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THE NATURAL HISTORY SECRETARY.

“It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease.

SIR Wm. JONES.

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On the other side of the chain we find, between it and the next parallel, *viz.* the Kuen-Luen Chain, the valley of the Yarkandkash (river), which extends from the Korakoram or Yarkand pass to Tashgurkhan, and the Akzai Chin or White Desert, which is continued towards the S. E., nobody knows how far. The valley of the Yarkand river and the Akzai Chin are separated one from the other by a low ridge of mountains similar to the masses of mountains found between the other great chains of the Himalaya. All we know of the valley of the Yarkandkash is that some mines of rock-salt occur there, and that both in the beds of the Yarkandkash and Karakash and in the ravines of the neighbourhood, some pebbles are collected and used for cheap jewellery; and these pebbles are either quartz stones or rocks decidedly volcanic. There is apparently some analogy between these mountains and those of the centre of Rupshu and of Ladak. The Akzai plain is also very similar to the countries just mentioned, in at least the one character of being an elevated, rainless desert, spotted with small lakes, some fresh, and others salt.

It is superfluous to say that I know nothing of the Geology of the Yarkandkash and Karakash valleys and of the Aksai Chin; neither is there anything known of the formation of the Kuen Luen or Piryukh Chain, except that it is reported to contain valuable copper and gold mines. Another small chain or range, half way between the Kuen Luen and Yarkand seems to be the last parallel of the Himalaya. Yarkand is supposed to be in latitude N. 38° and about 5000 feet above the sea. From the top of the Korakoram pass to the foot of the hills, the distance is approximately 110 miles, and the descent 13,000 feet or about 118 feet per mile, a mild slope for a mountainous country.

(To be continued.)

Contributions to Indian Malacology, No. VIII. List of Estuary shells collected in the delta of the IRAWADY, in PEGU, with descriptions of the new species. By WILLIAM T. BLANFORD, A. R. S. M., F. G. S., Cor. Mem. Z. S. &c.

[Received 14th November, 1866.]

A short visit to Calcutta, and access to various works on conchology which have, for some years past, been beyond my reach, have enabled me to prepare the following list of the species of mollusca collected by me in the Pegu delta during the early portion of 1862. In March and April of that year, whilst engaged in the Geological Survey of the country south of Bassein, I was compelled to traverse the network of creeks which intersect the Irawaddy delta in every direction, and, in so doing, I had many opportunities of searching for the various mollusca inhabiting the channels of brackish and salt water.

The western portion of the Irawaddy delta south of Bassein is of peculiar character. Instead of the endless alluvial flat which is usually alone met with near the mouth of large rivers, the country is frequently undulating, and even, in places, hilly; the hills being surrounded by plains of alluvial soil intersected by tidal channels. Rock not unfrequently occurs in these creeks, and affords a habitat for many mollusca which are not met with in the usual muddy flats.

The Bassein river itself, one of the numerous mouths of the Irawaddy, like the Mutlah and other great channels of the Ganges delta, is at present rather an arm of the sea than a river; as it receives no fresh water directly from the Irawaddy except during the height of the rains. In the cold weather the water is perfectly salt for many miles above the mouth, and marine animals abound. Thus for many days, during the time I was traversing the neighbourhood, the water swarmed with *Medusæ*. The volume of fresh water which pours into the Bassein river can at no time be very large, for the mollusca which inhabit the southern side of Negrais Island, some distance within the mouth of the river, are typically marine, comprising species of *Parmophorus*, *Triforis*, *Trochus*, *Chama*, &c., and not including any of the usual estuary forms *Assiminea*, *Amphibola*, *Neritina*, &c., whilst at Poorian Point and Pagoda Point, the two headlands which form

the entrance to the Bassein river, precisely the same mollusca occur as along the Arakan coast near Cape Negrais.* At the mouths of those channels by which the mass of fresh water poured down by the Irawady reaches the sea, I do not think that any typically marine animals are met with, nor could they exist, for, in the height of the rains, I have found the water outside the mouth of the Rangoon river perfectly fresh and drinkable, and yet this is only a minor channel compared to the Chinabuckeer and the neighbouring branches, down which the great bulk of the water pours.

To the greater saltness of the Bassein river I attribute the presence of the numerous marine types mentioned in the following list. It will be seen that a few distinctly marine species were met with; the number, however, was small. There are also in the list two or three genera, forms of which do not appear to have been hitherto found in estuaries, e. g. *Tectura*, *Sphenia*, *Scalaria*; whilst, on the other hand, the genus *Scaphula* had previously only been met with in fresh water.

The fauna and flora of the Irawady delta appear to be twofold.† Farther from the sea, where the water is more or less brackish, the creeks are mostly narrow and deep, with steep banks, which are covered at high water, and bordered by an unbroken belt of salt swamp, in which grow high trees, chiefly of *Bruguiera gymnorhiza*? The views along the creeks, with their borders of dense high forest, are often of great beauty. This belt of salt swamp and high trees varies much in breadth, from a few yards to half a mile or more; inside it are either open plains, which, if uncultivated, are covered with high grass, or else rises, usually of gravel, occasionally of rock, which are covered with jungle.

The mollusks of this tract comprise *Neritina depressa*, *N. obtusa* and *N. Smithii*; the species of *Tectura*, *Modiola*, *Martesia* and *Sphenia* named in the following list are met with wherever rocks occur; *Scaphula* is found under stones, *Auricula* and *Cyrena* inhabit the salt swamp. *Teredo* perforates the dead trees. *Neritina cornucopia* is principally met with in this region, but is also found lower down the

* Amongst others, I found species of *Dolium*, *Ricimula*, *Ranella*, &c.

† I regret that my want of knowledge of botany and the paucity of the observations I was able to make upon the zoology, prevent me from entering fully into this subject. I can merely point out the fact that a distinction exists between the fauna and flora of the delta nearer to the coast, and that found further inland, and illustrate it in the single instance of the mollusca.

estuaries: *Littorina melanostoma* also occasionally occurs, but its home is nearer the sea.

Lower down where the creeks are broader, the belt of salt swamp is narrower in general, and a broad shelving muddy shore succeeds, the upper portion covered by a thick forest of *Avicensia*, while lower down *Nipa* palms frequently occur. The beauty of the wide creeks is greatly enhanced by the broad fringe of the bright green *Avicensia*, over the tops of which the summits of hills, covered with dense green forest, are frequently visible.* On the sloping muddy shore species of *Potamides*, *Assiminia*, *Amphibola*, *Plecotrema*, *Haminea*, *Stenothyra*; *Arca granosa*, *Nassa planicostata*, and *Columbella Duclosiana* are to be met with. On the stems of the *Nipa* and on the mangrove bushes *Neritina crepidularia* and *N. cornucopia*, *Littorina melanostoma* and *L. scabra* are found in abundance.

I have only included in the present list those shells from the Bassein river which are found above Negrais Island, for the reasons already stated. I regret that the list is not more perfect, and that I am obliged to leave a few specimens undetermined. On the other hand the majority have been carefully compared, and the names quoted may, I think, in most cases, be relied upon. Immediately after leaving Pegu, I was in England for a few months; and owing to the kindness of the late Mr. S. P. Woodward, of Mr. Arthur Adams, and especially of the late Mr. Hugh Cuming, who allowed me to compare my shells with the original types in his unrivalled cabinet, I was enabled to determine, not merely my estuary collections, but also a much more numerous series of marine species from the Arakan coast, in a manner which would have been simply impossible in India.

Unfortunately, during the years which have elapsed since these shells were compared, a few have been mislaid or lost during constant travelling in various parts of India. Still I hope that this list may have some value as a contribution to our knowledge both of the geographical distribution and of the habitats of mollusca. Several of the species named, and some of the genera have, so far as I am aware, never before

* So great is the height of the trees fringing the upper creeks, and so completely do they shut out all the surrounding country, that I was working amongst them for several days in ignorance of the existence of hills nearly 1000 feet high within 15 or 20 miles of me.

been shown to inhabit the estuaries of India or Burma. Our estuary lists have hitherto been almost as imperfect as our catalogues of marine species; almost all that is known of the molluscan inhabitants of our deltas being due to the labours of Mr. Benson, who has described many of the forms found in the Ganges.

