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## Annals and Magazine of Natural History: Series 7

Publication details, including instructions  
for authors and subscription information:  
<http://www.tandfonline.com/loi/tnah13>

### XXXVI.—Natural history notes from R.I.M.S. 'Investigator.'—Series III., No. 10. On Mollusca from the Bay of Bengal and the Arabian Sea

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Published online: 29 Sep 2009.

To cite this article: Edgar A. Smith I.S.O. (1906) XXXVI.—Natural history notes from R.I.M.S. 'Investigator.'—Series III., No. 10. On Mollusca from the Bay of Bengal and the Arabian Sea , Annals and Magazine of Natural History: Series 7, 18:106, 245-264, DOI: [10.1080/00222930608562609](https://doi.org/10.1080/00222930608562609)

To link to this article: <http://dx.doi.org/10.1080/00222930608562609>

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# THE ANNALS

AND

## MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 106. OCTOBER 1906.

XXXVI.—*Natural History Notes from R.I.M.S. 'Investigator.'*—Series III., No. 10. *On Mollusca from the Bay of Bengal and the Arabian Sea.* By EDGAR A. SMITH, I.S.O.

[Concluded from p. 175.]

### *Bathybembix Nevilli*, sp. n.

Testa turbinata, imperforata, alba, periostraco tenui griseo induta; spira conica, pagodiformis; anfractus 8-9, supra concave declives, infra medium angulati, ad angulum acute tuberculati, supra ad suturam tuberculati, infra ad suturam minute denticulati, lineis incrementi obliquis striati, ultimus infra angulum tuberculatum liris quinque crenulatis cinctus; apertura obliqua, irregulariter rotundata, intus sulcis levibus 4-5 sculpta; labrum tenue, basi subexpansum; columella alba, incrassata, reflexa, callo tenui labro juncta.

Alt. 30 mm., diam. maj. 26, min. 22; apertura 12 longa, 13 lata.

*Hab.* Station 277, south of Ceylon, 859-880 fath.

The minute tuberculation or crenulation at the suture and the crenulation of the five basal liræ are caused by the lines of growth. The acute tubercles are about twenty in number upon the last whorl, and become smaller and closer together as they ascend the spire.

Rather like *B. argenteo-nitens*, Lischke, from Japan, but smaller, with a thicker external calcareous surface, more

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acute tubercles, and stronger lines of growth making the basal liræ more distinctly crenulated.

Named *B. Nevilli* in remembrance of my late friend Geoffrey Nevill, formerly of the Indian Museum, Calcutta.

*Gaza (Callogaza ?) Frederici*, sp. n.

Testa breviter conica, late umbilicata, albo-margaritacea ; anfractus 8, regulariter lente accrescentes, plani, supra et infra serie tuberculorum acutorum ornati, lineisque incrementi obliquis sculpti, sutura canaliculata sejuncti, ultimus ad peripheriam carina secunda pulcherrime serrata cinctus, infra liris concentricis quinque minute serratis ornatus ; apertura oblique subquadrata, intus iridescens, margaritacea ; labrum leviter incrassatum, album, subexpansum ; columella reflexa, umbilicum partim obtegens, callo tenui labro juncta.

Diam. maj. 25 mm., min. 23 ; alt. 20.

*Hab.* Station 333, Gulf of Manar, 401 fath.

A single specimen only. It is a very beautiful form and well characterized by its nacreous surface, the rows of acute tubercles at the upper and lower part of the whorls, the deep channelled suture, the wide pervious umbilicus, partly covered by the reflection of the columella, and the bicarinate character of the body-whorl. The lower keel, which forms the periphery, is very finely serrated by the clearly developed lines of growth. Of the five basal liræ, which are also minutely serrated, that which borders the umbilicus is stouter than the rest.

*Basilissa patula*, Martens, is more widely umbilicated, has a third row of acute nodules, only four on the base, and a less raised spire, and the characters of the peristome appear to be different if Martens's shell was mature.

Named after my friend Mr. F. Beavis, who was much impressed with the beauty of this shell.

*Calliostoma admirandum*, sp. n.

Testa elate acute conica, imperforata, pallide cornea, maculis saturatioribus irregulariter picta ; anfractus 9, plani, seriebus quinque granulorum minimorum, seriebus minoribus intercalantibus, ornati, ultimus ad peripheriam acute angulatus, infra concentricè liratus, liris circiter 12, subgranulatis, rufo punctatis ; apertura obliqua, subquadrata ; columella alba, incrassata, obliqua, leviter arcuata, reflexa.

Diam. 17 mm., alt. 20.

*Hab.* Station 258, W. of Travancore, 102 fath., sand.

The series of granules on the last and penultimate whorls are alternately larger and smaller, but on the upper volutions the finer granules are wanting.

*Glyphis delicata* (Smith).

*Fissurella delicata*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 249; Illust. Zool. 'Investigator,' Mollusca, pl. xii. figs. 8, 8a.

*Hab.* Station 333, Gulf of Manar, 401 fath.

A single specimen, differing from the type only in its greater size. It is 39 mm. long, 24 broad, and 14 high.

*Puncturella (Cranopsis) asturiana* (Fischer).

*Puncturella (Cranopsis) asturiana*, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 371; 1904, vol. xiv. p. 5.

*Hab.* Station 333, Gulf of Manar, 401 fath.

This is another instance of the same species occurring in the Indian and Atlantic Oceans. The only slight difference between the shells from the above locality and those obtained by the 'Challenger' Expedition in the West Indies in 390 fath. is that the slit is perhaps a little nearer the apex in the Manar shells than in those from Culebra Island.

