

REVISION OF THE ASIATIC SPECIES OF THE GENUS *CORBICULA*.

IV.—THE SPECIES OF THE GENUS *CORBICULA* FROM THE SUNDA ISLANDS, THE CELEBES AND NEW GUINEA.

By B. PRASHAD, *D.Sc., F.R.S.E., F.A.S.B.*,

Zoological Survey of India, Calcutta.

(Plates XXIV-XXVI.)

In this paper¹ the species of the genus *Corbicula* from the Large Sunda Islands consisting of Sumatra, Java and Borneo, the Celebes and New Guinea are dealt with. It completes the account of these freshwater bivalves of the area, for, so far as is known, no species of the genus are found in any of the Small Sunda Islands.

The revision of the species of the genus *Corbicula* found in Sumatra, Java, Borneo, and the Celebes by von Martens published in the Zoological Results² of Professor Max Weber's Expedition to the Dutch East Indies was the most complete account of these bivalves from any area, but unfortunately the author missed a paper by Clessin³ containing descriptions of new species of the genus from the area, published some ten years earlier, and as a result a certain amount of confusion was introduced in the nomenclature of the different species. Further, the material at the disposal of the author was not sufficiently extensive, and several of his supposed new species have now to be relegated to the synonymy of the already known forms. Since von Martens' paper a number of other important contributions on the genus have been published by Bullen, von Martens, the Sarasins and Krui-mel.⁴ I have had the advantage of examining almost all the material on which the works of these authors were based, and have also examined the older types so far as these are available. In addition I have had, thanks to the courtesy of the authorities of the Zoological Museum, Amsterdam, large collections of fresh material from different parts of the Dutch East Indies sent to me. It has thus been possible to deal with the *Corbicula*-fauna of the area in much greater detail than was possible when I published my earlier papers in this series. I have also, I hope, succeeded in ascertaining the distribution and limits of variation of the different species more accurately.

In the following account I have reproduced photographs of series of shells of the different species showing the changes in outline and form as undergone during growth. These photographs, in my opinion, are far more useful for the correct interpretation of the species than elaborate descriptions. I have, however, so far as possible, included short notes on the distinguishing characters of the different species and their relationships. It may also be noted here that the various groups suggested by von Martens, in his paper cited above, are

¹ The last paper of this series was published in *Mem. Ind. Mus.*, IX, pp. 49-68 (1929).

² von Martens, E.—*Weber's Zool. Ergebn. Niederländ. Ost.-Ind.*, IV, pp. 108-121, pl. vii (1897).

³ Clessin, S.—*Malakozool. Blätt.* (n.f.), IX, pp. 78, 79, pl. iii (1887).

⁴ References to the works of these authors are given in the body of the paper.

not, owing to the species intergrading into one another, of much value for the grouping of the species of this genus.

The species of the genus from the area under consideration and which I am able to recognise as valid are: *C. javanica* (Mousson) from Java, *C. ducalis* Prime from Java and Sumatra, *C. pulchella* (Philippi), *C. rivalis* (Philippi) and *C. gracilis* Prime from Java, *C. sumatrana* Clessin, *C. lacustris* von Martens, *C. gustaviana* von Martens, *C. tobae* von Martens, and *C. moltkiana* Prime from Sumatra, *C. pullata* (Philippi) from Sumatra and Borneo, *C. tumida* Deshayes and *C. bitruncata* von Martens from Celebes and *C. debilis* (Gould) from New Guinea.

The *Corbicula*-fauna of the area on the whole appears to be allied to that of Indo-China on the one hand and of the Philippine Islands on the other.

Corbicula javanica (Mousson).

(Pl. XXIV, figs. 1—6.)

