recorded as yet from American shores.

51. *VANIKORO DESHAYESIANA*, Récluz. It may not be out of place here to state that *Vanikoro* (1832) of Quoy & Gaimard has precedence by nine years over the more familiar *Narica*, Récluz. The former name has been objected to as being barbarous, having been so christened after the Island of Vanikoro, where the original species (*V. cancellata*, Lam.) was discovered. Barbarous terms are not altogether forbidden, only discountenanced as much as possible by the rules of nomenclature, and for our own part we much prefer such a name to one which might be confusing, *Narica* and *Natica* only differing by a single letter. Anyhow, *Leucotis*, Swainson, 1840, has precedence by one year over *Narica*, while *Merria*, Gray, was not established until 1842.

52. *TURBO RADIATUS*, Gmel. Very fine specimens. Operculum shining, with a greenish tinge. Under this name Mr. Pilsbry (*Man. Conch.*, ser. I, vol. x, p. 200) unites many of Kiener and Reeve's well-known species. The distribution is most extensive, ranging over the whole Indo-Pacific province.

53. *TROCHUS* (*LAMPROSTOMA*) *INCRASSATUS*, Lam. A common but variable Eastern species.

54. *TROCHUS* (*LAMPROSTOMA*) *PUSTULOSUS*, Phil. Seemingly a well-marked shell, but Pilsbry (*Man. Conch.*, ser. i, vol. xi, p. 30) with some doubt allies it to *T. calcaratus*, Souv., from New Caledonia.

55. *TROCHUS* (*TECTUS*) *OBELISCUS*, Gmel. More widely known as *T. pyramis*, Born (or Phil.). A very abundant species throughout the Eastern tropical area.

56. *MONODONTA LABIO*, L. Recorded from African, Indian, Chinese, and Japanese coasts, and not uncommonly in most of the Polynesian islands.

57. *CLANCULUS STIGMATARIUS*, A. Ad.

58. *CLANCULUS UNEDO*, A. Ad. This and the preceding species occur together. We defer to Pilsbry's acute differentiation (*Man. Conch.*, ser. i, vol. x, pp. 69-71) as regards their distinctness. The former has the wider distribution, the latter being almost confined to the New Caledonian Archipelago.

59. *PATELLA TESTUDINARIA*, L. A handsome *Patella*, which ranges from the Philippines southward.

60. *PATELLA OCLATA*, Meusch. Two examples. We consider this to be a somewhat obscure species.

61. *ACMÆA* (*PATELLOIDEA*) *SACCHARINA*, L. Fine examples. Not uncommon throughout the Eastern area.

62. *SIPHONARIA EXIGUA*, Sby. A large species, marked by many, radiating, white ribs. Its range is from the Philippines south-westward.

63. *PLACUNA PLACENTA*, L. This, the *Placenta orbicularis*, Retz, is especially frequent in Chinese waters.

64. *MELEAGRINA MARGARITIFERA*, L. Distributed throughout the Eastern region, in abundance.

65. *AMUSIUM PLEURONECTES*, L. China is its headquarters. It is the type of the genus *Amusium*, Bolten.

66. *TELLINA FOLIACEA*, L. Very fine examples of this beautiful species, which is distributed from the Philippines south-westward.

67. *MACTRA ANTIQUATA*, Spengler. Another fine mollusc, which has its headquarters in the Philippines.

68. *TAPES INDICA*, Hanley. Not infrequent on the shores of India proper (Abercrombie, Townsend, etc.).

69. *SILIQUA RADIATA*, L. A beautiful and common species. The Pelecypoda in the present collection are very insignificant in number and interest, as compared with the Gastropoda.

SUMMARY.

The record for the Marine Molluscan Fauna of the Andaman Islands, as shown in our three papers, now stands as follows:—

No. I	...	...	...	97 species.
„ II	...	...	...	215 „
„ III	...	...	...	69 „
				381 „

The principal genera in the enumeration, when the number of species in each is computed, are *Mitra*, *Nassa*, and *Terebra*; these, with *Oliva*, were specially sought after by Mr. Booley, and no doubt many other interesting forms await the explorer, particularly among the more northern islands of the Andaman group, where, we are informed, hardly any collecting has yet been done. From the deep sea, however, beyond and around these coasts, and other parts of the Bay of Bengal, the “Investigator” dredging expedition has recently procured several new and wonderful abyssal forms, which are being worked out by Mr. Edgar Smith.

ON THE DIVERGENT FORMS AT PRESENT INCORPORATED IN
THE FAMILY MELANIIDÆ.

By J. E. S. MOORE.

Read 9th December, 1898.

IN his great work on the Morphology and Classification of the Proso-branchiata, Bouvier¹ showed, after a study of several examples of true Melaniidæ and of the Cerithiidæ, that it is impossible on purely anatomical grounds to separate the one from the other, and he has made it evident at the same time that within the Melaniidæ as a whole there are forms which in their morphological characters are widely divergent from one another. Bouvier has described in some detail the anatomical peculiarities of *Melania amarula* (Linn.), Lamarck's type of the genus, *M. costata*, Quoy & G., *M. filocarinata*, Montf., *M. tuberculata*, Müll., and *M. asperata*, Lam.

Through the courtesy of my friend Mr. Edgar Smith, I have been able to examine a number of other Melanias, and we have consequently now at our disposal a sufficient body of morphological facts to enable us to discuss with profit the inter-relationships of these forms.

A large number of the genera and subgenera which are at present included in the Melaniidæ have never been examined anatomically, but have been referred to this family with *M. amarula* (Linn.), solely on the characters of their shells.

On this account it will be found, in the succeeding survey, that Bouvier's statements,² firstly, that purely conchological determinations are always to be regarded as more or less distinctly hypothetical, and secondly, that "deux coquilles identiques peuvent protéger des animaux fort différents," are both quite true; and lastly, we shall see that his conclusion, "la famille des Mélaniides est une des plus mal établis dans tout le groupe des Prosobranches, elle est pour ainsi dire basée sur les habitats des genres qui la composent," rather under- than over-estimates the present unsatisfactory systematic aspect of the group.

Bouvier found that in *M. amarula* (Linn.) the nervous system is constructed on a plan which is characteristic of a large group of Prosobranchiata, including many families besides the Melaniidæ. In this form the cerebral ganglia are closely applied to each other, while the pleural ganglia are equally closely applied to them beneath, or rather immediately behind. On each side the great pallial nerves have two separate roots, which anastomose in the body-wall, and thereby give rise to what Bouvier has termed the *dyaloneurous*

¹ Ann. Sci. Nat., ser. xvii, tom. iii (1887).

² Tom. cit., p. 130.

type of nervous system. The cerebro- and pedo-pleural connectives are not long, and the pedal ganglia possess no scalariform pedal cords.

This type of nervous system is encountered in the Cerithiidae, and in a slightly modified form among the Turritellidae, the Typhobiidae, the Strombidae, the Aporrhaidae, and the Xenophoridae.

In the genus *Melanopsis*, on the other hand, Bouvier found that the nervous system is widely different, being much more comparable to that met with in the genera *Vivipara*, *Cyclophorus*, and their allies. Thus, among the different animals which have hitherto been considered as sufficiently closely related to form the members of a single family, we find types of organization that are singularly diverse. For purely conchological reasons three genera of mollusca occurring in Lake Tanganyika, namely, *Nassopsis*, *Paramelania*, and *Typhobia*, have also, until lately, been regarded as belonging to the Melaniidae; and since I have had an opportunity of fully examining the anatomical characters of these forms, it will be of interest to review in the light of Bouvier's work the conclusions to which my researches have led.

In a recent paper¹ I have described the anatomy of *Typhobia* in detail, with that of the allied Tanganyikan genus *Bathanalia*, and have therein made it evident that both these syphonate gastropods differ almost as widely from *Melania amarula* in one direction as *Melanopsis* does in another. In *Typhobia* and *Bathanalia* the nervous system is on the same general plan as in *Melania amarula*, or in *Aporrhais*; but in its general anatomy, as for example in its radula, *Typhobia* corresponds much more closely to the latter than to the former of these two genera. I was thus led to dissociate *Typhobia* and *Bathanalia* altogether from the Melaniidae, and place them in a new family, the Typhobiidae, which, in its general anatomical characters, finds its nearest relations in *Strombus* and the *Aporrhais* group.

Nassopsis, a full account of the anatomy of which will, I hope, shortly appear in the Quart. Journ. Micros. Sci., exhibits yet another type of nervous system, the cerebral ganglia being widely separated from each other. The pleural ganglia are separated from, and are distinctly below, the cerebral ganglia, as in *Vivipara*; but the right pallial nerve, instead of originating in two roots, as in the latter genus, here springs as a single trunk from the sub-intestinal ganglion, which is put into direct connection with the pleural ganglion by a stout cord. Thus *Nassopsis* is, according to Bouvier's definition, strongly zygoneurous on the right side.

These peculiarities, however, are not the only differences between this and the preceding types. We find that in *Nassopsis* the cerebral ganglia are secondarily united by a very distinct *labial commissure*, just as in the Rhipidoglossa and such Archi-taenioglossa as *Ampullaria* and *Vivipara*, and to make the homology between the nervous system of *Nassopsis* and the more primitive Archi-taenioglossa complete, we find further that the pedal ganglia are continued backward into *long*

¹ Quart. Journ. Micros. Sci., vol. xli (1898), p. 181.

scalariform pedal cords.¹ Moreover, we find in *Nassopsis* that the buccal mass and the salivary glands are similar to those of *Littorina* or *Vivipara*, while the stomach is extremely peculiar. This organ is in the first place divided into two chambers, into one of which the œsophagus, intestine, and liver open, while the other has thick walls, is lined internally with a singularly iridescent membrane, and contains an almost globular crystalline style. Furthermore, there appears on the postero-ventral wall of the stomach a spirally arranged valvular structure, which I am disposed to regard as homologous with the spiral cæcum so frequently present in the Rhipidoglossa.

Similar primitive features are exhibited in the genital apparatus, for we find that there are no accessory genital organs, and that the animal is viviparous.

Thus, so far from *Nassopsis* conforming to the true Melanian type, it is seen upon anatomical examination to be a highly peculiar and primitive form; a form which I believe to be on the whole more primitive and more typically representative of the Archi-tænioglossa than the genus *Vivipara* itself.

The existence in this tænioglossate of what I believe to be the rhipidoglossate spiral cæcum is something quite new, and must be regarded as of great interest in connecting the Archi-tænioglossa with the Rhipidoglossa.

I have already pointed out² that the shell of *Nassopsis*, like so many of the halolimnic Tanganyikan types, is indistinguishable from the Jurassic *Purpurina Bellona*, D'Orb., so that, viewed from whatever side we will, *Nassopsis* appears persistently to be a form which has no connection with the Melaniidæ, and belongs to an extremely old type. I have, therefore, felt justified, at any rate for the present, in including it among the otherwise extinct Purpurinidæ.

In *Bythoceras*, another mollusc from the deep water of Lake Tanganyika, we have a form which, judged by the shell and operculum, appears to be closely related to the genus *Paramelania*. *Paramelania* has always been considered by conchologists to be closely related to *Nassopsis*; but if it bears any relation to *Bythoceras*—and the reverse is almost inconceivable—then it can have no affinities whatever with *Nassopsis*, because *Bythoceras* is found to have the general anatomy, the nerves, the alimentary canal, and pallial complex of the true Ceritho-Melanian group, while in certain features of its radula *Bythoceras* is almost indistinguishable from the marine genus *Tympanotomus*.

Thus it is apparent that the genera *Typhobia*, *Bythoceras*, *Nassopsis*, and *Melanopsis* not only differ as widely from each other as members of so many distinct families, but that, with the exception of *Bythoceras*, they bear not the slightest resemblance to the typical Melanian group, and must unquestionably be expunged from it.

¹ It will have been noted that the European *Vivipara* is dyaloneurous in Bouvier's sense; but I find that in the Tanganyikan genus *Neothauma* (the generic distinction of which from *Vivipara* Dr. Pelseneer regards as superfluous), the right side of the nervous system is zygoneurous, as in *Nassopsis*.

² Quart. Journ. Micros. Sci., vol. xli (1898), p. 303.

Before, however, going further, it is advisable to discuss somewhat in detail the anatomical characters of some of the more typical members of the Melaniidæ.

In their admirable work, "Die Süßwasser-Molluscen von Celebes," the cousins Sarasin have divided the Melaniidæ into three 'untergruppen,' namely, *Palæo-*, *Neo-*, and *Tylo-Melania* respectively, and these groups are distinguished mainly by the characters of their opercula and radulæ.

In the first series the radula has the conspicuous littorinoid character which is apparent in *Melania episcopalis* and the genus *Pachychilus*, while the operculum is multispiral.

In the Neo-Melanian group the radula has the peculiar features associated with forms more nearly related to *Melania amarula*; as, for example, *Melania punctata* (L.), and *Melania tuberculata* (Müll.), while the operculum is littorinoid.

Before receiving a copy of the Sarasins' work, I had been led, from a study of the soft parts and radulæ, to form conclusions which were somewhat similar to the above, and had made use of the terms *Littorino-* and *Ceritho-Melania*.

The third type described by the Sarasins appears to be peculiar to Celebes, not being represented among the African or the New World forms.

In *Melania episcopalis* we find that the radula-sac is long, that the salivary glands have the true littorinoid character, while the nerves, except in the probably unimportant feature of being more normally dyaloneurous on the right, are littorinoid too. There is, however, a remarkable development of the reproductive apparatus, in the form of a subcutaneous dorsal pouch, opening beneath the eye, and connected with the genital aperture by a groove corresponding, probably, to that present in the Opisthobranchs. So far as at present known, this condition is only met with elsewhere in the Tænioglossa among some closely allied Philippine species of *Melania*, and in the genus *Tanganyicia*, a form which, however, in many ways belongs to a totally distinct type. I am therefore led to the conclusion that the grooves and pouches are probably to be regarded as extremely primitive characters, and to be looked upon as the last remains among existing Prosobranchia of the grooves and introversible penes of the Opisthobranchia.

This opinion is strengthened by the fact that in the female *Littorina* and some other forms, such as *Strombus*, part of this accessory reproductive apparatus, the groove, still remains, although in these cases it appears to be quite without function.

The existence of this curious apparatus in *M. episcopalis*, therefore, does not necessarily at all dissociate it from the rest of the Littorino-Melaniæ in which the pouch is absent.

I have come, therefore, to the conclusion that it is in the highest degree probable the Littorino-Melaniæ (or Palæo-Melaniæ of the Sarasins) have arisen, independently from the Ceritho- or Neo-Melaniæ, as fresh-water derivatives of an old littorinoid group; but it is clear that, if this be so, such conchological similarities as these two groups

now exhibit are due merely to convergence, and are not real. To sum up: It appears that a number of forms, such as *Typhobia*, *Bythoceras*, *Nassopsis*, and *Melanopsis*, must unquestionably be excluded from the Melaniidæ, if that family is to be represented by the *Melania amarula* type, and they will have either to be incorporated into other totally distinct families or formed into new ones. It also seems that those forms which remain can be split up into the Littorino- and Ceritho-Melaniæ respectively, and that neither of these groups bears any near morphological relationship to the other.

Lastly, Bouvier, as noted, has already reduced the distinction between the Ceritho-Melaniæ and the Cerithiidæ to a vanishing point, by showing that apart from the characters of their shells the members of these families are not capable of being morphologically distinguished from each other. Family distinctions are, however, generally far greater than this even among the Prosobranchia, and it is only logical, therefore, that the Ceritho-Melaniæ, with their type, *Melania amarula*, should be bodily transferred to the Cerithiidæ as simply the fresh-water contingent of that family.

This would necessitate the creation of a new family name for the littorinoid forms, if further investigation does not show, as it possibly will, that they must be transferred bodily to the Littorinidæ.

SOME ACCOUNT OF THE SYNONYMY AND AFFINITIES OF
DONOVANIA MINIMA (MONT.).

By MARTIN F. WOODWARD,
Demonstrator of Zoology, Royal College of Science, London.

Read 9th December, 1898.

THE observations recorded in this note were made at the suggestion of Mr. E. R. Sykes, who sent me two live specimens of *Donovania minima*, with the request that I would endeavour to determine its correct systematic position, considerable uncertainty existing as to whether it should be regarded as belonging to the Pleurotomidæ, or to the Muricidæ.

On looking up the various published descriptions of this shell I found that, in addition to the uncertainty regarding its affinities, there was an almost worse confusion concerning its name. I have, therefore, been at some pains to work out the synonymy of this species, and though in the end I have adopted the name *Donovania*, given by Bucquoy, Dautzenberg, and Dollfus, yet, since I do not quite agree with all the synonyms they have accepted for it, I have ventured to append a short account of my re-investigation of the subject.

The earliest undoubted record is generally admitted to be that of Montagu, in 1803,¹ when, under the name of *Buccinum minimum*, he described a small shell answering perfectly to an almost mature specimen of *Donovania*. His figure is bad and unrecognisable, but the description, as regards form, sculpture, colour, size, and locality, fits extremely well. Hence Montagu's specific name is still retained. There seems, however, to have been a doubt in the minds of some writers whether Montagu, or Donovan first named this shell. The latter author figured and described² very briefly, under the name of *Buccinum brunneum*, a shell which appears to correspond to Montagu's *Buccinum minimum*. Considerable confusion exists as to the exact date of publication of the various volumes of Donovan's British Shells, vol. v being variously given as 1802 and 1803. Mr. C. Davies Sherborn,³ who has investigated this matter, informs me that there is little doubt that the second half of vol. v, which contains

¹ Montagu, Test. Brit., pt. i (1803), p. 247, pl. viii, fig. 2.

² Nat. Hist. Brit. Shells, vol. v, pl. cxix, fig. 2.

³ Mr. C. D. Sherborn's investigations show that the work was published in sixty monthly parts, of which the first was issued in 1799 (month not known). The five volumes appeared as follows: vol. i, 1799-1800; vol. ii, 1800-1; vol. iii, 1801-2; vol. iv, 1802-3; vol. v, 1803-4. Thus the later part of vol. v, in which he describes *Buccinum brunneum*, did not appear until 1804.

the description of *Buccinum brunneum*, was not published till 1804, so that Montagu's *Buccinum minimum*, 1803, evidently has priority.

The *B. minimum* of Montagu was accepted by all the early conchological writers, Maton & Rackett, De Blainville, Dillwyn, and possibly Wood, whose figure, however, suggests a hairy shell. Fleming, who called it *Fusus minimus*, was the first to throw doubt on its determination as a *Buccinum*.

In 1826 Risso¹ described three new genera of Gastropoda—*Lachesis*, *Anna*, and *Nesæa* (two species)—which call for special comment. The descriptions of these are not very precise, but the figures are very clear, and if correct, appear to me to show that neither *Lachesis*, nor *Nesæa* has anything to do with Montagu's *Buccinum minimum*; this conclusion is supported by the definitions of the genera, so far as they go.

The type of the genus *Anna*, which Risso placed with the Pleurotomidæ, more nearly resembles our shell, but differs from it conspicuously in size, being 10 mm. long, whereas *Buccinum minimum*, Mont., rarely exceeds 5 mm. *Anna*, moreover, was a fossil form. All traces of this type appear to have been lost, and I can find no mention of later date of an undoubted *Anna*. Thus it seems inadvisable, considering the uncertainty with which this genus is enshrouded, and its slight resemblance only to *Buccinum minimum*, to refer the latter to it.

After this date we find Montagu's shell masquerading under a variety of names; it becomes the *Nassa minima* of Brown, and, according to some, the *Fusus subnigris* of the same author, but this I think doubtful, since that shell is considerably larger than Montagu's.

It seems to me extremely probable that a slightly larger Mediterranean species² of the same genus, having more whorls than Montagu's shell, has been confused with the latter, and as such I should regard *Buccinum minimum*, Philippi, *B. rubrum*, Potiez & Michaud, and *Fusus turritellatus*, Deshayes.

Further confusion regarding Montagu's shell was introduced by Grey,³ when he revived Risso's genus *Anna*, and regarded *A. Massena*, Risso, as synonymous with *Buccinum minimum*, Mont., *Fusus turritellatus*, Desh., and *Buccinum Scacchianum*, Philippi, thus confusing at least two, if not three or four, perfectly distinct shells. *B. Scacchianum*, Philippi (= *Purpura picta* of Turton and of Scacchi, and *Nassa picta* of Brown), is probably a *Columbella*, and in no way resembles *Buccinum minimum*, *Fusus turritellatus*, or *Anna Massena*. Grey also regarded Risso's two genera *Lachesis* and *Nesæa* as identical and as synonyms of *Pisania*.⁴

¹ Nat. Hist., tom. iv. pp. 211, 214, and 233, pl. v, figs. 65, 67, 68, and 69.

² Monterosato mentions five Mediterranean species of the genus *Lachesis* (? = *Donovania*).

³ Proc. Zool. Soc., 1847, p. 134.

⁴ T. c., p. 133.

The earliest record which I can find of the application of Risso's generic term *Lachesis* to Montagu's *Buccinum minimum* is in S. P. Woodward's Manual in 1851, and from that date Montagu's shell appears to have been known under this name to most conchologists (e.g., Forbes & Hanley, Adams, Gwyn Jeffreys, Monterosato, and Fischer). In 1882 Bucquoy, Dautzenberg, and Dollfus proposed the name *Donovania* for this shell on the grounds that *Lachesis* and *Nesæa* were both preoccupied; these authors give a very excellent account of this shell, and a full synonymy, but are, I think, wrong in their conclusion that the genera *Lachesis* and *Nesæa* of Risso were founded upon specimens of *Buccinum minimum*, Mont. I do not know whether S. P. Woodward was the first to perpetrate this error, but am sure that a careful comparison of Risso's figures and description of *Lachesis* and *Nesæa* with a good example of Montagu's shell will show that they are quite distinct. We are indebted, therefore, to MM. Bucquoy, Dautzenberg, and Dollfus for a very appropriate name for *Buccinum minimum*, Mont., and may in future safely speak of the shell as *Donovania minima* (Mont.).

With respect to its systematic position, *Donovania minima* was of course originally placed in the Buccinidæ, and with slight wanderings held this position until 1847, when Grey placed it, under the generic name *Anna*, in his section Conina of the family Muricidæ. S. P. Woodward in 1851 placed it doubtfully as a section of *Pleurotoma*. Forbes & Hanley referred it in 1855 to the Muricidæ, but Adams in 1858 restored it to the Pleurotomidæ; in 1867 Jeffreys, who first describes the animal, placed it in the Muricidæ; Bucquoy, Dautzenberg, and Dollfus, and, following these authors, Tryon, placed it with the Pleurotomidæ, whilst, lastly, Fischer returned it once more to the Muricidæ.

Some differences exist between the various published descriptions of the shell of *Donovania*, owing to the fact that many of these were based upon immature specimens. It is apparently only late in life, though not necessarily only in the largest specimens, that the outer lip becomes thickened, and 5-6 inconspicuous ridges or denticulations, appear on its inner side. There are six rounded whorls, the apical one (the protoconch) alone differing in sculpture; this last is generally slightly inclined to the major axis of the shell, globose, and at first finely granular, but gradually develops fine longitudinal ribs, which lower down become obscured by the conspicuous transverse spiral striæ.

The operculum (Fig. I) is flattened and broad, the nucleus being apical. Fischer compares it with that of *Ocinebra*, but it appears to me, from the position of the nucleus, to approximate more to that of *Pisania*.

The animal (Fig. II) is of a pale yellowish, translucent, white, with opaque white dots scattered over the surface of the foot, body, and siphon. The siphon is large; the tentacles moderately developed, thickened proximally for rather more than one-third of their total length, the eyes being situated at the posterior side at the distal end of this thickened portion, the extremities of the tentacles taper

slightly; a well-marked penis is present; the foot is long and narrow, slightly expanded anteriorly, where it presents a convex border, divided into two by a transverse groove, the latter being continued up the side of the foot almost to the operculum, this groove probably separates the propodium from the mesopodium, posteriorly the foot tapers very slightly, and is finally rounded off; the operculum projects on either side of the foot.

The radula is long and narrow, and typically rhachiglossate; it consists of about fifty transverse rows, each of which is composed of three teeth (Fig. III). The median tooth presents a roughly quadrangular base, the anterior border being concave, and a small backwardly directed conical cusp; the lateral teeth are large and

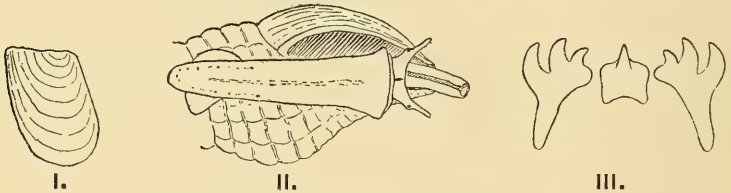


FIG. I. Operculum of *Donovania minima*.
 ,, II. Ventral aspect of the animal.
 ,, III. Transverse row of teeth from the radula.
 (All considerably magnified.)

tricuspid, the cusps incurved and increasing in size from within outwards, the base is concave anteriorly, and produced laterally into a handle-like process.

The character of the radula shows at once that *Donovania* has no connection with the Pleurotomidæ, but that it is typically rhachiglossate. It, however, differs considerably from the Muricidæ in the form of its teeth, approaching more nearly to the Buccinidæ, and amongst them perhaps most closely to *Pisania*. In its central tooth we find a suggestion of *Sipho*, while its lateral teeth are much more buccinoid, but peculiar in the lateral prolongation of the base.

Fischer places the genus *Pisania* in the Buccinidæ, and to that family I think we should also refer *Donovania*, ranking it next to *Pisania*, which it approximates somewhat, as already mentioned, both in its radula and operculum.

ORDINARY MEETING.

FRIDAY, 11TH NOVEMBER, 1898.

Professor G. B. HOWES, LL.D., F.R.S., etc., Vice-President, in the Chair.

The following were elected to membership of the Society: T. H. Aldrich, Sir Henry H. Howorth, Dr. H. von Jhering.

The following communications were read:—

1. "A Revision of the Pliocene Non-Marine Mollusca of England." By A. S. Kennard and B. B. Woodward, F.L.S., etc.
2. "Description of two new species of Trochidæ from the Commander Islands." By Edgar A. Smith, F.Z.S., etc.
3. "Description of a new species of *Tridacna*." By G. B. Sowerby, F.L.S., etc.
4. "On some supposed new species of Land Mollusca from the Moluccas." By H. Fulton.

Mr. E. R. Sykes exhibited several species of *Eulima* from Guernsey, including specimens of *E. gracilis*, Forbes, usually regarded as a variety of *E. distorta*, Desh., and gave reasons for regarding Forbes' species as a sound one. Mr. Sykes also showed and remarked upon specimens of *Micraulax* from Ceylon.

Mr. M. F. Woodward exhibited a wax model of the animal of *Pleurotomaria Beyrichii*, Hilg., and drew attention to many interesting features in the external anatomy.

Specimens and drawings in illustration of their papers were placed on the table by A. S. Kennard, B. B. Woodward, E. A. Smith, H. Fulton, and G. B. Sowerby.

ORDINARY MEETING.

FRIDAY, 9TH DECEMBER, 1898.

J. COSMO MELVILL, M.A., F.L.S., etc., Vice-President, in the Chair.

The following were elected to membership of the Society: T. Howard Bloomer and Professor H. de Cort.

The following communications were read:—

1. "Notes on a third collection of Marine Shells from the Andaman Islands, with descriptions of new species of *Mitra*." By J. Cosmo Melvill, M.A., F.L.S., etc., and E. R. Sykes, B.A., F.Z.S., etc.
2. "Descriptions of three new species of Marine Shells from N.W. Australia." By Edgar A. Smith, F.Z.S., etc.
3. "The Melaniidæ, a heterogeneous family." By J. E. S. Moore.
4. "On the Synonymy and Affinities of *Donovania minima*, Mont." By M. F. Woodward.

Mr. S. I. Da Costa exhibited a series of very rare *Bulimi* and *Bulimuli* from South America, including an unnamed and probably new *Bulimulus*.

Mr. J. Cosmo Melvill showed specimens of *Cypræa caput-serpentis* and of his new form *C. caput-draconis*, and he brought forward additional evidence in favour of regarding the latter as a distinct form. He also with Mr. Sykes exhibited specimens in illustration of their joint paper. Mr. Sykes placed on the table specimens in illustration of Mr. M. F. Woodward's paper.

ADDRESS OF THE PRESIDENT.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc.

Delivered 10th February, 1899.

LADIES AND GENTLEMEN,

The Address of your first President, Dr. Henry Woodward, contained, as he happily termed it, "a haul of the naturalist's dredge," and enumerated in chronological order the progress of marine exploration, both private and public, the outcome of many cruises, initiated by our own and foreign nations, to investigate the fauna of the deep sea; and he followed this by several pages of the interesting results, with valuable suggestions as to the distribution of certain forms in time and space.

Your second President, Dr. G. B. Howes, has on two occasions, in 1895 and 1896, taken as his subject the progress of malacological science, during the short existence of our Society, in the field, the museum, and the laboratory. In these two Addresses Dr. Howes' large and varied knowledge not only of the literature on the subject, but of the great work in progress, is shown on every page. I feel it a difficult task to follow so talented a predecessor in this chair. He stands on a platform of biological inquiry which I, although keenly desiring to explore it closely, can only survey from a distance. Hence I cannot hope to cover so wide a field, full of fresh discovery and suggestiveness. My sphere of labour has been in India, an area large in itself, but small when compared to the rest of the world; my researches have been confined to the land and fresh-water mollusca, and as a field collector to only a portion of our Indian Empire. My duties carried me for years to the high mountains of the country, never to the seaboard, so that my knowledge of marine shells is restricted to such fossil forms as I had opportunity now and then to collect.

A short account of the Indian workers in this branch of Natural History may be of interest. Excluding the European conchologists, Pfeiffer, Cuming, etc., who described single species, or collections, from the East, brought or sent home at various times, with the localities often very ill-defined, according to our present ideas and requirements regarding distribution, the work of conchology in our Indian possessions does not go back very far in time. The first systematic collectors of land-shells were Capt. Thomas Hutton, of the 37th Regiment of Bengal Native Infantry, and Mr. W. H. Benson, of the Bengal Civil Service. Hutton's first contribution is to be found in the Journal of the Asiatic Society of Bengal, entitled "Notices of some Land and Fresh-water Shells occurring in

Afghanistan." He was with the Army of the Indus that advanced into that country in 1839, and the collection was made between Dadur in Sind, to Girishk on the Helmund, crossing the Bolan Pass.

This is a country fresh in our memories; another army has gone into it and returned, but we know very little more of its land mollusca. Officers of the Army, interested in any branch of Natural History, are as rare in these days as they were in Hutton's time. I can only name one man, Mr. M. T. Ogle, an old Survey Assistant of my own, who brought back any shells from Afghanistan. Except when on actual service in face of an active enemy, no men have better opportunities for research than officers of H.M. Army. Days, weeks, even months, are spent by many in the most favourable places in the world, where Nature is lavish of her gifts, where the monotony and solitude of the life are to some temperaments almost unbearable; in such a quarter, if they only possessed an interest in some branch of science, their lives would at once be full of pleasure, and the sameness of the daily military duty would not be felt. It is no excuse to say there is no time, or that duties would be neglected; the lives of such men as Sir Henry Rawlinson (and many others can be recalled) show what can be, and has been, accomplished by our race in every part of the world, even when fully employed departmentally.

Benson, to whom Hutton sent most of his shells, and with whom he was in constant communication, began work about the year 1834. In August of that year he exhibited, at a meeting of the Zoological Society of London, a collection of land and fresh-water shells formed in the Gangetic Provinces of India. It comprised forty species, which he presented to the Society, and it would be interesting to know what eventually became of them. His paper was an important communication, and followed a previous one in 1832 to the Asiatic Society of Bengal, on a collection presented to that Society from the same part of India. The animal of a *Macrochlamys* was described for the first time, and even reached this country alive.