*Scaphander mundus*, Watson, var.

*Scaphander mundus*, Watson, Gasteropoda 'Challenger' Exped. p. 643, pl. xlviii. fig. 2.

*Hab.* Station 276, W. of Ceylon, 1003 fath.; off Arrou I., 800 fath. ('Challenger').

The 'Investigator' specimens are rather more finely punctate than the types, but are similar in other respects.

*Scaphander andamanicus*, Smith.

*Scaphander andamanicus*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 167, pl. iv. fig. 15; 1904, vol. xiv. p. 5.

*Hab.* Station 256, W. of Ceylon, 937 fath., green mud; Station 273, off Malabar coast, 823-870 fath.; Station 321, S. of Ceylon, 660 fath.

*Scaphander cancellatus*, Martens.

*Scaphander cancellatus*, Martens, Deutsch. Tiefsee-Exped. 'Valdivia,' vol. vii. p. 131, pl. v. fig. 19.

*Hab.* Station 322, Andaman Islands, 378 fath.; Station 259, W. of Malabar coast, 295-360 fath., green mud and sand; W. of Sumatra, 470-646 metres (*Martens*).

Although varying somewhat in form, some examples being narrower than others, the strong cancellated sculpture will distinguish this species from its congeners.

*Scaphander vicinus*, sp. n.

Testa ovata, mediocriter tenuis, alba, periostraco tenui pallide lutescenti induta, lævis, nitida, interdum lineis elatis transversis vel carinis instructa, lineis incrementi striata, et spiraliter transversim leviter punctata, punctis elongatis gracilibus; apertura alba, supra anfractum producta; columella valde arcuata, incrassata, reflexa, callo tenui apici juncta.

Longit. 36 mm., diam. 24.

*Hab.* Station 318, W. of Ceylon, 1085 fath.

More delicately punctate than *S. mundus*, Watson, *S. andamanicus*, Smith, or *S. cancellatus*, Martens. *S. alatus*, Dall, is closely allied, but has the lip peculiarly produced, and *S. nobilis*, Verrill, has a different columella and sculpture.

*Dentalium magnificum*, Smith.

*Dentalium magnificum*, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 371; 1904, vol. xiv. p. 7; Illust. Zool. 'Investigator,' Mollusca, pl. vii. figs. 5, 5a; Pilsbry, Man. Conch. vol. xvii. pp. 78, 251.

*Hab.* Station 232, off Travancore coast, 430 fath., grey mud; Station 265, off N. of Ceylon, 225-594 fath., mud; Station 323, N. of Andaman Islands, 463 fath.; Station 327, W. of Burmah, 419 fath.

The specimens from Station 232 are a trifle more slender than the typical form, but in other respects quite similar. A young specimen from Station 327, 73 mm. in length and 8 at its broadest end, tapers to a fine point only 1 mm. in diameter, and there exhibits a very narrow slit 5 mm. in length.

*Dentalium keras*, Watson.

*Dentalium keras*, Watson, 'Challenger' Scaphopoda, p. 3, pl. i. fig. 4; Dall, Bull. Mus. Comp. Zool. Harvard, vol. xviii. p. 425; Pilsbry, Man. Conch. vol. xvii. p. 68, pl. iii. fig. 41.

*Hab.* Station 316, S. of Ceylon, 1500 fath.

These specimens are much finer than the 'Challenger' type from the mid-Pacific, E. of Japan. The largest is 62 mm. in length and 11 in diameter at the aperture.

*Dentalium profundorum*, Smith.

*Dentalium profundorum*, Smith, Ann. & Mag. Nat. Hist, 1894, vol. xiv. p. 167, pl. iv. fig. 18; Pilsbry, Man. Conch. vol. xvii. p. 79, pl. vi. fig. 82.

*Hab.* Station 283, off E. of Ceylon, 1086 fath.; Station 331, off Andaman Islands, 569 fath.

The single very slender specimen from Station 331, although 80 mm. in length, is only 6 mm. at the broadest diameter. This results from its perfect growth from the very young state, the young shell not being broken as is generally the case in these large *Dentalia*. It tapers to a point less than a millimetre broad, and exhibits in the usual position a very fine slit 4 mm. in length. The examples from Station 283 are quite like the original type from off Colombo.

*Dentalium serrulatum*, sp. n.

Testa solidiuscula, leviter arcuata, lente attenuata, longitudinaliter tenuiter lirata, liris sæpe plus minus minute serratis, transversim tenuiter striata, striisque longitudinalibus indistincte decussata, alba, postice breviter fissurata; apertura circularis.  
Longit. 56 mm., diam. max. 6.

*Hab.* Andaman Islands, 60 fath.

The distinguishing feature of this species is the peculiar fine serration of the fine riblets, especially those upon the concave curve of the shell. Probably this character would be lost in worn specimens. Judging from the gradual tapering of the shell, I do not think it would attain much larger dimensions than those here given. The fine decussation of the surface is only observable in well-preserved examples. The riblets number sixty to sixty-six at the larger end and about thirty at the narrow extremity. Only one of the two specimens exhibits a slight terminal notch, but probably the young shell would have a narrow slit. The curve of shell is different in the two examples at hand, one being straighter than the other.

*Dentalium cornu-bovis*, sp. n.

Testa magna, valde curvata, celeriter accrescens, alba, nitida, solidiuscula, tenuissime longitudinaliter striata, striis antice fere obsoletis, lineis incrementi oblique flexuosis sculpta, postice breviter vel vix fissâ; apertura circularis, ad marginem tenuis, intus alba.  
Longit. 59 mm., diam. max. 12.

