

4. On a Collection of Land-Shells made in Borneo by Mr. A. Everett, with Descriptions of supposed new Species. By Lieut.-Col. H. H. GODWIN-AUSTEN, F.R.S., F.Z.S., &c.—Part II.¹ Zonitidæ and Helicidæ.

[Received January 1, 1891.]

(Plates II.—VI.)

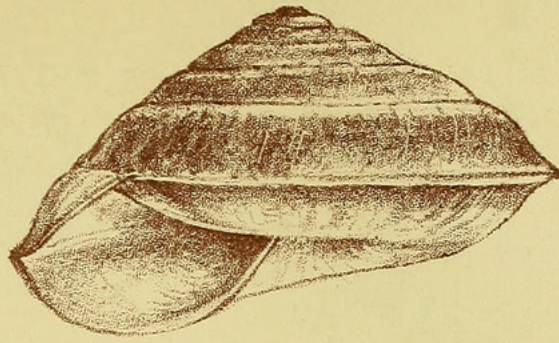
It is necessary to limit this second part of my memoir on the Bornean land-shells to those contained in the two families Zonitidæ and Helicidæ, not including the genera *Bulimus*, *Achatina*, &c., for I have not had leisure to examine the species of *Stenogyra* in the collection. Since submitting the first part I have received, through the kindness of Mr. J. Whitehead, all the shells he collected in Borneo and Palawan. I have also had placed in my hands a second consignment from Mr. Everett since his last return to Borneo. Both of these collections contain examples of new species, particularly the last mentioned, for the shells in it had been obtained by Mr. Hose, when collecting orchids in the mountains of the interior of Borneo, in quite new ground. This last collection will also add a considerable supplemental list to my paper on the operculated shells of Borneo already published. I have also to thank Mr. Aldrich of Cincinnati, for sending me examples of the new species which he obtained from Borneo through Mr. Doherty, some of which Mr. Aldrich had already described. A *Diplommatica*, referred by him to *D. concinna*, I find to be a new species, which I have recently described and figured as *D. aldrichi* (see Ann. Mag. N. H. ser. 6, vol. vi. p. 246, pl. vii. fig. 3).

The examination of these shells has brought out several interesting facts connected with the distribution of genera. It has extended the range of some, up to the present exclusively Indian genera, thus far to the eastward. For instance, the genus *Microcystina*, first described from the Nicobar Islands by Mörch, and there and in the neighbouring Andaman Islands represented by three species, has now been found in Borneo, represented by four species. They are small glassy shells, with a peculiar twisted columellar margin, which readily distinguishes them from other similar-looking shells. This genus has not been found either in the Eastern Himalaya or the Khasi Hill-ranges, both of which have been well worked, neither as yet in Pegu or in Upper Burmah. However, in this last-named country vast areas exist which have never been systematically searched, so that species of the genus may very likely be found in the mountainous country between Burmah, Tenasserim, and Siam.

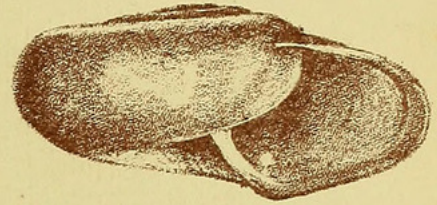
Durgella is another genus that we find ranging thus far to the eastward, represented by small heliciform delicate glassy shells; the anatomy and the odontophore of the Bornean species are precisely similar to those of a species found in the Khasi Hills, and of another

¹ For Part I., see P. Z. S. 1889, p. 332.

1 x 1.5



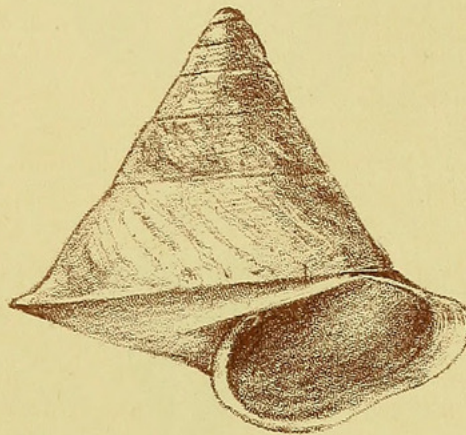
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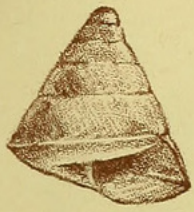
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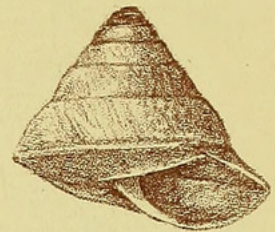
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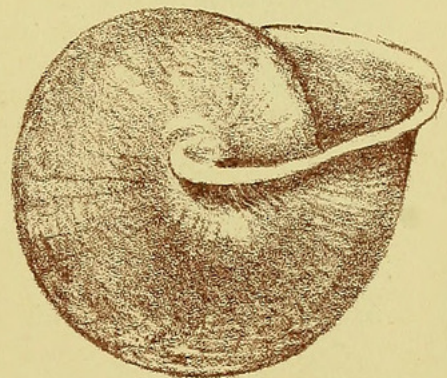
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5 x 2.5



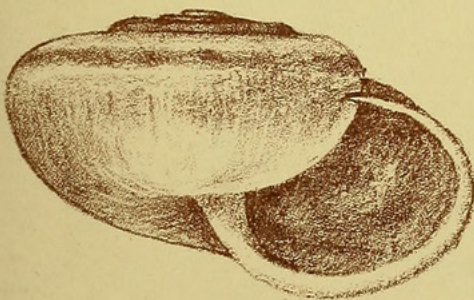
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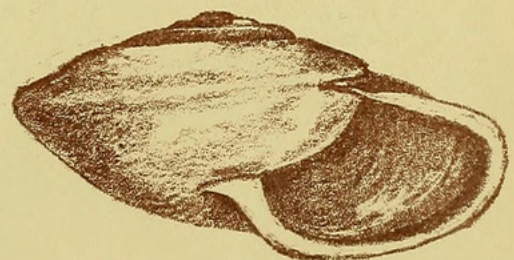
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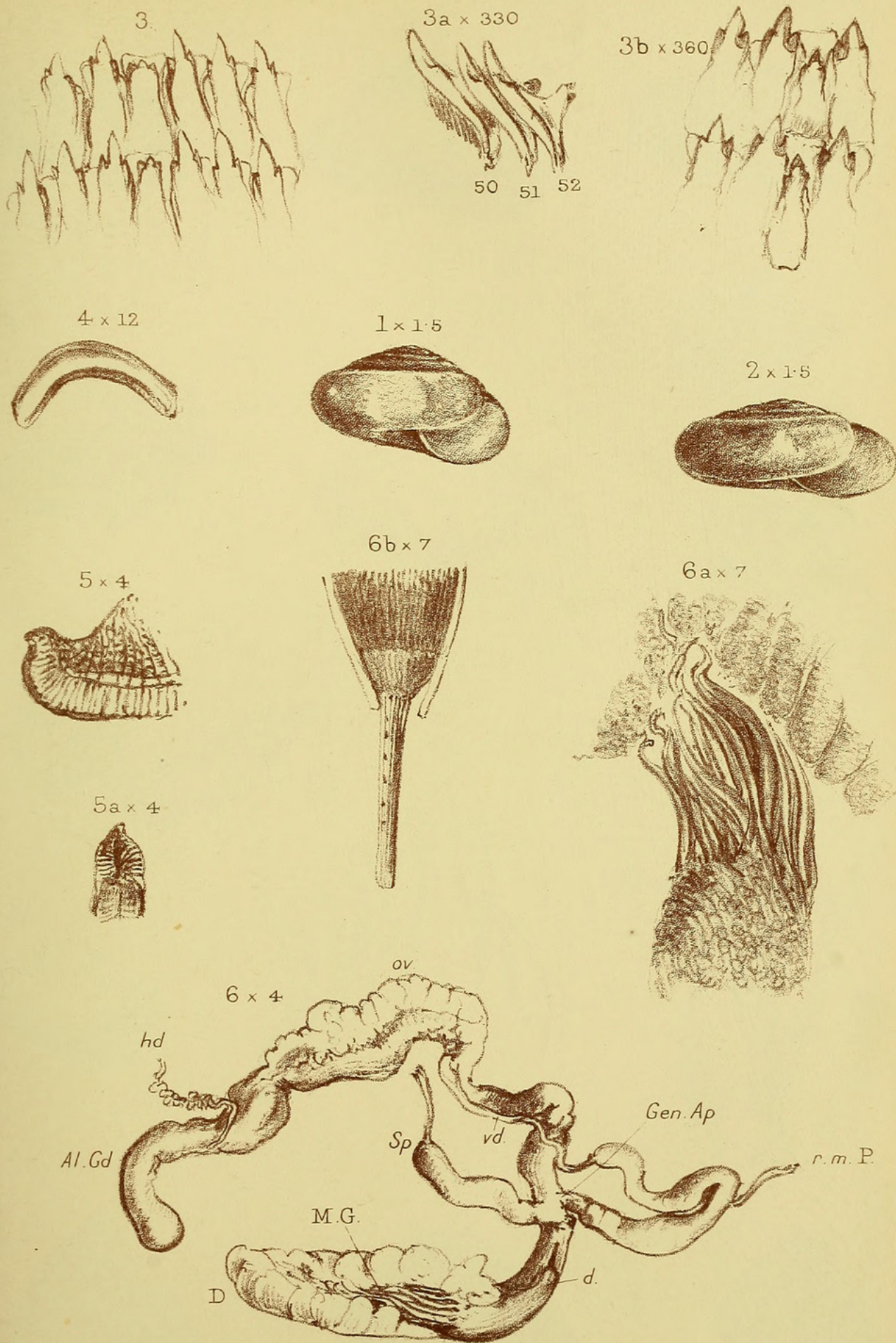
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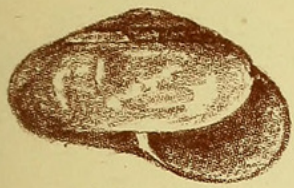


