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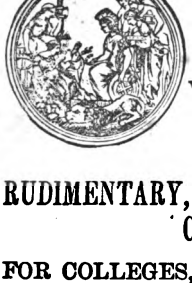

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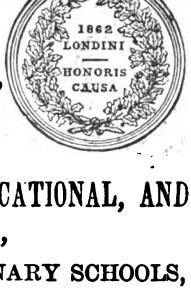

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APPENDIX

TO THE

MANUAL OF MOLLUSCA,

OF S. P. WOODWARD, A.L.S.,

CONTAINING SUCH

RECENT AND FOSSIL SHELLS

AS ARE NOT MENTIONED IN THE SECOND EDITION OF THAT WORK.

By RALPH TATE, A.L.S., F.G.S.

LONDON:
VIRTUE & CO., 26, IVY LANE.
NEW YORK: VIRTUE & YORSTON.
1868.

CLASS I.—CEPHALOPODA.

ORDER I.—DIBRANCHIATA.

FAMILY III.—TEUTHIDÆ.

PHYLLOTEUTHIS, Meek and Hayden.

Type, P. subovatus. Cretaceous. Nebraska.

Pen corneous, thin, subovate, slightly concave below, and convex above. From behind the middle it narrows towards the front, the outline of the lateral margins being convex, while the posterior end is more or less obtusely angular. Apparently related to *Beloteuthis* and *Teudopsis*.

(See p. 168.)

FAMILY IV.—BELEMNITIDÆ.*

The *Shell* of *Belemnites* consists fundamentally of:—

1. A hollow cone, the *phragmocone*, Fig. 1, *p*, with a thin shelly wall, termed the *conotheca*, C, and which is divided by transverse septa, concave above and convex below, into chambers or loculi; the septa are perforated near the ventral margin by a *siphuncle*.

2. A *guard* or *rostrum*, *g*, more or less extensively enveloping the apical part of the phragmocone. "The phragmocone is not a chambered body made to fit into a conical hollow previously formed in the rostrum, as some have conjectured, but both *rostrum* and cone grew together; the former was formed on the exterior of a secretive surface, and the latter on the interior of another secretive surface." (Phillips.)

The rostrum is composed of calcareous matter arranged in fibres perpendicularly to the planes of the laminæ of growth. Pro-

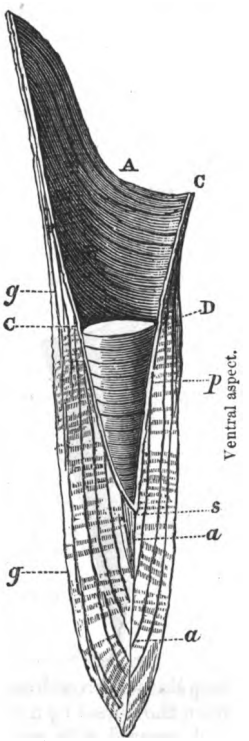

Fig. 1.

* See p. 173.

fessor Owen describes the fibres, in specimens from Christian Malford, as of a trihedral prismatic form, and $\frac{1}{1000}$th of an inch in diameter. These fibres are disposed concentrically around an axis, *a*, the so-called apical line, which extends from the extremity of the phragmocone to that of the rostrum. Indications of a thin capsule or formative membrane appear in some *Belemnites* investing the guard; in those of the Oxford clay it is represented by a granular incrustation; in some liassic species it appears in delicate plaits, like ridges or furrows; in some specimens of *Belemnitella mucronata* from the upper chalk of Antrim, it is in the form of a very thin nacreous layer.

3. A *pro-ostracum*, or anterior shell, which is a dorsal extension of the *conotheca* beyond the end where the guard disappears. The surface of the conotheca is marked by lines of growth, and, according to Voltz, it may be described in four principal regions radiating from the apex: one dorsal, Fig. 2, *a*, with

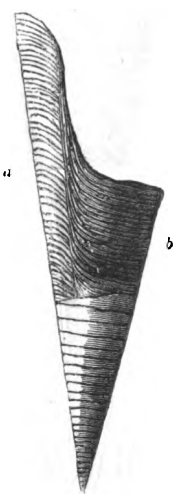

Fig. 2.

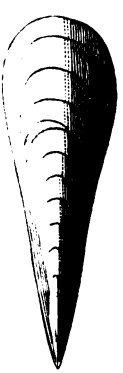

Fig. 3.

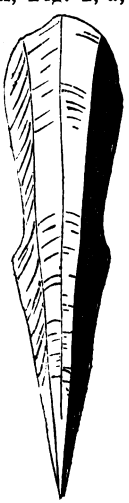

Fig. 4.

loop lines of growth advancing forward; two lateral, *b*, separated from the dorsal by a continuous straight or nearly straight line, and covered with very obliquely arched striæ in a hyperbolic form, in part nearly parallel to the dorso-lateral boundary line, and in part reflexed, so as to form lines in retiring curves across the ventral portion nearly parallel to the edges of the septa.

There were at least three kinds of pro-ostracum in the family *Belemnitidæ*.

A. In many *Belemnites* the extension of the *conotheca* seems to run out in one simple broad plate, Fig. 3, as in *B. hastatus* from Solenhofen.

B. In *Belemnites Puzosianus*, D'Orbigny, the pro-ostracum is very thin, and apparently horny or imperfectly calcified in the dorsal region, supported laterally by two long, narrow, parallel, calcareous plates, Fig. 4, as in *B. Puzosianus* from the Oxford clay. Professor Huxley considers this difference between the pro-ostraca of generic importance.

C. The third kind of pro-ostracum is exhibited by *Orthocera elongata*, De la Beche, the type of the genus *Xiphoteuthis*, Huxley; it is calcareous, and is composed of concentric lamellæ, each of which consists of fibres disposed perpendicularly to the plane of the lamella; the *phragmocone* is very long and narrow, and the guard cylindroidal.

Professor Huxley suspects that a thoroughly well-preserved specimen of *Belemnoteuthis* will some day demonstrate the existence of a fourth kind of pro-ostracum among the *Belemnitidæ*.

The genera in the family are:—1, *Belemnites;* 2, *Belemnitella;* 3, *Xiphoteuthis;* 4, *Belemnoteuthis;* 5, *Plesioteuthis;* 6, *Celœno;* 7, *Beloptera;* 8, *Belemnosis;* 9, *Conoteuthis;* and ? *Helicerus*.

"The *A anthoteuthes* of Munster, so far as they are known only by hooks and impressions of soft parts, may have been either *Belemnites*, or *Belemnoteuthis*, or *Plesioteuthes*, or may have belonged to the genus *Celœno*." (Huxley.)

The genus *Belopeltis*, Voltz, was founded on the pro-ostraca of *Belemnites*, species of which were unknown.

The genus *Actinocamax*, Miller, was founded on the guard of *Belemnites* and *Belemnitella*, the upper parts of which had decayed, and thus presented no alveolar cavity.

Order II.—Tetrabranchiata.

Family I.—Nautilidæ
(including Family II.—Orthoceratidæ).

Division *a*.—Air-chambers confined to one part of the shell.

Ascoceras, Barrande, 1846.*

Etymology, askos, a leathern bottle, and *ceras*.

* At p. 185 Mr. Woodward refers to M. Barrande's second volume of the "Cephalopods of Bohemia." The *Ascoras*, *Glossoceras*, and *Aphragmites* are here described.

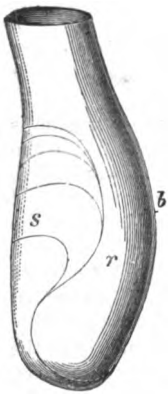

Fig. 5.
Diagram of *Ascoceras* (after Barrande).

Type, A. Bohemicum, Barr., Fig. 5.

Shell flask-shaped, smooth, transversely or longitudinally striated, or ornamented with annular folds, or plicated. The terminal chamber (*r*) occupying the space above the air-chambers (*s*), and extending down one side of nearly the whole length of the shell in the form of a wide and deep cavity, which is embraced by the decurrent edges of the incomplete septa (four or five in number). This cavity also communicates at its base with a small siphuncle which traverses the minute apical air-chambers. Aperture of shell simple.

The wide ventral cavity of *Ascoceras* is of the same nature as the large lateral siphuncle of *Cameroceras*.

Distribution, 16 species. Lower—Upper Silurian. Bohemia, Norway, England, Canada.

Glossoceras, Barrande, 1865.

Etymology, *glossa*, a tongue, and *ceras*.

Type, G. gracile, Barrande. Upper Silurian. Bohemia.

Shell similar to that of *Ascoceras*, but the dorsal margin of the aperture is extended in the form of a ligulate projection, subtriangularly rounded at the end, and recurved towards the interior of the shell.

This process gives rise to a distinct lobe on each side of the opening, which is analogous to that which exists in *Hercoceras*, *Ophidioceras*, and in certain species of *Phragmoceras* and *Gomphoceras*.

Distribution, 2 species. Middle and Upper Silurian. Anticosti; Bohemia.

Aphragmites, Barrande, 1865.

Etymology, *a*, without *phragmos*, a partition; and the usual termination.

Type, Ascoceras Buchii, Barrande.

Shell, similar to that of *Ascoceras*, but the air-chambers are deciduous.

Distribution, 2 species. Upper Silurian. Bohemia.

Division *b*.—Air-chambers occupying the whole cavity of the shell.

Piloceras, Salter, 1859.

Fig. 6. Diagram of *Piloceras* (after Salter).

Etymology, *pilos*, a cap, and *ceras*, a horn.

Type, P. invaginatum, Salter, Fig. 6.

Shell, broad, conical, sub-cylindrical, or compressed, and slightly curved. Siphuncle and septa combined as a series of conical concave septa, which fit into each other sheathwise.

Distribution, 3 species. Lower Silurian. Scotland. Canada.

Orthoceras.*

Sub-genera:—

1. Goniоceras, Hall, 1847.

Etymology, *gonios*, an angle.

Type, G. anceps. Lower Silurian. United States.

Shell, having the general form and structure of *Orthoceras*, flattened with extremely salient angles; septa sinuous; section of shell, an extended ellipse with projecting angles; siphuncle ventral.

2. Endoceras, Hall, see W. M., ii. p. 192.

3. Tretoceras, Salter, 1858 (*Diploceras*, Salter, 1856).

Etymology, *tretos*, pierced.

Type, Orthoceras bisiphonatum, Sowerby. Lower Silurian. Wales.

Shell elongated; septa pierced by a sub-central beaded siphuncle, and also by a deep lateral cavity continuous with the terminal chamber, and passing down side by side with the siphuncle—the cavity affecting at least seven of the uppermost septa, if not the whole.

Cyrtoceras.†

Sub-genera:—

1. Onoceras, see W. M., ii. 193. "The shells of this genus and *Cyrtoceras* pass gradually into each other, but *Onoceras* may be retained for those species which are much inflated in the anterior half or two-thirds of the shell length" (Billings); and "which have a more or less *strangulated aperture*" (Barrande).

* See p. 190. † See p. 194.

2. CYRTOCERINA,* Billings, 1865.

Type, C. typica, Billings.

Shell having the general characters of *Cyrtoceras*, but differs in the short, thick form, and in the large siphuncle on the *dorsal* side.

Distribution, 2 species. Silurian. Canada.

3. STREPTOCERAS, Billings, 1865.

Etymology, *streptos*, curved, and *ceras*.

Shell having the form of *Onoceras*, but with a trilobed aperture like *Phragmoceras*.

Distribution, 2 species. Middle Silurian. Canada.

LITUITES, Breynius.†

Type, L. lituus, Hisinger.

Shell discoidal, whorls (2—5) close or separate; last chamber produced in a straight, or nearly straight line, sometimes slightly curved, in a direction contrary to that of the spire; lateral margins of the aperture extended and curved towards the interior of the shell; the aperture contracted thus presents two distinct orifices, the smaller corresponding to the convex or ventral side, the larger to the concave or dorsal side of the shell.

L. lituus is the only species in which the aperture has been observed. 28 species from the Middle and Upper ? Silurian rocks of Europe and North America, belong here or to allied genera.

Sub-genus:—OPHIDIOCERAS, Barrande, 1867.

Synonym, *Ophioceras*, Barrande, 1865.

Etymology, *ophiodes*, shaped like a serpent, and *ceras*.

Type, O. Nakholmensis, Kjerulf (*Lituites*).

Shell with the produced portion very short or wanting.

The shells of the Bohemian species are keeled on the convex side.

Distribution, 7 species. Middle Silurian; Norway (1). Upper Silurian, Bohemia (6).

LITUUNCULUS, Barrande, 1867.

Shell as in *Lituites*, but with a simple aperture. No species have been yet observed.

Sub-genus:—DISCOCERAS, Barrande, 1867.

Etymology, *diskos*, a quoit, and *ceras*.

Type, D. antiquissimus, Eichwald (*Lituites*).

* See p. 194. † See p. 189.

Shell with the produced portion very short or wanting.

This sub-genus bears the same relation to *Lituunculus* (the existence of which is supposed) that *Ophidioceras* does to *Lituites*.

Distribution, 3 species. Middle Silurian. Russia, Germany, Norway.

HERCOCERAS, Barrande, 1867.

Etymology, *erkos*, a wall, and *ceras*.

Type, H. mirum, Bar. Middle Silurian, Bohemia.

Shell usually involute, as in *Nautilus*, rarely with separated whorls as in *Gyroceras*, or with a spire as in *Trochoceras*. *Body-chamber* with a diaphragm perpendicular to the axis of the shell, the concavity of which is opposed to that of the last septum. This disposition throws the aperture on the convex side of the shell, which is deeply excavated. *Siphuncle* dorsal, cylindrical, inflated between the chambers, separated from the shell.

Nautilus subtuberculatus, Sandberger, from the Devonian of Nassau, may belong to this genus.

BATHMOCERAS, Barrande, 1867.

Etymology, in allusion to the imbricated arrangement of the partitions.

Type, B. complexum, Barr. (Orthoceras).

Shell having the general appearance of *Orthoceras*. Part of the body-chamber occupied by a series of imbricating plates, which decrease in horizontal extension from below upwards. *Siphuncle* composed of a series of superimposed funnel-shaped tubes, the narrow end directed towards the aperture of the shell.

Distribution, 2 species. Middle Silurian, Bohemia.

AULACOCERAS, Hauer, 1860.

Etymology, *aulax*, a furrow, and *ceras*.

Type, A. sulcatum, Hauer, Fig. 7.

Shell straight, like *Orthoceras;* corrugated, with two deep lateral furrows; siphon simple, very small, marginal and dorsal, situated between the longitudinal sulci. The test increases rapidly in thickness towards the apex of the shell.

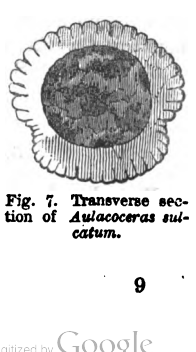

Fig. 7. Transverse section of *Aulacoceras sulcatum*.

The genus is a transition form between the *Nautilidæ* and the *Belemnitidæ*.

Distribution, 4 species. Upper Trias, Austria.

[FAMILY GONIATIDÆ. Barrande.]

Shell involute or straight; septa concave in their median section; sutures usually with angular lobes; septal tubes conical, more or less prolonged, but always directed backwards. Siphuncle cylindrical, of small diameter, always marginal; siphonal investment not persistent; convexo-ventral margin of the aperture sloped, lines of growth and ornamentation of the shell with a corresponding sinuosity.

The genera enumerated in this family are *Goniatites*, *Clymenia*, and *Bactrites*. Dr. Woodward includes the *Goniatites* and the *Bactrites* (pp. 196, 197) with the *Ammonitidæ;* and the *Clymenia* with the Nautilidæ (p. 190).

FAMILY III.—AMMONITIDÆ.

Shell various; septa convex in their median section; sutures always lobed, ramified, or denticulated; septal tube cylindrical and always directed forwards. Siphuncle cylindroid of small diameter, always marginal; siphonal investment more or less solid and persistent. Convexo-ventral? margin of the aperture more or less prolonged, which determines a similar convexity in the lines of growth and ornamentation of the test; there are rare specific exceptions.

DIVISION I.—SUTURES LOBED OR DENTICULATED AT THE BASE.

1. RHABDOCERAS (see p. 196).

2. BACULINA, D'Orbigny, 1850.

Example, B. Rouyana, D'Orb. Neocomian, France.

Shell like *Baculites*, but its lobes and saddles are not foliated, there being between these forms a similar distinction to that between *Ceratites* and *Ammonites*.