*Hab.* Indian Ocean, 1154 fath.; var. from Station 248, W. of Travancore, 224–284 fath., sand.

The greater part of the surface of this interesting shell is merely finely striated, but the younger portion is somewhat distinctly lirate. It enlarges more rapidly than *D. keras* and is more finely sculptured. The variety from Station 248 has the striation continued to the aperture.

*Dentalium usitatum*, Smith.

*Dentalium usitatum*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 168, pl. iv. figs. 16, 16 a; Pilsbry, Man. Conch. vol. xvii. p. 29, pl. x. figs. 68, 69.

*Hab.* Station 325, W. of Burmah, 843 fath.

The largest specimen is 58 mm. in length, 1 mm. in diameter at the tip, and 5 anteriorly. The apex was originally described as “haud fissa,” but the present examples exhibit a very narrow slit, varying in length from 1 to 3 mm. The presence or absence of an apical fissure is known to be a variable character in some other species of this genus.

*Dentalium insolitum*, Smith.

*Dentalium insolitum*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 168, pl. iv. figs. 17, 17 a; Pilsbry, Man. Conch. vol. xvii. p. 109, pl. xxii. figs. 56, 57.

*Hab.* Station 282, off N. of Ceylon, 498–726 fath.

*Dentalium lubricatum*, Sowb.

*Dentalium lubricatum*, Sowerby, Thes. Conch. vol. iii. p. 97, pl. ccxxv. fig. 56; Reeve's Conch. Icon. vol. xviii. fig. 55; Pilsbry, Man. Conch. vol. xvii. p. 110, pl. xix. fig. 22.

*Hab.* Station 331, off Andaman Islands, 569 fath.

A single specimen about the same size as the type from Australia, but a trifle more curved, agreeing in this respect with the two other specimens received together with the figured shell in the Cuming Collection.

*Dentalium eburneum*, Linn.

*Dentalium eburneum*, Linn.; Pilsbry, Man. Conch. vol. xvii. p. 115, pl. xx. figs. 33, 34.

*Hab.* Station 271, off Malabar coast, 22 fath.

The single specimen, 47 mm. in length, differs only from the normal form in being a pale flesh-colour instead of white. It exhibits the raised rings and longitudinal striæ so characteristic of the species.

*Dentalium subcurvatum*, sp. n.

Testa gracilis, lente accrescens, parum arcuata, alba, haud nitida, longitudinaliter tenuiter lirata, liris filiformibus, antice circiter 32, striisque incrementi conspicuis supra et inter liras continuis sculpta.

Longit. 63 mm., diam. max. 6.

*Hab.* Station 275, S.W. of Cape Comorin, 731-771 fath.

Only a single specimen obtained. It tapers very slowly, is only slightly curved and delicately ribbed, the fine ribs being in places almost crenulate, caused by being cut through or crossed by the strong lines of growth.

*Lepidopleurus andamanicus*, sp. n.

Testa parva, sordide albida, elongata, mediocriter alta, in medio fere carinata, intus albida, undique minute punctulata, epidermide quasi decidua punctata induta; valva antica angusta, intus incrassata, margine posteriore in medio angulato; valvæ centrales angustæ, apice distincto instructæ, margine utrinque apicem leviter concavo; areæ laterales leviter elatæ, sulco arcuato transverso utrinque sæpe sculptæ; laminæ suturales parvæ, substriatæ; sinus mediocriter profundus; valva postica anteriore longior, in medio mucronata; ligamentum angustum, dense et microscopice spiculosum.

Longit. 13 mm., diam. 7, alt. 3.5.

*Hab.* Off N. Sentinel Island, Andaman Islands, 240 fath.

Rather like *L. arctica*, Sars (Moll. Reg. Arct. Norveg. pl. vii. figs. 7 a, 7 d-7 g), but not quite so broad, more sharply angled down the back, with a narrower sinus between the sutural laminæ, more distinct apex to the central valves, &c. The sculpture is peculiar. The surface seems to be covered with a minutely shagreened epidermis, which is easily rubbed off, leaving, however, the impression of the shagreening. The curved sulcus at the sides of the valves being continuous round the shell marks off a narrow encircling zone; it is not, however, present in every specimen.

*Nucula (Acila) granulata*, sp. n.

Testa valde inæquilateralis, ovato-subtrigonalis, antice oblique subtruncata, ad extremitatem subacute angulata, postice acute rotundata, modice convexa, albida, periostraco tenui olivaceo-flavo induta, seriebus confertis arcuatis granorum postice divergentibus instructa; umbones incurvati, ad apicem læves, longe ante medium siti; lunula infra umbones excavata, dein prominens; area postica angusta, lanceolata, lævis, circumscripta.

Longit. 15 mm., alt. 11, diam. 7.

*Hab.* Station 324, W. of Burmah, 448 fath.

One specimen only. Remarkable on account of the radiating series of granules or small pustules. The extreme tips of the umbones are smooth, then comes a small defined umbonal cap with about nine plain radiating riblets, after which commence the rows of granules. These are as broad as, or even in some cases broader than, the grooves between them. On the anterior slope they become ridges rather than rows of pustules and are at right angles to the margin of the valves. They are also very much of the same character on the lunular slope.

*Nucula Layardi*, A. Adams.

*Nucula Layardi*, A. Adams; Hanley, Sowerby's Thes. Conch. vol. iii. p. 160, pl. ccxxx. fig. 153.