It is, of course, highly improbable that the present list is nearly complete. Only a very small portion of the Irawadi delta was examined, and that imperfectly. Still the number of species is considerable, and probably includes all those which are most abundant. A few forms since found by Mr. Theobald and Mr. Fedden will be noted in their place.

The classification employed is mainly that of Messrs. H. and A. Adams, in the Genera of Recent Mollusca. I have not, however, followed those authors in employing the obscure and forgotten generic terms of Klein, Montfort and others. I have only deviated from their arrangement in one essential particular, viz., the transfer of *Assiminia* from the vicinity of *Helix*, from which it differs in every point of structure, to that of *Littorina*, to which it is closely allied. If it be objected that *Assiminia* is as closely related to *Cyclostoma* as it is to *Littorina*, I can only suggest that *Cyclostoma* be also-relegated to the same position in the neighbourhood of *Littorina*.

Class GASTEROPODA.

Sub-class PROSOBRANCHIATA.

Family BUCCINIDÆ.

No. 1, *Nassa planicostata*, A. Adams.

Estuary of the Bassein river, creeping upon mud between tidemarks. Scarce.

No. 2, *Purpura bitubercularis*, Lam.

Not common. Found in the lower part of the delta, with the next species.

Family MITRIDÆ.

No. 3, *Columbella Ducloziana*, Sow.

Found in abundance at one spot in the estuary of the Bassein river, amongst stones with mud. The specimens were unusually fine. I also met with this shell on the mud flats of Ramri Island, coast of Arakan.

Family SCALARIADÆ (*Scalida*, H. and A. Adams.)

No. 4, *Scalaria*, sp.

A minute species, apparently new. As I possess but a solitary specimen, which is not in the best possible order, I hesitate to describe it. It is one of the smallest forms known, measuring only 3 millimetres in length. It was found under stones in the Myittaya creek.

Family CERITHIIDÆ.

No. 5, *Cerithium* (*Vertagus*) *obeliscus*, Born.

A single specimen was found at Port Dalhousie.

No. 6, *Potamides* (*Tympanotonos*) *alatus*, Phil.

No. 7, *Potamides* (*Tympanotonos*) *euriptera*, A. Ad.

Both this and the last species are met with abundantly on mud between tide marks, not far from the sea. They also occur on the sea coast where it is muddy.

No. 8, *Potamides* (*Telescopium*) *fuscus*, Chemn.

Common on mud between tidemarks, where the water is completely salt.

Besides the above, a species of *Cerithidea* has been found by Mr. Theobald in the estuaries of Burma. I did not meet with it.

Family LITTORINIDÆ.

No. 9, *Littorina melanostoma*, Gray.

Very abundant upon "mangrove" trees, close to high water mark.

No. 10, *L. scabra*, L.

Occurs with the last, which appears to pass into it. Two varieties of this form occur, one more coarsely sculptured and more stoutly keeled than the other.

No. 11, *L. zic-zac*, Chemn.

Syn. *L. undulata*, Gray.

This species is frequently found on the sea coast, especially near mouths of rivers. In the estuary of the Bassein river, it occurs together with true estuarine forms. It is met with on stones and dead wood, close to high water mark.

Family ASSIMINIIDÆ.

No. 12, *Assiminia rubella*, W. Blanf. pl. II. fig. 11. 12.

A small roundly ovate, dull red species, which occurs abundantly

near Port Dalhousie, on mud between tidemarks. It is a characteristic *Assiminia*, though much shorter and rounder than the Bengal species *A. Francesia*, Gray, and belonging in fact to a different section of the genus. It is closely allied to some Singapore species and also to *A. marginata*, Leith, which inhabits Bombay, but may be distinguished from all by the double marginal impressed line below the suture.

The animal is deep red, with a black spot upon each of the lobes into which the proboscis is divided. The eyes are at the top of the short tentacles.

Family RISSOIDÆ.

IRAVADIA, n. g.

Testa imperforata, turrata, spiraliter costata, solida, epidermide tecta: apertura ovata, integra, antice obsolete effusa; peristomate recto, extus variciformi-incrassato, intus dilatato.

Animal? Operculum?

Shell imperforate, turritid, spirally ribbed, rather thick, covered with an epidermis. Aperture ovate, without a canal, slightly effuse in front; peristome straight, not sinuate, with an external varix, and slightly expanded within. Animal and operculum unknown.

No. 13, *Iravadia ornata*, n. sp. Pl. II. fig. 13. 14.

Testa turrata, decollata, subcylindrica, (junior elongato-conica), solida, spiraliter costata, inter costas confertim verticaliter costulata, sub epidermide olivacea vel ferruginea albida. Anfr. superst. 3-4, rotundati, superi tribus, penultimus quatuor, ultimus sex costis spiralibus ornati, hoc juxta aperturam paulo ascendente. Apertura sub-verticalis, elliptica, intus alba, (in testâ juniori postice angulata), antice subangulata et in testâ adultâ obsolete effusa, in juniori subcanaliculata; peristoma extus incrassatum, nodoso-variciforme, nodis costis spiralibus congruentibus, intus vix expansum. Operc.?

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

Shell turritid, decollated (the young shell elongately conical,) thick, spirally ridged, with close vertical costulation between the ridges, white, with a brownish or olive epidermis. Whorls apparently about 6, when perfect, but only 3 or 4 remain in all the specimens collected; body whorl with 6 spiral ribs, of which 4 only appear on the penultimate whorl, and 3 on the upper whorls, the lower ribs being concealed. On all the upper whorls the 2nd and 3rd ridges are the

strongest. Those near the suture, both above and below, are less strongly marked, and are occasionally obsolete. On the last whorl the uppermost ridge near the suture is alone fainter than the others. The body whorl ascends a little towards the aperture, which is subvertical and nearly elliptical. The anterior canaliculation is obsolete in the adult, but it is well marked in the young shell. Peristome much thickened, externally variciform, the varix being nodose in consequence of the spiral ribs of the body whorl being continuous upon it. In young specimens the lip is grooved inside, the grooves corresponding to the external ribbing, and slight remains of this grooving may be traced in the adult shell.

I had at first classed this shell as a *Rissoina* on account of the obsolete canal, although it differs in essential characters from any species of that genus. I am indebted to my friend Dr. Stoliczka for calling my attention to the great distinctions which exist between the present form and *Rissoina*, and some of which equally serve to distinguish it from *Rissoa* and all other genera of the group. *Iravadia* differs from *Rissoina* in possessing an epidermis, in having spiral sculpture, in the peristome neither being sinuate above, nor projecting below, and in the columellar margin being simply curved in front and not excavated. From *Rissoa* it is distinguished also by its epidermis and sculpture, by the obsolete channel in front of the aperture, which, in young specimens, is quite as distinct as in *Rissoina*, and by the absence of any tendency to the columellar tooth or fold, which is so conspicuous in the typical species of the genus. The characters of the sculpture, epidermis, and aperture serve equally to separate the present form from *Alvania*, *Onoba*, *Ceratia* and other genera of *Rissoidea*: *Hydrobia* and *Ammicola* alone have an epidermis, but both are smooth shells without a variciform peristome.

It is unfortunate that no specimen of the operculum has been preserved. The few shells found were collected during a hurried journey in a boat. The species was only met with at one spot, under stones, amongst some rocks in a creek leading into the Myittaya, a branch of the Bassein river. Several specimens were obtained, but when an opportunity was afforded of examining them at leisure, the opercula had disappeared. In the absence of the operculum, I should be disposed to consider the genus as more nearly allied to *Rissoina* than to

any other, and such naturalists as may refuse generic rank to *Iravadia*, may perhaps best class it as a subgenus or section of that genus. It may have affinities with a curious species from Peru (*Rissoina sulcifera*, Trosc.) figured by Schwarz von Mohrenstern in his monograph of *Rissoina* in the Denksch. k. k. Akad. Wien, xix, 182, Taf. 10, fig. 83, and the differences between which and all other *Rissoinae* are pointed out by that author.