B. acuarius, Schlotheim, is from the Oxfordian strata of Gammelshausen in Wurtemberg.

3. COCHLOCERAS, Hauer, 1860.

Etymology, *cochlos*, a snail-shell, and *ceras*.

Type, C. Fischeri, Hauer, Fig. 8.

Shell resembling that of *Turrilites*, with the sutural lobes simple, as in *Rhabdoceras* and *Clydonites*.

Distribution, 3 species. Upper Triassic strata of Hallstadt, Austria.

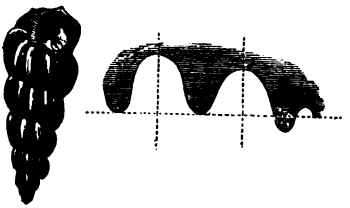

Fig. 8. Shell and sutural lobes of *Cochloceras Fischeri*.

4. CHORISTOCERAS, Hauer, 1865.

Type, C. Marshii, Hauer.

Shell somewhat similar in form to *Crioceras*, with the lobular ornamentation characteristic of *Ceratites*.

Distribution, 4 species. Upper Trias, Austria.

5. CLYDONITES, Hauer, 1860.

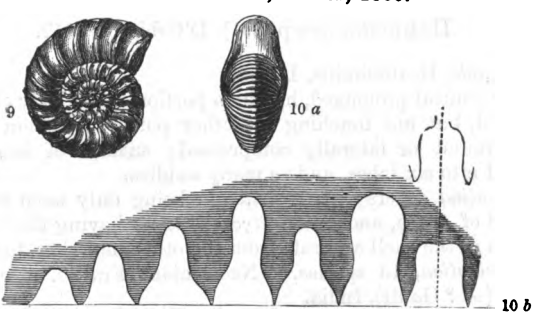

Fig. 9. Shell of *Clydonites costatus*, Hau. Figs. 10a, 10b. Shell and sutural lobes of *C. delphinocephalus*, Hau.

Etymology, *kludon*, the surge, with the usual termination.

Examples, Goniatites Eryx, Münst; Ammonites delphinocephalus, Hauer. Figs. 9, 10.

Shell, discoidal; sutures lobed; lobes entire, not crenulated as in *Ceratites*.

Distribution, Upper Triassic strata, Hallstadt and St. Cassian, in the Austrian Alps; North-western Himalayas; 21 species. Upper Cretaceous, 2 species described as *Ceratites* by D'Orbigny.

6. CERATITES (see p. 197).

DIVISION II.—SUTURES FOLIATED

Including the genera *Ammonites* (p. 197), *Toxoceras*, *Ancyloceras*,* *Scaphites*, *Helicoceras*, and *Turrilites* (p. 200), *Hamites*, *Ptychoceras*, and *Baculites* (p. 201), and the following.

ANISOCERAS (see p. 200), Pictet, 1854.

Etymology, *anisos*, unequal; and *ceras*.

Example, Hamites armatus, Sowerby.

Shell at first growing in an open helicoid spire, afterwards more or less prolonged and reflected; ornamented by transverse ribs. Sutures of septa divided into 5 lobes and 5 saddles, all bipartite; the lateral saddles are the largest.

Fossil, 12 species. Gault—Upper Green Sand, Europe. Cretaceous, India. 1 species, Jurassic. North-west Himalayas.

Species of *Helioceras* founded on helicoid portions of shells may belong to this genus.

HAMULINA (see p. 201), D'Orbigny, 1852.

Example, H. dissimilis, D'Orb.

Shell conical prolonged, having a portion of the body chamber reflected, but not touching the other portion; section of the shell round or laterally compressed; sutures of the septa divided into six lobes, and as many saddles.

Hamulina differs from *Hamites* in being only once reflected instead of twice, and from *Ptychoceras* in having the reflected portion of the shell separate from the other, not close together.

Distribution, 15 species. Neocomian, France. Ootatoor group (= ? Gault), India.

PELTARION, Deslongchamps, 1859.

Founded on the mandibular armature of tetrabranchiate cephalopods

* Many of the forms considered to belong to *Crioceras* have been ascertained by M. Astier to be only more or less incomplete individuals of species belonging to *Ancyloceras*. That *Crioceras* must merge into *Ancyloceras* appears inevitable.

Example, P. bilobatum. Upper Lias, Normandy. Fig. 11. Calcareous plates nearly circular or transversely oval; ante-

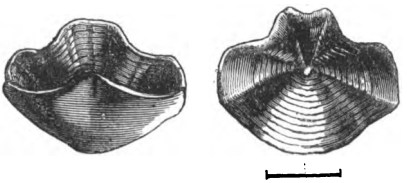

Fig. 11.

rior border rounded, posterior produced and truncated; concave above and flattened below; the two faces have one-half smooth and the other concentrically striated in an inverse direction to each other.

Fossil, 3 or 4 species. Up. Lias — Cor. Rag. England; Normandy; Wurtemberg.

CLASS II.—GASTEROPODA.

Order I.—Prosobranchiata.

Family II.—Muricidæ (see p. 212, &c.).

The genera included in this family are:—

Murex, Typhis, Pisania, Trophon, Fasciolaria, Turbinella (*Cynodonta*, *Latirus*, *Lagena*), Fusus (*Clavella*, *Chrysodomus*, *Pusionella*, *Tritonidea*), Fulgur, Cominella, Myristica, and Lachesis

Anachis, H. and A. Adams.

Type, Columbella scalarina, Sowerby.

Shell like *Columbella;* operculum elongated, unguiform, nucleus terminal, having close analogies with *Pisania*.

Distribution, 27 species. Tropical America.

Ptychatractus, Stimpson, 1865.

Etymology, *ptych*, a fold; *atractus*, a spindle.

Type, Fasciolaria ligata, Mighels and Adams. Deep water; United States.

Shell fusiform, spirally striated; aperture with a rather long canal; columella plicated as in *Fasciolaria*; operculum like that of *Chrysodomus*. Lingual dentition, resembles that of the *Purpuridæ*, 1·1·1. Rhachidian tooth, deeply arched, with three denticles; lateral teeth versatile, elongated, simple, hook-shaped, base swollen.

Buccinopsis, Jeffreys, 1859.

Etymology, having the aspect of Buccinum.

Synonym, Liomesus, Stimpson, 1865.

Type, Buccinum Dalei, J. Sowerby, Britain.

Shell oval, spirally striated; epidermis filmy; spire short, obtuse; outer lip smooth within; canal short and open; operculum triangular; nucleus placed on the inner base of the aperture.

The lingual dentition makes an approach to Mangelia, and consists of a single plain and slightly curved tooth on each side of a thin non-denticulated plate.

The egg cases of Buccinopsis are separate.

Distribution, 3 species. German Ocean, North Atlantic, Spitzbergen, Behring's Straits.

Fossil. B. Dalei occurs in the Red, Antwerp, and Coralline Crags. England, Belgium.

Cheletropis is the fry of species belonging to the *Muricidæ*.

Adamsia, Dunker, resembles a sculptured *Cominella* without the sutural construction of the whorls. 2 species. Australia.

Family III.—Buccinidæ.*

The enumerated genera are:—

Buccinum, Pseudoliva, Bullia, Eburna, Phos, Nassa (*Cyllene*, *Northia*, *Cyclonassa*), Columbella, Truncaria, and Terebra (*Myurella*), Subula (*Euryta*).

Truncaria, A. Adams and Reeve, 1848.

Synonym, Buccinopsis, Deshayes.

Type, T. filosa (Buccinum). Adams and Reeve. China.

Shell oval, oblong; spire elongated; apex acute, often channelled at the suture; aperture oblong, dilated in front, angulated, sometimes with a small canal behind; outer lip simple or bordered; columella concave, abruptly truncated, and shorter than the right lip.

* See p. 218, &c.

Species of this genus are *Buccinums* with a truncated columella.

Distribution, 5 species. China, Central Ameria, Vigo Bay.

Fossil, 3 species. Eocene. Paris basin.

[FAMILY PURPURIDÆ]

Is composed of the following genera:—

PURPURA, including *Monoceros* (of sectional value)* and the sub-genera:—

Concholepas, *Cuma*, *Rapana* (see p. 217, under *Pyrula*), *Pinaxia*, Adams.

Iopas, H. and A. Adams, 1853. *Shell* bucciniform, with a small canal in the posterior angle of the aperture. *Fossil*, 3 species. Eocene. Paris.

Vitularia, Swainson, 1840. V. salebrosa. South and Central America. *Shell* with irregular varices; operculum as in *Purpura*.

Nitidella, Swainson. *Shell* as *Cylindra;* spire sometimes decollated; lip continuous or crenated; operculum elongate; nucleus lateral.

RICINULA, HARPA, RHIZOCHCHILUS (*Coralliophila*, Adams), and MAGILUS, with the

Sub-genus Leptoconchus, Rüppell.

Shell similar to that of *Magilus*; young shell only with an operculum.

[FAMILY CASSIDÆ.]

The genera referred to this family are:—

RANELLA (p. 214), TRITON (p. 214), PYRULA (p. 217), CASSIS (p. 224), ONISCIA (p. 225), CASSIDARIA (p. 225), DOLIUM (*Malea*) (p. 226), and

NASSARIA, Pfeiffer.

Animal analogous with that of *Ranella*, as regards the length of the tentacles, position of the eyes, smallness of the head, and by the form of the operculum, but is provided with a long branchial siphon.

Shell sub-canaculated in front, and deeply notched.

[FAMILY OLIVIDÆ]

Includes OLIVA (*Olivella*, *Scaphula*, *Agaronia*), ANCILLARIA (*Monoptygma*, Lea).†

* See p. 223. † See p. 227.

[Family Volutidæ]

Contains Columbellina (p. 227), Mitra (*Imbricaria*, *Cylindra*, *Strigatella*, and *Hyalina*) (p. 231), Voluta (*Volutilithes*, *Scaphella*, *Volutomitra*, and *Melo*) (p. 230), Cymba (p. 231), Marginella (p. 232), Volvaria (p. 232), and

Lyria, Gray, 1847.

Synonyms, Harpella, Gray; Enæta, Gray.

Types, L. deliciosa, Montf.; L. harpa, Barnes.

Shell ovate oblong, mitriform, thick, sometimes longitudinally costated; aperture subovate, with a large number of columellar plaits, the two anterior of these being the strongest; posterior portion of the inner lip provided with a large number of short cross-plaits. Operculum ovate-elongate, thin; corneous nucleus at first nearly central, at a more advanced age subapical.

Distribution, 14 species. Pacific Ocean, America, Madagascar, Australia, Japan, New Caledonia, Antilles.

Fossil, 3 species. Cretaceous. India. The species in the Tertiary strata have not been distinguished from *Voluta*.

Cystiscus, Stimpson, 1865.

Type, C. capensis, Cape of Good Hope.

Shell resembling that of *Marginella;* small, thin, ovate, inflated, smooth, and polished; aperture narrow, columella plaited.

Animal with an elongated foot, truncated in front; head oblong, depressed; tentacles triangular, flattened, and horizontal; eyes at the lateral margins of the head, at the bases of the tentacles. Lingual dentition, 0·1·0, resembling the rhachidian teeth of *Murex*, thick and strong, with seven unequal conical denticles.

[Family Cypræidæ]

Includes Erato, Cypræa (*Cyprovula*, *Luponia*, and *Trivia*), Ovula (*Volva* and *Radius*), Pachybathron, Pedicularia, and Dentiora, Pease, 1862.

Type, D. rubida, Sandwich Islands.

Shell differs from that of *Pedicularia* in the flat or excavated columella, compressed, and toothed.

Family Conidæ

Contains Conus (*Conarbis*), Dibaphus, Pleurotoma (*Drillia*, *Bela*, *Clionella*, *Daphnella*), Clavatula (*Tomella*), Mangelia (*Clathurella*), Lachesis, Cithara, and

Borsonia, Bellardi, 1839.

Synonym, Cordieria, Ronault, 1848.

Shell like *Pleurotoma*, with oblique folds on the thick columella, and thus establishes a passage between *Pleurotoma* and *Turbinella*.

Distribution, 4 species. East Indies.

Fossil, 23 species. Eocene—. France, Italy, England, United States.

Gosavia, Stoliczka, 1865.

Type, Voluta squamosa, Zekeli.

Shell similar to that of *Conus;* aperture narrow, elongated; base emarginate; outer lips notched near the posterior suture; columella lip plicated, the anterior plaits being always the strongest.

Fossil, 8 species. Cretaceous. — Eocene? Gosau; India.

[Family Naticidæ.]

The genera are—

Natica, containing as sub-genera *Naticospis*, *Neverita*, *Lunatia*, *Globulus*, *Globularia*, *Polinices*, *Cernina*, and

Euspira (Agassiz), Morris and Lycett, 1850.

Spire more or less elevated; whorls few, distinct, angulated, or carinated.

Fossil, 6 species. Inferior Oolite—. Forest Marble. England.

"*Euspira* presents considerable affinities to the Palæozoic genus, *Scalites* (Hall), in the lines of growth having the appearance of a slight fissure, where the angle occurs in the volution." (Mor. and Lyc.)

Sigaretus (and sub-genus *Naticina*).

Lamellaria (*Oncidiopsis* and *Marsenia*), Velutina.

Amaura.

Type, A. candida, Möller. Greenland.

"*Animal* allied to *Natica;* foot small, compact without any posterior lobe; the front lobe deeply sinuated; eyes subcutaneous, situated at the internal base of the lobe; operculum terminal, few-whorled, horny, thin.

"*Shell* ovate, imperforate, spire small, produced; mouth reversed, pear-shaped, about half the length of the shell." (Möller.)

Fossil, species. Cretaceous. Germany, Britain.

DESHAYESIA, Raulin, 1844 (see p. 236).

Dedicated to M. Deshayes, author of "Description des Animaux sans Vertèbres dans le bassin de Paris," &c.

Synonym, Naticella, Grateloup (non Münster).

Type, D. Parisiensis, Raulin.

Shell subglobose, thick, umbilicated; spire short; aperture entire, semicircular, oblique; columella oblique; callosity denticulated; umbilicus covered by the callosity; right lip acute, smooth internally.

This genus presents a very remarkable combination of the characters of *Natica* and *Nerita*, and appears to establish a passage between these two genera, types of distinct families.

Distribution, 2 species. Oligocene and Miocene. Paris and Bordeaux Basins

PTYCHOSTOMA, Laube.

Fossil, 3 species. St. Cassian.

[FAMILY CANCELLARIDÆ.]

The genera are—

CANCELLARIA (*Admete*, p. 216), TRICHOTROPIS (p. 216), ? CERITHIOPSIS (p. 242), ? SEPARATISTA, and

PURPURINA,* D'Orbigny, 1850 (p. 222).

Type, Purpurina Bellona, D'Orbigny, Fig. 12.

* This genus has been the subject of careful research and revision by Messrs. Eugene Deslongchamps and Piette; and I think it advisable to replace the characters of this group, given in p. 222 of the Manual, by those emended by the authors above mentioned.

Shell oval, elongated, ventricose, thick; whorls rounded or rendered angular by the upper portion being channelled; last whorl much developed. Ornamentation usually of large longitudinal ribs, crossed by numerous striæ; aperture large in the young state, slightly notched in front; columella rounded; umbilical groove deep, narrow, but well defined.

Fossil, 8 species. Inferior Oolite—Kelloway Rock. England, France, Germany.

Fig. 12 *Parpurina Bellona.*

TORELLIA (Loven), Jeffreys, 1867.

Dedicated to Dr. Otto Torell, of Norway.

Type, T. vestita, Jeffreys. Shetland and Norway.

Animal with the produced lips and lingual dentition of *Capulus*.

Shell globose, covered with a velvety epidermis; spire very short; apex depressed; aperture roundish; pillar with a blunt tubercle at its base; groove internal, scarcely perceptible; operculum like that of *Trichotropis*.

[FAMILY NERITOPSIDÆ.]

Genera:—NERITOPSIS and NARICA with *Naticella* as a sub-genus (see p. 261).

[FAMILY PYRAMIDELLIDÆ.*]

The following genera and sub-genera are additional:—

PYRAMIDELLA. Sub-genus *Chrysallida*, P. Carpenter, 1857.

Shell pupiform; peristone continuous; edge of lip thin; columella-plait distinct, though hidden; operculum in the typical species radiately corrugated.

Distribution, 25 species. E. and W. Indies, Japan, Mazatlan.

ODOSTOMIA. Some of the Mazatlan species have the peristone continuous.

Sub-genera:—*Auriculina*, Gray.

