

XLVII.—Descriptions of three new species of *Paludomus* from Burmah, and of some forms of *Stenothyra* (Nematura) from Penang, Mergui, &c. By W. H. BENSON, Esq.

THE forms first to be described belong to the genus *Paludomus* proper of Swainson (recently deceased at New Zealand), who was unacquainted with the Cingalese forms added by Reeve, and since separated chiefly with reference to the opercula. This circumstance, and not the applicability of Reeve's character, which is far from expressing the true features of the operculum, properly warrant Mr. E. Layard's restriction of Swainson's name to the shells which present a close affinity to *P. conica*, Gray. In a paper contained in the Proc. Zool. Soc. for 1854, Mr. Layard stated that, with the addition of the position of the nucleus in the operculum, Reeve's characters sufficiently describe it; but, even thus amended, the author has omitted the essential character separating it from *Paludina*, as pointed out to him in a communication dated in April 1852, when I accompanied the information with the distinctive characters of the divisions *Tanalia*, Gray, and *Philopotamis*, Lay., under the names of *Serenia* and *Heteropoma*, and with figures of the opercula of the three genera. The fact is that the nucleus of *Paludomus* proper, unlike that of the similarly horny and concentrically striate operculum of *Paludina*, is subspiral, and analogous to the testaceous one of *Bithinia*. I had prepared a memoir on the subject, with illustrations of the variations of the opercula in *Paludomus* and the *Melaniadæ*, which has been partly anticipated by the paper already before the public.

The genus *Paludomus* requires revision, especially with respect to the unfigured species, which demand more strictly defined characters. It will be found also that several species belong to it, of which the affinity was unsuspected by the describers; among them *Melania obesa*, Philippi, which is really an inhabitant of the vicinity of Bombay, not of Australia, and which may possibly be the same as *P. parva*, Layard; then the Egyptian *Cyclostoma Bulimoides*, Olivier, which has the true typical operculum of *Paludomus*, and which is singular in the genus from presenting a perforated base; lastly, *Melania lutosa* of Souleyet from the lower part of the Hooghly River near Calcutta. Both Philippi and Souleyet notice the concentric striation of the operculum in the shells which they doubtfully referred to *Melania*, overlooking however the structure of the nucleus. In the Atlas to the 'Voyage of the Bonite,' Souleyet gives a figure of the animal, which curiously illustrates its affinity to both *Melania* and *Paludina*.

The unguulate operculum of *Tanalia*, Gr., is analogous to that

of the marine genus *Purpura*, and the animal (of which I was, in the early part of 1853, kindly furnished with an interesting sketch by Mr. Frederick Layard of the Ceylon Civil Service) fully bears out the separation of the shell. It may, indeed, be a question whether *Tanalia* belongs to the *Paludomidae* at all. On the other hand, the subspiral operculum of *Philopotamis*, Lay., seems rather to indicate its place to be among the *Melaniade*, from the spiral and subspiral types of which family it differs in having the nucleus removed towards the right side of the base; the formation of the shell alone exhibiting a relation to the *Paludomidae*. The subspiral opercula of the American forms *Anculosa*, *Gyrostoma*, and *Amnicola*, all point rather to the *Melaniade* than to *Paludomus*. Reeve, who was right in his conjecture respecting the affinity of *Melania obesa*, Ph., to *Paludomus*, has erred respecting that of *M. Grüneri*, Ph., inasmuch as, according to the assertion of Philippi, its operculum consists of six spiral turns.

I may add the following characters of the restricted genus from my inedited paper above referred to.

PALUDOMUS, Swainson.

Testa plerumque imperforata, globoso-ovata, ovato-oblonga, vel ovato-acuta, fere solida, glabra, spiraliter sulcata, vel lirata, interdum spinuloso-costata, epidermide cornea induta; apertura subverticali, ovato-acuta, callo parietali munita, margine columellari crasso, arcuato, basali integro, interdum subeffuso.

Operculo corneo, concavo; nucleo subspirali insulari, submediano, ad sinistram sito, striis lamellatis concentricis partem majorem disci usurpantibus, circumdato.