The curious little shell dredged by Mr. A. Adams in the seas of Japan and described by him as *Vanesia sulcatina* in the Annals and Magazine of Natural History for 1861, Ser. 3, vol. viii, p. 242, may also possibly have some affinities with *Iravadia*.

No. 14, *Stenothyra monilifera*, Bens. Pl. II, fig. 15.

I found two specimens of this species at Port Dalhousie in the Bassein river. The type was first obtained by Mr. Theobald at Mergui and Rangoon, and the shell has since been found in Cochin China. As the species does not appear to have been figured, I add an illustration of it.

Family NERITINIDÆ.

No. 15, *Neritina Peguensis*, n. sp. Pl. I, fig. 1—16.

Testa globosa, oblique ovalis, solida, confertim oblique subsinuata rugata, interdum spinigera, epidermide fusco-olivacea, minute flavo-punctulata, aliquando maculis oblongis subcurvatis flavis infra suturam ornata, vel fasciis subobsoletis spiralibus circumdata, induta, sub epidermide caerulea vel rubella, albido-maculata. Spira vix exserta, plerumque erosa, sutura elevato-compressa. Anfr. circa 3, superi planulato-concavi, ultimus superne ad suturam appressus, supra peripheriam aut carinatus, spinisque distantibus munitus, vel obsolete angulatus, subtus rotundatus. Apertura intus lactea; peristoma semiovale, area columellari planulata, luteola v. sordide albidâ, minute denticulata, plicâ unâ majori intrante supramediâ munitâ, antice edentata. Operc. extus planum, albidum, margine externâ nigra, intus rubrum.

Maj. diam. 19, min. 15, alt. 19 mill. Hab. in rivulo ad Promontorium Negrais.

Var. minor testâ magis rotundata, spinis omnino carentibus, fig. 13—16. Maj. diam. 14, min. 11, alt. 15 mill.

Hab. ad Portum Dalhousie.

Shell globose, obliquely oval, solid, closely obliquely and rather sinuously wrinkled, sometimes bearing spines, covered with a dark epidermis. Colour generally dark olive with minute yellow specks, occasionally with oblong splashes of yellow below the suture; these generally curve backwards, and are sometimes, but rarely, of large size. Some shells are surrounded more or less obsoletely with yellow bands. Beneath the epidermis the shell is pink or bluish spotted with white. Young specimens are frequently pink, with yellow specks, in front of each of which is a black streak like a shadow. The spire is barely exerted, apex obtuse, and generally eroded, the erosion extending frequently down the spire, and often a portion of the outer surface of the last whorl itself is wanting; suture raised, compressed. Whorls 3, the upper ones frequently wanting, but when present, flattened or sub-concave. Last whorl concave and compressed against the suture above, then either carinate above the periphery and bearing short subdistant spines, or else obtusely, more or less obsoletely angulate. Below it is always rounded. Aperture milky within, peristome semioval, columellar area flat, yellow or dirty white, minutely denticulate, except in front, and having a prominent re-entering tooth just above the middle. Operculum pinkish white outside, exterior margin black, red inside.

The nearest ally to this form with which I am acquainted in *N. obscurata*, Recluz, which has a more expanded mouth, and more deeply emarginate columellar area, the whorls appear also rather differently shaped above.

The present species is eminently variable. The type occurred in abundance close to the beach in a small stream which descends from the hills close to Cape Negrais; specimens were especially abundant in a brackish pool at the beach, spinous and spineless shells occurred mixed together, and the presence or absence of spines is evidently of no importance. The spineless variety from Port Dalhousie was found in the salt water of the Bassein river, abounding along the strand between tide marks.

To illustrate the variation of this species, several specimens have been figured.

Specimens collected by Mr. Theobald in Arakan illustrate the gradual passage, by absolutely insensible gradations, of this form, into the very distinct *N. retifera*, Bens. of the Ganges delta.

No. 16, *Neritina obtusa*, Benson.

Scarce. I obtained two specimens on limestone rock at Thaman-dewa in the Bassein river.

No. 17, *Neritina Smithii* Gray.

Less common than in the estuary of the Ganges.

I have another species of *Neritina* belonging to the typical section from the estuary of a small stream running into the sea just north of Cape Negrais. I have been unable to identify it with any known species, and it may possibly be new.*

No. 18, *Neritina (Dostia) depressa*, Benson, pl. I, fig. 17, 18, 19.

There are specimens of this shell amongst my Irawaddy collections: I think they are from Rangoon. The species is generally found in fresh or slightly brackish water, while *Neritina crepidularia* and *N. cornucopia* are chiefly met with nearer the sea, where the water is more salt. In Bombay Island, however, I have met with *N. depressa* on the sea shore.

No., 19, *Neritina (Dostia) crepidularia*, Less. Pl. I. fig. 20, 21, 22.

This shell and the next are found rather abundantly upon trees growing in places covered by water at each tide, and especially upon *Nipa* palms. *N. crepidularia* frequently occurs upon the sea shore, as well as in estuaries.

No. 20, *Neritina (Dostia) cornucopia*, Benson, pl. I, fig. 23, 24, 25.

Locally abundant. The shells found by me in Pegu differ slightly from the type, which is scarce in the Hoogly at Calcutta. In the latter, the apex of the shell is very nearly in the same plane as the edge of the peristome, sometimes actually so and touching it. In Pegu specimens, the peristome is free from the apex. The difference is very trifling, and there is slight variation in this character in specimens from the same river. In other respects, the shells appear to agree excellently.

I learned from Mr. Benson some years since that *Neritina melanostoma*, Troschel, is identical with *N. cornucopia*, the latter name having priority.† The figures of the former in Philippi's *Abbildungen*

* Further examination shows it to be one of the forms already referred to as intermediate between *N. Peguensis* and *N. retifera*, B. It is smooth like the latter.

† *N. melanostoma* was published in Wiegman's *Archiv* for 1837, p. 179; *N. cornucopia* was described by Mr. Benson in this *Journal* for 1836. Vol. V. p. 748.

are poor, but the specimens were from Bengal, and they present no essential difference from immature shells of *cornucopia*, so Mr. Benson is doubtless correct. Reeve in *Conch. Icon.* quotes *N. melanostoma* as a synonym of *N. crepidularia* and ignores *N. cornucopia* altogether. Von Martens (*Malakoz. Blätter*, 1863, X, 127.) shews that the colour of the columella and lip is sometimes white and sometimes black in several *Neritinae* of the *Dostia* section.

The fact very probably is, that we have in this case an example of a phenomenon not uncommon in the animal kingdom. Two distinct races spring up side by side, arising from one type, and in the original locality do not change their form, but although they breed truly, they are only distinguishable by some slight constant distinction. As both, however, migrate into distant regions, the difference becomes greater, and at length both become so diverse, that no question can remain as to their being in common natural history talk, "distinct species." Thus while *Neritina cornucopia* and *N. depressa*, inhabiting the Ganges delta, are scarcely distinguishable from each other by any more important character than the colour of the aperture, the same shells in Pegu have varied so much, that each differs from the other at least as much as it does from their congener *N. crepidularia*. In other places the race representing *N. cornucopia* may be perfectly undistinguishable from *N. crepidularia*, as appears to have been observed by v. Martens in Singapore. It is highly probable that the origin of species through variation takes place in space as well as in time. More observations on this question are desirable.

Figures of the three forms occurring in the Pegu delta are added.

Family PALUDINIDÆ ?

No. 21, *Larina* ? *Burmana*, n. sp. Pl. II, fig. 1.

Testa ovato-globosa, imperforata, tenuis, castanea, striatula, nitidula. Spira conoidea, apice erosula, sutura valde impressa. Anfr. 5, rotundati, sensim descendentes, ultimus tumidus, subtus rotundatus. Apertura vix obliqua, subelliptica, superne angulata; peristoma rectum, tenue, marginibus callo tenui junctis, columellari expansa. ? Operc. corneum. Long. 11, diam. 8 mill. Apertura 7½ mill. longa, 6 lata.