NEW BORNEAN LAND-SHELLS.

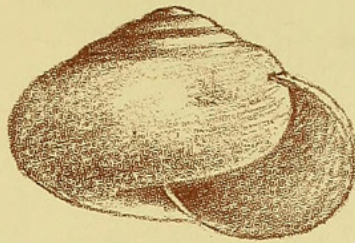


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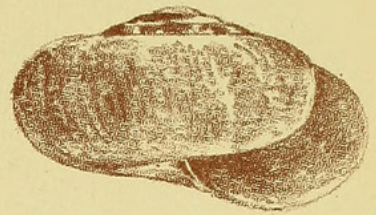
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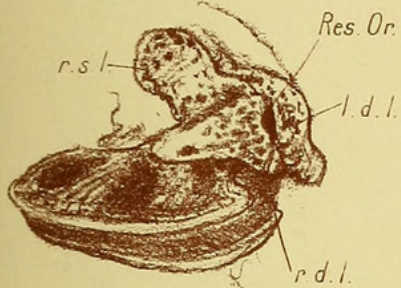
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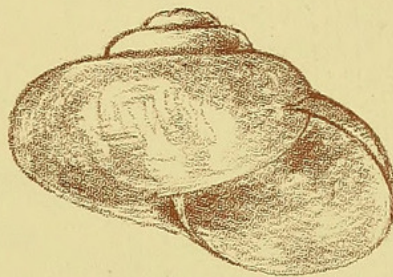
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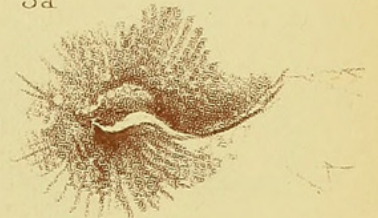
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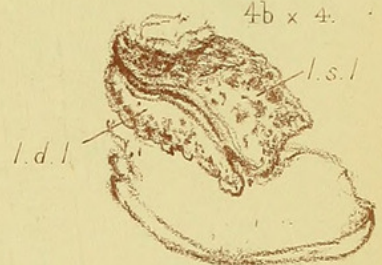
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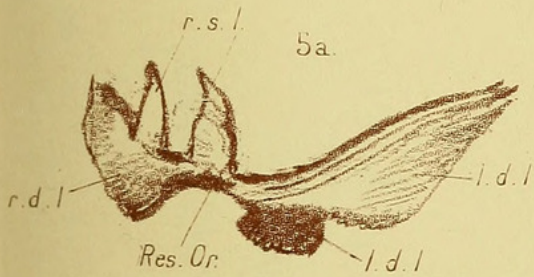
3a



4b x 4.



5a.

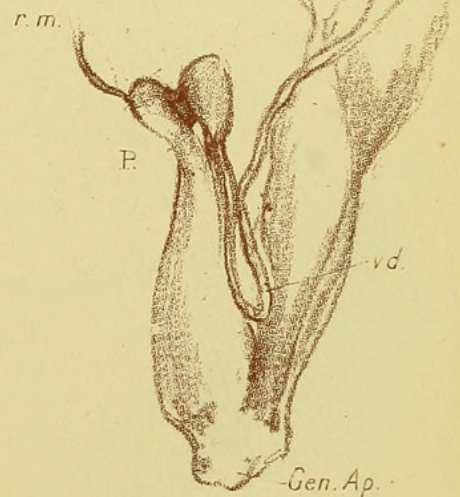


5b.



X

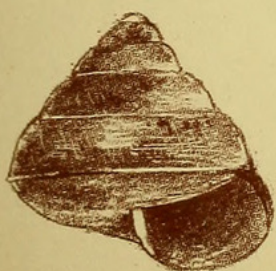
4c.