1849. *Cyrena orientalis* var. *Javanica*, Mousson, *Moll. Java*, p. 86, pl. xv, fig. 2.
 1857. *Corbicula Moussoni*, Deshayes, *Cat. Brit. Mus. Conch.*, II, p. 227.
 1857. *Corbicula Moussoni*, Adams, H. & A., *Gen. Rec. Moll.*, II, p. 447.
 1860. *Corbicula Moussoni*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, p. 271.
 1869. *Corbicula Moussoni*, Prime, *Amer. Journ. Conch.*, V, p. 134.
 1869. *Corbicula ovalina*, Frauenfeld (*nec* Deshayes), *Verhandl. Zool.-bot. Gesell. Wien*, XIX, p. 863.
 1877. *Cyrena Moussoniana*, Sowerby, *Conch. Icon.*, XX, *Cyrena*, pl. xvii, fig. 97.
 1878. *Corbicula javanica*, Clessin, *Martini u. Chemn. Conch.-Cab.* (n.f.), IX (3), *Cycladeen*, p. 181, pl. xxxi, fig. 20.
 1897. *Corbicula javanica*, von Martens, *Weber's Zool. Ergebn. Niederland. Ost.-Ind.*, IV, p. 111.
 1904. *Corbicula subrostrata*, Bullen, *Proc. Malacol. Soc. London*, VI, p. 109, pl. vi, figs. 7-9.
 1906. *Corbicula Moussoniana* and *C. subrostrata*, Bullen, *Proc. Malacol. Soc. London*, VII, pp. 16, 130.
 1914. *Corbicula javanica* and *C. ovalina*, Leschke, *Mitteil. Naturhist. Mus. Hamburg*, XXXI, p. 269.
 1928. *Corbicula moussoni* and *C. subrostrata*, Degner, *Treubia*, X, p. 390.
 1929. *Corbicula javanica* and *C. subrostrata*, van Benthem Jutting, *Treubia*, XI, p. 88.

In view of the good descriptions of this species by Deshayes, Mousson and Clessin it is not necessary to redescribe the species. It may, however, be noted that it is one of the largest of the species of the genus found in Java and is distinguished from the allied *C. ducalis* Prime by the shell being very inequilateral, much longer than high, much less tumid, the posterior part of the shell much more elongated and broadly rostrate, and the sculpture consisting of distinct but closely placed striae. The posterior cardinal teeth are also much longer than the anterior ones. I figure a series of shells of different ages and give below the measurements (in millimetres) of a number of shells:

| | | | | | | | |
|----------------|----|------|------|------|------|------|----|
| Length | .. | 18 | 25 | 30 | 37.2 | 41 | 45 |
| Maximum height | .. | 15.8 | 22 | 25 | 23.8 | 34.8 | 38 |
| Thickness | | 11 | 14.5 | 16.8 | 23.2 | 24.3 | 24 |

Distribution.—The species is so far known from Java only.

Remarks.—*C. javanica* appears to be allied to *C. bocourti* Morelet of Indo-China and the Chinese *C. largillierti* (Phil.).

***Corbicula ducalis* Prime.**

(Pl. XXIV, figs. 7—12.)

1847. *Corbicula fluminea*, Philippi (in part), *Abbild. Beschreib. Conch.*, II, p. 76, pl. i, fig. 3.
 1849. *Corbicula fluminea*, Mousson (*nec* Müller), *Moll. Java*, p. 87, pl. xv, fig. 3.
 1857. *Corbicula fluminea*, Deshayes (in part), *Cat. Brit. Mus. Conch.*, II, p. 226.
 1862. *Corbicula ducalis*, Prime, *Proc. Boston Soc. Nat. Hist.*, VII, p. 274.
 1866. *Corbicula ducalis*, Prime, *Ann. Lyc. Nat. Hist. New York*, VIII, p. 225, fig. 58.
 1867. *Corbicula colonialis*, *id.*, *ibid.*, p. 416.
 1869. *Corbicula colonialis* and *C. ducalis*, Prime, *Amer. Journ. Conch.*, V, pp. 129, 131.
 1874. *Corbicula ducalis*, Issel, *Ann. Mus. Civ. Stor. Nat. Genova*, VI, p. 475.
 1877. *Cyrena gracilis*, Sowerby (*nec* Prime), *Conch. Icon.*, XX, *Cyrena*, pl. xiv, fig. 67.
 1877-78. *Corbicula fluminea* var. *Moussoni* (*nec* *Moussoni* Deshayes), *C. ducalis* and *C. colonialis*, Clessin, *Martini u. Chemn. Conch.-Cab.* (n.f.), IX (3), *Cycladeen*, pp. 154, 184, pl. xxvii, figs. 16-18, pl. xxxii, figs. 5, 6.
 1878. *Corbicula ducalis*, Prime, *Bull. Mus. Comp. Zool. Harvard*, V, p. 43.
 1880. *Corbicula ducalis*, Schepman, *Veth Midden-Sumatra*, IV, p. 17.
 1890. *Corbicula fluminea*, Boettger, *Ber. Senckenberg. Naturfor. Gesell.*, p. 163.
 1897. *Corbicula ducalis*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost.-Ind.*, IV, p. 114.
 1908. *Corbicula fluminalis*, Rolle, *Nachrbl. Deutsch. Malakozool. Gesell.*, XL, p. 69.
 1912. *Corbicula ducalis*, Schepman, *Proc. Malacol. Soc. London*, X, p. 238.
 1914. *Corbicula ducalis*, Leschke, *Mittel. Naturhist. Mus. Hamburg*, XXXI, pp. 222, 268.
 1928. *Corbicula ducalis*, Degner, *Treubia*, X, p. 389.
 1929. *Corbicula ducalis*, van Benthem Jutting, *Treubia*, XI, p. 88.

