

XXII.—On the Land- and Freshwater-Shells of the Louisiade Archipelago. By EDGAR A. SMITH.

[Plate XIII.]

THE British Museum has recently received from Mr. Basil Thomson a very interesting collection of land- and freshwater-shells made by him in some of the islands of the Louisiade Archipelago. In naming these specimens it has been necessary to study what has been written upon the shell-fauna of these islands, and I have thus got together a complete list of the known species*.

The first and only collections of any extent from this locality which have come to Europe were those made by MacGillivray during the voyage of the 'Rattlesnake' in May, June, and July 1849.

Most of the species proved to be new, and the majority were described and figured by Forbes in the second volume of MacGillivray's narrative of the voyage.

About half a dozen additional new forms have since been described by Pfeiffer, Cox, Angas, and H. Adams.

The present collection consists of fourteen species of terrestrial forms, ten of which are new, and nine freshwater species.

The most important discovery made by Mr. Thomson is that of the four new species of *Pupinella*, one among them being still larger than the *P. grandis* of Forbes. They are remarkable in presenting curious modifications in the labial slit or notch; indeed in two of them this feature is so abnormal that it might almost be considered of subgeneric importance. Mr. Gwatkin, however, who has kindly examined the radula of *P. Macgregori* and *P. rosseliana*, observes: "there is certainly nothing in the radula to call for subgeneric distinction."

Fifteen land-shells have already been recorded from the Louisiade Islands, and Mr. Thomson has now added eleven others, making, together with three forms collected by MacGillivray and not recorded by Forbes, a total of twenty-nine. With the exception of the Auriculidæ and of *Helix Boyeri* and *H. coniformis*, about the locality of which there is some doubt, all the species are peculiar to these islands.

Of freshwater forms only a single species has hitherto been noticed, namely *Neritina diadema*. I now enumerate fifteen

* With the exception of Nos. 9, 11, 12, and 14, all the species are in the Museum.

additional species, nine collected by Mr. Thomson and the rest by MacGillivray.

In the following list a few species * recorded from Woodlark Island are omitted, as that island scarcely comes within the Louisiade group, being situated considerably to the north.

A. TERRESTRIAL SPECIES.

1. *Nanina divisa*, Forbes.

Helix divisa, Forbes, Appendix to MacGillivray's Voyage of the 'Rattlesnake,' vol. ii. p. 376, pl. ii. figs. 5 *a-b*; Reeve, Conch. Icon. fig. 1450; Tryon, Man. Conch. ser. 2, vol. ii. pl. xiii. fig. 70.

Hab. Sudest Island.

2. *Nanina inclinata*, Pfr. (Pl. XIII. fig. 16.)

Helix inclinata, Pfeiffer, Proc. Zool. Soc. 1863, p. 526; Monogr. Hel. vol. v. p. 129.

Hab. Louisiade group (New Caledonia). This is evidently a *lapsus calami*, New Guinea of course being intended.

A number of specimens from St. Aignan obtained by Mr. Thomson agree in many respects with the description of this species, but exhibit on the upper surface excessively fine spiral striæ, which are not mentioned but may have been overlooked by Pfeiffer. *N. divisa* is rather smaller, less acutely keeled, and has the perforation a little more open.

3. *Nanina rosseliana*. (Pl. XIII. fig. 15.)

Testa anguste perforata, depresso conoidea, in medio acute carinata, roseo-fuscescens, superne subnitida, infra valde polita; anfract. 6, planiusculi, lente crescentes, lineis incrementi obliquis arcuatis, striisque spiralibus confertis minutis sculpti; ultimus haud descendens, supra et infra carinam impressus, inferne haud spiraliter striatus; apertura angulato-lunata; perist. simplex, tenue, supra umbilicum leviter expansum et reflexum.

Diam. maj. 40, min. 36, alt. $21\frac{1}{2}$ millim.

Hab. Rossel Island.

This species is larger than either *N. divisa* or *N. inclinata*. It is of a brighter vinous brown colour and has a rather more conical spire.

