

VII. *Report on the Mollusca collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea.* By GUY C. ROBSON, B.A.\*

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THE collection of Mollusca obtained by the Expeditions, though it contains some new and very interesting forms, is not large enough to necessitate any attempt to modify existing opinions on the zoo-geographical relationships of New Guinea. One or two observations of a general nature are, however, necessary by way of introduction.

Thanks to the work of Tapparone Canefri, Hedley, and E. A. Smith, we are in possession of a good amount of information upon the molluscan shells of the better known parts of New Guinea. The two workers first named have also, with a few others, published some account of the anatomy of these forms. In 1886-7 Möllendorf and in 1895 Hedley published papers upon the general relationships of the molluscan fauna of the main and adjacent islands. Since that date no comprehensive work upon this fauna or its relationships appears to have been published. Möllendorf attempted

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† For explanation of the Plates, see pp. 303-306.

to trace the influence of the surrounding molluscan faunas upon the island and its several subregions; while Hedley laid down the broad principles of its relationships, laying stress on its Oriental rather than its Australasian character, in opposition to Cooke ('Cambridge Natural History: Mollusca'), who had emphasized the latter. Examination of the present collection, though the precise position of the two new Zonitoid genera is as yet unsettled, tends to confirm Hedley's view. The occurrence of a probably new *Diplommata* and two new genera of Zonitoids points to Continental Asiatic rather than to Australian affinities. But generalizations upon the molluscan fauna of this, as of all other countries, must await the coming of more ample anatomical knowledge. The experience of many workers could be quoted which goes to show that speculations upon the affinities of various faunas based upon conchological characters are frequently unreliable and inadequate. There is urgent need for more anatomical knowledge, and until this is forthcoming, and until our conchologists turn anatomists, the real position of the molluscan fauna of New Guinea and of its several political divisions—Dutch, British, and German—must, to the scientific mind, remain unresolved.

Of the new forms described here the genus for which the name *Chronos* is proposed is specially interesting, as much for the great altitude at which it was obtained (viz. over 14,000 ft.) as for its anatomy. Mollusca from the higher ranges in New Guinea have already been recorded (*cf.* Kobelt, *Nachrichtsbl. Malakozool. Ges.* 1913, Heft ii. p. 87), one of which came from over 12,000 feet. The author is not aware of any instance of Mollusca being obtained at greater altitudes than that here recorded.

It is significant that the two new genera obtained from the high mountains offer considerable difficulty with regard to their systematic position, though it should be pointed out at the same time that the *Sulcobasis* was obtained from about the same altitude as the *Antinous*.

The author wishes to express his thanks and indebtedness to Col. H. H. Godwin-Austen, F.R.S., and Mr. G. K. Gude for assistance rendered him, and also to the Rev. Dr. H. M. Gwatkin for help in interpreting some of the radulæ of the several forms here figured.

The following is a list of the species obtained arranged according to the stations:—

Launch Camp . . . . .	{	<i>Xesta citrina</i> (Linn.) *.
		<i>Cristigibba tortilabia</i> (Lesson).
		<i>Papuina lituus</i> (Lesson).
Base-Cano Camp . . . . .	{	<i>Cristigibba</i> sp.
		<i>Papuina wollastoni</i> , sp. n.
		<i>Melania plumbea</i> Brot.

\* [The parentheses around the names of authors placed after scientific names in this paper are used in accordance with Article 23 of the International Rules of Nomenclature (Proc. 7th Int. Cong. Boston, 1907, p. 44 (1912).—EDITOR.]

- |                                       |   |
|---------------------------------------|---|
| Cano Camp, 150 ft. . . . .            | <i>Diplommatina</i> sp.                           |
| Camp III., 2500 ft. . . . .           | { <i>Calycia crystallina</i> (Rve.).              |
|                                       | { <i>Xesta citrina</i> (Linn.).                   |
| „ XI.-XII., 8000-11,500 ft. . . .     | <i>Sulcobasis</i> sp.                             |
| „ XIII., 10,500 ft. . . . .           | <i>Antinous anthropophagorum</i> , gen. et sp. n. |
| Snow-line on Mt. Carstenz, 14,200 ft. | <i>Chronos sublimis</i> , gen. et sp. n.          |
| (? Locality) . . . . .                | { <i>Papuina taumantias</i> T. Canefri.           |
|                                       | { <i>Xesta citrina</i> (Linn.).                   |

All specimens, including types, have been presented to the Zoological Department, British Museum.

## GASTROPODA.

**STREPTONEURA.**

**TÆNIOGLOSSA.**

1. MELANIA PLUMBEA Brot.

Journ. de Conch. 1864, p. 19 ; Küster's Conch. Cab. F. p. 310.

Two shells, from between Base and Cano Camps.

Neither specimen is quite so elongated in the spire as the specimen figured by Brot. One of them lacks the costæ on the body-whorl, variability in the occurrence of which appears to be characteristic of the species.

## 2. DIPLOMMATINA sp.

One shell from vegetable débris, Cano Camp.

This is a small markedly triangular form, having six whorls closely set with diagonal finely decussated ribs, and exhibiting other characters that differentiate it from the other known species of the genus. The author does not feel justified, however, in making a new species upon the shell of a single specimen.

EUTHYNEURA.

## PULMONATA.

ZONITIDÆ.

### 3. CALYCIA CRYSTALLINA (Reeve).

Conch. Icon. 1848, pl. 32 (*Bulimus crystallinus*).

One shell from Camp III. (2500 ft.).

According to Pilsbry, this form, originally considered to be a *Bulimoid*, is now to be placed among the *Zonitidæ* on good anatomical grounds.

4. *XESTA CITRINA* (Linn.).

Syst. (ed. xii.) 1245.

One shell from Launch Camp, three complete examples from Camp III. (2500 ft.), one from unknown locality.

