XXVIII. MOLLUSCA, II: ZONITIDAE AND HELICIDAE (in part).

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(Plates xxiii–xxiv.)

The collection made by Mr. S. W. Kemp, Assistant Superintendent, Indian Museum, when attached as naturalist to the Force under Major-General Hamilton Bower, which entered the Abor country in the winter of 1911–12, is one of the finest and most interesting from the Eastern Frontier I have ever looked over, containing as it does so many genera and new species, and so many that are quite distinct from the land mollusca at present known from the most western part of Assam.

As it must be a very long time before all this material, a very large amount of which is beautifully preserved in spirit, can be examined and the anatomical details worked out, I think it well to give now a preliminary generic list of the species in the collection. The description of new genera and new species to follow at intervals. The first contribution I now submit treats of two interesting new species. Added to this collection I have received from officers of the Indian Survey Department a small collection from the Miri Hills which were entered the same season of 1911–12 by a party under Lt. R. S. Wahab, R.E.

Quite recently I have received many new shells collected during 1912–13 by Lt. G. F. T. Oakes, R E., who has been extending his work in the Abor Hills of the previous year. Some of these species of *Spiraculum*, *Glessula*, *Sirella*, reached me alive and two species of *Glessula* at the time of writing (June) are still living.

To both these officers and Mr. Kemp especially I am much indebted and I sincerely thank them.

LIST OF GENERA REPRESENTED IN THE COLLECTION.

ZONITIDAE.

MACROCHLAMYINAE.

Macrochlamys (sp. nov.).
New Genus.
Sarama (*S kempi*, n. sp.).
Khasiella (sp. nov.).
Oxytes oslei, G.-A. (near *O. oxytes*, Bs.)
Taphrospira.

HELICARIONINAE.

Cryptaustenia.
Austenia (*A. rotungensis*, n. sp.).
Girasia.

DURGELLINAE.

Durgella.

HELICIDAE.

Sivella (sp. nov.).
Planispira (*P. delibrata* var. *fasciata*, G.-A.)
Plectopylis (sp. nov.).
Plectotropis.
Amphidromus.
Opeas.
Glessula.
Clausilia (sp. nov.).

Austenia rotungensis, sp. nov.

(Pl. xxiii, figs. 1-5 ; pl. xxiv, figs. 1-5).

Rotung, Abor Hills, 24-xii-11 *(S. W. Kemp)*. 3 specimens. Nos. 5693-4 and 5881.

The largest specimen (5881) measures 70 mm., the one dissected (5963) 60 mm., and both are very much contracted in the spirit ; it must be quite 100 mm. when living.

Animal, as in spirit, ash-grey with a rufous tinge, darker about the head, palest on the mantle lobes. There are signs of a few distinct dark spots on the side of the foot. Sole of foot has a distinct central area, crossed by distinct V-shaped lines. Right and left shell lobes are united above the respiratory orifice and a short indistinct cicatrix can be seen where the junction takes place. The left dorsal lobe is large and expanded forwards in front over the neck, the right is small, lying between the above orifice and the hinder part of the shell. All the lobes are smooth. Foot behind is as long as the shell, as contracted, it is much compressed on the side, very sharply keeled, terminating in a vertical, linear mucous pore, and having no lobe over it, there is a slight turning over above the nearly vertical slit (pl. xxiii, fig. 5).

The peripodial margin is well marked by being much paler than the part above, and is closely streaked with fine lines. The surface of the body is very rough, in the largest the rows of tubercles being conspicuous, in the specimen dissected it was less so, due probably to the different action of the spirit. The usual parallel grooves are not conspicuous, but there is a line of oblong tubercles which can be followed to the extremity of the foot, better to be understood in the drawing than it can be described, as well as the margin of the mucous gland. In these details of structure it differs considerably from its nearest known ally *A. resplendens*, Nevill, of Upper Burma ; in *resplendens* the peripodial grooves hardly show at all, *vide* Moll. India, vol. ii, p. 287. The eye tentacles are very

bulbous at the base and very close together. When the shell is removed from the animal, it is noteworthy that the apical coil of the visceral sac is present (pl. xxiii, fig. 4), a mere remnant certainly, yet a character showing a link with some more snail-like ancestor. The same minute coil occurs also in *A. resplendens*, *vide* my description and fig. 2*f*, Moll. Ind., vol. ii, p. 287. In this respect, both species differ considerably from *A gigas* of the Khasi Hills, a species which has lost it altogether and may be considered a more recent evolution.

Generative organs.—The packing of the different parts, in other words their juxtaposition within the animal is of interest (pl. xxiv, figs. 1 and 2)—they rest directly on the sole of the foot, with the long large dull yellow coloured albumen gland at the posterior end of the body cavity. The oviduct conspicuously and much coiled occupying the anterior and resting against the ample intestine (pl. xxiv, figs 1–2). When turned and viewed from the right side, the penis is seen to have a position on the right anterior upper side, the amatorial organ below it, lying parallel and close to the spermatheca. Separated out and removed from the other parts the genitalia were beautifully seen. The penis has a long flagellum where the vas deferens joins it, thence a very long and somewhat twisted tube extends to the generative aperture. The retractor muscle attached where the tube is bent on itself.