4. *Trochomorpha nigrans*. (Pl. XIII. figs. 9-11.)

Testa late umbilicata, depresso conoidea, castanea, linea filiformi

* *Helix woodlarkiana*, Souverbie, *Partula similaris* and *P. woodlarkiana* of Hartmann, *Pupina moulinsiana*, Fisch. & Bern., &c.

pallida circa peripheriam quoque ad suturam ornata; anfract. 6, vix convexiusculi, sensim accrescentes, parum nitidi, lineis incrementi tenuibus sculpti, ultimus acute carinatus, antice haud descendens, inferne nitens; umbilicus perspectivus, latus, profundus; apertura diagonalis, subrhombeo-lunaris; perist. simplex, acutum, margine superiore oblique arcuato, inferiore recedente.

Diam. maj. 17, min. 15, alt. 7 millim.

Hab. Rossel Island.

This species approaches *T. papua* and *T. planorbis* and some other species in many respects. It may be recognized by the dark chestnut-colour and the white thread-like keel and suture.

5. *Helix (Chloritis) Leei*, Cox.

Helix Leei, Cox, Proc. Zool. Soc. Lond. 1873, p. 565, pl. xlviii. figs. 5, 5 a; Pfeiffer, Mon. Hel. vol. vii. p. 395.

Hab. St. Aignan (*B. Thomson*).

Dr. Cox does not quote any particular island for his type.

6. *Helix (Chloritis) subcorpulentus*. (Pl. XIII. fig. 14.)

Testa late et profunde umbilicata, subtenuis, globoso-depressa, nitida, pallide fuscescens, apicem versus pallidior; anfract. 5, convexiusculi, subceleriter accrescentes, lineis incrementi obliquis tenuibus sculpti, sutura bene impressa sejuncti; ultimus inflatus, antice breviter oblique descendens; apertura late lunata, parum obliqua, intus margaritacea; perist. livido-rufescens, late expansum et reflexum, marginibus callo tenuissimo junctis, columellari valde dilatato.

Diam. maj. 40, min. 32, alt. 25 millim.

Hab. Rossel Island.

In form this species is very like *H. Leei*; it is, however, much larger and differently sculptured; it exhibits no trace of the oblique rows of granules occurring in that species, the epidermis apparently being non-pilose.

7. *Helix (Geotrochus) Chapmani*, Cox.

Helix Chapmani, Cox, Proc. Linn. Soc. N. S. Wales, 1880, vol. iv. p. 115, pl. xvi. fig. 2.

Helix (Acavus) coraliolabris, Smith, Ann. & Mag. Nat. Hist. 1887, vol. xix. p. 419, pl. xv. fig. 4.

Hab. Rossel Island (*Cox and Thomson*).

I must plead as an excuse for describing this species that it is not referred to in the 'Zoological Record' for 1880, upon which I relied for species published since the eighth volume of Pfeiffer's Monogr. Helic.

Ann. & Mag. N. Hist. Ser. 6. Vol. iv.

8. *Helix* (*Geotrochus*) *lousiadensis*, Forbes.

Helix lousiadensis, Forbes, Voy. 'Rattlesnake,' vol. ii. p. 376, pl. ii. figs. 8 a, b; Reeve, Conch. Icon. fig. 1449.

Hab. Sudest Island (*MacGillivray*).

9. *Helix* (*Geotrochus*) *millicentæ*, Cox.

Helix millicentæ, Cox, Proc. Zool. Soc. 1871, p. 323, pl. xxxiv. figs. 2-2 a.

Hab. Louisiade Islands (*Cox*). No special island mentioned.

10. *Helix* (*Geotrochus*) *Thomsoni*.
(Pl. XIII. figs. 12, 13.)

Testa imperforata, subconico-globosa, roseo-purpurea, pallido-luteo maculata et variegata, leviter nitida, incrementi lineis striisque obliquis minutis corrugatis confertis sculpta; anfract. $4\frac{1}{2}$, convexiusculi, celeriter crescentes, sutura simplici sejuncti, ultimus primo carinatus (carina antice obsoleta), prope aperturam subito deflexus, pone labrum constrictus; apertura obliqua, elongata, intus roseo-purpurea; perist. albidum, expansum et reflexum, margine superiore antice sinuato, columellari lato, appresso, intus oblique rectilineari.

