ON THE ANATOMY OF *HEMIPLECTA FLOWERI*, E. A. Smith, FROM PERAK, MALAY PENINSULA; WITH NOTES ON SOME OTHER EASTERN GENERA.

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Read 8th December, 1899.

PLATE IV.

HEMIPLECTA FLOWERI, Smith.

EARLY in the present year I received from Mr. Stanley Flower a spirit specimen of this fine species, labelled Larut, Perak. About the same time some shells had been presented to the British Museum (Natural History), and were shown to me by Mr. E. A. Smith, who described the species before this Society in March. In February I began an investigation of its anatomy, but could not complete the drawings in time for Mr. Smith's paper. These I am now able to submit.

EXTERNAL FEATURES. — The living animal is apparently black, or grey-black, and, judging from the wrinkled condition of its edge in the spirit specimen, the foot probably spreads out thin and flat when the animal is in motion, as seen, to name a striking instance, in the large *Eucochlias ochthoplax*, Bens., the foot of which is often extended till it forms a thin oval disc, giving great holding power. The peripodial fringe is very marked, streaked with pale lines on the black ground; the parallel grooves so distinctive in many genera of the Zonitidæ are not apparent.

The sole of the foot is not divided; the whole surface is wrinkled by contraction. This in life would probably be quite smooth, while the mucous gland (Pl. IV, Fig. 1) would apparently be broad and open, without any very marked overhanging lobe. The mucous gland does not extend to the sole of the foot. There is a right shell-lobe (Figs. 2 and 5), situated at a short distance below the upper inner angle of the aperture; also a well-developed left shell lobe (Fig. 3), tongue-shaped, and given off from the narrow The left neck-lobe is divided into two very peristomatic edge. distinct and widely separated portions (Fig. 3). At the lower angle of the aperture (Fig. 4), and corresponding with the dark band of colour round the umbilical region, there occurs an expansion of the shell-lobe, which we may term the 'umbilical, or columellar lobe,' and the breadth of this is indicated by one or more shallow grooves on the surface of the shell itself. There is also (as noted by Mr. Smith) a single, shallow, but well-marked groove following the suture about 6 mm. from it. This is also indicated on the edge of the shell-lobe by slight notching or folding (Fig. 2). The inside surface of the mantle zone resting against the umbilical margin was, I noticed, of a red-brown colour, corresponding to the coloration of the shell within the umbilicus. But it seems to me more likely that this was a stain extracted by the alcohol from the shell after death, rather than the remnant, in this part of the animal, of the colouring matter which produces the band.

The shell-muscle is strengthened by a peculiar, flattened, disc-like expansion (s.m.), Figs. 7-9), which I have not observed before in any other species. Close to this, internally, are situated the attachments of the retractor muscles of the buccal mass, amatorial organ, etc.

INTERNAL ANATOMY.—The salivary glands are disposed in two thin, flat masses, connected with each other and covering the stomach. The buccal mass is short and flat on the basal side. The jaw (Fig. 10) has a large central projection.

The radula (Fig. 11) has the formulæ—

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The central tooth and 18 admedian teeth are straight-sided; the next 34 lateral teeth—that is, up to the 52nd—are aculeate; the 31 uncini are bicuspid.

Genitalia (Fig. 6).—The amatorial organ, which is proportionately of great length (75 mm.), tapers to the retractor muscle. The spermatheca is long, broad at its base, gradually dwindling to a well-defined connective muscle attached to the oviduct. The male organ (Fig. 6a), which tapers from the generative aperture backward, is bent on itself, the two portions being attached about midway by muscular tissue (m.). It then leads up to the short kalk sac (k.), and the vas-deferens (v.d.) enters it at the side. Above the bend a cæcum is given off, which presents one single coil, and to the rounded apex of this the retractor muscle is attached (Fig. 6a). We have here some interesting details illustrative of the variation met with in these animals, and serving to distinguish this species from other large forms. Compared with the type species of *Hemiplecta*, the male organ is similar, save that in H. Humphreysiana there is no cæcum, whereas in this Perak species a cæcum, approaching in form that of Macrochlamys, is present. The spermatheca of Hemiplecta Humphreysiana is rather short, and pear-shaped, not long, and narrowing to an attachment muscle. There is some difference in the relative position of the right shell-lobe in the two species: in the Perak form it is given off at a lower point on the mantle zone, and this is also the case in some other species. The radula is of the same type in both, and if the admedians be added to the curved aculeate laterals the number is identical, viz. 70 : 1 : 70, the difference in the total number being made up in the outermost bicuspid teeth. The jaw of the Perak snail has a much larger central projection. These differences do not outweigh the similarity of the

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radula, and shell and dorsal lobes, and I therefore leave it, where Mr. E. A. Smith placed it, in *Hemiplecta*.

HEMIPLECTA NEPTUNA, Pfr.

Specimens of another large land-shell, taken in Siam, exact locality not stated, have lately been received from Mr. Daly. These, thanks to our President, I have examined: with one exception they were not in the best state of preservation. They had been identified as *H. distincta*, Pfr., but I now believe, for reasons given below, that they are *H. neptuna*, Pfr.