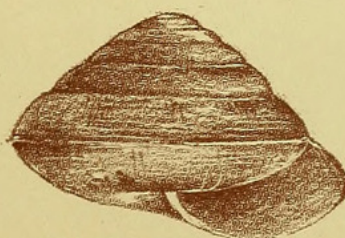
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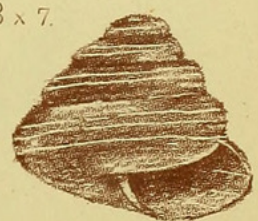
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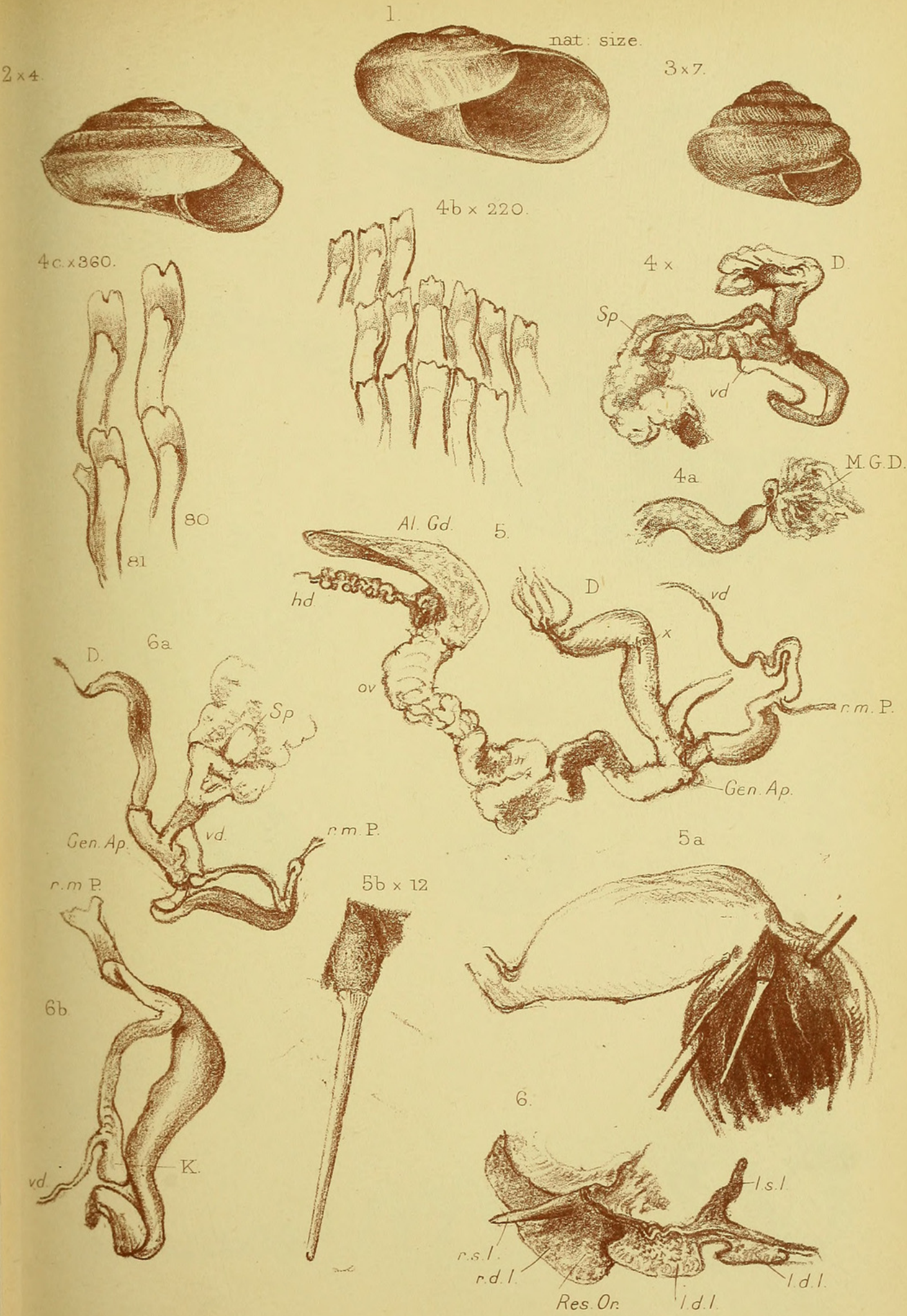
6 x 4.



8 x 7.

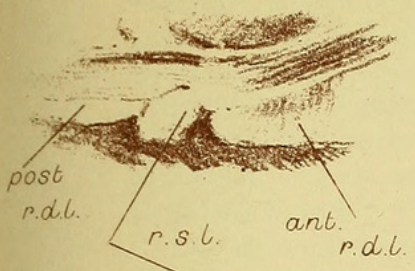


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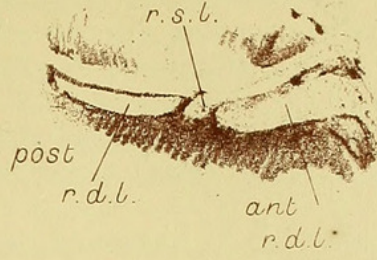


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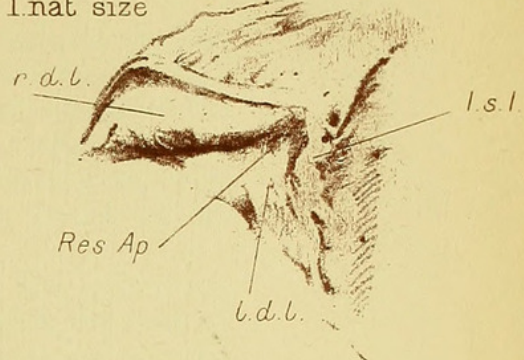
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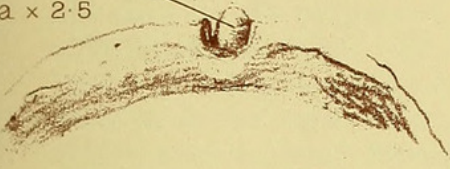
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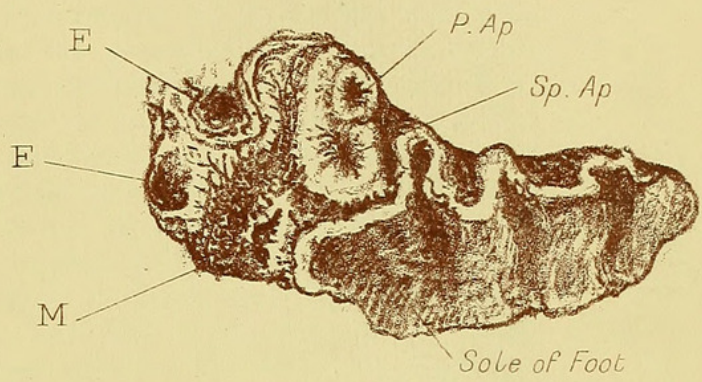
1.nat size



3a x 2.5



5.natural size

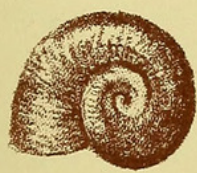


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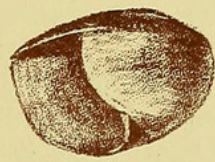


6.nat size

9 natural size



9 a



Al. Gd

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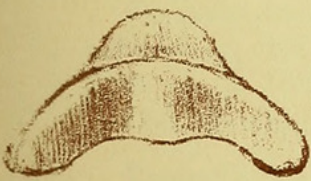
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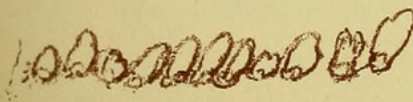
7 x 4



8 x 340

C 1 2 3

8 a x 340



NEW BORNEAN LAND-SHELLS

obtained by Colonel Beddome in Travancore. *Sitala* is another genus having a similar distribution, and one section of it (represented by the peculiar little shells *S. tricarinata* and *S. subbilirata* of the Nilghiri and Andaman Islands respectively) finds a representative species in Borneo in *Sitala kusana*. When the intervening countries and islands come to be better known, other allied forms will no doubt be found.

The closer the external characters of the animal are looked at, and the more an attempt is made to combine these with the form of the shell for the purpose of generic classification, the greater are the difficulties met with. Dr. von Martens found this so much the case when he took up the Land-shells of Eastern Asia, that he fell back on to the shell alone. If, however, we go further and take the internal anatomy, especially the points of difference in the reproductive and other organs, and the odontophore, which has been so well done by Professor Semper in the same region, we do find some well-marked differences, and these we discover have but little bearing on the form of the shell, which may be considered as of secondary importance. It is to be expected that modification of the internal structure of the animal is brought about much more slowly than change in the shelly covering, and that it is consequently far more persistent. The first is a combination of many different organs, a change in one affecting all the others, while the shell is a single structure merely secreted by the mantle, and affected rapidly by change of climatic conditions and the nature of the rock on which the animal lives.

When such a sounder system of classification has been thoroughly worked out, we shall be able to trace with some degree of exactness the areas over which certain genera of Land-Mollusca extend. Then noting how such areas have been affected by the more recent geological changes leading up to the present outlines of the land and the intervening seas, we may be enabled to contemplate and draw some conclusions as to how far present distribution has been dependent on and connected with such changes.

In the descriptions of the species which follow, I have attempted to show how very different are details of the anatomy of the Bornean *Helices* when compared with those of very similar-looking shells of the Indian region.

Fam. ZONITIDÆ.

Vaginula hasselti, v. Martens, Preuss. Exped. Ost-Asien, Land-schneck. p. 176, t. v. figs. 2, 4 (1867); Fisch. Nouv. Arch. du Mus. vii. p. 158 (1871).