The genus occurs in Ceylon, Southern India, Gangetic India to the eastward of a line drawn from Sikkim to the mouth of the Hooghly, in the Burhampooter in Assam, and in the hill-streams which flow into that river from the eastward, in Burmah, and Sumatra.

I possess from North-eastern India, besides *P. conica*, Gray, *lutosa*, Soul., *Stephanus*, nobis, and *Paludinoides*, Reeve, four other species which I cannot, with any degree of certainty, refer to published descriptions; and from Southern India two species in addition to *P. obesa*, Ph.

I may remark cursorily that Swainson's name having reference to the *dwelling-place* of the genus in marshes, the specific names ought to bear a feminine termination.

1. *Paludomus labiosa*, nobis, n. s.

Testa ovato-globosa, læviuscula, oblique tenuiter et obsolete spiraliter striata, versus suturam 2-3-sulcata, luteo-olivacea, nigrescenti-

castaneo fasciata, fasciis tribus latioribus; spira brevi, apice eroso; anfractibus 2 superstitibus convexis, ultimo $\frac{3}{4}$ testæ superante; apertura obliqua, ovata, superne acute angulata, fauce quadri-fasciata, peristomate tenui, acuto, margine dextro superne declivi, medio valde arcuato, columellari incrassato, dilatato-appresso, extus fuscato, intus albido, compressiusculo; callo parietali mediocri. Operculo typico.

Long. 13, diam. 11 mill. Apert. 10 mill. longa, $7\frac{1}{2}$ lata.

Hab. in rivulis vallis Tenasserim. Teste W. Theobald.

2. *Paludomus ornata*, nobis, n. s.

Testa ovato-conica, solidiuscula, læviuscula, striis remotis obsolete cincta, infra suturam marginatam bisulcata, luteo-olivacea, fasciis 4 fusco-castaneis, suturali angusta, secunda latissima, quarta inconspicua, ornata; spira conica, apice eroso; anfractibus 4 superstitibus convexis, ultimo $\frac{2}{3}$ testæ vix superante; apertura vix obliqua, ovata, fauce cæruleo-albida, 4-fasciata, superne angulata, angulo intus calloso; peristomate tenui, acuto, marginibus callo albo junctis, columellari subrevoluto, angusto, albo. Operc. —?

Long. 18, diam. 13 mill. Apert. 13 mill. longa, 8 lata.

Hab. in regno Burmanico. Teste W. Theobald.

3. *Paludomus regulata*, nobis, n. s.

Testa ovato-acuta, solidiuscula, regulatim distincte spiraliter sulcata, interstitiis latis planatis, minutissime confertissimeque decussato-striatis, sulcis 2-3 prope suturam latioribus profundioribus, pallide lutea, fasciis sub quatuor, tertia latiori, ornata; spira elata, conica, apice acuto; anfractibus 6, convexiusculis, ultimo dimidium testæ vix superante; apertura verticali, ovata, superne angulata; albida, intus 4-fasciata, peristomatis margine dextro recto acuto, ætate intus vix incrassato-marginato, parietali calloso, columellari versus basin subdilatato, appresso. Operc. ut in sp. typ.

Long. 19-24, diam. 12-14 mill. Long. apert. majoris 13, lat. 9 mill.

Hab. ad Thyet-Myo Burmanorum. Detexit W. Theobald.

Genus *STENOTHYRA*, Benson, Annals, Ser. 2. vol. xvii. p. 342.

Nematura, ejusdem, Journ. As. Soc. Calc. vol. v. p. 781.

1. *Stenothyra cingulata*, nobis, n. s.

Testa vix rimata, ovato-fusiforimi, compressiuscula, nitida, lineis remotiusculis spiralibus, leviter impressis, puncticulatis cingulata, translucente pallide cornea vel hyalina; spira elongata, ovato-acuta, apice acuto, fulvescente, sutura profunda; anfractibus 5, superioribus convexis, ultimo ventre longiori convexiusculo, antice descendente, subtus rotundato, $\frac{2}{3}$ longitudinis testæ æquante; apertura vix obliqua, ovata, superne angulata, peristomate acutiusculo.

Operculo —?

Long. 5, diam. 3 mill.

Hab. ad insulam Penang. Detexit Dr. Theodore Cantor.