EXTERNAL FEATURES.—No right shell-lobe is present, but there is an indication of a small left shell-lobe (Fig. 12) just above the division of the left dorsal lobe into the usual anterior and posterior parts: it is represented by a slight widening and turning back of the edge for 3 mm. The left dorsal lobes are very narrow for the large size of the shell. At about 12 mm. from the respiratory orifice is the division between these dorsal lobes, 2 mm. wide; the posterior portion commences and continues as a distinct narrow lobe for 19 mm. The foot, which appears to have been of a ruddy ochre tint, is streaked and blotched sparingly in one specimen with dark grey; in the others it was plain. The peripodial margin is nearly 3 mm. in width, but the two parallel grooves above it are not conspicuous. The central area of the foot is not defined. The segmentlike cross-lines of the peripodium can be followed beneath the edge of the foot, and at a short distance disappear. The mucous pore is broad, triangular in shape, similar to that of Haughtonia conferta, Pfr.

INTERNAL ANATOMY. — Genitalia (Fig. 13). — The amatorial organ is very long, about 45 mm., with a diameter of 4 mm. To its posterior, rounded end is attached a long retractor muscle, unusually broad in one specimen. The male organ (Fig. 13a) agrees in general with that of Hemiplecta Humphreysiana and H. Floweri, the kalksac being small as in those species; it varies, however, in the portion near the attachment of the retractor muscle. Where the penis bends on itself, a broad muscle lies along the edge, then follow a sharp bend and a short blunt cæcum-like process, from which a long thin muscle extends: the latter is always present; but the broad muscle here seems additional. The spermatheca is attached at its usually free end by well-developed muscles to the base of the oviduct; it is short, oval, rather transparent, on a thick, short stem. There is a large globose swelling on the free oviduct, and as it came into view during dissection among the genitalia and other organs of the body it was very conspicuous by its yellow colour. I have suggested that a similar enlargement present in some other genera in this position may be an ovitheca. Its precise function has yet to be discovered, but this may possibly be gleaned by studying sections.

Radula (Fig. 14).—The central tooth is long and narrow; the admedian teeth are plain, straight-sided, and there are more than

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sixty long, curved, aculeate laterals; next follows a numerous bicuspid series, in the outermost of which the cusps are even in length, the uncini are very minute. There are 148 rows of teeth, arranged thus:

The shell is very globosely subturbinate, with the side of the spire convex; a pale band borders the periphery above; the umbilicus is 4 mm. wide, and the columellar margin is obliquely curved to the lower margin of the aperture. Size of the largest specimen 63.25 mm. This form agrees well with *H. neptuna*, Pfr., obtained by Monsieur Mouhot in Siam, described in P.Z.S., 1861, p. 190, and figured in the Novit. Conch., pl. xlviii, figs. 1 and 2, the open umbilicus being well shown.

Helix distincta, Pfr., is described in the Zeitschr. f. Malak, 1850, p. 69, its habitat being the Moluccas. The shell is figured in Chemn., 2nd ed., *Helix*, No. 863, pl. cxxxiv, figs. 1 and 2; from this it is seen that the outline is not that of the Siam species, while the umbilicus is very considerably smaller. The figure in the Conch. Icon. (pl. lxxxvi, fig. 465) does not settle the size of the umbilicus, only a frontal view of the shell being given; the columellar margin is represented as rather straight, and the habitat is said to be unknown.

Professor von Martens, in his list of Siamese land mollusca in "Die Preuss. Exped. Ost-Asien," p. 69, records *Nanina distincta* as one of the largest and most abundant shells in Siam, and figures the animal, pl. vi, fig. 8. He says: (1) the shell is narrowly umbilicated; (2) depressedly turbinate; (3) its size is 54 mm. in major diameter; (4) the jaw is plain and without a central projection. In all these points there is disagreement with the species sent home by Mr. Daly.

On looking up *H. distincta* in the Natural History Museum, on one tablet are two shells under this name; one is marked with a cross in pencil, and on the back is written, "*H. pluto*, Pfr., Lao Mountains, Cambodja, figured in Novitates, pl. lv, figs. 8, 9." The other is marked with two crosses, and the corresponding note reads:—"var. *neptuna*, young." Mr. Daly's shell agrees best with this specimen.

Professor Semper, in his "Reisen im Archipel der Philippinen," Bd. iii, p. 63, pl. vi, fig. 27, under *Xesta distincta*, mentions having obtained two shells from Zamboanga, in Mindanao. He, however, described the animal, and figured the jaw and radula of a young specimen from Saigon, Cochin China, which is over 500 miles from Siam. The jaw has no central projection; the central tooth and admedians are tricuspid, the laterals bicuspid, with 160 to 180 teeth on each side of the radula. This description does not answer for the jaw, the form of the teeth, or the dental formula of the Siam species, which I identify as *Hemiplecta neptuna*.

The question arises, does the anatomy of the species which Semper identified as *Xesta distincta* from Saigon correspond with that of the species in the typical locality Mindanao, and again, will this anatomical



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Godwin-Austen, Henry Haversham. 1900. "ON THE ANATOMY OF HEMIPLECTA FLOWERI, E. A. SMITH, FROM PERAK, MALAY PENINSULA; WITH NOTES ON SOME OTHER EASTERN GENERA." *Proceedings of the Malacological Society of London* 4, 31–36.

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