

XV A FURTHER REPORT ON MOLLUSCA  
FROM LAKE CHILKA ON THE  
EAST COAST OF INDIA.

By H. B. PRESTON, F.Z.S.

At the request of Dr. Annandale of the Indian Museum the author has examined a second collection of Mollusca from Lake Chilka, a report on which is given below. The first collection was made by Dr. Annandale and Mr. Kemp in 1913 and included thirty-four species of which twenty-one were described as new,<sup>1</sup> though two of these (*Velorita satparaënsis* and *Tornatina soror*) have from the examination of considerable further material proved to be unworthy of retention, as will be seen later. The present collection was made by the same collectors during September and December of 1913 and January, February, March, July and September of 1914, and contains sixty-seven species of which twenty-five appear to have hitherto escaped notice and are described and figured in the present report, the type specimens in all cases being returned to the Indian Museum. This large number of new forms in both collections may be accounted for by the fact that practically no systematic collecting has ever been previously done in the lake.

As was to be expected a large proportion of the species originally recorded are again included in this second collection, some however very sparingly while others are conspicuous by their total absence. This is largely because examples of some easily recognized species were not sent.

In conclusion the author would take this opportunity to express his thanks to Mr. E. A. Smith, I.S.O., for much help ungrudgingly given in the generic determination of the smaller Pelecypods of which both collections contain a large number.

Class **GASTROPODA.**

Order *PROSOBRANCHIA.*

Family **TEREBRIDAE.**

***Terebra rambhaënsis*, Preston.**

*Rec. Ind. Mus.*, X, p. 297.

Nalbano and channel S.E. of Nalbano, 4-8 ft.

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<sup>1</sup> *Rec. Ind. Mus.*, X, pp. 297-310 (1914).

## Family NASSIDAE.

**Nassa sistroidea**, G. and H. Nevill.

*J. As. Soc. Bengal*, XLIII, pt. 2, pl. i, fig. 6.

Serua Nadi, 5-9 ft. (two immature examples).

**Nassa marratii**, Smith.

*J. Linn. Soc.*, XII, p. 543; *Proc. Zool. Soc. London*, 1878, p. 809.

Channel off Satpara Point, 8-12 ft.

**Nassa orissaënsis**, Preston.

*Rec. Ind. Mus.*, X, p. 299.

Channel off Barhampur Id., 6-9 ft.; 1 mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft.; opposite Barkul bungalow; 2-8 miles N.E.  $\frac{1}{2}$  E. of Kalidai, 5-6 ft.; S.E. of Barkuda and Samal Id.,  $\frac{1}{4}$  mile off shore, 6 ft.; 2-3 miles S.E. by E.  $\frac{1}{2}$  E. of Patsahani-pur,  $4\frac{3}{4}$ - $5\frac{1}{2}$  ft.; Serua Nadi, 5-9 ft.; channel between Barnikuda and Satpara,  $6\frac{1}{2}$  ft.; about 4 miles E.N.E. of Kalupara Ghat; 1-1 $\frac{1}{2}$  miles off Kalupara Ghat. channel from Satpara towards Barnikuda, 9-12 ft.

**Nassa denegabilis**, Preston.

*T. c.*, pp. 297-299.

Channel between Satpara and Barhampur, 8-20 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; Sand-dunes opposite Manikpatna; Serua Nadi, 5-9 ft.

**Bullia vittata**, Linn.

*Syst. Nat.*, Edit. 12, p. 1206.

Outer bar close to mouth (a single young and dead specimen).

## Family STROMBIDAE.

**Strombus isabella**, Lk.

*Anim. s. vert.*, IX, p. 700.

Chilka Lake (a very young specimen).

## Family CERITHIIDAE.

**Potamides (Tympantonus) fluviatilis**, Pot. and Mich.

*Cat. Moll. de Douai*, p. 363.

Channel between Satpara and Barhampur, 8-20 ft.; channel from Satpara towards Barnikuda, 9-12 ft.; off Barnikuda, 5-12 ft.

**Potamides (Telescopium) fuscum**, Schumacher.*Essai Nouv. Syst.*, p. 233.

Outer bar opposite Manikpatna temple.

## Family FOSSARIDAE.

**Chilkaia**, gen. n.

Shell minute, ovate, rimate, with large body whorl and aperture, spirally lirate and transversely plicate; operculum?

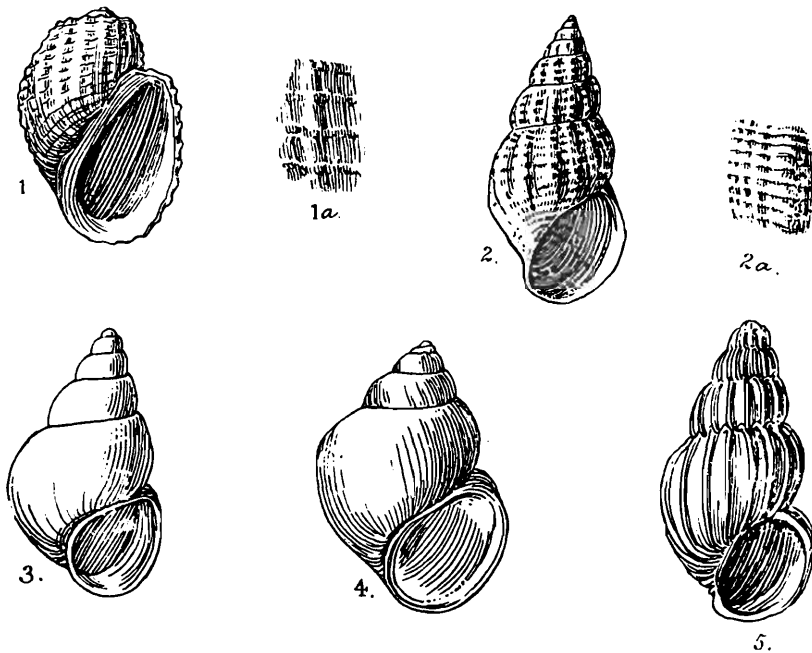
*Hab.*—Lake Chilka, E. coast of India.

FIG. 1.—*Chilkaia imitatrix*, sp. n.  $\times 10$ .  
 " 1a.—" " (sculpture)  $\times 30$ .  
 " 2.—*Litiopa (Alaba) copiosa*, sp. n.  $\times 8$ .  
 " 2a.—" " (sculpture)  $\times 12$ .  
 " 3.—*Stenothyra trigona*, sp. n.  $\times 14$ .  
 " 4.—*Stenothyra obesula*, sp. n.  $\times 8$ .  
 " 5.—*Epitonium hamatulae*, sp. n.  $\times 4$ .

**Chilkaia imitatrix**, sp. n.

(Figs. 1, 1a.)

Shell small, oblong ovate, covered with a light reddish periostracum; whorls 3, finely and wavyly spirally lirate and slightly distantly obliquely transversely plicate, the last whorl shouldered in the infra-sutural region; suture impressed; perforation very narrow; columella whitish, descending in a curve, extending above into a thick, white, restricted, parietal callus which unites it with the labrum above; labrum acute, a very little dilated below; aperture oblique and rather elongately ovate.