Shell having the general aspect of *Odostomia*, but presenting no vestige of a plait. Mazatlan, 3 species.

Fossil, 4 species. Tertiary. United States.

Parthenia, Lowe (*Ebalia*, Adams). Surface sculptured; columella plaited.

Distribution, 10 species. Mazatlan, Japan.

* See p. 238.

SCALENOSTOMA, Deshayes, 1863.

Type, S. carinatum, Isle of Bourbon.

Shell in form allied to *Pyramidella* and *Niso*, turriculated, white, imperforate; columella not plicated; opening subtriangular, slightly bent in the direction of its length; margin simple, notched near the suture.

CHEMNITZIA. Sub-genera:—*Dunkeria*, P. Carpenter (dedicated to Professor W. Dunker). Aperture as in *Chemnitzia*, but the whorls rounded as in *Aclis*; whorls cancellated.

Distribution, 7 species. Mazatlan, Japan.

Pseudomelania, Pictet and Campiche, 1864.

Etymology, *pseudo*, false, and *Melania*, a generic name.

Shell turriculated, spire acute, test thick, imperforate, without ornamentation. Aperture oval, rounded in front, more or less angulated behind; columella thick, conforming to the general curvature of the aperture; lip simple.

Distribution. Trias—Chalk. Europe, South Africa. The cretaceous species are 14 in number.

EULIMA. Sub-genus:—*Leiostraca*, H. and A. Adams (*Balcis*, Leach).

Shell with a slight varix on each side of the spire.

Distribution, 8 species. Mazatlan, Taboga.

ACICULINA, Deshayes, 1864.

Shell small, aciculated; apex laterally inclined; whorls numerous, convex, smooth; aperture entire, small, subquadrangular; columella straight, narrow, cylindrical, and simple.

Distribution, 6 species. Eocene. Paris basin.

MATHILDA, Semper, 1865.

Shell turriculated, apex revolute, abruptly turned from left to right; whorls in the typical species transversely cingulated and reticulated, longitudinally striated; aperture entire, subrotund, base sometimes subeffuse; lip acute; columella smooth, not plicated.

Distribution. The type *Turritella quadricarinatus*, Brocchi, is living in the Mediterranean, and is fossil in the Crag of Anvers, and at Bologna.

Fossil, 13 species. Eocene—. Europe, United States.

SOLENISCUS, Meek and Worthen, 1860.

Etymology, *soleniskos*, a little channel or gutter.

Type, S. typicus. Upper Coal Measures. Springfield, Illinois.

Shell fusiform, smooth, body whorls contracted below into a distinct straight canal, with an oblique plait on the columella.

Agrees with *Macrocheilus* in its smooth surface and columella fold, but differs in its fusiform outline, narrow aperture, and distinct canal. In its general appearance resembles *Fasciolaria*, but has only one instead of two or three columella folds, and is destitute of ornamentation, and its outer lip is smooth within.

EUCHRYSALIS, Lambe.

Fossil, 6 species. St. Cassian, Austria.

[FAMILY STILIFERIDÆ.]

The genera are:—

STILIFER.—Dr. Fischer supposes that *Stilifer*, though living like a parasite on the tegumentary system of the echinoderms or their appendages, does not feed on their substance, as has been supposed. Mr. Gwyn Jeffreys's impression is that it feeds on the excretions of the echinoderms.

STYLIFERINA, Adams.

Shell imperforated, ovate conical, thin, smooth; whorls many, produced in a styliform spire; nucleus sinistral; aperture subquadrate; lip simple, straight.

Distribution, 2 species. Japan.

M. Freyer, of Trieste, is of opinion that *Entoconcha* (*E. murabilis*), which is parasitic on *Synapta digituta*, is the embryonic condition of a species of *Natica*.

FAMILY III.—CERITHIADÆ.*

Includes CERITHIUM (*Rhinoclavis* and *Bittium*), TRIFORIS, POTAMIDES (*Vicarya*, *Cerithidea*, *Terebralia*, *Pyrazus*, and *Lampania*), NERINÆA, and the following additional genera and sub-genera:—

CERITHIUM.—*Sub-genus.* *Sandbergeria*, Bosquet, 1860. Dedicated to Professor Sandberger. *Type*, Cerithium cancellata, Nyst. sp. *Shell* short, like *Cerithium*, canal terminal, very broad, and short. M. Bosquet describes the type as having an operculum as in *Stenothyra;* it is very questionable as to whether the operculum belonged to the shell.

* See p. 242, &c.

Distribution, 29 species. Cretaceous; India. Eocene. France, Netherlands.

EUSTOMA, Piette, 1855.

Type, E. tuberculosa, Piette.

Shell in the young state resembling *Cerithium;* in the adult, the margins of the aperture are much expanded and posteriorly united by an indistinct canal; canal elongated.

Fossil, 2 species. Great Oolite. Ardennes.

EXELISSA, Piette, 1861.

Etymology, *exelisso*, to unfold.

Synonym, Kilvertia, Lycett, 1863.

Type, Cerithium strangulatum, D'Archiac.

Shell small, elongated, subcylindrical, somewhat pupæform, many whorled, perpendicularly costated, tuberculated or spined; last whorl cylindrical, contracted at the base, with a tendency to separate from the axis; aperture orbicular, entire, the lips elevated, produced, and slightly thickened; columella solid.

Fossil, 14 species. Mid. Lias—Kimmeridge Clay. England and France. The shelly freestone of the Inferior Oolite, Gloucestershire, contains some undescribed species. Cretaceous, 1 sp. ? India.

FIBULA, Piette, 1857.

Example, Turritella Roissyi, D'Archiac.

Shell elongated, columella straight, with a rudimentary groove near the base; outer lip arched, slightly notched at the suture; base of the aperture forming a slight canal, or rounded and entire, depending upon the exact period of growth at which the animal perished.

The species of this genus possess characters intermediate and approximating them to *Turritella* and to *Cerithium*.

Fossil, 21 species. Triassic—Cretaceous. Europe, India.

CRYPTOPLOCUS, Pictet and Campiche, 1854.

Etymology, *cryptos*, hidden; *ploce*, a plait.

Example, Nerinæa monilifera, D'Orb.

Shell, as in *Nerinæa*, without columella and labial plaits; one plait on the posterior face of the aperture, a disposition very analogous to that in some *Cerithiums*, such as *C. nodulosum;* aperture rounds ', not channeled in front; umbilicated or imperforate.

Distribution, 7 species. Jurassic and Cretaceous. France, Switzerland, Germany.

PLANAXIS. M. Deshayes places this genus in *Littorinidæ*, but Dr. Macdonald states that it is anatomically closely related to *Cerithium*, the lingual teeth are similar, and that the auditory sacs contain spherical otoliths.

QUOYIA, Deshayes, 1830.

Dedicated to the celebrated naturalist to the Astrolabe.

Synonyms, Fissilabria, Brown; Leucostoma, Swainson.

Shell solid, elongated, conical, apex decollated; whorls flat, the body whorl sub-angular at the base; aperture small, semilunar, produced in front; columella thick, curved, truncated anteriorly, with a spiral fold posteriorly, operculum horny, paucispiral, nucleus lateral.

Distribution, 2 species. New Guinea, Cochin China.

Fossil. Eocene, Paris (1). Miocene, Dax (1).

The three following genera are provisionally referred to *Cerithiadæ*.

CERITELLA, Morris and Lycett, 1850.

Etymology, diminutive of *Cerithium*.

Synonym, Tubifer (pars), Piette, 1856.

Type, Ceritella acuta, Mor. and Lyc.

Shell turreted, subulate, spire acute; whorls flat, margins usually sulcated; last whorl large; aperture elongated and narrow; canal short; columella smooth, rounded, and slightly reflected at the base; outer lip thin.

Fossil, 17 species. Middle Jurassic strata. England, France.

BRACHYTREMA, Morris and Lycett, 1850.

Etymology, *brachyos*, short, and *tremos*, a cut.

Examples, B. Buvignieri, Mor. and Lyc., B. Wrightii, Cotteau (Fig. 13).

Shell small, turreted, turbinated; whorls either costated, nodulated, or cancellated; the last whorl large and ventricose; columella smooth, rounded, twisted near its base, and reflecting outwards, forming a short, oblique canal; aperture moderately subovate, its length being usually less than that of the spire.

Fig. 13.
Brachytrema Wrightii.

Some species, as *B. varicosa* and *B. pygmæa*, acquired at certain arrests of growth thickened outer lips or varices, as in *Triton*.

Fossil, 16 species. The greater number belong to the Great Oolite, others occur in the Kelloway Rock. England, France.

MESOSTOMA, Deshayes, 1864.

Example, M. grata, Dh.

Shell elongated, turreted, scalariform; aperture nearly circular, dilated, obliquely cut, terminating in front by a semi-canaliculated angle; columella slightly concave, cylindrical, obliquely truncated, lip simple, and slightly expanded.

Fossil, 4 species. Eocene. Paris basin.

[FAMILY APORRHAIDÆ, Gray, 1856,]

Includes the genera APORRHAIS (see p. 244), PTERODONTA, STRUTHIOLARIA (p. 246), and HALIA; also

ALARIA, Morris and Lycett, 1854.

Synonym, Tessarolax, Gabb, 1864.

Etymology, *ala*, a wing.

Examples, Alaria trifida, Phillips, sp.; A. cingulata, Pictet and Roux, sp.

Shell turreted, fusiform, terminating anteriorly by a canal; wing digitated or palmated, formed by the prolongation of the free border of the last whorl, and which is applied against the last whorl but one, but never adheres to the rest of the spire; posterior canal wanting; right lip without a sinus.

Distribution, about 50 species. Jurassic. Europe, Himalaya Mountains, South Africa. Cretaceous, 9 species. England, France, Germany.

The species of this genus have been referred to *Rostellaria*, *Pterocera*, and *Aporrhais*.

DIARTHEMA, Piette.

Shell with continuous varices.

Distribution. Lower Oolites. France.

Pelicaria vernis, Adams, has a spiral shell; the spire of adult covered with an enamel coat; aperture ovate; outer lip sinuous, sharp-edged.

? BULIMELLA, Hall, 1857.

Shell more or less fusiform; whorls convex, the last one much enlarged; columella truncated; outer lip thin, with a slight notch or sinus at the margin near its junction with the pillar.

Distribution, 3 species. Carboniferous. Indiana.

[FAMILY VERMETIDÆ.]

The shells of species of this family are distinguished from those of the *Serpulæ* by the presence of a spiral nucleus and of concave smooth interior septa.

If the shell is formed of a solid matter strongly sculptured with longitudinal grooves or scales, or of a brownish colour, it is certainly formed by a *Vermetus;* but if the shell is of a soft earthy matter, feebly longitudinally grooved, it is doubtful to which it belongs.

The shells of the *Serpulidæ* have an anal opening (except *Cymospira*), and appear only to be composed of two layers, the *Vermetidæ* having three.

The interior of several species contains very long lamellæ, generally regarded of generic value; but they are dissolved with age, like the teeth of some species of *Pupa*.

All the *Vermeti* are viviparous, and the lamellæ within the tubes may serve for the retention of the fry.

The genera and sub-genera contained in this family are VERMETUS (*Petaloconchus*, *Serpulorbis*) (p. 249), and SILIQUARIA (p. 249).

[FAMILY CÆCIDÆ.]

Shell with a spiral nucleus; tubular, regular, sometimes fixed aperture orbicular; operculum horny, multispiral; margin sometimes fimbriated.

CÆCUM, Fleming.*

Nuclear whorls orbicular, in the same plane as the adult, frequently decollated; operculum concave or flattened.

Sections:—Elephantulum. Comparatively of large size, tapering; sculpture longitudinal.

Distribution, 9 species. Mazatlan (6), West Indies, Mauritius.

Fossil, 1 species (C. liratum), Carpenter. Cor. Crag. Sutton.

Anellum (typical Cæca). *Adult shell* annulated.

Distribution, 14 species. Europe, Matzatlan, Australia, Japan.

Fossil, 2 species. Eocene. Paris, Suffolk.

Fartulum. Smooth, cylindrical.

Distribution, 10 species. Mazatlan, Teneriffe, Singapore, Australia.

Fossil, *C. mamillatum*, S. Wood. Cor. Crag. Sutton.

Sub-genera:—BROCHINA, Gray.

Type, Dentalium glabrum, Mont.

* See p. 249.

Shell like *Cœcum*, smooth; aperture simple, acute; apex closed by a mamillated plug; operculum, convex.

Distribution, 2 species. Europe, West Indies, Mazatlan.

Meioceras, Carpenter.

Etymology, *meion*, rather small; *ceras*, horn.

Young shell spiral or flat; *adult* somewhat inflated; aperture oblique; operculum spiral, scarcely concave.

Distribution, 3 species. West Indies.

Streblоceras, Carpenter, 1858.

Etymology, *streblos*, twisted; *ceras*, horn.

Shell with the spire not decollated, no plug formed; nuclear whorls orbicular, perpendicular to the plane of the adult; the plane of growth is flat, as in *Cœcum*, but some examples have a slight twist, forming an approach to *Meioceras*.

Fossil, 4 species. Eocene. Hampshire, Paris.

Family V.—Turritellidæ*

Includes Turritella, Proto, Mesalia, and

Cassiope, Coquand, 1865.

Synonym, Omphalia, Zekeli, 1852 (non *Omphalius*, Philippi, 1847).

Example, Turritella Renauxiana, D'Orbigny.

Shell thicker, and with more rapidly increasing whorls than in *Turritella*, often pupiform; aperture rounded, continuous; outer lip notched or sinuated by an impressed furrow, which winds round the last whorl; columella usually distinctly umbilicated.

Distribution, 32 species. Cretaceous. Europe, India, and America.

[Family Scalariadæ†]

Includes Scalaria and the sub-genera *Eglisia*, *Pyrgiscus*, and *Cirostrema*, Mörch.

Shell solid, varices irregular, whorls generally cancellated.

Cochlearia, Braun.

Synonym, Chilocyclus, Bronn.

* See p. 248. † See p. 250.

Shell turriculated, thick; aperture circular, continuous, with a large expanded border.

Fossil, 2 species. Saint Cassian beds, Austria.

Holopella, McCoy, 1852.

Example, H. gregaria, Sow. (Turritella), Sil. Syst. t. 3, f. 1.

Etymology, *'olos*, entire, and *ope*, an aperture.

Shell elongated, slender, of numerous gradually increasing whorls, generally crossed by slightly arched striæ; mouth circular, with the peristome entire; base rounded, with or without a minute umbilicus.

The shells of the species composing this genus differ from those of *Turritella* in the continuous peristome and definite round margin to the aperture, thus approaching much nearer to *Scalaria*.

Fossil, 12 species. Silurian—Trias. Europe, United States.

Family IV.—Melaniadæ.*

Melania.—Tentacles long, with eyes on the exterior side at about a third of the length; margin of the mantle festooned.

Sub-genera, *Vibex*, *Melanatria*, *Hemsinus*, and *Philopotamis*, Layard, *P. sulcata*, Reeve, sp. *Operculum* subspiral; nucleus marginal. *Shell* solid, paludiniform. *Distribution*, 5 species. Ceylon. Habit of *Tanalia*.

Paludomus (*Type*, P. conicus, Gray), as restricted by the separation of *Philopotamis* and *Tanalia*, is characterised by the concentric structure of the adult operculum resembling that of *Paludina*, and a spiral nucleus situated about the middle of its height, and nearest to the left margin.

Distribution, India, Burmah, Egypt, East Indian Archipelago, Mauritius, Ceylon (2 species, reduced from 14). In tanks and marshes.

Sub-genus, *Tanalia*, Gray.

Synonym, Ganga, Layard, founded upon certain monstrous forms of *T. aculeata*.

Type, T. aculeata Chemnitz.

Shell semiglobose, costate, nodulose; mouth very large, ovate; operculum unguiculate; nucleus marginal.

Distribution, 2 species. Inhabiting mountain streams, adhering to rocks, or crawling over sandy bottoms, Ceylon.

Fossil, 2 species. Upper Chalk. Gosau

* See p. 246, &c.

Io, Lea, 1831.

Synonyms, Melafusus and Ceriphasia, Swainson; Pleurocera and Strepoma, Raf.; Trypanostoma, Lea; Telescopella, Gray.

Type, I. fluvialis, Say (Fusus).

Animal with the mantle margin plain; eyes at the base of the tentacles, which are short; operculum subspiral.

Shell fusiform, inflated, conical or oval; aperture produced into a more or less obvious canal in front.