Hab. Borneo, near Benkajang.

Vaginula bleekeri, Keferst. Zeitschr. f. wiss. Zool. 1865, p. 118, t. ix. figs. 1, 2; v. Martens, Preuss. Exped. Ost-Asien, Land-schneck. p. 177 (1867); Fisch. Nouv. Arch. du Mus. vii. p. 161 (1871).

Hab. Sarawak (*Doria* and *Beccari*).

Vaginula wallacei, Issel, Ann. Mus. Civ. Genova, vi. p. 385, t. iv. figs. 1-3 (1874).

Hab. Sarawak, one example (*Doria* and *Beccari*).

Parmarion beccarii, Issel, Ann. Mus. Civ. Genova, vi. p. 386, t. iv. figs. 9-11 (1874).

Hab. Sarawak, two examples (*Doria* and *Beccari*).

Parmarion doriae, Issel, Ann. Mus. Civ. Genova, vi. p. 388, t. iv. figs. 7, 8 (1874).

Hab. Sarawak, one example (*Doria* and *Beccari*).

Damayantia dilecta, Issel, Ann. Mus. Civ. Genova, vi. p. 390, t. iv. figs. 4-6 (1874).

Hab. Sarawak, three examples (*Doria* and *Beccari*).

Helicarion borneensis.

Vitrina borneensis, Pfeiff. P. Z. S. 1856, p. 324; id. Monogr. Helic. iv. p. 793 (1859); id. Novitat. Conch. t. xxviii. figs. 10-12; Reeve, Conch. Icon. pl. vi. fig. 41.

Helicarion borneensis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 186 (1867).

Hab. Borneo (*Cuming Coll.*).

This shell has not since been sent home from Borneo, and I am therefore in doubt as to the correctness of habitat assigned to it.

HELICARION (?) WHITEHEADI, n. sp. (Plate V. fig. 1.)

Shell depressedly globose, tumid, slight subangulation on periphery, not perforate; sculpture coarse, a peculiarly wrinkled surface, the lines having a very oblique transverse direction; colour rich umber-brown, pale purple and iridescent within the aperture; spire low, rounded on apex; suture impressed; whorls $3\frac{1}{2}$, rapidly increasing, the last much expanded; aperture widely ovate, oblique; peristome thin, not reflected at all on columellar margin, which is subvertical.

Size: maj. diam. 35.0, min. 28.0; alt. axis 12.0; breadth of aperture 20.0 millim.

Hab. Kina Balu Mountain, altitude not known (*Mr. J. Whitehead*).

I place this next to *Helicarion borneensis*, not that I think it has any affinity to that genus as restricted, but only in its widest sense; the animal would be a most interesting one to examine, and will probably be found allied to local races, and not having anything in common with forms such as *Girasia* of the Indian Region, with which the shell outwardly has resemblance. Only two specimens were brought home by Mr. Whitehead.

XESTA GLUTINOSA. (Plate V. figs. 6-6 b.)

Helix glutinosa, Metcalfe, P. Z. S. 1851, p. 70; Pfeiff. Monogr. Helic. iii. p. 54 (1853), et v. p. 90 (1868); Reeve, Conch. Icon. pl. cxcvi. fig. 1378 (1854).

Nanina glutinosa, v. Martens, Preuss. Exped. Ost-Asien, Land-schneck. p. 214 (1867).

Macrochlamys glutinosa, Wallace, P. Z. S. 1865, p. 405.

Nanina (Xesta) glutinosa, Issel, Ann. Mus. Civ. Genova, vi. p. 392 (1874).

Hab. Niah Hills (*A. Everett*).

Mr. Everett collected a fine set of this species, which has a very conspicuous canaliculate groove above the keel of the shell, and this on the upper whorls produces a raised beading at the suture. In the same locality he obtained a beautiful dark madder-brown variety, similar in coloration to *X. decrespignyi*, which retains exactly the form of the typical shell, and is not separable by any other character. I would designate this as var. *rubra*.

Shell-lobes (Plate V. fig. 6, *r.s.l.* and *l.s.l.*) as in *Macrochlamys*; the right dorsal lobe (*r.d.l.*) large; the left differs from above and is divided in two parts, of which the anterior is narrow and long, the posterior being very rudimentary. Situated between, there is a very well-defined long tongue-like shell-lobe. The living shell must be very prettily mottled, as the black-spotted integuments of the respiratory sac would show through the glassy thin shell.

Mucous gland with an overhanging lobe, the aperture does not extend down to the sole of the foot as shown in pl. xxxv. fig. 6 of my 'Land and Freshwater Mollusca of India.'

Odontophore has plain, unicuspid, triangular-shaped centrals; about eighty of the outer laterals are bicuspid, and those on the side of the radula are very minute:

110 . 14 . 1 . 14 . 110
124 . 1 . 124.

Jaw slightly curved on the cutting-edge, with only the slightest indication of a central projection. The generative organs approach nearest to *Macrochlamys* of the Indian Region, but variation presents itself in the male organ (Plate V. figs. 6 *a* and 6 *b*). It is bent upon itself, the calc-sac is short and knob-like, and where the retractor muscle is given off there is a simple bend, with no projection, and doubling together of the tube and the formation of a coil as in so many of the Indian genera and species. The drawings given by Professor Semper of the reproductive organs of *Xesta*, which include *X. citrina* and *X. mindanaensis*, particularly of the latter, agree with *X. glutinosa*. As regards the odontophore, it is similar to that of *X. citrina* in the simple centrals, which I consider to be the type of the genus; it is also the type of *X. mindanaensis*. It may be noted that the odontophores of the Indian species *X. belangeri*, *tranquebarica*, and *maderaspatana* differ considerably in their tricuspid form, and will, I think, prove different in other characters¹.

¹ In the British Museum (Cuming Collection) is a specimen labelled from the Solomon Islands (Hon. Capt. Keppel) named *H. capitanea*, Pfr. (P. Z. S. 1854, p. 49). It is a young shell, evidently of *X. glutinosa*, and, I should say, not obtained in the islands quoted.

XESTA DECRESPIGNYI.

Nanina (Xesta) decrespignyi, Higgins, P. Z. S. 1868, p. 179, pl. xiv. fig. 4; Issel, Ann. Mus. Civ. Genova, vi. p. 392, t. v. figs. 13-15 (1874).

Hab. Trusan (*A. Everett*).

The animal has exactly the same form of shell-lobes as in *X. glutinosa* above described.

Nov. var. *pallida fasciata*.

In Dr. Hungerford's collection there is one specimen which in every respect resembles this shell except in coloration, this being of the pale yellowish tint of *X. glutinosa*, and like that shell having a single thin dark band on the periphery, a similar variation to that met with in *X. glutinosa*, only in an opposite direction.

Xesta (?) brotii.

Helix brotii, Bonnet, Rev. Zool. 1864, p. 67, pl. v. fig. 1; Pfeiff. Monogr. Helic. v. p. 460 (1868); v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 397 (1867).

HEMIPLECTA Densa.

Helix densa, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 62, pl. xvi. fig. 8 (1850); Pfeiff. Monogr. Helic. iii. p. 111 (1853), et v. p. 180 (1868).

Helix schumacheriana, Pfeiff. Zeitschr. f. Malak. 1850, p. 70; id. Monogr. Helic. iv. p. 110 (1859); Metcalfe, P. Z. S. 1851, p. 70; Reeve, Conch. Icon. pl. lxxiii. fig. 379 (1852).

Nanina corrosa, Mousson, Journ. d. Conch. vi. p. 156 (1857).

Helix corrosa, Pfeiff. Monogr. Helic. iv. p. 348 (1859).

Nanina herklotsiana, Dohrn, Malak. Blätt. vi. p. 206 (1859).

Nanina atrofusca, Albers, Helic. ed. ii. p. 53 (1860).

Hemiplecta schumacheriana, Wall. P. Z. S. 1865, p. 406.