Alt. 2.5, diam. maj. 1.75 mm.

Aperture: alt. 1.25, diam. .75 mm.

*Hab.*—Mahosa, southwards towards sandhills, 4-8 ft. (*Type*); Serua Nadi, 5-9 ft.

Bearing, in miniature, an extraordinary resemblance to the more ovate forms of *Paramelania* from Lake Tanganyika.

Family LITIOPIDAE.

*Litiopa* (*Alaba*) *kempi*, Preston.

*Rec. Ind. Mus.*, X, p. 300.

8 miles W. by S. of Breakfast Id., 5-5 $\frac{3}{4}$  ft.; E. side of Rambha Bay, 1-4 $\frac{3}{4}$  ft.; 1 mile N.E. by E. of Chiriya Id., 5 $\frac{1}{2}$ -6 $\frac{3}{4}$  ft.; Breakfast Id., midway between Ganta Sila and Chiriya Id. South Pt., 5-6 ft.; Nalbano and channel N.E. of Nalbano, 4-8 ft.; southwards from Mahosa, 5-9 ft.; Mahosa, Barhampur Id.; off Sankuda Id., Ganjam District, Madras; Rambha Bay; among grass-like weeds on sandy bottom in 3-3 $\frac{1}{2}$  ft. of water close to shore of Barkuda Id.

*Litiopa* (*Alaba*) *copiosa*, sp. n.

(Figs. 2, 2a, p. 291.)

Shell small, fusiformly turrite, whitish, showing traces of having been covered with a thin greenish periostracum, the last whorl narrowly transversely banded with reddish brown; whorls 6, the last two moderately convex, the upper whorls flattish, sculptured with fine, closely-set, spiral lirae and slightly oblique, rounded, rather distant, transverse costulae; suture impressed, crenellated by the terminations of the transverse costulae; columella obliquely descending, scarcely reflexed, diffused above into a restricted, well defined, parietal callus which reaches to the upper margin of the labrum; labrum simple; aperture oblique, ovate.

Alt. 3.75, diam. maj. 1.75 mm.

*Hab.*—Serua Nadi, 5-9 ft. (*Type*); channel between Barnikuda and Satpara, 6 $\frac{1}{2}$  ft.; Mahosa, southwards towards sandhills, 4-8 ft.; channel from Satpara towards Barnikuda, 9-12 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.

Family HYDROBIIDAE.

*Stenothyra minima*, Sow.

*Ann. Mag. Nat. Hist. London* (Charlesworth's series), I, 1837, p. 217 (as *Nematura*).

Opposite Barkul bungalow; 1-5 miles N. by E. of Kalidai, 7-7 $\frac{1}{2}$  ft.; 1 mile N.E. by E. of Chiriya Id., 5 $\frac{1}{2}$ -6 $\frac{3}{4}$  ft.; southernmost island of Manikpatna series; 1 mile S. of Kalidai, 4-8 ft.; Serua Nadi, 5-9 ft.; between Barkuda and mainland, 6-8 ft.

***Stenothyra chilkaënsis*, Preston.***Rec. Ind. Mus.*, X, p. 300.

Serua Nadi, 5-9 ft.; 4-9 miles E.,  $\frac{1}{2}$  S. of Barkul bungalow,  $5\frac{1}{4}$ - $5\frac{3}{4}$  ft.; channel off Barhampur Id., 6-9 ft.; 1 mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft.; channel between Barnikuda and Satpara,  $6\frac{1}{2}$  ft.; off Barnikuda, inside lake, 6 ft.; 2-8 miles N.E.  $\frac{1}{2}$  E. of Kalidai, 5-6 ft.; 1 mile S. of Kalidai, 4-8 ft.; between Barkuda and mainland, 6-8 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; southwards from Mahosa, 5-9 ft.; S.E. of Barkuda and Samel Id.,  $\frac{1}{4}$  mile off shore, 6 ft.; channel from Satpara towards Barnikuda, 9-12 ft.

***Stenothyra orissaënsis*, Preston.***T.c.*, pp. 300-301.

Serua Nadi, 5-9 ft.; Rambha Bay, about 6 ft. of water, among weeds; about 4 miles E.N.E. of Kalupara Ghat, 6-7 ft.; 1 mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; 2 miles N.E. by N.  $\frac{1}{2}$  N. of Kalidai, 7 ft.

***Stenothyra trigona*, sp. n.**

(Fig. 3, p. 192.)

Shell rimate, thin, turrite, semitransparent, greyish white; whorls 5, smooth, rather rapidly increasing, the last inflated, ascending a little in front; suture impressed, margined below; perforation appearing as a narrow and not very deep chink; columellar lip descending in a curve; labrum continuous; aperture oblique, ovate.

Alt. 2.5 (nearly), diam. maj. 1.5, diam. min. 1 mm.

*Hab.*—Lake Chilka, opposite Barkul bungalow (*Type*); Rambha Bay, among weeds; Serua Nadi, 5-9 ft.; 1 mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.

***Stenothyra obesula*, sp. n.**

(Fig. 4, p. 291.)

Shell rimate, ovately fusiform, of an olive colour; whorls 4, smooth, the first three small and regularly increasing, the last large, inflated, descending in front; suture impressed, very narrowly margined below; perforation reduced to a mere chink; labrum continuous, the margin dark brown; aperture slightly oblique, ovate; operculum normal.

Alt. 3.25, diam. maj. 2.25 mm.

*Hab.*—Southernmost island of Manikpatna series.

This species stands out, owing to the obese form of the last whorl, from any other yet described from the Indian region.

## Family NATICIDAE.

**Natica marochiensis**, Gmel.

*Syst. Nat.*, p. 3673, No. 15.

Satpara, Chilka Lake.

Dead shells inhabited by *Coenobita*.

**Natica maculosa**, Lamarck.

*Anim. s. vert.* (Desh. ed.), VIII, p. 641.

Satpara, Chilka Lake.

Dead shells inhabited by *Diogenes*.

## Family SCALARIIDAE.

**Epitonium hamatulæ**, sp. n.

(Fig. 5, p. 291.)

Shell imperforate, turrately fusiform, whitish flesh colour; remaining whorls 5, sculptured with rather fine, erect and closely-set, transverse costulae, the terminations of which are bent forward in a hook-like manner in the immediate super-sutural region and of which there are seventeen on the last whorl, the interstices being quite smooth; suture impressed, crenellated by the hook-like terminations of the transverse costulae; columella descending in a slightly angular curve; aperture oblique, oval.

Alt. 7.75, diam. maj. 4.5 mm.

Aperture: alt. 3, diam. 2 mm.

*Hab.*—Channel off Barhampur Id., 6-9 ft.

## Family PYRAMIDELLIDAE.

**Chrysalida (Mormula) humilis**, Preston.

*Journal of Malacology*, XII, 1905, p. 6 [as *Pyramidella (Mormula)*].