From this period Benson was an enthusiastic worker, and it may be truly said that he laid the foundation for the study of Indian terrestrial and fluviatile mollusca on a thoroughly scientific basis. More important too, for his time, he was imbued with that proper appreciation of geographical distribution, without which so much of the value of malacology as a science is lost. His descriptions are most accurate, and his remarks and conclusions often of great interest. By his excellent example he gathered about him a number of men in the service of the Hon. East India Company, who followed in his footsteps. We find among these some, whose names are household words in Indian Natural History; others, full of future promise, fell in the service of their country; whilst a few yet survive. The following is a list of such of these early workers whose names most deserve to be recorded and recalled to memory, since we are indebted to them for contributions towards our present studies, and many of their names will be familiar to you in nomenclature, though the individual naturalist or collector is known but to a few:—Major

Alexander, Dr. J. F. Bacon, Col. W. G. Baker, Sir David Barclay, Col. R. H. Beddome, Capt. C. A. Benson, Dr. W. Bland, R.N., Capt. W. T. Boys, Lieut. Burkinyoung, Dr. Theo. Cantor, J. Chesson, Lieut. W. G. Cox, Dr. Francis Day, Rev. S. B. Fairbank, Major FitzGerald, Col. Robert Gordon, A. A. Gould, Capt. J. C. Haughton, Dr. Helfer, Dr. R. Hungerford, Col. Jenkins, Dr. Jerdon, E. L. Layard, Hugh Nevill, Dr. J. T. Pearson, Jas. Prinsep, Dr. Rawes, Major Rowlatt, Capt. Sankey, R.E., and Mrs Sankey, J. Doyle Smith, Sir E. Tennent, Dr. Thomson, Dr. Traill, Robert Trotter, and Dr. Walker.

I began collecting seriously in 1862, and my first small gathering, made near Skardo in Little Tibet, was sent home to be named by S. P. Woodward.¹ At this time Captain Thomas Hutton, who had retired and was residing at Jellapahar Mussoorie, was the first officer I met, after ten years in the country, who possessed a library, with the exception of Dr. Verchere, a geologist, who took an interest in natural history. I owe a considerable debt of gratitude to Hutton for the loan of books and for assistance in naming some of the first species I got together in the N.W. Himalaya. The remains of his own collection he had about this time sent to a married sister, living in Australia, and it would be interesting to know what eventually became of these, since they included so many species identified with both Hutton's and Benson's labours. A great stimulus to Indian conchology and science generally was given when the Government of India established the Geological Survey Department in 1851. Dr. Thomas Oldham was selected Superintendent, and as the work expanded it was followed by the appointment of Assistants, men with scientific training, acquired either on the home surveys, or at the School of Mines. Most of the Assistants on the Geological Survey began to collect and publish the results. T. Oldham, W. Theobald, W. T. Blanford, H. F. Blanford, W. King, R. B. Foote are conspicuous for the work they have done; they were followed later by F. Stoliczka and V. Ball.

The formation of the Indian Museum and the transfer to it of the valuable collections formed under the care of the Asiatic Society of Bengal, accompanied by the appointment of Dr. J. Anderson as Superintendent, with Geoffrey Nevill as an assistant, was a further stimulus to our particular branch of Natural History.

I have mentioned Ferdinand Stoliczka, and I am safe in saying that some of the most valuable papers on Malacology were published by him. It had been his intention to work out the whole of the land operculated genera. Alas! he never lived to accomplish this. He was appointed Geologist and Naturalist to the Yarkand Mission, and on the return journey, up on the Karakoram Pass, he succumbed to the effects of the great altitude, and science lost a most gifted and promising disciple.

Thus it was that from about 1856 onwards there existed in India a small band of naturalists, devoted to the collection and study of

¹ Proc. Zool. Soc., 1864, p. 388.

its recent mollusca, as the many papers published at this period testify.

It was my good fortune to become associated with several of these naturalists, whom I may call fellow surveyors, and to form many lifelong friendships. The association particularly with Henry F. and W. T. Blanford, Ferdinand Stoliczka, and Geoffrey Nevill, I can well say has brightened my life, and led to a more profitable use of many hours of that life. It gave a stimulus to research when in the field, and enlivened days of solitude when extending the survey of India into the then unknown districts of its Eastern Frontier.

I feel now another pleasure in the satisfaction that I was able, in my turn, to import new interests into the lives of others, my assistants on the Eastern Frontier Survey, that I know rendered their work more pleasurable, and made it something more than the daily use of the theodolite and plane table. Among these I may mention M. T. Ogle, W. Chennell, both of whom eventually died from the exposure and hard work they underwent, W. Robert Belletty, Captain Badgley, and last, and my latest contributor in Burma, Colonel R. Woodthorpe, R.E, the news of whose sad death in Calcutta has only reached me since I began to write this address. As collectors in Ornithology, Entomology, and particularly in Conchology, these assistants greatly distinguished themselves.

On being transferred from Kashmir and the N.W. Himalayas to the Eastern Frontier, I soon learned what a veritable mine of wealth in land-shells this part of India presented. I shall not readily forget my first arrival in 1865, at the base of the Khasi range at Teria Ghat, with its great profusion of animal and plant life, amid scenery so well described by Sir Joseph Hooker in his "Himalayan Journals." Every condition suited to molluscan life is there extant. A humid atmosphere, limestone rocks, or rich vegetable mould, a shady forest, with a luxuriant growth of mosses, ferns, bamboos, and palms. Species of many genera were there seen by me for the first time, and in abundance—the large, finely marked *Cyclophorus*, the hairy *Spiraculum*, the glassy *Pupina*, curiously formed *Alycæus*, delicate *Diplommatina*, and minute pink *Georissa*, with many an interesting form of *Helix*. It is not surprising that in such a field I continued to collect, and since that time it has been my endeavour to extract something useful out of the materials I got together, and the opportunities for observation then afforded to me. The result is my position here this evening, for the honour of which my thanks are due to you. I can assure you that I often feel I did not make all the use of the opportunities that presented themselves. I wish I possessed the magician's power to transfer myself to many similar, even richer spots, I can recall, and in the capacity of guide see some of the younger working members of this Society gathering in what would there await them, and I feel sure many would not object to be my fellow-travellers on such an expedition.

I must return to Teria Ghat: it teaches us something, viz., that the molluscan fauna, even in what may be called a well explored part of

India, has not yet been by any means exhausted, especially as concerns the minute forms, such as *Pupa*, *Acmella*, *Paludestrina*, etc. These live on the moist green surface of the rocks, or on the mossy ledges, but only during the rains. When I tell you that from the neighbourhood of one place, Cherra Punji, I only succeeded in finding two such species, and one of these I sought for in vain a few years afterwards, how many must remain to be discovered in the successive deep gorges east and west of Teria, 130 miles on one side to the Garo Hills and 150 miles to the Naga Hills on the other. The heat, the drenching rain, the necessary exposure, and the insalubrity of some of these valleys during the summer months render them almost inaccessible, except to a most keen and strong collector. The rainy season is also the best time for seeking the slug-like forms, of which several must remain to be discovered. Such a form lives on the south end of the Cherra Plateau, near the great cave. One day in the month of June, when with a party of Khasias forcing our way through the dense scrub to the mouth of the cave, I took off a leaf a slug of a genus which I had never seen before. During the transfer to a box it was dropped into the undergrowth, and could not again be found, and although further search was made as we proceeded, I never succeeded in finding another.

How often it is that species one year most abundant are not obtainable the next. Benson's account of the discovery in 1842, at Moradabad, of *Camptoceras terebra* is a good example; in 1843, in the same piece of water which had once formed the bed of the Ram Ganga River, only three specimens could be found; in 1845 none could be seen at all. This genus was not again met with until 1869, when I discovered one morning in a marsh in the Maimensing District, near the base of the Garo Hills, not only one, but two species, which were described by Henry Blanford as *C. Austeni* and *C. lineatum*. This spot is 760 miles from Moradabad. No one has ever taken them since, yet the genus must be, I feel convinced, a common one, of which other species probably will some day be discovered. It is still more interesting to relate that this genus, so little known even at the present time, was found fossil by Mr. Shrubsole about 1880, in the Eocene beds of Sheppey, and the species was identified, described, and figured by me as *C. priscum*. This is a remarkable fact in the distribution of a genus in time and area. With such a gap to bridge over it should make us very careful in drawing conclusions regarding the original development and course of distribution of animal life, and its range in time. We have to bear in mind as well the extreme paucity of the material we have to work with, limited to so few genera, no fossil evidence at all in the majority of them.

This leads me to draw attention to the work that yet remains to be accomplished, not only among living forms, but their fossil predecessors, and how little has yet been effected. Take, for example, the mammalian fossil beds of Miocene and Pliocene age, perhaps better known as the Siwalik Series, tilted and faulted, compressed against the base of the Himalayas, and skirting the Sulaiman Range to Baluchistan. These beds are of enormous thickness, and present in places land surface after land surface,

separated by sedimentary deposits, and indicating conditions similar to those now obtaining in the same part of the world. I once had an opportunity, on a spell of leave with nothing else to do, of closely examining these deposits near Nahun, and I very soon discovered beds containing fresh-water shells, belonging to the genera *Unio*, *Bythinia*, and *Vivipara*. When digging out inch by inch the pelvis and hind leg of an elephant, associated with Chelonian remains, which were embedded in a thick bed of dark clay, several specimens of *Ampullaria* were found. Now these I should not have noticed under an ordinary passing inspection of the supposed face of the deposit, and it showed me that a close examination of such clay beds, digging them out and working over the material with a lens, might yield important results, and disclose minute species of not only fresh-water but land shells also: in such beds, indeed, *Camptoceras* might even occur. Similarly, on an exhaustive search, there is much, I am sure, to be yet found in the later Pliocene deposits of the Valley of Kashmir, which rest against the northern slopes of the Pir Panjal range. These beds are of great thickness, presenting at intervals old marsh and lacustrine surfaces, to obtain a better knowledge of the ancient fauna of which would be most valuable. I noticed that the fresh-water shells in these beds were very frequently flattened out by pressure, and compression of this kind may be one of the reasons for the paucity of fossil land-shells. Unless quite filled with fine silt they would certainly be broken, and closely coiled species would fill up very slowly.

These Pliocene beds, capped by the later Karewah deposits, extend round the Kashmir Valley for sixty miles from the south to the west and north-west, with a maximum breadth of fifteen miles. At Hirpur, which is 2,500 feet above the Jhelum River, I estimated the whole series to be 1,400 feet thick. I could only spare one afternoon for an examination of this spot. The shells were like existing species, an acuminate *Lymnea* and a small *Planorbis*, the latter the more abundant; impressions of a bulrush were very common, and a few small fish scales were detected. These occurred on two horizons, separated by 65 feet of coarse sands and coarse conglomerate. It is evident there is further work to be done here, open to future travellers. Mammalian remains might also possibly be found, but the teeth, or bones, of a *rakhsus*, or demon, were never reported to me in Kashmir, though such relics are well known to the natives in the neighbourhood of Jammu and Aknur, for there they say was the field of a great battle between demons. Rhunbeer Singh, the Maharajah of Kashmir, had one brought to show me when I paid him a visit, and we had a long and amusing discussion. I tried to show him it was the molar of an elephant, but he would not be convinced.

I should not expect to find many land-shells preserved in these deposits, for they are by no means common in the Kashmir Valley at the present day. *Bulimus candelaris* is perhaps the commonest shell, but very local. There is still much to be done even in this part of India. Stoliczka collected here on his way to Yarkand, while Theobald paid the valley a hasty visit in 1877, at the dry time

of the year. Some twenty species have been recorded, but the limit of the range of many has yet to be determined. Theobald's list¹ of sixty-four species includes shells from Murree, the base of the outer hills of the Punjab, and even far out into the plains.

To give some idea of the present land molluscan fauna of the North-West Frontier, I have listed out all the species hitherto recorded, separating those north of the Pir Panjal axis of elevation from those of the south side, Murree and the Punjab frontier. As regards this part of India, the first list (Appendix A) shows that the majority of the genera and species are European and Central Asian, with the exception of a few species of Zonitidæ which have passed over into this area. Species of this purely Oriental group are not numerous; only five genera, represented by as many species, occur. Three of these were found at Sonamurg, at the head of the Sind Valley at 10,000 feet, where the cold of Winter is even at the present day extreme, and deep snow covers the ground for many months. During the Glacial Period this valley was filled by a glacier forty miles in length, the terminal end of which was only about five miles from the Plain of Kashmir, so the present extension up and occupation of this part of the Sind Valley by these genera can only date from the decline of those conditions. The Valley of Kashmir in early Post-Glacial times was, I am led to think, quite open, with a temperate climate; and as representatives of these genera are now found living in the Jhelum Valley, at Murree, etc., their original and Pre-Glacial extension was from that southern side. Thus we may infer that a long and gradual exposure to cold conditions has rendered members of a tropical group able to contend with, and exist through, a long, rigorous winter. It would be also interesting to know whether any species of the Zonitidæ occur at a similar altitude in the main valleys of Maru Wardwan, which were also for many, many miles of their course once filled with ice, and how far exactly such species do extend. The same information is wanted on the Chenab and Sutlej Rivers. In Kashmir not a single operculated land-shell is recorded;² two or three of the Helices are well-known N.W. Himalayan forms. The second list (Appendix B) is a fuller one as regards the Land Shells. The greater number are found in the N.W. Himalayas, and indicate extension from that direction. Further west, we know nothing of the land-shells of Chitral and the Khyber Hills, the few obtained from the Kuttak Hills and the Kuram Valley are confined to the genera *Petræus*, *Bensonia*, and a *Macrochlamys* very close to *M. Flemingi*. In Afghanistan Palearctic species come in, and in Sind, on the Khojhak range, a *Parmacella* has been found.

We have here reached the limit of the extension of the Zonitidæ, and I will now pass to a review of the genera and subgenera of the Zonitidæ, more particularly concerning what is known up to

¹ Journ. Asiatic Soc. Bengal, vol. xlvii, pt. 2 (1878), p. 148.

² The exact limit of *Alyceus* and of *Diplommatina* west of the Sutlej has yet to be ascertained.

the present of their anatomy, and what value it may be in future classification.

The classification of the Indian Land Mollusca having up to the present been based mainly on such conchological knowledge we possessed, aided by a few external characters of the animals, I have thought it might be of interest, and particularly to the members of this Society, to treat the subject from a malacological point of view. I propose to limit my observations to this large, interesting, and, I believe, very ancient family, the Zonitidæ. Semper, Von Martens, Stoliczka, Simroth, and others have done much excellent preliminary work on the anatomy and external form of the animal in many of the genera described by them, and these authorities I shall quote. The material I have myself obtained, examined, and refer to, may perhaps interest other workers, and, if it does nothing more, will, I trust, extend the knowledge of present distribution, and give perhaps a glimpse of the past history, or phylogeny of some genera and subgenera.

A study of this family extending over many years enables me to show to what extent variation in the internal organs has proceeded in different species, and how restricted such differences are to species within certain well-defined areas. This variation seems to play round certain organs, leaving others unchanged.

In this investigation I have taken cognizance of every character, internal or external, that I found to vary, and it naturally follows that some organs assume a greater prominence than others. I have disregarded the nervous system, for it is a study in itself. Although in the more slug-like forms there may be found considerable modification of the salivary glands, the form of the buccal mass, the coils of the intestine, and the position of retractor muscle attachments, they may well be also treated as specific differences, and at present left alone; nor does the form of the mucous pore assist very much. The value of the arrangement of the intestinal coils in classification has lately been very well exemplified by H. A. Pilsbry and E. C. Vanatta in a paper on a "Revision of North American Slugs,"¹ as well as in a paper on the "Phylogeny of the Genera of Arionidæ."²

I must here quote a paragraph from the above joint paper:³ "Trivial and unsatisfactory as are the external features of slugs, the details of their internal morphology are wonderfully varied. Everywhere there are important characters, and those who starve their souls on a mere study of the genitalia and oral armature miss the best part of the feast." This is true of every family, but it applies more particularly to the Zonitidæ. Valuable material is constantly coming into the country, yet how much of it, only partially examined, is thrown away. The animal is mutilated, the head being severed from the body, and the most interesting organs destroyed

¹ Proc. Acad. Nat. Sci. Philadelphia, 1898, pp. 219-261.

² Ante, p. 94.

³ T.c., p. 219.

merely to extract one single character, the odontophore, which, valuable in one respect, is useless, except when taken in conjunction with all the other characters.

The genus *Macrochlamys*, originally named by Benson from the presence of the peculiar mantle lobes which play over the surface of the shell, being a well-known genus, and the richest in species of the whole family, with an extensive range, I shall take it first, show the modifications the animal presents, and then pass on to other, more or less similar genera. The typical *Macrochlamys* (section A) is a common form in Calcutta, extending thence up the Gangetic Valley, from the Rajmahal Hills to Allahabad, in the north-west Himalaya as far east as Muree, where *M. splendens* is recorded by Theobald. *M. Flemingi* is also found there. A yet undescribed species, allied to this last, I have received from the Kuram Valley. The genus occurs eastward from Darjiling, the Bhutan, Dafla, and Singpho Hills,¹ by the Naga Hills, the plain districts to the south, and away to Arakan and Pegu.

In addition to the presence of shell-lobes on both sides of the body and division of the left neck lobe into two distinct portions, the most noticeable character of the typical form (section A) is to be found in the genitalia. This consists of a coiled, cœcum-like appendage, where the retractor muscle is given off from the male organ. Still, the characters of the typical Calcutta species, *M. Hardwickii*, are not constant over the area I have indicated.

In the Munipur and Naga Hills and North Burma a form is met with, *M. atricolor* (section B), which ranges to Bamao in North Burma. In this the left shell lobe cannot be seen, while, on the other hand, the right shell lobe is enormously developed, and in life must extend right across the shell: the long flagellum of the male organ is reduced to a mere rounded knob. Another departure from the type is *M. Cacharica* (section C). In this the amatorial organ is absent. This variation is not an accidental matter, as some malacologists might suppose, but seems constant in all the specimens I examined, and a similar modification is to be found in other genera of the Zonitidæ, while Pilsbry has noted the loss of this organ in other families with which he has dealt.

Let us turn next to notice two genera, peculiarly distinct in their shell characters from *Macrochlamys*, with its thin, glassy test. These are *Oxytes* and *Bensonia*, with large, solid, often sharply keeled shells. Again, we meet in both with the coiled cœcum from which the retractor muscle springs, and which in *Orobia* is enormously developed. This character, I may point out, I have never seen in any other Indian genus besides these. Whence it is derived, and what its special function may be, I am at a loss to say. *Oxytes* and *Bensonia* possess no shell-lobes to the mantle, but have the left dorsal lobe divided into

¹ The species from these hills remains to be named and described. It is small, of the type of *M. levicula*, and although only 12 mm. in diameter, every character, even to the coiled cœcum, is present. Size, therefore, has little to do with the simplification of the genitalia.

two very distinct and separate portions. There are some minor differences in the radulae of the different species, but on the whole they appear to me nearer to *Macrochlamys* than to any other genus.

Oxytes ranges from Darjiling (*O. orobia*), the Bhutan Hills, and the Khasi Hills, to Burma and Tenasserim.

Bensonia is represented in the North-West Himalaya by *B. labiata*, and thence ranges to Kashmir and Murree, and in *B. Wynnei* to the arid Kuttak Hills, near Peshawur, and the Kuram Valley. It is thus a North-West Indian genus. I am, however, inclined to think a species like, or near to *B. convexa* occurs at Darjiling, but I have not met with any animal that could be referred to it in the Eastern Hills or in Southern India.

Passing south-eastward towards the confines of the area I have defined for *Macrochlamys*, we find a change commencing in *M. resplendens* (section E), of Tenasserim; we have the shell-lobes still present, but the generative organs are modified in that the coiled mass has gone, and the male organ is more like that of *Hemiplecta* (*Humphreysiana*). In a large Siamese species we find the same features, and I think we are here beyond the range of the Indian type of the genus.

I have failed to find among any *Macrochlamys*-like shells of Peninsular India the exact similarity of anatomical detail so typical of the genus; there are many shells in this part of India which up to the present are included in it, among them being *M. pedina* and *M. platychlamys*, from Bombay. The first-named I include in section D of *Macrochlamys*. It has both the right and left shell lobes, but the former is extremely rudimentary, and judging from analogy and its reduced size in spirit, it cannot be largely protrusible in life. The male organ has become altered in form, its most interesting feature being the replacement of the many-coiled disc by a simple short bend in a cœcum-like process, the retractor muscle rising beyond and above this.

The other species, *platychlamys*, presents far greater diversity when compared with species of *Macrochlamys*. The broad shell-lobes cover the shell almost completely in life, and the generative organs are on a very different plan, and comparatively simple in detail. The examination of the Ceylon shell *regulata* presented anatomical characters of the same type, and I have therefore placed these two species in a new subgenus, *Eurychlamys* (see Appendix). The most interesting fact in connection with this particular development is the discovery that a Sikkim and Bhutan species, *planospira*, must be included with them. I previously placed *planospira*, on account of its shell-lobes and shell (besides not taking into sufficient consideration all the details of its internal anatomy), in *Austenia*, but it will be seen that its anatomy does not at all resemble that of the latter genus.

Continuing the review of the shells of Peninsular India and Ceylon, I have been fortunate in obtaining through various friends, among whom I may mention Dr. Thurston, Mr. Phipson, Mr. W. T. Blanford, and particularly Mr. Collett in Ceylon, other species preserved in spirit, and I am enabled to point out a few details of their general anatomy. They represent six genera, viz., *Ariophanta*, *Nilgiria*,

Euplecta, and the slug-like forms *Africarion*, *Mariella*, and *Ratnadvipia*, a new subgenus (cf. p. 253). The two first genera show so many points in common, that they may be considered very closely allied indeed. *Euplecta* presents certain affinities, yet it may be noticed that in its dorsal lobes there is a departure from *Nilgiria*. All three have very small sessile spermathecas associated with a different form of spermatophore.

Ariophanta has its headquarters in this part of India, but ranges northwards up to the edge of the Gangetic plain, only one species, *A. interrupta*, crossing the delta and occurring in Jessore, seventy miles north-east of Calcutta, although it has never been recorded from further north, or east. As to *A. retrorsa* of Tenasserim and Tavoy, I have always doubted whether it really belongs to this group. I have, however, never had an adult example to dissect, but the radula certainly presents considerable differences. Several Malayan species placed in this genus by Semper differ widely in their anatomy, and must, I consider, be placed elsewhere.

Euplecta is a genus typical of this Peninsula and presenting the greatest development of species in Ceylon. In the details of its generative system it shows a change, and one noticeable at once; briefly stated, a broad muscular band gathers a portion of the male organ together and forms a loop. It possesses also a very small right shell lobe, of about the same size as in *M. pedina*, but no left shell lobe. The very striking form of the spermatophore, so very different from any other with which I am acquainted, is also noteworthy. Very many species were originally placed in this genus of Semper's, yet I believe myself that all foreign to this part of India will finally have to be removed from it. The sculpture and character of the shell are very marked. At present the only species still included in *Euplecta* that await examination are two or three inhabiting Darjiling and the Khasi Hills. These possess so very different a style of sculpture (of which *vidua* may be taken as an example) that I cannot believe they are to be associated with *Euplecta*.

In southern India *Africarion*, represented by *A. ater*, stands alone; no slug-like mollusc hitherto known on the Himalayan, or eastern side can be placed near it. We have to go to East Africa to find one at all similar in its anatomy; it is another interesting example to add to the list of species, pointed out by W. T. Blanford, as having a similar eastern transoceanic connection. It was discovered by Colonel Beddome, and I have not heard of anyone else who has been fortunate enough to find it. Again, *Mariella* is a genus of considerable interest. One species, *M. Beddomei*, was described by me under the subgeneric title *Dekhania*. Gray founded his genus from external characters alone, upon a single specimen in the British Museum, labelled Mahi, which everyone had assumed to be one of the Seychelles Islands. Mr. Cockerell, however, was the first person to associate the name with Mahe on the south-west coast of Peninsular India, and comparison of the type with Beddome's specimens, and some others lately received from Mr. Daly, of Mysore, confirms the identity. It has a very remarkable similarity to *Girasia* of the Khasi Hills: there are

differences in the radula and jaw, and in the shell, which the mantle lobes cover to a greater extent; these divergences are only such as might be expected when the great extent of country intervening is considered. Our member, Mr. Webb, has lately re-examined this genus and confirms my original views. I have also, when lately working out the retractor muscle system of *Girasia*, examined that of this southern genus also. The agreement is very great; no difference either is to be found in the form of the spermatophore.¹

I would here make a few remarks on these curious and beautifully formed structures; they have not received the attention they demand in classification, except from a few biologists. In looking at the modification and intricate details they present, we are brought to consider the vast interval of time it must have taken to effect changes in any group of animals, particularly in the mollusca; the thousands and thousands of years represented by the Tertiary Period does not seem enough for this evolution. How vast it becomes when we try to reconstruct the form of the spermatophore in the Zonitidæ before they began to branch off one from the other! We see that in the case of such an excretory instrument as a spermatophore any change in the proportions or details of its different parts, is the result of modifications that have taken place in the interior of another organ within which it is moulded, and, again, a proportionate change in that of another organ, the spermatheca, within which it comes to finally rest. When we are trying to extend our knowledge of geographical distribution we cannot be too particular, or afford to neglect any morphological details that are presented to us. While a great deal of small minor variation has gone on, in a broad sense quite recently, in the form of the shell, in its sculpture, etc., there has not been, on the other hand, so great an amount of what constitutes true generic change. In this family of the Zonitidæ, as represented in India, the spermatophore illustrates this. Only four well-marked and specialized types have been noticed by me, up to the present, occurring in the genera: (1) *Macrochlamys*; (2) *Ariophanta* and *Nilgiria*; (3) *Girasia* and *Austenia*; (4) *Euplecta*; this last being the most differentiated. These structures will accentuate the value of certain main groups when the time comes to decide upon them. There is, however, an enormous amount of material to be examined, and until this is done we should hold back from the creation of these divisions and subdivisions, at which there is a great tendency to play, and occasionally we see no attempt made to describe the particular characters that mark off one division from another.

It truly comes to this, the examination of the spermatophore of every species among the Zonitidæ would be far more satisfactory than that of the muscular tube that surrounds it, for in the spermatophore we have reached the end of a stage of development, the resultant of original birth and existence about to begin again,

¹ The restoration of this from broken portions, figured by Mr. Webb (ante, pl. ix, fig. 6), is not by any means true to nature.

which goes no further. The form of the interior or mould depends much on the stage of development reached by the spermatophore, and this modifies the external outline. I do not think this is sufficiently taken into consideration by certain malacologists, who are given to see in some genera of the mollusca they are studying differences which to them are specific, but which truly are extremely slight variations in the external outline of the reproductive organs.

Returning again to geographical distribution, I have to notice another form inhabiting Ceylon, viz. the *irradians* of Benson, for which I cannot find a prototype. In its jaw and radula there are interesting differences as compared with other species, and its reproductive organs are far simpler than one might have expected. The tentacles are nearly white in spirit specimens; in life I believe they are yellow. On these grounds I have had to create a new subgenus, *Ratnadvipia*,¹ for its reception.

Smaller species from this part of India will be alluded to further on.

I now pass on to genera occurring in Burma and the Malay Peninsula, etc. First in importance comes *Hemiplecta* of Singapur (the type being *H. Humphreysiana*), a genus which has suffered much from the lack of adequate definition of its characters, and on the ground of shell character alone has either been made the receptacle for forms from Peninsular India, or been itself merged in the genus *Rhysota*. This was Stoliczka's course when he placed *H. Cymatium* of Penang in *Rhysota*. It agrees in every particular with *H. Humphreysiana*. In the presence of shell-lobes on both sides, in the radula and generative organs, it is quite unlike any South Indian form. This genus, represented by *H. densa*, extends to Borneo, and includes several other species in that very distinct province of Malayana.

Cryptosoma as a subgenus is represented by several large species from Burma, Siam, etc. The points that distinguish this from kindred forms are not many; there is scarcely any change in the generative system, in its general outlines, but the spermatophore is armed with spines, while such are absent in *Girasia* and *Austenia*. The jaw and radula differ altogether, as the formula of the latter shows. It has lately been claimed that this genus is found in Calcutta, and Mr. Collinge has described and figured a small species and named it after me. Unfortunately, all description of the jaw and radula is omitted, and I should expect the number of teeth in the row would have conformed to *A. Bensoni* had they been examined, while the genitalia figured were not quite complete. The shell is remarkably like *A. Bensoni*, which is fairly common and well known in Calcutta.

I would add a word or two of warning concerning Calcutta species. Many circumstances conspire there to promote the introduction of foreign species. The extensive Botanical Garden is a good place for shells, and consignments of plants are constantly being received there from every part of India and of the world, so that a transported shell might very well become established, and spread far and wide, as some have done in this very locality.

¹ One of the old names of Ceylon: *ratna*, 'a jewel,' and *dvipa*, 'an island.'

In speculating on the distribution of land-shells, this casual picking up and transport by man's agency is an element we have always to consider. One means of transport lies in the thatch of the native craft plying on the great rivers of India. Thatched boats coming down from Assam, Cachar, and Sylhet work all through the delta to Chittagong, and even down the coast at times. This was brought home to me very practically on one occasion when crossing the Bheels of Sylhet during the rains. We were poling through the high reeds, when I noticed they were covered with *Helix* (*Planispira*) *similaris*, of which I collected a good number of very fine specimens. In such a place, even if they fall in the water, blown off by the wind, they would soon get on to the reeds again, and thus survive until the floods abated; but how easily they would be knocked off into or on to the thatch of a boat, and be carried down to the sea margin! The species has an enormous range, and this may be one of the means by which that has been brought about. Minute species may have been transported in fruit, such as melons, and especially the banana, and in vegetables, by the same agency of native vessels, which have been navigating the Eastern seas for hundreds and hundreds of years, perhaps long before our knowledge of ancient Egypt begins.

Coming to the North-East Frontier and Burma, *Girasia*, and the closely related subgenera *Austenia* and *Ibycus*, have, perhaps, as extended a range as any of the Indian land mollusca. These subgenera are associated in the typical locality, the Khasi Hills, whence Sir Joseph Hooker first sent home *Girasia*, throughout Assam, the foot of the Eastern Himalaya, westward to Sikkim, and in the North-West Himalaya from Gurhwal to Chamba as far as Murree. They are found also from North Burma to Pegu and along the Siam border. The giant of the race, *A. magnificus*, was discovered by Dr. J. Anderson in Yunnan. I have not yet seen any species from Siam proper, nor from the Andaman Islands.

The slug-like form finds its fullest development in *Girasia rubrum* (assuming it to belong to this genus) of the Naga Hills. In this species the shell has become reduced to a minute thin oval disc, and there is truly here as great a difference, comparing it with *Girasia*, as there is between this last and *Austenia*. I have no doubt that similar molluscs will be found in other parts of India if only they are sought for.¹

Species of *Girasia* are found inhabiting the plain country of Assam, as well as the mountain ranges up to 5,000 and even 8,000 feet; they are not, like so many other species, tied as it were to rocky ground, and this may account for their very general distribution. I have pointed out that one form of the genus occurs in Peninsular India. They rejoice in damp; the complete saturation point is the one best suited

¹ In such a series as this we are compelled to give the shell greater weight in classification than it otherwise would deserve, and supposing by any possibility such forms as these were preserved in a fossil state, such a course would be strictly right, and prove the most useful for purposes of identification.

to their existence. Thus they are to be seen at their best development in the rainy season, and I believe these moist conditions have played no small part in their evolution, by the stimulus they have given to the expansion of the shell-lobes. When kept in captivity they do not live long; the mantle shrivels up and exposes the shell more and more daily, the bright and glistening surface of the body becomes first dull and then covered with fungoid growth and sores, under which the animal succumbs.

There is yet another section of mollusca with thin, poorly developed shells, which are concealed, like those of the genera I have already spoken of, beneath ample shell-lobes. This section is represented by the genus *Durgella*, first known as a native of Tenasserim, and it possesses very distinctive characteristics of its own. Its principal points of divergence from *Girasia* and its allies are found in the feeble, straight jaw, and large broad radula, with minute central tooth and an immense number of serrated teeth, all similar in shape, in each row, while the generative organs are simple. Since Mr. W. T. Blanford described the genus, species have been discovered in the Khasi Hills, in the Assam Plain, one in the Andamans, one in Peninsular India, and one far away in Borneo. It has thus a very remarkable range. No close relationship has yet been found between it and other forms; save perhaps with *Kaliella*, which it resembles in the form of the lateral teeth of the radula. *Durgella*, therefore, may perhaps represent a primitive race that has nearly died out, but it is yet possible that further research may reveal other forms with which it can be associated.

Kaliella has a very interesting range. Starting with Kashmir, it is found along the whole of Northern India, at or near the base of the hills, in the plains, in Assam, Burma, Southern India, and Ceylon, and I have even received it from Madagascar. *Sitala* is hardly less circumscribed in its range. The two genera are in certain points allied anatomically, but it is noteworthy that *Sitala*, as shown by Stoliczka, has one section, represented by *S. infula*, in which the amatorial organ is absent, and the teeth of the radula are very numerous.

I have now brought to your notice the majority of Zonitoid genera the animals of which have been examined.

