

Kirby, quoting Consul Krug, says of a large West Indian Hymenopteron (*Scolia atrata*) that it digs its nest, "then goes in search of a grasshopper. Having partially disabled it with its sting, it mounts on its back and rides it up to its own grave, where it buries it. If the grave proves to be too small, the wasp drives the grasshopper away while it enlarges it as much as is required, and then brings the grasshopper back to the hole."

There is a great deal of interest in the life around us, of which we know very little.

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EXPLANATION OF PLATE XXIX.

Fig. 1. *Porrothete antipodiana*.

Fig. 2. *Salvus monachus*.

Both natural size.

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ART. XXIV.—*On the Anatomy of Paryphanta busbyi, Gray.*

By R. MURDOCH.

[Read before the Wellington Philosophical Society, 16th December, 1902.]

Plate XXVII.

An example of this fine species preserved in alcohol recently came into my possession. Unfortunately, the animal was completely retracted within the shell and very hard, an unsatisfactory condition for anatomical investigation. In order to extract the animal it was necessary to sacrifice the shell. The retractor muscle encircled the columella to the extent of a complete volution; the muscular impression is somewhat acutely ovate, and the position of its upper margin is about one and a half whorls from the apex of the shell. Above this, and proceeding towards the apical whorl, there is an ill-defined narrow muscular scar. This was doubtless the seat of the retractor muscle in the young animal, but in the adult form I do not think there is any muscular attachment outside of the area defined by the great impression.

The animal is bluish-black, with the foot-sole perhaps a shade lighter in colour. On the head and neck are a few regular rows of rugæ, somewhat quadrate in outline; on other parts of the body the rugæ appear to be oval-shaped, irregular in size, and not forming continuous rows.\* The mantle has a sharp even margin, and a deeply incised line or groove rather

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\* For a figure of the animal, see Proc Linn. Soc. N.S.W. (2), vol. ii., pl. xx., fig. 6.

less than 2 mm. from the edge. On the underside of the mantle is the usual prominent lappet which conceals the respiratory and anal pores, and in addition to this is a long narrow fold on the left side.

The buccal mass (fig. 1) is enormous in size and muscular development. Its posterior end is curved down and forward, and a powerful ventral muscle firmly binds it to the more anterior cylindrical portion. The retractor muscle (*r. m.*) envelops the posterior end, and from the anterior portion of the mass proceed a number of ventro-lateral muscles (*ant. r. m.*), which unite with the immediately adjoining body-walls. The œsophagus (*œs.*) enters the buccal cavity dorsally in the anterior fourth. The salivary glands (*s. g.*) are situated upon the posterior half of the buccal mass; they are fused together in the median line and partly envelope the œsophagus. From the anterior end of each gland proceeds a small salivary duct (*s. d.*), which enters the buccal cavity a little below the œsophageal opening. The stomach (*st.*) forms a simple elongated sac, and the tract of the intestine does not appear to differ from *P. hochstetteri*, Pfr.

The teeth have been described and figured by Captain Hutton;\* the formula given is 50-0-50. In the specimen under investigation many of the rows of teeth give the formula 52-0-52. A few of the innermost teeth (fig. 2), usually not more than two on each side, are small and very slender. Occasionally one of these slender spicula-like teeth is somewhat separated from the adjoining teeth, and where this occurs it gives to the row the appearance of a central tooth. Fig. 3 represents the teeth 20 to 26 in one of the rows.

The kidney is shortly tongue-shaped, in length less than twice its breadth, about half the length of the lung, and about one and a half times the length of the pericardium; the latter has the usual position on the left margin of the kidney. The ureter continues around the right margin of the kidney, follows the posterior limit of the lung, and opens close to the intestine. From this point the intestine, or rectum, forms a long straight tube. There is a well-marked ridge on the pulmonary wall less than 3 mm. from the side of the rectum, and the narrow area thus defined appears to be the open continuation of the ureter. The above-mentioned ridge examined in section proves to be tubular; it continues into the tissue of the mantle, and appears to unite with the blood-sinus contained therein. The venation of the lung, with the exception of the great pulmonary vein, is very indistinct. This vein runs direct to the auricle, is of considerable breadth, and has an undulating, almost convolute, appearance. On approaching the

\* Trans. N.Z. Inst., vol. xiv., p. 153, pl. iv., figs. A, L.

pneumostome it forms several branches, and the latter, with their accompanying afferent vessels, are fairly well indicated. The vessels on the rectal side of the lung are minute and very much branched, while on the cardiac side only a few traces may be seen.

