

CHUSAN SHELLS.

Described by W. H. BENSON, ESQ., *Bengal Civil Service.* *Collected by* DR. T. CANTOR.*

The following memoir was written so far back as 1841, and was embodied by Dr. Cantor in his 'Descriptive Catalogue of animals collected at Chusan' drawn up by order of Government, as already explained in an editorial note which will be found at p. 624, of the last Vol. of this Journal. Dr. Cantor's report was not as intended, published at a time when the result of his observations would have excited the most interest, and what were novelties in 1841, have subsequently been described and made known, by other zoologists. Mr. Benson's memorandum, however, on the Chusan Shells is so complete in itself and so likely, notwithstanding the time which has elapsed since it was written, to prove of assistance to Indian Conchologists, that the Editor has obtained the author's permission to publish it.—ED.

INCILARIA.† Nov. gen.

Corpus elongatum, posticè attenuatum, repens, undique velo marginatum. Tentaculis quatuor, superioribus oculiferis, inferioribus integris. Foramen commune latere dextro, non procul ab extremitate anticâ veli situm.

* *List of Shells, presented to the Museum of the Asiatic Society, by* DR. CANTOR, *in 1842.*

1.—*From Chusan.*

Helix raveda, Benson.

—— *tapeina*, Benson.

—— *naninoïdes*, Benson.

Clausilia pluviatilis, Benson.

—— *aculus*, Benson.

Achatina erecta, Benson.

Planorbis papyraceus, Benson.

—— *hemisphærule*, Benson.

—— *compressus*, Hutton.

Limnaea plicatula, Benson.

—— *minor*, Benson.

Paludina quadrata, Benson.

—— *lecythoïdes*, Benson.

—— (*Bithinia*) *longicornis*, Benson.

—— (*Bithinia*) *striatula*, Benson.

† From *Incile*, a gutter, with reference to the gutter-like channel, which divides the mantle from the foot.

This animal is clearly not a slug (*Limax*,) from the occurrence of a general, instead of a partial shield, which covers the body nearly to the extremity like a mantle. It differs, however, from *Onchidium*, Buchanan, *Vaginulus*, Cuvier, and *Veronicella*, Blainville, in having the common orifice at the right side and near the posterior extremity under the mantle, but in the anterior part of the mantle as in *Arion*. From *Onchidium* it differs also in having the lower tentacula or appendices whole, and not bifurcate or palmated. The animal forms a connecting link between *Arion* and *Onchidium*. I have not access to any description of *Phylomique* or *Eumele*, indicated in p. 153, Rangs Manuel des Mollusques, as brought to De Ferrussac's notice by M. Rafinesque.

Melania cancellata, Benson.

Batillaria zonalis, Benson.

Dreissena purpurascens, Benson.

Modiola senhousia, Benson.

Anodon gibbum, Benson.

Corbicula fuscata, Lamarck.

Venus sinensis, Lamarck.

Sanguinolaria iridescens, Benson.

Arca galactodes, Benson.

2.—From Macao.

Helix similaris, Benson.

Achatina erecta, Benson.

Succinea ——— ?

Littorina ——— ?

Littorina ——— ?

Mytilus ——— ?

3.—From various localities.

Placuna placenta ?

This shell is used by the Chinese as a substitute for panes in windows. Several junks, loaded with these shells, arrived at Chusan, in 1840. They were said to be collected on the shores of Formosa, and the Loo-choo Islands.

Placuna ? Found in a house in Ting-haé.

Pecten. Found in a house in Ting-haé.

Haliotis. From the Island of Quel-paert.

Agaricia, (Lamouroux). This beautiful undescribed Madreporé is said to inhabit the shores of Chin-choo, (Fokien Province).

INCILARIA BILINEATA, Benson.

Corpore livido, velo punctis maculisque fuscis conspersis ornato, lineis duabus lateralibus nigrescentibus, unico obscuriore mediano strigato.

"* Found in the earth under the roots of trees. Great numbers were seen at night above ground on plants and trees, also on rainy days, when they appear suddenly. This slug appears to be a favourite prey of a toad (*Bufo gargarizans*, Cantor) which swarms at night, and on rainy days, and I once observed a spider, (*Latrodectus timacida* Cantor MS,) seize one of these slugs. The Chinese apply the slug as a poultice for bruises, &c. The respiratory orifice is very minute. The sketch represents a good-sized specimen creeping on *Stillingia sebifera*."

HELIX RAVIDA, Benson.

Testa subglobosâ, umbilicatâ, epidermide olivaceâ, anfractibus sex transversé subplicatis, ultimo ventricosos, suturis impressis, umbilico mediocri; aperturâ suborbiculari elongatiusculâ; labio reflexo, tenui explanato labro acuto.

Axis 1. 3.—Diam. 1. 33.

This shell is nearly related to *H. pomatia*, but has more depressed whorls, and a shorter spire in proportion. The apex inclines more to a point than in *pomatia*. It has not the thickening of the peristome which is so marked in that species.

The colour, sculpture and smaller size also serve to distinguish it. The length of the aperture slightly exceeds the breadth. The colour of the epidermis in the lower whorl is more saturate than in the upper ones.

"Inhabits trees, mossy stones, rocks, crevices, and the earth; common at all times in shady places, particularly abundant at night, early in the morning, and on rainy days. The animal is used by the Chinese in headache, and for bruises. The shell is removed, and the animal applied to the suffering part."

* Dr. Cantor's notes on habitat, locality, uses, &c. are included in the lines with inverted commas.

HELIX TAPEINA, Benson.