Microcystina is an Andaman form, and if the shell can be trusted occurs in Ceylon and Borneo, but better material from these lands must be worked over again.

Sophina, described by Stoliczka, is a very distinct genus, peculiarly local, confined to Tenasserim and southwards to the Malay Peninsula, and not extending to the north. *Xesta* is a well-marked Malayan group, so is *Rhysota*. *Parmarion*, *Microparmarion*, and *Damayantia*, Simroth has shown to be genera very distinctive in themselves, and inhabitants of Java and other islands, as well as Borneo. In *Microcystina*, numerous small forms have been placed, apparently because there was no other genus open to receive them; it no doubt will break up into several very distinct divisions, and leave *Microcystina* proper to the islands of the Pacific. You will, I think, agree with me that this investigation may be said to have only been begun. There is a vast amount of work

to be done: in the Andaman Islands, for instance, there is a group of *Macrochlamys*-like shells represented by *choinix*: we know from dried-up animals that shell-lobes are present, but we have yet to learn to what section of the above genus they belong. *Hemiplecta Haughtoni* is another large species concerning which we know nothing for certain. In Southern India there is *M. ? ampulla*, also the large species *II. ? basileus*, of which the same may be said. When we come to the smaller fry, they are too numerous to mention, and we do not know what further research may show. No better example of this can be quoted than the discovery by Mr. Collett in Ceylon of a form belonging to the Endodontidæ, for which I founded the genus *Philalanka*,¹ and I may here put on record that a very closely allied species was lately sent me by Mr. Stanley Flower from the Batu Caves, near Selangor in the Malay Peninsula. The examination of this animal so interested Mr. Pilsbry that in a letter he writes: "This is to me the most interesting addition made for years to the fauna of Ceylon and India. I believe, however, there can be no doubt of the soundness of your conclusions as to the affinities of the little fellow." I quote this because, as we are all so liable at times to come to wrong conclusions, it is confirmatory (of course, subject to the correctness of my drawings and description) of the position of this mollusc. There are several other small shells from Ceylon of equal interest, such as *Pupa miccylla*, which I cannot believe is a *Pupa* at all.

The outcome of what I have said and feel is this: a great deal more has to be done, and I hope this Society will be the means of helping to do it. It will never be completed as it should be, until some malacologist goes out to work in the country, and on fresh material. There should be an examination in the typical habitats of species which Benson and others described long ago. At the same time other species would be made known, for which only a trained naturalist knows how and where to look.

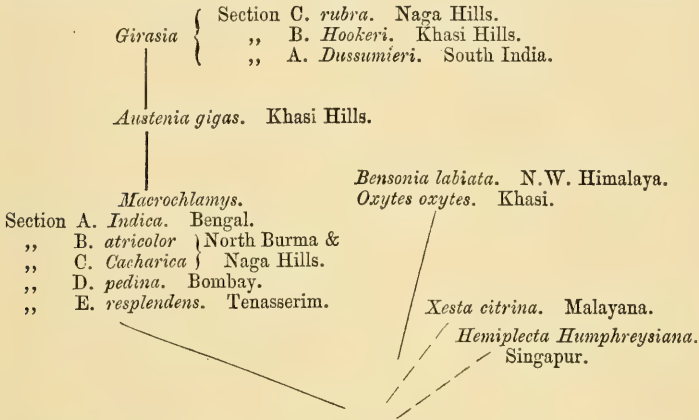
Pilsbry, in "The Phylogeny of the Arionidæ," says: "As a whole, the Arionidæ not only do not possess the characters of primitive shell-less forms, 'Unbeschaligkeit,' but the series of recent genera unmistakably indicates their descent from a group with well-developed spiral shell."² How much more distinctly is similar evolution exemplified in this section of the Indian Zonitidæ. Between *Macrochlamys* and *Girasia* forms are to be found wherein the chief successive differences consist in a less developed shell and greater developed shell-lobes. In this series anatomical details at last become more of specific than of generic account, and it is most instructive to follow, as the original spiral visceral mass becomes a simple bag, the gradual concentration backwards under the shell-lobes of the branchial cavity, with the heart and kidney in the anterior part, while the liver lobes, intestine, albumen gland, hermaphrodite duct, and ovotestes follow on the posterior side, and finally the complete isolation in a cavity of its own, of a quite rudimentary shell, as in *G. rubra*. This is sufficient

¹ Ante, p. 11.

² Ante, p. 99.

to show there is something more than an indication that *Girasia* is the more recent development, and the same line of reasoning points to *Macrochlamys* being relatively in turn the more primitive genus. It is not so easy to locate *Oxytes* and *Bensonia*; the probability is that they started like *Macrochlamys* from some no longer existing form, and have had a cotemporaneous development with *Macrochlamys* itself.

The following diagram is a graphic representation of the possible succession of a few of these genera:—



When one examines the genera from South India and Ceylon, one cannot but fail to be impressed with the many important points in their anatomy, which differentiate them from genera of the same family occupying other parts of India. Without enumerating the many genera and species of other families which are quite peculiar and restricted to this Peninsula, the number of genera I have brought to your notice in this address is large and characteristic of isolation. Nor is this more than might be expected, as the result of the past conditions over a considerable part of this area. The geological evidence indicates that this part of India is one of the oldest of land surfaces on the globe. Ever since the east and west Cretaceous oceans washed its shores, the fringing line of which is preserved at different points, some part of it at least remained dry land. Very similar conditions appear to have existed during Nummulitic times, and not until the advent of the Eocene does there appear to have been any connection with Palearctic lands and fauna on the north-west. With the deposition of the Nahan series of deposits in a gradually sinking belt, under conditions which, there is every reason for supposing, were alluvial, not far from and just keeping above the sea-level, a broad dry land connection was established. We may imagine the great alluvial plain of Maimensing and Sylhet, between the line of mountains and the sea, to be representative of such conditions there; for there may be seen the piling up of similar deposits of

sandy beds without a pebble in them. During Cretaceous times and afterwards there is evidence of the connection, perhaps by an isthmus, with the North-East Himalayan area, across the present Gangetic Delta, the line of coast lying then on the north side of the present more recent elevation of the Khasi Hill range. All this, briefly stated, supports the possibility that the genera and species of to-day are the direct descendants of the molluscan fauna of a very early time, and the survivors of many changes. How far they have been modified, how old some may be, only the evidence of fossil forms can show. I here revert to remarks made at the commencement of this address, on the importance of trying strenuously to find some of these fossil representatives, and, if possible, arrive at what has been the extent of the changes and in what direction. Evidence exists, but as yet it has been superficially worked. Take, for example, the Cretaceous fossils, which are far too ancient for us to expect that any very close resemblance with the present forms would be shown; yet only four species of *Helix* have been found in South India;¹ probably this is not a quarter of what may be preserved.² Coming to the inter-Trappean beds and the Tertiaries, patient search will no doubt be rewarded—it cannot fail to be—with an addition to the number of fossil land-shells of the very greatest interest and value. What we want to know is at what period and to what extent changes in the molluscan fauna of India have taken place. Mr. W. T. Blanford has dealt with this inquiry, and on the evidence of what has been hitherto found writes:—³ “All the forms known from the Upper Siwaliks, with one exception, are recent species of land and fresh-water shells now living in the area. Of *seven* fresh-water mollusca⁴ found associated with the Lower Siwaliks, none appears to be identical with any living species, and only two are allied, one closely, the other more remotely, to forms now met with in Burmah, 30° of longitude further east. . . . One-third of the species of mammalia survived the changes that took place, whereas not a single mollusk is found both in the Upper and Lower Siwaliks.”

In conclusion, let me say how exceedingly glad I am that my old and very good friend for so many years follows me in this chair. The Mollusca were an old love of his long ago, and he will, I hope, at some future meeting, favour us with his views on their distribution, which his great knowledge in other orders will enable him to treat of more fully than I have done.

¹ These are three species of *Anchistoma*, having the character of *Covilla* or *Plectopylis*, the first restricted to Ceylon and one species put in *Macrocyclus*.

² These land-shells are from deposits on the margin of the old Cretaceous coastline, and others may be looked for in similarly situated deposits of that age. On the Garo-Khasi boundary, for instance, λ 25·25, on the Trigonometrical Station of Lumdekor, an outlier, a good section is to be seen. The pale-coloured, fine silty deposits were full of the most beautifully preserved plant remains I have ever seen, indicating the proximity of a forest-clad land.

³ Rec. Geol. Surv. Ind., vol. xviii (1885), p. 38, pl. i.

⁴ Mem. Geol. Surv. Ind., vol. xx, pt. 2, p. 129.

APPENDIX A.

LIST OF SHELLS FROM KASHMIR TERRITORY, NORTH OF THE
PIR PANJAL AND KAJNAG RANGES, INCLUDING YARKAND.

1. *Macrochlamys Austenianus*, Nevill. Sonamurg, Kashmir (Stoliczka), south of the Zoji La. This seems to be a dwarf form of *M. Flemingi*.
2. (*Macrochlamys* ?) *Kashmirensis*, Nevill. Sonamurg, Kashmir (Stoliczka), south of the Zoji La.
3. (*Microcystis* ?) *Sonamurgensis*, Nevill. Sonamurg, Kashmir (Stoliczka), south of the Zoji La. Stoliczka noted that the animal possesses a mucous pore.
4. (*Thysanota* ?) *hyba*, Bs. Aijas, east of the Walur Lake, Kashmir (Theobald). Theobald also records this species from between Chamba and Dalhousie. The typical locality is the sub-Himalaya, near the Sulej River. Should the animal of this species eventually be found to be similar to *crinigera* of Southern India, it will have to be transferred to a genus of the Helicidæ, for an examination of the latter species shows that *crinigera* possesses a pointed heliciform extremity to the foot.
5. *Kaliella Barrackpurensis*, Pfr. ? Kashmir Valley. Whether this single specimen was found in the valley, or outside, is not stated. Theobald's title to his paper says "more particularly of the Jhelum Valley and the hills north of Jamu," which is sub-Himalayan. The height of this specimen is given as 6 mm. This must be either an error in measurement, or it is another species, for I have never seen, among hundreds of specimens, any approaching this size.
6. *Hyalina fulva*, Drap. Mataian (Stoliczka), north of Pir Panjal (Theobald); also from Spiti and Lâhul (Stoliczka).
7. *Hyalina lucida*, Drap. North of Pir Panjal (Theobald).
Whether any anatomical differences exist between the Kashmir and European forms of *Hyalinia* has yet to be discovered.
8. *Vitrina pellucida*, Müll. Mataian, Dras. North of Zoji La (Stoliczka). I think this will prove to be a distinct species. The animal of the European form is pale in colour; Stoliczka records that of Kashmir as "blackish, with the tentacles short." He also obtained it in Lâhul.
9. *Hygromia hispida*, Linn. Skardo, Baltistan (Godwin-Austen). None of these shells collected by me at Kuardo in Skardo were found living; they were sub-fossil in an alluvial deposit near the Indus River, probably of Interglacial age.
10. *Eulota Mataianensis*, Nevill. Mataian, Dras.
11. ,, *Huttoni*, Pfr. "Widely distributed" (Theobald).
12. *Vallonia costata*, Müll., var. "Large and finely ribbed." Skardo, Baltistan (Godwin-Austen).
13. *Vallonia costata*, var. *Asiatica*, Nevill. Yarkand (Stoliczka).
14. ,, *Ladacensis*, Nevill. Mataian, Dras; Leh, Ladak.

15. *Vallonia pulchella*, Müller. Skardo, Baltistan (Godwin-Austen).
16. *Eulota phaeozona*, V. Martens. Yarkand (Stoliczka).
17. „ *plectotropis*, V. Martens. Yarkand (Stoliczka).
18. *Helicella Stoliczkana*, Nevill. Yarkand (Stoliczka).
19. *Petræus candelaris* = *domina*, Bs. Kashmir Valley (Theobald); Nishat Bagh (Godwin-Austen). Extends to Murree, etc.
20. *Petræus arcuatus*, Hutton. Kashmir (Theobald). Extends to Simla.
21. *Petræus Stoliczkanus*, Nevill. Sonamurg.
22. *Pupa eurina*, Bs. Skardo (Godwin - Austen). The typical specimens were found in the exuviae of the River Gogra at Tribeni Ghat. This river rises in the Tibetan plateau, and these shells may have been brought down thus from far back in the mountain range.
23. *Pupa (Pupilla) muscorum*, Linn. Pangkong Lake, Ladak, and Yarkand.
24. *Zua lubrica*, Skardo (Godwin-Austen).
25. „ *cristata*, V. Martens. Yarkand (Stoliczka).
26. *Succinea Pfeifferi*, Rossm., var. *Yarkandensis*, Nevill. Yarkand (Stoliczka).
27. *Succinea Pfeifferi*, var. *subintermedia*, Nevill. Also from Kandahar (Hutton).
28. *Succinea putris*, Linn.¹ Skardo (Godwin-Austen).
29. „ „ var. Yarkand (Stoliczka); Kandahar (Hutton); Calcutta.
30. *Succinea oblonga*, Drap.¹ (Godwin-Austen.) Kashmir (G. Nevill, by Museum collector).
31. *Succinea Martensiana*, Nevill. Yarkand (Stoliczka).
32. „ *Indica*, Pfr. Kashmir (Stoliczka).
33. *Limnæa peregra*, ? Müll. Skardo (Godwin-Austen).
34. „ *palustris*?, Linn. Skardo (Godwin-Austen).
35. „ *lagotis*, Schr. Pangkong Lake.
36. „ *auricularia*, Linn. L. Sirikul, Pamir.
37. „ *Deflippii*, Iss., var. *Sirikulensis*, Nev. L. Sirikul, Pamir.
38. „ *lagotis*, var. *Yarkandensis*, Nev. Yarkand.
39. „ „ var. *subdisjuncta*, Nev. Leh.
40. „ „ var. *costulata*, Nev. Leh.
41. „ *Andersoniana*, Nev. Yarkand and Yunnan.
42. „ *truncatula*, Müll. Skardo (Godwin - Austen), Leh (Stoliczka).
43. *Limnæa Lessoni*, Issel. (Persia) Pamir Kul.
44. *Planorbis (Gyraulus) albus*, Müll., var. Leh, Pangkong Lake, Yarkand.
45. *Planorbis (Gyraulus) lævis*, var. *Ladacensis*, Nevill. Leh.
46. „ (*Tropiodiscus*) *subangulatus*, Phil., var. Yarkand.
47. „ (*Segmentina*) *nitidus*, Müll. Yarkand.
48. „ (*Hippentis*) *complanatus*, Linn. Yarkand.

¹ I doubt the identification of these two species; the animals of species in this genus have not been well and thoroughly examined. Its accomplishment might show very much that may be of better specific value than the shells present us with.

49. *Planorbis (Armiger) nautileus*, Linn. Yarkand.
 50. " " *nanus*. Skardo (Godwin-Austen).
 51. *Bythinia pulchella*, Bs. Kashmir Valley (Theobald).
 52. *Valvata piscinalis*, Müll. Pangkong Lake, Sopur (Theobald).
 53. " *Stoliczkana*, Nevill. Yarkand.
 54. *Corbicula Kashmirensis*. Jhelum River (Theobald).
 55. " *occidens*, Bs. Jhelum River (Theobald).
 56. *Sphaerium Indicum*, Desh. Quoted by Theobald. Exact locality not given.
 57. *Pisidium obtusale*, Pfr. Pangkong Lake (Stoliczka).
 58. " *hydaspicola*, Theob. Shupiyān, Kashmir Valley (Theobald). This stream is a tributary of the Jhelum, flowing from the northern slopes of the Pir Panjal.
Pisidium. Species not identified. Skardo (Godwin-Austen).
 ,, Three species unnamed by Nevill. Yarkand (Stoliczka).

APPENDIX B.

LIST OF SHELLS FROM KASHMIR TERRITORY, SOUTH OF THE PIR PANJAL AND KAJNAG RANGES, INCLUDING THE MURREE HILLS AND HAZARA.

(LAND SPECIES.)

1. *Ennea bicolor*, Hutton. In outer hills, near plains.
2. *Macrochlamys splendens*, Hutton. Tinali (Stoliczka). Spirit specimen described by me was supplied by Theobald as from Murree.
3. *Macrochlamys splendens*, Hutton. Uri, Jhelum Valley (Theobald). I doubt the identification. Theobald says "like *aspides*" (which is a Tenasserim shell), "lip thickened inside as in *Bensonia monticola*."
4. *Macrochlamys*, near *prona*, Nevill. A single specimen from the outer hills, exact locality not given (Theobald).
5. *Macrochlamys*, near *prona*, Nevill. Young shells, Murree (Stoliczka).
6. *Macrochlamys patane*, Bs. Uri (Theobald). I doubt very much this extension of a Darjiling species so far to the westward, and it has not been recorded from the well-worked N.W. Himalayan area.
7. *Macrochlamys*, species resembling *levicula*, Bs. Uri (Theobald). Impossible to say what this may be, but it is very unlikely to be a *Durgella*.
8. *Macrochlamys Flemingi*, Pfr. Jhelum and Chenab Valleys, and Murree (Theobald), Tinali (Stoliczka).
9. *Macrochlamys Austenianus*, Nev. Tandiani (Theobald). This is the young of the preceding species, not the form found at the head of the Sind Valley.

10. *Macrochlamys cassida*, Bs. Uri, Jhelum Valley (Theobald).
 11. *Austenia Theobaldi*, Godwin-Austen. Bichlari, Chenab Valley (Theobald).
 12. *Austenia scutella*, Bs. Nasmana, Chenab Valley (Theobald).
 13. *Bensonia monticola*, Hutton. Chenab Valley (Theobald).
 14. " " var. *Murriensis*, Nevill. Changligulli, near Murree (Stoliczka).
 15. *Bensonia Jamuensis*, Theobald. Tawi Valley (not "Jawi"), near Jamu (Theobald).
 16. *Bensonia angelica*, Pfr. Uri (Stoliczka).
 17. " *Jacquemonti*, V. Martens. Murree (Stoliczka).
 18. " (?) *chloroplax*, Bs. Murree (Stoliczka). Extends to Simla.
 19. *Microcystis*? *Nevillianus*, Theobald. Tandiani (Theobald).
 20. *Thysanota Tandianensis*, Theobald. Tandiani (Theobald).
 21. *Trochomorpha*? near *hyba*, Bs. "The animal has a distinct overhanging mucous pore."—*Theobald*.
 22. *Kaliella fastigiata*, Hutton. Tandiani (Theobald).
 23. *Anadenus altivagus*, Theobald. Changligulli, near Murree (Theobald). This genus ranges to Sikkim.
 24. *Pyramidula humilis*. Tandiani and Murree (Theobald). Ranges to Simla and Mussoorie.
 25. *Peronæus Nevillianus*, Theobald. Tandiani (Theobald).
 26. *Buliminus (Petræus) Mainwaringianus*, Nev. (Stoliczka.)
 27. " " *Beddomeanus*, Nev., vars. *typica*, *turrita*, *pusilla*. Tandiani (Theobald).
 28. *Buliminus (Petræus) pretiosus*, Cantor. Tinali (Stoliczka), Kathai Fort, Jhelum Valley (Theobald).
 29. *Buliminus (Petræus) domina*, Bs. Murree (Stoliczka).
 30. " " Dextral var. Abbottabad (Theobald).
 31. " " *Smithii*, Bs. Uri and Murree (Theobald).
 32. " " *candelaris*, Pfr. Tinali (Stoliczka).
 33. " " *Sindicus*, Bs. Kohala, near Murree.
 34. " " *rufistrigatus*. On the outer hills (Theobald).
 35. *Pupa*, like *plicidens*. Jhelum Valley (Theobald). Not described.
 36. *Pupa Himalayana*, Bs. Jhelum Valley and Pir Panjal; also from Naini Tal, Mussoorie, and Simla.
 37. *Pupa Huttoniana*, Bs. Jhelum Valley. Is a South Indian form. Since Theobald says it has been "carried down during floods into the plains," he alludes, I presume, to the south side of the Pir Panjal range.
 38. *Clausilia (Phædusa) Waagani*, Stol. Below Baramula (Stoliczka).
 39. " " *cylindrica*, Gray. Tandiani (Theobald), Murree (Stoliczka). Ranges to Simla and Naini Tal.
 40. *Opeas gracilis*, Bs. In outer hills, near plains.
 41. *Geostilbia balanus*, Bs. In outer hills, near plains.
 42. *Cælostele scalaris*, Bs. In outer hills, near plains.
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NOTES ON THE ANATOMY OF *TRACHYCYSTIS*, *DORCASIA*,
AND *ISOMERIA*.

By WILLIAM MOSS and WILFRED MARK WEBB, F.L.S., etc.

Read 13th January, 1899.

1. *TRACHYCYSTIS* *LYGÆA*, Melv. & Pons.

The genitalia have not hitherto been described, but the external characters of the animal, with the structure of its radula and jaw, led Mr. Pilsbry¹ to include the present and other species of *Trachycystis* in a subgenus under *Phasis* in the family Endodontidæ. The authors of the species, on the other hand, have quite recently removed it from *Trachycystis* and placed it under *Zingis* in the Zonitidæ.²

Through the kindness of Mr. Ponsonby the writers have been enabled to examine several specimens from West Africa, and if the result had been made known to him before the publication of his joint paper with Mr. Melvill, it might have induced those authors to retain this species in its original position. The foot of *T. lygæa* has a pedal groove, but lacks the tail-like caudal appendage characteristic of *Zingis Natalensis* and *Z. Trotteriana*. This latter fact and the character of the dentition, in the opinion of the writers, clearly establish the connection of this species with the Endodontidæ. In very few genera of Endodontidæ is the internal structure known, but *Trachycystis lygæa* agrees with these in having genitalia devoid of accessory organs and the retractor muscle inserted at the apex of the penis. The entrance of the vas deferens into the same part of the penis is another common feature in this family. At first sight *T. lygæa* would appear to differ in this respect, for at about its middle the penis is joined by the vas deferens, which becomes partially imbedded in the muscular wall of the former until it finally disappears. By transmitted light its lumen is distinguishable throughout the latter part of its course to the apex of the penis. This state of affairs may be what prevails in *Amphidoxa*, section *Stephanoda*, which Pilsbry describes as having a vas deferens which "passes gradually into the penis"; but the figure given in the Manual of Conchology³ is not sufficiently detailed to enable an opinion to be definitely formed. Furthermore, in *T. lygæa* the duct of the spermatheca is long, as it is in *Pyramidula*.⁴

¹ Man. Conch., ser. II, vol. ix, p. 37.

² "A Contribution towards a Check-list of the Non-Marine Molluscan Fauna of South Africa": Proc. Malac. Soc., vol. iii, pp. 173 and 171.

³ T.c., p. 40; pl. i, fig. 16.

⁴ Man. Conch., t.c., p. 42, pl. xi, e.g. *Patula alternata*, Say, fig. 20.

A particular feature of this system of organs (Fig. I) is the long vestibule, which is much like that of *Pleurodonte* (*Caprinus*) *orbiculata* shown in Pilsbry's figure, but not mentioned in his description.¹

On the other hand, *T. lygæa*, as well as several nearly allied species, *T. conisalea*, Melv. & Pons., *T. Burnupi*, Melv. & Pons., and *T. aulacophora*, Ancey, do not possess the spiral striations on the apex of the shell cited as a character of *Trachycystis* by Pilsbry,² nor, again, have the inner marginal teeth of the radula the remarkably long entocones (Fig. II) figured by Pilsbry,³ while anything like the numerous flat plaits on the jaw mentioned in the same work can only be seen when it is greatly magnified (Fig. III).

2. DORCASIA GLOBULUS, MÜLL.

The figure given by Pilsbry of the genitalia of *Dorcasia Alexandri*⁴ was from a badly preserved specimen, and shows signs of immaturity, so that the drawing (Fig. IV) of a dissection prepared from examples of *Dorcasia globulus* is worthy of note. The specimens which supplied material for this note came from Robbin Island (Cape of Good Hope), and were furnished in this case also by Mr. Ponsonby. Several interesting peculiarities were met with. In the two species mentioned the organs are much alike, but the way in which the various structures were found to be interwoven in the latter is rather remarkable.

The vagina swells after the separation of the male and female ducts, and this swelling is outlined upon one side by the vas deferens, and on the other by the duct of the spermatheca, which is tightly bound above to the oviduct by connective tissue. Near the same spot the retractor muscle of the penis finds an attachment, and the spermatheca and the upper part of its duct are so hidden and so closely applied to the oviduct, that at first sight the lower part of the former appears to be continuous with the latter, and thus to be vagina, while the swelling of the oviduct might well be a spermatheca. The vas deferens, again, is firmly bound for a considerable part of its length to the penis, which it enters at its junction with the retractor muscle.

The radula has been figured by Pilsbry,⁵ and calls for no comment. The jaw is smooth, as in *D. Alexandri*, but scarcely separable from the part of the buccal mass to which it is attached, being apparently little more than a hardening of the tissue which forms the upper boundary of the mouth. It was found to be impossible in the three or four specimens investigated to detach the jaw without breaking it into pieces.

¹ T.c., p. 91, pl. xxiv, fig. 10.

² T.c., p. 87, pl. x, fig. 7.

³ T.c., pl. xviii, figs. 3, 4.

⁴ Man. Conch., ser. II, vol. ix, p. 172, Frontispiece, fig. 3.

⁵ T.c., pl. li, fig. 3.

3. ISOMERIA SUBCASTANEA, Pfr.

The specimens upon which the following investigations were made were kindly given by Mr. S. I. Da Costa, and came from Ecuador. *Isomeria* is placed under *Pleurodonte*¹ in Pilsbry's classification, but up to the present nothing has been described save the shell.

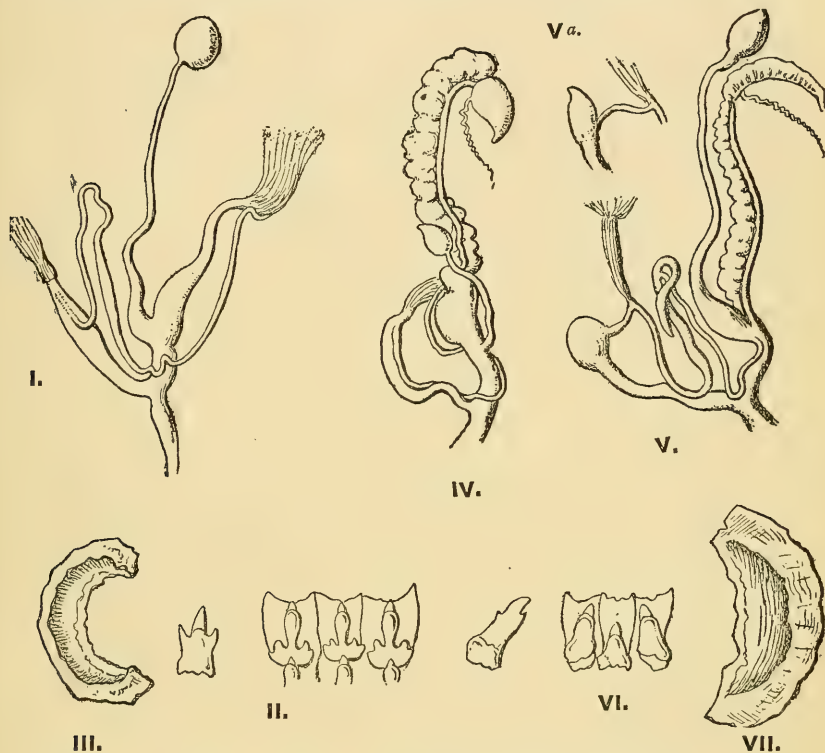


FIG. I. Genitalia of *Trachycystis lygaea*, Melv. & Pons., from West Africa, enlarged three times.
 ,, II. A median tooth with the two adjacent laterals and a marginal one from the radula of the same, enlarged.
 ,, III. The jaw of the same, enlarged.
 ,, IV. Genitalia of *Dorcasia globulus*, Müll., from Robbin Island, slightly reduced.
 ,, V. Genitalia of *Isomeria subcastanea*, Pfr., from Ecuador, somewhat reduced.
 ,, Va. The junction of the epiphallus and penis in a second specimen.
 ,, VI. A median tooth with the two adjacent laterals and a marginal one from the radula of the same, enlarged.
 ,, VII. The jaw of the same, enlarged.

¹ T.c., p. 93.

The genitalia (Fig. V) are now shown to be typical of *Pleurodonte*, in that the female system is simple and by the presence of an epiphallus and a flagellum, but the retractor muscle is seated on the epiphallus instead of upon the penis, in this character agreeing with the Asiatic and Australian rather than with the American forms. The male organs, in particular, resemble those of *Chlorites Porteri*¹ more nearly than they do *Pleurodonte*, thus emphasizing Pilsbry's remarks² as to the affinities of this latter genus and its distribution.

The radula has unicuspid central and lateral teeth (Fig. VI), the mesocones being very largely developed. Some of the marginals may be described in the words which Pilsbry applies to those of *Chlorites*, when he says³ that the latter have "a large bifid mesocone and an ectocone," but the outermost are very rudimentary. The jaw (Fig. VII) is longitudinally striated.

¹ T.c., pl. xxviii, fig. 1.

² T.c., p. 86.

³ T.c., p. 119.

NOTE ON *VOLUTA ROADNIGHTÆ*, McCoy.

By MRS. AGNES KENYON.

Read 13th January, 1899.

IN the Proceedings of the Royal Society of Victoria for May, 1898, it is stated that the type-specimen of *Voluta Roadnightæ* is preserved in the National Museum, Melbourne. Since this, though doubtless printed in good faith, is an inaccurate statement, I thought it might be of interest to recall exactly how many specimens have been found, where they were obtained, and where they are now preserved.

The first and type specimen of this rare and beautiful Volute came to light in a very curious and unexpected manner, as it was discovered by chance by the late Baron Sir Ferdinand von Mueller, the Government Botanist for Victoria, who, when holiday-making at the Lake's Entrance, Gippsland, south coast of Victoria, happened to notice a shell which was being used for the purpose of propping up his bedroom window at the hotel. Although in a broken and mutilated condition it appeared new to him, and he therefore obtained possession of it, and ascertained that it had been found by Mrs. Roadknight, the landlord's mother, some years previously, in the vicinity of the Red Bluff on the Ninety-mile beach. Upon his return to Melbourne, he placed the shell in the hands of the late Sir Frederick McCoy, Director of the National Museum, who described it under the name of *Voluta Roadnightæ*.¹ This specimen was, I believe, sent to Germany.

The second example was discovered by a somewhat similar chance in 1880 by Mr. Butler, a solicitor of Portland, who, at Kentbruck, near Cape Bridgewater, noticed this shell lying on a mantelpiece, and was told that it had been found on the beach between Cape Bridgewater and Cape Nelson, south-west of Victoria. The shell was given to Mr. Butler by the farmer who found it, and subsequently passed into the possession of the Melbourne Museum, June, 1881. Early in the same year, Mrs. Butler found a broken specimen (the third) on the Narrawong beach, a few miles from Portland, and some time afterwards presented it to the Museum. In 1893 a fourth and larger, but water-worn and imperfect, specimen was obtained by Mr. Worcester, at Corner Inlet, Gippsland.

The fifth specimen, which is also water-worn and imperfect, was found in 1894 by Mr. May, near Maria Island, on the east coast of Tasmania. A sixth example, also found on the east coast of Tasmania, near Swansea, by a Mr. E. O. Cotton, in 1895, is likewise in a broken, water-worn, and fragmentary condition. The seventh and finest specimen, both in size and markings, obtained in 1897, is from the same locality as the first and fourth specimens, namely, Ninety-mile beach, Gippsland, where the lately discovered *V. Rossiteri* and *V. Kenyoniana* were found. Unfortunately it is damaged near the aperture. Its dimensions are, alt. 8, lat. 5 inches, and it exceeds in size the only entire specimen in the Melbourne Museum. The seventh and fourth specimens are in the collection of the writer.

¹ Ann. & Mag. Nat. Hist., ser. v, vol. viii (1881), p. 88.

SOME NOTES ON THE NON-MARINE MOLLUSCAN FAUNA OF THE
HAWAIIAN ISLANDS, WITH DIAGNOSES OF NEW SPECIES.

By C. F. ANCEY.

Read 13th January, 1899.

(PLATES XII AND XIII, FIGS. 8, 16, 20.)