This species of the genus *Corbicula* appears to be the least understood of the species found in the Dutch East Indies. As is clear from the synonymy given above, it was confused with the Chinese species *C. fluminea* (Müller) by Philippi, and Mousson and Deshayes followed him in their accounts. Prime was the first to unravel the confusion and described it under the name *C. ducalis*, but later described shells of the same species as *C. colonialis*. Sowerby described and figured shells of *C. ducalis* as *C. gracilis* Prime. von Martens cleared up the confusion in reference to the species and gave a short description, but he also did not take into account the great variation exhibited by the species. *C. ducalis* may be redescribed as follows: Species of a medium size, oval-trigonal; inequilateral, longer than high, thick-shelled, moderately inflated; broadly rounded anteriorly, rostrate, truncate posteriorly, ventral margin greatly arched but from about the middle running straight to the truncate posterior margin; umbones prominent, somewhat acuminate, lying at about 2/5th of the length from the anterior end, mostly eroded in full-grown shells, but in young shells with concentric, closely situated, regular ridges; surface sculpture usually consisting of regular, concentric, distantly placed ridges, but in a few cases the ridges are closer and not so high. In full-grown shells such as those photographed on pl. XXIV (figs. 11, 12) the marginal area is covered by much more closely placed and irregular striae. The colour of the periostracum varies from greenish-yellow to dark brown. The nacre is

light bluish-white with pink to reddish in the middle; the hinge is always dark violet. The hinge is normal, strongly developed, with the anterior cardinals somewhat impressed, owing to the muscle scar impinging on them; anterior and posterior cardinals almost equal in size. The nymphs are broadly heart-shaped and bear the usual ribbing of the shell.

Measurements (in millimetres).

| | | | | | | | |
|-------------------|------|------|------|------|------|------|------|
| Length .. | 16 | 21 | 24 | 31.8 | 32 | 38.5 | 41 |
| Maximum height .. | 13.8 | 18.3 | 20.2 | 29.2 | 28.4 | 35 | 34.2 |
| Thickness | 10.7 | 13.6 | 15.1 | 20.5 | 21 | 24.8 | 23.7 |

Distribution.—*C. ducalis* is widely distributed in Java and Sumatra. von Martens has also recorded a specimen of it from Celebes, and Issel records it from Borneo, but both these records are doubtful.

Remarks.—*C. ducalis* is allied to *C. fluminea* (Müller) of China and *C. baudoni* Morlet of Indo-China, but is distinguished from both these species by its form and sculpture. It is just possible that *C. javana* Clessin is a synonym of this species.¹

***Corbicula pulchella* (Mousson).**

(Pl. XXIV, figs. 13, 14.)

1849. *Cyrena pulchella*, Mousson, *Moll. Java*, p. 88, pl. xv, fig. 4.
 1854. *Corbicula pulchella*, Deshayes, *Cat. Brit. Mus. Conch.*, II, p. 228.
 1857. *Corbicula pulchella*, Adams, H. & A., *Gen. Rec. Moll.*, II, p. 447.
 1860. *Corbicula pulchella*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, p. 272.
 1869. *Corbicula pulchella*, Prime, *Amer. Journ. Conch.*, V, p. 135.
 1878. *Corbicula pulchella*, Clessin, *Martini u. Chemn. Conch.-Cab.* (n.f.), IX (3), *Cycladeen*, p. 181, pl. xxx, figs. 7, 8.
 1897. *Corbicula pulchella*, von Martens, *Weber's Zool. Ergebn. Niederland. Ost.-Ind.*, IV, p. 120.
 1914. *Corbicula pulchella*, Leschke, *Mitteil. Naturhist. Mus. Hamburg*, XXXI, p. 269.
 1929. *Corbicula pulchella*, van Benthem Jutting, *Treubia*, XI, p. 88.