5. *ANTINOUS ANTHROPOPHAGORUM*, gen. et sp. n. (Pl. XXXII. figs. 3, 4 *a*, 7, 8 *a*, *b*; Pl. XXXIII. fig. 6 *a-c*.)

One complete specimen, Camp XIII. (10,500 ft.).

*ANTINOUS*, gen. n.

Foot-sole undivided, dorsal mucous pore lacking a covering tongue. A single rudimentary shell-lobe (?) is present; the radula resembles that of *Microcystina* and there is a simple jaw. The genitalia are near those of *Rhysota*, but the proximal portion of the vas deferens is swollen out, while the seminal channel of the penis has its margin much plicate at its distal extremity. The shell is bluntly carinate, perforate, with a simple aperture and a non-reflexed columella.

*ANTINOUS ANTHROPOPHAGORUM*, sp. n.

*Systematic Position*.—It is impossible as yet to decide upon the exact systematic position this genus occupies among the Zonitidæ. Clearly referable to that family, in spite of the absence of longitudinal subdivision of the foot-sole, it does not readily fall into line with any of the forms of which the anatomy is known.

The general form of the genitalia allies it with *Rhysota* (2), but the characters of the mantle-lobes and radula distinguish it from that genus. On the other hand, the radula has a good deal in common with that of *Microcystina*\* [cf. *M. sappho* (6)]; but sundry characters, such as those of the mucous gland, male generative organs, and shell, distinguish it from that group.

A. *External Appearance*.

The colour of the specimen (preserved in alcohol) is very dark bluish grey on the dorsum and sides of the foot, while the sole is dirty yellow suffused with pale orange (in life the whole sole was possibly orange-coloured). The mantle is dark grey, with a broad dirty yellow border, the extremity of which is edged with a bluish-black rim.

The sole is undivided. There is a broad peripodium (Pl. XXXII. fig. 8 *b*) with two closely approximated peripodial grooves. A dorsally placed caudal mucous pore is found (Pl. XXXII. fig. 8 *a*), from which a covering tongue is lacking. The dorsum of the foot is characteristic. Its sagittal axis is occupied by an irregular groove, from which are given off bilaterally at regular intervals a number of posteriorly directed

\* Cf. also *Bensoniu luzonica* (9).

grooves that cut up the surface into a number of quadrate blocks or masses of epidermal tubercles or rugosities.

Right and left *dorsal lobes* are found, while remote on the left-hand side of the mantle is found a very narrow elongate pallial projection that possibly represents the *dorsal shell-lobe*. Whether this is rudimentary or in process of development it is difficult to decide. The author is also a little uncertain as to the correct interpretation of the two lobes already described (Pl. XXXII. fig. 4 *a*).

The *shell* (Pl. XXXIII. fig. 6 *a, b, c*) is of a rich dark chestnut-brown, scarcely varying in hue between apex and umbilicus, though portions of the apex are decorticated and discoloured. There are  $4\frac{3}{4}$  whorls, increasing regularly in size, somewhat polished in texture, crossed transversely by irregular growth-lines, which are often broad and separated by wide intervals, with their ends somewhat indenting the suture of the last whorl. On the apical whorls a faint spiral grooving is seen, and the growth-lines are accompanied by a fine transverse striation. The apex is only moderately prominent. The last whorl is bluntly carinate at its upper end, and the keel so formed is slightly tuberculated by the broader growth-lines. The aperture is rounded, moderate in size, and the lips are simple. The umbilicus is very slightly perforate, while the columella is gently curved in accordance with the form of the aperture, and is scarcely reflexed. On the under surface very faint traces of a spiral grooving are found.

Size: 16 mm. br.  $\times$  10 mm. alt.

#### B. *Internal Characters.*

The *jaw* (Pl. XXXII. fig. 7) is simple and strongly arcuate, with a prominent median projection.

The *radula* (Pl. XXXII. fig. 3).—Owing to the excessively close crowding of the aculeate marginal teeth, it is impossible to speak with absolute certainty as to the formula. The following, however, is approximately correct:—?20 . 14–15 . 1 . 14–15 . ?20.

The median tooth is tricuspid, with a large median cusp and a broad basal plate. The laterals are, properly speaking, bicuspid, though the admedian members of the series are so squarely shouldered on their upper internal angle as to give the impression of a third cusp at that point. At about the tenth tooth of this series the main cusp begins to slant inwards and becomes elongate and dagger-like, and the whole tooth becomes narrower until after the transitional 13–15, when a simple sabre-like tooth is found. It is very difficult to make out the basal portion of these teeth, so closely are they set, though the character indicated in the drawing is probably correct.

*Genitalia* (text-fig. 6).—The *penis* is broad and moderately long. Internally it bears a main seminal groove with several accessory grooves, all of which are thrown into a number of folds at the distal (epiphallic) end (text-fig. 5). An *epiphallus* is found, of moderate length and terminating in a broad stout *retractor*. The long

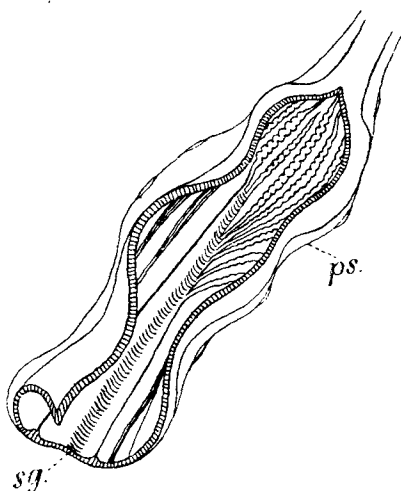
*vas deferens* is peculiar as regards its proximal end soon after it quits the epiphallus. Here it swells out into an ovoid structure, which is involved in the same connective-tissue sheath as the reniform *kalk-sac*.

The *spermatheca* is simple and moderately long. Close to where the *vas deferens* is given off from the conjoined male and female ducts there is a round glandular body, brownish in colour, the precise nature of which is as yet uncertain.