This shell was found by Dr. Cantor in company with *St. glabrata*, A. Adams, but more rarely. Its narrower elongated form distinguishes it from all previously described species. The sculpture has some resemblance to that of *St. polita*, Sow., and to that of the species next to be described.

2. *Stenothyra monilifera*, nobis, n. s.

Testa subperforato-rimata, oblongo-ovata, compressiuscula, nitidiuscula, sulcis confertioribus, dense puncticulatis, spiralibus impressa, fusco-cornea, fascia pallida supra mediam ornata, versus apicem obtusulum hyalinum rubente, spira convexo-conica, sutura profunda, canaliculata; anfractibus $4\frac{1}{2}$ convexis, ultimo subsoluto, $\frac{3}{7}$ testæ æquante, antice valde descendente, subtus rotundato, periomphalo subcompresso; apertura obliqua diagonali, rotundato-ovali, sulco profundiori ab anfractu penultimo divisa, peristomate obtusulo, callo parietali superne solum conspicuo. Operculo corneo-pellucido, apice ad dextram spectante.

Long. $4\frac{1}{2}$, diam. 3 mill.

Hab. ad Mergui Burmanorum. Teste W. Theobald.

Distinguished from the last by its form, more developed sculpture, colour, want of polish, and peculiar umbilical rimation.

3. *Stenothyra foveolata*, nobis, n. s.

Testa vix rimata, ovato-acuta, spiraliter foveolato-striata, striis versus basin confertissimis, spira conica, apice acuto, sutura mediocri; anfractibus 5 convexiusculis, ultimo ad ventrem planiusculo, $\frac{1}{3}$ testæ æquante, antice descendente, basi rotundato; apertura obliqua, rotundato-ovata, peristomate obtuso, margine parietali sulco mediocri ab anfractu ventrali separato. Operculo — ?

Long. 5, diam. $3\frac{1}{2}$ mill.

Hab. in Gange fluvio, prope Sikrigali. Teste Capt. T. Hutton.

This shell has reached me in a weathered condition, so that the colour and the normal condition of the surface cannot be exactly described. Its form, however, and the pitted lines seem to mark it as a distinct species. In form it resembles the small *St. puncticulata*, A. Adams, from the Eastern Isles; but in that species the punctulate lines are faint and distant, and not closely set even towards the base, while a scarcely compressed ridge runs down by the side of the slightly impressed rimation and joins the columellar margin below it, a feature not found in the Gangetic shell. Another *Stenothyra* resembling *foveolata* in the characters of the aperture, and marked with delicately punctulate lines, was found with it, but, from the imperfection of the spire, its identity with it cannot be safely declared. The degree of closeness between the lines is about the same, and the surface is of a pale horn-colour, as in some specimens of *St. Delta*,

like which also it presents a faint oblique striation. These shells are important as showing the occurrence of the genus at a distance of 300 miles from the sea, and 200 miles above the extreme influence of the tides.

4. *Stenothyra frustillum*, nobis, n. s.

Testa vix rimata, minima, ovato-conoidea, politissima, sub lente obsolete oblique striatula, albida, translucens, spira convexo-conoidea, apice obtusulo, sutura leviter impressa; anfractibus 4 convexiusculis, ultimo ventricosiore, minime compresso, dimidium testæ non æquante, antice descendente, basi rotundata; apertura subrotundata, marginibus peristomatis acutiusculis. Operc. — ? Long. $1\frac{1}{2}$, diam. 1 mill.

Hab. in Australia. Mus. Cuming.

5. *Stenothyra strigilata*, nobis, n. s.

Testa non rimata, oblongo-ovata, solidiuscula, nitidula, oblique obsolete striatula, creberrime spiraliter sulcata, lineis brevissimis obliquis excavatis (punctorum loco) sulcos occupantibus, fusco-nigrescente; spira ovato-conica, apice eroso, sutura impressa; anfractibus 4 superstitibus convexiusculis, ultimo dimidium testæ æquante, antice valde descendente basi rotundata; apertura ovata, subverticali, intus livide cærulescente, peritremate obtuso, margine parietali intus callo, superne subito desinente, munito, dextro intus longitudinaliter sulco marginato. Operculo tenui translucens, concaviusculo, corneo, intus costa albida marginato.