The amatorial organ is very long and cylindrical, of much the same thickness throughout. The spermatheca is long and large, tapering to the free end: it was as full of spermatophores as it could hold, some 4 or 5, and so pressed together I had very great difficulty in getting one out, and then it was not perfect. It was quite typical of those seen in other species of the genus—other parts alluded to above do not require any detailed description. Characters are very much what is to be seen in *A. resplendens* (Moll. Ind., vol. ii, pl cxxx, 2*b*–2*e*), the flagellum is much longer and the amatorial organ more attenuate, not so large and thick.

The central tooth and admedian teeth are long and narrow with inner and outer cusps, they gradually become narrower and gradually change with about 6 transitional into bicuspid elongate curved teeth. No sharply defined line between the two, the outer marginals are very small. Formula 68 6. 27. 1. 27. 6. 68 or 101-1 101. This radula differs from *A. gigas* and *resplendens* in having a greater number in the row, and not quite the same in their shape.

The jaw is very concave on the cutting edge, with a central projection, rather narrow and well arched above

Shell elongately spatulate; slightly concave on the upper margin of the peristome. Sculpture none. Smooth, lines of growth showing the form in the early stages of growth.

Colour strong ochraceous, apex white, inside dull milky white. Suture very short, deep. Whorls one, rapidly increasing.

Aperture elongately oval.

Peristome: Edge of peristome thin and membranaceous.

Size: Major diam. 23 0 ; minor diam. 13·0.

It is almost impossible to get a perfect shell. In pl. xxiii, fig. 4, there may be seen a portion of thin internal side wall of the shell (S) adherent to the visceral sac and left or rather torn off when the shell was removed.

Sarama kempi, n. sp.

(Plate xxiii, figs. 6, 7, 8 ; pl. xxiv, figs. 6, 7.)

Upper Rotung, Abor Hills.

Shell thin, glassy, depressedly globose, scarcely perforate.

Sculpture strong, regular, somewhat wavy, longitudinal striation, coarser on the base.

Colour with animal in shell very dark greenish brown, animal removed sienna brown. Spire flat convex. Suture shallow. Whorls 6, regularly increasing, apical closely wound and flat.

Aperture laterally ovate, sub-vertical.

Peristome very thin, as also on the columellar margin which is very oblique.

Size: Major diameter 18·25 ; alt. axis 7·25 mm.

This species in its anatomy is nearest to *Sarama kala*, G.-A., of Sikkim, but I do not remember seeing before shell lobes at all like these, especially the left shell lobe.

Mr. Kemp's field note of this species dated 6-1-12, is as follows :—"Common under leaf-stems of plantain. When fully "extended anterior part of body very dull purplish grey with "darker grey eye-stalks. Hinder part of foot and mantle lobes "salmon-pink speckled with a paler shade ; under surface of foot "rather darker salmon-pink with a yellowish tinge along the "edges. The margin of the sole in dorso-lateral view, salmon "pink. Body of animal, seen through shell, horn-coloured, in "one case with a few large pale flecks on the outer whorl."

Animal in spirit:—Both the right and left shell lobes are peculiarly long, rounded and thickened, in typical species of the genus, these are thin and flat, in this case they do not appear to broaden out when the animal is alive; they are connected with a band which overlaps the edge of the peristome and these with the dorsal lobes are conspicuous against the dark colour of the adjacent parts. The animal in this state is so well described above by Mr. Kemp, after whom I have the pleasure of naming it, that one made from a spirit specimen would be no improvement. The gland at the extremity of the foot has an overhanging hooked lobe—the visceral sac is very blue black with 4 white spots on the periphery of the last whorl. It is this, seen through the transparent sienna brown shell, which gives it such a fine colour.

Genitalia.—The male organ is small, a short rather thick sheath from the end of which a long retractor muscle is given off, there is a very short and black epiphallus, and an equally short flagellum in which a spermatophore forming is seen, the vas

deferens joins at the base of this. The amatorial organ is present, very large and long, bent sharply on itself and held thus in this position by quite a net work of fine muscles. The spermatheca is short thus corresponding to the short spermatophore, the ovotestis and prostate together are not at all like what is seen in true *Macrochlamys*, the convolute sacs of the first are short and form a very conspicuous regular row

The radula is notable from its very dark colouration, confined to the subradula membrane on which it rests, and thus conforming to other parts of the animal, especially the visceral sac. This character constitutes it a dark race. The formula is 50. 3. 12. 1 12. 3. 50. The central and admedians are of the usual form, the marginals bicuspid, at first elongate narrow, lying close together, rather straight, with cusp far below the point, rising higher and higher, those near the margin itself shorter and evenly bicuspid.

Jaw is very solid, much arched above, nearly straight in front, only slightly concave, differing from any that I can remember having seen before.

Until I had seen the genitalia I had placed this mollusc in *Macrochlamys*; they were however a surprise to me, the penis did not present the well-known typical characters of that genus. It at once recalled that of *Sarama kala* from Damsang, Daling District of Western Bhutan, while the form of the shell although much larger and the very dark colouration of the animal are common to both. We have here in the Abor country 420 miles to the eastward a very close ally of *S. kala*, but differing in one character only, the presence of an amatorial organ or dart sac which the type of the genus does not possess. It modifies to this extent the description of the genus *Sarama*, one I felt necessary to constitute and published in the "Fauna of British India," p. 275.

The interest attaching to the distribution is very great, particularly with regard to species of *Sarama* which no doubt remain to be found in the long stretch of intermediate mountain country, linking up the two species.