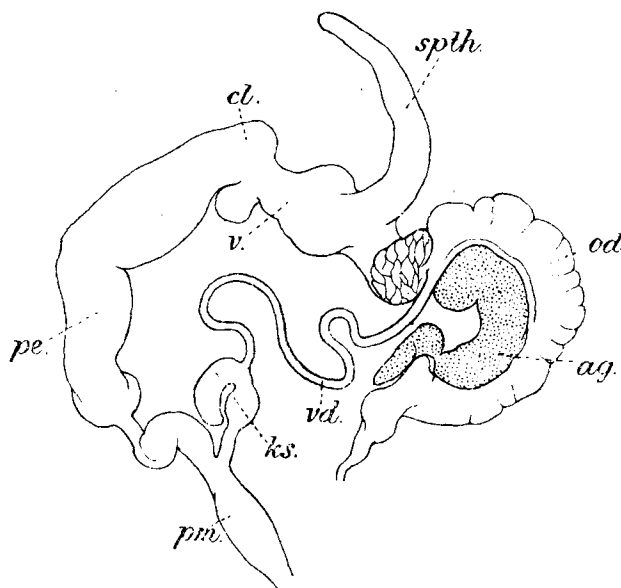
6. *CHRONOS SUBLIMIS*, gen. et sp. n. (Pl. XXXII. figs. 4 b-6, 9-12; Pl. XXXIII. fig. 7 a-c.)

Twenty-five examples (mostly juvenile) from snow-line on Mt. Carstenz (14,200 ft.).

Text-figure 5.



Text-figure 6.



Text-fig. 5.—Penis of *Antinous anthropophagorum*. *sg.*, seminal groove; *ps.*, penis-sheath.

Text-fig. 6.—Genitalia of *Antinous anthropophagorum*. *pe.*, penis; *pm.*, penis retractor; *ks.*, kalk-sac; *vd.*, vas deferens; *ag.*, albumen gland; *od.*, oviduct; *spth.*, spermatheca; *v.*, vagina; *cl.*, common genital aperture.

#### *CHRONOS*, gen. n.

Foot with a dorsal mucous pore provided with a covering tongue and a broad peripodium surmounted by a single groove; sole tripartite. Shell-lobes absent. Jaw very simple, but remarkably deep; radula consisting of a number of rows of numerous sickle-shaped teeth, which are very little modified serially.

Genitalia with an extensive albumen gland, terminating in numerous digitate processes, and well-developed epiphallus and club-shaped spermatheca. Shell delicate, somewhat like that of *Helicarion*, the last whorl increasing rapidly, with a wrinkled

periostracum and a large rounded aperture, subperforate and with a non-reflexed columella.

*Systematic Position.*—The character of the foot, dorsal lobes, and genitalia enable us to place this genus among the Zonitidæ, but it is difficult to decide its precise place within that family. The characters here described do not associate it with any of the subdivisions of the Zonitidæ hitherto established. A more complete comprehension of the limits and subdivisions of this family is, as a matter of fact, required; and when this is attained, the interesting form here described will no doubt be assigned a satisfactory systematic position.

CHRONOS SUBLIMIS, sp. n.

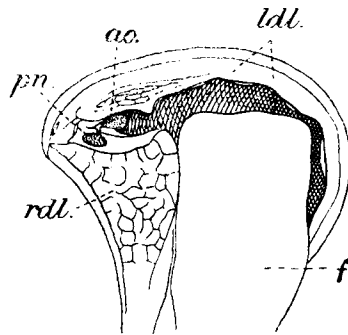
A. *External Appearance.*

The *mantle* (alcohol specimens) is colourless, save for a tract of dark brown or blackish grey over the region occupied by the kidney and dark irregular freckles round the mantle-edge and along the course of the rectum (Pl. XXXII. fig. 9).

The apical whorls of the body are very dark bluish black, except on their underside, which is dirty yellow. The foot is dark blue to black dorsally, but on the peripodium and underside it is mouse-coloured.

The *foot* is quadrate in shape, and the sole is subdivided longitudinally by two grooves, which divide it into three series of large square corrugations of the epidermis (Pl. XXXII. fig. 11).

Text-figure 7.

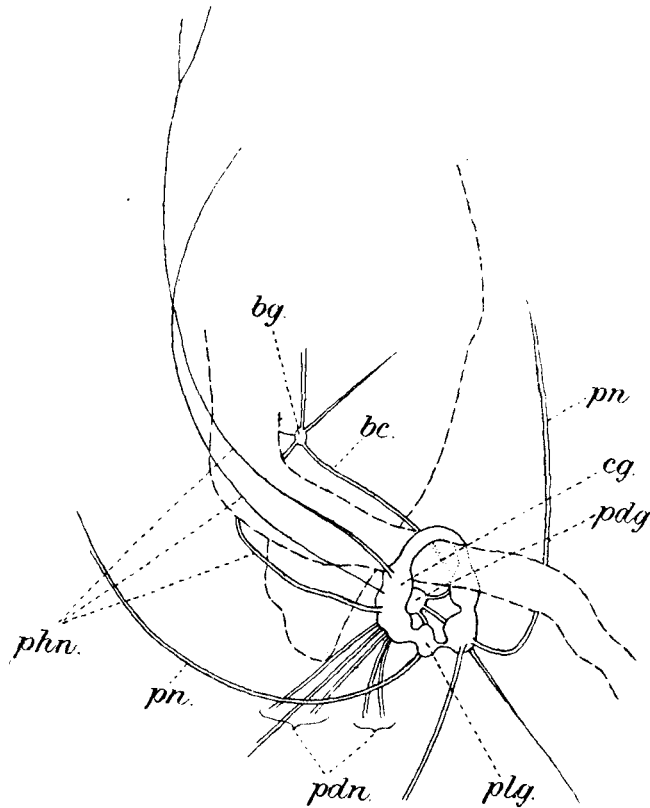


Aperture of mantle-cavity in *Chronos sublimis*. *rdl.*, right dorsal lobe; *ldl.*, left dorsal lobe; *pn.*, pneumostome; *ao.*, anal orifice; *f.*, foot.