Nanina densa, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 230, t. x. fig. 1 (1867).

Animal:—The extremity of the foot is rather square, the mucous gland large, not extending to the sole of the foot, and with apparently no overhanging lobe. The right dorsal lobe is of usual size, but the left is very poorly developed, being very narrow and separated into two parts, the posterior portion being narrow and only 6 millim. long; in the space between them lies a small left shell-lobe, flat and tongue-shaped; a right shell-lobe is also present, which would appear in life to be broad and triangular in outline.

The odontophore is like that of *H. humphreysiana* from Singapur, the type of the genus *Hemiplecta*. Jaw circular, no central projection. The shells had been taken evidently in the cold season, and the generative organs were not fully developed in the specimens I dissected, but enough was seen to show the presence of a long simple amatorial organ, and the male organ also as in *Hemiplecta*.

Hemiplecta souleyetiana.

Helix souleyetiana, Pfeiff. P. Z. S. 1851, p. 252; id. Monogr. Helic. iii. p. 74 (1853), et v. p. 130 (1868); id. in Martini u. Chemnitz, Conch.-Cab. ed. ii. p. 401, pl. cxliv. figs. 16, 17.

Nanina souleyetiana, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 233 (1867); Issel, Ann. Mus. Civ. Genova, vi. p. 396 (1874).

Issel says this is a doubtful species from Zamboanga.

Hemiplecta donovani.

Helix donovani, Pfeiff. Zeitschr. f. Malak. 1851, p. 26; id. Monogr. Helic. iii. p. 75 (1853), et v. p. 130 (1868); id. in Mart. u. Chemn. Conch.-Cab. ed. ii. p. 413, t. cxlvii. figs. 8, 9.

Nanina donovani, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 233 (1867).

Hemiplecta (?) obliquata.

Helix obliquata, Reeve, Conch. Icon. pl. lxxiv. fig. 384 (1852); Pfeiff. Monogr. Helic. v. p. 115 (1868).

Nanina obliquata, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 235 (1867).

Xesta obliquata, Semper, Reisen im Arch. Philippinen, Landmoll. p. 67 (1870).

Hab. Banghey Island (*A. Everett*).

Hemiplecta (?) nobilis.

Helix nobilis, Pfeiff. (non Reeve), P. Z. S. 1849, p. 126; id. Monogr. Helic. iii. p. 69 (1853), et v. p. 121 (1868); id. in Mart. u. Chemn. Conch.-Cab. ed. ii. p. 291, pl. cxxv. figs. 1, 2.

Xesta nobilis, Semper, Reisen im Arch. Philippinen, Landmoll. p. 67 (1870).

RYSSOTA BROOKEI. (Plate VI.)

Helix brookei, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 60, pl. xv. figs. 4 a, 4 b (1850); Metcalfe, P. Z. S. 1851, p. 70; Reeve, Conch. Icon. pl. lxxiii. fig. 377 (1852); Pfeiff. Monogr. Helic. iii. p. 52 (1853), et v. p. 81 (1868); Mart. u. Chemn. Conch.-Cab. ed. ii. p. 350, pl. cxxxv. figs. 1, 2.

Helix gigas, Pfeiff. Zeitschr. f. Malak. 1850, p. 81.

Ryssota brookei, Wall. P. Z. S. 1865, p. 407.

Nanina brookei, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 238 (1867).

Nanina (Rhyssota) brookei, Issel, Ann. Mus. Civ. Genova, vi. p. 397 (1874).

Ariophanta brookei, Pfeiff. u. Cless. Nomencl. Helic. p. 55 (1881).

Size: maj. diam. 80.0, min. 67.0; alt. axis 39.0 millim.

The young shell, several of which occurred in the collection sent to the British Museum by Mr. Hose, and which, owing to the

kindness of Mr. Edgar Smith, I am enabled to figure (Plate VI. figs. 9, 9 a), consists of two whorls, is globose, very thin and delicate, transparent, of a ruddy brown colour, with an elongate quadrate aperture flatly convex above, and measures, maj. diam. 18·0, alt. axis 10·5 millim. It would be interesting to know at what age it reaches this size and its full maturity.

Description of the animal from a spirit-specimen:—Foot below not divided as in *Macrochlamys*, &c.; no mucous gland; the extremity of the foot is flattened, rounded (Plate VI. fig. 4); the pallial margin very narrow and with no pallial groove (fig. 5) as seen in the genus *Ariophanta*, &c. In life I should say the animal was very similar to that of *H. ochthoplax*, Bs.

There is not the slightest trace in the spirit-specimen of a mucous gland either above or below, and although von Martens in his work, 'Die Preuss. Exped. Ost-Asien, Landschneck,' says at p. 188 that in some large coarse species, as *Rhysota ovum* and *Xesta distincta*, he found the foot coarsely wrinkled, flat, and with a blunt end, the slime-gland little marked, so that on the whole it resembles the foot of *Helix pomatia*, yet I feel sure there would remain some indication of the gland in the spirit-specimen; surely the divided sole of the foot would remain visible, and some modification of the pallial margin would show where the slit of the gland was situated, but in this large Bornean species there is no trace left to show that it ever existed.

The dorsal lobes of the mantle (Plate VI. figs. 1, 2, 3, 3 a) are small for the size of the animal. The left dorsal lobe (we are speaking of a sinistral species) is of the ordinary form; the right is divided into two separate parts, one anterior, the other posterior. Exactly between these two is a right or peristomial shell-lobe (see figs. 2, 3), and near the respiratory orifice at the inner and upper margin of the aperture a tongue-like left shell-lobe is given off from the margin of the left dorsal lobe. This, although much contracted by the spirit, is evidently of considerable extension when alive. (In Semper's description of *Ryssota* both shell-lobes are said to be absent.) So that here we have in this sinistral species an approach to *Macrochlamys* in its shell-lobes, and to the genus *Oxytes* in its dorsal lobes. The contraction of the animal shows the apertures coinciding with the male organ and the spermatheca very plainly (see Plate VI. fig. 5).

The generative organs (fig. 6, nat. size) are exactly similar to those of *Ryssota ovum* figured by Semper in 'Reisen im Archipel der Philippinen,' pl. iv. fig. 1, and correspond also with those given on the same plate of *R. porphyria*, *R. semiglobosa*, *R. dvitija*, and *R. bulla*, simple, and having no amatorial organ.

Now, in the five figures given by him of the generative organs of so-called *Ariophanta* on pl. iii., they all possess the amatorial organ with mucous glands and well-developed *sagittæ amatoriæ* (see fig. 18); thus they are of a much more complicated nature than in the species under review.

In *R. brookei* the male organ consists of a large pear-shaped sac,

closing towards the posterior end and contracted for a short distance into a tube, the retractor muscle being at the junction of the vas deferens. The spermatheca is very and unusually long, extending to the albumen-gland; it rises from another pear-shaped muscular sac, on the side of which the oviduct enters. There is nothing remarkable about the ovo-testes or albumen-gland.

The odontophore (Plate VI. fig. 8).—The form of the median teeth very gradually merges into that of the laterals, which become at last little short straight teeth. The central teeth are all unicuspid, the central tooth of all being triangular in form; the formula is

$$\begin{array}{ccccccc} 109 & . & 43 & . & 1 & . & 43 & . & 109 \\ & & & & 152 & . & 1 & . & 152. \end{array}$$

The lingual ribbon I extracted is nearly perfect, not a row was lost, and it contains 177 rows, giving the enormous number of 54,000 teeth.

The jaw (Plate VI. fig. 7) has a low central projection, and is not much bent.

The character of this animal differs so widely from those in genera with which it is now associated that it does not seem at all in the position it should occupy, and with *R. ovum* and others will have to be moved. As I have only been able to obtain one example of *R. brookei* in spirit, it is better to wait until others are examined before doing so.

Nanina (Ryssota) borneensis.