*Hab.* Persian Gulf, 47 fath. ('Investigator'); Ceylon (*Adams*).

The single shell is probably adult and measures 15 mm. in length, whereas the type in the "Cuming" Collection is only 10½, the figure above quoted being enlarged. The Ceylon shells are evidently young, from their thinness. The present example is moderately thick, white beneath the periostracum, and beautifully white-nacreous within. The hinge-teeth are long, acute, six in front and nineteen behind.

*Yoldia vicina*, sp. n.

Testa *Y. nicobaricæ* similis, sed postice magis acuminata, striisque obliquis minus confertis insculpta; valvæ tenues, pellucidæ, periostraco flavo-olivaceo induta, nitida; pagina interna nitens, cæruleo-albida; dentes posteriores circiter 26, anteriores ad 19, paulo validiores; umbones lævigati, aliquanto antemediani.

Longit. 20·5 mm., alt. 11·5, diam. 7.

*Hab.* Persian Gulf, 35 and 47 fath.

This species is very like *Y. nicobarica*, Brug., but is more sharply pointed at the posterior extremity, which is not so high up as in that species. The oblique striæ are much fewer and further apart, and terminate in an oblique line nearer the middle of the valves. Two specimens only were obtained.

*Malletia brevis*, sp. n.

Testa oblonga, antice rotundata, postice subquadrata, multum convexa, periostraco nitente flavescenti induta, apices versus pallidior, incrementi lineis tenuibus sculpta, striis postice magis conspicuis,

confertioribus; lunula angusta, concava, carinis circumscripta; area postica nulla; dentes erecti, acuti, anteriores circiter 14, posteriores ad 21.

Longit. 14 mm., alt. 10, diam. 7.

*Hab.* Station 318, off W. of Ceylon, 1085 fath.

Differs from *M. conspicua*, Smith, in form and sculpture, being more rounded in front, shorter, and squarer posteriorly. A single specimen.

*Solenomya patagonica*, Smith.

*Solenomya patagonica*, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 11.

*Hab.* Station 260, W. of Cape Comorin, 487 fath., grey mud and Globigerine ooze; Station 327, W. of Burmah, 419 fath.

A single specimen from the latter station is remarkable for its great size. The shell, exclusive of the extension of the periostracum, is 100 mm. in length and 33 in height, being much larger than any of the other known species.

*Arca (Acar) domingensis*, Lamarck.

*Hab.* Station 291, Gulf of Oman, 48–49 fath.

A very widely distributed species, occurring in various localities in the Atlantic, Indian, and Pacific Oceans.

*Arca (Barbatia) pteroessa*, Smith.

*Arca (Barbatia) pteroessa*, Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiv. p. 12.

*Hab.* Station 316, S. of Ceylon, 1500 fath.

*Arca (Barbatia) incerta*, Smith.

*Arca (Barbatia) incerta*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 251; Illust. Zool. 'Investigator,' Mollusca, pl. xiii. figs. 3, 3 a.

*Hab.* Station 333, Gulf of Manar, 401 fath.

These specimens are larger than the type, measuring 29 mm. in length, 15 in height, and 11·5 in diameter.

*Arca (Barbatia) innocens*, sp. n.

Testa parva, oblonga, valde inæquilateralis, mediocriter convexa, utrinque obliqua, alba, radiatim tenuiter confertim costulata, costis subnodulosis, posterioribus quam anticis magis distantibus, periostraco tenui, inter costas plus minus hirsuto, induta; latus anterius oblique curvatum, supra acute angulatum, posticum

primo recte obliquum, ad extremitatem acute rotundatum; margo ventris rectiusculus; valvæ haud crassæ, intus cæruleo-albidæ, radiatim subsulcatæ, ad marginem denticulatæ; area dorsalis lanceolata, periostraco fusco induta; umbones longe antemediani, circiter in  $\frac{1}{5}$  longitudinis collocati; dentes cardinis parvi, circa 30-32.

Longit. 18 mm., alt. 11.5, diam. 7.

*Hab.* Station 258, W. of Travancore, 102 fath., sand.

This species may be separated from *A. incerta*, Smith, both by its form and sculpture. That species is narrow anteriorly and widens behind, whereas the present form is almost equally broad at both ends. The surface of the valves is less distinctly granulated and the ribs upon the posterior slope are fewer, broader, and further apart than in *incerta*. The hinge-teeth are different in the two species, those at the hinder end of *incerta* being peculiarly oblique, whereas in this species they are more upright and coarser.

*Limopsis indica*, Smith.

*Limopsis indica*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 171, pl. v. fig. 7; 1895, vol. xvi. p. 15; 1904, vol. xiv. p. 12.

*Hab.* Station 249, S.W. of Cape Comorin, 1022 fath., green mud and Globigerine ooze; Station 269, W. of Cape Comorin, 464 fath., green mud and sand; Station?, 1055 fath.

Some of the specimens from the above localities are considerably larger than the type, being 30 mm. in length, 27 high, and 14 in diameter.

*Modiola philippinarum*, Hanley.

*Modiola philippinarum*, Hanley, Proc. Zool. Soc. 1844, p. 15; Cat. Recent Shells, p. 235, pl. xxiv. fig. 26; Reeve, Con. Icon. vol. x. fig. 1.

*Hab.* Persian Gulf, 27 fath.

The single specimen is rather narrowed posteriorly, but agrees in every other respect with the typical form.

*Modiola (Amygdalum) Watsoni*, Smith.

*Modiola Watsoni*, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 14; 1904, vol. xiv. p. 11.