The *sole* is surmounted by a broad peripodium, but only one peripodial groove is found. The dorsum of the foot (Pl. XXXII. fig. 5) is covered with corrugations; those bordering the peripodial groove are square in shape, and are continued on to the median line of the tongue or lappet that covers the caudal mucous pore. The lateral areas of this tongue are separated by grooves from the median portion, and constitute the terminal portion of the peripodium. Right and left dorsal lobes are found, the latter continued practically all round the mantle-edge in an unbroken line (text-fig. 7).

The *shell* (Pl. XXXIII. fig. 7 *a, b, c*) is small and semi-transparent. The apex is decorticated and bleached to a bluish white, while the rest of the whorls are light brown above, slightly tinted with green, and a very delicate dark green below. The whorls number four; the last increases rapidly in size, while the apical ones are tolerably prominent and convex in profile. The suture of the last whorl is impressed. The aperture is rounded, large, simple, and nacreous within. The umbilicus is shallow, and nearly entirely covered over by a reflexion of the columella. The latter is well rounded.

Text-figure 8.



Central nervous system in *Chronos sublimis*. *cg.*, cerebral ganglion; *plg.*, pallial ganglion; *pdg.*, pedal ganglion; *bg.*, buccal ganglion; *bc.*, cerebro-buccal commissure; *phn.*, pharyngeal nerves; *pn.*, pallial nerve; *pdn.*, pedal nerves.

The surface is covered by a rather glossy periostracum, marked transversely by irregular growth-lines and fine striæ, the former occasioning a kind of irregular transverse striping. The periostracum of the body-whorl is, in addition, seamed by longitudinal grooves, which impart a wrinkled texture to the surface.

On the apical whorls the transverse sculpture is visible as more regularly arranged



and more closely set striæ and ribbing; while on the penultimate whorl the transverse striping is very marked.

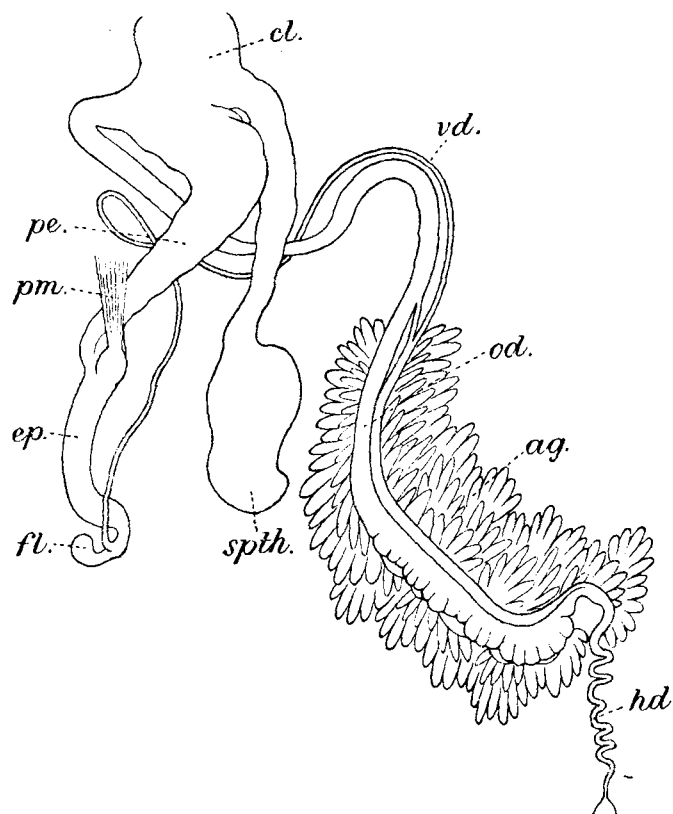
Dimensions: 12 mm. max. breadth  $\times$  7.8 max. alt., aperture 7 mm. wide.

### B. Internal Characters.

The *jaw* (Pl. XXXII. fig. 10) is very deep and simple in shape. It is devoid of a median projection and is delicate in texture. In addition to the concentric lines of growth, fine radial lines are observable.

A single row of teeth from the *radula* (Pl. XXXII. fig. 12) consists of about 110

Text-figure 9.



Genitalia of *Chronos sublimis*. For lettering, see text-fig. 11 (p. 299).

teeth on each side (it is impossible to state the exact number), very closely packed and difficult to observe. From the first admedian tooth to the extreme marginals there is very little modification, all the teeth being of a curved sabre-like pattern, somewhat broad at the base, and presenting an ovate section when viewed (as in the figure) from the basal end.

*Alimentary tract, etc.*—If the long sabre-like teeth are held to indicate a carnivorous mode of living, the condition of the intestine lends support to this view, as it is

relatively short, consisting of but two simple coils round the peculiarly trilobed liver (Pl. XXXII. fig. 4 *b*).

*Heart, kidney, etc.*—The auricle exhibits a rather peculiar shape, being slightly folded on itself around its junction with the ventricle, which is effected by means of a narrow rather elongate neck. The ventricle is somewhat triangular in section. The kidney was not dissected fully enough to warrant particular description (Pl. XXXII. fig. 6).

*Nervous system.*—The general disposition only was made out (text-fig. 8). It may be remarked, however, that the nerves innervating the viscera proceeded from the same ganglionic mass as those innervating the right side of the mantle, careful dissection failing to reveal any discontinuity in the tissues between the pallial and visceral roots. It would therefore appear that the visceral and right pallial ganglia are completely fused. This condition was observed in two specimens, but must await further proof.

