ON SOME DEEP-SEA MOLLUSCS FROM THE INDIAN OCEAN, WITH DESCRIPTIONS OF THREE NEW SPECIES (BIVALVIA).

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[Plate IV.]

Introduction.

In the unnamed spirit collections of the Zoological Survey of India I happened to come across one bottle containing some bivalves of the families Nuculidae, Lyonsiidae, Poromyidae and Cuspidariidae and bearing the locality-label ' Indian Ocean ' The specimens were medium-sized, mostly thin-shelled, and found to represent the genera *Nucula, Lyonsia, Cetoconcha* and *Cuspidaria*. Some of them, on a closer study, proved to be new to science, since the peculiarities as observed in their shell-characters did not seem to agree with any of the known forms of these genera described so far. They are designated here as *Nucula prestoni, Lyonsia annandalei* and *Cetoconcha indica*. Besides these, there was one specimen of the genus *Cuspidaria* representing the well-known species *C. macrorhynchus* Smith (1895) and also one of *Cetoconcha* representing the rare species *C. eximia* (Prashad, 1932) hitherto known only from the Flores Sea, north of Sumbawa. Although the exact locality and depths at which these specimens were collected are not known, they may be classed with the deep-water molluscs in view of the form, texture, sculpture, colouration and affinities.

My cordial thanks are due to Dr. S. L. Hora, Director, Zoological Survey of India, for his useful suggestions and criticism. The figures used in this paper are all sketched by Sri A. K. Mondal, artist of this department, to whom my thanks are also due.

Family Nuculidae.

Genus **Nucula** Lamarck, 1759.

Subgenus **Acila** H. & A. Adams, 1858.

Nucula prestoni, sp. nov.

(Plate IV, figs. 1-3).

There are two very good specimens in the collection which I assign to this new species. They possess thick shells unlike any other in the collection and appear on a cursory view to be somewhat identical with *Nucula (A.) granulata* Smith (1906)[1] from the west of Burma in the

[1] Smith, E. A. *Ann. & Mag. Nat. Hist.* (7) XVIII, pp. 251, 252 (1906); *Illustr. Zool. R. I. M. S.* ' *Investigator* ', *Moll.* Part VI, pl. xxiii, figs. 1, 1a (1909). See also Prashad's paper in *Archiv f. Naturges. N. F. II, pp.* 134, 135 (1933) and Winckworth's paper in *Proc. Malac. Soc. London,* XXIV(1), p. 25 (1940).

Bay of Bengal, in 448 fathoms. But a careful examination reveals certain very interesting features in their shell-characters which may amply justify their separate specific rank. So, I consider it a great pleasure to associate with this new species, *Nucula prestoni*, the name of the late Mr. H. B. Preston who contributed so much towards our knowledge of the Molluscan fauna of India.

The remarkable features which may easily distinguish this interesting species from its nearest ally *N. granulata* are :—

(i) The radiating ridges (see figs. 1, 2) on the surface of the shell are quite simple and lack entirely in granules or pustules so characteristic of *granulata*, but appearing more stronger, oblique, regular and distant, though less in number (16). They, no doubt, divaricate anteriorly like those of the latter, but their upward limbs are stronger, oblique and less in number, though showing slight granulations here and there. Moreover, they show slight knob-like dilatations at the end (see fig. 3) on both the sides. But what is more remarkable is that some of them even appear bifid or trifid at the end—a feature recalling that found in the teeth of the well-known cowry, *Staphylaea consobrina consobrina* (Garrett).

(ii) The umbonal caps are quite plain, but bear no radiating ridges at all.

(iii) The postero-ventral end of the shell is not so produced and, consequently, the angle formed there appearing somewhat blunt or less pronounced.

But its resemblance to *granulata* is also quite close, *i.e.*, its shell is ovate, subtrigonal, tumid and olivaceous green like that of the latter. Moreover, the difference in size of the shells between these two species also appears quite negligible. Because the holotype of *granulata* is known to measure 15 mm. in length, 11 mm. in height and 7 mm. in diameter, while that of *prestoni* measures 13 mm. in length, 11 mm. in height and 7 mm. in diameter. The paratype of the latter measures $12\frac{1}{2}$ mm. $\times 10\frac{1}{4}$ mm. $\times 7$ mm.