1. ENDODONTA (THAUMATODON) NUDA, n.sp. Pl. XII, Fig. 1.

Testa articularis, rotuliformis, depressa, aperte umbilicata (umbilicus sat magnus, circularis, tertio diametri minor), micans, lutea, strigis fuscis in ultimo anfractu fulguratis, inferne evanidis amœne picta, costulis lamellosis confertis, circa umbilicum magis approximatis exarata. Spira plana, anfractus 5 convexi, angusti, lente accrescentes, sutura impressa; ultimus cylindricus, haud deflexus. Apertura vix obliqua, rotundato-lunata, lamellis 2 volventibus in pariete (supera majore) et palatalibus 5 minus prolongatis, æquidistantibus obstructa. Peristoma simplex, acutum, marginibus remotis. Diam. 3, alt. 1.25 mm.

Hab.—Olaa, Central Hawaii (M. Thaanum).

This is a very distinct little form; the armature of the aperture resembles that of *E. contorta*, Fér., of Oahu, but the shell is not hirsute, though quite fresh.

2. MICROCYSTIS SERICANS, n.sp. Pl. XII, Fig. 5.

Testa orbicularis, depressa, imperforata (in loco perforationis minute foveata), tenuis, pellucida, læte cornea, nitens, supra subsericeo-micans. Spira obtusa, vix elata, valde depressa, anfractus $4\frac{1}{2}$, convexiusculi, lente accrescentes, lineis incrementi inconspicuis, sutura superficiali divisi; ultimus mediocriter altus, initio (ad insertionem superam aperturæ et supra peripheriam) obtuse angulatus, postea rotundatus, infra depresso-convexiusculus. Apertura lunata, fere recta, margine externo cum basali regulariter curvato; columella minute incrassata. Diam. maj. 7.33, min. 6.5 mm.; alt. 4.25 mm.

Hab.—Olaa, Central Hawaii (Thaanum).

This is very distinct from its nearest ally, *M. cicercula*, Gould, which is found on a different part of Hawaii. It is more depressed above, has $4\frac{1}{2}$, not 5 whorls, and a somewhat silky lustre on its upper surface.

3. PTERODISCUS PETASUS, n.sp. Pl. XII, Fig. 4.

Testa latissime et perspective umbilicata, sublenticularis, tenuis, luteo-fusca, concolor, vix nitens, ruditer et confertim rugoso-striata, striis lamellosis. Spira late conoidea, lateribus subconcavis, vertice prominulo, obtusiusculo. Anfractus 5, fere plani, sutura lineari et

parum profunda discreti, regulariter crescentes, ultimus carina superne acuta et alia infra obtusiore circa umbilicum præditus, haud deflexus, superne subdeclivis, infra carinam majorem inverse conicus, planatus. Umbilicus acetabuliformis, conicus; apertura fere recta, securiformis, ad dextram acute ad basin obtusius angulata, prorsus edentula. Peristoma simplex, rectum, marginibus remotis. Diam. maj. 4·33, min. 3·75 mm.; alt. 2·2 mm.

Hab.—Waianae Mountains, Oahu (Baldwin).

A singular little species, shaped like *Endodonta fabrefacta*, Pease, of Raiatea, Society Islands, and quite unlike any other species from the Hawaiian Islands, except *P. digonophorus*, Ancey, also of Oahu. The latter, however, is darker, and has a planulate spire.

4. *THAANUMIA OMPHALODES*, n. gen. et sp. Pl. XII, Fig. 8.

Testa aperte umbilicata, ovato-conica, parum nitens, subsericina, tenuis, acute et irregulariter per longitudinem testæ costulata, costulis sublamellosis, leviter flexuosis, intense rufo-cornea, peristomate dilute purpureo. Spira regulariter conica, ambitu rectilinearis, apice subobtusa. Anfractus 6, convexi, regulariter crescentes, sutura impressa divisi, embryonales minutissime spiraliter sculpti, sequentes costulati, interstitiis irregulariter striatuli, ultimus initio subangulatus, ovatus, dilatatus, ad finem minute breviterque subascendens, circa umbilicum angulatus et compressus. Apertura recta, basi recedens, irregulariter ovalis, utrinque angustata. Columella recte descendens, longa, angulo obtuso basi juncta, basi intus leviter contorto-plicata. Peristoma undique expansiusculum, ad columellam magis dilatatum, marginibus haud conniventibus. Long. 6·33, lat. 3·5 mm.; alt. apert. 2·66 mm.

Hab.—Waianae Mountains, Oahu (Baldwin).

Four specimens were found. This very beautiful and striking species is provisionally located in the family Achatinellidæ, though the sculpture of the apex is unlike that of any other genus of the group. Since it could not be placed satisfactorily in any known genus, I venture to propose *Thaanumia* for its reception. It is well characterized by its peculiar shape, resembling *Buliminus Hartungi* of the Azores, deep circular umbilicus, thin shell, form of aperture, small basal pillar fold and sculpture, not to speak of the very peculiar striation of the nepionic whorls. It cannot be located in *Leptachatina*, to which I had formerly referred it.

5. *AMASTRA FROSTI*, Ancey, var. *UNICOLOR*, n. var. Pl. XII, Fig. 11.

Testa forma typo similis, sed unicolor stramineo-flavescens, fasciis fuscis omnino destituta.

Hab.—Waianae Mountains, Oahu (Baldwin and others).

6. *AMASTRA SIMULARIS*, Hartman.

Amastra simularis, Hartman: Proc. Ac. Nat. Sci. Philad., 1888, p. 252, pl. xiii, fig. 7.

The type-specimen of this variable species is described as follows:—“Shell dextral, ovate conic, whorls $5\frac{1}{2}$, slightly rounded, body whorl somewhat inflated, two-thirds the length, the first one and a half composed of slightly curved plicæ, suture lightly impressed, epidermis dark brown with black zig-zagged lines and linear striæ, body whorl a dark red colour beneath the epidermis, aperture semi-ovate, dark red, columella straight, with a white twisted plait near the base. L. 15, W. 7, L. apt. 6. Diam. apt. 3 mill. Molokai.”

This species, as before remarked, is a protean one, according to Mr. Baldwin, who states (*in litt.*) that Mr. Sykes' *A. citrea* is but a form of Hartman's shell. The same gentleman also sent me the following varieties, stating that the animals do not vary, the shells only differing in colour and shape. They were both collected in Molokai.

Var. MAURA, n.var. Pl. XIII, Fig. 16.

Shell much larger and more obese than the type (length 17, width 9, apert. 7 mm.), with 6 whorls. Colour dark red, blackish at the apex, periostracum black, decorticated at some places; columellar margin very dark with a whitish fold; interior of aperture dark purple red.

Var. SEMICARNEA, n.var. Pl. XIII, Fig. 8.

Shell larger than the type, but more slender than var. *maura* (length 16.5, width 8.5, apert. 6 mm.), with 6 whorls. Apex blackish, the subsequent whorls fulvous, sometimes with straight, somewhat obscured, revolving lines, the lower half of the last whorl yellowish flesh-coloured. Columellar margin bluish, with a white plait. Mouth light-coloured.

It should be remarked that Hartman's original figure is somewhat inaccurate, and does not give an adequate idea of the shell.

7. BALDWINIA, n.subgen. (of ACHATINELLA).

Testa subgeneri *Partulina* affinis, sed plerumque tenuior, peristomate parum incrassato et expansiusculo et præcipue plica columellari contorta deficiente discrepans.

Hab.—Hawaii and, perhaps, Oahu and Maui.

Types: *Achatinella physa*, Newcomb, *A. Horneri*, Baldwin, *A. Hawaiiensis*, Baldwin, all from Hawaii. *A. grisea*, Newc., and *A. dubia*, Newc., may be referable also to this group; which has been confounded by some with *Partulina*, and by others with *Newcombia*, while it appears to stand apart from both. It differs from *Perdicella* in having a larger shell with expanded and somewhat thickened lip; and I name it after Mr. D. D. Baldwin, who has added so much to our knowledge of the Hawaiian fauna.

8. LEPTACHATINA ISTHMICA, n.sp. Pl. XIII, Fig. 20.

Testa subfossilis (an omnino extincta?), pro genere crassiuscula, subopaca, nitens, alba, ultimo anfractu post suturam plerumque

daucino-rubro, peristomate albo; oblongo-conoidea, lævis, lineolis incrementi sub valida lente, minutis, præcipue ad partem superam ejusque anfractus instructa, imperforata vel obtecte subrimata. Spira convexo-attenuata, conoidea, summo minuto, obtusiusculo. Anfractus 7, fere plani, regulariter crescentes, sutura lineari, pellucido-marginata; ultimus oblongus, basi regulariter attenuatus. Apertura subobliqua, oblonga, superne angulata, inferne angustata, plica columellari sat valido munita. Peristoma incrassatum, obtusum, ad columellam supra locum perforationis callose subdilatatum, marginibus callo junctis. Long. 9, diam. 4 mm.; alt. apert. 4 mm.

Hab.—Sand Hills, between East and West Maui, with *Leptachatina extincta* and *Tornatellina extincta* (Baldwin).

This species has been discovered in a fossil condition only, but may still be living in the island. It is thick for the genus, and the last whorl is more or less stained with red towards the aperture.

9. SUCCINEA BICOLORATA, n.sp. Pl. XII, Fig. 2.

Testa ovalis, perfragilis, pellucida, pallide cornea, ad basin et columellam late rufo-tincta, irregulariter rugoso-striata. Spira pro genere mediocris, conica, pallida, apice subpapillosa; anfractus 3, haud valde convexi, sutura impressa, celeriter crescentes, ultimo oblongo-ovato. Apertura magna, ovalis, subobliqua, sursim attenuata. Columella haud incrassata, arcuata. Peristoma simplex, parum expansum. Long. 14·5, diam. 9 mm.; long. apert. 11·5 mm.

Hab.—Waimea, Hawaii (Prof. Lyons).

This fine, very thin-shelled species and the next are remarkable on account of the very striking manner of coloration; nothing like it has been hitherto recorded in the genus. Another species, *S. Newcombiana*, Garrett, has been described from the same district of Waimea; since the description appears to have escaped the notice of all subsequent writers on the subject, and as it was omitted in my paper on the *Succineæ* of the Archipelago, I take the opportunity of transcribing it here.

“*Succinea Newcombiana*, Garrett.—Shell wide-ovate, very thin, fragile, somewhat inflated, pellucid, whitish horn-colour; body-whorl very large and distinctly striated; spire very small, depressed, with one volution; aperture suborbicular and nearly the whole length of the shell; outer lip much expanded.

“Length: three lines.

“Animal pale flesh-colour, mantle obsoletely fasciated and slightly reflected over the shell. Foot narrow, elongated and minutely speckled with brown.

“Habitat: District of Waimea, Hawaii.

“Observation: This singular species is somewhat rare, and occurs on bushes at an elevation of about four thousand feet above the level of the sea. This species is dedicated to Dr. W. Newcomb, late of Honolulu, S.I.” (Garrett, in Proc. Ac. Nat. Sci. Cal., 1857.)

10. *Succinea thaanumi*, n.sp. Pl. XII, Fig. 3.

Testa late ovata, fragilis, pellucida, subdepressa, lineis incrementi rugiformibus irregulariter et grosse impressa, rubella vel luteo-succinea, circa columellam late et insigniter rubro-tincta. Spira conoidea, parva, parum producta, apice minuto, obtusiusculo. Anfractus $2\frac{3}{4}$, celeriter crescentes, convexiusculi, sutura impressa, ultimus multo maximus, late ovalis, testam fere totam æquans. Apertura ampla, lata, margine supero cum dextro arcuatim juncto, extus elliptico, columellari longe arcuato, tenui, absque plica, basali patulo. Long. 15, lat. 10 mm.; alt. ap. 13, lat. ap. 9 mm.

Hab.—Olaa, Hawaii (Thaanum).

A remarkably fine species, allied to the last, but broader, less thin-shelled, more coarsely sculptured, less shining, and with a more diminutive spire of $2\frac{3}{4}$ whorls only. Named after its discoverer. It recalls to mind *Amphibulima patula*, Brug.

Var. β .—Purpurea, unicolor.

11. *Succinea casta*, n.sp. (*S. venusta*, Gould, var. ?)
Pl. XII, Fig. 10.

Testa oblonga, tenuis, pellucida, succinea (margine columellari interdum rufo-tincto), lineis incrementi rugiformibus, sed lævibus, irregulariter notata, nitens. Spira obtusa, producta, summo valde mamillato, pallida vel rubella. Anfractus $2\frac{1}{2}$ – $2\frac{3}{4}$, celerrime crescentes, oblongi, regulares. Apertura obliqua, ampla, ovata, superne attenuata et angulata, basi subrecedens. Columella arcuata, tenuis, plica destituta, margine externo regulariter curvato. Peristoma simplex, acutum, haud patulum. Long. 13–14.5, lat. 7.5–8.33 mm.; long. apert. 9.5–10 mm.

Hab.—Olaa, Hawaii (Thaanum).

I do not know Gould's *S. venusta*, of which *S. casta* may perhaps prove to be a local race, but according to the description *S. venusta* is smaller, has the last whorl broad and gibbous, which is not the case in *S. casta*; the coloration, also, is not the same, specimens of *S. casta* being more or less reddish around the columella and on the spire, no mention of this being made in Gould's description. Thus I think the species may be conveniently separated.

12. *Succinea garrettiana*, n.sp. Pl. XII, Fig. 7.

Testa ovata, tenuissima, intense cinnamomeo-rufescens, sericeo-nitens, irregulariter rugoso-striata. Spira sat brevis, conoidea, obtusa, apice papillata, sutura valde impressa. Anfractus 3, convexi, celeriter crescentes, ultimo magno, ovato, subinflato. Apertura ovata, sursim subattenuata, subobliqua. Columella arcuata, superne indistincte et levissime contortula. Peristoma simplex, acutum, haud expansum. Long. 9.75, lat. 6.25 mm.; long. apert. vix 7 mm.

Hab.—Rainbow Falls, Hilo, Hawaii. Found in the gorge of the falls, in very wet places only, on green slimy rocks where water is always trickling down (Baldwin).

Allied to *S. canella*, Gould, of Maui, and *S. Konaensis*, Sykes, of Kona, Hawaii. From the latter it is quite recognizable, being of a warmer colour and less produced spire. It is dedicated to my late distinguished friend and co-worker, Mr. A. Garrett, of Huahine, Society Islands.

13. *SUCCINEA WAIANAENSIS*, n.sp. Pl. XII, Fig. 12.

Testa elongato-ovalis, tenuis, pellucida, straminea vel pallide succinea, spira plerumque, apice præsertim, pallide rufula, leviter rugoso-striata, striis subflexuosis. Spira pro genere producta, apice papillata, conico-elongata. Anfractus 3, convexi, quasi evoluti; sutura profunda, valde obliqua, antice descendens. Apertura subobliqua, $\frac{2}{3}$ totius testæ subæquans, ovata, superne angulata, margine externo regulariter arcuato, columellari levius arcuato, supra obsolete subplicato, tenui. Callus parietalis in peradultis distinctus. Long. 15, lat. 7.5 mm.; long. apert. 9.5 mm.

Hab.—Waianae Mountains, Oahu (Baldwin).

In form it resembles *S. pallida*, Pfr., of the Society group, and it is quite distinct from any species hitherto detected in the Hawaiian Islands.

14. *SUCCINEA INCONSPICUA*, n.sp. Pl. XII, Fig. 9.

Testa ovalis, tenuis, pellucida, succineo-lutea, lineis incrementi lævibus irregulariter impressa. Spira sat producta, conica, apice minuto, papillari, $\frac{2}{3}$ longitudinis totius adæquans. Anfractus 3, convexi, sutura impressa et satis descendente discreti, rapide crescentes; ultimus ovato-oblongus, subobliquus. Apertura leviter obliqua, regulariter ovalis, superne subangulata. Peristoma simplex, acutum, haud expansum, margine externo arcuato, columellari arcuato, simplici, tenui. Long. 11, lat. 6.25 mm.; alt. apert. 7.5 mm.

Hab.—Waimea, Hawaii (Prof. Lyons).

This species, although of a simpler character than the preceding one, is different from all the Hawaiian species with which I am acquainted. As compared with *S. Waianaensis*, it is smaller and thinner, and the suture is not so oblique, the spire being less produced and papillose.

15. *MELANIA BALDWINI*, n.sp. Pl. XII, Fig. 6.

Testa turrita, solidiuscula, nitide olivacea, unicolor vel persæpe serie punctorum vel macularum parvarum fuscorum infra suturam decorata, apice purpureo-fuscescenti, integro. Spira regulariter conico-attenuata, acuta. Anfractus 12, convexi, sutura canaliculata divisi, superiores lineis incis spiralibus numerosis et lineis incrementi flexuosis et costulis magis obsolete crebre decussati, 3 ultimi infra suturam omnino lævigati, postea lineis incis spiralibus sat distantibus regulariter perarati, intervallis plus minusve crispulatis. Apertura oblonga, intus cærulescenti-livida, elliptica, superne subacuta, basi vix ampliata,

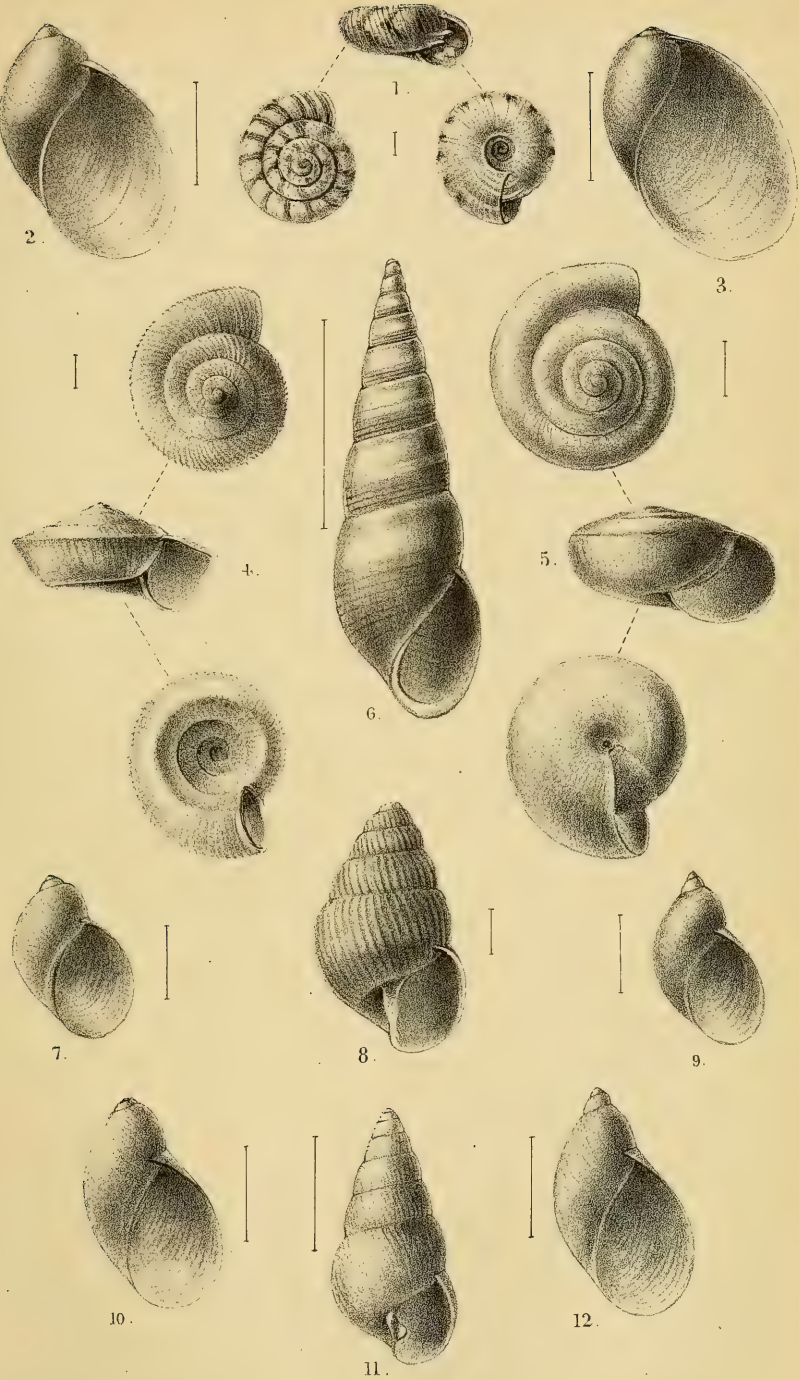
rotundata; columella arcuata, incrassata, albido-cærulescens. Long. 30, lat. 9·5 mm.; long. apert. 10, lat. apert. 4·66 mm.

Hab.—Lahaina, Maui (Baldwin).

This pretty *Melania* is allied to *M. Oahuensis*, Pease, according to Dr. A. Brot, the eminent writer on Melaniidæ, to whom I sent specimens, and who declared them to belong to an undescribed species.

EXPLANATION OF PLATE XII.

- FIG. 1. *Endodonta nuda*, n.sp.
 ,, 2. *Succinea bicolorata*, n.sp.
 ,, 3. ,, *Thaanumi*, n.sp.
 ,, 4. *Pterodiscus petasus*, n.sp.
 ,, 5. *Microcystis sericans*, n.sp.
 ,, 6. *Melania Baldwinii*, n.sp.
 ,, 7. *Succinea Garrettiana*, n.sp.
 ,, 8. *Thaanumia omphalodes*, n. gen. et sp.
 ,, 9. *Succinea inconspicua*, n.sp.
 ,, 10. ,, *casta*, n.sp.
 ,, 11. *Amastra Frosti*, var. *unicolor*, n. var.
 ,, 12. *Succinea Waianaensis*, n.sp.
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21.

ILLUSTRATIONS OF, WITH NOTES ON, SOME HAWAIIAN
NON-MARINE MOLLUSCA.

By E. R. SYKES, B.A., F.L.S., etc.

Read 13th January, 1899.

PLATES XIII AND XIV.

IN preparing a study of the Hawaiian Non-Marine Fauna, I have had the advantage of examining a series of 'type-specimens' described by Mons. Ancey, to whom I desire to tender my thanks for the loan. Since they were unfigured I took the opportunity of having them drawn, and Plate XIII is the result. Similarly, having been able, through the kindness of Prof. Hyatt, to examine the 'types' of Mr. Gulick's species of *Leptachatina*—now preserved in the Museum of the Boston Society of Natural History—and feeling that the illustrations already published¹ were by no means satisfactory, I have had these also redrawn, and the majority are represented on Plate XIV.

I do not here propose to deal with their synonymy, any comments on this subject being reserved for future publication, and the figures are simply issued here as illustrations of described forms, owing to the size of the plates being unsuitable for my work on the Hawaiian Fauna.

EXPLANATION OF PLATES XIII AND XIV.

PL. XIII.

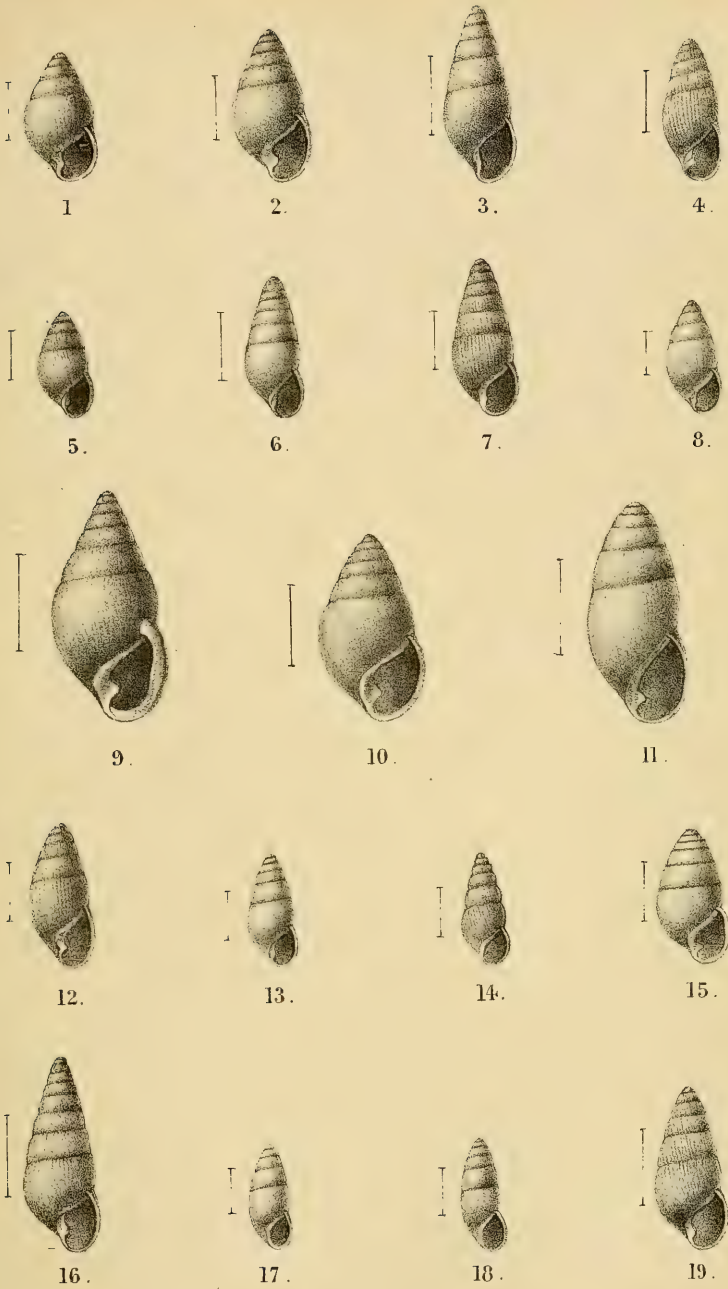
- FIGS. 1-3. *Hyalinia Baldwinii*, Ancey: Bull. Soc. Malac. France, vol. vi (1889), p. 204.
 ,, 4. *Succinea aurulenta*, Ancey: t.c., p. 242.
 ,, 5-7. *Microcystis turgida*, Ancey: l.c., vol. vii (1890), p. 339.
 ,, 8. *Amastra simularis*, Hartman, n.var. *semicarnea*, Ancey: Proc. Malac. Soc., this vol. ante, p. 270.
 ,, 9-11. *Patula digonophora*, Ancey: Bull. Soc. Malac. France, vol. vi (1889), p. 171.
 ,, 12. *Amastra Frosti*, Ancey: Mém. Soc. Zool. France, vol. v (1892), p. 719.
 ,, 13-15. *Microcystis platyla*, Ancey: Bull. Soc. Malac. France, vol. vi (1889), p. 196.
 ,, 16. *Amastra simularis*, Hartman, n.var. *maura*, Ancey: Proc. Malac. Soc., this vol. ante, p. 270.
 ,, 17. *Auriculella obliqua*, Ancey: Mém. Soc. Zool. France, vol. v (1892), p. 721.
 ,, 18. *Leptachatina columna*, Ancey: Le Naturaliste, an. xi (1889), p. 266.
 ,, 19. *Limnæa aulacospira*, Ancey: t.c., p. 290.
 ,, 20. *Leptachatina isthmica*, Ancey, n.sp.: Proc. Malac. Soc., this vol. ante, p. 270.
 ,, 21. *Auriculella Westerlundiana*, Ancey: Bull. Soc. Malac. France, vol. vi (1889), p. 218.

¹ Ann. Lyc. Nat. Hist. New York, vol. vi, pl. vi.

PL. XIV.

FIG. 1.	<i>Leptachatina</i>	<i>gummea</i>	(Gulick):	Ann. Lyc. Nat. Hist. New York,
				vol. vi, p. 182, pl. vi, fig. 10.
„ 2.	„	<i>fragilis</i> ,	Gulick,	t. c., p. 183, pl. vi, fig. 11.
„ 3.	„	<i>terebralis</i>	„	t. c., p. 193, pl. vi, fig. 21.
„ 4.	„	<i>costulata</i>	„	t. c., p. 177, pl. vi, fig. 5.
„ 5.	„	<i>granifera</i>	„	t. c., p. 185, pl. vi, fig. 13.
„ 6.	„	<i>turrita</i>	„	t. c., p. 192, pl. vi, fig. 20.
„ 7.	„	<i>octogyrata</i>	„	t. c., p. 190, pl. vi, fig. 18.
„ 8.	„	<i>triticea</i>	„	t. c., p. 184, pl. vi, fig. 12.
„ 9.	„	<i>lagena</i>	„	t. c., p. 175, pl. vi, fig. 3.
„ 10.	„	<i>lacrima</i>	„	t. c., p. 176, pl. vi, fig. 4.
„ 11.	„	<i>resinula</i>	„	t. c., p. 174, pl. vi, fig. 2.
„ 12.	„	<i>leucochila</i>	„	t. c., p. 173, pl. vi, fig. 1.
„ 13.	„	<i>parvula</i>	„	t. c., p. 195, pl. vi, fig. 24.
„ 14.	„	<i>petila</i>	„	t. c., p. 189, pl. vi, fig. 17.
„ 15.	„	<i>fumida</i>	„	t. c., p. 181, pl. vi, fig. 9.
„ 16.	„	<i>subula</i>	„	t. c., p. 191, pl. vi, fig. 19.
„ 17.	„	<i>saxatilis</i>	„	t. c., p. 187, pl. vi, fig. 15.
„ 18.	„	<i>exilis</i>	„	t. c., p. 188, pl. vi, fig. 16.
„ 19.	„	<i>striatella</i>	„	t. c., p. 178, pl. vi, fig. 6.

N.B.—These species were all described as *Achatinella*: pp. 172–230 of Mr. Gulick's paper were issued in December, 1856, the remainder in February, 1858.



ON *DINOPLAX FOSSUS*, N.SP., AND *CHITON CRAWFORDI*, N.SP.,
FROM SOUTH AFRICA.

By E. R. SYKES, B.A., F.L.S., etc.

Read 10th March, 1899.

SEVERAL specimens of an interesting form of *Dinoplax*, collected by Mr. Burnup at Umkomaas, have recently passed through my hands. At first I was inclined to refer them to a variety of the well-known *D. gigas*, but subsequently comparison with a young and fresh specimen of that species led me to consider them as new, and Mr. Pilsbry, who very kindly examined them, confirmed that opinion.

1. *DINOPLAX FOSSUS*, n.sp. Fig. I.

Shell elongate-oval, elevated, ground colour generally brown, but occasionally greyish, mottled and spotted with red, chestnut, or slate markings. The median valves have the lateral areas well raised. The central areas are foveolate with, in addition, stab-like markings, which frequently coalesce so as to produce riblets; always with a few riblets on either side of the beaks. The lateral areas are radially striate, the number of the striæ varying greatly. The anterior valve is elevated, with similar sculpture to the lateral areas. The posterior valve depressed, having the mucro posterior, and the slope behind it short. Interior white, marked with brown and green. Sutural plates wide, connected across the sinus. Anterior valve with 7-11, median 1, posterior 7-11 slits. Girdle strong, fleshy, with many small spines, and bunches of them at the sutures. Length about 55, breadth about 35 mm.

Hab.—Umkomaas (Burnup).

The differences between this species and *D. gigas* are best expressed in tabular form as follows:—

<i>Dinoplax gigas.</i>	<i>Dinoplax fossus.</i>
Microscopically punctate, with indistinct riblets on the lateral areas.	Punctate, with stab-like markings which frequently coalesce and cause striæ; riblets on laterals much more distinct; a group of small riblets each side of the beaks.
Girdle with bunches of spines and a few scattered single ones.	Girdle densely clothed with spines, which form groups at the sutures.
Considerably larger.	

Mr. Sowerby recorded¹ the occurrence in South Africa of *Chiton lyratus*, Sby.; in noting this² I expressed the opinion that the species

¹ Journ. Conch., vol. vii, p. 373.

² Proc. Malac. Soc., vol. i, p. 135, footnote.

was probably identical with *C. Canariensis*, D'Orb. Mr. Pilsbry¹ suggested that these two species required comparison, and that *C. dissimilis*, Reeve, might well be the same as D'Orbigny's species. Recently I have examined the types of all three species and the specimens identified by Mr. Sowerby. *C. dissimilis* and *C. lyratus* are, I think, one and the same species; *C. Canariensis*, however, is distinct, and may be separated by its stronger sculpture and more raised lateral areas. Mr. Sowerby's South African specimens are, in

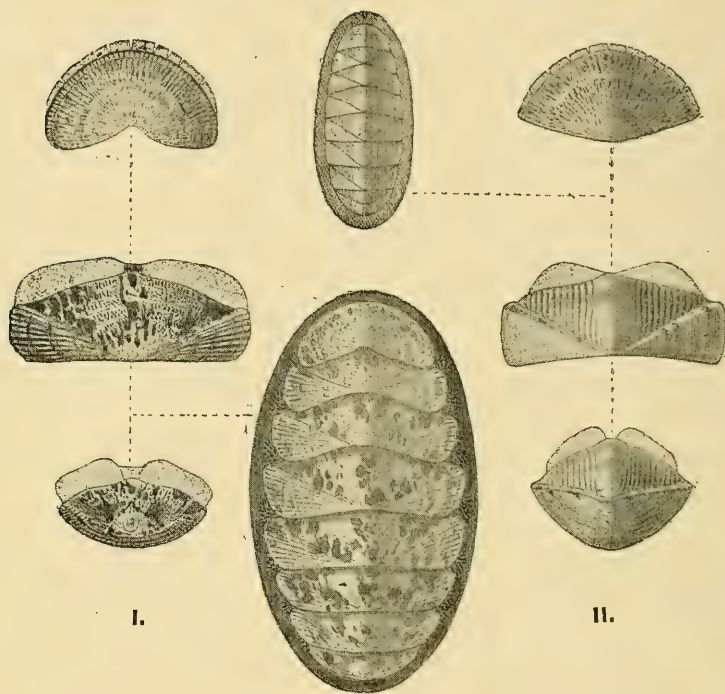


Fig. I. *Dinoplax fessus*, n.sp.