The pedal gland opens between the head and foot immediately below the mouth; it forms a long flattish structure, much folded and lying on the floor of the body cavity. Its posterior end is slightly enlarged, and enclosed in a cavity in the foot, to which it has a muscular attachment. From the termination of the gland the usual tube or duct proceeds through the substance of the foot, but does not form a caudal mucous pore.

The retractor muscles: The buccal mass and pedal retractors are fused together posteriorly where they unite with the columella of the shell. The buccal retractor rests dorsally on the pedal muscles, and forms a broad powerful band. The pedal retractors are continuously attached to the foot, and there are no free progressively attached pedal retractors as in *Helix*. The ocular retractors branch from the pedal muscles; they bifurcate towards their anterior ends, and supply the inferior tentacle retractors.

The genital system is particularly interesting, and differs from the three anatomically known species—viz., *P. hochstetteri*, Pfr.,\* *P. edwardi*, Suter,† and *P. umula*, Pfr.,‡ in the extreme reduction of the male organs and the absence of a receptaculum seminis; but, when compared with the genital organs of *Schizoglossa novoseelandica*, Pfr.,§ a slug-like animal, there is a most remarkable resemblance. Fig. 4 gives a general outline of the genitalia.

There is a blunt, somewhat triangular, projection of the vaginal wall, with a retractor muscle proceeding to the adjoining body-wall; this is the only evidence of the male organs before any of the surrounding tissue has been dissected away. On removing this outer tissue a small loop is seen to project from the vaginal wall (fig. 5, p.). This I regard as the posterior termination of the penis, which passes into the vas deferens without any perceptible change, except a slight diminution of the tube. To follow the course

\* Godwin-Austen, Proc. Malac. Soc. London, vol. i., pp. 5-9, pl. i. (by an evident slip of the pen this plate is made to appear as illustrating the anatomy of *P. busbyi*); Collinge, Ann. Mag. N.H., ser. 7, vol. vii., pp. 68-70, pl. ii., figs. 17-21; Beutler, Zool. Jahrb. (Abth. f. Morph.), 1901, bd. 14, pp. 369-416, t. 26-29.

† Collinge, *ibid.*, pp. 70-71, pl. ii., figs. 22-25.

‡ A note on the anatomy of this species has been forwarded to the Malac. Soc. London, but the publication has not yet reached me.

§ Hedley, Proc. Linn. Soc. N.S.W. (series 2), vol. vii., pp. 387-392, pls. ix.-x.; Collinge, *ibid.*, pp. 71-72, pl. ii., figs. 26-30.

of these organs sectional investigation is necessary, and fig. 5 has in part been constructed from the data thus obtained. The anterior portion of the vagina (*ant. vg.*) forms a wide chamber, closed posteriorly by a valve-like papillar structure (*vg. p.*); the interior walls are slightly darkish in colour, and weakly longitudinally plicated. The papilla is continuously united with the vaginal wall, and the perforation through its centre is the only communication with the oviduct. Its anterior third projects freely into the anterior vaginal chamber. Its walls are comparatively thick; internally they are lightly longitudinally plicated, and have a whitish epitheloid lining.