In his paper cited above von Martens placed *C. pulchella* in the group "Debiles" which he had characterized (*op. cit.* p. 110) as "Dünschalig, abgerundet, mit schwächer Ausbildung der Sculptur." In his account of the species he, however, remarked that he had no specimens before him which agree with these characters for even the three specimens, which he had received from Mousson himself, labelled as *C. pulchella*, had strongly developed ribs differing from those of shells of the Debiles Group. I have three lots of specimens before me which agree in all respects with Mousson's description about sculpture *viz.* "tenuiten sulcata," or "fein gerieft." The specimens before me, two of which I figure, have a large number of regular, very closely placed and slightly impressed ribs. The species seems to be allied to the Indian *C. bensoni* Deshayes and *C. sylhetica* Preston.²

¹ Clessin, S.—*Martini u. Chemn. Conch.-Cab.* (n.f.), IX (3), *Cycladeen*, p. 180, pl. xxxi, figs. 16, 17 (1878).

² See Prashad, B.—*Mem. Ind. Mus.*, IX, pp. 23, 24 (1928).

Measurements (in millimetres).

| | | | | | | | | |
|----------------|----|----|----|----|------|------|------|-----|
| Length | .. | .. | .. | .. | 10.5 | 10.8 | 11.2 | 13 |
| Maximum height | .. | .. | .. | .. | 8.4 | 9 | 9.4 | 11 |
| Thickness | .. | .. | .. | .. | 6.2 | 6 | 6.2 | 6.8 |

Distribution.—*C. pulchella* (Mousson) is so far known from Java only.

Corbicula rivalis (Philippi).

(Pl. XXIV, figs. 15, 16.)

1850. *Cyrena rivalis*, Philippi, *Abbild. Beschreib. Conch.*, III, p. 110, pl. iii, fig. 5.1857. *Corbicula compressa*, Deshayes, *Cat. Brit. Mus. Conch.*, II, p. 227.1857. *Corbicula compressa* and *C. rivalis*, Adams, H. & A., *Gen. Rec. Moll.*, II, pp. 447, 448.1860. *Corbicula compressa* and *C. rivalis*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, pp. 269, 273.1869. *Corbicula compressa* and *C. rivalis*, Prime, *Amer. Journ. Conch.*, V, pp. 129, 136.1877. *Cyrena compressa*, Sowerby, *Conch. Icon.* XX, *Cyrena*, pl. xii, fig. 58.1877-78. *Corbicula rivalis* and *C. compressa*, Clessin, *Martini u. Chemn. Conch.-Cab.* (n.f.), IX (3), *Cycladeen*, pp. 159, 168, pl. xxvii, fig. 15, pl. xxix, figs. 11, 12.1897. *Corbicula rivalis*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost-Ind.*, IV, p. 120, pl. vii, figs. 32, 33.1914. *Corbicula rivalis* (with *C. compressa* as synonym), Leschke, *Mitteil. Naturhist. Mus. Hamburg*, XXXI, pp. 269, 270.1929. *Corbicula rivalis*, van Benthem Jutting, *Treubia*, XI, p. 88.

Deshayes's description of the species renders a re-description of the species unnecessary. It may, however, be pointed out that the species is a thin-shelled, trigonal form with the anterior and posterior sides subequal, rather compressed and with regular, concentric but not deeply impressed striae all over the surface.

Mousson's specimen figured by von Martens in his paper cited above is a greatly worn shell, and does not show the characteristic features of the species. I, therefore, publish photographs of two shells from Pasurnan, Java, from the collection of Frühstorfer in the Amsterdam Museum.

Measurements (in millimetres).

| | | | | | | | | |
|----------------|----|----|----|----|------|------|------|------|
| Length | .. | .. | .. | .. | 15.8 | 23 | 23.8 | 24.3 |
| Maximum height | .. | .. | .. | .. | 13.7 | 18.5 | 19.7 | [20 |
| Thickness | .. | .. | .. | .. | 8.5 | 11.8 | 12 | 12.2 |

Distribution.—The species is so far known from Java only.

Remarks.—*C. rivalis* appears to be allied to *C. pulchella* (Mousson), but the shells of the former are much larger and the ribbing is better developed.

Corbicula gracilis Prime.

(Pl. XXIV, figs. 17—19.)

1860. *Corbicula gracilis*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, p. 270.1862. *Corbicula gracilis*, Prime, *Journ. Conchyliol.*, X, p. 389, pl. xiv, fig. 7.