Journ. Asiatic Socy. Vol. 5, p. 352, No. 7. This shell was originally described with a collection from the N. E. Frontier of Bengal, in which Chinese forms began to mix with those of our eastern provinces.

“Only two specimens, which occurred on the stem of *Salisburia genko*, were found, at sunrise. The Chinese had no name for the snail, and were evidently not acquainted with it, from which it would appear not to be common.”

HELIX NANINOIDES, Benson.

Testâ solidiusculâ, subdiscoideâ, superne radiatim, tenuiter striatâ, infra striis lævigatis, distantibus. Spirâ depresso-conoideâ, apice obtusato, planulato ; aperturâ transverse lunatâ, labro obtuso crasso, infrâ subreflexo.

This shell is nearly related to, and is probably one of the terminal species. The want of gloss, observable above, shews that it is not endued with the lubricating processes which exist on the mantle of *N. vitrinoides*. The under side is somewhat polished.

Dr. Cantor found three shells at different times lying on the ground in his garden at Ting-hae, but never saw it alive, nor did the Chinese know it. It is common at Singapore and Pinang.

CLAUSILIA PLUVIATILIS, Benson.

Testâ fusiforme pallide olivaceâ, spirâ attenuatâ, crystallinâ apice papillari ; anfractibus 14, medianis ventricosioribus, omnibus leviter transverse striatis. Peristomate valde reflexo planato, ad basin labii plicâ obliqua, solidâ, sulcoque concurrente munito.

Axis 1. 1 poll.

This beautiful shell, which is much larger and more narrow in the upper whorls than *C. loxostoma* of our N. E. Frontier, is distinguished by the curious canal which cuts obliquely through the reflected peristome at the base of the inner lip, and which is margined above by an incrassated prolongation of the lowermost internal plica. The peristome is as broadly and suddenly reflected, as in the Maltese *Cl. labiosa*. In form, it approaches the Dalmatian species *Cl. lævigata*, but it is more ventricose in the lower whorls, and more attenuated in the upper. The delicacy of the oblique striæ imparts

a silky lustre to the epidermis. The base of the shell has an oblique keel at the back of the canal on the peristome, as in *Goniostoma*, Swainson (*Bulimus goniostoma*, Sowerby. Zool. Journ. Vol. I) Swainson has placed *Clausilia* among the *Achatinidæ*, and the discovery of this interesting species will go far to prove the propriety of the location. This shell represents the subgenus *Goniostoma* in the neighbouring group of *Bulimus*. Among the *Achatina* proper, it would seem to represent *Achatinella*, in which the emargination at the base of the inner lip is fortified by a thickening of the base of the columella.

This *Clausilia* was only observed after heavy and protracted falls of rain, when Dr. Cantor found at different times three specimens lying on the ground. Eight other specimens were found by digging in the wet earth, where they appeared in company with the smaller *Clausilia aculeus*. The animal is like that of *C. aculus*, and differs only in size, and in being of a greyish black colour.

CLAUSILIA ACULUS, Benson.

Testá subulata nitida, epidermide fuscescenti, anfractibus 10 aut 11, oblique leviter striatis; aperturá dentibus duobus vel tribus munitá, peristomate reflexo.

Axis longioris 0.65, minoris 0.5 poll.

There are two sizes of this shell; the dwarf kind appears to be the more abundant. It varies in the presence or absence of the lower plait or tooth, as do some of the European species. Neither of the larger specimens, which I have under inspection shews any trace of it, while in the dwarf variety it is more frequently exhibited than otherwise. The specimens appear to be by no means liable to truncation.

“Lives in the earth, on mossy stones, walls and trees. Appears in great numbers in rainy weather. The Chinese call this species by the same name as *C. pluvialis*.”

ACHATINA ERECTA, Benson.

Testá albidá, solidiuscula, subulato-turritá, epidermide foedá, scabrá, anfractibus octo planulatis, suturis impressis, apice obtuso.

This shell belongs to the same division as, and is closely allied to, our Indian *Bulimus gracilis*, Hutton, and *Bulimus clavulus* of the

West Indies, which Sowerby arranges as an *Achatina*. In all these shells there is a slight evasion or sinuation of the base of the mouth, occasioned by the protrusion of the outer lip ; but in none of them is there the decided truncation of the base of the columella which distinguishes the true *Achatina*. Dr. Cantor's shell approaches most nearly to those forms of *Achatina* which are represented by *A. octona* (subgenus *Macrospira*, Swainson,) but it cannot, notwithstanding its elongated form and oblong aperture, be received into Swainson's subgenus *Leptospira*, by which he makes the transition to *Achatina* from *Bulimus*, with reference to the character assigned by him to the outer lip of *Leptospira* ; and it agrees still less with his figure of *L. signata*, which possesses an exserted aperture with a free border. It is nevertheless not distantly related to *Bulimus decollatus*, which he would place in that sub-genus. In one adult specimen sent, the inner lip and base are considerably thickened by a deposition of shelly matter, added like an anterior lip after the animal had attained its full growth. In its habit of carrying its shell erect, the animal differs from our Indian species, which although it occasionally lifts its shell a little, ordinarily trails it behind.

" Invariably found in company with *Clausilia aculus*. Except in colour, the animals are alike. In habits they differ only in one respect. The *Clausilia* drags the shell along with the apex touching the ground, while the other carries the shell erect on its back. *A. erecta* was also found by Dr. Cantor at Macao, although not accompanied by the *Clausilia*, which he only met with at Chusan.

PLANORBIS PAPYRACEUS, Benson.