Shell ovately globose, imperforate, thin, translucent, smooth, brownish, horny. Spire conoidal, apex eroded, suture deep. Whorls 5 (perhaps more in adult specimens), rounded, obsoletely striated, regu-

larly descending, the last tumid, rounded beneath. Aperture nearly vertical, subelliptical, angulate above. Peristome thin, straight, margins united by thin callus, columellar margin narrowly expanded.

The operculum of this peculiar species was unfortunately lost, and the animal was not observed. In the hurry of travelling, the specimens were placed in a box and forgotten, until the fleshy portions were too much decayed for examination. About half a dozen individuals were found under stones in the Myittaya creek, in the same place which yielded *Iravadia ornata* and other forms.

Mr. A. Adams, who very kindly aided me in determining some of the species contained in my Pegu collections, suggested that this shell might possibly be a second species of the genus *Larina*, established by him for an Australian shell, the animal of which also is unknown. In appearance this shell somewhat resembles a *Lymnea*. It is not impossible that it may have affinities with *Amphibola*. I have a distinct impression that the shells possessed a horny operculum, or I should have been disposed to class them in the *Velutinidæ*.

Family TECTURIDÆ.

No. 22, *Tectura fluviatilis*, n. sp. Pl. II, fig. 2, 3, 4.

Testa depresso-conica, rotundato-ovalis, tenuis, epidermide fusco-olivacea induta, lineis radiantibus, strisque confertis minutis concentricis decussata, intus cæruleo albida, interdum fasciâ concentricâ lacteâ, vel etiam omnino hoc colore versus marginem saturata, ad apicem ferruginea. Apex subcentralis, erosa.

Major diam. $21\frac{1}{2}$ min. 20 alt. 6

„ 20 „ 17 „ $5\frac{1}{2}$

„ 14 „ 12 „ 4

Shell much depressed, conical, subcircularly oval, thin, covered with a very dark olive epidermis, always eroded at the apex, marked with fine radiating raised lines and with close and minute concentric striae of growth; inside the shell is bluish white, sometimes with one or more milky concentric bands, or the whole interior is milky, except the apex which is invariably ferruginous, the area so coloured having some correspondence to the amount of external erosion, and the colour being evidently due to a deposition of shell inside to protect the animal as the external portion is corroded away.

This species is found on rocks, rarely on trunks of trees, in many of

the creeks near high water mark, in brackish water. It was not met with near the sea, where the water was very salt.

The foot is large, filling the cavity of the shell, muzzle broad, tentacles long and fine, mouth not notched beneath. It does not appear to keep to one place and form a hole for itself like some *Patella*, but it is very sluggish in its movements.

Sub-class OPISTHOBRANCHIATA.

* Family BULLIDÆ.

No. 23, *Haminea tenera*, A. Ad.

Not common. In Bombay this species abounds upon mud flats. The animal is red.

Sub-class PULMONIFERA.

Family AURICULIDÆ.

No. 24, *Auricula Judæ*, L.

This species is completely blind, as has been noticed by von Martens (Ueber die Landschnecken der Molukken, Malakoz. Blätter; 1863, X. 126) and as is shewn in Eydoux's drawing copied in Mrs. Gray's mollusca. The same is the case with all other species of the same group which I have examined. In some instances, e. g. the Bombay species, which has received, I believe, a MS. name from Mr. Benson, the eyes may be detected beneath the skin by looking very carefully. (Von Martens observed this in one instance in *A. Judæ*.) Such eyes can, however, be of but little use as percipient points to the animals. There is, however, one group of true *Auriculæ*, typified by *A. subula*, Quoy and Gaimard, in which the eyes are normally developed, the same as in *Melampus*, *Cassidula*, and other *Auriculidæ*. A small species of this type inhabits Bombay. The forms belonging to this sub-division appear also distinguished by a more elevated spire. Further observations are, however, necessary before a division of the genus can be proposed on these grounds, as there appears great probability that the two forms pass into each other.

I found specimens of *A. Judæ* alive under the bark of dead trees, on muddy banks of creeks, in places overflowed by the tide. Unquestionably, so far as my experience goes, none of the Eastern *Auriculidæ* (*Auricula*, *Cassidula*, *Melampus*, *Pythia*, *Plecotrema*) are land shells, all are met with in places overflowed by salt or brackish water at every tide. They are in fact true estuary shells.

Some of the specimens of this species collected by me shew an almost complete passage into *A. dactylus* Pfeiffer, as described and figured in *Novitates Conchologicae* I, 15, pl. V. fig. 15. 16. This species is stated by Mr. Theobald to be found at Mergui (J. A. S. B. for 1857, xxvi. 253.)

No. 25, *Auricula nitidula*, n. sp. Pl. II. fig. 5, 6.

Testa non rimata, subfusiformi oblonga, solida, nitidula, sub epidermide olivacea alba, lineis impressis confertis verticalibus minutissime rugata, aliis spiralibus granulato-decussata, sculpturâ infra suturam magis impressâ. Spira conoidea, apice eroso, sutura impressa. Anfr. 5 convexi, ultimus vix descendens, $\frac{2}{3}$ longitudinis subæquans, basi rotundatus. Apertura verticalis, plicæ parietales 2, supera parva, profunda, alia obliqua, plica columellaris haud valida, diagonalis: perist. crassum, marginibus callo tenui junctis, dextro superne vix sinuato, intus callo elevato incrassato.

Long. 28, diam. 12 $\frac{1}{2}$ mill. Apertura c. perist. 19 mill. longa, intus 5 lata.

Shell not rimate, subfusiformly oblong, solid, smooth, having a greasy lustre, white, epidermis olive, covered with minute granulations produced by the intersection of vertical and spiral impressed lines, both very close and the former sinuous, the sculpture being most strongly marked below the suture. Spire conoidal, apex eroded, suture impressed. Whorls 5 convex, the last nearly $\frac{2}{3}$ of the whole length, scarcely descending, rounded at the base. Aperture vertical with 2 parietal plicæ, the upper one small, far inside; the lower strong, oblique; columellar plica moderate in size, diagonal; the peristome thick, the margins united by a thin callus which is somewhat expanded upon the penultimate whorl, the right margin scarcely sinuate above, and thickened inside.

This species which is found very rarely with the last, exactly resembles it in general form, but has rounded whorls and finer sculpture, besides being of much smaller size. The animal is white, while that of *A. Judæ* is mottled. *A. nitidula* somewhat resembles *A. Chinensis* Pfr. which, however, is much less attenuate below, and differs in the form of the aperture, &c.

But two or three specimens of this form were met with. In Mr. Theobald's lists of Burmese shells, *A. glans*, Bens. is mentioned. I can

find no description of this species, and cannot therefore say if it be the present form or not.

No. 26, *Plecotrema Cumingiana*, n. sp. Pl. II. fig. 16.

Testa subrimata, subelliptico-ovata, solida, punctis impressis crebris, lineas spirales confertas formantibus, striisque incrementi obliquis ornata, ferrugineo-fusca. Spira conoidea, lateribus vix convexiusculis, apice erosa, sutura lævi lineari. Anfr. 4 superst., superi planulati, vix discreti, sulcis spiralibus punctatis 4 notati, ultimus ad peripheriam subangulatus, subtus compressiusculus. Apertura vix obliqua, plicis parietalibus 2, superiori brevi obliqua, alterâ intrante, extus bifidâ, plicâ columellari subobliquâ; peristoma rectum, pone limbum acutum intus callosum, margine dextro tridentato.

Long. 5, diam. 3 mill. Apert. 3 $\frac{1}{4}$ mill. longa.

Shell subrimate, subelliptically ovate, solid, marked with close spiral lines, formed of thickly set punctiform impressions, and with oblique striae of growth; reddish brown in colour. Spire conoidal, the sides barely convex, apex eroded, suture flat. Whorls 4 remaining, the upper flat, scarcely distinguishable, marked with 4 spiral dotted lines, the last whorl subangulate at the periphery, somewhat compressed below. Aperture very slightly oblique, with two parietal folds, the upper short, oblique, the lower re-entering, externally bifid, the columellar fold sub-oblique; peristome straight, margin sharp, but inside the sharp edge thickened and bearing 3 teeth within the right margin.