The penis (*p.*) opens into the posterior portion of the papillar structure in the form of a small tube; it proceeds through the thick vaginal wall in an oblique anterior direction, and becomes slightly enlarged or bulbous towards its termination. The vas deferens (*v. d.*), as previously stated, is free to a very limited extent, and is imbedded in the vaginal wall. Its posterior prostatic course through the prominent folds or plications of the oviduct is tubular to a little above the position of section *b*, thence open, but for a short distance enfolded on all sides by the above-mentioned plications as figured in section *c*. From this point to the albumen gland it is a well-marked area of a rusty brownish tint, and somewhat separated from the uteral portion by the longitudinal folds. The uterus (*ut.*) is thrown into numerous sacculations, and its interior walls are richly convolutedly plicated. There is no indication of a receptaculum seminis. The albumen gland (*alb. g.*) is very large, a usual feature in this group of animals; in outline it is roughly boot-shaped. The hermaphrodite duct (*h. d.*) enters near the base of the albumen gland; it is a simple straight tube, with several short lesser tubes branching from it and uniting with the several masses which form the hermaphrodite gland. The latter (*h. g.*) are closely convoluted structures and imbedded in the liver.

When compared with *Schizoglossa novoseelandica* it is found that the vas deferens in the latter species is free to a greater extent, that no portion of its internal prostatic course appears to be tubular, and there does not appear to be any vaginal papilla. During copulation the atrium is everted; the penis pore is thus brought forward and may be detected on the everted wall. In *P. busbyi* what I have termed the anterior vaginal chamber doubtless undergoes complete eversion, and the vaginal papilla will be thrust outwards to a considerable degree—probably to a much greater extent than the appearance of the organ in its present condition suggests. The generative organs of the three previously mentioned species differ from each other in a rather marked degree, and the type of the genus further accentuates the divergence.

There yet remain two rare species which are anatomically unknown—viz., *P. gilliesi*, Smith, and *P. lignaria*, Hutton. A knowledge of the anatomy of these species is much to be desired, and I trust the collector who may have the good fortune to secure them will not neglect to preserve the animals.

In the allied genus *Rhytida* the teeth of the majority of the species have been described and figured, but, with the exception of two species, *R. greenwoodi*, Gray,\* and *R. meesoni*, Suter,† nothing is known of their general anatomy.

## EXPLANATION OF PLATE XXVII.

*Paryphanta busbyi*, Gray.

Fig. 1. Buccal mass, salivary glands, and portion of the alimentary canal.

Fig. 2. } Teeth.

Fig. 3. }  
Fig. 4. } Generative organs.

Fig. 5. Sectional view of portion of the generative organs, with transverse sections *a*, *b*, *c*, *d*.

## Abbreviations.

<i>alb. g.</i> Albumen gland.	<i>ovd.</i> Oviduct.
<i>ant. r. m.</i> Anterior retractor muscles.	<i>p.</i> Penis.
<i>ant. vg.</i> Anterior vaginal chamber.	<i>pr.</i> Prostate.
<i>b. m.</i> Buccal mass.	<i>r. m.</i> Retractor muscle.
<i>h. d.</i> Hermaphrodite duct.	<i>s. g.</i> Salivary gland.
<i>h. g.</i> Hermaphrodite gland.	<i>s. d.</i> Salivary duct.
<i>ms.</i> Muscular tissue connecting the oviduct with body-wall.	<i>st.</i> Stomach.
<i>oes.</i> Oesophagus.	<i>ut.</i> Uterus.
	<i>v. d.</i> Vas deferens.
	<i>vg.</i> Vagina.
	<i>vg. p.</i> Vaginal papilla.

ART. XXV. — On the Occurrence of *Paludicella* in New Zealand.

By A. HAMILTON.

[Read before the Otago Institute, 11th November, 1902.]

IN volume xii. of the "Transactions of the New Zealand Institute" † I noted the finding of a species of *Plumatella* in one of the rivers of Hawke's Bay. I have since found the same species (*Plumatella repens*) occurring plentifully in the Water of Leith and other streams near Dunedin. Within the last few months, however, another fresh-water Polyzoön has

\* Collinge, *l.c.*, pp. 66–68, pl. i., figs. 1–16; Murdoch, Proc. Malac. Soc. London (part 4), vol. iv., pp. 166–168, pl. xvii., figs. 5, 6.

† Murdoch, Proc. Malac. Soc. London (part iv.), vol. iv., p. 168, pl. xvii., fig. 7.

‡ p. 301.