Testá compressá, olivaceo-corneá, sub-politá, minutissime radiato-striatá, anfractu ultimo latiori, supra infraque æqualiter convexo ; peripheriá carinatá, spirá basique ambabus depressis, umbilicatis ; umbilico inferiori arctiori ; labro superiori valdé prominente, semicirculari ; inferiori recedente, recto.

Diam, 0.4 poll.

" Found in canals and ponds attached to *Chara* ; not numerous. It is to be observed that the canals at Chusan communicate with the sea (those of Ting-hae, of course more immediately so,) and although the water is fresh and inhabited by frogs, fresh-water fishes, *Dytiscus*,

Nepa, and covered with *Lemna* and *Chara*, yet it is mixed with salt-water in the vicinity of the sea, which may account for the appearance of marine Crustacea and Testacea."

Whorls 4 in number. This shell seems to take its stand between the depressed *Planorbis* (as *marginatus*, *carinatus*, *spirorbis*, *vortex* etc.) in which the angle of the penultimate volution scarcely enters the mouth of the shell, and the Sylhet species *umbilicalis*,* the English *nitidus*, the Bengal *trochoides*, in which the angle of the penultimate whorl projects far into the cavity of the mouth. In its compressed form it assorts with *carinatus*, while in the character just noted, in the great comparative breadth of the last whorl, and in the somewhat contracted umbilicus, it approaches to *umbilicalis*. The arcuated and nearly semicircular upper lip forms a bow, of which the straight lower lip replaces the chord, and joining on to it at the sharp periphery, gives the mouth a very singular appearance.

In this description, I have considered the shell as dextral. On a former occasion I gave my reasons with reference to the position of the animal in the shell, and Mr. Gray, who quotes my observations, states that Mr. Desmoulins, who has examined the question in detail, concludes that the shell of *Planorbis* is essentially dextral, and that a displacement to the left side of the extremities of certain organs which are themselves on the right side, has led to the erroneous opinion, derived from imperfect anatomical investigation, that the animals were sinistral. Swainson, somewhat strangely seemed to be unaware of this investigation, when he noted that one of the characters of *Planorbis* was a reversed aperture. I have not referred this shell, nor the next, to any of his sub-genera of *Planorbis*. He evidently has not worked them out, nor traced their analogies to the families of the *Phytophaga*. His sub-genera *Planorbis* and *Helisoma* appear to be scarcely distinguishable by their descriptions, as will appear from the following table, in which I have merely transposed all that Swainson says regarding them, for the sake of the juxta-position of the characters, putting my own observations within brackets.

* Dr. Cantor has lately discovered at Serampore and Barrackpore a new species, belonging to this type of form which is closely allied to *umbilicalis*.

Sub-genus *Planorbis*, Drap.*P. corneus*.

1. Spiral whorls few.
2. Body-whorl ventricose.
3. (Note. This may be said to be the case in *Pl. corneus*, it matters not which side be regarded as containing the apex).

Sub-genus *Helisoma*, Sw.—*H. bicarinata*.

1. Whorls hardly three.
2. Shell ventricose.
3. The spire sunk below the body-whorl.

I have not Sowerby's Genera to refer to for the type of *Helisoma*, but if it be intended for the reception of forms similar to that next to be described, and which is 'par excellence' of the Heliciform type; and if *Helisoma* be an unclassical abbreviation of the hybrid word *Helicosoma*, in allusion thereto, then the *depression of the spire* must have reference to the depth and construction of the umbilicus on the *really* lower side, and the character "shell ventricose" must refer to the convexity (in the more typical species) of the upper side of the shell. If Swainson should not have intended to characterise this type, I would propose the term *Helicorbis* for it, and would offer the following incomplete sketch of an arrangement. I have omitted *Segmentina*, Fleming; as though its singular internal divisions make it represent the *Cephalopoda*, yet its *form* does not separate it from the subgenus in which *Planorbis nitidus* will be found, and it is not representative, quoad that structure, of any of the families of the tribe to which it belongs.

Families of the
Phytophaga.

Analogies.

Subgenera of *Planorbis*.1. *Helicidæ*.

Typical.

Helicorbis? Benson.*H. hemisphærulea*, Benson.*H. nitida*, Gray's Turton Pl.
8, f. 93.*H. umbilicalis*, Journ. As.
Soc. 5. p. 741.*H. papyraceus*, Benson.*Trochorbis*, Benson.*Trochorbis trochoides*, J. A.
S. 5. p. 742.2. *Trochidæ*.

Aberrant.

Subtypical.

3. *Haliotidæ* Spire evanescent, *Planorbis*.
 Aperture patulous. *P. corneus*, auct.
 P. indicus, Benson. J. A. S.
 5. p. 743.
 P. corpulentus, Say. Append.
 to Exped. to St. Peter's
 River. Pl. 15. Fig 9.
4. *Naticidæ* ?*
5. *Turbinidæ*. Aperture rounded, *Omalodiscus*, Benson.
 not encroached (†*Spirorbis*, Swainson.)
 upon by the pre-
 vious whorl.
 O. marginatus, *Spirorbis al-*
 bus, &c.

PLANORBIS HEMISPHERULA, Benson.

Testâ nitidâ, olivaceo-corneâ, supra convexâ, apice planulatâ, infra excavatâ, umbilico coarctato ; peripheriâ obtusâ, nullo modo carinatâ.

Diam. 0.25 poll.

This species, belonging to the circle of *Helicorbis*, is nearly related to the Sylhet *umbilicalis*, but differs in colour, in its greater convexity and narrower umbilicus. The periphery is rounded, not angulate ; the spire has no depression below the surface of any of the whorls, while the underside is concave. I have another species of the subgenus in which the umbilicus is as narrow as in *Trochorbis*, none of the previous whorls being visible. It will form the passage from *Helicorbis* to that sub-genus ; it is from the Indus at Sukker, is very minute, and was accidentally sent to me, secured from injury in the hardened mud which filled the aperture of a *Paludina bengalensis*, picked up with other well known shells of the provinces by a friend, on the bank of that river.

