

THE GROSS ANATOMY OF *CORBICULA*  
*FLUMINALIS* (Müller).

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In a recent paper on the molluscs of Baluchistan and Seistan<sup>1</sup> Dr. Annandale and I have discussed the synonymy of *Corbicula fluminalis* at some length. A few additional remarks may, however, be made regarding the type-species of the genus *Corbicula*. This genus was established in 1811 by Megerle<sup>2</sup> with Müller's species *Tellina fluminalis*<sup>3</sup> as the type. Preston<sup>4</sup>, admitting this, referred to "*Corbicula fluminalis*, Megerle" as the type-species of the genus *Corbicula*; this is evidently a mistake since the author of the species *C. fluminalis* was Müller and not Megerle; the latter author only separated some of Müller's species of *Tellina* under the new name *Corbicula*.

The anatomy of the various species of *Corbicula* is very imperfectly known, the only work of any importance being a paper on the anatomy of a Chinese species (*C. lagillierii*) by Fischer.<sup>5</sup> I have therefore thought it desirable to describe the soft-parts of *C. fluminalis*, specimens of which, collected by Captain C. L. Boulenger at various places on the Euphrates, Mesopotamia, the original locality of Müller's species, and from Seistan, collected by Dr. N. Annandale and Dr. S. W. Kemp, are now available.

*Animal.* Corresponding to the shape of the shell the animal is trigonal, very much swollen in the umbonal region and greatly depressed below. Specimens preserved in spirit are of a creamy colour, the muscles and foot being of a much darker shade of yellow.

The mantle is translucent and thin up to the pallial junction, the further lower part is much thicker owing to well-developed radial pallial muscles, while the free border is still thicker. The margin of the mantle is entire and without any papillae along the edge. There is, however, a row of small conical papillae on the inner surface a little behind the edge. The papillae are much reduced or even absent in the middle region of the pedal orifice. In the siphonal region also there are papillae in the same situation, but these are much smaller in size. The mantle-flaps of the two sides are not free from one another but owing to the absence of a supra-

<sup>1</sup> *Rec. Ind. Mus.* XVIII, p. 58, pl. viii, figs. 1-6 (1919).

<sup>2</sup> *Mag. Ges. Naturf. Freude Berlin*, V, p. 56 (1811).

<sup>3</sup> Müller's *Verm. Terr. Fluv.* II, p. 205 (1774).

<sup>4</sup> *Faun. Brit. Ind., Freshw. Moll.*, p. 210 (1915).

<sup>5</sup> *Journ. Conchylol.* XI, pp. 1-10, pl. i, figs. 1-3 (1863).

anal aperture and the formation of a siphonal orifice consequent on the development of the two siphons, the arrangement is different from that in the Unionidae. Anteriorly the two flaps are united with one another to a point a little below the anterior adductor muscle. From this point to an imaginary vertical line drawn in continuation of the anterior border of the posterior adductor muscle to the free edge of the mantle, the two flaps are separate, forming the large pedal orifice for the protrusion of the foot. At the posterior termination of the pedal orifice the two flaps are united by a well-developed muscular connection, thus separating off the pedal from the siphonal orifice. The siphonal orifice extends to a little below the upper margin of the posterior adductor muscle, and encloses the anal and the branchial siphons. The mantle in the siphonal region is notched a little below the middle, marking off the regions for the two siphons. Above the siphonal orifice the mantle flaps are united with one another as on the antero-dorsal border.

There are two adductor muscles. Of these the anterior one lies a little below the anterior margin of the pedal orifice, and is circular in outline and of about the same size as the posterior adductor. The latter lies just above the anal siphon. A small pedal retractor muscle, ovoidal in outline, is situated above the posterior adductor muscle; its fibres, which by their contraction retract the foot as the shell-valves close, are easily traceable to the foot. The well-developed radiating palleal muscle-fibres of the mantle have been referred to already; they originate near the palleal line and end slightly behind the free edge of the mantle. In consequence of the absence of a distinct siphonal sinus on the shell the siphonal contractors are feebly developed and appear as specialized radial palleal fibres, which are more numerous in this region, are specially thickened and have a distinct antero-posterior course.

In all the preserved specimens the siphons are fully contracted. It is not possible, therefore, to decide as to their respective lengths. The two siphons are, however, quite separate from one another, the upper or anal siphon being the smaller of the two. It has a rounded orifice with one or two small papillae surrounding it, and has the anus opening into it anteriorly just behind the posterior adductor muscle. The lower or branchial siphon is much larger, with an ovoidal orifice in the contracted condition, and bears three to four rows of elongate papillae on its external orifice.

The attachments of the gills are quite normal. The outer lamellae of the outer pair are attached to the mantle, the inner lamellae of the outer pair to the outer lamellae of the inner, while the inner lamellae of the inner pair are attached along a little more than the anterior half to the abdominal mass, the rest becoming fused with the same part of the lamella of the gill of the opposite side. The outer pair of gills are much shorter in both length and width than the inner pair.

The palps are comparatively short, fleshy structures somewhat triangular in outline and the two palps of each side are of about the same size. The abdominal mass is much larger comparatively than that of *C. lagillierti*. The foot is small and feebly developed, it is rounded posteriorly and has a slightly pointed tip on the anterior side. The rest of the digestive system is very similar to that of the genus *Galatea*.<sup>1</sup> The rectum and the heart, lying in the pericardium, are plainly visible through the mantle.

There is nothing special to note about the nervous, circulatory and excretory systems. Regarding the genital system the only point of interest is the more swollen condition of the abdominal mass in the females.

*Affinities, etc.* The animal closely resembles that of *C. lagillierti* described by Fischer (*loc. cit.*), only differing in the better development of the siphons, the abdominal mass and the palpeal muscles. The siphonal muscle is poorly developed and the palps are much smaller. These differences may possibly be correlated, as Dr. Annandale has suggested to me, with the peculiar conditions in which *Corbicula fluminalis* is found. These are its living buried in soft mud and the long period of hibernation during the dry weather.

Fischer's remark as to the main distinguishing characters of the genus *Corbicula*, when he says, "On distinguera aisément les cyrènes à levrs branchie non réunies en arriere avec celles du côté opposé," is far from a correct description for, as has been described, the inner lamellae of the inner pair of gills of the two sides are united with each other in the posterior part and are not free. Fischer himself had recognized this, for in his "Manuel de Conchyliologie" (p. 1091) he described the animal of the genus *Corbicula* as having "branchie réunies en arrière."

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<sup>1</sup> Rang in *Ann. Sci. Nat.* XXII, pp. 152-164, pl. v (1832).