1869. *Corbicula gracilis*, Prime, *Amer. Journ. Conch.*, V, p. 132.
 1878. *Corbicula gracilis*, Clessin, *Martini u. Chemn. Conch.-Cab.* (n.f.), IX (3), *Cycladeen*, p. 191, pl. xxxviii, fig. 2.
 1897. *Corbicula sulcata*, Clessin, *op. cit.*, p. 188, pl. xxxii, figs. 17, 18.
 1900. *Corbicula sulcata*, von Martens, *Nachrbl. Deutsch. Malakozool. Gesell.*, XXII, p. 17.
 1914. *Corbicula gracilis* and *C. sulcata*, Leschke, *Mitteil. Naturhist. Mus. Hamburg*, XXXI, pp. 269, 270.
 1928. *Corbicula gracilis* and *C. sulcata*, Degner, *Treubia*, X, pp. 389, 390.
 1929. *Corbicula gracilis* and *C. sulcata*, van Benthem Jutting, *Treubia*, XI, p. 88.

There seems to have been a great deal of confusion in reference to *Corbicula gracilis* Prime. Sowerby figured and described under this name a shell which, as I have pointed out above, is a young shell of *C. ducalis* Prime, while von Martens did not include this species as distinct in the forms known from the Dutch East Indies. He, however, noted that it is allied to *C. sulcata* Clessin, but is distinguished by the proportion of the length to the height being much shorter. I believe that it is a distinct species and from an examination of the specimens identified by Clessin as *C. sulcata* I have no doubt that the latter is a synonym of this species.

It is a small oval species of a greenish-olive colour with the anterior and posterior sides subequal, and the surface covered with regular, concentric, distantly placed ridges.

I give below the measurements (in millimetres) of a few specimens and figure three shells from Sindanglya about 60 miles from Batavia, Java.

| | | | | | | |
|----------------|------|------|------|------|------|------|
| Length | 15.4 | 17 | 17.5 | 18.2 | 18.8 | 19.4 |
| Maximum height | 12.2 | 13.8 | 14.3 | 15 | 14.7 | 15 |
| Thickness | 8.7 | 10 | 10.8 | 11.8 | 11.6 | 11.8 |

Distribution.—*C. gracilis* is so far known from the island of Java only.

Remarks.—This species is allied to *C. tumida* Deshayes from Borneo. Probably the specimens recorded as *C. tumida* Deshayes by von Martens (*op. cit.* p. 113) from Sumatra are also to be referred to this species.

***Corbicula sumatrana* Clessin.**

(Pl. XXV, figs. 1—8.)

1887. *Corbicula Sumatrana*, Clessin, *Malakozool. Blätt.*, (n.f.), IX, p. 78, pl. iii, fig. 7.
 1887. *Corbicula Verbecki*, *id.*, *ibid.*, p. 79, pl. iii, fig. 8.
 1897. *Corbicula trapezoidea*, *C. angulifera* and *C. gibba*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost-Ind.*, IV, pp. 115, 116, 121, pl. vii, figs. 14-19, 28-31, 25-27.
 1921. *Corbicula trapezoidea* and *C. angulifera*, Prashad, *Rec. Ind. Mus.*, XXII, pp. 404, 505.
 1928. *Corbicula angulifera*, *C. gibba* and *C. trapezoidea*, Degner, *Treubia*, X, pp. 389, 390.

Clessin in the same paper described shells from the Singkarah Lake, Sumatra, under the names *C. sumatrana* and *C. verbecki*, while von Martens in ignorance of Clessin's paper described the same species under the names *C. trapezoidea*, *C. angulifera* and *C. gibba*. The species is very variable, and I give below a redescription of it based on a large number of shells.

Shells greatly varying in outline from triangular to trapezoid or even ovoid ; of a medium size, usually longer than high, thick-shelled, greatly inflated ; broadly rounded anteriorly, slightly rostrate and subtruncate posteriorly ; ventral margin not greatly arched, but in some specimens arching up suddenly from below the umbonal region ; umbones prominent, acuminate, almost touching in the middle ; surface sculpture consisting of regular concentric strong ridges with broad interspaces, the ridges arching up at an angle from near a low ridge which appears to run down from the posterior margin of the umbones ; the ridges sometimes become irregular on older shells. The colour of the shells varies from greenish-olive to dark brown. The nacre is light blue to salmon pink or dark violet. The hinge is normal, greatly arched, and has the anterior cardinals greatly impressed in the lower third. The nymphs are broadly heart-shaped and bear low, thin ridges.

Measurements (in millimetres).

| | | | | | | | |
|-------------------|----|------|------|------|------|------|------|
| Length .. | .. | 15 | 17.4 | 22 | 22.4 | 23.3 | 25.2 |
| Maximum height .. | .. | 13.8 | 16.5 | 24 | 19.1 | 22.4 | 21 |
| Thickness .. | .. | 10 | 13.2 | 19.5 | 14.4 | 16.7 | 15.5 |

Distribution.—*C. sumatrana* is widely distributed in the lakes of Sumatra and appears to be a true lacustrine species.