*Hab.* Station 265, off N. of Ceylon, 225-594 fath.; Station 267, off W. of Ceylon, 457-589 fath.; Station 340, Gulf of Oman, 261 fath.

*Modiola (Amygdalum) arborescens* (Chemnitz).

*Modiola arborescens*, Chemnitz; Reeve, Conch. Icon. vol. x. fig. 30; Clessin, Conch.-Cab., Mytilidæ, p. 100, pl. xxix. fig. 10.

*Hab.* Station 346, Persian Gulf, 47 fath. ('Investigator'); Tasmania and off Sydney (*Brazier*).

*Crenella persica*, sp. n.

Testa parva, irregulariter ovata, globosa, tenuis, sordide pellucido-albida, liris tenuissimis radiantibus aliisque concentricis paulo remotis cancellata; umbones læves, incurvati, albi, contigui, terminales; pagina interna nitida, structuram cancellatam externam exhibens, ad marginem undique denticulata; dens cardinis unicus, plus minus bifidus in utraque valva; ligamentum gracile, intra marginem situm.

Longit. 6 mm., alt. 4.5, diam. 4.

*Hab.* Persian Gulf, 47 fath.

The very delicate radiating costellæ have a tendency to bifurcate at the outer margin.

*Amussium caducum*, Smith.

*Amussium caducum*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 173; 1895, vol. xvi. p. 18; 1904, vol. xiv. p. 13.

*Hab.* Station 269, W. of Cape Comorin, 464 fath., green mud and sand; Stations 289, 297, Gulf of Oman, 667-811 fath.; Station 322, Andaman Islands, 378 fath.; Station 327, W. of Burmah, 419 fath.

*Amussium Alcocki*, Smith.

*Amussium Alcocki*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 172, pl. v. figs. 15, 16.

*Hab.* Station 275, S.W. of Cape Comorin, 731-771 fath.

*Amussium investigatoris*, sp. n.

Testa subcircularis, compressa, fragilis; valva dextra albido-pellucida, radiis opaco-albis circiter 10 picta, concentrice regulariter et tenuiter striata, intus costis ad 10 albis medioeriter crassis haud ad marginem attingentibus instructa; valva sinistra convexior, flavescens, radiis decem aurantiacis ornata, radiatim tenuiter costulata et concentrice delicate lamellata, lamellis supra costulas squamulatis, intus flavescens, costis albidis 10 tenuioribus munita; auriculæ parvæ, subæquales; umbones acuti, lateribus ad angulum circa 113° convergentibus.

Longit. 26 mm., alt. 26.5, diam. 5.5.

*Hab.* Station 248, W. of Travancore, 224–284 fath., sand.

The sculpture of the two valves in this beautiful species is altogether different, that of the right valve, which is a little flatter than the left, consisting of very delicate and close-set regular lamellæ or striæ, whilst the left valve has numerous fine radiating riblets, which are minutely squamose through being crossed by the very fine concentric lamellæ. The internal riblets, ten in number in each valve, do not reach to the margin, and those of the left valve are a little finer than those of the right. The colour of the valves is also different. The deeper valve is more or less orange-tinted within and without, whereas the right valve is almost white, with only a trace of colour on each side towards the dorsal slopes.

*Amussium manaricum*, sp. n.

Testa fragilis, pellucido-albida, opaco-albo radiata, inæquivalvis, leviter obliqua, et paulum inæquilateralis, valva sinistra convexiuscula, concentrice tenuiter lamellata, lirisque radiantibus tenuibus plus minus cancellata, valva dextra concentrice lamellata, versus marginem concava; umbones acuti, ad angulum circa 115° convergentes; liræ internæ circiter 15, haud ad marginem continuæ, illis in valva sinistra tenuioribus; auriculæ inæquales, anticis paullum majoribus.

Longit. 24·5 mm., alt. 26, diam. 4·5.

*Hab.* Station 333, Gulf of Manar, 401 fath.; Station 322, Andaman Islands, 378 fath.

The valves are fairly strong up to the ends of the radiating liræ, but beyond that point they become very fragile and easily break away. The concentric fine lamellæ are very similar in both valves, but the left valve, which is gently convex from the umbo to the opposite margin, also exhibits fine radiating liræ. These, however, gradually disappear about the middle of the valve, so that only the upper half of the surface is cancellated. The auricles, of which the anterior are a trifle larger than the posterior, exhibit fine lines of growth and a few radiating threads also, excepting the hinder auricle of the right valve, which hardly shows any trace of this radiating sculpture. The front auricle of the same valve is bounded below by a narrow groove at the byssal sinus.

*Loripes victorialis* (Melvill).

*Cryptodon victorialis*, Melvill, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 98, pl. ii. fig. 8.

*Hab.* Station 346, Persian Gulf, 47 fath.

The presence of hinge-teeth, as described by Mr. Melvill,

at once removes this species from *Cryptodon*, which is edentulous. I am inclined to refer it to the genus *Loripes*, with which it is practically identical in dentition, but the ligament is not quite so deeply placed within the dorsal margin.

*Lucina dentifera*, Jonas.

*Lucina dentifera*, Jonas; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiv. p. 10.

*Hab.* Station 346, Persian Gulf, 47 fath.

*Lucina bengalensis*, Smith.

*Lucina bengalensis*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 171, pl. v. figs. 1, 2; 1904, vol. xiv. p. 10.

*Hab.* Station 261, W. of Cape Comorin, 336-445 fath., green mud and sand; Station 323, N. of Andaman Islands, 463 fath.

*Cryptodon investigatoris*, Smith.