Helix borneensis, Pfeiff. P. Z. S. 1849, p. 127; id. Monogr. Helic. iii. p. 70 (1853), et. v. p. 114 (1868); Reeve, Conch. Icon. pl. cxvi. fig. 1379 (1854).

Nanina borneensis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 238.

DYAKIA, gen. nov. (Type, *Helix hugonis*, Pfeiff.)

No shell-lobes to the mantle, and the dorsal lobe much reduced in size. Shells generally sinistral. Hitherto placed in *Ariophanta*. The amatorial organ of peculiar form, with a calcareous dart or *sagitta amatoria*. For further description of details see *D. hugonis*.

DYAKIA HUGONIS. (Plate V. figs. 5-5 b.)

Helix hugonis, Pfeiff. P. Z. S. 1863, p. 523; id. Novitat. Conch. iii. pl. lxxiv. figs. 1, 3; id. Monogr. Helic. v. p. 81 (1868).

Helix sinistra, Bonnet, Rev. Zool. 1864, p. 67, pl. v. fig. 2.

Nanina (Hemiplecta) hugonis, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 225 (1868).

The anatomy of *Hemiplecta humphreysiana*, Lea, from Singapore, the type of the genus, which I have examined and alluded to before, differs widely from that of *H. hugonis*.

Hab. Two specimens from Trusan, and one dextral variety from the Niah Hills (*A. Everett*).

Fortunately a few specimens were preserved in spirit by Mr. Everett, and I am thus able to give the following detailed description:—

Animal, pale ruddy colour with small black specklings. The dorsal lobes are very considerably reduced in size; they present a very small lappet-like left dorsal and a fringing right dorsal lobe, and no shell-lobes in the spirit-specimen.

The odontophore consists of numerous teeth in the rows; the laterals very minute and unicuspid; the centrals are simple, straight-sided, spear-shaped teeth without cusps:

50 . 60 . 18 . 1 . 18 . 50 or 60
78 . 1 . 78.

The jaw is arched with a central projection.

The generative organs (Plate V. fig. 5) are interesting because they are, as regards the amatory organ, like some other forms from the same region, and present a type not yet known to exist in India.

The male organ is simple, bent on itself; the amatorial organ has at the free end a large secretory gland, made up of five separate glands; a short muscular cylindrical part comes next, armed at the lower part with a very beautiful fine calcareous dart 3.25 millim. in length (figs. 5 *a* and 5 *b*); its position is at the end of a long cylindrical open sac with rugous sides, near the base of which is the spermatheca. The albumen-gland is large, but the other parts of the generative organs present nothing that differs from the usual form.

Several of the sinistral shells inhabiting the Malay Archipelago were placed in the genus *Ariophanta* by Prof. Semper; but as I have pointed out in 'Land and Freshwater Moll. of India,' p. 133, they are very unlike the type of this genus, which is from Bombay, and require a subgeneric position assigned to them. The principal and remarkable character is the form of the amatorial organ, so well illustrated by Professor Semper on pl. iii. of his fine work on the Land-Mollusca of the Philippine Archipelago, where he figures the generative organs of *Ariophanta rareguttata* (Adenore), *rumphii* (Java), *nemorensis* (Celebes), and *striata* (Singapore). On pl. vii. of the same work the form of the teeth of the radula of five species is given; here dissimilarity exists. *A. (Amphidroma) martini* (Sumatra), *rareguttata*, and *nemorensis* have plain simple teeth; but in *A. rumphii* and *striata* they are tricuspid, merging into bicuspid shape in the laterals. All these species should now be placed in the genus *Dyakia*.

DYAKIA INTRADENTATA, n. sp.

Shell very similar to *D. hugonis* in form and coloration, more acute in the spire and rather flatter on the base, with the umbilical region more excavated. The whorls more closely wound. Sculpture coarser and more decussate, that on the lower side finely papillate. Looked at from below there is a very remarkable dent or small depression indicating the presence of an internal tooth, and this is situated at the distance of exactly half a whorl from the aperture.

Molu Mountains, in Dr. Hungerford's collection (*Boxall*).

Having seen but one specimen, I at first thought that this shell was only a reversed variety of *D. hugonis*, and that the depression was the result of some injury. I now find that Dr. Hungerford has two specimens, and a young shell in Mr. Everett's collection from the Niah Hills is evidently of the same species.

DYAKIA REGALIS.

Helix regalis, Benson, Ann. Mag. N. H. ser. 2, vol. v. p. 215 (1850); Reeve, Conch. Icon. pl. xcvi. fig. 526 (1852); Pfeiff. Monogr. Helic. iii. p. 52 (1853), et v. p. 82 (1868); id. in Mart. u. Chemn. Conch.-Cab. ed. ii. p. 377, t. cxli. figs. 5, 6.

Helix vittata, Adams & Reeve, Zool. Voy. Samarang, Moll. p. 60, pl. xv. figs. 7 a-c (1850); Metcalfe, P. Z. S. 1851, p. 70.

Ryssota (?) *regalis*, Wall. P. Z. S. 1865, p. 407.

Nanina regalis, v. Martens, Preuss. Exped. Ost-Asien, Land-schneck. p. 225 (1867).

Var. UNICOLOR.

N.W. Borneo (*Everett*).

DYAKIA BUSANENSIS, n. sp. (Plate II. fig. 1.)

Shell discoid, sharply keeled; umbilicated; sculpture above finely decussate, produced by rather irregular transverse lines of growth crossed by very longitudinal hair-like striæ; below glassy, no spiral striæ, a few transverse lines; colour pale ashy white, with a single broad band next to the periphery and suture; spire low, flatly pyramidal; apex rounded; suture a mere thread; whorls 5, sides very flat; aperture semilunate, oblique; peristome thin; columellar margin oblique, not reflected, very weak.

Size: maj. diam. 19.0, min. 17.2; alt. axis 6.7 millim.

Hab. Busan Hills (*A. Everett*).

Dyakia janus.

Helix janus bifrons, Chemn. Conch.-Cab. xi. p. 307, t. 213. figs. 3016, 3017.

Helix janus, Pfeiff. Monogr. Helic. i. p. 77 (1848), et v. p. 83 (1868); Reeve, Conch. Icon. pl. xci. fig. 494 (1852).

Nanina albersi, v. Martens, Monatsber. Akad. Berlin, 1864, p. 265; id. Preuss. Exped. Ost-Asien, Landschneck. p. 224, et xi. fig. 3 (1867).

Ryssota (?) *janus*, Wall. P. Z. S. 1865, p. 407.

Nanina janus, v. Martens, Preuss. Exped. Ost-Asien, Land-schneck. p. 226, t. xi. fig. 4 (1867).

Dyakia amphidroma.

Helix janus bifrons, var., Rousseau in Hombr. et Jacq. Voy. au Pôle Sud, Zool. v. p. 11, pl. v. figs. 1-3 (1854).

Helix martini, Pfeiff. P. Z. S. 1854, p. 149; id. Monogr. Helic. v. p. 300 (1859); Reeve, Conch. Icon. pl. cxiii. fig. 1356 (1854).

Nanina amphidroma, v. Martens, Monatsber. Akad. Berl. 1864,

p. 265 ; id. Preuss. Exped. Ost-Asien, Landschneck. p. 221, t. xi. figs. 2, 5, t. vi. figs. 3, 3 *b* (1867).

Nanina producta, Mousson, in collect.

Ariophanta martini, Pfr., Sumatra (= *amphidroma*, v. Mart.), Semper, Reise im Arch. d. Philipp., Landmoll. p. 51, t. vii. fig. 4.

Dyakia (?) *striata*.

Nanina striata, Gray, P. Z. S. 1834, p. 59 ; v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 228 (1867).

Helix orientalis, Reeve (non Gray), Conch. Icon. pl. lxxviii. fig. 409 (1852).