Long. 7, diam. 4 mill.

Hab. in Insula Borneo. Mus. Cuming.

This is the largest known species of the genus, and is a fine addition to it. The cross linear sculpture of the furrows is different in character from that of the several species which present puncticulate or foveolate lines.

The operculum of *Stenothyra* has a calcareous skeleton or basis, covered internally and externally by a horny layer, which led to its designation by myself in 1836, and A. Adams in 1851, as horny. According to Philippi, Gray states it to be calcareous, and, on fracture, it will be found to be brittle, and that in some species it does not yield to the knife like a horny substance, the calcareous matter being predominant; while in other very thin and pellucid opercula the horny part is in excess. On the whole, this part may be considered rather as of a mixed character than as either strictly calcareous or horny. The structure of the operculum is subspiral, and more analogous to that of *Assiminia* and *Hydrobia* than to that of *Bithinia*.

More extended characters of a few of the described species will

add to the information already possessed respecting this curious little genus. I shall begin with the typical species—

Stenothyra Delta, Benson.

Testa vix rimata, globoso-conica, læviuscula, oblique exilissime striata, striis obsoletis spirilibus minutissimis, versus basin remotioribus, decussata, pallide fulva, albida, vel cornea translucente; spira conica, acuminata, apice subtili, sutura impressa submarginata; anfractibus $5\frac{1}{2}$, superioribus convexis, sequentibus convexiusculis, ultimo ventricoso, compresso, $\frac{2}{3}$ testæ æquante, antice descendente, supra aperturam arcuatim striato, basi compresse rotundata; apertura obliqua, ovato-circulari, superne indentata, peristomatis margine dextro acutiusculo, columellari et basali expansiusculis, parietali intus callo inconspicuo superne truncato, munito, extus sulco impresso marginato; operculo corneo, limbo albido.

Long. 4–5, diam. $2\frac{1}{2}$ – $3\frac{1}{2}$ mill.

Hab. in locis lutosi fluvii Hooghly prope Calcutta Bengalensem, satis copiose; necnon in lacu salso prope Balliaghat, ligno natanti adhærentem ipse detexi.

SYN. *Nematura Delta*, Bens. Journ. As. Soc. 1836, vol. v. p. 781; Sow. Charlesw. Mag. 1837, vol. i. p. 217.

I found it alive in both the places named; also a dwarf variety in an aqueduct, supplied by a steam-engine from the river, in front of the Town Hall, at Calcutta.

Stenothyra glabrata, A. Adams.

Testa omnino imperforata, ovato-conica, lævissima, nitidissima, fusco-cornea vel olivacea, spira conica, apice acutiusculo, sutura impressa, submarginata; anfractibus 5 convexiusculis, ultimo ventricosiori, latere sinistro sæpius gibbosulo, antice descendente, $\frac{2}{3}$ testæ æquante, basi rotundata; apertura obliqua, rotundato-ovata, superne angulata, peristomate recto, obtuso, plerumque nigrescente. Operculo typico, concaviusculo, fusco.

Long. 3– $5\frac{1}{2}$, diam. 2– $3\frac{1}{4}$ mill.

Hab. in paludibus Insulæ Penang. Detexit Dr. Theo. Cantor.

SYN. *Nematura glabrata*, A. Adams, Pr. Z. Soc. July 22, 1851; et var. *olivacea*, ejusdem, loc. cit.

Nematura polita, Bens. MSS., nec Sow.

This shell, of which I have examined at least eighty specimens, when divested of the reddish-brown earthy coating which generally covers it, may be at once recognized, by its polish, dark suite of colours, and freedom from sculpture and umbilical rimation, independently of its form, which is more elongate than the Gangetic species; also by the gibbosity of the left side of the ventral volution, and the comparative absence of lateral

compression. It varies much in size. It was communicated to me by Dr. Cantor in 1842, and has been diffused under the MS. name above quoted, both in England and on the Continent. That name however was transferred, by some accident, to the following shell, under the impression that it had been so named by Sowerby. This circumstance may lead to some confusion, but the very different characters of the two species will permit of rectification on a cursory comparison.

Stenothyra polita, Sowerby.