This species was rather scarce, crawling on mud in company with *Assimineæ rubella*. It is distinguished from its allies, *P. striata*, Philippi, and *P. punctostriata*, H. and A. Adams, by its low spire and minute sculpture. In naming it after the late Mr. Hugh Cuming, I adopt the only means in my power of acknowledging my obligations to that gentleman for the very liberal manner in which he allowed me access to his collections, for the purpose of comparing and identifying my Pegu shells.

Besides the above *Auriculidæ*, I have received a *Pythia* which appears to be a variety of *P. trigona*, Troschel, from Mr. Theobald and Mr. Fedden, who both met with it on the Arakan coast, not far north of Cape Negrais. It is singular that I did not meet with species of either *Cassidula* or *Melampus*, as I have reason to believe that both inhabit the Irawadi delta or its immediate vicinity. Mr. Theobald has sent me *Cassidula aurisfelis*, Brug. from Arakan.

Family AMPHIBOLIDÆ.

No. 27, *Amphibola Burmana*, n. sp. Pl. II, fig. 7—10.

Testa aperte umbilicata, naticoides, tenuiuscula, castanea, periomphalo plerumque saturatori, nitidula, subsinuate striatula, infra suturam dense peroblique striata, lined una elevata spirali, interdum obsoleta, superne haud procul a sutura signata. Spira conoidea, apice vix obtusa, sutura profunda. Anfr. 4 rotundati, ultimus tumidus. Apertura ovata, superne recte angulata; peristoma vix interruptum, breviter adnatum, tenue, marginibus approximatis, callo tenui junctis, dextrali superne sinuata, basali recta, columellari breviter reflexo, umbilicum partim tegente. Operculum corneum, paucispirale, nucleo basali, sinistro.

Alt. 10, diam. $9\frac{1}{2}$ mill., apertura $7\frac{1}{2}$ longa, $5\frac{1}{2}$ lata.

Shell openly umbilicated, naticoid, rather thin, orange-brown, darker around the umbilicus, smooth, marked with subsinuate lines of growth, closely and very obliquely striated just below the suture, with a single raised spiral line, which is sometimes obsolete, on the upper portion of each whorl. Spire conoidal, apex subacute, suture deep. Whorls 4, rounded, the last swollen. Aperture ovate, rectangular above; peristome scarcely interrupted, free, except for a very short distance, from the last whorl, thin, margins closely approximate, united by thin callus, right margin rather deeply sinuate above, basal straight, columellar turned back near the umbilicus, which it partly conceals. Operculum horny, paucispiral, nucleus basal, sinistral.

This is, I believe, the first instance in which the presence of *Amphibola* has been indicated in the Indian or Burmese seas or estuaries; nevertheless, it is very common. I found, in Mr. Cuming's collection, specimens of the same form as that above described, which were collected in Malacca by Dr. Traill, and a smaller form, scarcely separable as a race from the above, abounds in Bombay harbour.

The present species is nearly allied to *A. fragilis*, Quoy and Gaimard, but is thinner, with a lower spire. It was found abundantly crawling on mud, between tidemarks, in company with *Assimineia rubella* and *Plecotrema Cumingiana*. The animal was difficult to make out, as it consisted of an indistinct translucent mass. There were no tentacles, and the eyes were on very short lobate pedicels. The animal differs considerably from the figure of that of *Amp. fragilis*, as copied from Quoy and Gaimard by both Adams and Mrs. Gray.

Class CONCHIFERA.

Family PHOLADIDÆ.

No. 28, *Martesia fluminalis*, n. sp. Pl. III, fig. 1, 2, 3.

Testa ovata-conica, valde inæquilateralis, antice hemispherica, postice sensim acuminata, extremitate membranacea, albida, tenuis. Valvæ versus margines epidermide crassa, coriacea induta, pagina antica juxta cardinem costulis confertissimis, sinuatis, concentricis, lineisque radiatis elevatis decussantibus pulchre ornata, subtus glabra, postica concentricè striata. Callum trilobato-peltatum, medio divisum. Valvula dorsalis rudimentaria, cornea.

Lat. $12\frac{1}{2}$, long. 6, alt. $5\frac{1}{2}$ mill.

Shell ovately conical, white, thin, inequilateral, anterior extremity hemispherical, posterior regularly acuminate and membranaceous at the extreme end. Valves near the edges covered with a thick coriaceous epidermis, which in places, and especially towards the posterior extremity, extends beyond the margin and forms a membranaceous fringe, uniting the valves more or less. Each valve is divided into two parts by a line passing obliquely from the hinge to the ventral margin and inclined slightly backwards; in front of this line the shell near the hinge is decussated with very close sinuate concentric and subdistant radiating costulation; near the ventral margin it is smooth. Behind the oblique line the valves are concentrically striated, more or less indistinctly. The callus covering the hinges is trilobate and divided by a fissure in the centre; dorsal valve rudimentary, horny, commencing at some distance from the hinge, increasing in breadth backwards, but very narrow throughout.

This species appears most nearly allied to *M. rivicola*, Sow., which was found perforating floating logs in a river in Borneo. The present species is blunter and shorter, and *M. rivicola* is destitute of the sculpture on the anterior portion of the valves.

M. fluminalis was found boring in soft argillaceous sandstone, in creeks far from the sea, where the water was brackish. The external orifice in the stone is very minute, and must have been made by the shell when very young. Inside, the burrow exactly fits the shell, so that the only possible motion is rotation upon the longest axis of the shell.

The epidermis appears normally to cover the posterior subdivision of the valves, but it is always deficient, except towards the margins.

No. 29, *Teredo* ? sp.

All the dead trees in creeks in the Irawady delta are perforated throughout by a species of *Teredo* (?). I either omitted to take specimens, or else have lost them since, and I can now find none to which to refer. It is possible that this shell may be the *Teredo thoracites* of Dr. Gould,* described in Vol. VI, of the Proceedings Boston Society of Natural History, and on which he subsequently, in Vol. VIII, proposed to found the subgenus *Calobates*, characterized by the "pallettes" (stylets) being "stilt shaped, bony." Dr. Gould's specimens were from Tavoy, but he does not mention if they were fluviatile or marine.

Family CORBULIDÆ.

No. 30, *Sphenia perversa*, n. sp. Pl. III. fig. 4, 5, 6.

Testa oblongo-ovata, parum inæquivalvis, valvâ dextrâ majori, tenuiuscula, alba, concentricè irregulariter striatâ, antice rotundata, postice acuminata, demum transverse truncata, ad extremitatem epidermide coriacea, rugatâ induta; margo dorsalis subrecta, ventralis antice convexa, postice vix concavâ. Processus cardinalis valvæ sinistræ (non dextræ) elongato-lamelliformis.

Lat. 11, long. 6, alt. 4 mill.

Shell oblong, slightly inequivalve, broadest at the umbo, somewhat acuminate posteriorly, and very much more so in young specimens; thin, white, irregularly striated, the posterior end covered with a thick coriaceous epidermis which is vertically furrowed. In the young shell the epidermis covers all the shell except the beaks; it is thin except along the dorsal and posterior margins, where it is thick and vertically sulcated. The dorsal margin is nearly straight, the ventral rounded in front and slightly concave behind in old shells, straight or nearly so in young specimens. There is a lamelliform process in the hinge of the *left valve*, in front of the cartilage.

This shell was met with in burrows in stone, apparently the holes of *Martesia* which had perished, at least they did not appear to have been formed by the present species. It was met with at a considerable distance from the sea, in company with *Martesia fluminalis*.

In every respect, except the position of the lamellar tooth in the hinge of the left valve instead of the right, the shell appears to be a true

* *Otia Conchologica* pp. 222, 241.

Sphenia. I scarcely think that the exceptional character justifies the creation of a new genus, as the characters of the animal unfortunately were not noted. The practice of establishing genera for single species on insufficient grounds is so objectionable, that it will be better to err in the opposite direction. When the animal has been examined, should it shew distinctions from *Sphenia*, it will be easy to propose a new generic or subgeneric appellation.

No. 31, *Corbula*, sp.

A single valve of a very thin species of *Corbula* was found on mud above Port Dalhousie.

Family TELLINIDÆ.

No. 32, *Sanguinolaria diphos*, L.