*Cryptodon investigatoris*, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 13, pl. ii. figs. 6, 6a; 1896, vol. xviii. p. 374; 1904, vol. xiv. p. 10.

*Hab.* Station 336, W. of Ceylon, 603 fath.

*Cryptodon omanensis*, sp. n.

Testa quadrato-rotundata, compressa, inæquilateralis, alba, lineis incrementi tenuibus ornata, striisque radiantibus tenuissimis umbones versus sculpta; lunula parva, excavata, circumscripta; umbones antemediani, acuti, approximati, ad apicem læves; linea cardinis leviter incrassata, lævis, edentula; ligamentum in sulco angusto profundo intra marginem situm; valvæ subtenuæ, intus radiatim tenuiter striatæ, cicatrice angusta, haud profunda, ab umbone marginem ventralem versus extendente sculptæ; cicatrix antica angusta, longit. 10 mm., intra lineam pallii sita, postica brevior, latior.

Longit. 26 mm., alt. 24, diam. 10.

*Hab.* Station 341, Gulf of Oman, 230 fath.

A flat compressed species like *C. barbatus* (Reeve), but thinner, lighter, and different in form. The concentric sculpture is very fine and at each side is slightly lamellated. The anterior and posterior ends are both somewhat roundly angulated and the ventral margin sharply arcuate.

*Cardita elegantula*, var. *conferta*, Smith.

*Cardita elegantula*, Deshayes; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiv. p. 9.

*Hab.* Station 328, S. of Lower Burmah, 61 fath.

The two specimens from the above locality and those already recorded in the 'Annals' are not quite identical with Deshayes's type. They have a few more ribs, the sulci between them are not quite so deep, and the nodules on the costæ are closer together. However, I am of opinion that a more extended series of specimens would show that these differences were not of specific value.

*Crassatellistes omanensis*, sp. n.

Testa *C. abruptæ*, Sowb.\*, similis, sed major, magis compressa, costis concentricis posticæ haud interruptis; valvæ mediocriter crassæ, intus et extra albidæ.

Longit. 35 mm., alt. 28, diam. 17.

*Hab.* Station 341, Gulf of Oman, 230 fath.

Beyond its superior size, rather compressed form, and continuous costæ there is little to distinguish this form from its South-African congener. The outline is very similar, the radiating microscopic striation is the same, the strength of the costæ, the character of the lunule, the escutcheon, the hinge, the scars, and the crenulation of the edge of the valves are all very much alike in both forms.

*Abra maxima* (Sowerby).

*Abra maxima*, Sowerby; Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. pl. v. figs. 5, 6; 1895, vol. xvi. p. 10; 1904, vol. xiv. p. 11.

*Hab.* Station 263, off N.E. coast of Ceylon, 665-771 fath., sand and soft green mud; Station 265, off N. of Ceylon, 225-594 fath., mud; Station 299, Gulf of Oman, 1299 fath.; Station 301, off Mekran coast, 1000 fath.; Station 321, off S. of Ceylon, 660 fath.; Station 327, W. of Burmah, 419 fath.

*Abra affinis*, Smith.

*Abra affinis*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 250; 1904, vol. xiv. p. 11; Illust. Zool. 'Investigator,' Moll. pl. xiii. figs. 2, 2a.

*Hab.* Station 265, off N. of Ceylon, 225-594 fath., mud.  
A single specimen, with the preceding species.

\* 'Marine Invert. S. Africa,' vol. iv. Mollusca, p. 10, pl. vi. fig. 15, as *Crassatella*.

*Tellina travancorica*, Smith.

*Tellina travancorica*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 249; 1904, vol. xiv. p. 11; Illust. Zool. 'Investigator,' Moll. pl. xiii. figs. 1, 1 a.

*Hab.* Stations 259, 337, W. of Malabar coast, 271–360 fath., green sand and mud.

These specimens, which appear to be adult, are somewhat smaller than those originally described, and the concentric sculpture is a little finer and closer together.

*Tellina (Arcopagia) Isseli*, H. Adams.

*Tellina (Arcopagia) Isseli*, H. Adams, Proc. Zool. Soc. 1870, p. 790, pl. xlviii. fig. 10.

*Hab.* Station 291, Gulf of Oman, 48–49 fath.

A single specimen without colour-rays as in the type from the Gulf of Suez, but like it in being marked with a red rust-like stain at the posterior end.

*Tellina (Arcopagia) altissima*, sp. n.

Testa parva, triangulatum rotundata, fere æquilateralis, valde convexa, dilute fusco-albida; latus anticum acute rotundatum, posticum magis acuminatum, subrostratum; margo dorsi utrinque valde declivis, anterior arcuatus, posterior rectiusculus; ventris margo multum curvatus; valvæ haud crassæ, leviter nitentes, lineis incrementi tenuibus sculptæ, striisque radiantibus tenuissimis subobsoletis ornatae, intus distinctius radiatim striatae, et plus minus albo-fusco tinctæ.

Longit. 16 mm., alt. 14, diam. 10.

*Hab.* Off Port Blair, Andaman Islands, 100 fath.

Somewhat resembling *T. robusta*, Hanley, but less solid and not quite of the same form. It is remarkably high in proportion to the length. The lateral teeth are long, slender, and remote.

*Macoma blairensis*, sp. n.

Testa oblonga, valde inæquilateralis, compressa, antice rotundata, postice oblique truncata, sordide albida, concentrice tenuissime striata, striis postice tenuiter lamellosis; margo dorsi anticus arcuatim descendens, posterior magis obliquus, rectus, brevior, ventralis late curvatus; valvæ mediocriter tenues, subnitentes, et radiatim microscopice striatae; plica postica, ab umbone valvæ dextræ radians, vix conspicua; cicatrix antica elongato-piriformis, postica rotundata; sinus pallii latus, profundus.