Distribution, 100 species. North America.

Sub-genera, *Lithasia*, Haldeman, 1840. *Synonyms*, Angitrema, Haldeman; Potodoma, Sw.; Glotella, Gray.

Columella callously thickened above and below; base of aperture notched. *Distribution*, 31 species. North America.

Strephobasis, Lea, 1861 (Megara sp., A. and H. Adams). *Shell* with a retorse canal at the base of the squarish aperture. *Distribution*, 8 species. North America.

Gyrotoma, Shuttleworth, 1845.

Synonyms, Goniobasis, Lea, 1862; Euryccelon, Lea.

Shell solid, oval, oblong, or turreted; many forms resemble *Paludomus;* aperture subrhomboidal, subangular in front, without a canal; columella frequently callously thickened above; operculum subspiral, as in *Melania*.

Distribution, 289 species. United States.

Fossil, 8 species. Eocene. North America.

Sub-genera, *Schizostoma*, Lea, 1842 (*Schizochilus*, Lea; *Melatoma carinifera*, Anthony); aperture with a slit in the upper part of the outer lip immediately under the suture. *Distribution*, 27 species. North America.

Meseschiza, Lea, 1864. Slit in the middle of the outer lip. *M. Grosvenori*. Indiana.

Paladilhea, Bourguignat, 1865.

Dedicated to Dr. Paladilhe.

Shell somewhat resembling that of *Acme;* test thin, crystalline, extremely fragile; base of aperture produced in front; peristome continuous, thin, truncated; outer lip with a slit towards the suture.

Distribution, 3 species. Fresh-water deposits. Herault. One of the species is living in the neighbourhood of Montpellier.

BUGESIA, Paladilhe, 1866.

Shell resembling somewhat a very small *Cerithium* or microscopic *Lithasia*, but differing generically in having a wide, compressed, not callous columella like that of *Lacuna*.

Distribution, *B. Bourguignati*. In washings of the River Lez, Montpellier.

ANCULOSA, Say, 1821.

Synonyms, Leptoxis, Rafinesque; Anculotus auctores.

Type, A. præmorsus.

Shell oval; aperture entire and rounded in front; columella callously thickened above.

Distribution, 31 species. North America.

MELANOPSIS, including *Pirena*, see p. 248, W. M., ii.

FAMILY VII.—PALUDINIDÆ.*

The genera contained in this family are—

PALUDINA, AMPULLARIA (*Pomus*, *Marisa*, *Asolene*), LANISTES, MELADOMUS, BITHINIA, with the following sub-genera of the last:—

Stenothyra (*Nematura*), *Hydrobia*, *Syncera*, *Paludinella*, *Littorinella*, *Amnicola*, and

MOITESSIERIA, Bourguignat, 1863.

Type, Paludina Simoniana, Charpentier.

Shell somewhat similar to that of *Acme*; test pitted; depressions octagonal, tetragonal, and rounded according to their position; peristome externally thickened; no operculum has been observed.

Distribution, 1 species. Saline springs at Fouradade (Pyrenees).

Fossil, 3 species. Alluvium of the river Garonne, at Toulouse.

POMATIOPSIS, Tyron, 1865.

Synonym, Chilocylus, Gill.

Shell elongated; margin of aperture slightly expanded; operculum corneous, subspiral, without an internal process.

Animal like that of *Hydrobia*, but the foot is furnished with lateral sinuses; terrestrial or amphibious.

Distribution, species. America.

* See p. 257, &c.

[Family Rissoidæ]

Includes Litiopa (p. 255), Rissoina (p. 256), Rissoa (p. 255), and the following additional genera:—

Diastoma, Deshayes, 1864.

Type, Melania costellata, Lamarck.

Shell elongated, turreted; whorls with varices; aperture very oblique, semi-lunate, entire; base sinuated, subangular; posterior angle acute, detached from the penultimate whorl; lip thin, curved; columella concave, depressed, narrow.

Fossil, 4 species. Eocene. Paris basin.

Amphithalamus, P. Carpenter, 1865.

Type, A. inclusus. West Coast of North America.

Shell like *Rissoa*, nucleus large; aperture with a produced lip, suddenly contracted in the adult.

This genus bears the same relation to *Rissoa* that *Stoastoma* does to *Helicina*.

Keilostoma, Deshayes, 1848.

Type, Melania marginata, Lamk.

Shell elongated, turriculated, regularly conical; generally striated transversely. Aperture entire, short, effuse at the base, angulated posteriorly; columella short, callous; the peristome entire, the left lip broad and thick, the right broadly margined.

Fossil, Eocene, 6 species; Paris basin. Belgium, England, Punjaub. Cretaceous, 5 species; India, Gosau.

Pterostoma, Deshayes, 1864.

Type, P. tuba. Eocene. Grignon, Paris.

Shell elongated, turriculated; peristome continuous, circular, very dilated and margined; columella very broad, expanded, and continuous with the peristome.

Scaliola, Adams, 1860.

Type, S. bella.

Animal with the rostrum elongated, cylindrical, annulated, bifid at the end; tentacles filiform, eyes prominent, black at the outer base of the tentacles; foot short, ovate, posteriorly sub-acuminate; operculum corneous, ovate, subspiral; nucleus subterminal.

Shell turreted, umbilicated or rimose; aperture more or less circular; peristome continuous; margin straight, acute.

The species have the habit of agglutinating grains of sand to the surface of the shell.

Distribution, 4 species. Japan, Philippines, 2—70 fathoms.

Fossil, 1 species. Oligocene, Latdorf.

Microstelma, A. Adams, 1863.

Type, M. Dædala, Adams. Japan, 48 fathoms.

Shell turreted, ovate, rimose, somewhat resembling *Pyramidella;* spire conical; whorls longitudinally plicated. Aperture oblong, produced in front, sub-canaliculate; columella thickened, straightish; lip simple.

Fossil, 1 species. Sub-apennine formation. Asti, Italy.

Barleeia, Clark.

Named in honour of the late G. Barlee.

Type, Turbo ruber, Montagu. Britain, Mediterranean.

Animal and *shell* related to *Rissoa;* mantle and opercular lobe destitute of filaments; operculum solid, auriform, and gibbous, nucleus excentric.

Distribution, 3 species. Atlantic and Pacific Oceans.

[Family Skeneidæ]

Includes *Skenea* (p. 256), and

Homalogyra, Jeffreys, 1867.

Synonyms, Omalogyra, Jeffreys; Spira, Brown; Ammonicerina, Costa, 1861.

Etymology, a flat circle.

Type, H. atomus, Philippi (Skenea nitidissima, F. and H.).

Animal with a flattened body, no tentacles; eyes sessile, and placed behind the head.

Shell minute, forming a flat coil; spire involute; whorls more or less angulated; mouth clasping both sides of the periphery; operculum few-whorled, with a central nucleus.

The upper part of the body of *H. atomus* is partially ciliated. The tongue has only a single row of teeth, resembling miniature shark's teeth.

Distribution, 2 species. In pools, and just beyond low water, on sea-weeds and *Zostera*. Norway, Britain, France, shores of the Mediterranean.

Fossil, upper tertiary deposits.

Family VI.—Littorinidæ.*

The genera are—

Littorina, including *Tectaria*, *Modulus*, and *Risella*; Lacuna, and

Fossarus, Philippi (p. 253).

Synonyms, Phasianema, Wood; Maravignia, Arados.

Shell perforated, sculptured; inner lip thin; aperture semilunate; operculum not spiral.

Animal with two frontal lobes between the tentacles.

Distribution, 43 species, including species of the sub-genera. Mediterranean and tropical seas.

Fossil, 4 species. Miocene. Europe.

Sub-genera, *Conradia*, *Couthouyia*, *Cithna*, *Gottoina*.

Fossarina, Adams, differs from *Fossarus* in the curved inner lip and circular aperture. 2 species. Australia.

Isapis, H. and A. Adams. *Columella* with a plait; in *I. anomala* it is almost obsolete. 4 species. Jamaica and Mazatlan.

Lacunella, Deshayes, 1864.

Etymology, diminutive of *Lacuna* (see p. 255).

Type, L. depressa, Desh. Eocene. Paris.

Shell ovate, thin, pellucid, shining, very depressed; apex obtuse; aperture large, dilated; outer lip thin, reflected; columella narrow, thin, concave, grooved, with the base perforated.

? Raulinia, Mayer, 1864.

Dedicated to M. Raulin.

Type, Odostomia alligata, Deshayes. Eocene. Paris basin.

Shell turbinated, oval-oblong, moderately thick, spirally sulcated; whorls rapidly increasing, convex; last whorl very large; aperture large, angulated posteriorly, expanded in front; columella broad, arcuate, flattened, with a prominent tuberculous tooth.

Eucyclus, E. Deslongchamps, 1860.

Etymology, *eu-kuklos*, circling, in allusion to the numerous plications or rings of the spire and base.

Examples, Turbo ornatus, Sow.; T. capitaneus, Münst.

* See p. 250.

Synonym, Amberleya,* Morris and Lycett.

Shell very thin (without a nacreous layer?); spire elongated, almost turriculated; surface ornamented by longitudinal plica-

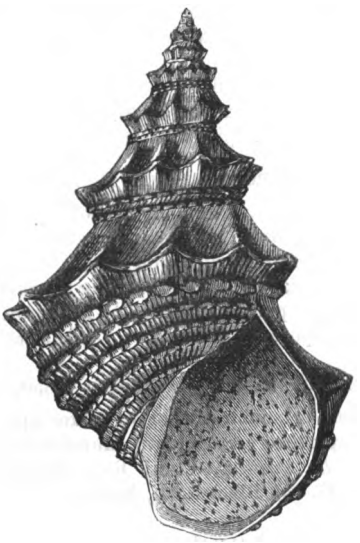

Fig. 14. *Eucyclus goniatus*, Desl..

tions and nodes; aperture oval, angular above; lip semi-circular, thin; columella flattened, imperforated.

Fossil, 23 species. Upper Lias— Kelloway Rock. England, France, Germany.

[Family Solaridæ]

Contains—

Solarium (see p. 253).

Sub-genera, *Torinia*, Gray.

Philippia, Gray (p. 253). *Shell* trochiform; umbilicus small. *Fossil*, 3 species. Miocene. America.

Disculus, Deshayes. *Shell* discoid; umbilicus very narrow, inferior angle of the aperture extended and oblique.

Adeorbis (p. 266), Cirrus (p. 271), Discohelix (p. 253), Euomphalus (pp. 267, 346), Bifrontia (p. 253), Platystoma (p. 254), Phanerotinus (p. 267), Maclurea (p. 345).

* This name was published in 1854, but the genus was insufficiently characterised.

OPHILETA, Vanuxem (p. 267), was founded on species of *Maclurea*, with very slender whorls. Mr. Billings regards them as distinct, and distinguishes them as follows:—"In *Maclurea* the aperture is entire, and the whorls usually large, but in *Ophileta* it has a sinus below and a notch above, while the whorls are usually more slender.

"In *Maclurea crenulata* (Billings) there is a sort of spiral band, and also there are indications of a sinus in the lip on the flat side, but they are only incipiently developed."—(Billings.)

STROPHOSTYLUS, Hall.

Etymology, *strepho*, I turn, and *stylus*, columella.

Shell subglobose or ovoid; spire small, body whorl large and ventricose; outer lip thin; columella twisted or spirally grooved within, not reflected; umbilicus wanting; aperture ovate or transversely oval; apparently related to *Platystoma*.

Distribution, 10 species. Silurian. United States.

HELIOCRYPTUS, D'Orbigny, 1850.

Shell depressed, orbicular; whorls embracing; umbilicated on both sides; aperture vertical, oval transverse.

Distribution. *H. pusillus*, Coral Rag, France, Germany; *H. radiatus*, U. G. S. Blackdown, Mans.

[FAMILY IANTHINIDÆ]

Includes—

IANTHINA and RECLUZIA (see p. 285).

FAMILY XII.—CALYPTRÆIDÆ.*

PLATYCERAS, Conrad, 1840 (see p. 277).

Type, Pileopsis vetusta, Sowerby.

Synonyms, Acroculia, Phillips, 1841; Orthonychia, Hall, 1843.

Shell depressed, subglobose to oblique, subconical; spire small; whorls few, free or contiguous; aperture more or less expanded, often campanulated, entire or sinuous.

Many species show a sinuosity of the striæ, indicating a notch in the margin of the aperture during the first stages of growth. Mr. Hall has been unable to recognise the peculiar muscular impressions which are characteristic of *Pileopsis*. Specimens of some species show the expansion of the columellar lip, and its partial or entire union with the volution, presenting all the

* See p. 275.

appearance of a thin columella with a deep umbilicus. P. *dumosum* is spiniferous; *P. subrectum* is simply bent or arcuate.

Distribution, 46 species. Silurian—Carboniferous. Europe, North America.

FAMILY IX.—TURBINIDÆ*

Includes PHASIANELLA (p. 263), IMPERATOR (p. 264), TURBO (p. 263), with the following sub-genera:—

Callopoma, Gray. Distinguished by the extreme complexity of the operculum. "The opercula of *C. fluctuosum*, Gray (Turbo) (Maz.), are flat, and covered with a dark horny layer inside, displaying about 6 whorls. Outside with a broad, central, spiral callus, white and granular, concealing the umbilicus, with extremely minute pustules over the surface, sometimes with a few sharp prickles. A deeply cut groove surrounds the callus, followed by a green, plaited, spiral frill prickly inside. Between this and the outer margin are 4—6 fine emerald necklaces, supported on slender spiral ribs, with deeply channeled interspaces. The operculum of *C. saxosum*, inhabiting Panama, is formed on a much coarser plan."—(P. Carpenter.)

Uvanilla, Gray. *Example*, *U. olivacea*, Mexico.

Distinguished by the absence of an umbilicus, and the biridged operculum.

Distribution, 3 species. Mazatlan, Mexico.

PHASIANELLA.

Sub-genus, *Eucosmia*, P. Carpenter, 1864.

Etymology, *eu*, well, and *cosmia*, adorned.

Shell solid, variegated as in *Phasianella*; aperture and whorls round; axis *umbilicated*.

Distribution, 4 species. Cape St. Lucas.

TROCHUS.

With the following sub-genera and sections:—

Margarita, Leach (p. 265). *Example*, T. helicinus, Fabr. *Shell* small, pearly, and umbilicated; lateral cirri, 3—7 in British species. No typical *Trochi* appear to inhabit North-East America, only those of this section. 3 species, Britain.

Gibbula, Leach (p. 265). *Example*, T. magus, Linné. *Shell* low-spired and umbilicated; lateral cirri, 3 on each side in the British species.

Circulus, Jeffreys. *Shell* very small, nearly flat-spired, with an exceedingly wide and open umbilicus. *Example*, Delphinula

* See p. 263.

Duminyi,* Requien; lateral cirri, 3 on each side (sometimes 4 on one side, and 3 on the other.—Clarke). *Fossil*, in the Coralline Crag; Britain; Catania. *Living*, Britain; Mediterranean.

Trochocochlea, Klein. Spire moderately raised; base, slightly umbilicated in the adult, perforated in the young, pillar lip with a strong tubercular tooth. Lateral appendages 3 to 4 on each side. *Example*, T. lineatus, Da Costa. Britain, France, Spain, Mogador.

Ziziphinus, Leach. Spire pyramidal, base imperforated; pillar lip notched or angulated at the lower part. *Example*, T. granulatus, Born. 7 species, Britain.

Omphalius, Philippi. *Type*, Trochus viridulus, Gmel. Mazatlan.

Shell with a spiral ridge surrounding the umbilicus, ending in one or more tubercles on the columella.

Distribution, 4 species. Mazatlan, China,

Pyramis, *Enida*, &c.

ROTELLA (see p. 265).

Sub-genera. *Isanda* (I. coronata), Adams. *Shell* orbicular, conical, pillar edge crenated; whorls rounded; axis umbilicated; operculum orbicular, of many whorls.

Chrysostoma, Gray. Turbo Nicobaricum, Gmel., related to *Isanda*. Pillar edge callous; operculum horny, spiral.

Microthyca, Adams, differs from *Isanda* in its continuous peristome and thickened outer lip. 1 species, Japan.

Umbonella, Adams. *Shell* porcellanous, small, turbinated, allied to *Chrysostoma*, but the aperture is circular, and the axis imperforate. 1 species, Japan.

LEUCORHYNCHIA, Crosse, 1867.

Etymology, *leucon*, white; *rhynchion*, a beak.