Channel off Barhampur Id., 6-9 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft. (a single deformed specimen); E. side of Rambha Bay, 1 4/4 ft.; southwards from Mahosa, 5-9 ft.; main channel W. of Satpara Id., 3-8 ft.; Serua Nadi, 5-9 ft.; Mahosa, southwards towards sandhills, 4-8 ft.

This appears to be a very variable species in sculpture, convexity of the whorls and size. Specimens differing in all these characters merge into one another but perhaps a single tapering specimen, which the author was at first inclined to regard as distinct, from "Breakfast Island midway between Ganta Sila and Chiriya Island South Point (5-6 ft.)", may be especially mentioned, the dimensions of this individual being:

Alt. 8.75, diam. maj. 2.75, diam. min. 2.5 mm.

Aperture: alt. 2, diam. 1 mm.

While those of the type specimen from Ceylon with which a number of Lake Chilka examples fairly agree are—

Alt. 4.75, diam. maj. 1.5 mm.

Aperture: alt. 5 mm.

Nevertheless one race would seem to stand out from all others and to be worthy of subspecific rank, while two other forms are so distinct as to warrant the accordance of full specific status.

***Chrysallida (Mormula) humilis chilkaënsis*, subsp. n.**

(Figs. 6, 6a.)

Shell differing from the typical *P. (M.) humilis*, Preston, in its less tapering, shorter and proportionately broader form, finer transverse costulae, coarser spiral striae and more oblique aperture.

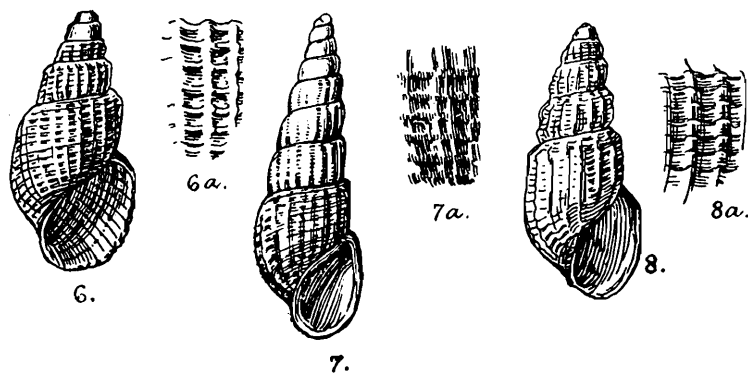


FIG. 6.—*Chrysallida (Mormula) humilis chilkaënsis*, subsp. n. × 8.  
 „ 6a.— „ „ „ „ (sculpture) × 12.  
 „ 7.—*Chrysallida (Mormula) ecclesia*, sp. n. × 4.  
 „ 7a.— „ „ „ „ (sculpture) × 8.  
 „ 8.—*Chrysallida (Mormula) nadiensis*, sp. n. × 8.  
 „ 8a.— „ „ „ „ (sculpture) × 12.

Alt. 3.25, diam. maj. 1.75 mm.

*Hab.*—Serua Nadi, 5-9 ft. (*Type*); main channel W of Satpara Id., 3-8 ft.; southwards from Mahosa, 5-9 ft.; channel between Barnikuda and Satpara, 6½ ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; Mahosa, southwards towards sandhills, 4-8 ft.; channel from Satpara towards Barnikuda, 9-12 ft.; off Barnikuda, inside lake, 6 ft.

***Chrysallida (Mormula) ecclesia*, sp. n.**

(Figs. 7, 7a.)

Shell subulately fusiform, tapering, reddish brown; whorls 8½, regularly increasing, not very convex, sculptured with rather closely-set, perpendicular, transverse plicae, crossed by fine, spiral lirae; suture impressed; columella descending in a curve, porcel-

lenous, slightly reflexed, extending above into a thin, well defined, restricted, parietal callus which reaches to the upper margin of the labrum; labrum acute, a little dilated at the base; aperture ovate, very slightly oblique.

Alt. 8.75, diam. maj. 2.75, diam. min. 2.25 mm.

Aperture: alt. 2, diam. 1 mm.

*Hab.*—Breakfast Id., midway between Ganta Sila and Chirya Id S. Point, 5-6 ft.

**Chrysalida (Mormula) nadiensis, sp. n.**

(Figs. 8, 8a, p. 295.)

Shell fusiform, white; whorls 6, regularly but rather rapidly increasing, shouldered above and below, transversely costulate and finely spirally striate, the costulae becoming obsolete and the striae coarser on the base of the shell; suture well impressed; columellar margin somewhat obliquely descending and a little inwardly bulging above, curved below, extending above into a thickish, well-defined, parietal callus which unites it with the upper margin of the labrum; labrum acute, rather dilated at the base; aperture slightly oblique, ovate.

Alt. 3.25, diam. maj. 1.25 mm.

*Hab.*—Serua Nadi, 5-9 ft. (*Type*); Mahosa, southwards towards sandhills, 4-8 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; 1 mile S. of Kalidai; 4-8 ft.

**Odostomia chilkaënsis, Preston.**

*Rec. Ind. Mus.*, X, pp. 301-302.

Mahosa, southwards towards sandhills, 4-8 ft.

Family NERITIDAE.

**Neritina souverbiana, Montrouzier.**

*J. Conchyliol., Paris*, XI, 1863, pp. 75, 175, pl. v, fig. 5.

Mahosa, Barhampur Id.; Serua Nadi, 5-9 ft.; 1 mile E. by N. of Patsahanipur, 4½ ft. (dead shells only).

Family CYCLOSTREMATIDAE

**Cyclostrema (Tubiola) innocens, sp. n.**

(Figs. 9, 9a-b, p. 299.)

Shell small, discoidal, almost planulate, milk white, smooth throughout; whorls 3, rather rapidly increasing, the last convex, marked only with growth striae; suture well impressed; umbilicus moderately wide; labrum continuous, simple; aperture rather large for the size of the shell, subcircular.

Alt. .5, diam. maj. 2, diam. min. 1.75 mm.

*Hab.*—Serua Nadi, 5-9 ft.



## Family TROCHIDAE.

**Umbonium vestiarum**, Lin.*Syst. Nat.*, X, p. 758.

Outer bar close to mouth; outer bar opposite Manikpatna temple.

**Solariella satparaënsis**, Preston.*Rec. Ind. Mus.*, X, pp. 302-303.

Mahosa, southwards towards sandhills, 4-8 ft. (a single dead specimen).

## Order OPISTHOBRANCHIA.

## Family BULLIDAE.

**Bulla (Haminea) crocata**, Pease.*Proc. Zool. Soc. London*, 1860, p. 19.

Serua Nadi, 5-9 ft. (a single small, though apparently, fully grown specimen).

## Family TORNATINIDAE.

**Tornatina estriata**, Preston.*Rec. Ind. Mus.*, X, p. 303Channel from Satpara towards Barnikuda, 9-12 ft.; one mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft.; Serua Nadi, 5-9 ft.; off Barnikuda, inside lake, 6 ft.; channel off Barhampur Id., 6-9 ft.; main channel W. of Satpara Id., 3-8 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; southwards from Mahosa, 5-9 ft.; 2 miles N.E. by N.,  $\frac{1}{2}$  N. of Kalidai, 7 ft.In view of the plasticity of the members of this genus, the author considers it necessary to unite *T. soror*<sup>1</sup> with the present species, this conclusion having been come to as a consequence of the examination of a very large further series of examples from the lake in which more or less connecting links between the two originally described forms occur.