Type-locality.—Indian Ocean.

Holotype.—Reg. No. M 16107/2 Zool. Surv. Ind.

Paratype.—Reg. No. M 16108/2 Zool. Surv. Ind.

Remarks.—The new species *Nucula* (*A.*) *prestoni* differs from its ally *N. granulata* Smith not only in the essential characters of its shell, but also in its distribution. It is important to note here that the discovery of this new form marks the third occurrence of the subgenus *Acila* in the Indian waters, the 1st and 2nd being represented by *N. fultoni* Smith (1892) from the Bay of Bengal, off the mouth of the River Hooghly (in deep water) and *N. granulata* from the west of Burma respectively as pointed out by Prashad in his paper on the revision of the Indian Nuculidae (1933, p. 35).

Family LYONSIIDAE.

Genus **Lyonsia** Turton, 1822.

Subgenus **Lyonsia** S. S.

Section ALLOGRAMMA Dall, 1903.

Lyonsia annandalei, sp. nov.

(Plate IV, figs. 4, 5.)

There is only one very handsome and interesting specimen in the collection which I designate as *Lyonsia annandalei* after the late Dr. N. Annandale, Founder-Director of the Zoological Survey of India, who made notable contributions to Indian Zoology. The species is described as follows :—

Shell medium, very thin and fragile, whitish, translucent, inequilateral, oblong—slightly more than *Lyonsia formosa* Jeffreys[1] off Gomera, Canaries (620 fathoms), off Carysfort in the Gulf of Mexico (349 fathoms) and Bay of Biscay (552-600 fathoms), somewhat quadrate, subcompressed, marked by very low, regular, rounded, poorly defined concentric folds throughout somewhat-like those in *L. oahuensis* Dall-Bartsch-Rehder[2] from the south coast of Oahu in Hawaii ; posterior side subtruncate as in *oahuensis* looking somewhat-like the unedged blade of a blunt chisel and bearing regular, close-set series of minute nodular spines (more prominent than in *formosa*) arranged longitudinally on diagonal flexuous ribs appearing more in number (10 to 11) and prominent than in the latter (only 6 to 8)—the innermost one of which is the largest and strongest of all and forms a distinct carina as in *formosa*, but slightly more produced below and, as such, the angle formed there appearing more pronounced, dorsal margin of this side slightly more incurved than in the latter ; anterior side obliquely rounded with slight elevation at the end and concavity at the dorsal margin, but, unlike *formosa*, lacking entirely in radiating ridges ; in the middle of the shell are five (instead of only one as in *formosa*) very strong and conspicuous, keel-like, slightly oblique radiating ridges which originate from the umbones and bear similar nodular spines as on the posterior side (though the nodules appear less stronger and bear less sharp spines)—the ridges being placed quite apart from one another with the interstices between them gradually becoming more narrow from behind forwards ; umbones almost median and slightly elevated with the beaks slightly inclined towards the anterior side ; ventral margin rendered greatly wavy by the external sculpture.

The presence of strong radiating ridges on the surface of the shell of this new species amply justifies its position, like that of *formosa*, into the section *Allogramma* Dall[3] of the subgenus *Lyonsia*. The shell measures 13·1 mm. in length, 8·6 mm. in height and 5 mm. in diameter.

[1] Jeffreys, J. G. *Proc. Zool. Soc. London*, p. 930, pl. lxx, fig. 1 (1881). See also Smith's paper in *Zool. Chall. Exped.* XIII, Pt. XXXV, p. 72, pl. vi, figs. 3-3b (1885).

[2] Dall, W. H., Bartsch, P. and Rehder, H. A. *Bernice P. Bishop Mus. Bull.* No. 153, pp. 215, 216, pl. lvi, figs. 9-12 (1938).

[3] Dall, W. H. *Trans. Wagner Free Inst. Sci.* III, pt. 6, p. 1514 (03).

Type-locality.—Indian Ocean.

Holotype.—Reg. No. M 16109/2 Zool. Surv. Ind.