Type, L. Caledonica, Crosse; inhabits under stones, New Caledonia.

Shell depressed, sub-discoid, umbilicated, polished, of few whorls; aperture rounded, not nacreous. A thick callosity arises from the front margin of the aperture and the columella lip, and is continued as a free rostrated process over the umbilicus. Operculum corneous, rounded, multispiral; nucleus, central.

* Adeorbis supranitida and A. tricarinata are varieties.

TEINOSTOMA, H. and A. Adams, 1853.

Type, T. politum.

Synonym, Calceolina, A. Adams.

Shell like *Rotella*, with a greatly produced mouth and callus.

It resembles *Cyclops* among the *Nassidæ*, and in the appearance of the base *Streptaxis* and *Anostoma* among the *Helicidæ*.

Distribution, 9 species. Japan, Mazatlan, St. Helena, Jamaica.

Fossil, 10 species. Eocene. Paris basin.

ETHALIA, H. and A. Adams.

Shell of the general aspect of *Vitrinella*, but agreeing with *Rotella* in having a callous base, and differing from the typical species of that genus in being frequently sculptured; in the callus winding round, generally not covering, the umbilicus; and in the outside of the callus not being glossy. The lip is generally not reflected over the body whorl.

They appear to retain permanently the young state of *Teinostoma*.

Distribution, 12 species, inhabiting deep water. Mazatlan, Jamaica, Japan.

MONODONTA.

DELPHINULA (including *Collonia*, *Liotia*, *Serpularia*, and *Crossostoma*).

CYCLOSTREMA, with *Adeorbis* and *Vitrinella* as sub-genera.

STOMATELLA, GENA, and BRODERIPIA.

FAMILY X.—HALIOTIDÆ.

Sub-family, HALIOTINÆ.

Genera—HALIOTIS (p. 268), STOMATIA (p. 268), TEINOTIS (p. 269).

Sub-family, SCISSURELLINÆ.

Genera—SCISSURELLA (p. 269), PLEUROTOMARIA (p. 270), (*Raphistoma* and *Scalites* are merely sections of this genus), MURCHISONIA (p. 270), CATANTOSTOMA (p. 270), TROCHOTOMA (p. 271), with the following additional genera and sub-genera:—

PLEUROTOMARIA (see p. 270).

Sub-genera:—*Leptomaria*, E. Deslongchamps, 1865. *L. amœna*, Deslong., sp. Shell like *Pleurotomaria*; the respiratory slit is narrow and elongated.

Distribution, Inferior oolite—Cretaceous.

Cryptœnia, E. Deslong., 1865. (*Helicina*, Sowerby) *C. heliciformis*, Deslong., sp. Shell of a rounded and compact form,

surface smooth or but slightly ornamented, slit excessively short, sometimes reduced to a simple fold; the band occupies the middle of the whorl, and is only visible on the body whorl.

Distribution. The species are numerous in the Carboniferous system, and range to the Middle Lias.

In the typical *Pleurotomaria* the slit is large, and the band is never concealed by the whorls of the spire.

SCHISMOPE, Jeffreys, 1856.

Etymology, *schisme*, a slit, and *ope*, a hole.

Synonym, Woodwardia, Fischer, 1861.

Type, S. striatula, Ph. Mediterranean.

Shell like *Scissurella*, but the spire is laterally compressed, as in *Stomatia*, and is not so trochiform. The slit in the peristome of the young shell is converted into a foramen in the adult; it does not commence until the animal is half grown.

S. striatula is a littoral species, whilst all the species of *Scissurella* inhabit deep water.

Fossil, 1 species, Miocene, Bordeaux.

Distribution, 4 species. Mediterranean, Japan.

Scissurella and *Schismope* are the analogues respectively to *Pleurotomaria* and *Trochotoma*, differing only in size; but in the two former genera the shell is translucent, not nacreous, as in the two latter.

DITREMARIA* (pars, D'Orb.), D. Deslongchamps, 1865.

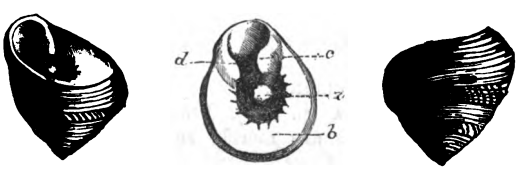

Fig. 15. *Ditremaria quinquecincta.*

a, Central tooth. *b*, Callosity of the base. *c*, Tooth on the right. *d*, Tooth on the left.

Type, D. quinquecincta, Ziet. sp. Coral Rag. Natheim, &c.

Shell trochiform; in place of the respiratory slit of *Trochotoma*, there are two elongated oval holes united by a transverse fissure; the base of the shell presents a large callosity, the umbilicus is deeply excavated, and a rounded tubercle arises

* See p. 271.

from it; the aperture is contracted, and the upper angle of each lip bears a more or less distinct tooth.

Distribution, 2 species, Great Oolite and Coral Rag, France and Germany.

Sub-family—BELLEROPHONTINÆ.

Genera :—PORCELLIA (p. 344), BELLEROPHON (p. 344) (with *Bucania*), and

TREMANOTUS, Hall, 1863.

Type, Bucania Chicagoensis, M'Chesney.

Shell thick, aperture dilated; having the form of *Bucania*, but with a row of isolated oval siphonal openings along the middle of the dorsal side.

Fossil, 2 species. Upper Silurian, North America.

? CARINAROPSIS, Hall.

Shell having a patelloid aspect. Spire usually attenuated; body whorl expanded abruptly; cavity shallow, presenting a kind of septum as in *Crepidula*.

Fossil, 2 species. Silurian, America.

FAMILY XI.—FISSURELLIDÆ.

DESLONGCHAMPSIA, M'Coy, 1850.

Dedicated to Dr. Eudes Deslongchamps, the renowned French palæontologist.

Type, D. Eugenei, M'Coy, Mor. and Lyc.

Shell patelliform, apex acute excentric; with a wide longitudinal anterior sulcus, produced into a rounded lobe.

"This genus differs from *Metoptoma* in its ornamented surface, and the front margin being produced downwards into a rounded lobe. This latter structure would prevent the firm adhesion of the shell."—(M'Coy.)

Fossil, 3 species. Lower Oolites. England, Normandy, Galicia.

FAMILY XIII.—PATELLIDÆ.

HELCION (Montfort, p. 278), Jeffreys.

Etymology, a breast-collar.

Synonyms, Nacella, Schumacher; Patina, Leach; Calyptra (pars), Klein.

Example, H. pellucidum. (Patella pellucida, Linné).

Shell semioval, not resembling a peaked hat as in *Patella;*

apex of embryonic shell slightly twisted; crown never prominent, incurved, and nearly terminal, usually thin, with an opalescent hue.

Animal. Mantle fringed at its edges with cirri; gills not so numerous as in *Patella*, and forming a shorter plume, which is interrupted over the head.

Helcion lives on *Laminariæ* and sea-weeds of a similar kind, and is therefore sublittoral.

Distribution. Species few, but having an extensive range. Europe, West and South Africa, Cape Horn, and Australia.

Fossil, included in *Patella*.

Lepeta, Gray (p. 281).

Derivation, possibly from *lepas*, the ancient name of the limpet.

Type, Patella cæca, Müller.

Shell minute, apex posterior. Animal blind.

Propilidium, Forbes and Hanley (p. 281).

Derivation, from its affinity to the genus *Pilidium*.

Type, P. ancyloide, Forbes.

Shell similar to *Lepeta*, but differing in always having a distinctly spiral apex and a plate or septum inside the crown.

Animal blind, as *Tectura fulva* and *Lepeta cæca* of this family.

"The tongue is very long, and the brown central spines conspicuous under the microscope resemble bramble-thorns in miniature."—(Forbes and Hanley.)

Distribution, 1 species. Shores of Ireland, Scotland, Sweden.

Gadinia (p. 281).

Sub-genus:—*Rowellia*, Cooper. *Animal* with broad flat tentacles, rounded and pectinated in front, projecting beyond the shell; foot moderate, round. *Shell* as in *Gadinia*.

Family XIV.—Dentaliadæ.

Gadus, Rang, 1829.

Synonym, Helonyx, Stimpson, 1865.

Example, Dentalium clavatum, Gould.

Shell small, resembling that of *Dentalium*, contracted at the anterior extremity, polished.

Animal with a greatly elongated cylindrical foot, obtuse at

the extremity; anal siphon longer than in *Dentalium*, not fissured.

Distribution, 2 species. China; Atlantic.

Fossil, 7 species. Cretaceous-Miocene. Paris; United States.

Order II.—Pulmonifera.*

Family I.—Helicidæ.†

Sophina, Benson, 1859.

Type, S. schistostelis, Bens.

Shell like *Helix;* columella callous, with a basal slit.

Distribution, 3 species. Moulmein.

Cylindrella (p. 293).

Animal with no buccal plate; the lingual dentition varies considerably in different species; in *C. scæva*, Guild., the formula is $\frac{26.1.26}{130}$; the central plate is small, obtusely pointed, the laterals are uncinated, joined two by two, upper edge fringed.

"*C. Goldfussi* possesses 4 lamellæ on the outer wall of the whorls. The axis of *C. turris* and of some other Mexican species is a highly polished tube, the young shells of which must have a wide open umbilicus."—(Bland.)

Macroceramus, Guilding.

The genus has affinities with *Bulimus*, *Pupa*, and *Cylindrella*.

Animal with an arcuate and striated buccal plate; lingual dentition distinct from that of *Cylindrella;* in *M. signatus*, Guild., $= \frac{27.1.27}{100}$, the central plate is narrow, with an obtuse tooth, laterals with one prominent tooth supporting two denticles and a small one at the base.

Fig.16. Central plate and laterals of *M. signatus* (Morse).

Shell with the axis simple as in *Bulimus;* in *M. amplus* a lamella revolves on the axis within the lower whorls.

Distribution, 30 species. The genus belongs to the West Indian fauna, and has its greatest development in Cuba and Haiti.

Achatina.—Sub-genus, *Geostilbia*, Crosse, 1867.

Type, G. Caledonica, Crosse. New Caledonica.

* See p. 285. † See p. 288.

Animal unknown; habit subterranean.

Shell similar to that of *Achatina acicula*, but the columella is not truncated, and the outer lip is thickened.

XANTHONYX, Crosse and Fischer, 1867.

Type, Vitrina Sumichrasti, Brot., Mexico.

Animal elongated, too large for complete retraction into the shell; jaw like that of *Arion*; lingual dentition consisting of a series of uniform teeth, with a broad and subquadrangular base; the median tooth with a large central cusp and denticle on each side; the laterals are bicuspid, the internal cusp long, the external short and obtuse, sometimes accompanied with the rudiment of a third; pulmonary orifice near the middle.

Shell imperforated, very thin, transparent, subdepressed, intermediate in form between *Vitrina* and *Simpulopsis*.

Distribution, 3 species. Mexico.

FAMILY II.—LIMACIDÆ.*

HYALIMAX, H. and A. Adams.

Type, Limax perlucidus, Quoy.

Animal limaciform, mantle large, shield-shaped; pulmonary orifice medial and marginal; foot attenuated behind, no mucus gland, separated below from the head by a distinct groove; jaw analogous to that of *Zonites* with the support of *Succinea*; lingual dentition with a tricuspid median plate, laterals with a large cusp, supporting two or three denticles.

Shell internal, rounded, thin, and slightly arched above.

Distribution, 2 species. Bourbon, Mauritius.

KRYNICKIA, Blainville, 1839.

Dedicated to the naturalist Krynicki.

Type, Limax megaspidus, Blainville.

Animal limaciform, but the anterior part of the mantle is free and detached from the body as far as the pulmonary orifice, which is situated far back.

Shell internal, flat, lamellose, elliptical, with no spiral nucleus.

Distribution, 8 species. Crimea, Caucasus, North America (1). Central America (1).

PHILOMYCUS, Rafinesque (p. 296).

Type, Limax Carolinensis, Bosc.

* See p. 295.

Synonym, Tebennophorus, Binney.

Animal elongated, convex, tapering behind, entirely covered by a thin mantle; respiratory orifice near the head; jaw smooth. No shell.

Distribution, 9 species. North America.

Sub-genus:—*Meghimatium*, Hasselt. *Syn.*, *Incilaria*, Benson. Body depressed, rounded at the end.

Distribution, 4 species. Java, Chusan.

Family IV.—Limnæidæ.*

Pompholyx, Lea, 1856.

Etymology, *pompholux*, lat. *bulla*.

Type, P. effusa, Lea. Sacramento river, California.

Shell gibbosely rounded, drawn back beneath, flattened above, imperforate; spire depressed; aperture very large, nearly round, effuse; outer lip acute, inner lip thickened, flattened.

Animal with two long tentacles, bearing eyes, and a second pair of eyes at the base on the inner side of the tentacles.

Distribution, 2 species. Western America.

Pitharella, Edwards, 1860.

Type, P. Rickmani, Ed. "Woolwich and Reading Series," Peckham and Dulwich, London.

Shell partaking of the characters of *Limnæa* and *Chilinia*, subcylindrical; aperture oval, rounded in front, narrowed behind; columella straight, or very obliquely twisted, arched anteriorly; outer lip simple, acute; inner lip thickened.

The species is associated with estuarine shells, remains of mammals and terrestrial plants.

Valenciennesia, Rosseau, 1842.

Dedicated to the late Professor Valenciennes of Paris.

Type, V. annulatus, Ros.; associated with fresh-water shells in a tertiary deposit, near Kertch, Crimea.

Shell resembles a gigantic Ancylus; apex much incurved; surface concentrically marked. A longitudinal plication extends from the apex to the right border, and corresponds with an internal channel; there is a second but less distinct plication on the left side.

Camptonyx, Benson, 1858.

Type, C. Theobaldi, Bens. Guzerat.

* See p. 300.

Shell like *Pileopsis*, dextral as in *Velletia*, with a respiratory channel on the right side.

"*Animal* with the respiratory orifice on the edge of the mantle. Eyes sessile at the middle of the hinder part of the base of the tentacles, and are visible only from above; tentacles rather conical than angular; upper mandible conspicuous, slightly lobed; lingual ribbon broad, with 86 rows of teeth, 87 in a row (43 . 1 . 43); they have simple obtuse hooks as in *Ancylus;* the central row only differs in being symmetrical; the laterals diminish gradually from the 14th to the 43rd, and a second cusp makes its appearance, and increases until the three near the margin are regularly bicuspid."—(Woodward.)

The habits of *C. Theobaldi* are terrestrial.

This genus is doubtfully distinct from *Valenciennesia*.

Poeyia, Bourguignat, 1860.

Dedicated to M. Poey of Havanna.

Type, P. Gundlachioides, Cuba.

Shell, above like *Gundlachia*, below like *Ancylus;* apex posterior, dextral, somewhat compressed, very obtuse; aperture large, peristome simple.

Brondelia, Bourguignat, 1860.

The two species Ancylus Drouetianus, Bourguignat, and B. gibbosa, Bourg., are terrestrial *Ancyli*, living on humid rocks in the forest of Edough, Boué (Algeria).

Acrochasma, Reuss, 1860.

Type, A. tricarinatum, Reuss, from the fresh-water limestones of Bohemia.

Shell trilateral, pyramidal, rounded below in its whole amplitude, with one posterior concave, and two lateral slightly convex planes, ending upwards in an acute reflected apex, beneath with a longitudinal aperture through the shell, which in its living state appears to have been covered with an epidermis. It may be considered as a fresh-water representative of the marine genus *Fissurella*.

Choanomphalus, Gerstfeldt, 1859.

Etymology, choanos, a funnel; *omphalos*, an umbilicus.

Type, C. Maacki, Lake Baikal.

Shell related to certain *Valvatæ*, with an infundibuliform umbilicus; no operculum.

Distribution, 3 species. Lake Baikal, Siberia.

PHYSELLA, Pfeiffer, 1861.

Founded on *P. Berendti*, said to be a terrestrial shell from Mirador, Mexico.

Shell like *Bulla*, spire minute; last whorl elongated; columella simple, arched, not truncated; peristome simple, straight.

FAMILY V.—AURICULIDÆ*

Contains the following genera :—

AURICULA, Lamarck. (See p. 304.)

Sub-genera, *Alexia* (A. myosotis), Leach (p. 305); *Leuconia* (A. bidentata), Gray.

POLYODONTA, Fischer (*Pythia*, Bolten) (p. 304).

PEDIPES, Adams (p. 304).

Distribution, 6 species.

Sub-genus :—*Marinula*, King. M. pepita. The animal has not the transverse groove of the foot of *Pedipes*.