## Class PELECYPODA.

## Order TETRABRANCHIA.

## Sub-order MYTILACEA.

## Family MYTILIDAE.

**Mytilus smaragdinus**, Chemnitz.*Conch. Cab.*, VIII, pl. lxxxiii, fig. 745.

Manikpatna, oyster-beds (a single, very immature specimen).

<sup>1</sup> *Rec. Ind. Mus.*, X, p. 303.

**Modiola undulata**, (Dkr.).*Proc. Zool. Soc. London*, 1856, p. 363.

Channel off Barhampur Id., 10-20 ft.; channel between Satpara and Barhampur, 8-20 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft. (young examples only); 1 mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft. (young only).

Var. **crassicostata**. Preston.

*Rec. Ind. Mus.*, X, p. 304.

Serua Nadi, 5-9 ft. (young specimens only); main channel W. of Satpara Id., 3-8 ft. (a young specimen).

Sub-order *ARCACEA*.

Family *ARCIDAE*.

**Arca (Fossularca) lactea**, Lin.*Syst. Nat.* p. 1141.

Channel between Satpara and Barhampur Id., 6-8 ft., and 8-20 ft.; main channel W. of Satpara Id., 3-8 ft.; Satpara.

After very careful comparison the author is unable to separate the present shells from the common European form, which has already been recorded from Bombay and Mergui as well as from S. Africa, the Red Sea, Aden, Ascension Id. and (somewhat doubtfully) from the Philippines.

Sub-order *ERYCINACEA*.

Family *ERYCINIDAE*.

**Kellya chilkaënsis**, sp. n.

(Figs. 10, 10a, p. 299.)

Shell very thin, flattened, oblong-ovate, transparent, pale brownish, except towards the margins where it is covered with a thin membranaceous reddish brown periostracum, concentrically striate; umbones very small; dorsal margin arched; ventral margin gently rounded; anterior side obtusely rounded; posterior side very slightly produced, rounded; hinge-teeth normal.

Long. 4.25, lat. 5.75 mm.

*Hab.*—Channel between Satpara and Barhampur Id., 6-8 ft. (*Type*); Mahosa, southwards towards sandhills, 4-8 ft.; 1 mile S. of Kalidai, 4-8 ft.; channel off Barhampur Id., 6-9 ft.; 4-7 miles E.  $\frac{1}{2}$  S. of Patsahanipur, 4- $4\frac{1}{4}$  ft.

**Kellya mahosaënsis**, sp. n.

(Fig. 11, p. 299.)

Shell minute, inequilateral, oblong-ovate, transparent, pale yellowish horn colour, reddish at the margins, concentrically

striate; umbones comparatively large and rather prominent; dorsal margin strongly arched; ventral margin contracted in the median part; anterior side very obtusely rounded; posterior side rounded; hinge-teeth normal.

Long. 1.5, lat. 1.25 mm.

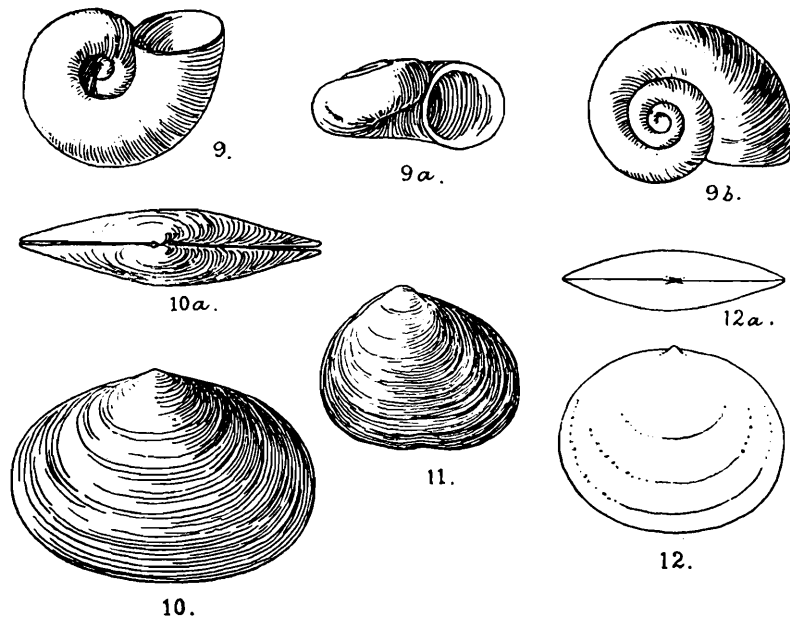
*Hab.*—Mahosa, southwards towards sandhills, 4-8 ft.

Family GALEOMMIDAE.

*Scintilla chilkaënsis*, sp. n.

(Figs. 12, 12a.)

Shell oblong ovate, considerably flattened, very thin, transparent, pale yellowish, polished, shining, irregularly concentrically striate; umbones very small; dorsal margin arched at either side, slightly sloping in the umbonal region; ventral margin



FIGS. 9, 9a, 9b.—*Cyclostrema (Tubiola) innocens*, sp. n.  $\times 10$ .  
 „ 10, 10a.—*Kellya chilkaënsis*, sp. n.  $\times 6$ .  
 „ 11.—*Kellya mahosaënsis*, sp. n.  $\times 14$ .  
 „ 12, 12a.—*Scintilla chilkaënsis*, sp. n.  $\times 4$ .

gently rounded; anterior side bluntly rounded; posterior side sloping above, rounded below; hinge-teeth normal.

Long. 4.5, lat. 5.75 mm.

*Hab.*—Mahosa, southwards towards sandhills, 2-8 ft. (*Type*); channel south of Satpara Point, 8-12 ft.; channel between Satpara and Barhampur, 8-20 ft.

Sub-order *CARDIACEA*.

Family *CARDIIDAE*.

*Cardium (Fulvia) rugatum*, Gronov.

Gronovius, *Zoophylaceum*, pl. xviii, fig. 5.

Outer bar close to mouth (juvenile examples only).

Sub-order *CONCHACEA*.

Family *VENERIDAE*.

***Meretrix casta*, Chem.**

*Anim. s. vert.*, VI, p. 299.

Satpara Bay; Mahosa, Barhampur Id.; outer bar, opposite Manikpatna temple (young only); swamp inside bar, N. of Barhampur Id.; Manikpatna Id.

A very large example was secured, but has reached the writer with no other locality attached than "Chilka Survey"; the dimensions of this specimen are as below.

Long. 67, lat. 73 mm.

Having now had the opportunity to examine fresh specimens of this species from the outer channels of the lake, the author is of opinion that the shell recently described by him as *Corbicula (Velorita) satparaënsis*<sup>1</sup> cannot stand, the worn subfossil remains upon which the species was based clearly proving it to be identical with individuals of *M. casta* now to hand; this conclusion is borne out by Blanford's record of the occurrence of *M. casta* in the Rambha Island Beds.<sup>2</sup>

***Meretrix ovum*, Hanley.**

*Proc. Zool Soc. London*, 1846, p. 21.