Remarks.—*Lyonsia* (*A.*) *annandalei*, no doubt, appears closely allied to Jeffreys's *formosa* and Dall-Bartsch-Rehder's *oahuensis*, but differs markedly from both in certain very essential features already discussed above. Preston's *L. samalinsulae*[1] off Samal Id., Chilka Lake, Orissa, also differs greatly from this new species both in regard to shape and sculpture of its shell. Jeffreys while describing his species *formosa* made an interesting remark : " A most lovely shell, and one of the prizes of the deep-sea dredger." The shell of the new species is also very pretty.

Family Poromyidae.

Genus **Cetoconcha** Dall, 1886[2].

Cetoconcha was introduced by Dall as a section of the genus *Poromya* Forbes (1844). But it so appears in the explanation of his pl. viii, fig. 10 concerning the new species *margarita* that he has given a clear indication, probably unconsciously, as to the use of *Cetoconcha* as a distinct genus. Woodring (1925)[3], Smith (1895)[4] and Prashad (1932)[5] seem to have upheld the former view, while Thiele (1935)[6] and Winckworth (*loc. cit.*, p. 28, 1940) the latter view, to which I also fully subscribe. Fulton (1924)[7], Thiele and Dall-Bartsch-Rehder (*loc. cit.*, p. 223) have rightly followed Dall in adopting the family name Poromyidae instead of Poromyacidae as used by Woodring, Prashad, and Smith-Gordon (1948)[8].

Woodring in dealing with the genus *Poromya* remarked : " There are only a few Tertiary and living species of *Poromya*. The living species, some of which are deep-water dwellers, have a restricted distribution around the borders of the Atlantic and Pacific." Prashad's account of *Poromya* in the Siboga Expedition volume also appears to support more or less the same view. But the discovery of such deep-water forms, namely, *Cetoconcha tornata* (Jeffreys) by Smith (*loc. cit.*, p. 11, 1895) on the east of Ceylon (in 1997 fathoms) which was hitherto known only from the great depths of the Atlantic and *C. indica*—the new species described below, in the Indian waters leaves no doubt about the fact that the range of the genus has certainly crossed the borders of the Atlantic and Pacific and extended into the far south-east Asia.

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[1] Preston, H. B. *Rec. Ind. Mus.* X, pp. 305, 310, text-figs. 16, 16a (1914); *ibid.* XI, p. 309 (1915).

[2] Dall, W. H. *Bull. Mus. Comp. Zool. Harvard Coll. Camb. Mass.* XII, pp. 195, 280 (1886).

[3] Woodring, W. P. *Miocene Moll. from Bowden, Jamaica, Pelecypoda*, 1, p. 88 (1925).

[4] Smith, E. A. *Ann. & Mag. Nat. Hist.* (6) XVI, p. 11 (1895).

[5] Prashad, B. *Siboga-Exped. Monogr. Pelecypoda*, LIIIc, p. 326 (1932).

[6] Thiele, J. *Handb. der Syst. Weichtierk.* II, p. 946 (1935).

[7] Fulton, H. G. *Shells of Rec. Moll.*, p. 32 (1924).

[8] Smith, A. G. and Gordon, M. *Proc. Calif. Acad. Sci.* (4) XXVI(8), p. 172 (1948).

Cetoconcha indica, sp. nov.

(Plate IV, figs. 6, 7.)

Two specimens represent the genus *Cetoconcha* in the collection, They exhibit some novelty as regards shape, size and other important characters of their shells. So, I propose to describe them as a new species under the name of *C. indica*. The following is a description of the species :—

Shell medium, subglobose, somewhat inflated, inequivalve, somewhat longer than high, bluntly rostrate posteriorly, compressed and vertically striated in the rostral area, pale straw coloured as in *P.* (*C.*) *eximia* Prashad (*loc. cit.*, p. 327, pl. vii, figs. 31, 32), granulations on the surface ill-defined, less in number but confined only to the margin of the shell, concentric striations on the surface somewhat regular ; umbones central but not so much inflated and prominent as in *eximia*, beaks rather inclined towards the anterior side ; posterior side distinctly truncated and beak-like—the beak appearing shorter and slightly more upwardly placed than in the latter, with a distinct angulation (about 135°) at its dorsal margin just below the umbonal area and great contraction at its ventral margin resulting in a greater convexity below in the postero-median ventral margin ; anterior side somewhat obliquely rounded as in *Cetoconcha* (=*Pecchiolia*) *tornata* (Jeffreys)[1] with the dorsal margin only slightly incurved and the ventral margin slightly contracted. The shells measure 12·6 mm. in length, 11·8 mm. in height and 7·5 mm. in diameter (holotype) and 11¼ mm. × 11 mm. × 7¼ mm. (paratype) respectively.