"*P. hemisphærule* is found in the same localities as *P. papyraceus*, on *Chara*, *Lemna*, &c. It is not numerous."

* Is this family a fair representative of the *Cypræidæ* among the *Zoophaga* ?

† This name having long been pre-occupied by a genus of *Annelides*, Swainson's subgenus requires a change of designation. Swainson has also called a genus of the *Olivinæ* "*Scaphula*" without observing that in 1834, I applied the name to a fluviatile form among the *Arcadæ*. Zoolog. Journ. vol. v.

LIMNAEA PLICATULA, Benson.

Testâ elongato ovatâ, corneâ scabriusculâ, anfractu ultimo transversé plicatulâ, suturis impressis; spirâ mediocri, apice acuto plerumque ferrugineo; aperturâ infra patulante, basi evasâ.

This shell differs scarcely in shape from a *Limnaea* (*L. miscella*, nobis) common in the Rivers of Rohilkhund and in the River Goomty, which approaches in some of its characters very nearly to one of the varieties of *L. chlamys*. The present species may be distinguished from *L. miscella* by the want of polish, by the more deeply impressed sutures, by the slight plications on the last whorl, and by its coloured apex.

"Found in fresh water ponds, floating on the surface, or attached to *Chara*. *L. plicatula* is common."

LIMNAEA MINOR, Benson.

Testâ ovato-acutâ, cornea, politâ, spirâ vix dimidium testæ efformante; apice obtusiusculo, anfractibus quatuor, suturis leviter impressis; apertura ovatâ, plicâ columellæ obsoletâ.

This very distinct shell was among the specimens of the last described species. The specimen under review is a small shell, and intermediate in form between the English *L. fossaria* (*minuta*, Lam. *truncatula*, Gray) and the large species of our Western Provinces, *L. bulla*, which again is nearly allied to the Bengal species *L. luteola* of Lamarck. From *L. bulla* it differs in its comparatively greater length of spire; from *L. fossaria* by the shorter spire and slightly excavated sutures.

BULLÆA CAURINA, Benson.

Testâ ovato-oblonga, albâ, tenuissimâ, papyraceâ, transversé eleganter minutissimeque striatulâ; aperturâ auriformi supra angustatâ, infra patulante; labro apicem superante; spirâ nullâ.

The part of the body-whorl which is visible when the aperture is turned towards the observer, is small in proportion to the mouth. The summit of the shell resembles the same part in *Bulla navium* and *B. solida*, but the outer lip is destitute of the fold where it rises above the apex, which appears in those species; resembling, in this respect *B. ampulla*. The thinness of the inner lip locates this shell in *Bullæa*. Its being internal, probably accounts for the state of

Dr. Cantor's specimens from the contraction of the cooked animals, compressing the very fragile shells. The same circumstance may have occasioned the want of success met with in the search for living examples.

"On entering a house in Tinghae, where the people had just finished their breakfast, Dr. Cantor observed a number of these shells (broken with but one exception,) on a dish. To an enquiry whence they came, the Chinamen asserted, that they were taken in the canal. Although Dr. C. offered a reward and almost daily dragged the canals, he was never able to procure another specimen. The same dish contained shells of *Paludina quadrata*, which is a favourite food of the Chinese, and is plentiful in all the canals, even close to the sea; and as the canals communicate with the sea, the *Bullæa* might possibly have been found in the locality assigned."

PALUDINA QUADRATA, Benson.

Testâ elongato-conoideâ, crassa, epidermide viridi-olivaceo, anfractibus sex planulatis, leviter transverse plicatis, longitudinaliter liratis; liris subquinis, aperturâ mediocri, intus albido-violaceâ; umbilico arcto, peritremate nigrescente.

The slightly prominent longitudinal ridges (which, with the flattening of the whorls, contribute to give the shell a singular appearance,) vary much in number, and in some specimens are nearly obsolete. The operculum is horny. The shell in its thickness and sculpture indicates an approach to the *Melanianæ*, but the animal having the eyes on an exserted pedicle, differs therein from *Melania* in which the eye is sessile on the tentaculum. It also differs from the ordinary forms of *Paludina*, in which the eye-supports seem to occupy a common tube with the tentaculum, and to be truncated at the point of divergence. The ridges of the shell are frequently invested with either a vegetable or a spongy growth, which gives it an appearance of having variegated bands, which do not properly belong to the epidermis.

"Extremely common in canals and fresh-water ponds, where it is found in the mud, and adhering to stones, wood, aquatic plants or any firm object which may happen to be immersed. The specimens vary in size; larger specimens were observed, than the one figured.

In the female, Dr. Cantor found from 7 to 10 young ones of different sizes. This species forms a common and favourite article of food with the Chinese, and large supplies were exposed for sale in the market at Tinghae."

PALUDINA LECYTHOIDES, Benson.

Testâ ovato-acutâ, olivaceâ; anfractibus sex aut septem rotundatis, transversé subplicatis; suturis excavatis; aperturâ oblongâ; peristomate subreflexo, nigro; apice acuto; umbilico ætate evanescente.