*Genitalia* (text-fig. 9).—On first opening the body-cavity one is struck by the extensive albumen gland, which extends its lobes with their finger-like processes around and among the other organs, which can only be separated out from the solid mass of the gland by cutting the latter away. The author has been struck by the possibility of this extensive development of the gland being merely a temporary physiological phase. Col. Godwin-Austen, F.R.S., informs him that he has observed considerable seasonal variation in the albumen gland of *Zonitoids*. But in any case the gland must be very extensive and diffuse.

The penis is straight, and at the point where the fibres of the retractor are given off it is peculiarly folded.

There is a stout and long *epiphallus*, terminating in a small reniform *flagellum*. The *vas deferens* is very long, and follows closely the course of the vagina.

The *spermatheca* is long and club-shaped. When containing the spermatophore it is rudely quadrate at its extremity. The diffuse *albumen gland* has been already commented upon. The junction of the latter with the oviduct was unfortunately not found, while the *ovo-testis* was only obtained in a fragmentary condition.

#### HELICIDÆ.

##### 7. PAPUINA LITUUS (Lesson). (Pl. XXXII. figs. 1, 2; Pl. XXXIII. fig. 8 *a-c*.)

*Helix lituus* Lesson, Voy. de la 'Coquille,' Zool. p. 309.

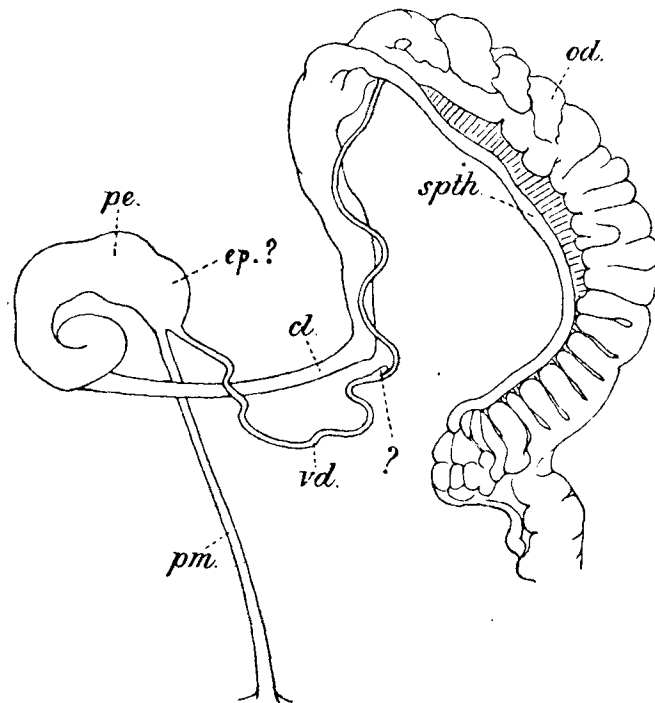
Two complete examples from Launch Camp.

These two examples have been referred to Lesson's species after examination of many other specimens and reference to all the available literature. The author has come to the conclusion that the conchological boundary between this species and *P. taumantias* T. Canefri is as yet ill-defined, and it is easy to confuse the two. In fact, until the radula and genitalia of this form were examined, the author actually set it down as *P. taumantias*. The conchological characters that differentiate this

species from *P. taumantias* would appear to be the persistence of an epidermis and the flattening of the body-whorl in *P. lituus* (Pl. XXXIII. fig. 8 *a, b, c*), while that species lacks the obsolete spiral striæ of *taumantias*. These characters, however, are very slight and hard to reconcile with the strongly marked differences in the genitalia. The account of the radula, jaw, and genitalia here published are, as far as can be made out, the first that have been given.

The *radula* and *jaw* call for little comment, and appear to be quite normal (Pl. XXXII. figs. 1, 2).

Text-figure 10.

Genitalia of *Papuina lituus*. For lettering, see text-fig. 11 (p. 299).

The *genitalia*.—A marked feature of this species is the great length of the *penis retractor*, which is attached to the distal extremity of the penis. There is apparently no epiphallus, unless the modified distal extremity of the penis to which the retractor is inserted represents this (text-fig. 10).

8. *PAPUINA WOLLASTONI*, sp. n. (Pl. XXXIII. figs. 1–5, 9 *a–c*.)

One complete example from between Base and Cano Camps.

The genus *Papuina* stands in serious need for a complete revision upon sound anatomical lines. Under the name are classified a great variety of forms, which differ widely enough to warrant division into separate subgenera. To allocate a form, therefore, to a genus in this condition is to give but an inadequate expression of its

systematic position. Increase in our knowledge of the anatomy of the group or of the conchological forms assigned to the group only can render the work possible. The following instance may serve as an example of the importance of anatomical work in dealing with such a group:—The conchological differences between the present species and many of the shells of the genus *Dendrotrochus*, now recognized as a Zonitid, are insignificant; and, moreover, the Zonitid forms more closely resemble this species of *Papuina* than do typical species of *Papuina*. Further, if it were to be maintained that the conchological characters that differentiate this species (and with it the other thin fragile Papuinas) from, e. g., *Dendrotrochus helicinoides*, are of family value, then it may be pointed out that such a reasoning would compel us to put such forms as *P. boivini* and *P. wollastoni*, not to mention other well-founded species of *Papuina* which differ markedly on conchological characters, into separate families!

There are a number of other species of *Papuina* conchologically near this form, but which, in default of anatomical knowledge, we must hesitate before grouping with it. These are:—*P. molesta* Smith, *P. leucotropis* Pfr., and *P. arrowensis* le Guill.

#### A. *External Appearance.*

The animal was very much shrunken by the spirit in which it was preserved.

Upon removing the shell the first thing that attracts attention is the pigment-tracts on the dorsal surface of the mantle (Pl. XXXIII. fig. 2). The intestine is seen in the usual position, and the integument covering it, as far as it can be traced, bears at regular intervals a number of dark brown patches, from each of which radiate a number of streaks, which run to the mid-dorsal line to form a faint irregular band in that axis or anastomose with similar lines from the patches anterior and posterior to it.