Fig. II. *Chiton Crawfordi*, n.sp.

my opinion, not *C. lyratus*, which is a West African species, but an undescribed form, and may be distinguished by the elevated lateral areas, coarser sculpture, and more elevated jugal ridge. From *C. Canariensis* they may be separated by being more elevated, longer in proportion to the breadth, and the girdle-scales being larger; also by the coloration, in which reddish tints predominate. I therefore propose to describe it under the name of:—

¹ Man. Conch., ser. I, vol. xiv, p. 184.

2. CHITON CRAWFORDI, n.sp. Fig. II.

Shell elongate-oval, much elevated, carinated. Ground-colour shades of pink, reddish brown, or crimson, often mottled with lighter or darker markings in blotches; spots, almost black in tint, being often present at the junction of the median and lateral areas. The central areas are smooth on the jugal tract, but below are marked with 12-15 conspicuous parallel liræ, only a portion of the upper ones being present. The lateral areas are well raised and smooth. The posterior valve has an elevated, central mucro, and the posterior slope is slightly concave. The anterior valve is smooth. The interior is whitish, with markings of chestnut. Anterior valve with 8, median 1, and posterior valve with 9 slits; the teeth pectinated and the slits inconspicuous. Girdle solid, the scales being fairly large and, under the microscope, closely striate. Length about 30, width about 15 mm.

Hab.—Algoa Bay (Crawford).

I may add that a single specimen collected in Algoa Bay by Mr. Crawford appears to belong to *Ischnochiton (Trachyradsia) fulgetrum*, Rve., which Carpenter considered to be probably from South Africa, and which Mr. Pilsbry has suggested may be the same as *C. planatus* and *C. dentatus*, both described by Spengler, and said to be from the Cape of Good Hope.

ON *ARIOPHANTA DALYI*, N. SUBSP., FROM MYSORE, WITH A NOTE
ON *MARIÆLLA DUSSUMIERI* (VAL.).

By W. T. BLANFORD, LL.D., F.R.S., etc.

Read 10th March, 1899.

IN reply to a letter of mine, asking Mr. W. M. Daly to look for certain snails and slugs, the animals of which are unknown or imperfectly known, he has been so good as to send to me a small collection of land mollusca from the Kadur District, a part of Mysore which has hitherto escaped the notice of malacologists, but which has recently yielded that most interesting discovery *Mulleria Dalyi*.¹ Amongst the forms sent was a slug which Lieut.-Col. Godwin-Austen, to whom I forwarded the specimens, identified with *Mariælla Dussumieri* (Val.). This identification tends to confirm Mr. Cockerell's suggestion² that the original locality for the slug was not the island of Mahé, in the Seychelles, but the port of the same name, a French possession on the Malabar Coast, only 125 miles south by west from Kadur.³

Some of the species sent by Mr. Daly appear to me to be undescribed, but the specimens being barely adult, I prefer awaiting additional evidence before describing them. One mollusc, however, an *Ariophanta*, of which several adult specimens have now reached me, is, I think, worthy of notice. It is evidently allied to the Nilgiri *Ariophanta cysis*, Bs., being somewhat intermediate in form between that species and the Mahableshwar *A. intumescens*, Blf., but it differs in so many characters from both that, although I was acquainted

¹ Ante, pp. 14, 87.

² Nautilus, xii (1898), p. 9.

³ Mr. Webb, in his paper on *Mariælla* (ante, p. 147), appears to have had some difficulty in ascertaining where M. Dussumier's collections were made. That the French traveller collected extensively in Malabar there can be no doubt, for some of the most characteristic Malabar vertebrates, e.g., *Draco Dussumieri*, Dum. et Bib., and *Semnopithecus Dussumieri*, Is. Geoffr. (= *S. hypoleucus*, Blyth), both peculiar to the area, were named after him. A reference to the *Mémoires du Musée d'Histoire Naturelle*, vol. xv, p. 377 (1827), shows that M. Dussumier, who was a merchant and shipowner of Bordeaux, made several voyages to China, and landed more than once in India, where he appears to have collected at different times on both coasts, the Coromandel and Malabar. He probably also touched at the Seychelles, and collected there, for amongst various specimens presented by him to the Museum at Paris, some were from those islands.

That there was once land connection between India and the Seychelles I hold as almost certain, but since the union was probably broken up as long ago as Eocene times, the occurrence of the same species of slug in both is very unlikely.

with several of the varieties of *A. cysis*, I thought the Mysore shell must be regarded as distinct, and I described it as a separate specific form. Colonel Beddome, however, on comparing the supposed new shell with his fine series of *A. cysis* from various hill tracts near the Malabar Coast, found that all passed into each other, and on going over the series again with him I have come to the same conclusion. I have long regarded *A. ampullaroides*, Rv., and *A. auris*, Pfr., as merely varieties of *A. cysis*, and I have specimens from the Nilgiris that are intermediate in character between *A. cysis* and *A. thyræus*, though I do not think that a depressed shell, like *A. thyræus*, with a thickened margin to the aperture, should be classed as a variety of a comparatively globose and thin-lipped form like *A. cysis*.

A precisely similar case is afforded by the group of dextrorse snails known as *Helix semirugata*, Beck, (*H. Tranquebarica*, Beck), *H. Belangeri*, Desh., *H. vitellina*, Pfr., and *H. Bombayana*, Grat., except that these forms, which are connected by intermediate varieties, inhabit the lowlands of the Indian Peninsula and Ceylon, and have a far greater range than *Ariophanta cysis* and its allies, which are confined to the Southern Sahyâdri, or Western Ghats, and are not known to occur north of Mysore. Lieut.-Col. Godwin-Austen has lately shown¹ that *H. semirugata* and several other Indian snails have animals closely resembling that of the type of *Ariophanta*.

It is difficult to say what is the best solution of the problem presented by the nomenclature of species or specific groups so varied as *A. cysis*. Many naturalists will probably object to classing all the forms together, and in any case some distinctive term is necessary for varieties or subspecies that exhibit so many peculiarities as the form figured below. I shall therefore give a description and a sub-specific name by which it may be identified.

ARIOPHANTA DALYI, n. subsp. (*A. cysis*, var.).

Testa sinistrorsa, umbilicata, depresso-globosa, tenuis, oblique striata, fusco-cornea, fascia pallida ad peripheriam circumdata, subtus juxta umbilicum pallido-cornea; spira convexo-conoidea, apice obtuso, sutura leviter impressa; anfr. 5 convexiusculi, ultimus non descendens, ad peripheriam obtuse angulatus, antice latior, superne planulatus, subtus tumidus, nitidus; apertura ampla, diagonalis, oblongo-ovata, vix lunata, margine superiori recto; perist. album, interdum rosco-tinctum, margine superiori vix, dextrali basaliq̄ue expansiusculis, columellari reflexo. Diam. maj. 39, min. 31; alt. 22 mm.

Hab.—Balur, province of Kadur, Mysore.

This form differs from typical *A. cysis* by having a higher spire, by the last whorl being subangulate at the periphery, by its darker colour and by the whitish band round the last whorl. The mouth, too, is differently shaped, owing to the upper margin in *A. Dalyi* being

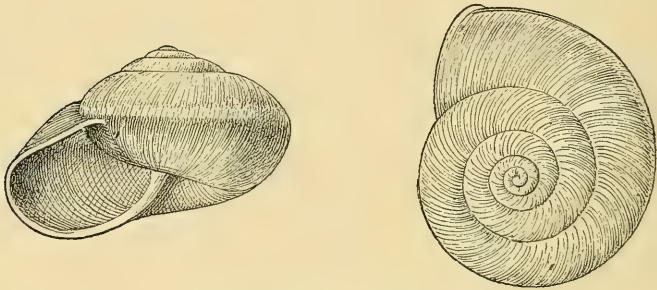
¹ Land and Fresh-water Mollusca of India, ii, p. 81.

straight, not curved. The spiral striation of *A. thyraeus* is completely wanting, as it is also in typical *A. cysis*. The form of *A. cysis* figured in the *Conchologia Indica*, pl. xxv, fig. 5, and said by Hanley (t.c., *Systematic List of Species*, p. vii, footnote) to be the variety named *Helix ampullaroides* by Reeve, approaches more nearly to *A. Dalyi* than any other described race, but still differs considerably.

From *A. intumescens* the present form may be at once distinguished by its more depressed form, much wider umbilicus, and differently shaped mouth.

I am indebted to Lieut.-Col. Godwin-Austen for the following notes on the animal:—The generative organs are like those of *A. levipes*,¹ only the calc-sac is not so long—it is hardly developed at all. The spermatheca is similar, small and sessile. Neck lobes as in other species of the genus *Ariophanta*, the left in two lappets separated by a long interval. The radula has the formula—

$$\begin{aligned} 50 : 3 : 17 : 1 : 17 : 3 : 50 \\ = 70 : 1 : 70 \end{aligned}$$



Ariophanta Dalyi (*A. cysis*, var.).

The form of the teeth as in *A. immerita* and *A. cysis*,² the laterals aculeate. Typical *A. cysis* has a greater number of lateral teeth, a Nilgiri radula exhibiting 82 : 1 : 82.³

The following is a list of the species of typical sinistorse *Ariophanta* known to occur in the Indian Peninsula, and their authentic localities. I have collected six species out of the eight myself.

Ariophanta levipes (Müll.): syn. *Helix trifasciata*, Chemn. Bombay and its neighbourhood; Eastern Guzerat. Type of the genus *Ariophanta*.

Ariophanta Laidlayana (Bs.). Western and South-Western Bengal.

Ariophanta Cadapaensis, Nev.: syn. *Helix Nicobarica*, Mart. and Chemn. Cuddapah (not Nicobar Islands).

¹ Land and Fresh-water Mollusca of India, ii, p. 81, pl. lxxx, figs. 5-5c.

² Op. cit., ii, pl. lxxxii, figs. 6, 7.

³ Op. cit., i, p. 139.

- Ariophanta interrupta* (Bs.): syn. *Helix Himalayana*, Lea. Bengal, Behar, Orissa, Vizagapatam (not Himalayas).
- Ariophanta immerita* (Blf.). South Canara. Doubtfully separable from the last.
- Ariophanta Bajadera* (Pfr.): syn. *Helix ammonica*, Val. Bombay and neighbourhood.
- Ariophanta intumescens*, Blf. Mahableshtar.
- Ariophanta cysis* (Bs.): syn. *Helix auris*, Pfr.; *H. cystis*, Rv.; *H. ampullaroides*, Rv.; and var. *A. Dalyi*, Blf. Southern Sahyádrí, from Mysore to the Nilgiris.
- Ariophanta thyreus*, (Bs.): syn. *Helix rhyssolemma*, Alb. Balarangam, Nilgiri and Anarmalai Hills, S. India.

No species is known from either the Himalayas or Ceylon. For this reason the name *Himalayana*, applied to a species by Lea, is misleading, and Benson's name *interrupta*, given a year later, should be preferred. For similar reasons the name *Nicobarica* is objectionable.

Theobald, in his Catalogue of the Land and Fresh-water Shells of British India, p. 22, includes a species *A. cyclotrema*, from the Sumeysur (Someshtar) Hills, at the base of the Himalayas, north of Tirhut. I have a typical specimen given to me by Mr. Theobald, and I have no doubt the species belongs to *Planispira* or *Trachia*, a section of *Helix* proper. Colonel Godwin-Austen has lately shown reasons for removing the Moulmein *H. retrorsa* from *Ariophanta*,¹ and uniting it to *Hemiplecta*, or some similar generic group. It thus appears probable that *Ariophanta* proper is confined absolutely to the Peninsula of India. So far as is at present known the dextrorse forms of the same genus (*Nilgiri*, G.-A.) are similarly restricted, except that some of them occur in Ceylon.

¹ Land and Fresh-water Mollusca of India, i, p. 133; ii, p. 82.

DESCRIPTION OF *HEMIPLECTA FLOWERI*, n.sp., FROM PERAK.

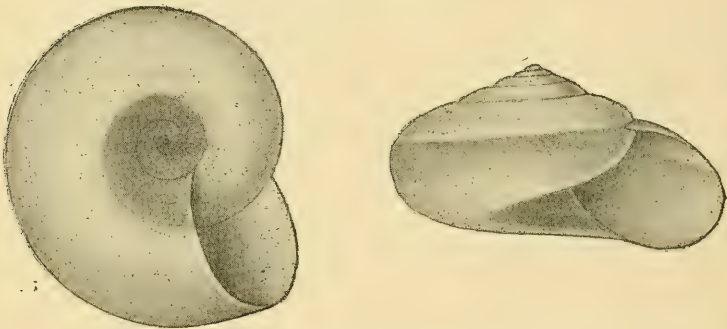
By EDGAR A. SMITH, F.Z.S., etc.

Read 10th March, 1899.

HEMIPLECTA FLOWERI, n.sp.

Testa orbicularis, late perspective umbilicata, flavo-olivacea, supra peripheriam zona pallida infra rufo marginata cincta, infra zonam saturate olivaceo tincta, circa umbilicum rufo-fusca; spira brevissime conica, ad apicem obtusa; anfractus 7, sublente accrescentes, convexiusculi, linea suturali alba rufo marginata sejuncti, superiores 3-4 fere læves, cæteri lineis incrementi obliquis arcuatis sculpti, irregulariter tenuiter et confertim oblique striati, ultimus antice vix descendens, ad peripheriam rotundatus, infra concentricè irregulariter tenuiter striatus; apertura obliqua, latissime lunata, intus cærulescens; peristoma simplex, haud incrassatum, marginibus leviter conniventibus, columellari ad insertionem vix expanso aut reflexo.

Diam. maj. 64, min. 51 mm.; alt. 38 mm.

*Hemiplecta Floweri*, n.sp.*Hab.*—Maxwell's Hill, Larut, Perak.

This very fine species is distinguished by the wide rich brown perspective umbilicus, the orbicular form, and peculiar oblique subwrinkly striation. The coloration is also distinctive. The sutural line itself is white. This is margined on the outside with a dark rufous line half a millimeter to a millimeter in width. The body-whorl slightly above the middle exhibits a pale zone 2-3 mm. in breadth, which is bordered beneath with a dark-red band of about the same width. Beneath this there is a broad dark-olive zone, which gradually becomes lighter upon the base of the whorl until the rich brown of the umbilicus is reached. A feature exhibited by this and

some other species¹ is the presence of one or more linear indentations upon the last whorl within the umbilical opening near the columellar margin.

Lieut.-Col. H. H. Godwin-Austen has a specimen in spirit and has promised to investigate the anatomy. Perhaps he will be able to trace the significance of these indented lines.

I have much pleasure in naming this very fine species after Mr. Stanley Flower, the Director of the Zoological Gardens at Ghizeh, Egypt, by whom they were collected and presented to the Natural History Museum.

¹ E.g., *H. Humphreysiana*, Lea; *H. densa*, Ad. & Reeve.

DESCRIPTIONS OF A NEW VARIETY AND FIVE NEW SPECIES
OF NEW ZEALAND LAND MOLLUSCA.

By HENRY SUTER.

Read 10th March, 1899.

PLATE XV.

1. ENDODONTA (CHAROPA) OTAGOENSIS, n.sp. Pl. XV, Fig. 1.

Shell small, discoidal, broadly umbilicated, fragile, semi-transparent, ribbed, not shining, yellowish-white with irregular reddish-brown streaks, forming mostly zigzag lines; spire flat; whorls 5, the first three very slowly, the others more rapidly increasing, convex; the protoconch of $1\frac{1}{2}$ volutions, whitish, microscopically striate, the other whorls with equidistant, rounded, oblique riblets, about 11 per millim., the interstices with microscopic lines of growth, no spiral striæ; suture deep, periphery rounded; aperture oblique, rotundly lunar, extremities converging, peristome thin, upper margin rapidly advancing, then turning down with a slight concave sinuation, columellar lip regularly arched, callous, and very little expanded towards the umbilicus, which is broad and perspective, about $\frac{1}{3}$ of the greatest diameter; base convex. Diam. maj. 6, min. 5.25 mm.; alt. 2.5 mm.; diam. of umbilicus 2 mm.

Hab.—In the native bush near Dunedin, under pieces of rotten wood. (H. S.)

Type in my collection.

E. Otagoensis is nearest allied to *E. tapirina*, Hutton, and *E. Colensoi*, mihi, but it is larger, and the riblets are more numerous than in both the species mentioned. *E. tapirina* has about 9 riblets per mm.; which are sharp, elevated, every third or fourth riblet being higher than the others, a peculiarity which is characteristic of the species; it is also non-decussate. *E. Colensoi* has 8 to 9 riblets per mm., and the interstices are microscopically decussate.

2. ENDODONTA (CHAROPA) SUBINFECTA, n.sp. Pl. XV, Fig. 2.

Shell very small, subdiscoidal, broadly umbilicated, thin, semi-transparent, ribbed, not shining, yellowish-white with rufous patches above, forming indistinct zigzag bands towards the base; spire almost flat; whorls 5, the first three very narrow, the others more rapidly increasing, the last slightly descending in front, convex; the white protoconch formed by $1\frac{1}{2}$ whorls, which are microscopically striate, the other whorls are adorned with equidistant, oblique, sharp, and rather elevated riblets, about 8 per millim., the interstices microscopically decussate; suture deep; periphery rounded; aperture

oblique, rotundly lunar; peristome thin, sharp, extremities converging, the upper lip slightly advancing, columellar lip regularly arched, slightly callous and expanded; umbilicus broad and perspective, about $\frac{1}{3}$ of the greatest diameter; base convex. Diam. 3, alt. 1.5 mm.; diam. of umbilicus 1.1 mm.

Hab.—Riccarton Bush, near Christchurch (H. S.). Pelorus Valley, Marlborough (J. McMahon).

Type in my collection.

It is very easy to mistake this species for *E. infecta*, Reeve, if it be not carefully examined. The latter is distinguished from it by the following characters, which at the same time will help to complete its diagnosis:—It is somewhat larger, the greater diam. being 3.5 mm., the riblets are closer, about 10 per mm., the interstices are not decussate, the last whorl on approaching the mouth is first a little narrowed over a short distance, and then slightly widened, or inflated, thus giving the shell an oval shape when seen from above; the upper margin of the peristome rapidly advancing and tapering, the outer lip with a concave sinuation, the umbilicus is broader, in proportion of 1 : 2.5 of the greatest diameter, 1 : 2.7 in *E. subinfecta*.

3. FLAMMULINA (PYRRHA) VIRESCENS, n.sp. Pl. XV, Figs. 3-7.

Shell (Figs. 3-3b) small, globosely depressed, perforate, faintly shining, horn-coloured with a greenish hue, which is more distinct at the base, thin, semi-transparent; spire low, convex; whorls $4\frac{1}{2}$, the first three slowly, the remainder more rapidly increasing; protoconch of $1\frac{1}{2}$ whorls, microscopically decussate, whorls flatly convex, somewhat irregularly striulate, with microscopic, narrow, distinct striæ; periphery rounded, subangled in young specimens; suture impressed; aperture transverse, oblique, broadly rotundly lunar, peristome simple, extremities distant, subconvergent, united by a faint callosity; columella vertical for a short distance, reflexed above towards the deep, narrow perforation, and partly covering it; base convex, more shining than the upper surface. Diam. maj. 9, min. 7.5 mm.; alt. 5.5 mm.; diam. of perforation 0.5 mm.

Hab.—At the foot of Mt. Stokes, Marlborough, South Island. (J. McMahon.)

Type in my collection.

From *F. cressida*, Hutt., it may at once be distinguished by its much smaller size and different colour; from *F. subincarnata*, mihi, by the much fainter radiate striæ, the presence of microscopic decussation, the rounded periphery in the adult, etc.

Animal with a well-developed caudal gland (Fig. 6).

Jaw (Fig. 4) slightly arcuate, narrower in the middle, very thin, consisting of about 45 narrow straight plaits, lying close together, which are finely longitudinally striate and indent the cutting edge. It agrees with the jaws of the other two known species.

Radula (Fig. 5) has the formula 23 : 10 : 1 : 10 : 23. The rhachidian tooth is long and narrow; reflected portion short, tricuspid, covering about one-third of the basal plate; the median cusp is short,

broad, with a small rounded mesocone, the lateral cusps are minute. The admedians (Nos. 1-10) have a short, broad inner cusp, with short rounded cone, and a small outer cusp. In the succeeding laterals (Nos. 11-16), the inner cusp is strong and broad, becoming (No. 16) as long as the basal plate; the outer cusp, though larger than in the preceding ones, is still small. The marginals that follow (Nos. 17-32) are tricuspid, with broad, short basal plate, the mesodont at first flanked by a narrow, sharp endodont, and at a wider interval by a small ectodont, gradually the endodont and mesodont coalesce, till they finally form a single bifid denticle, with a small separate ectodont. The last tooth of the series (No. 33) is minute, quadrate, with a single small denticle.

Reproductive organs (Fig. 7). There is a long vestibule, the penis is stout, broad, somewhat enlarged below the middle, constricted above it, the distal end is flatly convex, the retractor muscle is inserted at the anterior side of the distal portion, whilst on the posterior end the vas deferens enters. A rather long distance from the juncture of the penis with the vestibule, on the opposite side, the long, subcylindrical receptaculum seminis arises; this tapers off at its extremity and forms a rather long, filiform cæcum, slightly globular at its end. The most interesting feature in these reproductive organs is the fan-shaped, radially grooved appendiculum just opposite the receptaculum seminis. In no other genus of New Zealand land mollusca have I come across this interesting organ, although it is known to occur in some Australian forms; in these, however, it is of a different shape, forming only a long, cylindrical sac. I have not had an opportunity of dissecting the two other species of *Pyrrha*, and am therefore unable to say whether the appendiculum is a constant character of the subgenus. Since, however, in their shells and their dentition the three species closely resemble one another, it is but fair to presume that a similar appendiculum is present in all.

4. FLAMMULINA (PHACUSSA) FULMINATA, Hutton, var. COSTATA, n. var.

Pl. XV, Figs. 8 & 9.

This variety differs from the type in its somewhat larger size, in being costate, and in having mostly a different colour pattern. The protoconch is microscopically radiately striate, the other whorls have subequidistant low riblets, 4 to 5 per mm., between them are minute lines of growth, which are decussated by spiral striæ. The species, which is only finely striate, is also microscopically decussate, a feature not mentioned by Hutton. Of the six specimens (all of them more or less damaged) only one shows the reddish-brown longitudinal zigzag bands, the others having only broad, oblique streaks of the same colour. The number of whorls is the same in both. Diam. maj. 12, min. 11 mm.; alt. 7 mm.

Hab.—Resolution Island. I owe the specimens to the kindness of Mr. R. Henry, caretaker of this reserve for the New Zealand fauna.

Type in my collection.

No figures of *F. fulminata* having ever been published, I take this opportunity of giving some (Figs. 8–8*b*) after a specimen in my collection from Stewart Island.

Animal with a distinct caudal pore.

Jaw the same as in the other species of *Phacussa*.

Radula has the formula 25 : 15 : 1 : 15 : 25, having four more teeth in each transverse row than the type, as described and figured by Capt. Hutton, but otherwise the teeth are very much of the same character. The central tooth is tricuspid, with the side cusps minute, the laterals lack the entocone, the mesocone being large, these are followed by four transitional teeth, and there are 21 marginals with an oblique mesocone only.

The *Reproductive organs* (Fig. 9) are very simple. The penis is broadest at its distal end, at the outer end the retractor muscle is inserted, and opposite to it the vas deferens enters. The free oviduct is long and cylindrical, and on the side towards the male organ the oblong receptaculum seminis, with a short distal cæcum, takes its origin a little above the vestibule.

In *Phacussa hypopolia*, Pfr., the genital organs are very similar.

5. FLAMMULINA (PHACUSSA) HENRYI, n.sp. Pl. XV, Figs. 10–13.

Shell (Figs. 10–10*b*) subdiscoidal, umbilicated, with a low depressed conical spire, uniformly light brown, not shining, rather thin, costulate; whorls 5, first slowly and then more rapidly increasing; protoconch of $1\frac{1}{2}$ whorls faintly microscopically decussate, the other whorls with sharp, subequidistant riblets, about 3 per mm., the interstices microscopically decussated by numerous incremental and spiral striæ; the $1\frac{1}{2}$ whorls following the protoconch are sometimes ornamented with rufous zigzag lines; suture impressed; periphery rounded; aperture oblique, broadly rotundly lunar, peristome simple, with a slight callus inside, that is more pronounced on the columellar lip, which is reflexed towards the umbilicus; the latter is narrow, open, deep, showing two volutions, umbilical region whitish; base convex. Diam. maj. 10, min. 8·8 mm.; alt. 5·5 mm.; diam. of umbilicus 1·5 mm.

Hab.—Resolution Island.

Type in my collection.

I have much pleasure in naming this species after Mr. R. Henry, of Resolution Island, who so very kindly collected a number of shells on this hitherto conchologically unexplored island.

Animal with parapodial groove and small caudal pore.

Jaw (Fig. 11) consisting of numerous vertical, finely longitudinally striated plaits. The figure shows the jaw in the form it had when separated from the buccal mass.

Radula (Fig. 12) has the formula 24 : 6 : 1 : 6 : 24. The central tooth has a short, heart-shaped reflected portion, with a wide mesocone, not extending to the margin of the basal plate, no side cusps. The admedians have a strong, stout mesocone, at first vertical, but becoming ultimately very oblique and directed inwards, and

a minute ectocone; then follow five transitional teeth with basal plates, increasing in size, with small reflected portion and an aculeate mesocone gradually becoming narrower. Finally, there are 19 true marginals, having a small quadrate basal plate, to the inner side of which is attached a long, aculeate mesocone with a short projection above.

This species is nearest to *F. Helmsi*, Hutton, but has much more remote costæ and a wider umbilicus. From *F. fulminata costata* it is distinguished by the more distant and sharp riblets, and the much wider umbilicus.

6. PARYPHANTA EDWARDI, n.sp. Pl. XV, Figs. 14, 15.

Shell (Fig. 14)¹ large, subdiscoidal, umbilicated, brownish-black, submembranaceous, shining; spire low, broadly conoidal; whorls $3\frac{1}{2}$, rapidly increasing, flatly convex; protoconch of $1\frac{1}{2}$ whorls, almost smooth, but faintly radiately striated, light brown, the following whorl darker, malleated, the last whorl somewhat irregularly obliquely plaited in the direction of the growth-lines, crossed at right angles by more or less distinct shallow furrows; suture impressed; aperture oblique, oval, but little excavated by the penultimate whorl, shining within, and of a dark bluish tint, peristome thickened by the overlapping epidermis, columellar lip oblique, but very little expanded above, extremities converging, united by a very thin callosity on the penultimate whorl. Umbilicus pervious, moderate, deep, about $\frac{1}{3}$ of the minor diameter. Base smoother than the upper surface and more shining, convex. Diam. maj. 30, min 25 mm.; alt. 20 mm.

Hab.—Hossack Downs, Canterbury, where it was found by my son, in whose honour the species is named.

Type in my collection.

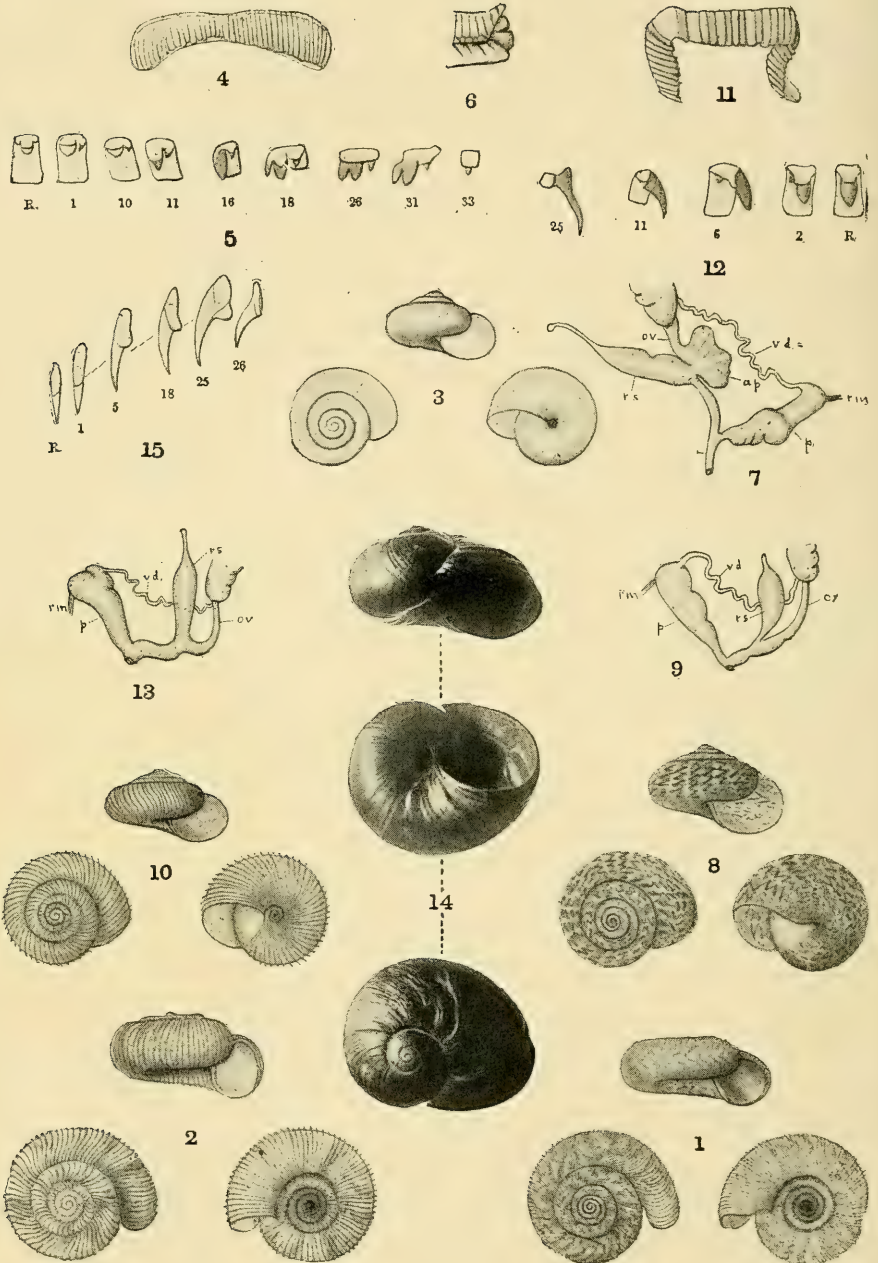
This species stands nearest to *P. atramentaria*, Shuttl., from Victoria, but is at once distinguished from it by the much more rapidly increasing whorls, the last occupying nearly $\frac{2}{3}$ of the greater diameter, and by its wider umbilicus.

Radula (Fig. 15) has the formula 26 : 1 : 26. The aculeate teeth increase in size from the centre to the margin, except the last one, which is smaller. The rhachidian tooth is short and with straight sides, the five following teeth are similar but longer, they then take on a more and more triangular shape.

The radula of *P. atramentaria* has the formula 50 : 1 : 50, the teeth increasing in size from the middle to about the 15th, thence getting slowly shorter towards the margins.

The only specimen I have contained the dried-up animal, thus enabling me to prepare the radula, but leaving no chance for examining the reproductive organs.

¹ For the photographs I am indebted to Capt. F. W. Hutton, F.R.S., etc., and they were taken by Mr. W. Sparkes, taxidermist in the Canterbury Museum.



H. Suter del.

MALACOLOGICAL SOCIETY OF LONDON.