Nearly allied to Gray's *P. chinensis*, and to *Paludina lecythes* nobis (Journ. As. Soc. Vol. V. page 745). It differs from the latter in its more produced form, more acute apex, the slighter convexity of the whorls, and its greater solidity. From *P. chinensis*, which has an eroded apex in the specimen figured, and which it resembles in habit, it differs in the absence of any angularity at the base of the aperture, which is also less oblique in the shell under review. In young specimens the olive-coloured epidermis has a lutescent tinge, and dark stripes accompany the plicæ of growth. The colours are darker in adults, and in one variety, the lower portion of the last whorl is ornamented by a series of light coloured longitudinal bands. In the very young shell, the aperture equals the spire in length; the spire is conoidal, and the peritrema of the last whorl, angular and subcarinate. The same characters are observable in the embryo, but the apex, in the latter state, is produced in a papillary form.

"Lives in the mud in ditches and fresh-water ponds. Not numerous. The snail, when once removed from its native element, keeps itself shut up, although confined in water. It is a favourite food with the Chinese, who eat it prepared in the same manner as other edible snails, viz. boiled. The embryones, which vary from 8 to 12, are somewhat larger than those of *P. quadrata*, and their shells are colourless and semitransparent, whereas the embryo of the latter is frequently of a dark colour."

PALUDINA (BITHINIA, Gray) LONGICORNIS, Benson.

Testâ ovato-conoideâ, corneâ, politâ, spirâ aperturam longitudine vix superante; anfractibus quatuor, ultimo convexo, suturis minimé depressis; aperturâ subrotundâ, supra angulatâ; peristomate subre-

flexo, nigrescente; labio crassissimo; operculo testaceo; umbilico evanido; apice obtuso.

This shell appertains to the group of small *Paludinæ* which Gray has separated under the designation of *Bithinia*, to which belong the English *P. impura*, the Indian species *cerameopoma* and *pulchella*, (nobis), *goniostoma* (Hutton) and one or two other species, inhabiting the rivers and pools of the gangetic plains, which as yet are undescribed. The present species is remarkable for the thickening of the inner lip in the part where it adheres to the penultimate whorl.

"Found in the canals in great numbers, attached to aquatic plants, stones, piles, &c."

PALUDINA (BITHINIA) STRIATULA, Benson.

Testâ ovato-acutâ, corneâ, politâ; spirâ elongatâ; anfractibus quinque convexiusculis, liris pluribus, interdum inconspicuis, circumdatis, suturis depressiusculis; apice obtusato. Peristomate reflexo, nigrescente, undato; umbilico evanido; operculo calcareo.

This form is singular among the *Bithinia* on account of the ridges on the whorls. All the other known species, including those above named, viz. *parvula* of the West Indies, *rudis* and *rubens* of Dalmatia, *fluminensis* of Hungary, *inflata* of the Ionian Islands, and a small Sicilian species which stands in my collection without a name, being deficient in sculpture. The number and degree of prominence of the ridges vary much, and they diminish in prominence in proportion to their paucity.

"Less common than *P. longicornis*, but found in the same localities. The animals and their habits are similar."

MELANIA CANCELLATA, Benson.

Testâ elongato-turritâ, olivaceâ solidiusculâ; anfractibus novem convexiusculis, omnibus costulis frequentibus, ultimoque fasciis tribus elevatis basalibus munitis; costulis liris plurimis cancellatis; suturis mediocriter excavatis; apice eroso.

Axis 1.0 poll. vel pauló plus.

This little species is nearly allied to the gigantic, *M. variabilis*, nobis, of Bengal, and like it, has the sinuated aperture, which indicates the approach of the genus to the neighbouring type: *Mela-*

nopsis. There are seldom more than seven whorls present, the apex being subject to decollation, which in this genus, I have observed to be an indication of residence in stagnant water.

"Nearly all adult specimens somewhat mutilated. Found in the canals close to the sea in the mud, and makes its appearance in the market, not as an article of food, but in company with the fish caught by dragging the bottom of the canals."

MELANIA (HEMISINUS? Swainson) CREBRICOSTIS, Benson.

Testâ elongato-turrita, olivaceâ, tenui, anfractibus plurimis leviter convexis; costis frequentissimis albidis, lævigatis munitis, ultimo costulis evanidis; balteo submediano, rugisque plurimis basalibus circumdato; suturis impressis; columellâ subrectâ; basi leviter canaliculato-effusâ; labro tenui, lævi, sub-reflexo; apice decollato. Axis testæ decollatæ 1.05 poll.

This is a very interesting shell, agreeing nearly with Swainson's subgenus *Hemisinus*, the type of which is figured in Griffith's Cuvier as *Melania lineota* (Vol. XII. Pl. 13, fig. 4). The Chusan shell however, shews no symptom of the crenation in the aperture, which is attributed to the type. The species now described leads to the sub-genus *Cerithidea*.

"Found among specimens of *Melania cancellata*."

BATILLARIA,* Nov. Gen.

Testâ turrita, insculptâ, rudi; anfractibus plurimis, aperturâ oblongâ, infrâ angustiore, basi truncatâ, evasâ; labro sinuatâ, suprâ emarginato, infra propecto; labio suprâ callo munito; columellâ planatâ, basi incrassatâ, oblique truncatâ, canalem vix efformante; operculo corneo, tenui, spirali, multiverticillato.

BATILLARIA ZONALIS, Benson.

Testâ elongato-turritâ, scabrâ, albidâ, fasciis fuscis ornatâ; anfractibus tredecim mediocriter convexis, costulis liris longitudinalibus decussatis, supra sub-nodulosis; apertura intus fasciis fuscis strigatâ; columellâ albâ. Axis 1.4 poll.

SYN. *Cerithium zonale*, Lam. L'océan des Antilles.

C. zonale, Gray, Griff. Cuv. 12, Pl. 14, fig. 1, China?

* *Batilla*, a shovel; from the lengthened form of the shell, and the conformation of the base of the aperture.

