

XIII. *Remarks on the Anatomy of Macgillivrayia pelagica and Cheletropis Huxleyi (FORBES); suggesting the establishment of a new Order of Gasteropoda.* By JOHN D. MACDONALD, R.N., Assistant-Surgeon H.M.S. 'Herald.' Communicated by Sir W. BURNETT, K.C.B. &c.

Received November 23,—Read December 21, 1854.

HAVING examined the anatomy of the *Macgillivrayia pelagica* and several smaller species of pelagic Gasteropoda, not exhibiting the least similarity in the character of their shells, I found that they all presented a very close relationship to each other, in the type of their respiratory organs, and in other points of structure of less importance.

The gills in every instance seemed to be fixed to the body of the animal immediately behind the head, and did not appear to be appended to the mantle, as in the Pectinibranchiata properly so called. They were also invariably four in number, and arranged in a cruciform manner round a central point.

They were free in the rest of their extent, elongated and flattened in form, with a pointed extremity, and fringed with large flowing cilia, set in a frilled border. They were furnished, moreover, with muscular fibres, disposed both transversely and in a longitudinal direction, and exhibited great mobility when protruded, but lay side by side in the last whorl of the shell when retracted.

The auditory capsules, each containing a spherical otolithe, were closely applied to the inner and posterior part of the larger or anterior ganglion of the subœsophageal mass.

There were but two tentacula, with an eye situate at the outer side of the base of each, consisting of a globular lens with distinct optic nerve and retinal expansion. The foot was large and very mobile, but a vesicular float has only been observed in *Macgillivrayia*.

The respiratory siphon was either a simple fold of the mantle, so rolled upon itself as to form a temporary tube (*Cheletropis*), or, as in *Macgillivrayia*, the borders of the fold were united through their whole extent, only leaving a small oblique aperture at the end to reveal its true nature. The siphon in *Macgillivrayia* is about twice the length of the shell, and as in the other species examined, beset with vibratile cilia.

A lingual ribbon of good proportional length with well-marked rachis and pleuræ occurs in all the species, none presenting the character of the broad pavement of hooklets to be found in the genus *Ianthina*. Very perfect labial plates with a close

file-like arrangement of dental points arm the mouth, in some instances at least, but most probably in all.

It is very remarkable, that the little animals possessing all the characters just detailed in common, should fabricate shells so very different in general form and other particulars as to permit of their arrangement into well-marked genera.

The obvious difference existing between the pectinibranchiate type of respiratory organs and that of the little Gasteropoda now under consideration, must at once afford sufficient grounds for placing the latter in a distinct order by themselves; in illustration of which, I have selected the anatomy of *Macgillivrayia pelagica* and *Cheletropis Huxleyi*, whose shells have been already described by Professor E. FORBES, and figured in Mr. MACGILLIVRAY'S 'Narrative of the Voyage of H.M.S. Rattlesnake.'

The beautiful little Gasteropod named after the latter gentleman, who was its first discoverer, was originally believed to be purely Australian, but upwards of a dozen specimens were captured in the towing-net, about the latitude of Bahia, while H.M.S.V. 'Torch' was proceeding to Rio de Janeiro.

The disc of the foot when expanded was of considerable breadth, but its attachment to the body was small and situate just beneath the neck (*Trachilipoda*). Its lateral borders were united posteriorly, forming a rounded extremity, to the upper surface or heel of which the concentric horny operculum with spiral nucleus was attached, but they were notched in front, so that the angles between them and the anterior margin, which was slightly convex, were prominent and pointed a little backwards. The raphe to be noticed in the mesial line, and in fact the whole character of this part of the organ, seemed to shadow forth the transformation of the single foot of the Gasteropod into the wing-like expansions of the Pteropod. The mouth of the animal was furnished with two horizontally placed, crescentic plates, adapted for acting upon one another in breaking up food.

The lingual strap bore many points of analogy to that of the Heteropods, the single series of plates in the rachis being angular with a finely serrated border, and the pleuræ consisting each of three rows of simple uncini, or with delicate teeth on the concave border.