Shell more elongated and destitute of spiral striæ; two convergent parietal plaits, columellar plait smaller, oblique; peristome rather simple.

Distribution, 10 species. Madeira, South America, Australia, Philippines.

MELAMPUS, Montfort (*Ophicardelus*, Beck; *Tralia*, Gray; *Laimodonta*, Nuttall; *Pira*, Tifata; *Signia* and *Persa*, Adams; *Cremnobates*, Sw.) (p. 304).

Sub-genus, *Cassidula*, Ferussac (*Rhodostoma*, Sw.; *Sidula*, Gray). Aperture banded.

PLECOTREMA, H. and A. Adams, 1853.

Type, P. typica, Adams.

Synonym, Lirator, Beck.

Shell ovate-conic, or rather fusiform, solid, spirally grooved; aperture oblong, contracted; columellar plait single, parietal plaits two, the lower of which is bifid; peristome thickened, sometimes terminating in a varix, bearing within two or rarely three teeth; axis imperforated or umbilicated.

* See p. 303.

Distribution, 14 species. Australia, Borneo, Philippines, China, Cuba.

BLAUNERIA, Shuttleworth, 1854.

Dedicated to M. Blauner.

Type, B. pellucida. Cuba, Jamaica, Florida, and Porto Rico.

Shell somewhat resembling *Achatina*, imperforate, oblong-turreted, thin; aperture narrow, elongated; body of the penultimate whorl bearing a single plait near the columella, which is rather truncated; peristome simple, straight.

Animal showing the characters of the family of the *Auriculidæ*, not of *Helicidæ*.

Distribution, 2 species. West Indies, Sandwich Islands.

STOLIDOMA, Deshayes, 1864.

Type, S. crassidens, Deshayes.

Shell oblong, turriculated, subcylindrical; apex obtuse, smooth polished; aperture elongated, obliquely inflected, narrowed behind, widened in front; columella straight, with a large median plait, compressed, and slightly oblique.

Distribution, 3 species. Eocene. Paris basin.

The shells of this genus are *Auriculæ*, with a single columella-plait, without teeth or plications on the right lip.

CARYCHIUM (see p. 305).

ZOSPEUM, Bourguignat, 1860.

Shell like *Carychium;* tentacles four; eyes absent.

Distribution, 11 species. Inhabiting the subterranean grottoes of Carniola. The animal is most active during the winter, at which time they propagate.

OTINA (see p. 238).

This genus is the type of a sub-family which has nearly the same relation to *Auriculinæ* as *Ancylus* to *Limnæa*.

Distribution, 3 species. Britain, United States, Benguela.

FAMILY VI.—CYCLOSTOMIDÆ.*

CYCLOSTOMA (see p. 306).

Sub-genus:—*Cyclotopsis*, Blanford, 1864.

Type, C. semistriatus, Sow.

Shell umbilicated, depressed, spirally striated; aperture subcircular; operculum concentric, multispiral, internally membranous, externally shelly; margins of the whorls raised.

Distribution, 5 species. India, Seychelles, Mauritius.

* See p. 306.

CYCLOPHORUS (see p. 308).

Sub-genera:—*Jerdonia*, Blanford, 1861.

Type, J. trochlea, Benson sp. Nilgiri Hills, India.

Shell minute, umbilicated, pyramidal, horny, tricarinated; operculum concentric, arctispiral, with a marginal sulcus all round; membranous internally, shelly externally; inner edge of each whorl resting on the outer edge of the next.

Cyathopoma, Blanford, 1864.

Type, C. filocinctum, Benson sp.

Shell minute, umbilicated, turbinated, or somewhat depressed; epidermis thick, sometimes hispid, smooth, spirally striated, or lirated; operculum truncate, conoid, concentric, multispiral; internally membranous, externally shelly; external margins of the whorls raised in the form of shelly plates, incurved; sometimes sculptured.

Animal white, with a short oval foot, undivided beneath; tentacles small, black, with eyes at the base.

Distribution, 5 species. India.

SPIRACULUM, Pearson.

Distinguished by the possession of a retroverted sutural tube open at both ends, and by a modification of the form of the mantle corresponding to the same.

Opisthoporus forms a sub-genus to *Spiraculum*.

CLOSTOPHIS, Benson, 1860.

Etymology, *clostos*, coiled, and *ophis*, a serpent.

Type, C. Sankeyi, Benson. Moulmein, Burmah.

Shell subconic; penultimate whorl the largest, last whorl separate and descending, subaxial small; aperture subcircular, entire, toothed; margin expanded.

RHIOSTOMA, Benson, 1860.

Etymology, *rhion*, a promontory.

Type, R. Haughtoni, Benson.

Shell subdiscoidal, broadly umbilicated; last whorl separate, laterally descending; aperture free, with an incision at the top, and a subtubular prominence crowning the slit; operculum multispiral.

Distribution, 6 species. Burmah, Siam, Cochin China.

ANAULUS, Pfeiffer, 1855.

Type, A. bombycinus. Borneo.

Shell umbilicated, pupinæform; peristome double, internal continuous, external dilated, perforated at the margin by a canal; canal sutural and internal, terminating anteriorly, and embraced by the outer portion of the double peristome (it can be traced externally along the last whorl), and reaching into the concavity of the spire. Operculum very thin, corneous; narrow-whorled.

Distribution, 3 species. East Indian Archipelago.

"The use of the sutural tube seems to be the preservation of a communication with the external air when the aperture is closed."—(Benson.)

OPISTHOSTOMA, Blanford, 1860.

Synonym, Plectostoma, Adams, 1865.

Type, O. Nilgirica, Blanford. The Nilgiris, India.

Shell pupiform, umbilicated, with a regular costulated ornamentation; apical whorls obliquely distorted; last whorl strangulated, separated from the others, and applied to the penultimate; peristome double, free portion prolonged backwards; operculum horny (?)

O. De Crespigni, Adams (*Plectostoma*), has a conical spire, and the apical whorls are not excentric to the axis of the lower whorls, as they are in the ovate spire of *O. Nilgirica*.

Distribution, 5 species. India, Borneo, West Africa.

[FAMILY PROSERPINIDÆ.]

Animal with a short annulated muzzle; tentacles two lateral, subulate; eyes subsessile on the outer side of the base of the tentacles; sides simple; foot moderate, truncated in front, acute, and keeled above behind, with a concavity in the front part; lateral and central teeth large, irregular, lobed, or dentated; operculum wanting.

Shell heliciform, shining, imperforated; base callous; the septa between the upper whorls absorbed as in *Helicina* and *Stoastoma*.

This family is most nearly related to *Helicinidæ*.

CERES, Gray, 1856.

Etymology, *Ceres*, the goddess of corn.

Type Carocolla eolina, Duclos.

Shell carinated, upper surface rugose, epidermis thin; callous beneath, shining; columella with one tooth or fold; lamelliferous on both sides of the aperture; peristome straight, slightly thickened.

"The lingual membrane of *C. Salleana*, Cuming, is broad, elongate, with numerous longitudinal series of teeth. Teeth 00·5·1·5·00; the central tooth (*o*, Fig. 17) oblong, distinct, with

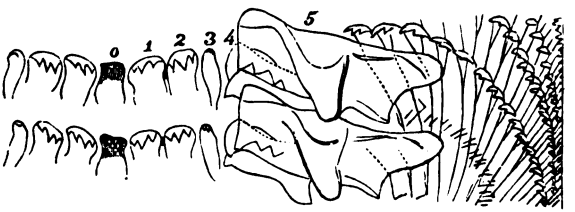

Fig. 17.

a broad simple reflexed tip; the first and second lateral teeth (1 and 2) rather broader than the central one, with a three-toothed recurved tip; the third (3) narrow, elongate, with a slightly recurved end; the fourth and fifth (4 and 5) much larger, oblong, and irregular shaped; the fourth about half as wide as the fifth, with three or four dentations on the inner side of the upper edge; the fifth very large, broad, with a large subcentral reflexed lobe; the lateral teeth are very numerous, subequal, similar, compressed, transparent, with a recurved tip, those of the inner teeth of the series being bifid."—(Gray.)

Distribution, 2 species. Mexico.

PROSERPINA, Gray, 1840.*

Etymology, *Proserpina*, the daughter of Ceres.

Type, P. nitida, Gray.

Synonym, Odontostoma, D'Orbigny.

Shell globose or depressed, smooth, shining; columella with one fold; body of the penultimate whorl provided with one or many spiral plaits, or wanting; aperture lunate, contracted often by palatal laminæ; peristome thin, straight.

P. Swiftii has the columella fold only, and is the sole representative of the family at present known to inhabit South America.

Distribution, 7 species. Cuba, Jamaica, Venezuela.

* See p. 289.

PROSERPINELLA, Bland, 1865.

Etymology, diminutive of *Proserpina*.
Type, P. Berendti, Bland.
Distribution, Mexico, 3000 to 4,000 feet.
Shell as in *Proserpina;* columella fold absent; aperture with one parietal lamelliform plait.

[FAMILY HELICINIDÆ]

Contains:—
HELICINA (*Lucidella*, *Trochatella*, *Alcadia*).
Schasicheila. *Shell* with very close, long, spiral, epidermal fringes. *Distribution*, 5 species. Central America and the Bahamas.
Perenna, Guppy, 1867; P. lamellosa, Guppy, Trinidad. *Shell* like *Helicina*, depressed; whorls lirate and carinate. Operculum thin, suboval, concentrically striated; nucleus subcentral. *Animal* like *Helicina*. *Distribution*, 2 species. Trinidad, Yucatan.

BOURCIERA, Pfeiffer, 1851.

Type, B. helicinæformis, Pf.
Shell like *Helicina*, dull, and without the columellar callosity; columella toothed beneath; aperture ovate; peristome spreading. Lingual dentition agrees with that of *Helicina*. Operculum ovate, horny, few-whorled.
Distribution, 2 species. South America.
STOASTOMA, and

GEORISSA, Blanford, 1864.

Type, Hydrocena pyxis, Benson.
Animal furnished with hemispherical lobes in the place of tentacles; eyes normal; foot short, rotund. Operculum semioval, no spiral structure as in *Helicina;* excentrically striated, testaceous, transparent.
Shell resembling that of *Hydrocena*, imperforated, small, conical, amber-, or reddish-coloured, spirally sulcated or striated.
Distribution, 6 species. Adhering to limestone rocks, India.

[FAMILY ACICULIDÆ.]

The genera enumerated in this family are:—ACICULA, GEOMELANIA, CHITTYA, and TRUNCATELLA, the last with the following

Sub-genus:—*Taheitia*, H. and A. Adams, 1863.

Type, Truncatella porrecta, Gould, Taheiti. Operculum shelly, furnished with erect radiating lamellæ. Aperture of shell ovate; last whorl separate; peristome continuous, expanded.

Order III.—Opistho-branchiata.

Family I.—Tornatellidæ.

Etallonia, Deshayes, 1864.

Dedicated to M. Etallon, a French palæontologist.

Type, E. cytharella, Desh.

Shell ovate, subfusiform, resembling certain small *Mitres;* spire short, conical, obtuse, few-whorled; aperture elongated, narrow, base entire, subemarginate; lip simple, acute, arched; columella thick, cylindrical, twisted in the middle to resemble an obtuse plait; acute anteriorly.

Distribution, 3 species. Eocene. Paris basin, Valognes.

Actæonella.—Sub-genus, *Volvulina*, Stoliczka, 1865; (Actæonella part, Meek, 1863).

Type, Volvaria lævis, Sowerby.

Shell ovate, volvuliform, involute, more or less attenuate above, widest below the middle, entirely without any traces of a spire.

Fossil, 5 species. Cretaceous. Germany, Syria.

Family VI.—Doridæ.

Angasiella, Crosse, 1864.

Dedicated to Mr. G. F. Angas.

Type, A. Edwardsi, Port Jackson.

Animal elongated, rounded in front, attenuated and pointed behind; mantle covering the head and foot; dorsal tentacles two, clavate as in *Doris;* gills plumose, less numerous, and placed in front of the anus as in *Triopa*, and occupying the median part of the back, a more forward position than in others of the *Doridæ*.

Plocamophorus, Ruppell.

Example, P. Ceylonicus, Kelaart sp.

Synonym, Peplidia, Lowe; ? Gymnodoris, Stimpson.

Animal, similar to *Polycera*, but the tentacles are retractile within sheaths.

Distribution, 3 species. Madeira, Australia, Ceylon.

KALINGA, Alder and Hancock, 1863.

Etymology, an old Indian name for *Telinguna*.

Type, K. ornata, Ald. and Han. Coromandel coast.

Animal with an obtusely rounded body; branchiæ plumose, non-retractile, surrounding the vent, but placed separately at a little distance from it on the posterior part of the back.

[FAMILY DORIDOPSIDÆ, Alder and Hancock, 1863.]

Dorsal tentacles retractile within sheaths; no oral tentacles. Tongue atrophied, buccal bulb modified into a delicate suctorial retractile proboscis; mantle devoid of spicula.

DORIDOPSIS, Alder and Hancock, 1863.

Body depressed, oval or elliptical; mantle covering the head and foot, smooth, or with soft warty tubercles; dorsal tentacles laminated; head minute, generally produced into small lateral lobes, without oral tentacles; branchiæ plumose, wholly or partially surrounding the vent on the media-dorsal line, retractile within a common cavity.

Distribution, 10 species. East Indies, China, Madeira.

FAMILY VII.—TRITONIADÆ.*

HERO, Loven.

Example, H. formosa, Lov.

Animal with no mantle; tentacles two, linear, simple non-retractile; veil plain, produced at the sides, gills branched or umbellated. Tongue with a large central denticulated spine, and two simple lateral spines. Jaws corneous.

[FAMILY EOLIDIDÆ.]

PHIDIANA, Gray.

Example, P. Patagonica, D'Orbigny.

Animal with a stout body; dorsal tentacles clavate, laminated; oval tentacles very large; gills in close transverse rows; sides of the foot rounded.

[FAMILY EOLIDÆ.]

MADRELLA, Alder and Hancock, 1863.

Type, M. ferruginosa, Ald. and Han. India.

Animal ovate, depressed, with a distinct cloak. Dorsal tentacles with the upper portion papillated: *no oral tentacles*. Head broad, with a semilunar veil. Branchiæ papillose or linear, placed in several rows round the margin of the cloak. *Anus*

* See p. 332.

lateral. Tongue narrow, with three pectinated plates in each row. Jaws large and strong, margins without denticulations. This genus is closely related to *Antiopa*.

PHYLLOBRANCHUS, Alder and Hancock, 1863.

Type, Proctonotus orientalis, Kelaart. India.

Animal elongated, flattened on the back, angulated at the sides, without a distinct cloak. Tentacles two, dorsal, longitudinally folded, bifurcate above, non-retractile. Head produced at the sides into angulated and folded expansions. Branchiæ leaf-like, with distinct foot-stalks, arranged in several rows along the sides of the back and round the head in front. Anus lateral. The tongue resembles that of *Hermæa*.

CLASS IV.—BRACHIOPODA.*

FAMILY I.—TEREBRATULIDÆ.†

TEREBRATULA (see p. 363).

Sub-genus, *Rensselæria*, Hall, 1859.

Dedicated to the late Hon. Stephen Van Rensselaer.

Examples, R. ovoides, Hall, Fig. 18; Terebratula strigiceps, Römer.

Shell ovoid or suborbicular, without mesial fold or sinus; beak prominent, acute, more or less incurved; foramen terminal, sometimes concealed. Ventral valve with two diverging cardinal teeth supported by strong dental plates. Dorsal valve with the dental sockets between the shell and a strong process from which the slender crura proceed, first in a direct line, and then one division of each, diverging into the centre of the ventral valve, terminate in acute points. On the other side the divisions extend nearly at right angles to the axis of the shell into the cavity of the dorsal valve; and thence bending abruptly forward and gradually converging, terminate above the centre of the shell in a thin flattened or longitudinally concave plate.

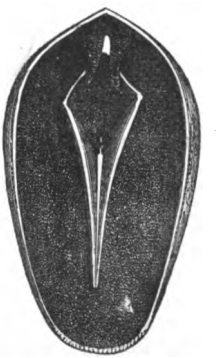

Fig. 18.
The interior of the dorsal valve of *R. ovoides*, showing the thickened processes at the beak, the crura, the loop, and the narrow longitudinal plate.

* See p. 354.

† See p. 363.

Rensselœria, if not synonymous with, is closely related to, *Meganteris*.