"From the coast of Chusan. Some were brought to Dr. Cantor from the entrance of the canal; but he did not himself find them in the estuary."

This shell does not agree with the characters of any of the subgenera of *Cerithium* in which Lamarck and Gray have placed it, and the structure of the base of the columella is almost precisely that of *Planaxis*, Lamarck, from which the form is sufficiently distinguished by the truncation of the base of the aperture, its sinuous outline, and the absence of the interior ribs, as well as by the elongated form of the spire. Swainson has considered *Planaxis* to be a terminal genus of the *Melaniæ*, and the present species in its form and sinuous lip presents characters in consonance with the typical species of *Melania*, while the columella approaches to the structure of that of *Melanopsis*. As in *Planaxis* and many of the *Cerithina*, there is a callus attached to the penultimate whorl near the top of the aperture, and its scabrous surface and occasional disposition to form a varix on the last whorl behind the pillar, give a farther resemblance to that sub-family.

LAGUNCULA, Nov. Gen.

Testâ turbinatâ, subglobosâ, aperturâ majori, integrâ, oblongâ, peristomate interrupto, labio subreflexo; umbilico profundo, tortuoso.

LAGUNCULA PULCHELLA, Benson.

Testâ albido-glaucâ, ovato-globosâ; anfractibus convexis, lineis longitudinalibus, elevatiusculis, aliis obliquis decussatis, instructis; suturis impressis; aperturâ intus fasciâ latâ pallidé-castaneâ ornatâ, columellâque intus concolori.

"Asserted to be an inhabitant of the canals at Chusan, and found under the same circumstances as *Venus chinensis*."

The raised lines crossing each other, give the facet-like appearance to the surface, which is frequently observable in *Limnaea*. The form of the umbilicus and the greater prominence of the raised lines near the umbilicus shew an approach to the subgenus *Globularia*. Whorls 5, exclusive of the apex, which is less acute than in *Assiminia*. The substance of the shell is thin, and it has much the aspect of a shortened *Paludina*, such as *P. crassa*. It appears

to be related both to *Assiminia* in the *Turbinidæ*, and to *Lacuna* and *Globularia* in the *Naticidæ*. From the former it is distinguished by its more globular form, and by the openness of the umbilicus, as well as by the absence of any distinct shelly plate, adhering to the body-whorl, within the aperture. From *Lacuna* it may be known by the circumstance of the umbilicus being situated about the centre of the aperture, instead of near its summit, and by the same absence of a shelly plate. From *Globularia* it is distinguished by its more lengthened form, less concave inner lip, and by the absence of a thickened belt at the base of the body whorl.

MYTILUS NIGER, Benson.

Testâ oblongâ, trigonâ; cardine unidentato; natibus subincurvatis, decorticatis, sub epidermide albis, marginibus purpurascens; intus margaritaceo-splendidâ, margine purpureo. Long. 3.4 poll. Lat. 1.7.

It is punctuate in the interior, especially near the beaks. There are *Flustra* on all the specimens, leading to the supposition, notwithstanding their nacre, that the habitat is marine.

DREISSENA PURPURASCENS, Benson.

Testâ oblongâ sub-quadratâ, radiato-plicatâ, sub epidermide albo purpureoque ornatâ, intus margaritaceâ, epidermide brunneo, apice subincurvato, compressiusculo. Long. 1.5, Lat. 0.8 poll.

The anterior margin is minutely toothed. The posterior muscular impression is curiously honey-combed, and the whole of the interior is strongly punctuate at nearly equidistant points. The plicæ or raised striæ are strong within a short distance of the beaks and along the anterior side of the umbonal slope, but become obsolete on the rest of the shell. The epidermis is scabrous and covered with a minute weed, which looks like a fresh-water production. The septum at the beaks refers this shell to *Dreissena* of Van Beneden, which includes the fluviatile species *polymorpha* of Europe.

"Dr. Cantor never saw those muscles alive, but found the empty shells about the houses at Tinghae. The Chinese said that they were found in great numbers in the canals close to the sea, but only in winter, when large supplies are brought to market. They also asserted that they attain upwards of six inches in length."

MODIOLA SENHOUSIA, Benson.

Testâ transversé oblongâ, subalatâ, gibbâ, læviusculâ; anticé angustatâ; intus iridescente; epidermide olivaceâ, obscuré radiatâ; alâ natibusque strigis flexuosis spadiceis ornatis, basi leviter emarginatâ. Long. 1.2, Lat. 0.6 poll.

Named by Dr. Cantor after the late Sir H. Le Fleming Senhouse, who first observed it and pointed it out to him. This gallant officer who commanded the naval forces in the attack on the city of Canton which resulted in its submission to the British arms, and who fell shortly afterwards a victim to his exertions in that engagement, was much attached to Natural History.

"Sir H. Le Fleming Senhouse observed numbers of this shell on board of one of the captured junks, where specimens were obtained from the Chinamen, who had brought a large supply, preserved in salt, from the east coast of Canton Province. Dr. Cantor afterwards found two specimens on the mud among the fragments of rocks which line the coast of Chusan. People at Tinghae were well acquainted with the muscle. Judging from the heaps of shells which lie about every house at Chusan, the people are great consumers of shell fish, and it is amusing to see how expert they are in opening bivalves, for which their inch-long nails are well adapted. Dr. Cantor later observed this shell inhabiting the shores of the Malayan Peninsula, Singapore and Pinang."—

The form belongs to the subgenus *Brachyodontes* of Swainson. A nearly allied, but much smaller, species occurs in the Creeks of the Sunderbuns, which I propose to describe as *M. variegata*.