Diam. maj. 27, min. 20, alt. 18 millim.

Var. Testa subdiaphana, luteo maculata et variegata.

Hab. St. Aignan.

This species, *H. lousiadensis*, and *H. millicentæ* are all closely allied, but exhibit certain differences which probably will prove constant, being confined to specimens from particular islands.

11. *Helix* (*Geotrochus*) *Dampieri*, Angas.

Helix (*Geotrochus*) *Dampieri*, Angas, Proc. Zool. Soc. 1869, p. 47, pl. ii. fig. 6; Pfeiffer, Mon. Helic. vol. vii. p. 310.

Hab. Louisiade Archipelago (*Angas*). No special island mentioned.

12. *Helix* (*Geotrochus*) *Boyeri*, Fischer and Bernardi.

Helix Boyeri, Fisch. & Bern. Journ. de Conch. 1856, vol. v. p. 297, pl. ix. figs. 8, 9; Pfeiffer, Mon. Helic. vol. iv. p. 201, vol. v. p. 270, vol. vii. p. 312.

Hab. Admiralty Islands (*F. & B.*); Louisiade Islands (*Angas*, fide *Pfeiffer*).

13. *Helix* (*Geotrochus*) *coniformis*, Férussac.

Helix (*Helicostyla*) *coniformis*, Férussac, Tab. Syst. Limaçons, p. 51; Hist. nat. Moll. pl. cviii. fig. 1; Pfeiffer, Conch.-Cab. p. 435, pl. cli. figs. 9, 10; Reeve, Conch. Icon. pl. xxiii. fig. 101.

Hab. New Ireland (*Férussac* and others); Louisiade Archipelago (*Kobelt*).

This species is quoted by *Kobelt* in his list of land- and freshwater-shells from the Louisiade Islands (*Jahrb. deutsche mal. Gesell.* 1880, p. 15); but he does not state upon whose authority he has included it. This and the preceding can only be accepted with reserve as Louisiade species.

14. *Helix* (*Geotrochus*) *Gurgustii*, Cox.

Helix Gurgustii, Cox, Proc. Linn. Soc. N. S. Wales, vol. iv. p. 114, pl. xvi. fig. 1.

Hab. Rossel Island (*Cox*).

15. *Helicina congener*. (Pl. XIII. fig. 17.)

Testa depresso trochiformis, in medio acute carinata, sordide albida vel flavescens, supra carinam (interdum quoque suturam infra) maculis sanguineis ornata; spira breviter conica, lateribus rectilinearibus; anfract. 5, celeriter crescentes, supremi 3-4 convexiusculi, ultimus planiusculus, liris spiralibus conspicuis circiter 8 supra angulum, et numerosis gracilioribus infra sculptus, antice vix descendens; apertura fere horizontalis, triangularis; peristoma album, leviter expansum.

Diam. maj. 19, min. 16, alt. 13 millim.

Hab. St. Aignan.

This species closely resembles *H. novo-guineensis* (*Smith*, Ann. & Mag. Nat. Hist. 1887, vol. xix. p. 425, pl. xv. figs. 11, 11 a). It has, however, a more elevated and conical spire, with the outlines straight instead of slightly curved, coarser spiral ridges upon the upper surface, and a different style of coloration.

16. *Helicina*, sp. nov.

Hab. Rossel Island.

A single dead shell in worn condition is all that was obtained. It is smaller and less sharply keeled than the preceding, apparently of a pale yellowish tint without markings, and finely spirally lirate.

17. *Helicina Stanleyi*, Forbes.

Helicina Stanleyi, Forbes, Voy. 'Rattlesnake,' vol. ii. p. 381, pl. iii. figs. 4 a, b; Pfeiffer, Mon. Pneumon. i. p. 401.