Satpara Bay; Mahosa, Barhampur Id.

***Meretrix morphina*, Lk.**

*Anim. s. vert.*, VI, p. 300.

Channel off Barhampur Id., 10-20 ft. (a single valve).

***Tivela dillwyni* (Deshayes).**

*Cat. Brit. Mus., Conchif.*, 1853, p. 49; *Cytherea mactroides*, Sowerby, *Thes. Conch.*, II, p. 615, pl. 128, fig. 56, *non* Born, *nec* Chemnitz, *nec* Lamarck.

Serua Nadi, 5-9 feet (young specimens only).

***Meroë scripta*, Gray.**

Rumphius, *Mus. Amb.*, pl. xliii, figs. L, M.

Outer channel, Lake Chilka (a single much worn valve).

***Tapes pinguis*, Chem.**

*Conch. Cab.*, VI, p. 355, pl. xxxiv, figs. 355-357 (as *Venus*).

Manikpatna Id. (a somewhat inflated and rounded variety); Manikpatna Id. (a normal specimen); swamp inside bar N. of Barhampur Id.; S. side of Satpara Id., opposite bungalow.

<sup>1</sup> *Rec. Ind. Mus.*, X, p. 306.

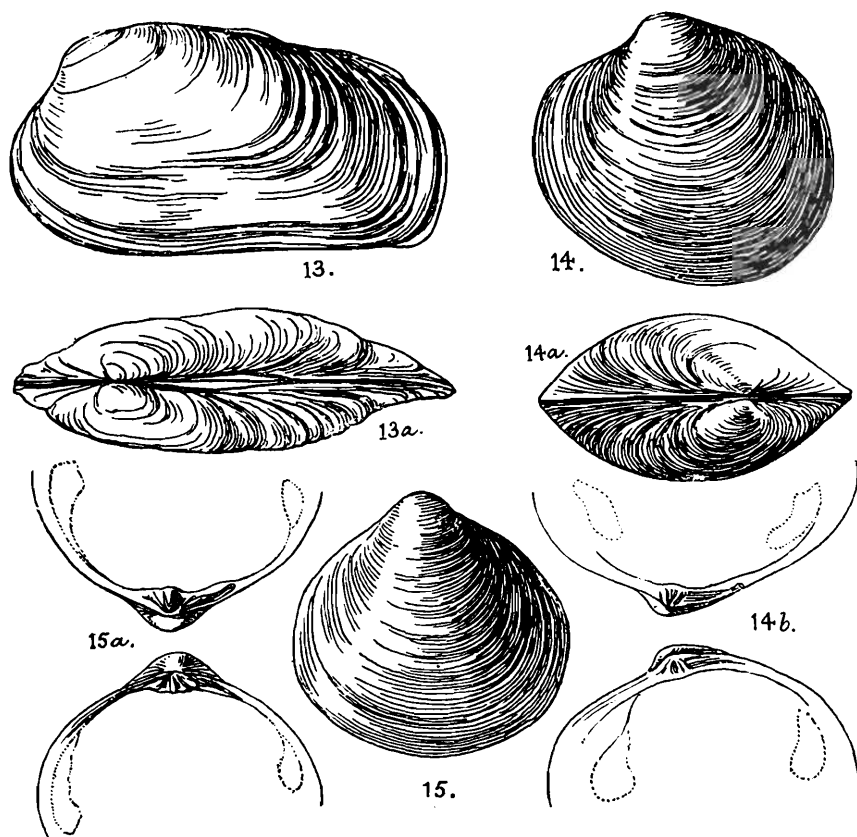
<sup>2</sup> *Rec. Geol. Surv. India*, V, p. 61.

***Tapes ceylonensis*, Sow***Thes. Conch.*, I, p. 683, pl. cxlvi, figs. 24-25.

Sand-dunes opposite Manikpatna (juvenile examples); channel near Mirzapur, 8-12 ft.; Mahosa, Barhampur Id; Serua Nadi, 5-9 ft. (young specimens only).

***Clementia annandalei*, Preston.***Rec. Ind. Mus.*, X, p. 306.

Serua Nadi, 5-9 ft. (young examples); Nalbano and channel S.E. of Nalbano, 4-8 ft (also young).



FIGS. 13, 13a.—*Petricola esculpturata*, sp. n.  $\times 3$ .  
 ,, 14, 14a.—*Diplodonta satparaensis*, sp. n.  $\times 1\frac{1}{2}$ .  
 ,, 14b.— " " (hinge)  $\times 1\frac{1}{2}$ .  
 ,, 15.—*Diplodonta barhampurensis*, sp. n.  $\times 3$ .  
 ,, 15a.— " " (hinge)  $\times 3$ .

**Family PETRICOLIDAE.*****Petricola esculpturata*, sp. n.**

(Figs. 13, 13a.)

Shell oblong, rather solid, white, showing traces of having been covered with a thin pale greenish brown periostracum, concentrically striate with lines of growth, but without other sculpture; umbones small, not very prominent, very anteriorly situa-

ted; dorsal margin sloping towards the posterior side; ventral margin nearly straight; anterior side obliquely and rapidly sloping above, somewhat rounded below; posterior side produced, very obtusely rounded, angled below; hinge normal.

The dimensions of the type specimen are as follows:—

Long. 13·25, lat. 23, diam. 75 mm.

Those of a larger, though imperfect individual are—

Long. 17, lat. 31·5, diam. 11·5 mm.

*Hab.*—Manikpatna, oyster-beds.

Since the above was written the author has seen more specimens of this species from the Chilka Lake, the largest of which yields the following measurements:—

Long. 27·5, lat. 47, diam. 17·25 mm.

#### Family UNGULINIDAE.

#### *Diplodonta satparaënsis*, sp. n.

(Figs. 14, 14a-b, p. 301.)

Shell ovately rhomboidal, fragile, slightly glossy, whitish, covered with a very thin, pale greenish yellow periostracum, irregularly finely and closely concentrically striate; umbones small, but slightly prominent; dorsal margin arched; ventral margin anteriorly sloping, posteriorly rounded; anterior side angled above, then descending in a rather oblique curve; posterior side sloping, rather abruptly rounded; right valve bearing two small cardinal teeth, of which the anterior is short and sloping and the posterior narrowly bifid above, broadly so below; left valve also bearing two cardinals of which the anterior is rather narrowly bifid and the posterior very fine and oblique.

Long. 19, lat. 20·5 mm.

*Hab.*—Channel between Satpara and Barhampur, 8-20 ft. (*Type*); swamp inside bar N. of Barhampur Id.; channel off Satpara, 16-20 ft.; Kalidai Id.; between Mahosa and Satpara, 6 ft.; Satpara Bay; channel off Barhampur Id., 10-20 ft.; channel off Barhampur Id., 6-9 ft.; channel between Barnikuda and Satpara, 6½ ft.; southwards from Mahosa, 5-9 ft.; Mahosa, Barhampur Id.