Helix naninoides (Benson), Pfeiff. Monogr. Helic. v. p. 122 (1868).

Helix striata, Pfeiff. Monogr. Helic. i. p. 55 (1848).

Helix isabella, Rousseau in Hombr. et Jacq. Voy. au Pôle Sud, Zool. v. p. 6, t. iv. figs. 7-10 (1854).

Hemiplecta naninoides, Wall. P. Z. S. 1865, p. 406.

Ariophanta striata, Semper, Reisen im Arch. d. Philipp., Landmoll. p. 53, t. iii. figs. 21 *a*, *b*, t. vii. fig. 5.

Dyakia (?) *mindaiensis*.

Helix mindaiensis, Bock, P. Z. S. 1881, p. 633 (Amonta District).

Dyakia (?) *sarawakana* : *Nanina* (*Ariophanta*) *sarawakana*, Dohrn, Nachricht. deutsch. Malak. Gesellsch. 1881, p. 66 (Sarawak).

DYAKIA NASUTA. (Plate V. figs. 4-4 *c*.)

Helix nasuta, Metcalfe, P. Z. S. 1851, p. 70 ; Pfeiff. Monogr. Helic. iii. p. 203 (1853), et v. p. 306 (1868) ; Reeve, Conch. Icon. pl. clvii. fig. 1031 (1853).

Ryssota ? *nasuta*, Wall. P. Z. S. 1865, p. 407.

Nanina (*Hemiplecta*) *nasuta*, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 224 (1867).

Hab. Niah Hills.

One specimen of this very remarkable and beautiful shell was preserved in spirit. Animal pale-coloured, like that of *D. hugonis* ; the mucous gland has a very small overhanging lobe and a broad pallial margin. The odontophore (Plate V. fig. 4 *b*) has the central tooth tricuspid, the central cusp hardly rising above those on either side ; the median are square at the end, bicuspid, the laterals (fig. 4 *c*, 80th and 81st) have a sharp inner cusp and a rounded outer cusp, rising close together ; the outermost laterals are unicuspid and small :

$$\begin{array}{c} + 70 . 14 . 1 . 14 . 70 + \\ + 80 . 1 . 80 + . \end{array}$$

Some of the small outermost teeth were lost in dissection. The generative organs (figs. 4 and 4 *a*) are similar to those of *D. hugonis* and do not require any further description.

It would be difficult to select two shells differing so much in form as *D. hugonis* and *D. nasuta*; any classification based on shell-characters would place them widely apart, yet the animals as regards their structure are closely allied. This points to a long occupation of this island by this group of land-shells.

DYAKIA MOLUENSIS, n. sp. (Plate II. fig. 6.)

Shell sinistral, depressedly pyramidal, not perforate, solid, rounded below, sharply keeled; sculpture, irregular furrowing, crossed by rough transverse curvilinear and broken granulation; colour dark chestnut-brown, with a lemon-yellow narrow line on the periphery and also running with the suture, a circle of same colour around the umbilicus; spire low, sides flat; apex blunt; suture linear; whorls 5, gradually increasing, flat-sided; aperture semi-lunate, very oblique; peristome thickened below, with a slightly sinuate margin above; columellar margin oblique.

Size: maj. diam. 28.0, min. 24.8; alt. axis 9.3 millim.

Hab. Molu Hills (*A. Everett*).

Only one specimen was sent home of this very pretty shell, which is somewhat like the dextral *H. albula* from Moti Island, one of the Ternate group.

EVERETTIA, subgen. nov. (Plate III.)

(Type, *Macrochlamys jucunda*.)

The animal from a spirit-specimen is pale ochre in colour, with jet-black tentacles and a black band on either side of the neck from the base of the tentacles running backwards.

The pallial margin (fig. 5) is broad, the foot below with a central ambulatory area. The mucous gland (fig. 5 *a*) is large, and in life the extremity of the foot is apparently much pointed and overhanging. There are no linguiform shell-lobes either on the right or left side, but on the latter the lobe is a simple band turned back over the edge of the peristome; both the right and left neck-lobes are very small.

The generative organs (fig. 6) are very peculiar and unlike those of any species I have examined or that I find figured by Professor Semper. The principal difference lies in the amatorial organ or dart-sac; this is cylindrical below as in other genera, but at the inner extremity terminates in a fringe of very numerous accessory glands (fig. 6 *a*), very nearly equal in length to the solid fleshy lower portion. These fringe-like glands are finely pointed and lie buried in a mass of mucous glands having a segmented structure, each separate lobe being associated with one of the accessory glands. The lower end is armed with a stout and solid calcareous dart (*Liebespiel*), having a conical attachment to the muscular portion (fig. 6 *b*). The penis has no calc-sac. The albumen-gland is very large.

The odontophore:—The rows of teeth, about 90, gradually decrease to the outer margin, the formula being

30.	26.	1.	26.	30.
	56.	1.	56.	

The central tooth is much shorter and smaller than the laterals, and is tricuspid (fig. 3 *b*), the two outer cusps being just below the centre point; in one specimen dissected, owing to the central part being much worn, this central tooth is evenly tricuspid (fig. 3). The laterals rise from long narrow plates, and are very pointed, with an outer and inner cusp some distance below the apex, being thus also tricuspid; the outermost laterals are very nearly unicuspid (fig. 3 *a*). The jaw is curved, but has no central projection (fig. 4).

This shell was placed by von Martens in the genus *Macrochlamys*; and looking at its shiny glassy shell, so very like many in the Indian region, I should certainly have done the same; yet the animal differs from that genus not in one but in several characters—externally in the absence of the long shell-lobes; internally in the odontophore and jaw; and in the reproductive organs it is widely separable, *Macrochlamys* not possessing the *spicula amoris*. In searching through Semper's work for characters approaching those now figured and described, I observe the nearest, as might be expected, in those genera found in the islands of the Malay Archipelago and not in those found to the westward in India. On plate iii. figs. 1, 2, *Reise im Archipel d. Philipp.*, is shown the *sagitta amatoria* of *Tennentia philippinensis* and *Parmarion pupillaris*, from Java, of the same type. This I would submit is an indication that the slug-like forms of this part of the world are the descendants of these glassy *Helices*, just as we find the general anatomy of *Girasia*, a slug-like species of India, to be like that of *Macrochlamys*, and that although the outward form of both animal and shell is very similar respectively, the races of the two areas have a most remote relationship. How far these characters of *Everettia* and *Dyakia* extend around this area is yet to be discovered. We cannot as yet say with certainty that shells with similar internal structure do not exist in India; they are certainly absent in the N.E. Himalayas and Khasi Hill Ranges, but there are numbers of even large species in Southern India yet to be examined, and of which we know as yet nothing. Of the shells of New Guinea we are also quite ignorant, at least I have not seen any work on their anatomical variations.

EVERETTIA CONSUL.

Helix resplendens (Philippi), Metcalfe, P. Z. S. 1851, p. 70(?).

Helix consul, Pfeiff. P. Z. S. 1854, p. 289; id. Monogr. Helic. iv. p. 44 (1859), et v. p. 97 (1868); id. Novitat. Conch. iii. pl. lxxiv. figs. 13, 14; Reeve, Conch. Icon. pl. cxviii. fig. 1395 (1854).

Macrochlamys consul, Wall. P. Z. S. 1865, p. 405.

Nanina consul, v. Martens, Preuss. Exp. Ost-Asien, Landschneck. p. 240 (1867).

EVERETTIA JUCUNDA. (Plate III. fig. 1.)

Helix jucunda, Pfeiff. P. Z. S. 1863, p. 524; id. Novitat. Conch. iii. pl. lxxiv. figs. 11, 12; id. Monogr. Helic. v. p. 101 (1868).

Nanina (Macrochlamys) jucunda, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 40, t. xii. fig. 7 (1867).

The specimen figured measures: maj. diam. 19.0, min. 18.5; alt. axis 9.0 millim.