Hab. Duchateau Isles, Louisiade Archipelago (*MacGillivray*).

18. *Helicina lousiadensis*, Forbes.

Helicina lousiadensis, Forbes, *l. c.* p. 382, pl. iii. figs. 5 a, b; Pfeiffer, Mon. Pneumon. i. p. 385; Sowerby, Thes. Conch. vol. iii. pl. cclxxv. figs. 349, 350; id. Conch. Icon. figs. 259 a, b.

Hab. Round Island in Coral Haven, north of Sudest Island (*MacGillivray*).

19. *Pupinella grandis*, Forbes.

Pupina grandis, Forbes, Voy. 'Rattlesnake,' vol. ii. p. 380, pl. ii. figs. 10 a-d; Pfeiffer, Conch.-Cab. ed. 2, Cyclostomacea, p. 238, pl. xxxi. figs. 19, 20; Sowerby, Conch. Icon., Pupinidæ, fig. 4.
Pupina Forbesi, Pfr. Mon. Pneumon. vol. i. p. 140.

Hab. Sudest Island, under dead leaves, chiefly about the roots of trees (*Forbes*).

The peristome of this species is usually of a reddish or orange tint, but occasionally white-lipped specimens are met with.

20. *Pupinella lousiadensis*. (Pl. XIII. figs. 3, 4.)

Testa *P. grandi* paulo major, forma, colore et sculptura similis; incisura labri sinistra levis, marginem externam haud persecans. Longit. 33, diam. $15\frac{2}{3}$ millim., apertura intus $7\frac{1}{2}$ mill. longa et lata.

Hab. Rossel Island.

This species is represented in the collection by seven specimens, which agree in every particular with the exception of the lip being paler in some specimens than others, as is the case with *P. grandis*. It may be said to be the Rossel-Island representative of that species, differing in its somewhat larger size and the slightness of the slit or notch on the columellar margin of the labrum. The slit scarcely cuts through a third of the thickness of the lip, whereas in *P. grandis* the labrum is cut completely through, the incision when viewed laterally forming a distinct loop. It is in the same position in both species.

21. *Pupinella Macgregori*. (Pl. XIII. figs. 1, 2.)

Testa *P. grandi* magnitudine, colore, forma et sculptura fere similis; labrum pallidum vel flavescens, superne anguste persectum, incisura extus supra regionem umbilici tubulum formante.

Longit. 29, diam. 15 millim., apertura intus 7 longa et lata.

Hab. Rossel Island.

This species is in general character also like *P. grandis*. It has, however, a somewhat shorter and broader aspect and is perhaps a little more strongly pitted upon the back of the body-whorl; it is, however, at once distinguished by the peculiarity of the labial slit, which is formed into a distinct tube over the umbilical region. In *P. grandis* and *P. louisianaensis* the slit is transverse to the lip; in the present species it is almost perpendicular to the axis of the shell and higher up than in the other species referred to.

22. *Pupinella rosseliana*. (Pl. XIII. figs. 5, 6, 6 a.)

Testa *P. grandi* paulo minor, brevior, colore et sculptura subsimilis; incisura labri fere obsoleta; labrum minus incrassatum, antice prominens.

Longit. 25, diam. $13\frac{1}{2}$ millim., apertura 7 longa et lata.

The smaller size and the almost obsolete notch in the labrum readily separate this species from the rest. These characters are quite constant in the sixty specimens examined.

The young shell, consisting of five whorls, is openly and perspectively umbilicated and has no ridge around the umbilicus, as in the adult form.

I have examined the opercula of *P. grandis*, *P. rosseliana*, and *P. Macgregori*, and observe that they all present trifling differences.

23. *Pupinella minor*. (Pl. XIII. figs. 7, 8.)

Testa pupiformis, sublævis, sordide albida (vel pallide rubida?); anfract. 6, regulariter crescentes, ultimus oblique descendens, supra apertura subplanatus; perist. incrassatum, reflexum, margine columellari angustissime persecto, incisura supra umbilici regionem tubulum irregularem formante.