The eyes, which were distinctly to be seen with a common lens, were surrounded by a rose-coloured zone, giving them a remarkable appearance. The four naked branchiæ fringed with gracefully curved cilia of unusually large size, radiated from a point at the back of the head like so many feathers set in a crown, which when taken together with the glowing eyes and brown labial teeth of the little mollusk, imparted quite a singular aspect to the whole physiognomy.

On the left side of the body a tubular process of the mantle protruded from the shell, and seemed to indicate the coexistence of a respiratory chamber with naked branchiæ. The length of this siphon nearly equalled that of the foot, and its aperture was oblique, as that of a portion of the mantle rolled into a tube would naturally be.

I had not the good fortune to find the vesicular float like that of *Ianthina*, noticed by Mr. MACGILLIVRAY in the first examples taken; but in one or two successful hauls of the towing-net off the Agulhas bank, Cape of Good Hope, the little animal again made its appearance, having been lost sight of on the voyage from Rio to the Cape, and the float was found *in statu quo*, consisting of an aggregation of vesicles varying, both in number and size, in different cases. It was exceedingly delicate, and might have been easily destroyed or separated from the foot on former occasions by the force of the water rushing through the meshes of the net.

The float of the *Ianthina* has been thought to be an extreme modification of the operculum, the absence of which in this genus no doubt has given rise to the idea; but as in the little *Macgillivrayia* both operculum and float are to be found in the same individual, we must admit the latter structure to be quite independent of the former, answering a distinctly different purpose.

The following account of the anatomy of *Cheletropis Huxleyi* is drawn up nearly *verbatim* from notes made on the examination of the species early in 1853; since which time I have met with one or two others of the same genus.

Numerous specimens of this interesting little mollusk were obtained in Bass's Strait and in the South Pacific, between Sydney and Lord Howe Island.

Its shell is of a darkish neutral colour, quite transparent, very brittle, and dotted all over with minute tubercles.

The spire is of moderate length, but small compared with the last whorl of the shell, which is large and full.

The aperture is oval, terminating anteriorly in a wide canal or notch. This notch, with two others of larger size on the outer lip, and two prominent teeth intervening, impart a characteristic appearance to the shell. Leading from the posterior tooth on the outer lip, a linear thickening of the shell may be traced quite to its apex.

The operculum is of an oval form, concentric, developed round a small spiral nucleus situate near one extremity, and altogether very much resembles that of *Atlanta*, being also extremely thin, vitreous-looking and brittle. It is not very easily detached from the foot for examination, and this circumstance, taken together with its extreme minuteness, might explain why it had not been observed by Professor FORBES.

The foot when exposed is proportionably long, rounded at the anterior and pointed at the posterior extremity. The whole surface of the disc is closely speckled with deep purple pigment-cells, in the centre of which the nuclei remain bright and transparent, not being obscured by the deposit. The whole surface of the foot is thickly covered with extremely delicate and active cilia.

That portion of the mantle which in *Macgillivrayia pelagica* forms a long and perfect tube, as a respiratory siphon, is short, and the opposite edges are merely brought together, without organic union, in the present species.

The cilia arming this part are much larger than those of the foot just alluded to

I have not discovered any vestige of a float, although it is possible that such may exist normally, and be detached by the rush of water through the towing-net, or some other accident.

The branchiæ or gills are of two kinds, *i. e.* covered and naked. The covered gill, as far as I have been able to observe, is single, but of considerable length. It is beautifully pectinated and fringed with long vibratile cilia, representing doubtless the respiratory organ of the pectinibranchiate Gasteropoda.

The basis of this structure is a long and narrow strip of a tough and fibrous material, folded upon itself so as to form a series of loops, invested with a coating of epithelium richly ciliated along the free border.

The naked gills are four in number, similar both in situation and character to those of *Macgillivrayia*.

Each gill is of an oval or elongated form, presenting a thin, frilled and corrugated border, beset with long whip-like cilia, which strike the water with a lashing movement.

In the central parts muscular fibres are distinctly discernible, some disposed lengthwise and others transversely, so that the whole structure and appearance of these organs, although very small, would recall to mind the sea-mouse and the numerous other marine annelidans of that character.