These pigment-tracts are in no way connected with the vascular system, the vessels of which may be seen running in no correspondence with the pigment, which lies in loose, rather superficial accumulations. The proximity of the centres of radiation to the intestine suggests that this pigment may be a digestive product. Kükenthal's description of the mantle of *P. vitrea* (7) as "dunkelbraun marmoriert und getigert" shows that other Papuinas are similarly decorated in a manner that may express specific differences.

A diagrammatic representation of the pattern in this form is given (Pl. XXXIII. fig. 2 b).

The *foot-sole* is narrow, undivided, and somewhat expanded posteriorly into a spatulate shape. The colour of the foot is light brown.

The *shell* (Pl. XXXIII. fig. 9 a, b, c) is delicate, acutely carinate, and lenticular in general appearance, the apex being somewhat depressed. The upper half exceeds the lower by very little in size. Whorls  $4\frac{3}{4}$ . The surface is sculptured by faint irregular lines of growth crossed by very fine and delicate spiral lines, which are usually undulating, and is, in addition, broken by bristle-scars arranged in a rudely quincuncial

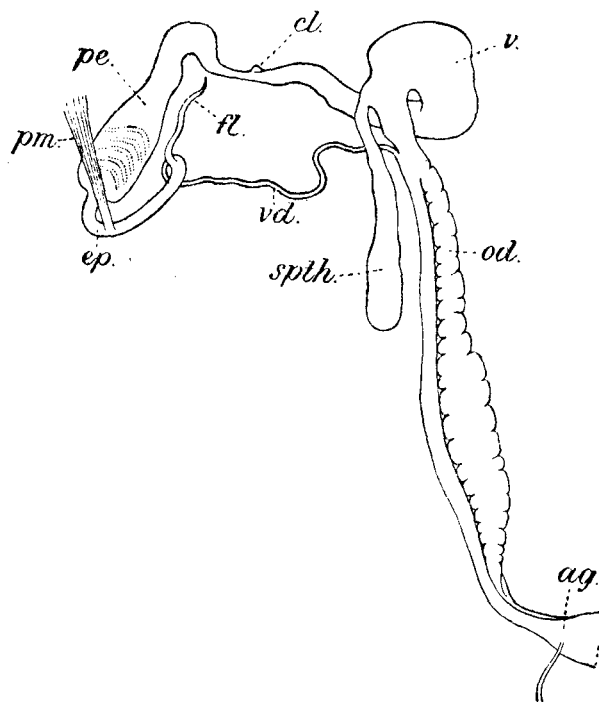
pattern. The remnants of a periostracum are visible at the sutures and elsewhere. The colour is dull ochreous above the carina, which is faintly suffused with brown, and exhibits a white edge. Below the carina it is pale and colourless. The columella is broad and reflexed over the umbilicus, which is, however, not entirely covered over by it. The aperture is rounded, and the inferior lip reflexed.

Dimensions : alt. 10 mm., width 14.5 mm., width of aperture 7 mm.

#### B. Internal Characters.

Within the mantle-cavity the pneumostome (Pl. XXXIII. fig. 3) calls for attention. The actual orifice is situated in the middle of a modified portion of the floor of the

Text-figure 11.



*Papuina wollastoni*, genitalia. *pe.*, penis; *pm.*, penis retractor; *ep.*, epiphallus; *fl.*, flagellum; *vd.*, vas deferens; *cl.*, common genital aperture; *v.*, vagina; *spth.*, spermatheca; *od.*, oviduct; *ag.*, albumen gland; below *ag.* is seen the hermaphrodite duct.

cavity. This area is circular in shape, and divided into two unequal parts by a groove which widens at one end to form the actual orifice, the two parts thus separated being probably capable of divarication one from another to increase the diameter of the respiratory aperture. One of these two lobes or flaps is continuous with the floor of the chamber, while the other is wholly separated from it by a shallow groove.

The *jaw* (Pl. XXXIII. fig. 5) is thin and rather weak, with no transverse ribbing and with a marked median protuberance.

The *radula* (Pl. XXXIII. fig. 4).—Unfortunately the marginal teeth were destroyed in extracting the lingual ribbon, so that the description labours under a regrettable deficiency. The median and lateral teeth would appear to be of the same type as those of *P. kubaryi*. Upon the internal edge of the cusp of the tenth (or ninth) lateral a small projection appears, which persists to the end of the series available for study. A similar cusp appears in the case of *P. kubaryi* in about the same position.

The *salivary gland* corresponds pretty closely to the description given by Kükenthal for *P. vitrea*, viz.: “Ein flache . . . ziemlich kompakte belag.” But it is characterized by ending anteriorly in a sharp point, which is continued past the origin of the two slender salivary ducts.

The *nervous system* may be most conveniently studied by referring to the figure (Pl. XXXIII. fig. 1).

The *genitalia* (text-fig. 11, p. 299).—The upper end of the penis-sac is squarely truncate, and is continued as a well-developed epiphallus, to which, at about half its length, the retractor is attached. There is a somewhat pointed and moderately long *flagellum*.

The *spermatheca* is long, and gradually expands up to its rounded and flattened distal extremity. There is a large vaginal dilatation of doubtful nature situated just before the origin of the spermatheca.

Only portions of the *hermaphrodite duct* and *albumen gland* were available for figuring.

9. PAPUINA TAUMANTIAS (Tapparone Canefri).

*Helix taumantias* T. Canefri (10).

One shell (locality unknown).

10. CRISTIGIBBA TORTILABIA (Lesson).

*Helix tortilabia* Lesson, Voy. de la ‘Coquille,’ Zool. ii, p. 311.

One shell from Launch Camp.

11. CRISTIGIBBA sp.

One shell from between Base and Cano Camps.

This specimen, which appears to be near but not the same as *C. tortilabia*, is too immature to justify description.

12. SULCOBASIS sp.

Two shells from between Camps 11 and 12 (8000–11,500 ft.).