Type-locality.—Indian Ocean.

Holotype.—Reg. No. M 16110/2 Zool. Surv. Ind.

Paratype.—Reg. No. M 16111/2 Zool. Surv. Ind.

Remarks.—The new species *Cetoconcha indica* shows some resemblance to *C. eximia* (Prashad) and *C. tornata* (Jeffreys) i certain important features of its shell, but the difference is also quite remarkable.

Cetoconcha eximia (Prashad, 1932).

1932. *Poromya* (*Cetoconcha*) *eximia*, Prashad, *Siboga Exped. Monogr. Pelecypoda*, LIIIc, p. 327, pl. vii, figs. 31, 32.

This very rare species is represented in the collection by a single specimen which in form, colouration and sculpture appears to correspond to Prashad's description and figures. But its occurrence in the Indian waters is rather remarkable and extends its range more westwards.

Family CUSPIDARIIDAE.

Genus **Cuspidaria** Nardo, 1840.

Subgenus **Cuspidaria** S. S.

Cuspidaria macrorhynchus Smith, 1895.

Type-locality.—Off West Coast of India in the Arabian Sea, 363 fathoms.

1895. *Cuspidaria macrorhynchus*, Smith, *Ann. & Mag. Nat. Hist* (6) XVI, p. 12, pl. ii, figs. 5, 5a.

[1]Jeffreys, J. G. *Ann. Mag. Nat. Hist.* (4) XVIII, p. 494 (1876). The species is figured by Smith in *Zool. Chall. Exped.* XIII, pl. xxv, nos. 9-9b (= *Verticordia*), 1885.)

1897. *Cuspidaria macrorhynchus*, Smith, *Illustr. Zool. R. I. M. S.* '*Investigator*', *Moll.*, pl. iii, figs. 5, 5a.

1931. *Cuspidaria macrorhynchus*, Thiele and Jaeckel, *Wiss. Ergebn. deuts Tiefsee—Exped.* XXI, p. 225.

1932. *Cuspidaria* (*Cuspidaria*) *macrorhynchus*, Prashad, *Siboga Exped. Monogr. Pelecypoda*, LIIIc, p. 328, pl. ix, fig. 17.

1937. *Cuspidaria macrorynchus*, Viader, *Maur. Inst. Bull.* 1(2), p. 69.

1940. *Cuspidaria macrorhynchus*, Winckworth, *Proc. Malac. Soc. London*, XXIV(1), p. 28.

Smith's name *macrorhynchus* for the species, though unanimously adopted by all workers, appears to have been wrongly spelled by Viader as '*macrorynchus*' Smith has clearly pointed out the close affinity of this form with his species, *C. Woollastoni* (after T. V Wollaston), from the Atlantic (*loc. cit.* p. 40, pl. x, 1885, figs. 6-6b, a little west of the Azores, 1,000 fathoms) in the general appearance of its shell and also its marked difference from the latter in the character of the rostrum. Prashad has also fully corroborated his statement.

The single specimen of *C. macrorhynchus* in the collection appears to agree with Smith's description and figures. Moreover, the small size of its shell measuring 22½ mm. in length, 9 mm. in height and 7½ mm. in diameter (with the rostrum 9¾ mm. in length) agrees somewhat closely with the holotype of *macrorhynchus* measuring 22 mm. × 9 mm. × 8 mm.

Distribution.—*Cuspidaria* (*C.*) *macrorhynchus* Smith was originally recorded from the Arabian Sea, but subsequently known from Mauritius, Sulu Sea and Timor Sea.