This shell lives at a depth of about 4 feet in the mud. I found it abundantly in a marsh overflowed by every tide and where I should never have suspected its existence, had not my Burmese coolies pointed it out and shewn me how to capture specimens. Burmese, being omnivorous beings, are far better acquainted with the hiding places of various animals than the natives of India are; amongst other dainties they eat *Sanguinolariæ*, and the process for catching them which they shewed me was ingenious. The first thing was to cut a very thin slip of bamboo, about 5 feet long and not more than $\frac{1}{2}$ inch in diameter, and to make a small barb at the end. This they thrust down all the small holes in the mud, many of which corresponded to the siphons of the *Sanguinolariæ* below. Now and then the bamboo went through a *Sanguinolaria*, as he lay vertically with his valves open below the mud; of course the bivalve immediately closed his valves upon the intruder, and was ignominiously dragged out by the bamboo, his exit being aided by digging when he approached the surface. The only objection to the plan is, that most of the specimens are slightly injured, as the shell closes with such force upon the bamboo as to break the thin ends of the valves. Some specimens were brought up in which the bamboo had been absolutely thrust down the siphon, thus literally impaling the *Sanguinolaria*. The siphons are of great length, considerably exceeding the shell.

No. 33, *Macoma ala*, Hanley.No. 34, *Scrobicularia angulata*, Chem.

I find both the above shells recorded in my list. I cannot now come

across the specimens, and I am under the impression that they were found dead in salt water marshes on the Arakan coast, and not in the delta, but they are both so common in all Indian estuaries, that it is equally probable that I found them in the Bassein river.

Family VENERIDÆ.

No. 35, *Chione Ceylonensis*, Sow.

I have mislaid my notes as to the exact locality of this species also. I think it was found at Dalhousie. In a backwater on the Arakan coast, I found an allied, but undescribed species of the same genus.

No. 36, *Artemis*, sp.

Of this I have a single immature specimen. It may be the young of *A. excisa*, Chem. but has not the sculpture of that species, nor its angulate posterior slope.

Family CYRENIDÆ.

No. 37, *Cyrena Bengalensis*, Lam.

Mangrove and other salt water swamps along the edges of creeks, amongst roots of trees and brushwood, common.

I am inclined to refer the shells I obtained to the above form, of which I suspect some others since described are merely varieties. *Cyrenæ* vary greatly with age, besides being eminently variable in form. Thus some of my specimens exactly agree with *C. turgida* Desh., but I cannot help believing that they are merely immature specimens of the thicker form which I refer to *C. Bengalensis*.

Family MYTILIDÆ.

No. 38, *Mytilus smaragdinus*, Chem.

Found in creeks below low water mark. I do not think it is generally known that the flesh of this species is very delicious. Some were brought to me along with a quantity of oysters, and the Burmese told me that the mussels were the better eating of the two. Not having much faith in Burmese palates, I preserved the shells and threw away the soft parts of the *Mytili*; but as a trial, I had two or three cooked with the oysters. I found that the Burmese were quite right, though the oysters were by no means unpalatable.

No. 39, *Modiola emarginata*, Bens.

A dwarf variety of this species occurs in salt water creeks.

Family ARCIDÆ.

No. 40, *Arca (Anomalocardia) granosa*, L.

This very common species was only found at one spot in the Bassein river. It was living in mud close to the surface, under stones and

roots of plants. The same species abounds in mud, amongst stones, in Bombay harbour, and is collected for food by the natives.

No. 41, *Scaphula deltæ*, n. sp. Pl. III., fig. 7-10.

Testa tumida, perelongato-rhomboidea, sub epidermide crassa, fusca, posticè radiatim lirata albida, lineis minutis elevatis confertissimis decussata, ante carinam costâ unicâ latâ, planulatâ, aliquando obsoletâ, a natibus ad marginem decurrente, munita, intus cærulescens, antice rotundata, posticè oblique truncata, margine ventrali antice convexâ, posticè vix concaviusculâ (testæ junioris rectâ). Carina perelevata, acuta, valvas in paginas duas dividens, anticâ tumidâ, posticâ concavâ. Area nitida, sub lente striatula, ligamento rhombeo solum antice induta. Dentes cardinales postici breves, obliqui, ab extremitate remotiusculi.

Lat. 10 long 3½ alt. 6½.

„ 8 „ 3 „ 5.

Shell very tumid, elongately rhomboidal, (the ventral and dorsal margins being parallel as in *S. celox*) covered with a thick, dark epidermis, which is rather rough and radiately ribbed behind the keel. Beneath the epidermis the shell is white, and decussately very minutely sculptured, one flat broad rib, scarcely raised, and occasionally obsolete in old specimens, passing from the umbones to the margin just in front of the keel. This is scarcely distinguishable until the epidermis is removed. The valves are bluish within, rounded in front, obliquely truncated at the posterior margin; the ventral margin is convex anteriorly, subconcave posteriorly, being straight for the greater part of its course in young shells, but becoming slightly concave, at the spot where the byssus passes out, in old specimens. The keel is very high and sharp, separating the valves into two subdivisions, the anterior of which is tumid, the posterior concave. The area is polished and striated rather obliquely, the ligament diamond-shaped and covering only the anterior portion, about $\frac{1}{3}$ to $\frac{1}{2}$ the length, of the area. The hinge teeth are oblique, but less so than in either *S. celox* or *S. pinna*, and the posterior teeth are much farther from the extremity of the shell than in either of those species.

The great distinction between this species and the other two previously described is in the far greater tumidity of the valves, which are nearly twice as broad in their diameter from side to side (of the closed valves) as they are from the dorsal to the ventral margin. The proportion of the two diameters in the present species averages

about 12 : 7. In *S. celox* it is 12 : 10½ and in *S. pinna* 12 : 9½.* The last named species is of a totally distinct form, being much wider posteriorly than in front, so that it is sub-trigonal in shape instead of rhomboidal. Its posterior hinge teeth, also, are near the extremity, and so oblique as to be almost parallel to the hinge line, while in its smooth, thin epidermis, marked concentric sculpture, and convex posterior subdivision of the valves, it differs widely from *S. deltae*. The ligament of *S. pinna* covers a greater proportion of the length of the area, (about ¾,) than does that of *S. deltae*. It is much narrower in proportion to its length, as is indeed the entire area, corresponding to the smaller tumidity of the valves. *S. celox* approaches more nearly to the present species, but is thinner and much less tumid, has its posterior hinge teeth more oblique and nearer to the extremity, and differs widely in sculpture.

S. deltae was found under stones in creeks, adhering by a byssus. It was not met with near the sea. It is the first species of the genus that has been found in brackish water, both of the forms described by Mr. Benson being from large rivers far above the influence of the tide.

Mr. Benson mentions the occasional occurrence of a raised rib in front of the keel in *S. celox*. I have several specimens, which I received from Mr. Theobald, shewing this peculiarity. It differs entirely from the flattened subobsolete rib of *S. deltae*.

Figures of all 3 species are added to illustrate the difference between them.

Family ANOMIAIDÆ.

No. 42, *Anomia*, sp.

The specimens of this shell have unfortunately been mislaid. I only obtained two or three specimens, and it is extremely difficult to make out the species of this genus.

No. 43, *Anomia* (*Ænigma*) *ænigmatica*, Chem.

Occasionally found adhering to stumps of trees in salt water creeks.

Family OSTREIDÆ.

No. 44, *Ostrea*, sp. (? 2 sp.)

A large form occurs in the creeks below low water mark. A smaller kind is met with between tide marks in mangrove swamps and creeks, attached to wood or stones. I unfortunately omitted to take specimens of either.

* Measured from authentic specimens of each species.

Abstract of the Results of the Hourly Meteorological Observations taken at the Surveyor General's Office, Calcutta, in the month of March 1866.