Longit. 44 mm., alt. 31, diam. 11.

*Hab.* Off Port Blair, Andaman Islands, 100 fath.

Something like *M. gubernaculum* (Hanley) in shape, but with a broader truncate end. The very fine lamellate sculpture behind the feeble posterior radiating plication is peculiar, the rest of the surface being smoother.

*Psammobia micans* (Hanley).

*Tellina micans*, Hanley, Sowerby's Thesaur. Conch. vol. i. p. 309, pl. lix. fig. 106; Römer, Conch.-Cab., *Tellina*, p. 120, pl. xxviii. figs. 5-7.

*Hab.* Persian Gulf, 31 fath. ('Investigator'); Philippine Islands (Hanley).

On account of the absence of lateral teeth and the oblique sculpture I am inclined to believe that this species should be referred to *Psammobia*. Römer considers *Tellina depauperata*, Martens, the same as the present species.

*Cardilia semisulcata* (Lamarck).

*Cardilia semisulcata*, Lamk.; Sowerby, in Reeve's Conch. Icon. vol. xix. fig. 1; H. & A. Adams, Gen. Rec. Moll. vol. iii. pl. cxii. figs. 6, 6a; Deshayes, Traité élément. Conch. vol. i. pt. 2, p. 254, pl. viii. bis, figs. 16-18.

*Hab.* Off Port Blair, Andaman Islands, 100 fath.

Only a single valve of this rare but widely distributed species was obtained. It has been recorded from South Australia (Lamarck), Straits of Malacca (Deshayes), China (Sowerby), Japan (Lischke), and specimens in the Cuming Collection are said to be from the Philippine Islands.

*Mactrinula tryphera*, Melvill.

*Mactrinula tryphera*, Melvill, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 97, pl. ii. fig. 7.

*Hab.* Station 345, Persian Gulf, 35 fath. ('Investigator' and Melvill).

An odd valve or two, the largest being 28.5 mm. in length, or 6 more than the type.

*Meretrix (Caryatis) pudicissima* (Smith).

*Cytherea (Caryatis) pudicissima*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 169, pl. v. figs. 3, 4.

*Hab.* Station 341, Gulf of Oman, 230 fath.; Station 244, off W. coast of India, 119-124 fath.

The type originally described was evidently only a young specimen, for the examples from the above locality (341) are

considerably larger and more solid shells, but agree in other respects. The largest is 23 mm. long, 20 in height, and 15 in diameter. The specimens from Station 244 are smaller and shorter than those from Station 341 : length 16·5 mm., height 16, diameter 12·25.

*Vesicomya cretacea*, sp. n.

Testa ovalis, valde inæquilateralis, mediocriter convexa, antice late rotundata, postice magis acuta, alba, cretacea, periostraco tenuissimo sordide flavescente hic illic induta, striis incrementi subrugose sculpta; lunula elongata, cordiformis, linea impressa circumscripta; area ligamenti elongata, profunda, utrinque carinata; valvæ mediocriter crassæ, intus albæ; cicatrix antica elongata, lævis, postica latior; linea pallii lata, lævis, haud sinuata; dentes cardinis duo in utraque valva, illis valvæ sinistræ conjunctis, divergentibus.

Longit. 57 mm., alt. 40, diam. 25.

*Hab.* Station 327, W. of Burmah, 419 fath.; Station 318, off W. of Ceylon, 1085 fath.

Beneath the ligament there is in each valve a rather deep groove, which starts a little behind the umbo and extends backwards about 8 mm., becoming gradually broader. It does not, however, appear to be for the reception of a resilium, the ligament being distinctly external.

More inæquilateral than *V. lepta*, Dall, from California, with the posterior dorsal margin more curved, the anterior more descending, and the hinge rather stronger.

The specimens from Station 318, the largest of which is only 44 mm. in length, and perhaps not adult, are thinner than the unique type, with a less strong hinge and only a faint indication of the groove in the nymphæ described above.

*Vesicomya brevis*, sp. n.

Testa brevis, subquadrata, multum convexa, valde inæquilateralis, utrinque late rotundata, postice supra subangulata, striis incrementi aspere sculpta, rufescenti-albida; valvæ haud crassæ, infra marginem dorsi posticum sulco lato, haud profundo et parum conspicuo instructæ, intus albæ, radiatim obscure striatæ; lunula cordiformis, linea impressa circumdata; area dorsalis posterior profunda, lata, utrinque carinata; dentes duo in utraque valva, illis valvæ sinistræ conjunctis, antico valvæ dextræ erecto, postico irregulari.

Longit. 36 mm., alt. 30, diam. 22.

*Hab.* Station 259, W. of Malabar coast, 295–360 fath., green mud and sand.

The muscular scars and pallial line are the same as in *V. cretacea*. There is a slight indication of the sulcus beneath the ligament mentioned as occurring in that species, and in the left valve there is an elevated ridge below it which might almost be regarded as a tooth. The dorsal escutcheon is both broader and deeper than in *V. cretacea*.

*V. indica*, Smith, has the anterior end more produced and more narrowed, the posterior end more sharply curved and not so distinctly angulated at its junction with the dorsal outline. The escutcheon in the present species, which may be only a variety of *indica*, is broader and deeper.

*Cardium exasperatum*, Sowerby.