#### *Diplodonta barhampurensis*, sp. n.

(Figs. 15, 15a, p. 301.)

Shell inflated, subequilateral, roundly trigonal, covered with a dark brown periostracum, finely concentrically striate; umbones rather large, prominent; dorsal margin somewhat angularly arched; ventral margin rounded; anterior side rounded; posterior side obtusely rounded; hinge normal.

Long. 13·75, lat. 14·75, diam. 10 mm.

*Hab.*—Channel off Barhampur Id., 10-20 ft.

**Diplodonta (Felania) annandalei**, Preston.*Rec. Ind. Mus.*, X, p. 307.

Channel between Satpara and Barhampur Id., 6-8 ft.; outer bar close to mouth; main channel W. of Satpara Id., 3-8 ft.; channel off Barhampur Id., 6-9 ft.; 3-4 miles E. by S.  $\frac{1}{2}$  S. of Patsahanipur, 5-5 $\frac{1}{4}$  ft.; 4-9 miles E. by S.  $\frac{1}{2}$  S. of Patsahanipur, 4-5 ft.; near Barnikuda, inside lake, 5 $\frac{1}{2}$  ft.; Satpara Bay; outer bar opposite Manikpatna temple; Maludaikuda Id.; 2-8 miles N.E.  $\frac{1}{2}$  E. of Kalidai, 5-6 ft.

**Diplodonta (Felania) chilkaënsis**, Preston.*T.c.*, p. 307.

Manikpatna Id., sand-dunes opposite Manikpatna; outer bar 1 mile S.W. of mouth, 6 ft.; swamp inside bar N. of Barhampur Id.; outer bar opposite Manikpatna temple; S. side of Satpara Id., opposite bungalow.

**Diplodonta (Felania) ovalis**, Preston.*T.c.*, pp. 308-309.

Outer bar, 1 mile S.W. of mouth, 6 ft.; channel between Satpara and Barhampur Id., 6-8 ft.

## Family DONACIDAE.

**Donax pulchella** Hanley.*Proc. Zool. Soc. London*, 1843, p. 6.

Outer bar close to mouth (a single valve).

## Family PSAMMOBIIDAE.

**Psammobia mahosaënsis**, sp. n.

(Figs. 16, 16a-b, p. 304.)

Shell small, very inequilateral, ovately cuneiform, concentrically striate, whitish, covered with a thin brown periostracum which is chiefly noticeable round the margins, both valves angled posteriorly; umbones small; dorsal margin angularly arched; ventral margin gently rounded; anterior side rounded; posterior side rather abruptly descending; right valve furnished with two minute cardinal teeth, the anterior being placed at a very obtuse angle to the posterior; the left valve also bearing two minute cardinals of which the anterior fits between those of the right valve.

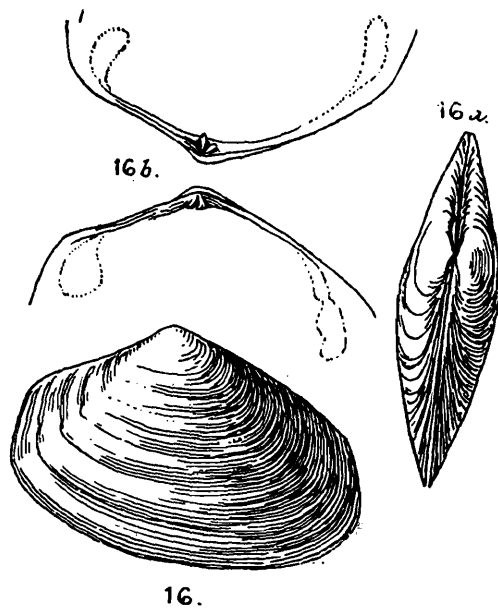
Long. 6.25, lat. 9.25 mm.

*Hab.*—Southwards from Mahosa, 5-9 ft. (*Type*); channel between Satpara and Barhampur, 8-20 ft.; channel between Barnikuda and Satpara, 6 $\frac{1}{2}$  ft.; on swamp inside bar N. of Barhampur Id.; Mahosa, southwards towards sandhills, 4-8 ft.

## Family SOLENIDAE.

In the writer's former paper, on the Mollusca of the Chilka Lake, he recorded what he supposed to be juvenile examples of *S. truncatus*, Wood,<sup>1</sup> this determination however cannot stand; Dr. Annandale has since gone thoroughly into the matter and reports that there are, in his opinion, no less than three forms in the lake, one, a form only found on a bottom of fine mud inside the lake, a second, which only differs in its larger size and thicker shell and which according to Dr. Annandale is found "at sandy localities in the outer parts of the lake", and a third, which is found with the second, but has a much narrower shell.

The first (*i.e.* the smallest) of the three forms would appear,



FIGS. 16, 16a.—*Psammobia mahosaensis*, sp. n.  $\times 4$ .  
 ,, 16b.— ,, ,, (hinge)  $\times 4$ .

from Dr. Annandale's investigations, to be sexually adult and, as no such small forms are known from the Indian region, the shells of the last two are described in the present paper, no material being at the time of writing on hand from which to draw up a diagnosis of the first, the specimens having been returned to the Indian Museum with the author's previous report.

***Solen annandalei*, sp. n.**

(Figs. 17, 17a, p. 305.)

Shell small, covered with a yellowish brown, glossy, shining, polished periostracum, and plainly marked with concentric growth lines; dorsal and ventral margins quite straight; anterior side obliquely sloping in an anterior direction; posterior side obtuse,

Sowerby, *Genera of Shells*; Reeve, *Con. Icon.*, *Solen*, XIX, 1874, pl. i, fig. 1.



slopingly rounded at the ventral corner and sharply so at the dorsal corner; right valve bearing a single cardinal tooth which is grooved below and posteriorly erect above; left valve furnished with a very anteriorly erect, somewhat claviform, cardinal tooth.

Long. 49.25, lat. 9.5 mm.

*Hab.*—Satpara Bay.

***Solen kempii*, sp. n**

(Figs. 18, 18a.)

Shell differing from *S. annandalei*, in its smaller and proportionately much narrower form, it is of a thinner texture and the concentric growth lines are not so clearly marked, the anterior side is more obliquely truncate, the cardinal tooth in the right

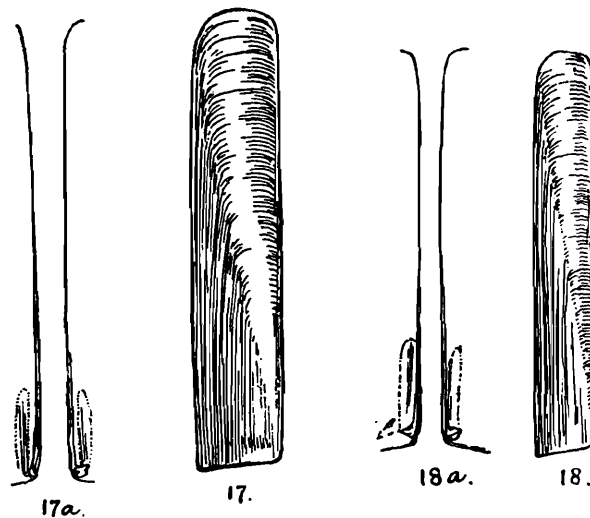


FIG. 17.—*Solen annandalei*, sp. n.  $\times 1\frac{1}{2}$ .  
 " 17a.— " " (hinge)  $\times 1\frac{1}{2}$ .  
 " 18.—*Solen kempii*, sp. n.  $\times 1\frac{1}{2}$ .  
 " 18a.— " " (hinge)  $\times 1\frac{1}{2}$ .

valve is grooved, though only shallowly, throughout its whole breadth, while that in the left valve is more rigidly erect, even than is the case in *S. annandalei*.