Remarks.—This species appears to be allied to *C. moreletiana* Prime¹ of Cochin-China, and appears to have been evolved under similar biological conditions.

***Corbicula lacustris* von Martens.**

(Pl. XXV, figs. 9, 10.)

1897. *Corbicula lacustris*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost-Ind.*, IV, p. 118, pl. vii, figs. 20-24.

1928. *Corbicula lacustris*, Degner, *Treubia*, X, p. 390.

I was originally inclined to consider this species of von Martens, which was collected from Singkarah Lake, as a synonym of *C. sumatrana* Clessin, but as I have not found any intermediate forms connecting it with the latter species, I propose leaving it as distinct. *C. lacustris*, as the name indicates, is a lacustrine species and was found down to a depth of 50 metres. It differs from *C. sumatrana* in the outline of the shell, the sculpture being less strongly developed and more irregular and the hinge more strongly arched.

I reproduce photographs of two shells.

Remarks.—There can be little doubt that *C. lacustris* is closely allied to *C. sumatrana* and is derived from it, the differences being probably due to the greater depths at which it lives in the lake of Singkarah.

***Corbicula gustaviana* von Martens.**

(Pl. XXV, figs. 11, 12.)

1900. *Corbicula gustaviana*, von Martens, *Nachtbl. Deutsch. Malakozool. Gesel.* XXII, p. 16.

1928. *Corbicula gustaviana*, Degner, *Treubia*, X, p. 390.

¹ See Prashad, B.—*Mem. Ind. Mus.*, IX, p. 38, pl. vi, figs. 1-5 (1929).

The description of *C. gustaviana* from Sumatra by von Martens is very complete and it is not necessary to redescribe it here. The species has not been figured so far, and I, therefore, publish photographs of two shells from the type-locality.

Remarks.—*C. gustaviana* does not, as von Martens suggested, belong to his group "Triangulares" but should be referred to the "Subaequilatae". It is allied to *C. javanica* (Mousson) and *C. pullata* (Phil.), but is distinguished by the shells being very nearly as high as long, the posterior subrostrate margin not so well developed, the ridges separated by broad interspaces and the hinge more angulate. It is just possible that *C. gustaviana* is only a form of *C. javanica*.

Corbicula tobae von Martens.

(Pl. XXV, figs. 13—16.)

1900. *Corbicula tobae*, von Martens, *Nachrbl. Deutsch. Malakozool. Gesell.*, XXII, p. 17.

1928. *Corbicula tobae*, Degner, *Treubia*, X, p. 390.

This species was described by von Martens three years after his revision of the Corbiculas of the Dutch East Indies and was referred by him to his group "Debiles". The species has never been figured so far and as von Martens' description is not quite complete I re-describe the species below and publish photographs of shells of different ages.

Shell trapezoidal-orbicular; greatly inflated, broadly rounded anteriorly, sharply truncated posteriorly; upper margin greatly arched anteriorly, nearly straight and slightly sloping posteriorly; ventral margin greatly arched. Umbones prominent, greatly inflated, situated in the anterior half of the shell, pointing forwards and inwards. Sculpture consisting of numerous low, but distinct, concentric ridges; stronger lines of growth are also to be distinguished here and there. Colour olive yellow to brown or even black, much darker in the older shells. Nacre dirty light blue to violet; hinge area much lighter in colour, Pallial line and adductor muscle scars feebly impressed. Hinge normal, teeth feebly developed, laterals only slightly arched and subequal.

Measurements (in millimetres).

| | | | | | | |
|----------------|------|------|------|------|------|------|
| Length | 15 | 15.5 | 16 | 17.2 | 17.8 | 22.5 |
| Maximum height | 13.2 | 12 | 14.4 | 15.4 | 16.5 | 20.4 |
| Thickness | 9.1 | 7.5 | 10 | 10 | 11.4 | 13.6 |

Distribution.—*C. tobae* appears to be confined to Lake Toba in Sumatra.

Remarks.—The species is one of the small-shelled and finely ridged species of the genus, and is allied to *C. pulchella* (Mousson).

Corbicula moltkiana Prime.

(Pl. XXV, figs. 17—22.)

1878. *Corbicula Moltkiana*, Prime, *Bull. Mus. Comp. Zool. Harvard*, V, p. 43.

1880. *Corbicula moltkeana*, Schepman, *Veth Midden-Sumatra*, IV, p. 17.

1897. *Corbicula Moltkeana*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost.-Ind.*, IV, p. 111, pl. vii, figs. 1—6.