Longit. 19, diam. 9 millim., apertura intus 5 millim. longa et lata.

Hab. Rossel Island.

This is a smaller species than *P. Angasi*, with a labial slit somewhat resembling that of *P. Macgregori*. The single specimen at hand is in worn condition, so it is impossible

to describe with certainty the colour and sculpture; but it appears to be a smoothish shell and slightly tinted with red, like *P. Angasi*.

24. *Pupinella Angasi*, H. Adams.

Pupinopsis Angasi, H. Adams, Proc. Zool. Soc. 1875, p. 389, pl. xlv. figs. 2, 2 a; Pfeiffer, Mon. Pneumon. Suppl. 3, p. 412 (*Pupinella*).

Hab. Louisiade Archipelago (*Adams*). No particular island recorded.

In this species the labial slit is more pronounced than in *P. lousiadensis*, but smaller than in *P. grandis*. *P. moulinsiana*, Fischer and Bernardi, from Woodlark Island, situated north of the Louisiade group, is a closely allied form.

25. *Auricula tornatelliformis*, Petit.

Auricula tornatelliformis, Petit, Journ. de Conch. 1853, vol. iv. p. 412, pl. xii. figs. 5, 6; Sowerby, Conch. Icon. fig. 6.

Hab. Pig Island, Louisiade Archipelago (*MacGillivray*, in Brit. Mus.); Phillipines (*Petit*).

26. *Pythia scarabæus*, Linné.

Hab. St. Aignan (*Basil Thomson*); Sudest Island (*MacGillivray*).

Widely distributed through the Malay region and the Pacific Islands.

27. *Cassidula sulculosa*, Mousson, var.

Auricula sulculosa, Mousson, Moll. Java, p. 45, pl. v. fig. 8; Sowerby, Conch. Icon. fig. 35 (bad!); Pfeiffer, Mon. Auric. p. 114, as *Cassidula*.

Hab. Sudest Island (*MacGillivray*, in Brit. Mus.).

The specimens from this locality agree with others from Guadalcanar, Solomon Islands, also collected by MacGillivray. They are of a dark olive-brown colour, with a pale zone at the shoulder of the body-whorl, and the basal carina is also light-coloured. The labrum is of a brown flesh tint and is not so deeply notched at the upper part as in typical specimens from Java, the Philippines, Fiji Islands, &c.

28. *Melampus luteus*, Quoy and Gaimard.

Auricula lutea, Q. & G., Voy. 'Astrolabe,' pl. xiii. figs. 25-27; Küster, Conch.-Cab. p. 39, pl. vi. figs. 1-3; Sowerby, Conch. Icon. pl. iii. fig. 19.

Hab. Louisiade Archipelago (fide *Kobelt*).

This species is widely distributed, occurring in some of the islands in the Indian Ocean, in the Malay Archipelago, and in many islands in the Pacific.

29. *Melampus caffer*, Küster.

Auricula caffra, Küster, Conch.-Cab. p. 36, pl. v. figs. 6-8; Sowerby, Conch. Icon. fig. 53 (bad!).

Hab. Pig Island, Louisiade Archipelago, under logs a few feet above high-water mark (*MacGillivray*, in Brit. Mus.); coast of Natal and Ohetaroa Island (*Küster*); Philippines (*Adams*); Samoa Islands (Brit. Mus.).

There is little doubt that this species is the *Auricula sciuri* described by Lesson in the Voyage of the 'Coquille.' The specimens from Pig Island I at one time (Proc. Zool. Soc. 1885, p. 600) referred to *M. fasciatus*.

B. FRESHWATER SPECIES.

Neritina diadema, Récluz, is the only species recorded from these islands; but MacGillivray, in the Voyage of the 'Rattlesnake' (vol. i. p. 213), mentions having met with "three kinds of *Melania*, a *Navicella*, and five species of *Neritina*," but he does not name them specifically. All of these are in the collection of the British Museum with the exception of two *Neritinæ*. The following is a list of the species at present known to me from this archipelago. Most of them are found in the Solomon and other neighbouring groups of islands, but some have a still wider range. No references or distribution are added, as these can be obtained in Brot's monograph of *Melania* and in Martens's works on *Neritina* and *Navicella*.