Fossil, 11 species. Silurian to Devonian. Europe, North America.

CENTRONELLA, Billings, 1859.

Etymology, diminutive of *kentron*, a spur.

Type, Rhynchonella glans-fagea, Hall.

Shell having the general form of *Terebratula*. Dorsal valve with a loop consisting of two riband-like lamellæ, which were united at an acute angle at the point of greatest extension, whence they recurve in a thin vertical plate which is not attached at either margin, approaching in some respects to *Waldheimia*.

Distribution, 4 species. Devonian. North America.

LEPTOCŒLIA, Hall, 1859. (Cœlospira, Hall).

Appears to differ from *Centronella* only in consisting of species which have the surface ribbed instead of smooth.

Distribution, 9 species. Mid. Silurian—Devonian. Europe, North America. No true Terebratulæ have been found in beds older than the Devonian.

FAMILY II.—SPIRIFERIDÆ.*

SYRINGOTHYRIS, Winchell, 1863.

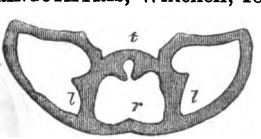

Fig. 19. Section through the beak of the ventral valve of *S. typa* (Winchell). *l*, dental plates or lamellæ; *t*, tube incomplete; *r*, mesial ridge.

Examples, S. typa, Winchell, Fig. 19; Spirifera distans, Sow.

Shell like that of *Spirifera*, with an elongated hinge-line. *Ventral* valve with a broad mesial sinus, a very broad area, and a narrow triangular fissure closed towards the apex by an external convex pseudo-deltidium; beneath which, and diverging from it, is another *transverse plate* connecting the vertical dental lamellæ, which are incurved so as to nearly join their inferior edges, thus forming a *fissured tube*, which projects beyond the limits of the plate from which it originates into the interior of the shell. A low median ridge extends from the

See p. 271.

beak to the anterior part of the valve. *Dorsal* valve depressed without an area, and with a distinct mesial fold. *Shell-structure* punctate.

Fossil, 2 species. Carboniferous. United States, Ireland, Belgium.

CYRTINA, Davidson, 1858.

Etymology, modified from the diminutive (*Cyrtidium*) of *Cyrtia*.

Examples, C. heteroclyta, C. Demarlii, and C. septosa.

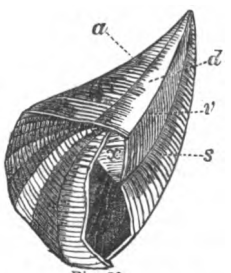

Fig. 20.
Cyrtina heteroclyta. *a*. Area; *s*, Septum; *v*, Dental plates; *d*, deltidium; *x*, v-shaped chamber.

Shell resembling *Spirifera*, but without the vertical shelly plates which diverge from the extremity of the beak. Interior of *ventral* valve with two contiguous vertical septa, which coalesce into one median plate, which extends from the extremity of the beak to within a short distance of the frontal margin, and then diverges to form dental plates, as in *Pentamerus*. The fissure is covered by an arch-shaped deltidium; but in *C. Demarlii* the median septum is continued as far as the under surface of the deltidium, and the dental plates are fixed to the sides, instead of the upper edge, as in *C. heteroclyta* and *C. septosa*.

"Spiral coils having the same position as in *Spirifera*, but the two first coils are connected a little in front of the mid-length by an apparatus somewhat like that of *Spirigera*, but not so complicated. A very slender process springs upwards towards the ventral valve from each coil, and, at a height of about one line, curves forwards. The two then unite and form a single band, which extends forwards to about the front of the coil, and there ends in an obtuse point."—(Billings.)

Distribution, 9 species. Devonian—Trias. Europe and North America.

MERISTELLA, Hall, 1860.

Etymology, diminutive of *Merista*, an allied genus.

Examples, Atrypa tumida, *Dal.*; Meristella lævis, Hall.

Shell oval, ovoid, orbicular or transverse. Valves unequally convex, with or without a median fold and sinus; beak apparently imperforate, incurved; area none. Surface smooth or

concentrically striated. *Dorsal* valve with a longitudinal septum; upper part of the *ventral* valve with a deep subtriangular muscular impression which unites with the rostral cavity.

The species of this genus are *Meristæ* without the peculiar appendage of the ventral valve.

Distribution, 17 species. Silurian—Devonian. Europe, North America.

The forms marked by plications on the mesial fold and sinus, and sometimes with obscure or distinct plications on the lateral portions of the shell, constitute the genus LEIORHYNCHUS, Hall. 4 species. Devonian. United States.

CHARIONELLA, Billings, 1861.

Synonym, *Cryptonella*, Hall, 1861.

Type, Athyris scitula.

Shell resembling *Athyris*, but more elongate-ovate or approaching to *Terebratula* in form. *Internal spires* as in *Athyris* and *Meristæ*, but the dorsal hinge-plate is either obsolete along the middle, or anchylosed to the bottom of the valve. *Foramen* terminal, bounded on the lower side by one or two deltidial pieces, or by a portion of the shell. The mesial septum in the dorsal valve is either absent or rudimentary.

Distribution, 15 species. Devonian. America, Spain.

NUCLEOSPIRA, Hall, 1859.

Etymology, *nucleus*, and *spira*.

Types, Spirifer pisum, Sowerby; Nucleospira ventricosa, Hall, Figs. 21, 22, 23.

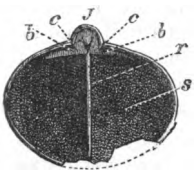

Fig. 21.

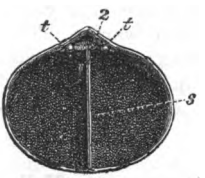

Fig. 22.

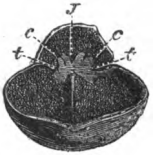

Fig. 23.

Nucleospira ventricosa.

Fig. 21, interior of the dorsal valve. Fig. 22, interior of the ventral valve. Fig. 23, interior of the dorsal valve, with a portion of the ventral valve attached.

J, cardinal process; *c c*, crural processes; *b b*, dental pockets; *r*, muscular impressions; *s*, medio-longitudinal septum; *t t*, teeth; 2, a flattened space or false area beneath the beak. (*Hall.*)

Shell punctate; spheroidal; beaked; hinge line shorter than the width of the shell; cardinal extremities rounded. Internal spires as in *Spirifera*. *Ventral* valve with a flattened space or false area beneath the beak, on each side of which, at the base, is a strong tooth; a narrow medio-longitudinal septum extends from the beak to the base. *Dorsal* valve furnished with a strong spatulate cardinal process, which, rising vertically from the cardinal margin, is closely grasped at its base by the cardinal teeth of the other valve; and thence bending abruptly upwards, and expanding, is projected into the cavity of the opposite beak, lying close upon the under side of the false area. Cardinal process grooved to allow of the passage of the peduncle, for the protrusion of which a minute foramen is sometimes observed in the beak. The crural processes originate at the base of the cardinal process. A medio-longitudinal septum as in the ventral valve.

Surface of shell apparently smooth, under a lens punctate; when perfect, covered with minute hair-like spines.

The larger species of this genus present some analogy in external appearance with *Spirigera*, and the presence of internal spires increases the similarity. The cardinal teeth resemble those of *Spirigera* and *Merista*. In form, and in the punctated test, it simulates *Magas;* while the elongate cardinal process of the dorsal valve resembles that structure in Thecidium.

Distribution, 7 species. Silurian. United States, England

Trematospira, Hall, 1859.

Etymology, *trema*, a foramen, and *spira*.

Example, T. multistriata, Hall.

Shell transverse, elliptical, or subrhomboidal, furnished with internal spires (arranged as in *Spirifera*); hinge line shorter than the width of the shell. Valves articulated by teeth and sockets; beak of ventral valve produced or incurved and truncated by a small round perforation separated from the hinge line by a deltidium. A deep triangular pit or foramen beneath the beak, *which is filled by the closely incurved beak of the dorsal valve.* False area sometimes defined.

Distribution, 7 species. Upper Silurian—Middle Devonian. United States.

This genus and the next appear to be closely related to *Retzia*.

Rhynchospira, Hall, 1859.

Etymology, ρυγχος, a beak, and *spira;* in allusion to its similarity in form to *Rhynchonella*, and having internal spires.

Type, Waldheimia formosa, Hall.

Shell somewhat similar to *Rhynchonella*, but usually more symmetrically rounded, and with less distinct mesial sinuosities; and in these characters they resemble *Waldheimia*.

Valves articulated by teeth and sockets, similar to those of *Nucleospira*; the crura supporting two conical spires. The cardinal process of the dorsal valve is a broad emarginate plate; beak of the ventral valve largely perforated. Surface plicated or striated.

Distribution, 7 species. Silurian—Devonian. United States, Russia.

Atrypa (see p. 378).

The internal appendages of *Atrypa reticularis* (see Fig. 24) consist of a pair of spiral cones, placed side by side, with their apices directed towards the cavity of the dorsal valve; the lamellæ have their origin on the socket-walls, and run parallel with the inner margin of the valve. "The spiral cones are connected by an entire and continuous loop, which is confined to the rostral part of the shell. The loop arises from the posterior portion of the first volutions of the spires, and curves gently forward and upward; the central or elevated portion is situated between and behind the cones, and forms a more or less abrupt curve, or is prolonged into a point directed towards the dorsal valve. The existence and form of this loop have been ascertained in several different varieties of *A. reticularis*, as well as in *A. spinosa*, Hall."—(Whitfield.)

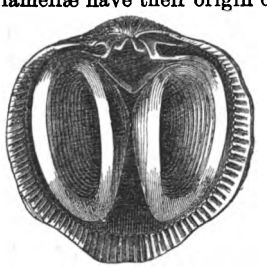

Fig. 24.

Sub-genus, Zygospira, Hall, 1862.

Synonym, Stenocisma, Conrad, 1847. Spiral cones connected by an entire and continuous loop in a very similar manner to that shown to exist in *Atrypa reticularis;* but the loop having its connection with the spiral lamellæ at a point relatively more distant from their origin on the hinge plate, and passing over, or in front of the spires.

Family III.—Rhynchonellidæ.*

Eatonia, Hall, 1859.

Dedicated to the late Professor Amos Eaton.

Examples, Atrypa peculiaris, Conrad; A. singularis, Vanuxem.

Shell like that of *Rhynchonella;* the lower half of the ventral valve with a broad deep sinus. Valves articulating by means of two teeth in the ventral valve, with corresponding sockets in the dorsal valve, and a median septum embraced between the deeply bifurcating cardinal process of the opposite one.

Dorsal valve with four crural processes; in the ventral valve the dental plates are represented by elevated lamellæ surrounding the muscular impression, which is much stronger and differs in some respects from that of *Rhynchonella*.

Fossil, 7 species. Upper Silurian. United States.

Camerella, Billings, 1859.

Examples, C. Volborthi, Billings; Atrypa extans, Hall.

Synonym, Triplesia, Hall, 1859.

Ventral valve with a small triangular chamber beneath the beak, supported by a short mesial septum as in *Pentamerus*. Dorsal valve with a single mesial septum and two short lamellæ for the support of the oral appendages, as in *Rhynchonella*. Surface smooth or obscurely plicated.

Distribution, 9 species. Lower Silurian. North America.

Eichwaldia, Billings, 1858.

Dedicated to Professor Eichwald, the celebrated Russian palæontologist.

Type, E. subtrigonalis, Lower Silurian. Canada.

Shell with the ventral valve perforated on the umbo for the passage of a peduncle; the place of the foramen beneath the beak being occupied by an imperforate concave plate; the interior of each valve divided by a medio-longitudinal ridge, that of the dorsal valve very prominent; hinge and teeth sockets wanting.

The internal structure of the ventral valve somewhat resembles that of *Pentamerus* or *Camerophoria*.

Distribution, 3 species. Silurian, Canada; England.

Stricklandinia, Billings, 1863.

Dedicated to the late Professor H. E. Strickland.

Synonyms, Stricklandia, Billings, 1859 (non Buckman); Rensselæria (pars), Hall.

* See p. 375.

Type, Pentamerus lens, Sowerby.

Shell usually large, elongate-oval, &c.; valves *nearly equal, never globose;* a short mesial septum in the interior of the ventral valve supporting a small triangular chamber beneath the beak as in *Pentamerus;* in the dorsal valve no longitudinal septa, spires, or loop, the whole of the internal solid organs consisting of two short or rudimentary dental plates, which in some species bear prolonged calcified processes for the support of the cirrated arms. A more or less developed area in the ventral valve.

In *S. lævis* and *S. microcamerus* the hinge line is straight and much extended. In *S. Arachne*, Billings, the area of the ventral valve is so much developed as to give the whole shell the external appearance of an Orthis.

Distribution, 10 species. Middle Silurian, Europe, America. *S. elongata*, Vanuxem, is the only species known in the Devonian rocks.

Family IV. — Orthidæ.*

Skenidium, Hall, 1861.

Etymology, skenidion, a little tent.

Type, Orthis insignis.

Shell having the general aspect of *Orthis*, except in the extreme elevation of the ventral valve; cardinal process prolonged into a median septum, which extends to the base or front margin of the shell, and occasionally bifurcates at this lower extremity. *Area* large and triangular in the typical species.

Distribution, 3 species. Silurian, United States.

Streptorhynchus, King, 1850 (see p. 380).

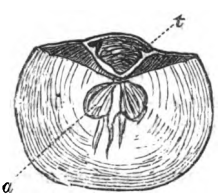

Fig. 25.

Fig. 26.

Streptorhynchus pelargonatus.

Fig. 25.—Interior of the ventral valve; *t*, teeth; *a*, cardinal muscular impressions.
Fig. 26.—Interior of the dorsal valve; *s*, sockets; *v*, cardinal process; *r*, adductor scar.

Etymology, strepto, I bend or twist; *rhynchos*, a beak.

Types, S. pelargonatus, Schloth. sp.; S. Devonica, D'Orb. sp.

* See p. 379.

Shell inequivalved, convex or concavo-convex, externally striated; hinge line rather shorter than the width of the shell; dorsal valve semicircular, with a small narrow area. Ventral valve with a prolonged and oftentimes bent beak; area triangular, with a fissure covered by a convex pseudo-deltidium. No foramen is observable, but the cardinal process is at times seen partially extending under the deltidium (Fig. 26).

Interior of ventral valve, with a strong hinge-work on either side at the base of the fissure, supported by a dental plate (Fig. 25, *t*); muscular scars two, elongated, oval, deeply excavated, separated by a wide mesial ridge (Fig. 26, *r*).

Interior of dorsal valve with a largely developed cardinal process, composed of two projections, grooved or bidentated towards the extremity of their outer surface; socket plates large, and partly united to the lower portion of the cardinal process; adductor scars quadruple, occupying more than a third of the length of the valve, and arranged in pairs, divided by a short rounded mesial ridge.

This genus is intermediate between Orthis and Strophomena.

Distribution, 6 species. Sil.—Perm. Europe, Asia, America, and Australia.

Tropidoleptus, Hall, 1859.

Etymology, *tropis*, a keel, and *leptos*, thin; the carinated ventral valve and shallow visceral cavity, in its analogy with *Leptæna*. (See "Reg. Rep.," 1856, p. 3.)

Type, Strophomena carinata, Conrad.

Shell transversely oval, or longitudinally semi-elliptical, articulating by teeth and sockets, hinge line about equal to the breadth of the shell. *Ventral* valve convex, with a linear area and triangular foramen in the margin of the area; from the inner edges of this proceed the dental lamellæ, which are separated from the area by a narrow groove strongly crenulated on the outer edge, and extending obliquely outwards, terminating in a low ridge which partially surrounds the muscular impression; *dorsal* valve concave; cardinal process prominent, wedge-shaped, supporting the bases of the crura; dental fossets crenulated, surface plicated; shell structure punctated.

Distribution, 2 species. Devonian. United States.

Vitulina, Hall, 1861.

Etymology, *Vitula*, a goddess.

Type, V. pustulosa. Devonian. New York.

Shell resembles that of *Tropidoleptus*, but the dental processes are not crenulated, nor distinctly separated from the area as in that genus.

AMPHICLINA, Laube, 1865.

Etymology, *amphi*, about, and *clino*, a slope.

Type, A. dubia, Münster (Producta).

Shell inequivalve circular, excavated, smooth; *ventral* valve convex, beak short; perforated; dorsal concave; hinge line very short and suboblique; area wanting; deltidium triangular, distinct; structure of the test fibrous, squamose; externally *Amphiclina* resembles some Leptænæ, the shell structure is very similar.