1900. *Corbicula moltkeana*, von Martens, *Nachrbl. Deutsch. Malakozool. Gesell.*, XXII, p. 17.

1921. *Corbicula moltkeana*, Prashad, *Rec. Ind. Mus.*, XXII, p. 504.

1928. *Corbicula moltkeana*, Degner, *Treubia*, X, p. 390.

In view of the good description of *C. moltkiana* by Prime it is not necessary to redescribe it. As von Martens pointed out it is a very variable species, more particularly in reference to the outline of the lower margin. As a result of this variation the shells differ in form and appear trigonal or trapezoidal; the proportion of the length to the height is also very variable. I figure a number of shells showing these differences.

Distribution.—*C. moltkiana* is so far known from Sumatra only.

Remarks.—The species is allied to *C. javanica* (Mousson), but the shell is much thinner, with the hinge less strongly developed and the sculpture, which consists of distantly placed ridges, not so deeply impressed.

***Corbicula pullata* (Philippi).**

(Pl. XXVI, figs. 1—6.)

1850. *Cyrena pullata*, Philippi, *Abbild. Beschreib. Conch.*, III, p. 110.

1854. *Corbicula pullata*, Deshayes, *Cat. Brit. Mus. Conch.*, II, p. 232.

1858. *Corbicula pullata*, Adams, H. & A., *Gen. Rec. Moll.*, II, p. 448.

1860. *Corbicula pullata*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, p. 272.

1869. *Corbicula pullata*, Prime, *Amer. Journ. Conch.*, V, p. 135.

1874. *Corbicula dyakorum* and vars. *olivacea* and *inaequilatera*, Issel, *Ann. Mus. Civ. Stor. Nat. Genova*, VI, p. 473, pl. vii, figs. 25-27.

1897. *Corbicula pullata*, von Martens, *Weber's Zool. Ergebn. Niederländ Ost.-Ind.*, IV, p. 117.

1914. *Corbicula pullata*, Leschke, *Mitteil. Naturhist. Mus. Hamburg*, XXXI, p. 269.

1922. *Corbicula pullata*, Prashad, *Rec. Ind. Mus.*, XXII, p. 505.

1928. *Corbicula pullata*, Degner, *Treubia*, X, p. 390.

Philippi did not publish a figure of this species and his meagre description of it does not allow of the species being identified with certainty. Fortunately von Martens found a specimen of it in Dunker's collection, apparently presented by Philippi, and described it in detail. He, however, did not publish a figure of this shell. I have seen this specimen and can confirm von Martens' conclusion that the species is the same as was later named *C. dyakorum* by Issel.

It is a trigonal, subequilateral species with the ventral margin greatly arched, rounded anteriorly and with a subtruncated posterior margin. Some old shells like the single left valve figured (Plate XXVI, fig. 6) are much higher than long and very inequilateral, while a few are more elongate. The sculpture consists of very regular, rather narrow but well impressed ridges.

Measurements (in millimetres).

| | | | | | | |
|------------------------|------|----|------|------|----|------|
| Length | 23.5 | 24 | 27.5 | 28 | 30 | 30 |
| Maximum height | 27.4 | 24 | 25 | 25.5 | 29 | 31.6 |
| Thickness | 15 | 16 | 17.4 | 16.8 | 18 | .. |

The first specimen is very worn in the umbonal region and the last one is a single valve.

Distribution.—This species is widely distributed in Borneo and Sumatra.

Remarks.—*C. pullata* appears to be allied to *C. javanica* (Mousson). I have after a careful examination of a fair series of specimens been unable to distinguish the varieties described by Issel.

Corbicula tumida Deshayes.

(Pl. XXVI, figs. 23—26.)

1854. *Corbicula tumida*, Deshayes, *Proc. Zool. Soc. London*, 1854, p. 343.

1854. *Corbicula tumida*, Deshayes, *Cat. Brit. Mus. Conch.*, II, p. 229.

1860. *Corbicula tumida*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, p. 274.

1866. *Corbicula tumida*, Prime, *Ann. Lyc. Nat. Hist. New York*, VIII, p. 219, fig. 50.

1874. *Corbicula tumida*, Issel, *Ann. Mus. Civ. Stor. Nat. Genova*, VI, p. 410.

1877. *Corbicula tumida*, Clessin, *Martini u. Chemn. Conch.-Cab.*, (n.f.), IX (3), *Cycladeen*, p. 135, pl. xxiv, fig. 11, pl. xxv, figs. 5, 6.

1897. *Corbicula tumida*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost.-Ind.*, IV, p. 113.