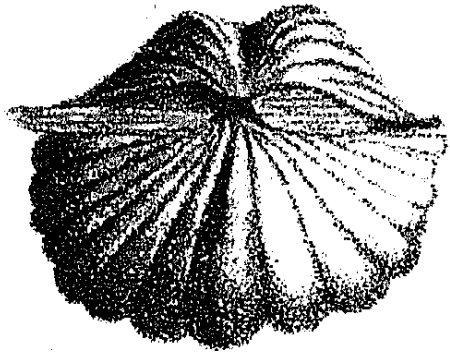
Latitude 22° 23' 1" North. Longitude 88° 20' 34" East.

Height of the Cistern of the Standard Barometer above the sea level, 18-11 feet

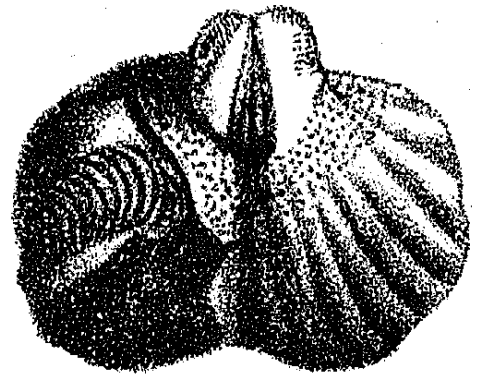
Daily Means, &c. of the Observations and of the Hygrometrical elements
dependent thereon.

| Date. | Mean Height of the Barometer at 32° Fahr. | Range of the Barometer during the day. | | | Mean Dry Bulb Thermometer. | Range of the Tempera- ture during the day. | | |
|-------|---|---|---------|---------|-------------------------------|---|------|-------|
| | | Max. | Min. | Diff. | | Max. | Min. | Diff. |
| | Inches. | Inches. | Inches. | Inches. | o | o | o | o |
| 1 | 29.789 | 29.866 | 29.740 | 0.126 | 81.4 | 93.6 | 72.8 | 20.8 |
| 2 | .821 | .898 | .748 | .150 | 82.3 | 92.8 | 74.5 | 18.3 |
| 3 | .821 | .927 | .745 | .182 | 81.4 | 91.7 | 72.4 | 19.3 |
| 4 | .756 | .818 | .678 | .140 | 81.8 | 93.6 | 72.0 | 21.6 |
| 5 | .786 | .865 | .732 | .133 | 82.4 | 94.8 | 72.4 | 22.4 |
| 6 | .816 | .892 | .757 | .135 | 81.8 | 94.0 | 71.4 | 22.6 |
| 7 | .792 | .860 | .724 | .136 | 82.6 | 94.0 | 75.4 | 18.6 |
| 8 | .793 | .876 | .719 | .157 | 83.4 | 95.2 | 72.5 | 22.7 |
| 9 | .800 | .872 | .732 | .140 | 83.8 | 95.0 | 75.4 | 19.6 |
| 10 | .784 | .859 | .719 | .140 | 83.4 | 94.4 | 76.7 | 17.7 |
| 11 | .858 | .937 | .775 | .162 | 83.6 | 92.4 | 76.8 | 15.6 |
| 12 | .977 | 30.060 | .900 | .160 | 83.4 | 92.4 | 77.4 | 15.0 |
| 13 | .967 | .056 | .872 | .184 | 83.3 | 92.2 | 77.8 | 14.4 |
| 14 | .845 | 29.945 | .764 | .181 | 86.4 | 96.4 | 77.9 | 18.5 |
| 15 | .828 | .924 | .761 | .163 | 84.3 | 94.0 | 76.6 | 17.4 |
| 16 | .871 | .952 | .812 | .140 | 84.5 | 94.0 | 79.0 | 15.0 |
| 17 | .885 | .970 | .822 | .148 | 84.0 | 94.4 | 77.0 | 17.4 |
| 18 | .820 | .899 | .750 | .149 | 83.4 | 92.9 | 77.0 | 15.9 |
| 19 | .798 | .869 | .729 | .140 | 84.5 | 95.0 | 77.6 | 17.4 |
| 20 | .842 | .921 | .779 | .142 | 84.3 | 94.0 | 76.6 | 17.4 |
| 21 | .798 | .878 | .703 | .175 | 85.5 | 96.5 | 76.8 | 19.7 |
| 22 | .717 | .803 | .619 | .184 | 86.7 | 98.6 | 77.8 | 20.8 |
| 23 | .715 | .790 | .663 | .127 | 86.4 | 98.4 | 77.8 | 20.6 |
| 24 | .751 | .838 | .684 | .154 | 84.9 | 95.3 | 77.6 | 17.7 |
| 25 | .748 | .827 | .678 | .149 | 86.4 | 96.2 | 81.0 | 15.2 |
| 26 | .700 | .769 | .626 | .143 | 87.4 | 97.4 | 80.7 | 16.7 |
| 27 | .730 | .811 | .668 | .143 | 86.1 | 95.1 | 79.5 | 15.6 |
| 28 | .812 | .914 | .743 | .171 | 84.9 | 93.2 | 76.0 | 17.2 |
| 29 | .859 | .960 | .771 | .189 | 81.9 | 91.6 | 73.8 | 17.8 |
| 30 | .855 | .927 | .775 | .152 | 81.0 | 91.0 | 72.4 | 18.6 |
| 31 | .806 | .887 | .739 | .148 | 83.7 | 93.0 | 77.0 | 16.0 |

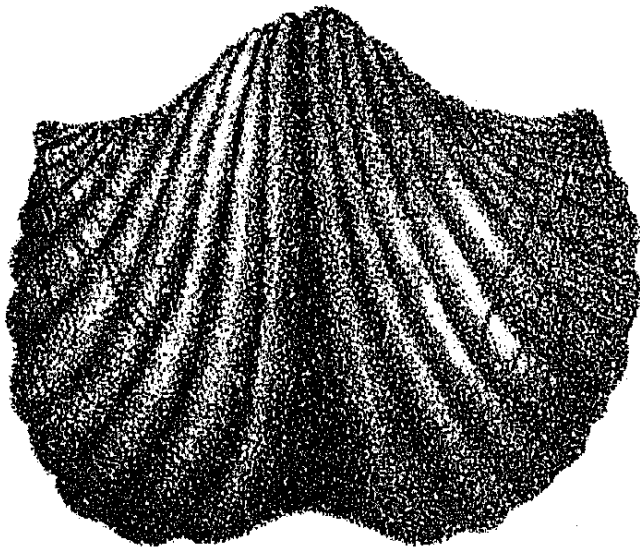
The Mean Height of the Barometer, as likewise the Dry and Wet Bulb Thermometer Means are derived, from the hourly observations, made during



1. a.



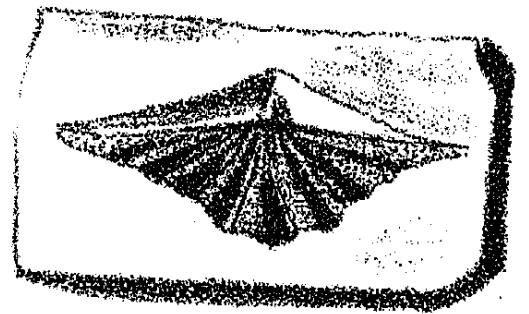
1. b.



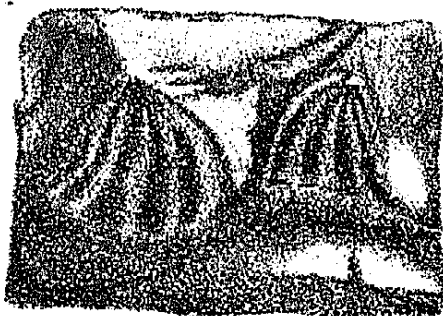
1.



2. a.



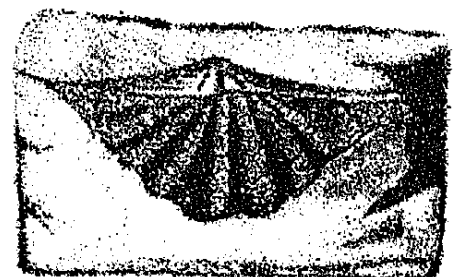
2.



2. c.



2. d.



2. b.



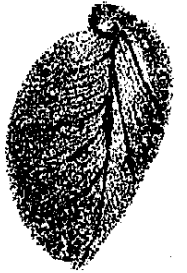
1.