Testa arcuato-rimata, ovato-pyramidata, lævi, exilissime confertim oblique striata, striis antice fortioribus, punctis (interdum elongatulis) lineas remotas spirales interruptas efformantibus, fusco-castanea vel castanea, spira elongato-conica, sutura impressa, apice acuminato; anfractibus $5\frac{1}{2}$, supremis valde convexis, ultimo antice celeriter descendente, $\frac{2}{3}$ testæ æquante, ventre majori planato, latere sinistro compresso, angulato, basi transverse cristato-carinata, circa periomphalum compresso-cingulatum sulcis nonnullis, peritrema transgradientibus, insculpta; apertura vix obliqua, ovata, superne leviter angulata, peristomate undique planato, callo parietali mediocri pallido. Operculo concavo, albido, duriori, epidermide fusco-castaneo induto.

Long. $6\frac{1}{2}$, diam. major $4\frac{1}{2}$, min. 3 mill.—Sp. mus. nost.

Hab. in paludibus Insulæ Singapore. Detexit amicus Dr. J. F. Bacon.

SYN. *Nematura polita*, Sow. teste A. Adams, Pr. Z. S. 1851.

Dr. Bacon sent me a single specimen from Singapore, from the marshes of which island he procured many species of *Auriculadæ*, including some new shells lately described by Pfeiffer. The specimen is more characteristic, and darker in colour than the typical one transmitted by Mr. Cuming from his collection for comparison. The species is easily known by its pinched carinate base, form, and peculiar sculpture. On the back of the shell the puncta are closer, and more disposed to form impressed continuous lines than on the flattened front.

Stenothyra minima, Sow.,

Charlesworth's Mag., April 1837, vol. i. p. 217, fig. 22 *b*, where this shell was very cursorily described as *Nematura minima*, Sowerby, in the following terms:—

“This is about one-fifteenth of an inch in length, and is translucent; it has a smooth polished surface and a small umbilicus, and it is of a light brown colour.”

It was subsequently described by Mr. Arthur Adams in the P. Z. S. July 1851, as follows, and was erroneously recorded as *N. minima*, Benson:—

“N. testa parva, cornea, semipellucida, ovali; spira subproducta; polita, fasciis rufis subobsoletis ornata; apertura orbiculari, peritremate simplici. Mus. Cuming.”

A specimen is now before me from Mr. Cuming's cabinet, which presents the following characters:—

Testa breviter distincte rimata, ovato-conica, sub lente oblique striatula, nitida, pellucida, albido-fulvescente; spira conica, apice obtuso, sutura late marginata; anfractibus 4 convexiusculis, ultimo antice breviter descendente, ventre convexiusculo, latere sinistro compresso angulato, basi rotundata; apertura verticali, subcirculari, superne angulata, peritremate acuto. Operc. —?

Long. 2, diam. 1 mill.

Sowerby says that many specimens were found in the collection of Mr. George Humphreys, in a box of minute shells which he had marked, “From the W. I.” No species has yet been recognized in the western hemisphere, so that “Western India” may possibly have been originally intended. An examination of the other shells in the box might have thrown some light on the question.

The shell cited by M. Albert Mousson, in his ‘Moll. von Java,’ as the Javanese representative of Quoy's and Gaimard's *Paludina ventricosa* from Celebes, and which forms another species of *Stenothyra*, may be distinguished from *St. minima*, which it about equals in size, by its more ovate form and less conic spire, by the greater descent of the last whorl anteriorly above the aperture, by the lengthened sulcus which separates the peristome from the body whorl, the deeper non-marginate suture, the more tumid ventral part of the last whorl, the absence of compression at the left side, and finally by its pale horny colour and duller surface. I owe this form to the kindness of M. Mousson.

Including *St. puncticulata*, A. Adams, P.Z.S. 1851, I have now before me eleven good species of the genus from Mr. Cuming's and my own collection. Sowerby has figured (*loc. cit.*) a fossil species from Grignon. The Delta of the Irawadi, the Siam and Anam rivers, the embouchures of streams in the islands of the Eastern Archipelago, and the waters of Southern India and Ceylon, ought to add materially to the list, when properly explored for these minute and interesting shells.

Cheltenham, 5th June 1856.