ANODON GIBBUM, Benson.

Testâ fragili, ovatâ, tumidâ, antice rotundatâ, postice subalatâ, supra angulatâ, extremitate posticâ subangulatâ, natibus concentricé rugosis, rugis parallelis, subdistantibus, areâ posticâ radiis tribus approximatis, leviter elevatis, rugosisque, munitâ; margaritâ interius albidâ versus apicem aurantio-tabescenti, versus marginem purpureo-viridique splendidé margaritaceâ; margine fusco; epidermide olivaceâ, obscure radiatâ. Long. 2.0, Lat. 3.2 poll.

This shell approaches in form and outward appearance so nearly

to one of the varieties of *A. cygneum*, that at first sight, it might be difficult to distinguish them; but on opening the valves, the superior splendour and vivid colouring of the Chinese shell at once suggest a specific difference. *A. cygneum* shews vestiges of raised rays, similar to the three on the surface of *A. gibbum*, but in an English specimen, of the variety *incrassatum*, does not present the concentric rugæ on the beaks, which are exhibited by Irish specimens of another variety, in which however, they are closer and more delicate than in the Chusan shell. The sub-cardinal muscular impressions are more immediately under the beaks in *A. gibbum*, while in the British species they are more removed towards the anterior side.

"Sometimes 5 inches in length. Very common in mud in the canals. Sold in the bazaars as an article of food. Large specimens are very brittle, and precaution should be taken to dry them in the shade."

UNIO (THELIDERMA, Swainson,) LEACH, Gray.

Testâ crassâ, subovatâ, alâtâ, compressâ, umbonibus dentibusque cardinalibus extremitati anticæ angustiori approximatis; valva sinistra dente cardinali interiori margineque cardinali pene parallelis; illa versus dentem lateralem mediocriter productam spectante; valvâ dextrâ dente cardinali unicâ crenatâ; valvis intus minime profundis; margaritâ iridescente, pallide salmonis colore tinctâ; natibus minimè prominentibus; rugis seriebus duabus e lineâ umbonali divaricatis; posterioribus simplicibus, anterioribus, basalibusque nodulosis, testam exteriorem munientibus, epidermide flavo-olivaceâ. Length 2 inches, breadth 3, weight of the two valves $1\frac{1}{2}$ oz.

The interior lobe of the cardinal tooth in the left valve is in a line with the lateral tooth, or nearly so. The anterior impression of the adductor muscle is finely sculptured in a radiate crystalliform manner. The epidermis is slight yellowish olive, verging into light brown. The posterior margin is sinuous, owing to the ends of the nodulous radiating ribs, which diverge in 2 curved series from the umbonal slope: those towards the posterior margin and wing being simple, while those which run towards the basal and anterior margin, consist of a series of nodules. The two smaller muscular impres-

sions of the cardinal group are in this species situated transversely, one of them being remote from the large impression, but in *U. divergens*, one is situated above the other, and both adjoin the large impression.

This shell is evidently the same species as that figured by Gray in Griffith's Cuvier, Vol. XII. Pl. 21, fig. 1, but without a description. The aspect of the shell, and still more that of *U. divergens*, reminds the observer of the thick nodulous forms which inhabit the waters of North America, and is quite unlike that of any of our Indian species, only one of which attains any moderate degree of thickness.

"A perfect specimen of this and a single (left) valve of the next species were found in a house at Tinghae. They are eaten by the inhabitants, who asserted that the shell is found in fresh-water somewhere on the Island. At Macao, Dr. Cantor afterwards saw a specimen with a gentleman who had received it from a native of Canton. The latter asserted that the shell inhabited the mud in the Canton river, at some distance in the interior."

UNIO THELIDERMA, Sw.) DIVERGENS, Benson.

Testâ crassâ, angulato-ovatâ, subalatâ, tumidiusculâ, facie externa tuberculato-plicatâ, rugis seriebus duobus e lineâ umbonali divaricantibus; posterioribus simplicioribus, anterioribus basalibusque plerumque nodulosis; natibus mediocriter prominentibus, epidermide nigrescente, striis subimbricatis. Valvæ sinistræ dente cardinali interiori versus angulum marginis posterioris basalisque spectante, ad latus exterius laminis pluribus munito; dente exteriori pene obsoleto brevi, a basi interioris divaricato; dente laterali brevi crasso. Long. 2.65, Lat. 3.5 poll.

The lateral tooth is nearly parallel with the direction of the inner cardinal tooth, instead of forming, as it were a prolongation of the same line, as in the last species. The anterior impression of the adductor muscle is irregularly reticulate. Anterior margin sinuous, from the protrusion of the extremities of the rugæ. Weight of a single valve $2\frac{3}{4}$ oz. nearly. It is not very distantly related to the American species *U. costatus*, Rafinesque (*undalatus*, Barnes) figured in Conrad's Monograph in plate No. 17.

CORBICULA FUSCUTA, (Lamarck.)

Testâ cordatâ subinæquilaterali fuscovirente, tumidiusculâ, politâ, intus et ad nates violaceâ, extrinsecus sulcis crebris circumdatâ, rugis intersitis subimbricatis; margine interiori plerumque nigrescente; natibus decorticatis. Lat. 1.3, Long. 1.15 poll.

This appears to be *Cyrena fuscata* of Lamarck, belonging to the division which Megerle has separated under the name of *Corbicula*, and which is well distinguished with reference to the minutely serrated and elongated laminar lateral teeth. The plica on the outside of the valves are more distant than in our Indian species.

“Found in the mud in the canals; sold in the market.”

VENUS SINENSIS, Auctorum.