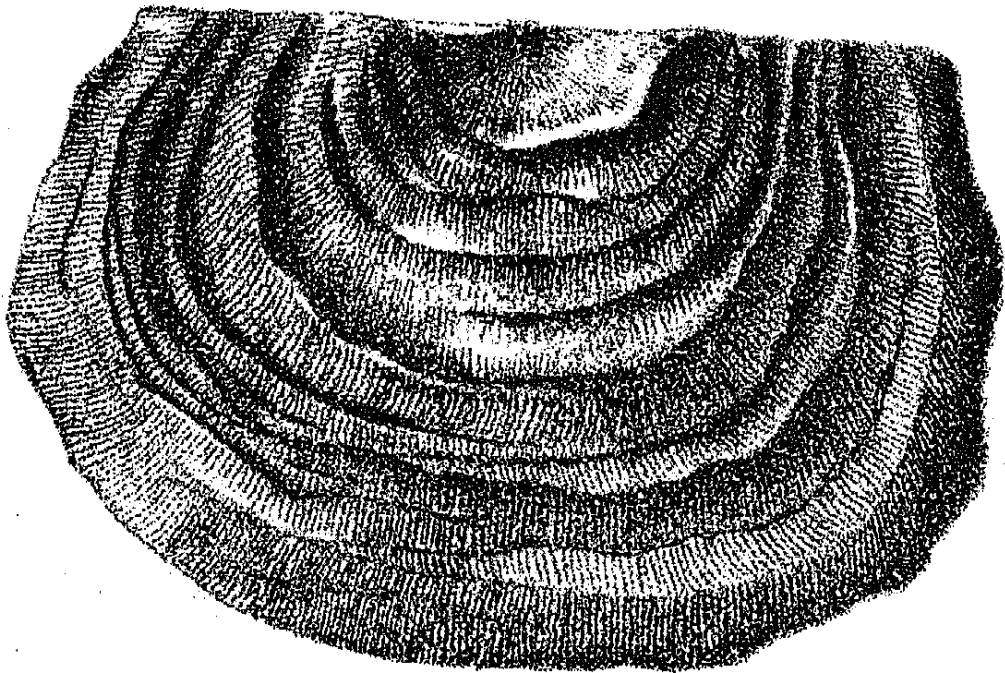
1. a.



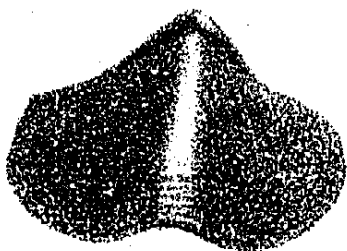
3.



3. a.



4.



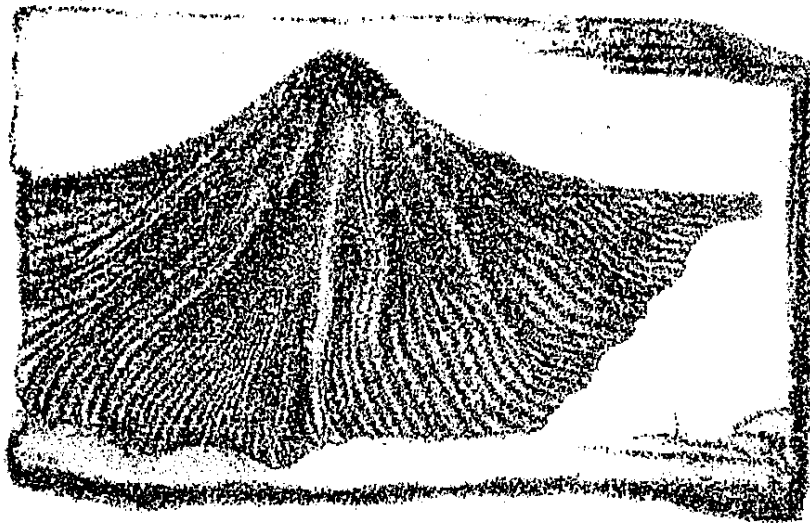
2.



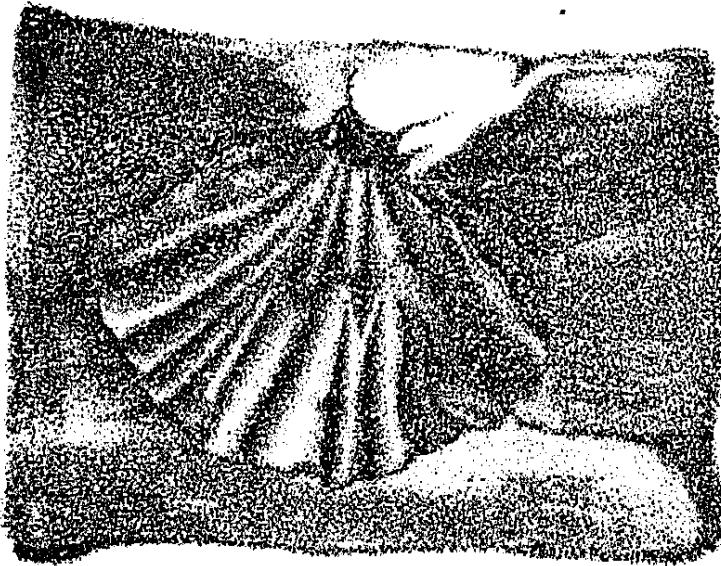
2. a.



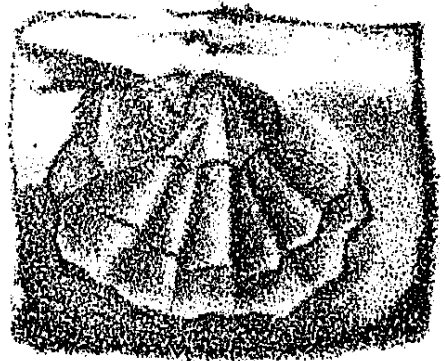
2. b.



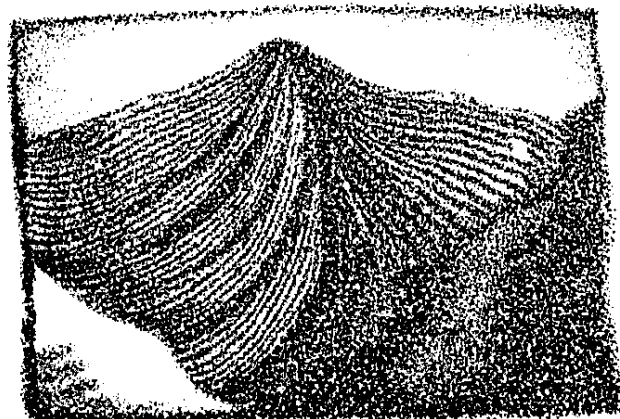
1.



2.



3.



4.

No. III.

(Published 3rd February, 1868.)

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JOURNAL

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PART II.—PHYSICAL SCIENCE.

No. I.—1867.

EXPERIMENTAL INVESTIGATIONS connected with the supply of WATER from the Hooghly to CALCUTTA, Part II, being Supplementary Observations; by DAVID WALDIE, Esq. F. C. S. &c.

[Received 28th September, 1866.]

In the preceding remarks I have directed attention to the discrepancies between my own results as to the quantity of organic matter by weight in the Hooghly water and those given in Dr. Macnamara's Report, and I have also made some pointed observations on the very doubtful accuracy and unsatisfactory nature of the results generally given by chemists respecting organic matter in waters, except some of the most recent. For though I have found that the process detailed in the previous part of my paper is older than I then supposed, having been recommended by Mr. Dugald Campbell in 1856 as suggested by Dr. Clark,* and that an analogous plan was given by Abel and Bloxam in 1854,† though imperfect, yet these plans seem either to have been little known, or neglected, or imperfectly carried out. Some analysts indeed of later date do not even attempt to estimate the amount of organic matter at all, apparently despairing of reliable results. But the process given, I believe, yields the most trustworthy results hitherto obtainable, if properly performed.

* Journ. Chem. Soc. Vol. IX. 1856, p. 51.

† Handbook of Chemistry, 1854.