These specimens are too badly damaged to describe as representing a new species, although they would appear to be different from the known species of this genus.

## LITERATURE CITED.

The following are the more important anatomical and distributional works referred to:—

- (1) BAVAY.—[Wichmann's] Résultats de l'expédition néerland. à la Nouvelle Guinée, vol. v. livr. ii. (1908).
- (2) BURNE.—Proc. Malacological Soc. London, ix. p. 208 (1910).
- (3) GODWIN-AUSTEN.—Fauna of British India (Testacellidæ and Zonitidæ).
- (4) „ —Land and Freshwater Mollusca of India.
- (5) HEDLEY.—Journal of Malacology, iv. 1895.
- (6) „ —Proc. Linn. Soc. N. S. Wales, 2nd ser. vi. 1891, *passim*.
- (7) KÜKENTHAL.—Abh. Senck. Naturf. Gesell. Bd. xxiv. p. 508 (1898).
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- (9) MÖLLENDORF und KOBELT.—Semper's Reis. in Arch. Philipp. Bd. 8.
- (10) TAPPARONE CANEFRI.—Ann. Mus. Civ. Storia Nat. Genova, xix. 1883, and Suppl. i. 1886.

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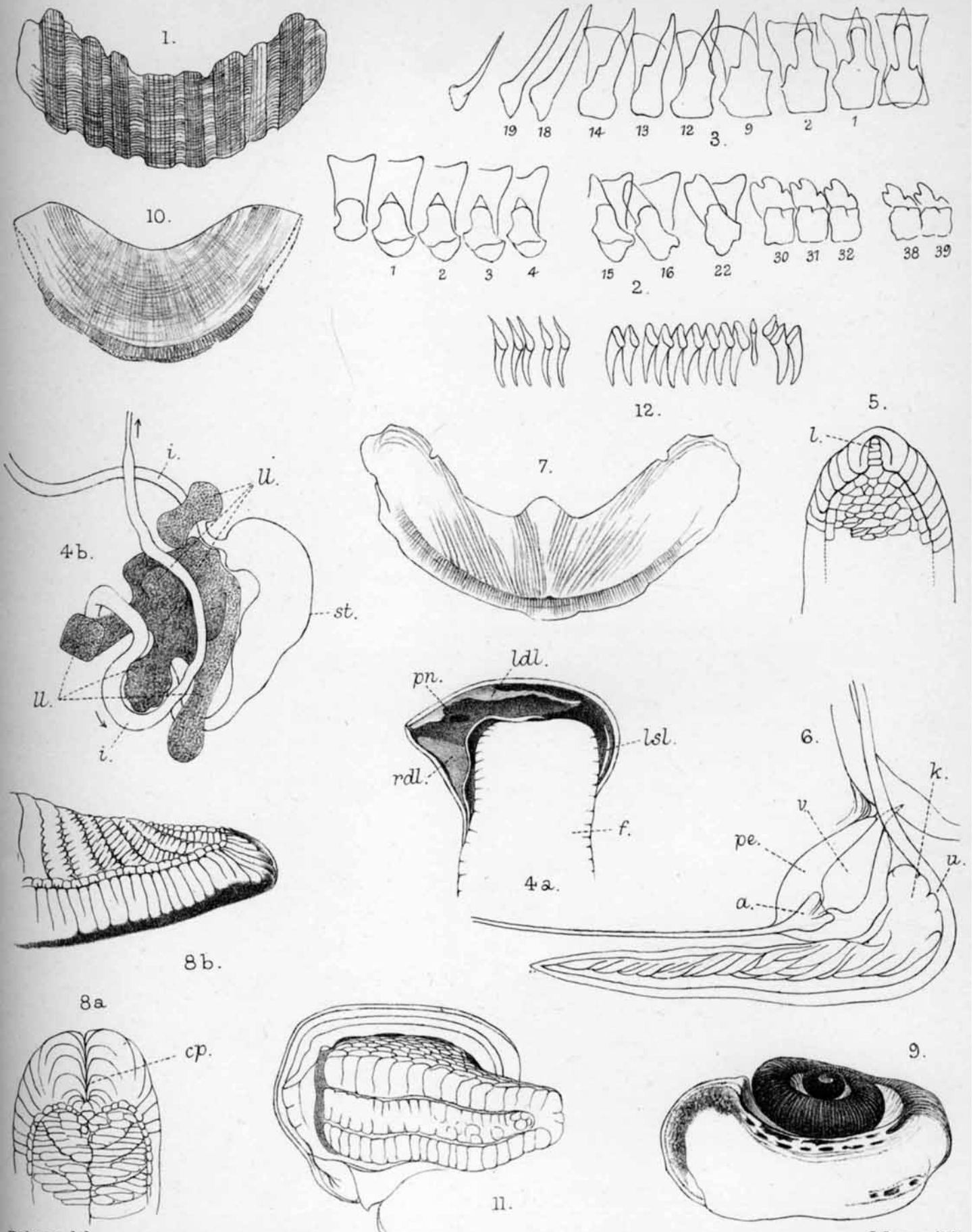




PLATE XXXII.

## PLATE XXXII.

- Fig. 1. *Papuina lituus*. Jaw.  
2. Id. Radula.  
3. *Antinous anthropophagorum*. Radula.  
4 a. Id. Mantle aperture. *rdd.*, right dorsal lobe; *ldl.*, left dorsal lobe; *lsl.*, left shell-lobe; *pn.*, pneumostome; *f.*, foot.  
4 b. *Chronos sublimis*. Intestine (semi-diagrammatic). *st.*, stomach; *ll.*, liver lobes; *i.*, intestine.  
5. Id. Dorsal surface of foot, showing lobe (*l*) of caudal pore.  
6. Id. Pericardial complex. *pe.*, pericardium; *a.*, auricle; *v.*, ventricle; *k.*, kidney; *u.*, ureter.  
7. *Antinous anthropophagorum*. Jaw.  
8 a. Id. Dorsal surface of foot, showing caudal pore (*cp.*).  
8 b. Id. Foot (lateral view).  
9. *Chronos sublimis*. General appearance of mantle and coils.  
10. Id. Jaw.  
11. Id. Foot-sole.  
12. Id. Radula.