*Cardium exasperatum*, Sowerby; Reeve, Conch. Icon. vol. ii. fig. 107; Römer, Conch.-Cab. p. 27, pl. ix. figs. 2, 3.

*Hab.* Off Port Blair, Andaman Islands, 100 fath. ('Investigator'); Swan River (*Sowerby*); Hong Kong (*Garrett*).

*Cardium fornicatum*, Sowerby.

*Cardium fornicatum*, Sowerby; Reeve, Conch. Icon. vol. ii. pl. xx. fig. 110.

*Hab.* Andaman Islands, 60 fath.

Also known from the Red Sea.

*Corbula crassa*, Hinds.

*Corbula crassa*, Hinds; Reeve, Conch. Icon. vol. ii. figs. 8 a-c; Smith, Lamellibranchiata 'Challenger' Exped. p. 30.

*Hab.* Off Port Blair, Andaman Islands, 100 fath.

Also known from Torres Straits, Port Essington, Straits of Macassar, and the Philippine Islands.

*Corbula persica*, sp. n.

Testa parva, valde inæquivalvis, paulum inæquilateralis, subtriangularis, postice truncata, alba, ad apices flavescens; valva dextra transversim fortiter et confertim costulata, sinistra concentrice tenuiter striata, epidermide fibrosa prope marginem induta, lirisque paucis radiantibus instructa; umbones levigati, flavescens.

Longit. 7 mm., alt. 6, diam. 4.5.

*Hab.* Station 346, Persian Gulf, 47 fath.

This species in size, form, and sculpture is rather like *C. Philippii*, Smith\*, a West Indian species. The young

\* Lamellibranchiata 'Challenger' Exped. p. 33, pl. vii. figs. 4-4 b.

shell, however, is different in size and shape and the right valve is less distinctly keeled posteriorly. *C. bifrons*, A. Adams, is another allied form. The white ribs, which contrast strongly with the yellow nuclear shell, are about seventeen to twenty in number. The right valve exhibits a faint rounded angle from the umbo to the lower corner of the posterior end, but less pronounced than that in *C. Philippii*.

*Corbula andamanica*, sp. n.

Testa *C. persicæ* similis, sed postice minus distincte truncata, valva dextra ad umbonem magis producta, costis tenuioribus, magis numerosis instructa.

Longit. 6.5 mm., alt. 6, diam. 4.

*Hab.* Off Port Blair, Andaman Islands, 100 fath.

Very like *C. persica*, yet differing in the points indicated. The ribs, which are dirty yellowish, are about twenty-five in number. *C. albuginosa*, Hinds, is closely allied, but longer, and with the right valve more finely sculptured.

*Solecuretus (Azor) coarctatus* (Gmelin).

*Solecuretus (Azor) coarctatus* (Gmelin); Smith, Lamellibranchiata 'Challenger' Exped. p. 79.

*Hab.* Station 295, Gulf of Oman, 37-40 fath.

Also known from the Nicobar and Philippine Islands. The synonymy and some remarks upon this species are given at the above reference.

*Lyonsiella papyracea*, Smith.

*Lyonsiella papyracea*, Smith, 'Challenger' Lamellibranchiata, p. 73, pl. xxv. figs. 2-2 b; Pelseneer, Anat. 'Challenger' Deep-sea Moll. p. 18, pl. ii. fig. 8.

*Hab.* Station 276, W. of Ceylon, 1006 fath. ('Investigator'); about 1100 miles south-west of Australia, in 1950 fath. ('Challenger').

The single specimen differs from the type in having more numerous radiating threads, about fifty-six altogether. It is rather larger and less fragile, and has a somewhat thicker and coarser periostracum. The form is very similar, although not absolutely identical; but that is a character which is liable to considerable variability.

*Cuspidaria approximata*, Smith.

*Cuspidaria approximata*, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 373; Illust. Zool. 'Investigator,' Moll. pl. viii. figs. 2-2 a.

*Hab.* Station 322, Andaman Islands, 378 fath.

A single specimen 2 mm. longer than the type. Specimens from the Gulf of Oman have been presented to the British Museum by Mr. J. C. Melvill.

XXXVII.—*Notes on the Genus Otomys.*

By R. C. WROUGHTON.

THE material available to me for examination in the collection of the Natural History Museum amounts to about 150 specimens (skins and skulls) from some 30 localities. Though Africa north of the Equator is very poorly represented, yet, at first sight, the total material seems sufficient for a fairly exhaustive classification; but, on careful comparison, I am convinced that this is not so, and that the area south of the Zambesi, which is especially well represented by series from many different localities, is just that in which the results I have obtained are the furthest from finality.

All but two species of the genus have the anterior molar in the lower jaw composed of four laminæ or their equivalents. Setting aside for the moment these two aberrant forms as Section III., the genus may be easily further divided into two sections, according as the lower incisors are smooth (or but faintly grooved), or are markedly grooved; and each of these Sections falls again naturally into two groups. In Section I., comprising the forms with smooth lower incisors, those in which the posterior molar in the upper jaw is composed of four laminæ (or their equivalents) and large bullæ form the *Brantsi* group, and those in which  $m^3$  is composed of five laminæ and the bullæ are quite small form the *unisulcatus* group. In Section II., comprising the forms with grooved lower incisors, those with a single groove as in *irroratus*, Brants, are readily separated from those with a double groove as in *Jacksoni*, Thos.

The geographical distribution fairly closely agrees with these main divisions of the genus. Thus Section I. is found in a strip of country running across S. Africa between 28° and 32° S. lat. Of Section II. the *Jacksoni* group is found