INCOME AND EXPENDITURE FOR THE YEAR ENDING 31st DECEMBER, 1898.

Dr.	£ s. d.	Cr.	£ s. d.
To Balance from last year	26 17 2	By Cost of "Proceedings"—	
" Annual Subscriptions—		Printing and Postage	£80 16 2
Ordinary Members	£38 17 0	Illustrating	18 0 6
Corresponding Members	19 6 1		—————
" Annual Subscriptions in arrear—		Printing Circulars, etc.	98 16 8
Ordinary Members	£7 7 0	Postage and Stationery	2 7 6
Corresponding Members	3 15 0	Gratuities to Attendants, etc.	5 3 8
" Annual Subscriptions in advance—			—————
Ordinary Members	£2 2 0		2 10 6
Corresponding Members	6 9 0		
" Entrance Fees	8 11 0		
" Donations for Illustrations	4 4 0		
" Advertisements in "Proceedings"	2 19 6		
" Sale of "Proceedings"	4 0 0		
" Dividends on £50 Metropolitan 2½% Stock	18 15 0		
"	1 5 0	" Balance in hand	26 18 5
	—————		—————
	£135 16 9		£135 16 9

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.
4th February, 1899.

(Signed) { HENRY WOODWARD.
 { WALTER CROUCH.

ORDINARY MEETING.

FRIDAY, 13TH JANUARY, 1899.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc., President, in the Chair.

Mr. W. Crouch and Dr. H. Woodward were appointed Auditors of the Accounts of the Society for the year 1898.

The following communications were read:—

1. "Notes on the Anatomy of *Trachycystis*, *Dorcasia*, and *Isomeria*." By W. Moss and W. M. Webb, F.L.S., etc.
2. "Illustrations of, with Notes on some, Non-Marine Hawaiian Mollusca." By E. R. Sykes, B.A., F.L.S., etc.
3. "Descriptions of new Non-Marine Mollusca from the Hawaiian Islands." By C. F. Ancey.
4. "Note on *Voluta Roadnightæ*." By Agnes Kenyon.

Mr. P. Lawson exhibited a manuscript catalogue of British shells drawn up by a Mr. Longstaff early in this century.

Mr. A. S. Kennard exhibited a specimen of *Physa heterostropha*, Say, an American shell living in a pond near Birmingham. Mr. G. B. Sowerby exhibited a fine group of *Arca Noë* obtained near Naples, and some brilliantly coloured Unionidæ from Sugar Lake, Wisconsin.

ANNUAL GENERAL MEETING.

FRIDAY, 10TH FEBRUARY, 1899.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc., President, in the Chair.

Mr. H. W. Burrows and Mr. A. S. Kennard were appointed Scrutineers.

The following Report was read:—

"Your Council, in presenting their sixth Annual Report, have again to chronicle a year of steady progress, although the membership of the Society unfortunately shows a slight decrease as compared with that of last year.

The roll on December 31st, 1898, stood as follows:—

Ordinary members	.....	.....	.....	.....	.....	.....	.....	94
Corresponding members	.....	.....	.....	.....	.....	.....	.....	74
Total								168

the totals for the two preceding years being 173 in 1897, and 162 in 1896.

During the past year six members have resigned, while the Society has further to deplore the loss of five of its members by death, and of

one member who has been removed through the operation of Rule X. The Society has thus lost 12 members, while only seven new members have been elected.

The finances of the Society are in a flourishing condition. After payment of all liabilities there remains a balance of £26 18s. 5*d.* in the Treasurer's hands, whilst the sum of £50 still remains invested in Metropolitan 2½ per cent. stock.

The number of papers communicated to the Society in the year was thirty-two, attributable to twenty authors.

Since the last Annual General Meeting, three more numbers of the 'Proceedings' have been issued, forming the first half of Vol. III, comprising 186 pages, with ten plates and numerous illustrations in the text.

Your thanks are due to the following who have borne a proportion of the cost of the illustrations, or who have assisted by furnishing drawings:—J. F. Babor, the Rev. R. Ashington Bullen, R. H. Burne, O. Collett, G. C. Crick, S. I. Da Costa, Lieut.-Col. H. H. Godwin-Austen, J. C. Melvill, J. E. S. Moore, E. A. Smith, G. B. Sowerby, H. Suter, E. R. Sykes, W. M. Webb, M. F. Woodward. Further, your thanks are specially due to the Council of the Linnean Society, through whose kindness the Society, as in previous years, has been permitted to hold its meetings in Burlington House."

On the motion of Dr. W. T. Blanford, seconded by Mr. H. W. Burrows, the above was adopted as the Annual Report of the Society.

The following were elected Officers and Council for the year 1899:—

President.—W. T. Blanford, LL.D., F.R.S., etc.

Vice-Presidents.—Lieut.-Col. H. H. Godwin-Austen, F.R.S., etc.; Prof. G. B. Howes, LL.D., F.R.S., etc.; J. Cosmo Melvill, M.A., F.L.S., etc.; E. A. Smith, F.Z.S., etc.

Treasurer.—G. F. Harris, F.G.S., etc.

Secretary.—Martin F. Woodward.

Editor.—B. B. Woodward, F.L.S., etc.

Six other Members of Council.—R. H. Burne, B.A., F.Z.S., etc.; H. W. Monckton, F.L.S., etc.; R. B. Newton, F.G.S., etc.; E. R. Sykes, B.A., F.L.S., etc.; Lieut.-Col. L. W. Wilmer; Henry Woodward, LL.D., F.R.S., etc.

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

OBITUARY NOTICES.

Lieut. C. E. BEDDOME, the Australian conchologist, who became a member of this Society in 1893, was an ardent and capable collector, especially devoting himself to Australian land-shells and Tasmanian marine mollusca. He published but little himself, the results of his collecting being described by Brazier and Petterd. He gave largely to the British Museum and to the Academy of Natural Sciences of Philadelphia, which latter body elected him a corresponding member.

GEORGES BERTHELIN, a student of the fossil mollusca and foraminifera of the Paris Basin Tertiaries, had also joined the Society in 1893.

By the death of JOSEPH CHARLES HIPPOLYTE CROSSE, not only this Society, but the whole malacological world, has suffered a severe loss. Crosse was born at Paris in 1826, and from 1861 was co-editor of the *Journal de Conchyliologie* with the late Dr. Paul Fischer. He was author of some 375 papers on mollusca, mostly descriptive of new exotic forms, besides contributing sections on land mollusca to the "Mission Scientifique au Mexique" and the "Histoire . . . de Madagascar." He died at Paris, 7th August, 1898. His connection with this Society likewise dates from 1893.

MR. C. N. PEAL, F.L.S., of Ealing, and DR. W. G. SHEPHERD were original members of the Society, and both of them enthusiastic collectors.

Amongst eminent malacologists who, however, did not belong to our body, allusion must be made to:—

FÉLIX BERNARD (1863–98), of the Musée d'Histoire Naturelle, Paris, whose researches on the Morphology of the Hinge in Pelecypoda have led to such important results, and whose premature death is much to be lamented.

A. EVERETT, whose name will always be associated with Borneo, whence he brought to enrich our collections such wonderful new forms of *Diplommatina* and *Opisthostoma*. He had lately extended his researches to other islands of the Eastern Archipelago.

DR. KARL LUDWIG FRIDOLINE SANDBERGER (1826–98), the well-known author of "Die Land- und-Süsswasser-Conchylien der Vorwelt," a work which will ever remain a classic for palæoconchologists.

Major-Gen. R. G. WOODTHORPE, R.E., who, though not a naturalist himself, collected and forwarded from the Siam frontier of India a fine series of shells, many examples of which still remain to be worked out.

ORDINARY MEETING.

FRIDAY, 10TH FEBRUARY, 1899.

W. T. BLANFORD, LL.D., F.R.S., etc., President, in the Chair.

The following were elected to membership of the Society: Francis J. Ede and V. V. Ramanan.

Mr. E. R. Sykes exhibited a series of Zonitoid and Helicoid land-shells from Ceylon.

The Linnean Society exhibited the Linnean types of Mollusca.

ORDINARY MEETING.

FRIDAY, 10TH MARCH, 1899.

W. T. BLANFORD, LL.D., F.R.S., etc., President, in the Chair.

The following were elected to membership of the Society:—Evenor Dupont and Kenneth Hurlstone Jones.

The following communications were read:—

1. "On an apparently undescribed *Ariophanta* from Mysore, with notes on *Mariella Dussumieri*." By W. T. Blanford, LL.D., F.R.S., etc.

2. "Description of new Species of *Hemiplecta* from Perak." By E. A. Smith, F.Z.S., etc.

3. "On new Species of *Chiton* and *Dinoplax* from South Africa." By E. R. Sykes, B.A., F.L.S., etc.

4. "Descriptions of five new Species of New Zealand Land Mollusca." By H. Suter.

Mr. J. H. Vanstone exhibited embryonic shells of *Planorbis corneus*, drawing attention to their sinistral torsion and sculptured character; also dissection of the nervous system of *Philine* and *Aplysia*, illustrating the loss of the streptoneurous condition by the Opisthobranchia.

Mr. S. I. Da Costa exhibited a new species of *Papuina* from New Guinea, and four species, new to science, of *Rhodea* from South America.

Mr. W. M. Webb exhibited two live specimens of *Ampullaria* and shells of different species of that genus collected by Major Stanley Patterson in Venezuela. The living examples were stated to have been obtained during the dry season from the upper parts of growing trees.

Mr. E. R. Sykes exhibited four species of *Clausilia* from Tonquin and an *Ancylus* from the Sandwich Isles.

Messrs. E. A. Smith and E. R. Sykes placed specimens upon the table in illustration of their papers.

NOTES ON *PALUDESTRINA JENKINSI* (SMITH) AND *P. CONFUSA*
(FRAUENF.).

By A. S. KENNARD and B. B. WOODWARD, F.L.S., etc.

Read 14th April, 1899.

PALUDESTRINA JENKINSI (Smith).

Paludestrina Jenkinsi (Smith) was first described, as *Hydrobia Jenkinsi*, by Mr. E. A. Smith in 1889,¹ from examples taken at Plumstead by Mr. A. J. Jenkins. Previous to this, however, three examples had been presented to the British Museum (Natural History) by Mr. Walter Crouch, who had obtained them at Beckton. Preceding Mr. Smith's description was a note on the same form by Mr. J. T. Marshall,² who considered it a variety of *P. ventrosa* (Mont.), and named it var. *carinata*. Mr. Jenkins informs us that he first noticed it in 1883 at East Greenwich. It is worthy of note that Mr. G. Sherriff Tye had examples, sent to him in 1886 by the late Miss E. R. Fairbrass, that had been taken between Deal and Sandwich, probably from the same locality where Mr. L. E. Adams obtained his specimens in 1891.³ Since the species was described it has been found in England at Topsham, Lewes, Hythe, Short Heath, near Dudley, near Middlesbrough, and Droylsden, Lancashire. In all these places it occurred abundantly, with the exception of the last-named, where a single dead specimen only was obtained. It has also been met with in several localities in Ireland, and we are greatly indebted to Mr. R. Welch, of Belfast, for kindly furnishing us with particulars. The first examples obtained in Ireland were procured by Mr. Welch in 1893, and were dead specimens from those curious 'pockets' of shells among sand-dunes at Port Stewart, co. Derry. Since then many examples have been seen living near by. Dead specimens have occurred at St. Johnstone, co. Donegal, and numerous live shells at Carrigans, in the same county, both these localities being on the River Foyle. It has also been taken at Culmore, co. Derry; Kenmare, co. Kerry; Newry, co. Down; and Antrim, at the mouth of the River Sixmilewater. It has not hitherto been detected outside the British Isles. The only contribution to its anatomy was made by one of us in 1892,⁴ when the radula was described and figured, and contrasted with that of *Paludestrina ventrosa*.

¹ "Notes on British *Hydrobiæ*, with description of a supposed new species": Journ. Conch., vol. vi (1889), pp. 142-5.

² "On *Hydrobiæ* and *Assimineæ* from the Thames Valley": t.c., p. 141.

³ Journ. Conch., vol. vii (1893), p. 148.

⁴ B. B. Woodward, "On the Radula of *Paludestrina Jenkinsi* (Smith), and that of *P. ventrosa* (Mont.)": Ann. & Mag. Nat. Hist., ser. vi, vol. ix (1892), pp. 376-378.

The opinion has been expressed that *P. Jenkinsi* is identical with *P. crystallina*, Pfr., but the Rev. Prof. H. M. Gwatkin informs us that the radulæ differ. He writes: "In the central tooth *P. crystallina* has a narrower form, a more decided anterior concave sweep, and more conspicuous basal teeth nearer to the posterior edge. But the central denticle is less developed than in *P. Jenkinsi*. So far the specific distinction is clear. My doubt is that I have a strong impression that one or the other is very variable."¹ The non-carinated examples of these species are certainly very near each other, but in the carinate specimens the carinæ in *P. Jenkinsi* are by no means so pronounced as in *P. crystallina*, and in the latter species they may rather be described as a series of spines which thus contrast with the tufts on the former. Hence we consider that *P. Jenkinsi* is a good species, and not to be ranked as one of the numerous synonyms of *P. crystallina*.

It was originally suggested by Mr. Jenkins² and Mr. W. Crouch³ that the species is not truly indigenous, but has been introduced from abroad, whilst Mr. L. E. Adams has suggested that it may have been introduced with timber from Finland.⁴ That it has hitherto been undetected abroad rather militates against the introduction theory, and no one has suggested so far that *Assimineæ Grayana* (Leach), which is practically confined to the Thames estuary, is also an involuntary immigrant.

In 1897 our friend Dr. Frank Corner sent us a small box of shells which he had obtained from a section exposed in enlarging one of the 'fleets' in the Roding Valley, near Barking. The shells occurred in patches under about two to three feet of 'marsh clay,' which deposit, Dr. Corner states, is in age "within the historic period." There were about a dozen examples of *Paludestrina Jenkinsi* associated with *Bythinia tentaculata* (Linn.), *Limnæa truncatula* (Müll.), *Planorbis marginatus*, Drap., and *P. spirorbis* (Linn.). These shells still retain their periostracum, a characteristic of many of the shells from the alluvium. The obvious conclusion is that the species has lived in this country for a much longer period than has hitherto been considered to be the case. In 1859 the late Mr. G. B. Sowerby figured, but did not describe,⁵ a shell under the name of *Rissoa castanea*, Jeffreys, examples of which had been taken by Mr. Pickering in a ditch about two miles below Gravesend. J. Gwyn Jeffreys, in alluding to these shells, states that they were considered, though with some doubt, to be a variety of *Hydrobia ventrosa* by Forbes and Hanley, but that they so greatly resembled a species of *Hydrobia* from the Cape of Good Hope that he

¹ Cf. L. E. Adams: The Collectors' Manual, 2nd ed., 1896, p. 145.

² "Distribution and Habits of the British *Hydrobiæ*": Science Gossip, vol. xxiv (1890), p. 106.

³ "Note on *Hydrobia Jenkinsi*": Essex Nat., vol. iv (1890), p. 213.

⁴ "A Theory as to the possible Introduction of *Hydrobia Jenkinsi*": Journ. Conch., vol. vii (1893), pp. 148-150.

⁵ Illustrated Index of British Shells, pl. xiv, fig. 11.

could not include them in the English Molluscan fauna, and added that repeated search in the same locality had failed to find any more examples.¹ Since Sowerby's figure somewhat resembles *Paludestrina Jenkinsi*, there seemed a probability that the species might be represented in the Jeffreys Collection, now alas!, at Washington, so examples were forwarded to Dr. W. H. Dall, who most kindly replied that while he has failed to trace any example of the *Rissoa castanea* in that collection, there were two examples agreeing in every respect with the specimens of *Paludestrina Jenkinsi* forwarded, and labelled "*Hydrobia ferrusina*, Hampshire, Sowerby." There can be no doubt that these are the shells which Jeffreys states had been sent to him some years ago by the late G. B. Sowerby, from that county.² Additional proof is thus furnished that the shell has been both overlooked and misidentified.

PALUDESTRINA CONFUSA (Frauenf.).

The first accurate record of this species for England was in 1840,³ when Dr. J. E. Gray noted it, under the name of *Littorina anatina*, Drap., as occurring in the marshes at Greenwich with *Assimineia Grayana*, Leach, and pointed out the differences between it and *Bythinia ventricosa*. In 1853 it was figured as *Rissoa anatina*, Drap.?, and a description of the animal given by Forbes and Hanley,⁴ who state that their examples were sent them by Mr. Pickering. They further remark that it was rare in the marshes near Greenwich.

J. Gwyn Jeffreys in 1862 noted that its habitat was in "muddy ditches which are occasionally overflowed by the tide of the Thames from Greenwich to below Woolwich," and he also noted that it had been found by Mr. Prestwich and Mr. Pickering in peat in the main drainage cutting between Woolwich Arsenal and Crossness.⁵ Mr. J. T. Marshall informs us that about 1870 it occurred between Erith and Abbey Wood, and also at Tilbury. Since then extensive building and draining operations have entirely changed the aspect of things, and between 1889 and 1893, when systematic search was made for this species, it was only taken in four localities—a single dead shell at Beckton, one dead and two live shells near Abbey Wood, one live shell between Erith and Dartford Creek, and numerous examples from a small ditch about half a mile west of Erith. In 1895 we took a single live specimen from the last-named locality. The ditch has now become dry, and no living example having since been found in the district, the mollusc must, we are afraid, be now considered extinct, though there is yet a possibility it may be found in some

¹ British Conchology, vol. i, pp. 68, 69.

² *Ibid.*, p. 69.

³ W. Turton: "A Manual of the Land and Fresh-water Shells of the British Islands," 1840, p. 87.

⁴ "History of British Mollusca," vol. iii (1853), p. 134, pl. lxxxvii, figs. 3, 4.

⁵ British Conchology, vol. i, pp. 64, 65.

other part of the Thames estuary. It has been suggested that this form also is not truly a native of this country, but besides the examples from the peat near Woolwich (the peat of the Thames alluvium probably belongs to the Bronze Age, but it is certainly pre-Roman), *P. confusa* has been found in the Pleistocene beds at West Wittering,¹ in Sussex, and at Stone,² in Hampshire. Examples from both these localities are preserved in the Museum of Practical Geology. The specimens from the peat we have been unable to trace.

¹ C. Reid: Quart. Journ. Geol. Soc., vol. xlviii (1892), p. 357.

² C. Reid: op. cit., vol. xlix (1893), p. 329.

DESCRIPTION OF *NASSA SUBCONSTRICTA*, n.sp., FROM
PORT CANNING, MOUTH OF THE GANGES.

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

Read 14th April, 1899.

Testa elongata, antice abbreviatio constricta, postice acuminata, pallide fuscescens, ad apicem alba, papillaris; spira acute pyramidalis, sutura angusta, anfractus 7, primi ($2\frac{1}{2}$) læves, rotundati, sequentes levissime convexi, superne leviter constricti, costis crassis lævibus rotundatis instructi, interstitiis spiraliter striati; anfractus ultimus convexiusculus, semicostatus, basin versus spiraliter tenuiter confertim liratus, prope aperturam costa crassa munitus; apertura parviuscula, intus albida, paucilirata; columella rectiuscula, alba, extus tenuiter callosa, vix effusa, intus plicata; labrum externum arcuatum, leviter reflexum; canalis brevis, latiusculus, vix recurvus. Long. 10, maj. diam. 4.5 mm.



Nassa subconstricta, n.sp.

Hab.—Port Canning, mouth of the Ganges (brackish water).

A well-defined species, of which several specimens were found in the collection of the late Colonel Mainwaring labelled "Port Canning." It has the look of a brackish-water shell. The longitudinal ribs of the spire are thick, rounded, and smooth, the spiral striæ in the interstices being quite conspicuous; nearly half the body-whorl is destitute of ribs, and in this portion of the shell the constriction, a little below the suture, is more clearly noticeable than where it is crossed by the ribs. In all the specimens there is a strong rib, or varix, behind the mouth.

DESCRIPTIONS OF SUPPOSED NEW SPECIES OF
STREPTAXIS AND *AMPHIDROMUS*.

By HUGH FULTON.

Read 14th April, 1899.

1. *STREPTAXIS POLITUS*, n.sp. Fig. I.

Shell depressed-globose, rather widely umbilicated, with short oblique striæ at the suture, otherwise smooth above and below, polished; whorls $6\frac{1}{2}$, slowly and regularly increasing, the last having two or three prominent varices; aperture oblique, lunate, not descending; peristome slightly expanded and reflected. Diam. maj. 28, alt. 14 mm.

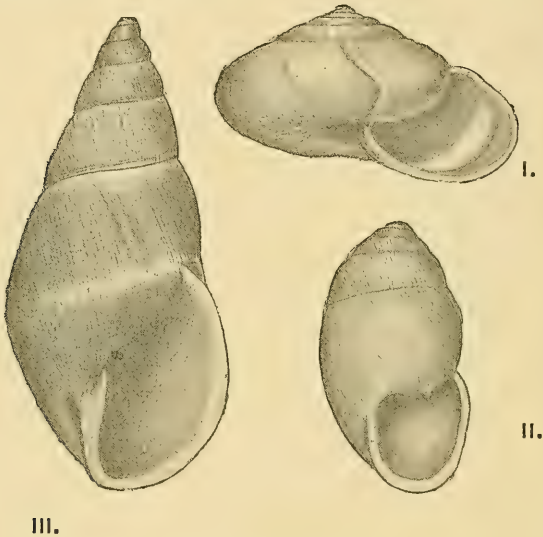


FIG. I. *Streptaxis politus*, n.sp.
 ,, II. *Streptaxis elongatus*, n.sp.
 ,, III. *Amphidromus Dautzenbergi*, n.sp.

Hab.—Brazil.

In general form very like *S. candidus*, Spix, but distinctly separable from that and other species known to me by its smooth and polished upper surface.

2. *STREPTAXIS ELONGATUS*, n.sp. Fig. II.

Shell rimate, oval, somewhat thin, whitish, polished; nucleus and front of last whorl almost smooth, remainder of exterior with

conspicuous close-set, oblique striæ; whorls $6\frac{1}{2}$, convex; aperture semi-ovate, erect; peristome slightly expanded, white; parietal wall with a small tooth or callosity. Alt. 24, diam. maj. 15 mm.

Hab.—Unknown.

Of this fine and distinct new form two specimens are before me. The nearest species known to me are the two East African ones *S. Mamboiensis* and *Kibweziensis* of E. A. Smith. These, however, are readily distinguished by their much smaller dimensions, being but little more than half the size of the present form.

3. AMPHIDROMUS DAUTZENBERGI, n.sp. Fig. III.

Shell dextral, oblong-conic, very narrowly umbilicated, slightly polished, of moderate solidity, whitish above, changing to greenish-yellow below, obscurely spirally striated; suture of last whorl slightly impressed and bordered by a narrow white band; whorls $6\frac{1}{2}$, the last obtusely angulated above the aperture at the periphery, last half indistinctly malleated; aperture semi-oval, white within; peristome moderately expanded, white, margins joined by a very thin callus; columella almost erect, rounded, widening at point of insertion. Alt. 42, diam. maj. 21 mm.

Hab.—Tonkin.

A single specimen only of this distinct new form, received with other shells from Tonkin. I have much pleasure in naming this species in honour of M. Ph. Dautzenberg.

REMARKS ON THE SHELLS OF THE GENUS *RHODEA*, WITH DESCRIPTIONS OF TWO NEW SPECIES FROM SOUTH AMERICA, AND THE DESCRIPTION OF *PAPUINA CHILOCHROA*, N.SP., FROM BRITISH NEW GUINEA.

By S. I. DA COSTA.

Read 14th April, 1899.

UP to the present only three species of the singular and interesting genus *Rhodea* have been described, all from the north-western portion of South America, and all admirably figured in the *Journal de Conchyliologie* for 1876, pp. 5-24, pl. i, figs. 1-3. The peculiarities of the shells of this genus lie principally in the remarkable triangular mouth, the excavation of the base, and the spiral columellar fold which ascends to the very apex, as shown in Figs. I and II of prepared specimens of *R. gigantea*, Mouss. During the preparation of the adult specimen, nine embryonic shells fell out, thus showing the animal to be viviparous, and a tenth young shell was found adhering to the parent, about a third of the way up the outside. Another peculiarity about the shells of this genus is, that in some species they are dextral, in others sinistral, whilst in one about to be described both dextral and sinistral examples occur.

GENUS *RHODEA*.

1. *RHODEA GIGANTEA*, MOUSS.: Pfr., Nov. Conch., iv, p. 119, pl. cxxvii, figs. 10, 11. Shell dextral.
2. *R. WALLISIANA*, DOHRN: Jahrb. Deutsch. Malak. Ges., vol. ii, p. 307, pl. x, figs. 7, 8. Shell sinistral.
3. *R. PFEIFFERI*, CROSSE: Journ. de Conch., 1876, p. 14, pl. i, figs. 1-1 b. Shell dextral.

4. *RHODEA ÆQUATORIA*, n.sp. Figs. III and IV.

Testa elongata, cylindræea, vel dextrorsa vel sinistrorsa, sordide albida, epidermide lutescente plus minus induta; spira cylindræea, superne sensim angustata, ad apicem obtusiuscula; anfractus 13, superiores quinque convexiusculi, sex sequentes planati, duo ultimi concavi, ad suturam acute et prominente carinati, oblique arcuatim striati, ultimus ad peripheriam carinatus, infra carinam radiatim striatus, planus; apertura—?(fracta); columella arcuata, spiraliter volvens, umbilicium cavum formans. Long. 23, diam. 4.5 mm.

Hab.—Paramba, Ecuador.

From the imperfect condition of the apertures of these shells it is impossible to ascertain the exact form of the mouth, but from their general aspect it is probable this is similar to that of *Rhodea Wallisiana*, Dohrn, which, however, is a somewhat larger species. Two specimens

only were found by Mr. Rosenberg during his recent travels in Ecuador, one being dextral, the other sinistral.

5. RHODEA CROSSEANA, n.sp. Fig. V.

Testa cylindræcea, apicem versus sensim angustata, tenuis, subpellucida, cornea; anfractus 13, superiores 3-4 læves, convexi, sequentes 2-3 convexi, cæteri fere plani, oblique tenuiter et confertim striati, sutura obliqua inter anfract. paucos ultimos carinata, sejuncti, ultimus ad peripheriam acute carinatus, infra carinam profunde excavatus; apertura irregulariter quadrata, bicanaliculata; columella spiraliter torta, intus ascendens, umbilicum fere ad apicem, pervium formans; labrum tenue, in medio angulatum, canaliculatum, infra concavum. Long. 31, diam. 5 mm.

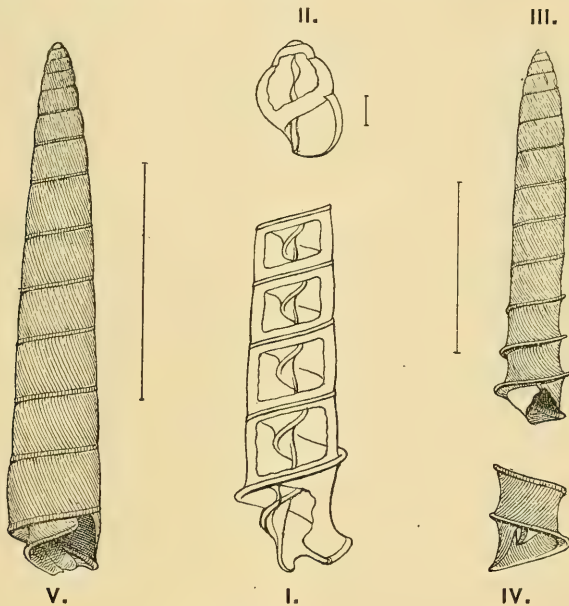


FIG. I. Portion of *Rhodæa gigantea*, Mouss., with the outer walls removed to show the spiral columellar fold.
 ,, II. A young specimen of the same, showing the form and the columellar fold.
 ,, III. *Rhodæa æquatoria*, n.sp. Dextral form.
 ,, IV. ————. Sinistral form.
 ,, V. ———— *Crosseana*, n.sp.

Hab.—River Dagua, United States of Colombia (W. F. H. Rosenberg).

Type in the British Museum (Natural History).

Very much larger than *R. Pfeifferi*, Crosse, with differently proportioned whorls; the body-whorl more deeply excavated beneath,

and the columella differently convoluted and more deeply reflexed, so that the basal channel is conspicuously deeper. Named in honour of the late M. Crosse, who so carefully monographed the genus.

PAPUINA CHILOCHROA, n.sp. Fig. VI.

Testa imperforata, globoso-conica, solidula, opaco-alba; anfractus 5, convexiusculi, tres primi glabri, vel lineis impressis obsolete decussati, ultimus undique oblique spiraliter corrugato-sulcatus et submalleatus, ad medium obtuse angulatus, basi planiusculus, concentric striolatus,



FIG. VI. *Papuina chilochoa*, n.sp.

pone labrum striga nigra ornatus et constrictus; sutura distincta, spira conica, acutiuscula; apertura ovato-oblonga; peristoma inerasatum, reflexum, nigro-castaneum, ad marginem corallio-rufum, marginibus approximatis, callo castaneo introrsum diffuso junctis, dextro sinuoso et reflexo, columellari dilatato, concavo-appresso. Diam. maj. 34, min. 27 mm.; alt. 26 mm.

Hab.—British New Guinea.

This species bears some resemblance to *P. Chapmani*, Cox, especially in the form and colour of the mouth, but differs from it in having a much less elevated spire.

ON *PLANISPIRA (CRISTIGIBBA) BURUENSIS*, n.sp., AND *OMPHALOTROPIS HERCULES*, n.sp., FROM THE ISLAND OF BURU.

By J. H. PONSONBY, F.Z.S., etc., and E. R. SYKES, B.A.,
F.L.S., etc.

1. *PLANISPIRA (CRISTIGIBBA) BURUENSIS*, n.sp. Fig. I.

Testa umbilicata, planorbiformis, tenuis, translucens, brunnea, fasciis latis albis duabus ornata et flammulis albis varie picta, circa umbilicum pallidior; spira depressa, anfr. 4 plani, sutura sat profunda

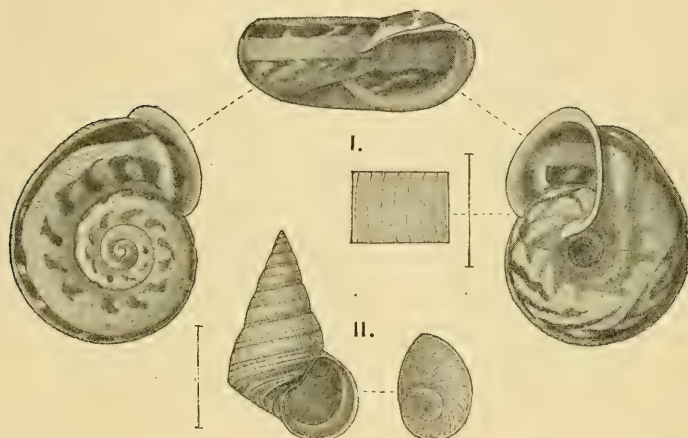


FIG. I. *Planispira (Cristigibba) Buruensis*, n.sp.
,, II. *Omphalotropis Hercules*, n.sp.

discreti, primus lævis, politus, reliqui striis obliquis crebris quasi asperatis sculpti, tres primi sensim accrescentes, ultimus inflatus, magnus, antice subito descendens, pone aperturam cristam elevatam exhibens, gibbosus; apertura orbicularis, valde obliqua; peristomate undique expanso et reflexo, albo, margine dextro superne arcuato, basali ad insertionem supra umbilicum cylindricum, usque ad apicem pervium, leviter dilatato. Diam. maj. 16·5, min. 12·8 mm.; alt. 6·5 mm.

Hab.—Mount Mada, Buru, at 3,000 feet.

Var. *a.* Testa viridescenti-cornea, tenuior, sculptura fere granulata. Diam. maj. 16, min. 13·5 mm.; alt. 7 mm.

Hab.—With type.

The external ridge or crest behind the outer lip recalls the similar process observable in *P. tortilabia*, Less., from which, however, and its allies, this pretty species is at once distinguished by the delicate texture of the shell, the flat discoidal growth, and the plan of coloration. In the last-mentioned particular it perhaps most nearly resembles *P. zebra*, which, however, lacks the characteristic 'crista.'