1. *Neritina Petiti*, Récluz.

Hab. St. Aignan (*Basil Thomson*).

2. *Neritina MacGillivrayi*, Reeve.

Hab. St. Aignan (*Thomson*).

3. *Neritina adumbrata*, Reeve.

Hab. St. Aignan (*Thomson*).

4. *Neritina variegata* Lesson.

Hab. St. Aignan (*Thomson*).

5. *Neritina subsulcata*, Sowerby.

Hab. St. Aignan (*Thomson*).

6. *Neritina powisiana*, Récluz (dark var.).

Hab. St. Aignan (*Thomson*).

7. *Neritina olivacea*, Récluz.

Hab. St. Aignan (*Thomson*).

8. *Neritina Turtoni*, Récluz.

Hab. Sudest Island (*MacGillivray*).

9. *Neritina diadema*, Récluz.

Hab. "Isola St. Stephens (Arcipelago Luisade)" (*Canefri*).

10. *Neritina brevispina*, Lamarck, var.

Hab. St. Aignan and Rossel Island (*Thomson*); Sudest Island (*Thomson and MacGillivray*).

The specimens from these islands agree with the form of this species named *subgranosa* by Récluz.

11. *Neritina tahitensis*, Lesson.

Hab. Sudest Island (*MacGillivray*).

12. *Septaria Bougainvillei*, Récluz.

Hab. Sudest Island (*MacGillivray*).

13. *Melania amarula*, Linné.

Hab. Sudest Island (*MacGillivray*).

14. *Melania salomonis*, Brot.

Hab. Sudest Island (*MacGillivray*).

15. *Melania maurula*, Reeve.

Hab. Louisiade Archipelago (*MacGillivray*).

"South-east coast of Guinea," the locality given by Reeve, is evidently an error, and doubtless New Guinea was intended, as suggested by Brot (*Mon. Melan.* p. 196). The specimen collected by MacGillivray, probably on Sudest or South-east

Island, as it is termed in the Voyage of the 'Rattlesnake,' agrees precisely with Reeve's types, excepting that the aperture is not quite so reddish within.

16. *Melania Petiti*, Philippi.

Hab. Rossel Island (*Thomson*).

Dr. Brot has kindly identified this species. All the specimens are small and have only the last and penultimate whorls remaining, producing a remarkably truncated appearance.

EXPLANATION OF PLATE XIII.

- Figs. 1, 2. Pupinella Macgregori.*
Figs. 3, 4. Pupinella louisianensis.
Figs. 5, 6, 6 a. Pupinella rosseliana.
Figs. 7, 8. Pupinella minor.
Figs. 9-11. Trochomorpha nigrans.
Figs. 12, 13. Helix (Geotrochus) Thomsoni.
Fig. 14. Helix (Chloritis) subcorpulentus.
Fig. 15. Nanina rosseliana.
Fig. 16. Nanina inclinata.
Fig. 17. Helicina congener.

XXIII.—On the Habits of certain Bornean Butterflies.

By SYDNEY B. J. SKERTCHLY, F.G.S., M.A.I.*

I. Introduction.

The following notes on the habits of butterflies are chiefly from observations made in British North Borneo. They were mostly written in the jungle, and every observation was recorded at the time. I was often for days amid such a wealth of gorgeous *Ornithopteras* and *Papilios*, &c., that any little point suggested while writing could be observed and any ambiguity be corrected without leaving the open-sided hut. This, however, is unhappily a rare chance, and seldom lasts long at a time.

II. The Hours of Appearance and General Habits.

As a rule our butterflies do not come out until about seven o'clock—that is, an hour after sunrise. By this time the

* [Since I communicated Mr. Skertchly's interesting notes "On Butterflies' Enemies," which appeared in the 'Annals,' ser. 6, vol. iii. p. 477, I have received some further observations of great interest to lepidopterists, which I now forward for publication.—W. L. DISTANT.]



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