Long. 43, lat. 6.5 mm

*Hab.*—20 miles S.E. by S. of Patsahanipur, 5½ feet.

Sub-order *MYACEA*.

Family *MACTRIDAE*.

***Standella annandalei*, sp. n.**

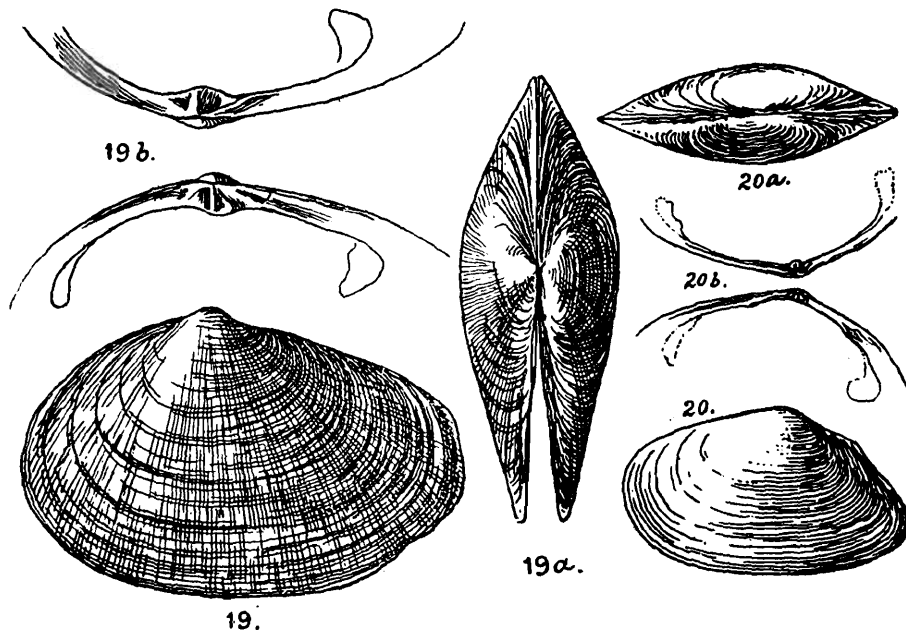
(Figs. 19, 19a-b, p. 306.)

Shell thin, fragile, gaping posteriorly, broadly cuneiform, whitish, covered with a thin brownish yellow periostracum, concentrically striate; umbones small; dorsal margin arched ante-

riorly, sloping posteriorly; ventral margin very gently rounded; anterior side rounded; posterior side produced, rather sharply rounded; right valve furnished with a V-shaped, somewhat anteriorly erect and jagged cardinal; left valve bearing an even more erect, but not jagged, cardinal tooth; lateral teeth in both valves short and sloping.

Long. 15.5, lat. 23.5 mm.

Hab.—N.E. side of Nalbano (*Type*); Satpara Bay.



FIGS. 19, 19a.—*Standella annandalei*, sp. n.  $\times 2$ .  
 ,, 19b.—" " (hinge)  $\times 3$ .  
 ,, 20, 20a.—*Tellina chilkaensis*, sp. n.  $\times 3$ .  
 ,, 20b.—" " (hinge)  $\times 3$ .

Sub-order ADESMACEA.

Family TEREDINIDAE.

*Xylotrya stutchburyi*, Sow.

Con. *Icon.*, XX, pl. ii, fig. 5, a, b, c.

Post in channel off Satpara Point, 3-8 ft.

Order DIBRANCHIA.

Sub-order TELLINACEA.

Family TELLINIDAE.

*Tellina chilkaensis*, sp. n.

(Figs. 20, 20a-b.)

Shell small, elongately ovate, yellowish flesh coloured, polished, shining, somewhat iridescent, concentrically striate, um-

bones small, rather flattened; dorsal margin anteriorly sloping and slightly arched, posteriorly shortly excavated; ventral margin very gently rounded; anterior side sharply rounded above, slopingly so below; posterior side bluntly rostrate; right valve bearing two divergent, short, grooved, cardinal teeth, a strong, anteriorly overhanging, anterior lateral and a very weak posterior lateral; left valve bearing a rather strong bifid anterior and a very weak posterior cardinal only.

Long. 6.25, lat. 9.75, diam. 3.25 mm.

*Hab.*—Channel off Barhampur Id., 6-9 ft.

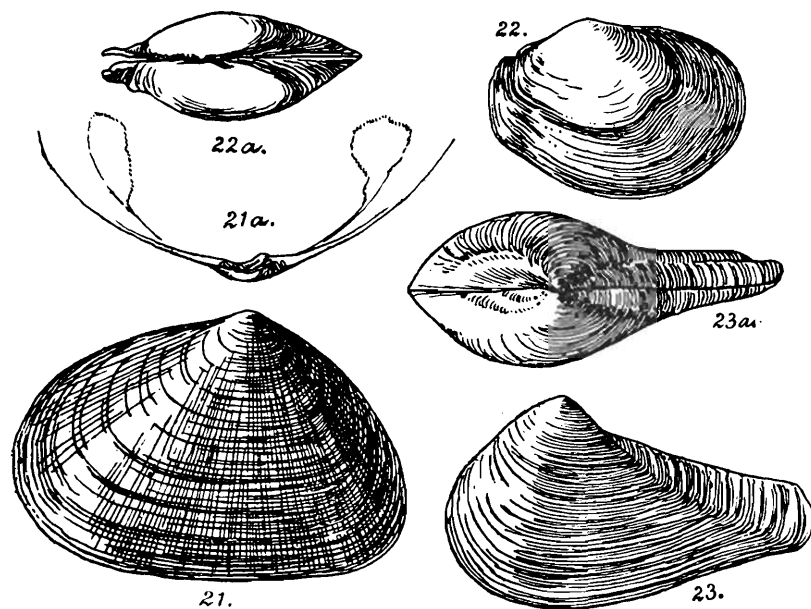


FIG. 21.—*Tellina barhampurensis*, sp. n.  $\times 3$ .  
 ,, 21a.— " " (hinge)  $\times 3$ .  
 ,, 22, 22a.—*Cumingia hinduorum*, sp. n.  $\times 4\frac{1}{2}$ .  
 ,, 23, 23a.—*Cuspidaria annandalei*, sp. n.  $\times 6$ .