1908. *Corbicula tumida*, von Martens, *Mitteil. Zool. Mus. Berlin*, IV, p. 265.

1928. *Corbicula tumida*, Degner, *Treubia*, X, p. 390.

Deshayes and Prime have described this species at great length and it is, therefore, unnecessary to redescribe it here. The species is distinguished by its transversely elongated oval, somewhat inflated and thin shell. The sculpture consists of rather low but distinct and very distantly placed ridges on its entire surface.

Distribution.—*C. tumida* is confined to Borneo. The specimens from Sumatra referred to this species by von Martens¹ were probably young examples of *C. ducalis* Prime.

Remarks.—The species is allied to *C. cumingii* Deshayes from the Philippines, and the young shells resemble those of *C. ducalis* Prime.

Corbicula bitruncata von Martens.

1908. *Corbicula bitruncata*, von Martens, *Mitteil. Zool. Mus. Berlin*, IV, p. 290, pl. vi, fig. 25.

I have, unfortunately, been unable to secure any specimens of this Bornean species, and am, therefore, unable to make any remarks about it. The species appears to be allied to *C. pullata* (Philippi).

Corbicula celebensis von Martens.

(Pl. XXVI, figs. 27, 28.)

1897. *Corbicula celebensis*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost.-Ind.*, IV, p. 113, pl. vii, figs. 11-13.

The detailed account of von Martens renders a redescription of this species unnecessary. It may, however, be noted that the species is closely allied to *C. tumida* from Borneo, but is to be distinguished from the latter by the shells being less elongate posteriorly and the ridges somewhat closer and not so well developed.

I publish photographs of two shells from the type-series which were collected by Professor Max Weber in a river near Maros, Celebes.

¹ von Martens, *op. cit.*, p. 113 (1897).

Corbicula subplanata von Martens.

(Pl. XXVI, figs. 7—20.)

1897. *Corbicula subplanata*, von Martens, *Weber's Zool. Ergebn. Niederländ. Ost.-Ind.*, IV, p. 112, pl. vii, figs. 7-10.
1898. *Corbicula matannensis* and *C. possoënsis*, Sarasin, P. & E., *Die Süßwass. Moll. Celebes*, p. 92, pl. xi, figs. 158-162.
1913. *Corbicula matanensis*, *C. mahalonensis*, *C. possoensis*, *C. towritensis*, *C. loehensis*, and *C. masapensis*, Kruimel, *Bijdrag. tot Dierk. Amsterdam*, XIX, pp. 231, 232, pl. iv, figs. 1-5.

After a careful comparison of a large series of shells, including the types, I have come to the conclusion that all the different forms from the rivers and lakes of Celebes enumerated in the synonymy above belong to the same species. The species is very variable, forms corresponding to one or other of the above named species occur indiscriminately in the various lakes and it is not possible, therefore, to distinguish any varieties.

The young shells are generally elongated ovate, of a brownish colour, but in older shells the posterior side becomes very much elongated and distinctly rostrate. Some shells appear trapezoidal while others are trigonal. The sculpture consists of low, closely placed and not deeply impressed ridges. The umbones are somewhat tumid and prominent in the young shells, but in older shells, owing to corrosion, become quite depressed. Younger shells are thin, but full-grown shells are solid and quite heavy. The colour varies from yellow to black and the nacre may be light blue to deep violet.

Distribution.—*C. subplanata* is widely distributed in the lakes and rivers of Celebes.

Remarks.—This species appears to be allied to *C. moltkiana* Prime.

Corbicula debilis (Gould).

(Pl. XXV, figs. 29, 30.)

1850. *Cyrena debilis*, Gould, *Proc. Boston Soc. Nat. Hist.*, III, p. 293.
1852. *Cyrena debilis*, Gould, *U.S. Explor. Exped., Mollusca*, p. 427, pl. xxxvi, figs. 529a, b.
1854. *Corbicula debilis*, Deshayes, *Cat. Brit. Mus. Conch.*, II, p. 234.
1860. *Corbicula debilis*, Prime, *Proc. Acad. Nat. Sci. Philadelphia*, XII, p. 269.
1869. *Corbicula debilis*, Prime, *Amer. Journ. Conch.*, V, p. 131.
1908. *Corbicula debilis*, Bavay, *Nova Guinea, Zoologie*, V, p. 291.

Bavay recorded four specimens of Gould's *C. debilis* from Sekano River, New Guinea, and added that the species is probably identical with *C. pulchella* (Mousson). I publish photographs of two of these shells from which it will be seen that the species, though allied to *C. pulchella*, differs from it in shape and sculpture.