The lingual strap is of considerable length, the anterior extremity lying between two club-shaped pieces of cartilage consisting of extremely minute cells. The rachis is formed of a single series of dental plates, which alternate with those of the pleuræ. The latter consist of broad quadrilateral masses, each presenting one or two principal tubercles, the most internal of which is somewhat uncinated. The posterior extremity of the tubular sac, in the floor of which these peculiar teeth are arranged, is rounded and slightly enlarged.

Besides the lingual teeth, the mouth is furnished with two file-like triturating plates, which are articulated with each other inferiorly (Pl. XVI. fig. 7). The two tentacula of each side appear as it were enclosed in one envelope, so as to form a single tactile instrument, bearing a large dark eye on its outer side, near the base. To this latter organ the tegumentary covering forms a kind of cornea, beneath which is a spherical lens, resting on a mass of black pigment, both being enclosed in a little sac; and the optic nerve, emerging from the supra-œsophageal ganglion, joins the miniature globe and expands into a retina. I have not been able to trace an opening through the pigment for the passage of luminous rays, but it is most probable that, as in the ocelli of insects, such exists at the central part, the pigment only encroaching on the sphere of the lens sufficiently to correct the aberration of light.

At some distance behind the eyes, when the neighbouring parts are carefully removed with fine needles, the auditory capsules may be distinctly seen with the microscope. They are of a rounded or oval form, containing each a beautifully transparent and highly refracting otolithe, much larger than the lens of the eye.

EXPLANATION OF PLATE.

PLATE XVI.

- Fig. 1. *Macgillivrayia pelagica* (about three times the natural size), as it appeared ascending the side of the vessel in which it was placed.
- Fig. 2. Ditto, with foot expanded at the surface of the water, the ends of the branchiæ protruding.
- Fig. 3. Ditto, the crucial gills fully exposed as the animal lay upon its side at the bottom of the vessel.
- Fig. 4. The four gills slightly magnified to exhibit their character more clearly.
- Fig. 5. Portion of lingual strap of *Macgillivrayia*.
- Fig. 6. Ditto of *Cheletropis*.
- Fig. 7. Labial plates of the latter.
- Fig. 8. Portion of covered gill of same.
- Fig. 9. A tentaculum, showing the anatomy of the eye.
- Fig. 10. One of the acoustic capsules containing a spherical otolithe. All the objects highly magnified.

The remaining figures show the relative sizes of the shells of several species of pelagic Gasteropods, all of which are represented about twice the natural size.

Figs. 11, 13 and 14 are quite new, requiring both names and descriptions.

Fig. 12. A species of *Cheletropis*, probably not that of HUXLEY.

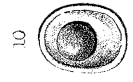
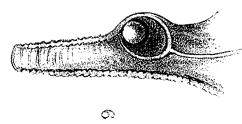
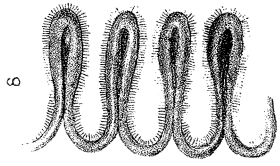
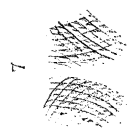
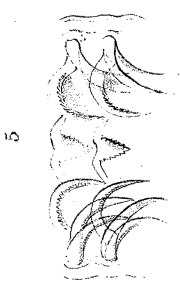
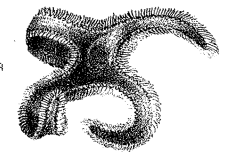
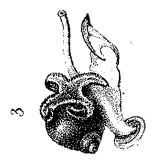
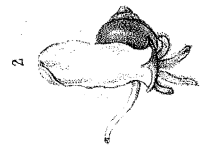
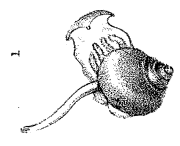
Fig. 15. *Macgillivrayia pelagica*.

The opercula of the respective shells are shown in the lowermost row, somewhat magnified, to exhibit the spiral nucleus and the lines of growth which determine their ultimate shape and character.

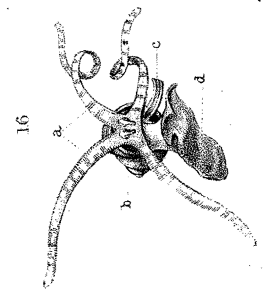
H.M.S. 'Herald,' Sydney,

February 11, 1854.

Figures



Figures



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