2. OMPHALOTROPIS HERCULES, n.sp. Fig. II.

Testa pro genere magna, elongato-pyramidalis, anguste perforata, obscure oblique striatula, brunnea, nitidula, lineis aut zonis cinereis spiraliter notata, apice acutulo, rufo-brunneo, carina obscura filiformi in medio anfractus ultimi et altera validiore circa umbilicum munita; anfr. 8-8½, plano-convexi; sutura anfractuum superiorum carina marginata; apertura piriformis, peristomate leviter incrassato, subreflexo, brunneo, marginibus callo junctis, margine columellari infra subito auriculatim dilatato; operculum corneum, tenue, subspirale. Long. 14·6, diam. max. 7·8 mm.

Hab.—Mt. Mada, Buru, at 3,000 feet.

Var. *a.* Crocea.

Hab.—With type.

Var. *β.* Minor. Long. 12, diam. max. 7 mm.

Hab.—Bara, Buru.

Closely related to *O. Ceramensis*, Pfr. (= *O. bicarinata*, Martens), which is found in Buru, Ceram, and Amboina; but the present species is larger, more attenuate, has more flattened whorls, whilst the earlier ones do not increase so rapidly in breadth. We cannot trace on our specimens of *O. Ceramensis*, even under a strong lens, the "lineis spiralibus subtilissimis confertissimis" described by authors.

NOTE ON THE EPIPHRAGM OF *ACHATINA IMMACULATA*, LAM.

By EDGAR A. SMITH, F.Z.S., etc.

Read 14th April, 1899.

ALTHOUGH mention has been made by Fischer¹ and others that the epiphragm in the genus *Achatina* has a slit, instead of a round perforation, as in *Helix*, during the first stage of formation, no description of the peculiar ridge which is present on the inner side

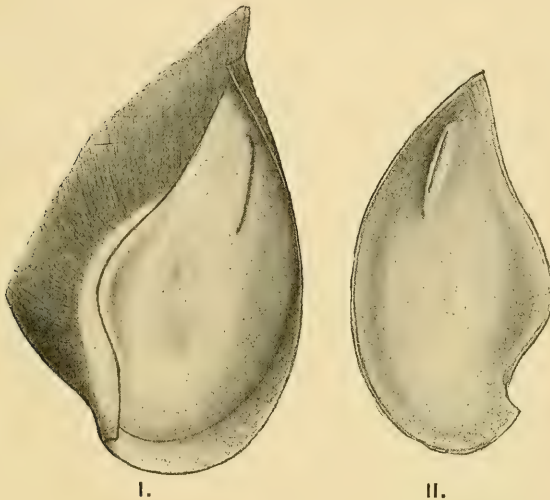


FIG. I. Aperture of *Achatina immaculata*, Lam., showing the epiphragm *in situ*.
 ,, II. Inner view of the epiphragm when removed from the shell.

appears to have been given. It may therefore be of interest to describe this structure as met with in *A. immaculata*, Lam., from Nyasaland.

The form of the epiphragm is, of course, practically that of the aperture of the shell, although it withdraws a little way back from the extreme edge at the lower, or anterior, end. This is necessary in order to allow a notch or sinus on the inner edge to fit under the columella. The smooth surface is not quite level, this unevenness resulting from the margin being modelled to the shell at varying

¹ Journ. de Conch., 1853, pp. 397-403.

distances from the edge of the aperture. As appears to be invariably the case in the genus, it is pure white and porcellanous, and the inner surface is coated with a mucous film which has quite a white pearly lustre. The slit is situated at the upper, or posterior, end, and looks exactly as if a knife had been thrust through from the outside so as to force the substance out into a ridge, which is slit down the middle, on the under surface. This slit is all but closed¹ in both of the specimens examined. Such a solid structure as this would largely help to prevent evaporation during periods of great heat and dryness, thus retaining within the shell the moisture so necessary for the life of the inhabitant. It would equally serve as a defensive barrier against insects and other enemies during these seasons of torpidity.

The use of the slit during æstivation, when life is almost suspended, is doubtless for the purpose of conveying air for respiration, although the breathing orifice is probably all but closed at such times. An examination of a retracted animal reveals a slit-like opening in the mantle leading to the respiratory orifice which would receive the perforated ridge on the epiphragm.

¹ The epiphragm of *Helix pomatia* and of *H. aperta* does not appear to be perforated.

NOTES ON SOME MARINE SHELLS FROM NORTH-WEST AUSTRALIA,
WITH DESCRIPTIONS OF NEW SPECIES.

By EDGAR A. SMITH, F.Z.S., etc.

Read 12th May, 1899.

1. CANCELLARIA REEVEANA, Crosse.

Hab.—Roebuck Bay, North-west Australia (J. J. Walker).

A single specimen from this locality, collected by Mr. J. J. Walker, of H.M.S. "Penguin," is interesting on account of the total absence of colour, being snow-white both externally and within the aperture. In form and sculpture it is quite normal. The typical form occurs at the Philippines and Japan. Mr. Tryon, in his monograph of this genus, placed this species as a variety of *C. asperella*, Lam., and also included under that species *C. Sinensis*, Reeve, and *C. melanostoma*, Sby., from Aden.¹

Although they exhibit a general resemblance to one another, I certainly think these forms may be separated. The distinction between *C. asperella* and *C. Reeveana* has already been pointed out by Crosse,² and *C. melanostoma* has differences of form, sculpture, and colour. *C. Sinensis* is very unsatisfactory, being founded on a single distorted shell in the Cuming Collection. It certainly very closely approaches *C. melanostoma* in many respects, but has not the characteristic brown callus on the columellar side of the aperture.

2. CORALLIOBIA FIMBRIATA, A. Adams. Fig. II.

Concholepas (Corallioبيا) fimbriata, A. Ad.: Proc. Zool. Soc., 1852, p. 93.

Magilus fimbriatus (A. Ad.): Sowerby, Conch. Icon., vol. xviii, pl. iii, figs. 9a, b.

Hab.—Mindanao, Philippines (Cuming); Mauritius (Robillard); Macclesfield Bank, China Sea, 30–50 fathoms (Bassett-Smith).

A specimen from the last-named locality is of interest as showing the character of the upper whorls and only very little of the cancellation, which is characteristic of the typical specimens. The spire consists of four very small whorls, of which the apical one is smooth and globose, the second has a single keel or angle, whilst the third and fourth have two spiral ridges. The body-whorl, which is enormous in comparison with the spire, spreads out into a subcircular, much flattened disc, and is very finely radiately striated, only the first

¹ Smith: Proc. Zool. Soc., 1891, p. 410.

² Journ. de Conch., 1861, p. 237.

convex portion showing some indication of cancellation. A feature which seems to have escaped attention is that the last scale of the lowermost transverse rib is formed into an open tube (Fig. II), apparently as a means for conveying water for respiration when the mollusc is closely adhering to corals or other substances. The anterior end of the aperture is narrowed and channelled, and then produced into the open tube above referred to. This also occurs in the variety *Robillardii*.¹

3. CALLIOSTOMA DECEPTUM, n.sp. Fig. V.

Testa parva, conica, imperforata, rubescenti-albida, seriebus spiralibus granulorum parvorum acutorum (in anfractu penultimo circiter 6) ornata; spira mediocriter acuta; anfractus 7 lente accrescentes, primus lævis, globosus, cæteri in medio subangulati, leviter gradati, supra et infra angulum planiusculi, ultimus basi angulatus, infra seriebus granulorum 7-8 instructus; apertura irregulariter subquadrata, intus sulcata; columella incrassata, extus callo prominente marginata. Diam. 7, alt. 9 mm.

Hab.—Holothuria Bank, 15-34 fathoms, and Baleine Bank, North-west Australia (J. J. Walker).

In the report on the zoological collections of H.M.S. "Alert," p. 72, some young examples of this species were erroneously considered to belong to *C. rubro-punctatum* (A. Adams). Full-grown specimens, although showing some similarity to that species, prove that the two forms are distinct. In the present species the series of granules are more numerous, the granules themselves not so acutely conical, and the base more closely granulated. Some examples exhibit scattered pale-brown dots, whilst others are uniformly of a very pale flesh tint.

4. TEREBRA WALKERI, n.sp. Fig. I.

Testa subulata, alba, liris spiralibus granulosis inæqualibus, quarum 3-4 cæteris majores, lirisque longitudinalibus gracillimis obliquis cancellata; anfractus 12, primus magnus, obtusus, lævis, secundus longitudinaliter fortiter costatus, in medio obtuse angulatus, haud spirallyter liratus, cæteri convexiusculi, sutura obliqua sejuncti, ultimus infra medium angulatus, infra concavus, liris 3-4 tenuibus incrementique lineis fortibus granose cancellatus; apertura irregulariter quadrata; canalis anterior obliquus, subrecurvus. Long. 26, diam. 6 mm.

Hab.—Holothuria Bank, North-west Australia, 10-30 fathoms (J. J. Walker).

Readily distinguishable by the unusual style of sculpture and the character of the apex. Upon the penultimate whorl there are seven spiral granose liræ, four of which are more prominent than the rest.

¹ *Leptoconchus Robillardii*, Liénard: Journ. de Conch., 1870, p. 305; 1871, p. 73, pl. i, figs. 5, 5a.

The body-whorl has one more, forming the angle at the periphery. Beneath this the surface is somewhat concave, and finely cancellated with three or four concentric liræ and strong lines of growth.

5. CANCELLARIA PALLIDA, n.sp. Fig. IV.

Testa parva, ovato-fusiformis, rimata, alba; spira elongata, ad apicem obtusa; anfractus 6-7, superiores duo læves, globosi, pellucidi, cæteri convexi, costis arcuatis tenuibus lirisque spiralibus filiformibus eleganter cancellati, ultimus costis paucis, hic illie aliis majoribus, instructus; apertura auriformis, longit. totius $\frac{1}{2}$ haud æquans; labrum varice extus incrassatum, intus liris tenuibus circiter 12 ornatum;

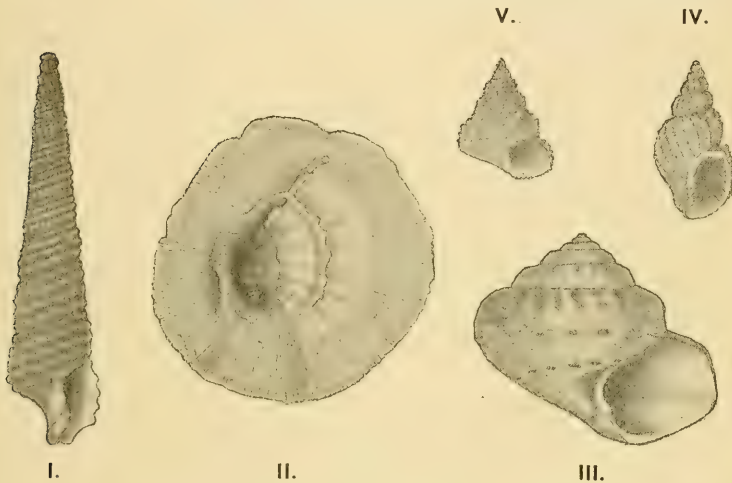


FIG. I. *Terebra Walkei*, n.sp. $\times 2$.
 ,, II. *Coralliochia fimbriata*, A. Ad. $\times 2$.
 ,, III. *Monilia simulans*, n.sp. $\times 2$.
 ,, IV. *Cancellaria pallida*, n.sp. $\times 2$.
 ,, V. *Calliostoma deceptum*, n.sp. $\times 2$.

columella triplicata, callo libero superne labro juncta, intus infra suturam lira subtuberculiformi instructa; sutura profunda, in anfractu ultimo antice fere canaliculata. Long. 10.5, diam. maj. 6 mm.; apertura 4.5 mm. longa.

Hab.—Cassini Island, North-west Australia, 25 fathoms (J. J. Walker).

In the single example of this little species the fine costæ number thirteen upon the penultimate whorl, and the spiral liræ about eight. Here and there a few of the costæ are stouter than the rest, probably indicating periods of arrested growth. Very fine incremental striæ cover the entire surface.

6. *MONILIA SIMULANS*, n.sp. Fig. III.

Testa depresso turbinata, perspective mediocriter umbilicata, rosea, coccineo-maculata, infra roseo alboque punctata; spira brevis, gradata, ad apicem acuta; anfractus 7, spiraliter tenuiter lirati, superiores supra tabulati, in medio angulati, infra angulum leviter convexi, ultimi duo supra nodose plicati, ultimus ad peripheriam carinatus, infra convexiusculus, liris concentricis circiter 10, lineis incrementi subcancellatis, subgranosis, ornatus, circa umbilicum cingulo crasso roseo tenuiter lirato succinctus; apertura irregulariter quadrata; columella alba, incrassata, in medio concava, antice subdentata. Diam. maj. 18, min. 16 mm.; alt. 14.5 mm.

Hab.—Macclesfield Bank, China Sea, 30–50 fathoms.

Two specimens of this very pretty species were collected by P. W. Bassett-Smith, Esq., of H.M.S. "Penguin." The upper surface bears considerable resemblance to our common British *Gibbula magus*, Linn. The keel of the body-whorl, and one of the liræ around the middle of the base, are very prettily spotted with deep rose and white.

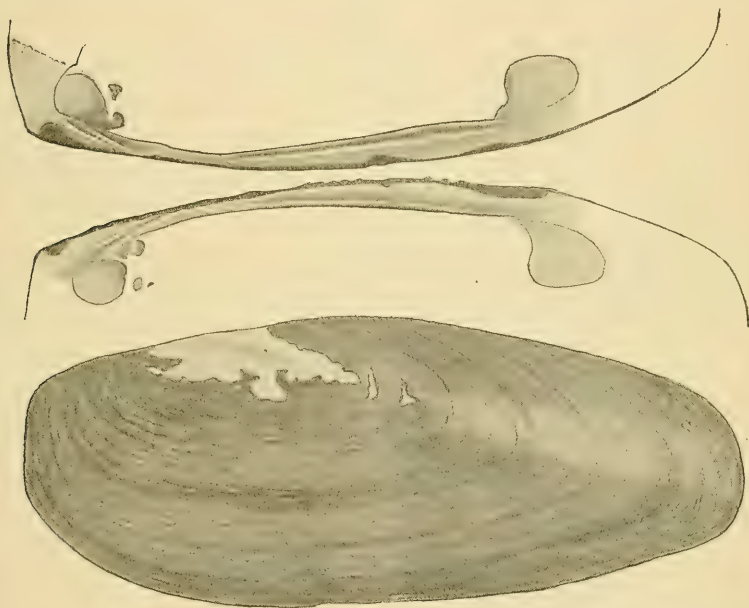
DESCRIPTION OF *UNIO PAHANGENSIS*, N.SP., FROM THE
RIVER PAHANG.

By EDGAR A. SMITH, F.Z.S., etc.

Read 9th June, 1899.

UNIO PAHANGENSIS.

Testa elongata, valde inæquilateralis, mediocriter compressa, antice rotundata, postice angustata, subeuneiformis, periostraco fusco induta, lineis incrementi validis striata; valvæ mediocriter crassæ, ad apicem erosæ, intus in medio dilutissime flavo-salmoneæ, infra et antice ad marginem cæruleo-albæ, postice purpurascens; margo dorsi anticus



Unio Pahangensis, n.sp.

subdescendens, posticus fere rectus, subhorizontalis, ventralis parum curvatus, antice sursum arcuatus; cicatrix anterior breviter piri-formis, bene impressa, postica major, superficialis; linea pallii antice crenulata; cicatrices pedis muscularum tres inæquales; dentes anteriores duo, quorum superior gracilis, elongatus, interior crassior, rugosus, substriatus, posticus unicus elongatus, rectus; dens unicus

anterior valvæ sinistrae elongatus, rugosus, dentes duo posteriores recti, æquales. Long. 131, alt. 50, diam. 24 mm.

Hab.—Pahang River, Malay Peninsula.

This species is remarkable for its elongate form. The colour of the periostracum is dark olive-brown, with here and there a darker concentric zone. There is also an indication of two or three obscure rays on the posterior area between the rounded umbonal ridge and the dorsal margin. The lines of growth are rather strong, and are faintly sinuated at their anterior termination.

The specimen described has been presented to the British Museum (Natural History) by Mr. L. Lindsay, who possesses a second specimen. They were picked up on the banks of the Pahang about ten years ago by a relative of Mr. Lindsay's.

NOTE ON THE NERVOUS SYSTEM OF *AMPULLARIA*, sp.

By R. H. BURNE, B.A., F.Z.S., etc.

Read 12th May, 1899.

SINCE I have lately had the opportunity of dissecting the nervous system of *Ampullaria*, sp.,¹ I propose, on account of the ambiguous nature of the relationships of this genus, to point out in the following note the features in which this dissection differs from that described by Bouvier² in his well-known memoir on the nervous system of Prosobranchs.

On p. 90 of the paper quoted, Bouvier describes the pedal ganglia and the nerves issuing from them; he recognizes five main nerves on each side. Three of these, situated on the median side and distributed to the sole of the foot, have a peculiar importance. The other two are less marked. They lie external to the three larger nerves, and are distributed to the lateral parts of the foot. This, it will be noticed, is an arrangement that bears no resemblance whatever to the scalariform pedal cords of *Vivipara*—the genus to which, in many respects, *Ampullaria* appears to be most nearly allied.

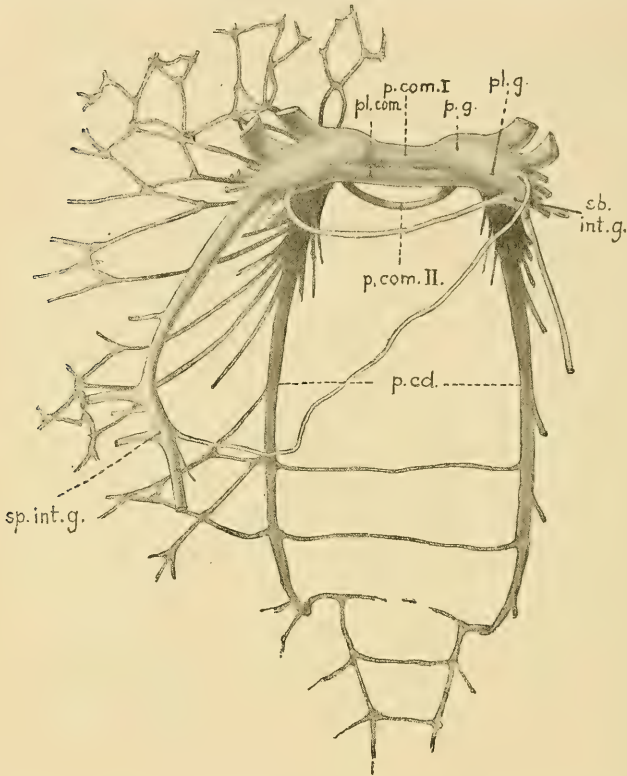
In *Ampullaria*, sp. (*vide* figure), each pedal ganglion sends downwards into the foot a bundle of nerves. One of these far exceeds the others in size. After a short downward course it runs backwards in the substance of the foot, approximating slightly to the median line. In its posterior half it is united to its fellow of the opposite side by a series of four or five very delicate commissures. Lateral and median nerves are given off from the main trunk, especially near its emergence from the pedal ganglion. The lateral nerves, as they approach the margin of the foot, anastomose with one another and also with the extremities of the other nerves that issue directly from the pedal ganglion. In this way the marginal portions of the foot are traversed by an intricate nervous network, with minute ganglionic masses situated at each point where two or more nerves unite. It will be at once noticed that in outward form this pedal nervous system is almost precisely similar to the scalariform cords of *Vivipara*. There is, however, this very essential difference between the two: In *Vivipara* the cords that run longitudinally backwards in the foot and are united at intervals by transverse commissures are ganglionic in nature, and form part of the pedal ganglia; in *Ampullaria* they are without ganglion cells, and thus are simply pedal nerves, issuing as in any of the higher gastropods from anteriorly concentrated pedal ganglia.

¹ Belonging to the Royal College of Surgeons of England.

² Bouvier, "Système nerveux . . . des Gastéropodes Prosobranches": Ann. Sci. Nat. Zoologie, sér. vii, tom. iii (1887).

Ampullaria, sp., in this point seems to represent an interesting stage in the anterior concentration of the pedal ganglia, in which, although the outward form of the scalariform pedal ganglion cords is retained, the ganglion cells are already concentrated towards the anterior end, and form definite pedal ganglia.

With regard to the pedal ganglia and their commissure Bouvier says:—"The pedal ganglia are united by a fairly long and very stout



The pleuropedal ganglia and surrounding nerves of *Ampullaria*, sp. (enlarged).

p. com. I. pedal commissure I. *p. com. II.* pedal commissure II. *p. g.* pedal ganglion. *p. cd.* pedal cords. *pl. com.* pleural commissure. *pl. g.* pleural ganglion. *sb. int. g.* subintestinal ganglion. *sp. int. g.* supra-intestinal ganglion.

commissure. They project somewhat in front, and are fused behind with the pallial (pleural) ganglia." This description is applicable enough, as far as it goes, to *Ampullaria*, sp.; but the commissure that unites the pleuropedal ganglion masses is not a simple stout band; on the contrary, it is distinctly separable into three: (1) a broad flat

commissure connecting the pedal ganglia above the pedal artery; (2) a smaller cylindrical commissure connecting the pedal ganglia beneath the pedal artery; and (3) a flat commissure connecting the pleural ganglia. Of these commissures, the first pedal and the pleural lie in the same plane, closely contiguous to one another, and although quite separate at either end, where they respectively emerge from the pleural and pedal parts of the ganglion mass, are united to one another in the middle of their course, and at this point show their individuality only by a superficial furrow. The second pedal commissure rises from the ventral surface of the pedal ganglia, and takes a semicircular course from one to the other beneath the pedal artery. From its position this commissure should be the most anterior of the ladder commissures that unite the pedal cords. In other respects the nervous system of *Ampullaria*, sp., corresponds very closely to that of the three species examined by Bouvier.

DESCRIPTION OF *SIGARETUS?* *DREWI*, n.sp. (FOSSIL), AND
CIRSONELLA? *NEOZELANICA*, n.sp., FROM NEW ZEALAND ;
 WITH NOTES ON SOME NEW ZEALAND LAND MOLLUSCA.

By R. MURDOCH.

Read 12th May, 1899.

PLATE XVI.

1. *SIGARETUS?*¹ *DREWI*, n.sp. Pl. XVI, Fig. 1.

Shell large, subglobose, ornamented with close, delicate, slightly undulating spiral lines, a somewhat stronger riblet at irregular distances ; whorls 5, spire small, the whorls slightly rounded, first two polished, body-whorl large and rounded ; aperture ovate, a little produced anteriorly ; columella slightly curved, callous and reflected, almost concealing the narrow chink-like umbilicus, outer lip thin. Length 39, breadth 34 mm.

Form and Loc.—Pliocene, sand and blue clay : Wanganui (Drew).

Type.—Wanganui Museum.

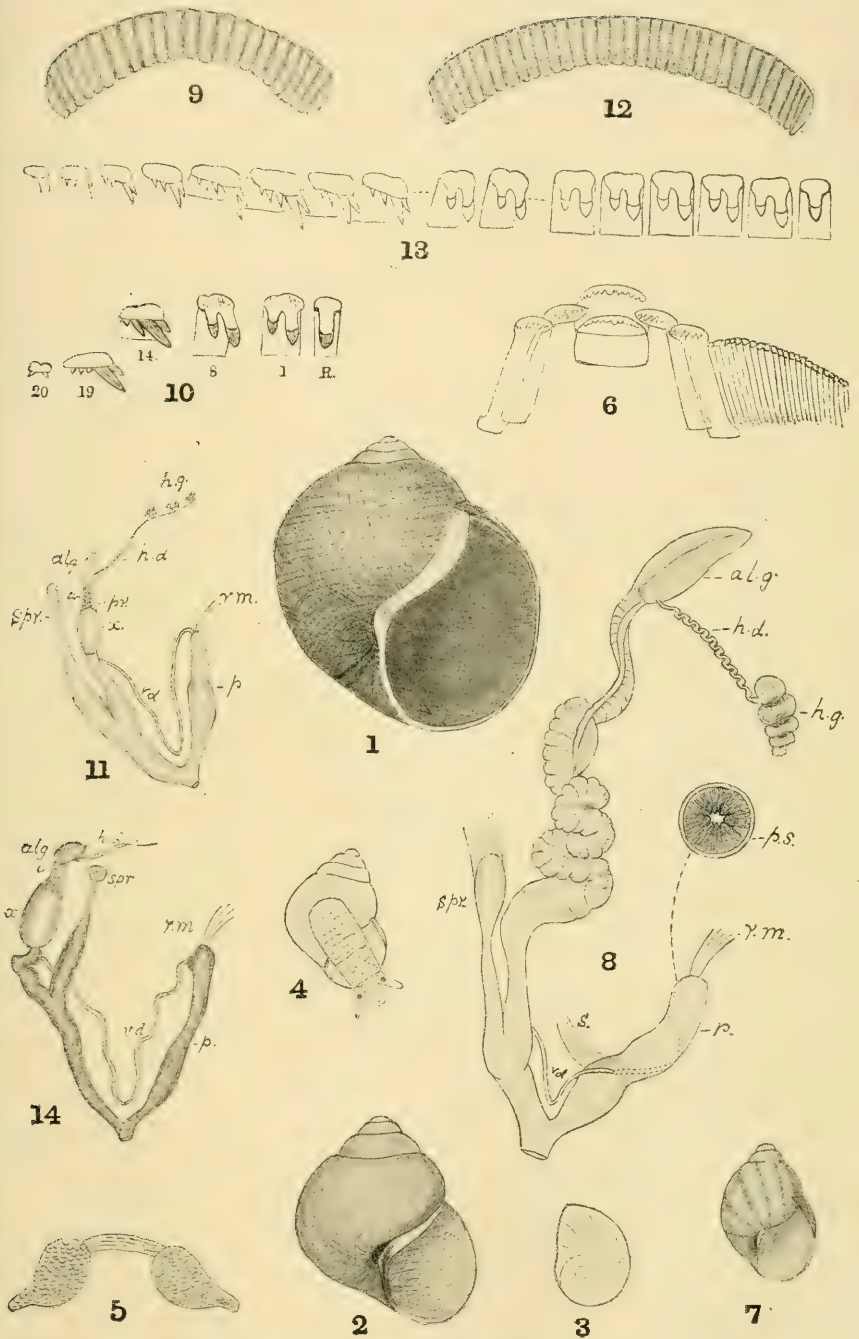
This species differs from *S. undulatus*, Hutton,² in its larger size, stouter shell, and less anteriorly produced aperture ; in sculpture they are much alike. I name the species after my friend Mr. S. H. Drew, Hon. Curator, Public Museum, Wanganui, who, by systematic collecting, has added much to our knowledge of the Pliocene fossils of this district.

2. *CIRSONELLA?* *NEOZELANICA*, n.sp. Pl. XVI, Figs. 2-6.

Shell small, ovate, perforate, periostracum very thin, horny-fuscos ; whorls 5, smooth, spire small, with the apex slightly eroded, the whorls somewhat rounded, the last about three-fourths of the total length and rounded, under an inch objective it is seen to be finely striate with growth-lines ; sutures well marked ; aperture ovate, somewhat oblique, columella thickened and slightly reflected, outer lip thin and simple ; a callus extends from the insertion of the outer lip to the columella, partially concealing the narrow umbilicus ; operculum horny, consisting of about two rapidly increasing whorls. Length 2·75, breadth 2·3 mm.

¹ [In attributing this shell to the genus *Sigaretus* the author has evidently followed Hutton, and owing to the impossibility of communicating with him in time for publication we have left it so, merely adding a ' ?,' but it is evidently nearer to *Ampullina*.—ED. MALAC. SOC.]

² Trans. New Zealand Inst., vol. xvii (1885), p. 318, pl. xviii, fig. 11 : for a better figure see Macleay Memorial Vol. (Linn. Soc. New South Wales), pl. vii, fig. 41.



Hab.—*North Island*: Inner Harbour, Napier. Found in considerable numbers around the margin of a brackish pool (F. Hutchinson, jun.).

Type.—Wanganui Museum.

Animal (Fig. 4).—Foot comparatively large, flat, and undivided; tail abruptly rounded; head produced into a retractile muzzle, emarginate anteriorly; tentacles of medium length, expanding and uniting at the base so as to conceal the posterior portion of muzzle, eyes immersed and situate in the lower half of tentacles; colour whitish throughout.

Jaws (Fig. 5).—Forming two irregularly ovate objects united by a narrow band, they are dark in colour, and the surface, as it were, imbricate with scale-like markings.

Dentition (Fig. 6).—Has the formula 23-2-1-2-23, in numerous transverse curved rows, the rachidian short and broad, with eleven minute cusps; the laterals elongated, with the apex somewhat expanded and curved inwards, the first armed with six or seven, the second with seven or eight minute denticles; uncini about twenty-three, having a single rounded cusp, and becoming shorter as they proceed outwards.

It is with some hesitation I refer this species to *Cirsonella*, Angas; a genus founded on shell characters only (Proc. Zool. Soc., 1877, p. 38), and created for the reception of *C. Australis*, Angas. There is no family, to my knowledge at least, in which it may be included; the dentition of *C. Neozelanica* seems nearest to that of the Cyclostrematidæ, and I provisionally place it near that family. The investigation of nearly allied forms will doubtless pave the way to a more satisfactory classification.

My thanks are due to Mr. H. Suter, of Christchurch, who, by letter, has given me much kindly assistance.

3. ENDODONTA (THAUMATODON) TAU (Pfr.).

Helix tau, Pfeiffer: Malak. Blätt., Bd. viii (1862), p. 148; Mon. Helic. Viv., vol. v, p. 159.

Helix tau, Pfr.: Hector, Cat. Land Moll. New Zealand, 1873, p. 12.

Patula timandra, Hutton: New Zealand Journ. Sci., vol. i (1883), p. 475; Man. New Zealand Moll., 1880, p. 8; Trans. New Zealand Inst., vol. xvi (1883), pp. 175 and 192.

Endodonta varicosa (Pfr.): Suter, Trans. New Zealand Inst., vol. xxvi (1894), p. 128, pl. xv, fig. 12.

Endodonta timandra (Hutt.): Suter, loc. cit. and pl. xv, fig. 13.

Patula (*Endodonta*) *timandra*, Hutt: Pilsbry, Man. Conch., ser. II, vol. viii, p. 84, pl. xxiv, figs. 21-23.

The identification of *Helix tau*, Pfr., has hitherto been most doubtful. At the suggestion of Mr. Suter, of Christchurch, I communicated with Dr. Rudolf Sturany, of the Hofmuseum, Vienna, who very kindly sends the following report, and also mentions that the whole of Pfeiffer's collection has been purchased by Dr. Dohrn,

of Stettin, and presented to the museum of that city, and through Dr. Dohrn's kindness he obtained the loan of type-specimens.

"The two original examples of *Helix tau*, Pfr., forwarded to me for examination contain within the mouth three deep inward running lamellæ, in a similar position to *E. timandra*, Hutton, and much remind me of that species. This important feature is not mentioned in Pfeiffer's original description; otherwise, his description agrees exactly with the examples"

The description of the sculpture of *E. tau* agrees equally well with *E. timandra*, and they are doubtless one and the same species, being the only known New Zealand form possessing three teeth in the aperture.

Hab.—*North Island*: Auckland, Howkiwi, Thames, Wangarei, Mt. Wellington, Pirongia Mt., Hawkes Bay, Forty-mile Bush, Wellington, Kaponga, Altham. *South Island*: Kenepuru.

4. ENDODONTA (CHAROPA) MUTABILIS (Suter).

Patula mutabilis, Suter: Trans New Zealand Inst., vol. xxiii (1891), p. 84, pl. xvi, figs. 2, *a*, *b*, *B*, *C*.

Charopa mutabilis, Suter: Hedley & Suter, Proc. Linn. Soc. New South Wales, ser. II, vol. vii (1893), p. 656.

Charopa tau (Pfr.): Suter, Proc. Linn. Soc. New South Wales, ser. II, vol. viii (1894), p. 499 (*non* Pfeiffer).

Patula (Charopa) mutabilis, Suter: Pilsbry, Man. Conch., ser. II, vol. viii, p. 101, pl. xix, figs. 25–27.

Dr. Sturany's report on *H. tau*, Pfr., clears up the position of this shell, which had been referred to that species.

Hab.—*South Island*: Hooker Valley (Suter), Castle Rock, Southland.

5. FLAMMULINA (PHENACOHILIX) PILULA, Reeve.

Pl. XVI, Figs. 9–11.

Since there is no published description of the anatomy of this species, I offer the following note. The external features of the animal are, briefly, a narrow undivided foot, supra-pedal grooves, and caudal mucous pore, the last-mentioned surmounted by a small papilla. The mantle is a little anterior, with an even margin, and scarcely reflected over the peristome of the shell.