### *Tellina barhampurensis*, sp. n.

(Figs. 21, 21a.)

Shell oblong-trigonal, whitish, concentrically and faintly radiately striate; umbone small; dorsal margin strongly arched; ventral margin almost straight; anterior side obtusely rounded; posterior side broad, rounded; anterior cardinal tooth very oblique, rather broadly bifid; posterior cardinal tooth angularly bent in a posterior direction; anterior lateral tooth very weak; posterior lateral short, erect.

Long. 14.5, lat. 20.5 mm.

*Hab.*—Channel between Satpara and Barhampur, 8-20 ft.

Unfortunately only a single valve (the right) has been available for description; but this is so characteristic that the author considers that no further apology is necessary for the founding of a species upon such scanty material.

## Family SCROBICULARIIDAE.

**Theora opalina**, Hinds.

*Proc. Zool. Soc. London*, 1843, p. 78 (as *Neaera*).

Main channel W. of Satpara Id., 3-8 ft.; main channel between Satpara and Barnikuda, 6 ft.; 2-8 miles N.E.  $\frac{1}{2}$  E. of Kalidai, 5-6 ft.; 1 mile N.E. by E. of Chiriya Id.,  $5\frac{1}{2}$ - $6\frac{3}{4}$  ft.; Serua Nadi, 5-9 ft.; 1- $1\frac{1}{2}$  miles off Kalupara Ghat, 6-7 ft.; channel between Satpara and Barhampur Id., 6-8 ft.

**Cumingia hinduorum**, sp. n.

(Figs. 22, 22a, p. 307.)

Shell ovately rhomboidal, very thin, greyish, concentrically striate with growth lines only; umbones small; not very prominent; dorsal margin arched; ventral margin anteriorly rounded; posteriorly sloping; anterior side produced, rather sharply rounded; posterior side very obtusely rostrate; hinge normal.

Long. 6.5, lat. 9 mm.

*Hab.*—Main channel W of Satpara Id., 3-8 ft. (*Type*); channel off Barhampur Id., 6-9 ft.; Mahosa, southwards towards sandhills, 4-8 ft.; 3-4 miles E. by S.  $\frac{1}{2}$  S. of Patsahanipur, 5- $5\frac{1}{4}$  ft.; channel between Satpara and Barnikuda, 6-10 ft.; southwards from Mahosa, 5-9 ft.; Mahosa, Barhampur Id.

## Sub-order ANATINACEA.

## Family CUSPIDARIIDAE.

**Cuspidaria annandalei**, sp. n.

(Figs. 23, 23a, p. 307.)

Shell small, irregularly triangulate, thin, yellowish white, except for the posterior prolongation and ventral margin which are covered with a light brown, membranaceous periostracum, concentrically striate, both valves being obliquely angled from the umbones downward, the angle being more accentuated in the right valve and extending to the ventral margin on the posterior side; umbones small, somewhat prominent; dorsal margin anteriorly arched, posteriorly gently sloping; ventral margin gently rounded especially anteriorly; anterior side rounded; posterior side rostrately produced, obliquely truncate, bearing a depression in both valves for about three-fourths of its length.

Long. 4, lat. 6.5 mm.

*Hab.*—4-9 miles E. by S.  $\frac{1}{2}$  S. of Patsahanipur, 4-5 ft. (*Type*); Serua Nadi, 5-9 ft.; 4-7 miles E.  $\frac{1}{2}$  S. of Patsahanipur, 4- $4\frac{1}{2}$  ft.; about 4 miles E.N.E. of Kalupara Ghat, 6-7 ft.; 4-9 miles E.  $\frac{1}{2}$  S. of Barkul bungalow,  $5\frac{1}{4}$ - $5\frac{3}{4}$  ft.; 1- $1\frac{1}{2}$  miles off Kalupara Ghat, 6-7 ft.; 1 mile S. of Kalidai, 4-8 ft.; Nalbano and channel S.E. of Nalbano, 4-8 ft.; main channel W of Satpara Id., 3-8 ft.; main channel between Satpara and Barnikuda, 6 ft.; Mahosa, Barhampur Id.

## Family LYONSIIDAE.

*Lyonsia samalinsulae*, Preston.*Rec. Ind. Mus.*, X, p. 310.

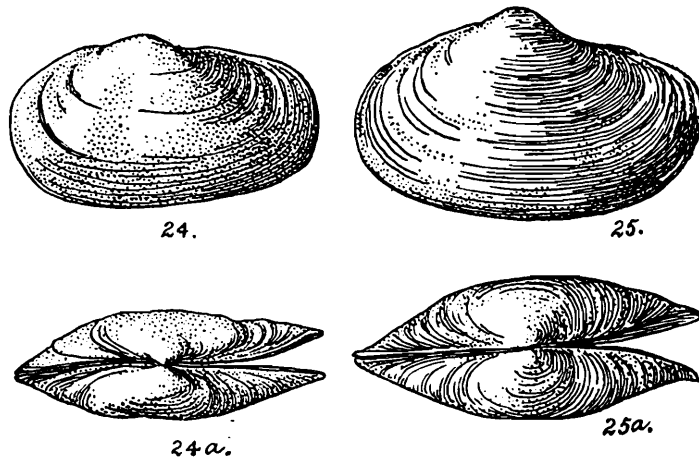
Main channel W of Satpara Id., 3-8 ft.; Serua Nadi, 5-9 ft.; Mahosa, southwards towards sandhills, 4-8 ft.

## Family ANATINIDAE.

*Anatina barkudaënsis*, sp. n.

(Figs. 25, 25a.)

Shell rather small, oblong, gaping at both ends, but especially posteriorly, concentrically striate and minutely pustulate except at the posterior side, where the pustules cease abruptly and the shell is only very coarsely and irregularly concentrically striate;



FIGS. 24, 24a.—*Anatina barkulensis*, sp. n.  $\times 3$ .  
 ,, 25, 25a.—*Anatina barkudaënsis*, sp. n.  $\times 3$ .

umbones of moderate size, slightly prominent; dorsal and ventral margins nearly straight; anterior side rounded; posterior side very abruptly rounded; hinge quite normal.

Long. 9.25, lat. 17 mm.

*Hab.*—Barkuda Id. (*Type*); Chiriya Id.; Manikpatna Id.; in mud at edge of Lake Rambha, Ganjam District, Madras; swamp inside bar, N. of Barhampur Id.; Satpara Bay; channel between Satpara and Barnikuda, 6-10 ft.; E. side of Rambha Bay, 1-4 $\frac{3}{4}$  ft.

*Anatina barkulensis*, sp. n.

(Figs. 24, 24a.)

Shell oblong ovate, thin, gaping at both sides, white, minutely pustulous, the margins showing traces of a reddish laminiferous periostracum, concentrically striate; umbones rather large, moderately prominent; anterior margin somewhat straight;

ventral margin gently rounded; anterior side rounded above, receding below; posterior side rounded; hinge normal.

Long. 11.25, lat. 20 mm.

*Hab.*—Barkul Point (*Type*); Mahosa, southwards towards sandhills, 4-8 ft.

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