Var. *nana* from Dr. Hungerford's collection. This is a MS. name of Mr. Geoffrey Nevill's, and appears in his copy of the 'Hand-list' as given to two specimens sent to the Indian Museum, Calcutta, as a variety of *jucunda*. The exact locality is not quoted.

Everettia hyalina.

Nanina hyalina, v. Martens, Monatsber. Akad. Berlin, 1864, p. 266; id. Preuss. Exped. Ost-Asien, Landschneck. p. 241, t. xii. fig. 5 (1867).

Helix (Macrochlamys) hyalina, Pfeiff. Monogr. Helic. v. p. 99 (1868).

Size: maj. diam. 22.5, min. 20.25; alt. axis 10.75 millim.

Von Martens describes the animal as black-grey, of a slender form; tentacles and neck black, with a white central line on the latter; mantle reflected; jaw with a middle projection. In many species of *Macrochlamys* similar dark and white varieties occur. This species occurred in a disused gold-mine at Kapuas-Strom, in Upper Pontianak, West Borneo.

Everettia aglaia.

Helix aglaia, Pfeiff. P.Z.S. 1854, p. 289; id. Monogr. Helic. iv. p. 46 (1859), et v. p. 103 (1868); Reeve, Conch. Icon. pl. cxcix. fig. 1396 (1854).

Nanina (Macrochlamys) aglaia, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 242, t. xii. fig. 13 (1867).

Macrochlamys aglaja, var. *emarginata*, Nevill.

Two specimens, Borneo (*Sowerby*, ex coll. Lombe Taylor). In this species the suture is not "*linea rufescente marginata*," Nevill, MS., Hand-l. Ind. Mus.

There is a fine series of these shells in the collection, some 85 specimens, and I have examined those in the British Museum. On my arranging them by localities in juxtaposition, it was at once apparent that those from the Niah Hills, 15 in number, and 2 from Kina Balu were alike and separable from all the rest. These last are *Everettia subconsul* of Mr. Edgar Smith, Ann. Mag. Nat. Hist., Aug. 1887, p. 132, from North Borneo (*J. Whitehead*), with which I have compared them. They may be known by the less number of whorls, *i. e.* not being so closely wound, and those from the Niah Hills are very ruddy in colour and flatter on spire (var. *depressa*, Plate III. fig. 2).

The remainder are from the following localities:—

No. 1. Trusan, 12.

No. 2. Labuan, 82; all range from 15 mm. in maj. diam.

No. 3. Tiga Island, 1; same as No. 2.

No. 4. Dahat Island, 2; olivaceous brown.

No. 5. Karemon Island, 11; these differ from all others in their dark sienna-brown colour, and might be designated as *consul* var. *rufa*.

No. 6. From Dr. Hungerford, marked Borneo; 4 specimens, exactly similar to No. 1, and identified by him as *jucunda*.

No. 7. Marked Borneo, 4; small; maj. diam. 14 mm.; named var. *nana*.

No. 8. Borneo? (*Boxall*), 3; not so closely wound as any from No. 1 to No. 8, but smaller than any of *subconsul*, and, I think, only a dwarf variety of that form.

The largest shell of the whole series was in the set No. 5, and measured 25 mm. maj. diam., alt. axis 14·25, of 7 whorls.

Helix consul was the first to be described from this part of the world, the exact locality being Sarawak; and an examination of the British Museum species led me to the conclusion that *jucunda* and *aglaia* are only based on the size, or at the best may be considered local varieties of *consul*. *E. hyalina* of von Martens appears to be another variety; but the type I have not seen, and it is most difficult to form any opinion from drawings when the differences are so minute and when shades of colour are so subtle and yet so constant in the groups from different areas.

E. hyalina appears to be larger and flatter in the spire than *jucunda*, and the proportions of the before-mentioned varieties come out as follows, as regards the maj. diam.: *E. consul* 22 mm., *jucunda* 11·18, *hyalina* 21·0, and *aglaia* 10·0.

EVERETTIA CUTTERI.

Macrochlamys cutteri, H. Adams, P. Z. S. 1870, p. 794, pl. xlviii. fig. 21.

This animal is jet-black throughout, with a pale band on the upper part of the neck running to the base of the eye-tentacles. There are no right or left shell-lobes; the right and left neck-lobes ample, the last not divided. Pallial margin as usual. Lingual ribbon and jaw as in *E. jucunda*, as also the generative organs.

Everettia bocki, Issel, Ann. Mus. Civ. Genova, vi. p. 399.

Hab. Borneo (*Carl Bock*).

MICROCYSTIS TERSA. (Plate IV. fig. 1.)

Nanina tersa, Issel, Ann. Mus. Civ. Genova, vi. p. 399, t. v. figs. 1-4 (1874).

Shell globose, thin, transparent glassy, very narrowly perforate; sculpture, no spiral striation except near the apex and that most minute; colour pale sienna tint; spire conical, sides flat; apex blunt; suture shallow, adpressed; whorls 5, regularly increasing and rather flat: aperture semi-ovate; peristome subvertical, sharp, scarcely reflected at the oblique columellar margin.

Size : maj. diam. 7·6, min. 7·5 ; alt. axis 4·6 millim.

Hab. Busan Hills (*A. Everett*).

Microcystis (?) *macdougalli*.

Nanina (?) *macdougalli*, Issel, Ann. Mus. Civ. Genova, vi. p. 400, t. v. figs. 9-12 (1874).

MICROCYSTIS *DYAKANA*, n. sp. (Plate IV. figs. 4, 4 a-4 c.)

Shell globose, thin, semi-transparent, very narrowly perforate, almost imperforate ; sculpture, under high lens very minute, somewhat wavy spiral striation, to the naked eye smooth and glassy ; colour pale dull ochraceous ; spire moderately high ; apex blunt ; suture adpressed, shallow ; whorls 4, convex, rather rapidly increasing ; aperture semi-ovate ; peristome sharply edged, reflected at the columellar margin, which is oblique, not thickened.

Size : maj. diam. 8·7, min. 7·7 ; alt. axis 4·5 millim.

Hab. Busan Hills (*A. Everett*).

This might very easily be mistaken for *Microcystis tersa* but for its larger size and fewer whorls, the form of the apex of the shell when viewed from the front being also very different.

The animal is of a pale ruddy brown colour with large black patches and spottings.

The right shell-lobe (*r.s.l.*) very ample, triangular in form ; the left shell-lobe also large as well as the neck-lobes (figs. 4 a & 4 b).

The radula was not seen, this part had been destroyed before it was placed in spirit.

The generative organs were also not perfect. The male organ is shown in Plate IV. fig. 4 c.

Microcystis (?) *lowi*.

Hyalina (?) *lowi*, Issel, Ann. Mus. Civ. Genova, vi. p. 401, t. v. figs. 16-19 (1874).

Microcystis (?) *perlucida*.

Hyalina perlucida, Issel, Ann. Mus. Civ. Genova, vi. p. 402, t. v. figs. 20-23 (1874).

MICROCYSTIS (?) *MILIACEA*.

Microcystis (?) *miliacea*, v. Martens, Preuss. Exped. Ost-Asien, Landschneck. p. 268, plate xii. fig. 15.

Liocystis, Nevill, Hand-list, MS. (from Amboyna).

Borneo (*Sowerby*, ex coll. Lombe Taylor, in coll. Indian Mus., Calcutta).

There is a doubt both as regards identification and habitats.

MICROCYSTINA *INFANS*. (Plate IV. fig. 2.)

Helix infans, Pfeiff. P. Z. S. 1854, p. 290 ; id. Monogr. Helic. iv. p. 51 (1859), et v. p. 108 (1868) ; Reeve, Conch. Icon. pl. cci. fig. 1417 (1854).



1891. "On a Collection of Land Shells made in Borneo by Mr. A. Everett, with descriptions of supposed new species. Pt. ii. Zonitid and Helicidae."

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