Jaw (Fig. 9).—Arcuate, composed of about twenty-three narrow plates, slightly overlapping at the sides and indenting the lower concave margin.

Dentition (Fig. 10).—Has the formula 20–1–20, or 7–13–1–13–7, in transverse, nearly straight rows; length of rachidian tooth rather more than twice its breadth, reflection large, without side cusps; laterals nearly twice as wide as the rachidian, and armed with two strong cusps having a meso- and an ectocone, the former being the larger; passing outward, the teeth gradually assume a sloping position, the

ectocoene increasing somewhat in length; marginals with numerous denticles, a small and a large point forming, as it were, a double denticle on the inner side of each tooth, except the last, which is bidentate.

Genitalia (Fig. 11).—The penis (*p*) is comparatively large and long, the upper half more slender, with the vas-deferens (*v.d.*) and retractor muscle inserted at the apex. The hermaphrodite gland (*h.g.*) consists of several small clusters of follicles imbedded in the liver; albumen gland (*al.g.*) large. The most interesting feature is a small sack-like lobe (*x.*), which partly envelops the uterus; it rises from the upper part of the free tube of the oviduct, passes upwards as a blind sack with the prostate branching from the side; the vas-deferens enters the wall of the oviduct a little below its base; whether it is a peculiar enlargement of the prostate or not, I have been unable to determine, but propose to give a more detailed description in a future paper (it appears to be a characteristic feature in *Laoma*, *Flammulina*, and *Endodonta*); the spermatheca (*spr.*) branches from the oviduct about midway between the enveloping lobe and genital cloaca, it is long and tapering, terminating above in a small oval-shaped sack.

6. FLAMMULINA (PHENACOHILIX) LUCETTA (Hutton).

Pl. XVI, Figs. 12-14.

Patula lucetta, Hutton: Trans. New Zealand Inst., vol. xvi (1884), p. 192.

Helix (*Patula*) *Stokesi*, Smith: Proc. Zool. Soc., 1884, p. 275, pl. xxiii, figs. 17-17*b*; Tryon, Man. Conch., ser. II, vol. iii, p. 262, pl. xxii, figs. 48-50.

Helix lucetta (Hutt.): Tryon, Man. Conch., ser. II, vol. iii, p. 22, pl. iii, figs. 7-9.

The investigation of the jaw and dentition of this species proves that it is not an *Endodonta*, as referred in recent classifications. Capt. Hutton originally described it as *Patula lucetta*; the name first appears on p. 162, Trans. New Zealand Inst., xvi, with a description of animal, jaw, and dentition, including a figure of the latter and brief note on the shell. This reference cannot apply to the true *P. lucetta*, the jaw and dentition seem not unlike *Charopa coma*, Gray, and in all probability should be referred to the var. *globosa*, Suter, of that species. The error might readily occur, since the shell and colour pattern of certain forms of *C. coma* very much resemble *Flammulina* (*P.*) *lucetta*. The type-specimens of the latter are preserved in the Canterbury Museum, New Zealand.

The animal has the characteristic supra-pedal grooves, a narrow foot, and caudal mucous pore with small papilla.

Jaw (Fig. 12).—Consists of about thirty-three narrow plates, slightly overlapping at the sides, and indenting the concave margin; under a high power they are seen to be strengthened by transverse wavy striæ.

Dentition (Fig. 13).—Has the formula 26-1-26 or 8-18-1-18-8, varying from 7-17-1-17-7, in numerous transverse, nearly straight

rows. The teeth are very similar to the preceding species, and a detailed description seems scarcely necessary.

Genitalia (Fig. 14).—Penis (*p.*) with the retractor muscle at the apex; the vas-deferens (*v.d.*) forms a slender tube, it unites with the penis in a small papilla a little below the apex, separating from the oviduct at the base of the enveloping sack or lobe; the spermatheca (*spr.*) situate somewhat high on the oviduct, tapering, the upper half slender, with a globose termination. The hermaphrodite gland, albumen gland, and enveloping sack are similar to the preceding species.

7. *PLACOSTYLUS BOVINUS*, Brug. Pl. XVI, Figs. 7 and 8.

An example of this rather rare species, preserved in spirits, has been placed in my hands by Mr. Drew, with a small bulimoid shell, the latter under the name of *Bulimus antipodarum*, Gray. There is no doubt this small shell (Fig. 7) is the young of *Placostylus bovinus*. I have had the opportunity of examining a good series, well illustrating the growth of the species. It has been pointed out by Mr. Suter¹ that *Bulimus antipodarum*, Gray, is not a *Placostylus*, but, in all probability, *Helicostyla fulgetrum*, Brod., accidentally introduced.

Animal.—Spirit specimen; the sides of body, neck, and tail black and granulated, the lines of granules somewhat irregular and sloping to the foot margin; tail depressed and somewhat pointed; foot dull leaden colour; ommatophores black, of medium length, genital pore a little behind the right ommatophore. Mantle with an even margin; a small fold projects from the under surface, commencing at the respiratory aperture, and extending almost to the dorsal line, a corresponding but smaller fold occurs on the left side; respiratory and anal apertures in the cleft of the right fold.

Genitalia (Fig. 8).—The penis (*p.*) is large and muscular, with a slight contraction in its lower half; a little below this point the outer envelope or sheath separates from the penis, and forms a broad, strong membrane, which is attached to the anterior portion of oviduct and adjoining body-wall. The retractor muscle (*r.m.*) is inserted at the apex, and attached distally to the dorsal body-wall, about midway between the pulmonary chamber and mantle margin; the vas-deferens (*v.d.*) forms a slender tube, the free portion short, it passes under the sheath at the point of separation, its outline may then be followed, curving round as represented by the dotted lines, and enters the cavity of the penis a little below the apex; at this point the interior walls are strongly corrugated, as illustrated in the cross section (*p.s.*). The hermaphrodite gland forms four or five small lobes imbedded in the liver; hermaphrodite duct closely convoluted, and of a dark colour. Albumen gland (*al.g.*) large, tongue-shaped; from the base of this gland proceed the uterus (*u.*) and prostate (*pr.*), whitish in colour, becoming darker in the lower portion, and thrown into several

¹ Trans. New Zealand Inst., vol. xxvi, pp. 125-6.

wide sacculated convolutions. The spermatheca (*spr.*) is an oval-shaped sack attached to the oviduct by a strong membrane, it branches from the free portion as a narrow tube.

Alimentary system.—The buccal mass is large and muscular, a large salivary gland envelops the œsophagus, with two salivary ducts emptying into the buccal cavity. The jaw and dentition have been described and figured by Capt. Hutton.¹ The stomach passes gradually into the intestine, the latter makes a left-hand spiral turn, passes forward to the pulmonary chamber, thence back for nearly the full length of the stomach, turns abruptly to the right, and proceeds as a straight narrow tube. Part of the stomach and intestine were in a bad state of preservation, but, so far as I could unravel them, seemed to be as described.

The muscular system is divided into right, left, and median bands, the latter forming the powerful retractor of the buccal mass; all three bands arise from the same point on the columella, the right and left in passing forward break up into numerous strands, which are attached to the foot, and also supply the ommatophore retractors, the right passing through the genital branch.

The principal ganglia of the nervous system form two groups, the larger lying beneath the posterior end of the buccal mass, the smaller on its dorsal surface, a band on each side uniting the two. The course of the nerves I have been unable to trace out.

Pedal gland.—This opens below the mouth, it forms a small undulating tube passing along the body-cavity, partially enveloped in a delicate tissue, which is attached to the body and terminates in the solid substance of the tail.

EXPLANATION OF PLATE XVI.

FIG. 1.	<i>Sigaretus ? Drewi.</i>	(Nat. size.)	
„ 2.	<i>Cirsonella ? Neozelanica.</i>	× 10.	
„ 3.	„	„	Operculum.
„ 4.	„	„	Animal.
„ 5.	„	„	Jaws.
„ 6.	„	„	Dentition.
„ 7.	<i>Flacostylus bovinus.</i>	(Juv., × $\frac{3}{2}$.)	
„ 8.	„	„	Genitalia.
„ 9.	<i>Flammulina pilula.</i>		Jaw.
„ 10.	„	„	Dentition.
„ 11.	„	„	Genitalia.
„ 12.	<i>Flammulina lucetta.</i>		Jaw.
„ 13.	„	„	Dentition.
„ 14.	„	„	Genitalia.
<i>al.g.</i>	Albumen gland.	<i>s.</i>	Sheath of penis.
<i>h.d.</i>	Hermaphrodite duct.	<i>spr.</i>	Spermatheca.
<i>h.g.</i>	Hermaphrodite gland.	<i>v.d.</i>	Vas-deferens.
<i>p.</i>	Penis.	<i>u.</i>	Uterus.
<i>p.s.</i>	Penis cross section.	<i>æ.</i>	Enveloping sack: function unknown.
<i>pr.</i>	Prostate.		
<i>r.m.</i>	Retractor muscle.		

¹ Trans. New Zealand Inst., vol. xiv, p. 152, pl. iii, figs. D, O.

NOTES ON LAND-SHELLS FROM A HOLOCENE DEPOSIT AT THE
HORSESHOE PIT, COLLEY HILL, REIGATE.

By the Rev. R. ASHINGTON BULLEN, B.A., F.L.S., etc.

Read 9th June, 1899.

THE object of this paper is to describe the land-shells from a deposit at Reigate which I worked in June and July, 1898. My aim was to work out as far as possible the date of *Helix pomatia*, to which Lieut.-Col. H. H. Godwin-Austen, F.R.S., our President, called attention on June 10th, 1898.

He had about twenty years before found some bones¹ associated with *H. pomatia* at a depth of about two feet. Dr. Henry Woodward, F.R.S., has identified amongst these bones the hyoid bone of *Equus* and the metatarsal either of *Ovis* (sp.) or *Capreolus caprea*. They are much eroded by roots of plants. In the metatarsal bone occurred a very brittle *Vallonia pulchella*. These bones, which adhere strongly to the tongue, are from the upper part of the quarry in the Upper Greensand to the east of the Horseshoe Pit, the superficial layer in which corresponds to that in the latter, though it is not so thick. The material in which the shells occur is a mixture of Middle Chalk and Upper Greensand. From the former derived examples occurred of *Terebratulina gracilis*, var. *lata*; *Terebratulina triangularis*, Ether.; *Rhynchonella Martini*, Mant.; *Kingena lima*, Defrance; *Rhynchonella Grasiana*?, D'Orb.; Belemnite fragment, and species of *Echini*; whilst probably from the Upper Greensand, there was a faceted hydrated manganous oxide (Mn O) nodule.

There are reasons for believing that the popular name of 'Roman' Snail for *Helix pomatia* is a misnomer. The species is found in southern Scandinavia,² to which the Romans did not penetrate. Mrs. McKenny Hughes points out that though *Helix aspersa* is found in great abundance in Roman rubbish pits at Chesterford³ and other places round Cambridge, and though it still occurs in a living state at Shelford, shells of *Helix pomatia* do not occur in such Roman remains. Kew⁴ (quoting Jeffreys) affirms that it does not occur in Roman remains among other shells in Northants, although abundant at Woodford in the same county, and (quoting Rev. L. Blomefield) says that the

¹ Now in my possession.

² Jordan, "Die Binnenmollusken, etc.": Nova Acta Acad. Cæs. Leop.-Carol., Bd. xlv, No. 4, table 10.

³ Geol. Mag., 1888, pp. 205, etc.

⁴ Dispersal of Shells, pp. 240, 241.

latter at Bath neither found nor heard of the discovery of a single specimen either living or dead, although the Romans occupied the spot more than 400 years. It seems strange that the Romans could have introduced a snail which in England they never used. Again, Jeffreys¹ says: "in all probability this kind of snail was not known to them, as another species (*H. lucorum*) takes its place in Central Italy."

At the Horseshoe deposit *H. pomatia* occurred at depths of 1 ft. 9 ins., 2 ft., 2 ft. 3 ins., 2 ft. 6 ins., and 2 ft. 9 ins. (fragments), and a young individual at 3 ft. 6 ins.

I found an early form of Neolithic scraper, with bulb and éraillure, at a depth of 2 ft. 6 ins., so that probably *Helix pomatia*, as well as *Helix aspersa*, is of Neolithic age.

Clausilia Rolphi (Gray) occurred at a depth of nearly three feet. It has been recorded only from Kent, Sussex, Hants, and Gloucestershire, according to Mr. J. C. Mansel-Pleydell, F.L.S., F.G.S., and, he adds, Dorset,² but Mr. Lionel Adams³ records all the British *Clausiliæ* for Surrey. I have not found *C. Rolphi* living at Reigate. It occurs in the Pleistocene deposits of Copford⁴ and Clacton,⁴ and North-east London,⁵ but it is not recorded from Barnwell, Grantchester, or Barrington. It occurs in Kent as high as 450 feet above O.D.

Pomatias reflexus occurred abundantly throughout the section.

The internal granules of *Arion ater* were so numerous between the two and three foot levels that I ceased to collect them. The abundance of this moisture-loving mollusc, as also of *Helicigona arbustorum* and *Carychium minimum*, points to a far damper condition of the locality than at present obtains. *Helicigona arbustorum* is now extinct in the neighbourhood of the Horseshoe Pit, although fine specimens were procurable a few years ago from an osier-bed near Redhill Station.

Helicella Cantiana so far occurs only in the upper two feet of the deposit.

An abnormally large thick internal shell of *Limax maximus* is worth noting. This was from near the 2 ft. 6 in. horizon. It measures $\frac{3}{8}$ " \times $\frac{3}{16}$ " \times $\frac{1}{8}$ ".

Cæcilianella acicula was extremely abundant throughout.

Bulinus montanus occurred (two specimens) at the 2 ft. and 2½ ft. levels respectively. It occurs in the Pleistocene of Barnwell,⁶ Grantchester,⁶ and Clacton,⁷ and is still living in the Thames Valley, but has not hitherto been recorded for this part of England. Like *Helicigona arbustorum*, *Helicodonta obvoluta*, and *Clausilia Rolphi*, it is very restricted in its range, and seems slowly dying out.

¹ Brit. Conch., vol. i, p. 178.

² Mollusca of Dorset, p. 17.

³ British Land and Fresh-water Shells, 2nd ed., p. 192.

⁴ Kennard & Woodward: Essex Naturalist, vol. x, p. 108.

⁵ B. B. Woodward: Proc. Geol. Assoc., vol. xi, p. 55.

⁶ Mrs. Hughes, op. cit.

⁷ Kennard & Woodward, op. cit.

LIST OF LAND MOLLUSCA
FROM THE HOLOCENE DEPOSIT AT REIGATE, WITH THE
RELATIVE DEPTHS AT WHICH THEY OCCUR.

NAME OF SPECIES.	Depth of occurrence as far as						
	6 inches.	1 foot.	18 inches.	2 feet.	2 ft. 6 ins.	3 feet.	4 feet.
<i>Limax maximus</i> , Linn.					X		
* <i>Agriolimax agrestis</i> (Linn.)		X		X	X	X	
<i>Vitrea cellaria</i> (Müll.)		X			X		
— <i>nitidula</i> (Drap.)	X		X	X	X	X	
— <i>pura</i> (Ald.)				X			
— <i>crystallina</i> (Müll.)				X	X	X	
* <i>Arion ater</i> (Linn.)		X		X		X	
— sp.					X		
* <i>Pyramidula rotundata</i> (Müll.)		X	X	X	X	X	X
<i>Helicella Cantiana</i> (Mont.)	X	X	X	X			
— <i>Itala</i> (Linn.)	X	X	X	X	X	X	
— <i>caperata</i> (Mont.)	X	X	X		X		
* <i>Hygromia rufescens</i> (Penn.)	X	X	X	X	X	X	X
* — <i>hispida</i> (Linn.)	X	X	X	X	X	X	
<i>Acanthinula aculeata</i> (Müll.)					X		
* <i>Vallonia pulchella</i> (Müll.)	X	X	X	X	X	X	
<i>Helicigona arbustorum</i> (Linn.)					X		X
— <i>lapicida</i> (Linn.)			X				
<i>Helix aspersa</i> , Müll.		X					
— <i>pomatia</i> , Linn.				X	X		X
— <i>memoralis</i> , Linn.			X	X	X	X	
— <i>hortensis</i> , Müll.						X	X
<i>Buliminus montanus</i> (Drap.)				X	X		
— <i>obscurus</i> (Müll.)			X				
<i>Cochlicopa lubrica</i> (Müll.)	X	X	X	X	X	X	
<i>Azeea tridens</i> (Pult.)			X			X	
<i>Cæcilianella acicula</i> (Müll.)	X	X	X	X	X	X	X
<i>Pupa muscorum</i> (Linn.)		X	X	X	X	X	
<i>Vertigo pygmaea</i> (Drap.)					X	X	
<i>Clausilia laminata</i> (Mont.)				X	X		
— <i>bidentata</i> (Ström.)				X	X	X	
— <i>biplicata</i> (Mont.)					X		
— <i>Rolphii</i> , Gray						X	
<i>Carychium minimum</i> , Müll.						X	
* <i>Pomatias reflexus</i> (Linn.)	X	X	X	X	X	X	
Total, 35 species.							

* Abundant.

Fragments of a banded *Helix* (probably *H. nemoralis*) were plentiful throughout, with portions of the opercula of *Pomatias reflexus*. Fragments of *Helix pomatia* were fairly abundant in the upper 2½ feet.

Helix aspersa (two specimens) occurred at 9 ins. and 10½ ins. depth respectively. I cannot understand its absence from the lower levels, as it is painfully abundant in Reigate gardens, and I have found it hibernating in some numbers in the Walton Lane, about the same level as the Horseshoe Pit.

My sincere thanks are due to Mr. B. B. Woodward, for much help in identifying critical specimens, to Dr. Henry Woodward, for identifying the bones mentioned, to Lieut.-Col. H. H. Godwin-Austen, for kindly giving me the *H. pomatia* and bones from Reigate, also to Mr. H. Woods, of Cambridge, and Dr. F. L. Kitchin, for identifying the derived fossils.

ANATOMICAL NOTES ON *MEDYLA INSCULPTA* (PFR.).

By HENRY SUTER.

Read 9th June, 1899.

THROUGH the kindness of Mr. Laing, of Christchurch, New Zealand, who spent several months on Norfolk Island, I obtained a number of land-shells preserved in formalin, all, with one exception, being

MEDYLA (EUPLECTA) INSCULPTA (Pfeiffer).*Helix insculpta*, Pfeiffer: Proc. Zool. Soc., 1845, p. 129.

A number of the shells contained the animal, though not in a very good condition for dissection. However, I was able to examine the dentition and the genital organs, of which I propose to give a short account.

Animal.—With two short, broad shell lobes, the left divided into two; the foot (Fig. I) shows distinct diagonal and double parapodial grooves; there is a pronounced caudal pore, situated above the termination of the parapodial pore. The sole is tripartite.

Jaw (Fig. II).—Extremely thin and fragile, transparent, with a strong median projection on the cutting edge, the outline being repeated (as a remnant of an earlier stage of growth) a little higher up.

Radula (Fig. III).—Formula 35-7-1-7-35. The minute outer marginals have an aculeate mesodont, denticulated on its posterior edge, with a small base of attachment; on the succeeding inner teeth the denticles, numbering from three to four, become successively more and more distinct, whilst just a little below the point of the mesodont an ectodont appears, consisting of two cusps, which are at first separate, but subsequently are united at the base. The marginals next gradually assume a triangular shape, and the denticles on the mesodont disappear, whilst the ectodont becomes simple and larger. A few transitional teeth lead to the asymmetrical laterals, each with a short and stout mesocone, extending to the posterior edge of the base, and a rather stout ectodont. The central tooth is tricuspid, the side cusps well developed, and the mesodont of the same length as on the laterals.

Genitalia (Fig. IV).—Simple, the lower portion consisting of a large, muscular, subcylindrical penis sac with a retractor muscle at its posterior end, where also the vas-deferens enters. At the anterior portion of the penis sac, near the atrium, an appendix is inserted which has nearly half the length of the former, and is slightly distended distally. The vagina is formed by a rather large muscular pouch, provided with a tubular receptaculum seminis on the side towards the common orifice, it is slightly bent, and does not widen

out posteriorly. In some specimens there was no spermatheca, but only a small papilla in its place; these were, perhaps, immature individuals. The free oviduct is slightly swollen in the middle. In one specimen I found three embryos of different stages of growth embedded in a transparent gelatinous mass, indicating that the species is viviparous.

The dentition and genital organs most nearly resemble those of *Sitala anthropophagorum*, described and figured by Hedley,¹ who mentions the presence of a dart sac, but in his figure only an appendix of the penis, inserted further back than in *M. insculpta*, and a spermatheca are present.

The close relationship between *S. anthropophagorum* and *Medyla insculpta* goes far to support the view expressed by Dr. von Möllendorff² that *Kaliella*, *Sitala*, *Coneuplecta*, and *Euplecta* may perhaps be considered as only sections of one genus.

M. insculpta has been removed from *Helix* to *Nanina*, *Zonites*,

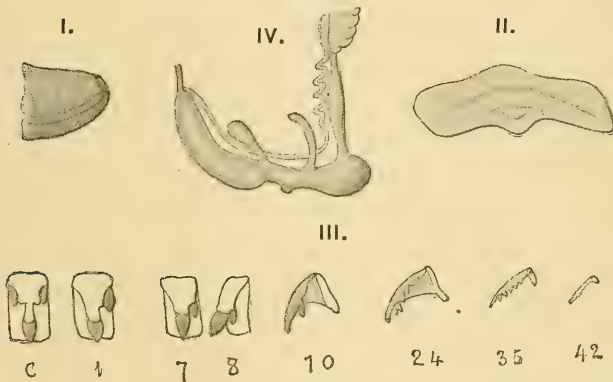


FIG. I. *Medyla insculpta* (Pfr.). Posterior portion of the foot, enlarged.
 " II. " " " " Jaw, much magnified.
 " III. " " " " Teeth of the radula, greatly magnified.
 " IV. " " " " Lower portion of the genitalia, much magnified.

Trochomorpha, and, finally, by Mousson to his genus *Trochonanina*. Dr. von Möllendorff has given good reasons for abandoning Mousson's genus, since it includes a number of now well-defined genera. The proper place for the species is, in my opinion, using Dr. von Möllendorff's latest classification, under the genus *Medyla*, Albers, section *Euplecta*, Semper.

When Pfeiffer described the shell its habitat was unknown, but later on it transpired that it came from Norfolk Island, and my

¹ Proc. Linn. Soc. New South Wales, ser. II, vol. IX, p. 336, pl. xxv, fig. 21; pl. xxvi, fig. 24.

² Bericht Senckenberg. Naturf. Gesell., 1893, p. 65.

specimens are from the same locality. There is, however, one thing that puzzles me: Pfeiffer, in his *Nom. Hel. Viv.*, 1881, p. 57, gives "*Helix basiodon*, Mor. [Siam]" as a synonym. He gives the habitat of *insculpta* as "Ins. Norfolk," "Siam" being only mentioned in brackets after the synonym. Tryon, on the other hand (*Man. Conch.*, ser. II, vol. ii, p. 48), has the habitat: "Ins. Norfolk, ? Siam." It seems to me hardly possible that the same species should occur in two such widely separated localities, and I am confident that some member of our Society will kindly clear up this doubtful point. Was Morelet mistaken about the habitat when creating his species?

ORDINARY MEETING.

FRIDAY, 14TH APRIL, 1899.

W. T. BLANFORD, LL.D., F.R.S., etc., President, in the Chair.

Dr. H. Marett Tims, F.Z.S., was elected to membership of the Society.

The following communications were read :—

1. "Notes on *Paludestrina Jenkinsi* and *P. confusa*." By A. S. Kennard and B. B. Woodward, F.L.S., etc.
2. "Description of a supposed New Species of *Nassa*." By G. B. Sowerby, F.L.S., etc.
3. "On supposed New Species of *Streptaxis* and *Amphidromus*." By H. Fulton.
4. "Remarks on the Shells of the Genus *Rhodea*, with descriptions of new species from South America, and the description of *Papuna chilochroa*, n.sp., from British New Guinea." By S. I. Da Costa.
5. "Note on the Epiphragm of *Achatina immaculata*, Lam." By E. A. Smith, F.Z.S., etc.

Mr. E. R. Sykes exhibited a series of shells of *Rissoia cingillus*.

Mr. A. S. Kennard exhibited a shell of *Mytilus edulis* containing a rough pearl.

Mr. M. F. Woodward exhibited and described the radula of *Pleurotomaria Beyrichii*, Hilgend.

Mr. W. M. Webb exhibited and commented upon a series of *Testacellæ*.

The authors of the several papers exhibited specimens in illustration of their respective communications.

ORDINARY MEETING.

FRIDAY, 12TH MAY, 1899.

Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., etc., Vice-President, in the Chair.

The following communications were read :—

1. "On *Planispira* (*Cristigibba*) *Buruensis*, n.sp., and *Omphalotropis Hercules*, n.sp., from the Island of Buru." By J. H. Ponsoyby, F.Z.S., etc., and E. R. Sykes, B.A., F.L.S., etc.
2. "Notes on the Nervous System of *Ampullaria*, sp." By R. H. Burne, B.A., F.Z.S., etc.
3. "Notes on some Marine Shells from North-west Australia, with descriptions of new species." By E. A. Smith, F.Z.S., etc.
4. "Descriptions of *Sigaretus*? *Drewi*, n.sp. (fossil), and *Cirsonella*? *Neozelanica*, n.sp., from New Zealand." By R. Murdoch.
5. "Notes on some New Zealand Land Mollusca." By R. Murdoch.

The Rev. R. Ashington Bullen exhibited a dead specimen of *Tellina radiata*, an American shell, from Courtmaesherry Bay, South-west Ireland, specimens of stunted and peat-stained *Limnæa stagnalis*, Linn., from La Carrière, Quebec, and West Hawkesbury, Ontario, and very acuminate specimens of *Hemiplecta densa*, var. *Schumacheriana*, Pfr., from the Malay Peninsula.

Mr. E. A. Smith exhibited, on behalf of Professor Pilsbry, a series of *Vivipara Georgiana* from Florida; also the var. *spheromorpha*, and the extinct var. *limnothauma*. Mr. Smith also exhibited a living *Venus mercenaria* from the north coast of Kent.

Mr. E. R. Sykes exhibited spirit specimens of *Proneomenia* and *Dondersia (Myzomenia) Banyulensis*, obtained at Plymouth. Also the types of the shells described by Mr. J. H. Ponsoy and himself in their joint paper.

Mr. W. M. Webb exhibited an oyster with a rough pearl, and the crab *Pinnotheres*.

Mr. R. H. Burne and Mr. Smith exhibited specimens in illustration of their papers.

ORDINARY MEETING.

FRIDAY, 9TH JUNE, 1899.

W. T. BLANFORD, LL.D., F.R.S., etc., President, in the Chair.

M. Henri Fischer was elected to membership of the Society.

The following communications were read:—

1. "Description of a New Species of *Unio* from the River Pahang." By E. A. Smith, F.Z.S., etc.
2. "Note on the reported occurrence of *Corbicula fluminalis* (Müll.), in South Africa." By J. H. Ponsoy, F.Z.S., etc.

In a valuable paper on the Pliocene Non-Marine Mollusca (Proc. Malac. Soc., vol. iii, p. 201), Messrs. Kennard and Woodward give "South Africa" as one of the localities in which this species has been found. It appears that Mr. J. R. Gregory (Geol. Mag., 1869, p. 91) records its occurrence in the Vaal River; but an examination of the specimens kindly placed at our disposal by that gentleman proves them to belong, not to that species, but to *C. Africana*, Krauss, and *C. Oliphantensis*, Craven. It would seem that *C. fluminalis* has not at present been found in South Africa.

3. "Notes on Land-Shells from a Holocene Deposit at the Horseshoe Pit, Colley Hill, Reigate." By the Rev. R. Ashington Bullen, M.A., F.L.S., etc.

4. "Anatomical Notes on *Medyla insculpta* (Pfr.)." By H. Suter.

Dr. J. C. Verco exhibited and made remarks upon the type-specimens of a large number of South Australian marine mollusca from his collection.

Mr. S. I. Da Costa exhibited an almost complete series of the known species of *Opisthostoma*.

Mr. Fulton exhibited on behalf of Mr. Sowerby a very fine series of *Neritina communis* and *N. dubia*.

Mr. W. M. Webb exhibited some fine examples of eggs and shells of *Strophocheilus*.

Mr. Crick exhibited and remarked upon a series of curiously eroded Belemnites, possibly partly digested, and one specimen showing what was believed to be the marks of the teeth of some predaceous animal.

Mr. E. R. Sykes exhibited a sale catalogue dated 1736.

Mr. M. F. Woodward exhibited shells of *Mytilus Deshayesi* from Western Australia, collected by Mr. B. H. Woodward.

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A † is prefixed to the name of fossil species.

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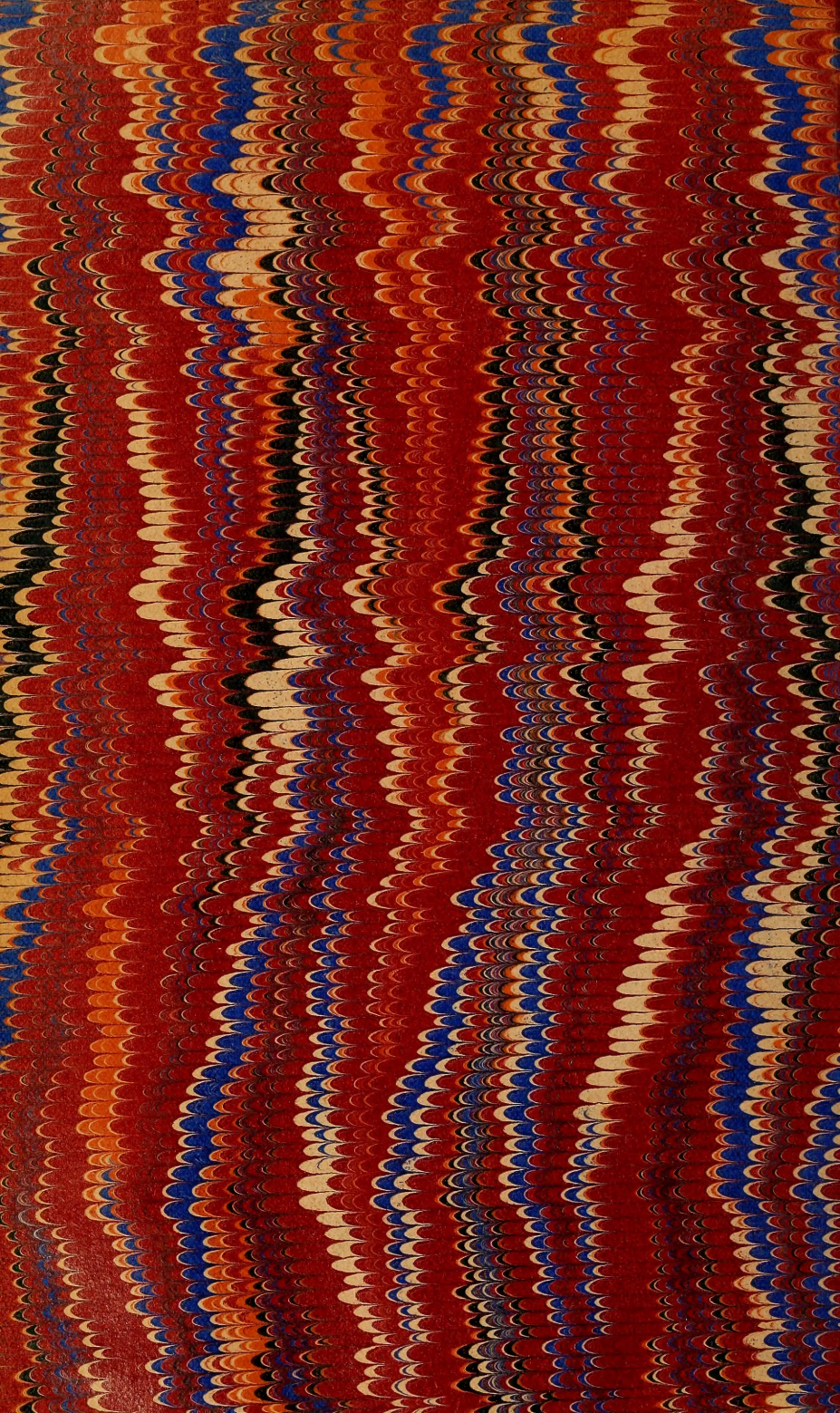
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