Testâ orbiculatâ, convexâ, albidâ, marginibus violaceis denticulatis, extrinsecus radiis violaceis plicisque concentricis exilissimis ornatâ; disco plerumque ferrugineo; dente cardinali postico, bifido sæpe bilobato, laminæ cardinalis extremitate posticâ concavatâ. Long. 1.7, Lat. 1.65.

Icon. Wood, Pl. 8, fig. 76, non bene.

In most specimens, the coloured rays are confined to the posterior half of the shell; but occasionally, they pervade the whole disk, and decussate the concentric plaits in such a manner, as to deceive the eye, and to cause the belief that there is a radiate striate sculpture. The siphonal scar cuts sharply through the sub-marginal impression, and ends in a point near the centre of the shell, as in *Artemis lineta*, and, in a less degree in *Venus gallina*.

“Dr. Cantor never saw this bivalve alive, but judging from the number of shells lying about houses at Chusan, it must be a common article of food. According to the Chinese, it is an inhabitant of the canals.”

SANGUINOLARIA IRIDESCENS, Benson.

Testâ subelliptica, compressâ, albidâ, iridescente, versus apicem incarnatâ, exilissime transversè striatâ, striis obsoletis radiatim decussata; latere postico subrostrato, subangulato, antico longiore, rotundato.

This shell has a chatoyant reflection on the exterior of the valves, of which the substance is not in the least degree pearly. The rostrated end exhibits a faint trace of the fold which characterizes the *Tellinæ*.

“Found under the same circumstances as the last, and asserted to be an inhabitant of the canals.”

ARCA GALACTODES, Benson.

Testâ subrhomboideâ, tumidâ, subæquilaterali, anticé subangulatâ, posticé rotundatâ, multiradiata; radiis exilissimis auctâ, rugis decussantibus; cardine mediocri, terminis exterioribus angulatis; natibus lævibus remotiusculis, incurvatis; margine lævi; epidermide fuscâ. Lat. 0.75, Long. 0.5, poll.

This shell belongs to the sub-division of *Arca*, which contains the English marine species *A. lactea* and the Crag fossil *A. lactanea*,* Wood. It is sufficiently distinguished from both by its tumid form; its greater length from beak to base, in comparison with its breadth, by the shortness of its cardinal line, and its more equilateral form. As in those species, the teeth are vertical at the centre of the hinge line, and inclined or radiate at the extremities. The lozenge-shaped space between the beaks is occupied by numerous raised lines, vertical to the hinge line, which are crossed again by faint depressed lines, affording a firmer hold to the ligament and performing the same office as the angulate concentric channels or scorings in *Byssoarca*.

“Found under the same circumstances as the last, and equally asserted by the Chinese to be an inhabitant of the canals.”

NOVACULINA CONSTRICTA, (Lamarck.)

Testâ albâ, tenui, transversè oblongâ, læviusculâ, extremitatibus rotundatis, radio mediano subconstrictâ; epidermide olivaceo-flavescente, postice quasi capillis intertextis adhærentibus vestitâ. Lat. 2.45, Long. 0.75, poll.

Solen constrictus, Lamarck, Vol. 5, p. 455.

This shell, which Lamarck has described as *Solen constrictus*, and which, on the authority of Péron, he considered to be from the Chinese or Japanese seas, appears to have been a specimen of this

* Mag. Nat. Hist. Vol. IV. N. S. P. 232, Pl. Supp. No. 13, f. 3.

shell, deprived of its epidermis. The terms in which Lamarck mentions its habitat, and the doubt whether it belonged to China or Japan, may well account for his describing it as a sea-shell. He places it immediately after the British marine species *Solen antiquatus*, which approaches *Novaculina* in form and in its exserted medial beaks, though it differs in the number of the teeth. From *Novaculina gangetica*,* (nobis), to which it bears a near resemblance, it is well distinguished by the radiate depression which runs from the apex to the base of the shell, and which bears an appearance, as if a string had been tightly tied obliquely round the closed valves when in a soft state.

Novaculina now numbers five species, two of them American, two Chinese, viz. *constricta* and *acutidens* (Sowerby, Broderip, Zool. Jour. Vol. IV. p. 361), and the Indian *gangetica*, the species on which the genus was originally founded. Swainson has adopted it as a sub-genus of *Solen*. Gray's *Solen novaculina* (Griff. Cuvier, Vol. 12, Pl. 31, fig. 1.) appears to represent an individual of *gangetica*, of which the teeth were injured. A dwarf variety of the latter shell occurs in the mud of the aqueducts in Calcutta.

"*Novaculina constricta* was picked up among a number of other shells, thrown in a heap outside the kitchen door at the house of the first civil Mandarin of Ting-hae."

With reference to the foregoing descriptions, it is interesting to observe that several forms are absent which might have been expected to occur in the latitude of Chusan. Among the land Testacea, independently of the true *Limaces*, we may notice the want of *Pupa*, *Vertigo*, *Carychium* and *Cyclostoma* which are met with in the temperate and warmer regions of Western Asia among rocks and under stones. We miss the more ventricose forms of *Bulimus* as well as of the genus *Achatina*. *Succinea* is also wanting, but occurs abundantly farther south, at Macao. Among the fresh water genera we miss *Ampullaria*, *Neritina* and *Navicella*, and among the Acephala, the genus *Psidium*.

MORADABAD, December 29th, 1841.

* Gleanings in Science, Vol. 2, p. 63, 1830, and Pl. V. fig. 4, vol. I. and Sowerby's Manual, fig. 63.



Benson, W. H. 1855. "Chusan shells." *The journal of the Asiatic Society of Bengal* 24, 119–140.

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