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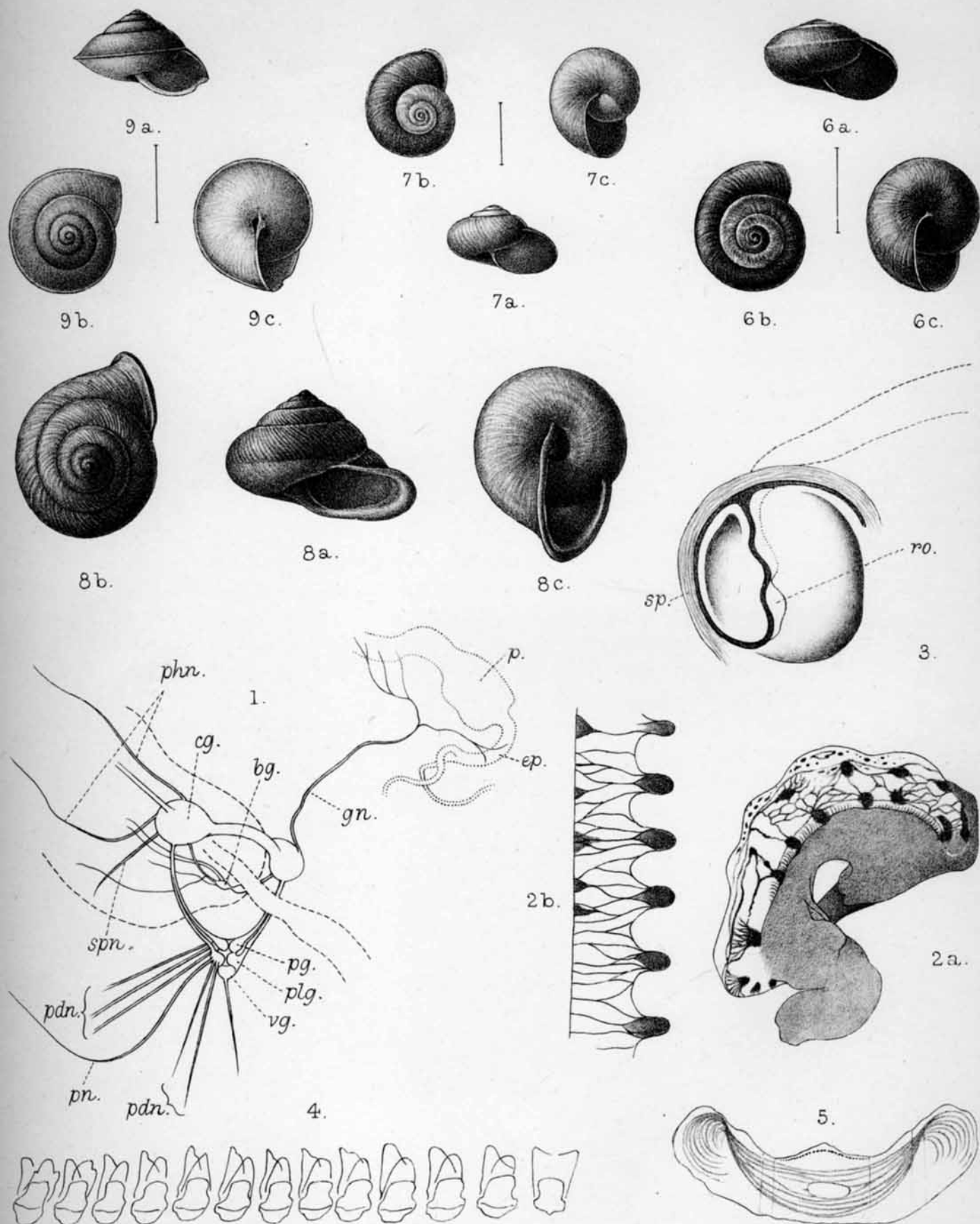
J. Green. lith.

1. 2. PAPUINA LITUUS, Less. 3, 4a, 7, 8a, b, ANTINOUS ANTHROPOPHAGORUM.  
4b, 5, 6, 9, 10, 11, 12, CHRONOS SUBLIMIS.

**PLATE XXXIII.**

## PLATE XXXIII.

- Fig. 1. *Papuina wollastoni*. Nervous system. *cg.*, cerebral ganglion; *pg.*, pedal ganglion; *plg.*, pallial ganglion; *vg.*, visceral ganglion; *bg.*, buccal ganglion; *pn.*, pallial nerve; *pdn.*, pedal nerves; *gn.*, penis-nerve; *phn.*, pharyngeal nerves; *spn.*, subpharyngeal nerves; *p.*, penis; *ep.*, epiphallus.
- 2 *a.* Id. Mantle (showing pigment-tracts).
- 2 *b.* Id. Diagrammatic representation of the pigment-tracts.
3. Id. Pneumostome viewed from within the branchial cavity. *ro.*, respiratory orifice; *sp.*, sphincter muscle.
4. Id. Radula.
5. Id. Jaw.
- 6 *a, b, c.* *Antinous anthropophagorum*. Shell.
- 7 *a, b, c.* *Chronos sublimis*. Shell.
- 8 *a, b, c.* *Papuina lituus*. Shell.
- 9 *a, b, c.* *Papuina wollastoni*. Shell.



Robson & Green del.

J. Green lith.

1, 2a, b, 3, 4, 5, 9a, b, c, PAPUINA WOLLASTONI.

6a, b, c, ANTINOUS ANTHROPOPHAGORUM.

7a, b, c, CHRONOS SUBLIMIS.

8a, b, c, PAPUINA LITUUS, Less.