Distribution, 2 species. St. Cassian, Austria.

Calceola. "Within the last few years the researches of Professors Suess and Lindström have thrown considerable doubt as to this genus belonging to the Brachiopoda." . . "If a brachiopod it seems the most abnormal of all its genera."—Davidson (1865).

FAMILY VIII.—LINGULIDÆ.*

LINGULELLA, Salter, 1866.

Etymology, diminutive of *Lingula*.

Type, Lingula Davisii, M'Coy.

"*Shell* nearly equivalve, broad oblong, the ventral valve pointed, *with a distinct pedicle-groove.* Muscular sears strong, nearly as in *Obolus*, but the pair of anterior retractors are more linear than in Obolus, and the sliding muscles small, and not quite external as in *Obolus*."—(Salter.)

Distribution, 3 species. Lower Silurian. Ireland, Wales, Norway.

LINGULEPIS, Hall, 1863.

Etymology, *lingula*, a little tongue; *lepis*, a scale.

Type, Lingula pinniformis, Owen.

Shell thin, subovate, or subtrigonal; composition and structure as in *Lingula*. Ventral or larger valve with beak more or less produced and pointed; visceral scar trilobed, with a longitudinal raised mesial line or septum—lateral divisions diverging, and usually longer than the middle one; dorsal or smaller valve with the beak less produced than that of the other; visceral scar flabelliform.

Distribution, 4 species. Silurian, America.

* See p. 390.

TRIMERELLA, Billings, 1863.

Shell allied to that of *Obolus*, from which it differs in the possession in the interior of each valve of three longitudinal septa of variable length, which support a horizontal or concave plate.

Distribution, 2 species. Silurian. Canada.

OBOLELLA, Billings, 1861.

Etymology, diminutive of *Obolus*.

Synonym, (?) Keyserlingia, Pander.

Type, Obolella chromatica, Billings.

"*Shell* ovate, circular or subquadrate, convex or plano-convex; ventral valve with a false area, which is sometimes minute, and usually grooved for the passage of the peduncle; dorsal valve either with or without an area; muscular scars in the ventral valve, four; one pair in front of the beak near the middle, or in the upper half of the shell, and the others situated one on each side near the cardinal edge; shell calcareous; surface concentrically striated, sometimes with thin extended lamellose edges."

"In general form these small shells somewhat resemble *Obolus*, but the arrangement of the muscular impressions is different. In *Obolus* the two central scars have their smaller extremities directed downwards, converging towards each other; but in this genus the arrangement is exactly the reverse."—(Billings.)

Distribution, 12 species. Lower Silurian. United States, Canada, England, Spain.

CLASS PTEROPODA.*

HERMICERATITES, Eichwald, 1840.

Shell cylindrical or semi-cylindrical, elongated, straight, with a dark brown corneous epidermis, furnished with a straight, median siphuncle, which does not traverse any chambers.

Fossil, 3 species. Middle Silurian. Russia.

SALTERELLA, Billings, 1861.

Dedicated to Mr. J. W. Salter, late Palæontologist to the Geological Survey of Great Britain.

Shell small, slender, conical, straight, consisting of many

* See p. 346.

cones placed one within the other; the transverse section of the tubes is circular or subtriangular; the surface is transversely or longitudinally striated.

Fossil, 3 species. Lower Silurian, Canada.

PHRAGMOTHECA, Barrande, 1867.

Type, P. Bohemica. Upper Silurian. Bohemia.

Shell like that of *Pterotheca*, but chambered.

CLASS CONCHIFERA.*

[FAMILY ANOMIADÆ.]

The genera included are: ANOMIA (*Limanomia*) (p. 408), PLACUNOMIA (p. 409), PLACUNA (p. 409), CAROLIA (p. 410), PLACUNOPSIS (p. 410), and PLACENTA (p. 410).

FAMILY I.—OSTREIDÆ.†

The genera enumerated are OSTREA (*Gryphœa*, *Exogyra*) and

PERNOSTREA, Munier-Chalmas, 1864.

Derivation from *Perna* and *Ostrea*.

Example, Ostrea Luciensis, D'Orbigny.

Shell more or less thick, adherent by the left valve, subcircular, squarish, or trapezoidal, nearly equilateral, inequivalve; test foliaceous, subnacreous, resembling that of *Ostrea*, no fibrous cortical layers; umbones obsolete; hinge line diverging more or less broad, with 4 to 8 vertical ligamental furrows, some long and deep, others short and rudimentary. Muscular impression subcircular or semilunar, deeper in the fixed valve than in the other.

The species of this genus, with the exception of the ligamental pits, have nearly all the characters of *Ostrea*; they serve to link the families *Ostreidæ* and *Aviculidæ*.

Distribution, 7 species. Middle Lias—, Forest Marble. France, England.

[FAMILY PECTINIDÆ.]

The genera are PECTEN (*Neithea*, *Pallium*), HEMIPECTEN (p. 412), HINNITES (p. 412), LIMA (p. 412), SPONDYLUS (p. 413), PEDUM (p. 414), PLICATULA (p. 414), and the following additional genera and sub-genera:—

* See p. 393. † See p. 407.

Pernopecten, Winchell, 1865.

Derivation, *Perna* and *Pecten*, from a combination of some of the characters of the two genera.

Type, Aviculopecten limæformis, White and Whitfield.

Shell subequivalve, inequilateral, auriculated; hinge line straight, with a central triangular cartilage pit and a transverse plate, with smaller lateral cartilage pits diminishing in size and depth from the centre outwards.

Pernopecten agrees with *Amusium* in its subsymmetrical ears, cardinal cartilage pit, and in the absence of radiating ridges, but differs in its straight hinge line and lateral cartilage pits.

Fossil, 7 species. Carboniferous limestone. Michigan, Belgium, Nassau. Probably others referred to *Avicula*, *Pterinea*, and more especially to *Aviculopecten*, *Amusium*, and *Pecten*.

Aviculopecten (p. 417) does not possess the prismatic of the *Aviculidæ*, but the peculiar corrugated tubular structure of the *Pectinidæ* (Meek). It bears the same relations to existing *Pectens* as *Pterinea* does to existing Aviculas.

Plicatula (see p. 414).

Sub-genus, *Harpax* (Parkinson, 1811), Deslongchamps, 1858.

Example, Harpax Parkinsoni, Brown.

Hinge of attached valve consisting of a flattened triangular plate, traversed by a central more or less perpendicular ligamental furrow, exterior to which are slightly marked diverging sulci to receive the elevated borders of the ligamental groove in the other valve; the outer borders of the plate form lengthened and elevated dental processes. Hinge plate of free valve traversed mesially by the ligamental groove, the borders to which are elevated and but slightly diverging; exterior to these are strongly impressed grooves to receive the dental processes of the other valve.

Fossil, 16 species. Lias and Lower Oolites. France and England.

Terquemia, Tate, 1867.

Dedicated to M. O. Terquem, an eminent palæontologist.

Example, T. Heberti, Terquem, Mem. Soc. Géol. de Fr., vol. viii. p. 106, t. 13, f. 1—3, 1865.

Synonym, Carpenteria, E. Deslongchamps, 1858 (*non* Gray, 1856.

Shell inequivalve, subequilateral, attached by the umbonal portion of the *right* valve; the left valve slightly concave,

smooth, and ornamented posteriorly, as also the free portion of the right valve, by concentric plications or radiating ribs. Hinge area triangular, transverse, striated in the same direction, edentulous, sometimes produced in the middle line; ligamental furrow median, longitudinal, straight, rather narrow. Muscular scar near the posterior margin; pallial line wanting. Externally the shells of this genus resemble those of *Hinnites* and *Ostrea*.

Fossil, 5 species. Lower— Upper Lias. France, Germany, Great Britain.

Family II.—Aviculidæ.*

Sub-family 1.—Pterineinæ. Cartilage contained in a series of linear furrows nearly parallel to the cardinal margin; hinge-margin broad, flat; anterior muscular scar moderately developed and deep. Extinct.

Genus :—Pterinea (probably includes the Silurian and Devonian species referred to *Avicula*).

Sub-genus :—*Eopteria*, Billings; *E. Typica*, L. Sil. Newfoundland. Valves equally convex, hinge with an external (?) ligament.

Monopteria, Meek, 1865.

Type, Gervillia longispina, Cox. Coal Measures. Kentucky. Hinge edentulous; anterior muscular scar faint, as in *Avicula*.

Myalina (see p. 421). Ambonychia (p. 417), (?) Actinodesma, and Pteroperna (p. 416). *A. Casei* (*Megapteria*, Meek), Lower Silurian, Indiana, differs from the typical forms of the genus in the great development of its posterior wing.

Sub-family 2.—Aviculinæ. Cartilage pit single, defined; anterior muscular scar very small.

Genera :—Avicula (*Maleagrina*, *Malleus*), Vulsella (p. 416); Aucella (p. 416), Monotis (p. 417), Halobia (p. 417), Posidonomya (?) Cardiola (p. 417); Eurydesma (p. 417).

Sub-family 3.—Pernidæ. Cartilage contained in a series of transverse furrows. Anterior muscular scar generally very small.

Genera :—Perna (p. 418), Crenatula (p. 418), Hypotrema (p. 418), Gervillia (p. 418), Bakewellia (p. 418), and Inoceramus (p. 419), and the following additional genera :—

* See p. 415.

HÖRNESIA, Laube, 1865.

Dedicated to Director Dr. Moriz Hörnes.

Type, Gervillia socialis, Sckloth, St. Cassian.

Differs from the typical Gervilliæ by the peculiar structure of the hinge, and by a more or less lengthened septum going through the cavity of the umbones. The genus is intermediate between *Cassianella* and *Gervillia*.

NAYADINA, Munier-Chalmas, 1863.

Type, N. Heberti, Munier, Cenonamian, Aubeterre.

Shell resembling a transverse *Vulsella*, rostrated posteriorly; the internal fibrous layer is wanting.

ELIGMUS, E. Deslongchamps, 1856.

Etymology, ἑλιγμός, a sinuosity, in allusion to the sinuosities of the borders of the post-apical opening.

Type, E. polytypus, E. Deslong. Fig. 27

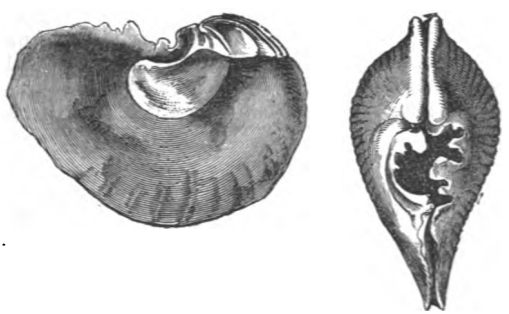

Fig. 27.—Eligmus Polytypus.

Animal unknown.

Shell free, or perhaps attached by a byssus, nearly equivalve, inequilateral; ovate or cylindrical, more or less compressed; anterior extremity inflated, and shorter than the attenuated posterior one. Test rather thick, foliaceous. Umbones inflated, slightly depressed or flattened, diverging and directed backwards. Valves closed at both extremities, with an unsymmetrical (byssal?) sinus, *s*, behind the umbones; ornamented by oblique, radiating carinated ribs. Hinge short, straight, edentulous; ligamental area triangular, with a superficial pit, *l*. Muscular scar single, situated on the free

end of a spoon-shaped process, *p*, which originates from beneath the umbonal cavity, pallial line wanting.

Distribution, 3 species. Inferior Oolite, and Great Oolite. Maine-et-Loire, Calvados, Balin, Galicia.

The internal process of *Eligmus* has no analogy with that of the *Myæ* and *Anatinæ*, which in them supports the cartilage, and is an internal prolongation of the hinge; whilst that of *Eligmus* gives attachment to the adductor muscle, and arises from beneath the hinge. *Eligmus* is related through *Vulsella Turonensis*, Dujardin, to *Vulsella;* the test, however, is not fibrous, and M. Munier supposes that the internal nacreous layer has been destroyed by fossilization.

Cassianella, Beyrich, 1861.

Synonym, Gryphorhynchus, Meek, 1864.

Type, Avicula gryphœata, Münster.

Shell thick, sub-hemispherical; right valve flat or convave, the left very gibbous; no defined byssal *sinus*. Umbones sub-central, hinge line equalling the greatest length of the shell, in both valves with a wide well-defined cardinal area; ears sub-equal, not produced. Hinge with several small irregular teeth near the middle. Surface striated.

Fossil, 6 species. Upper Trias— L. Lias. Austria, Bavaria, Himalayas.

Sub-family 4.—*Pinniinæ*.

Genus:—Pinna. Sub-genus, *Aviculopinna*, Meek.

Type, Pinna prisca, Münster. Permian.

Shell nearly or quite equivalve, beaks not terminal. The general aspect of the shell seems to be intermediate between *Pinna* and *Avicula*.

Trichites (see p. 420).

Family III.—Mytilidæ.*

Modiolaria, Beck (Jeffreys, 1863) (see p. 422).

Derivation, allied to the genus *Modiola* of Lamarck.

Example, Mytilus discors, Linné.

Synonyms, Lanistes, Humphreys; Lanistina, Gray.

Animal with the mantle folded in front into a wide incurrent tube, and behind into a conical excurrent tube; foot strap-shaped.

Shell rhomboidal, sculptured by two rows (one on each side)

* See p. 420.

of striæ, which radiate from the beaks, leaving the middle portion smooth, umbones incurved, hinge edentulous or crenulated, hinge-plate finely notched.

Distribution, Temperate and Arctic seas. The four British species occur fossilised in the Red and Coralline Crags and newer Tertiaries. Several species in the Upper Triassic and Jurassic formations, referred to *Modiola*, appear to belong here.

CRENELLA, Brown (see p. 422).

Etymology, diminutive of *crena*, a notch.

Example, Mytilus decussatus, Montagu.

Animal with the mantle open in front, and folded behind into a sessile excurrent tube; foot cylindrical, the free end being disk-like and issuing out of a sheath.

Shell oval or rhomboidal, nacreous, cancellated; umbones straight, ligament small, hinge of each valve furnished with an upright tooth, which is crenulated, as well as the hinge plate.

The animal does not spin a thick byssus, like *Modiolaria*, but secretes only a single thread for attachment, and by means of which it holds itself suspended in the water.

Distribution, 5 species. Low-water mark to 150 fathoms. Norway, Iceland, Greenland, New England, Britain, France.

C. rhombea occurs in a fossil state in the Coralline Crag, Sutton.

PRASINA, Deshayes, 1863.

Type, P. Borbonica, Desh. Isle of Bourbon.

Shell oblong thick cordiform, valves closed, margins entire inequilateral; lunule deep circular, projecting into the interior of the right valve, left valve in the same place furnished with dentiform tubercles; hinge line simple, arched; ligament external, narrow; muscular scars two, unequal, sub-central.

ANTHRACOPTERA, Salter, 1863.

Etymology, *anthrax*, coal, and *pteron*, a wing.

Example, A. Carbonaria, Dawson, sp.

This genus includes the so-called *Myalinæ*, but they have not the thick hinge-plate of the shells of that genus, and species which have been described by Ludwig as belonging to *Dreissena*. The form of the shell is triangular.

Fossil, 7 species of marine origin. Coal Measures. Great Britain, Nova Scotia, Westphalia.

FAMILY IV.—ARCADÆ.*

LIMOPSIS. Sub-genus, *Trigonocœlia*, Nyst.

Shell approaches *Leda* in form, and differs from *Limopsis* in the absence of the expanded ligamental area.

Fossil, 7 species. Eocene. Paris basin, Belgium, England, United States.

CTENODONTA, Salter, 1851 (p. 427).

Type, Tellinomya nasuta, Hall.

Synonym, Tellinomya, Hall.

Shell closed, differs from *Isourca* in not having the ligamental area, the ventricose character, large and often subspiral beaks; the surface of the shell is smooth or marked by lines of growth, but never cancellated; hinge teeth small and numerous.

Fossil, 40 species. Silurian—Carboniferous. Europe, N. America, Bolivia.

It is probable that most of the Palæozoic species referred to *Nucula* belong to *Ctenodonta*.

PALÆARCA, Hall, 1858.

Synonyms, Megalomus, Hall, 1852; Cyrtodonta, Billings, 1858; Cypricardites, Conrad, 1841.

Example, C. Canadensis, Billings

Shell equivalve, inequilateral; umbones near the anterior end or terminal; general form obliquely tumid, transversely subrhomboidal ovate; posterior extremity larger than the anterior, and usually broadly rounded; two to eight oblique anterior teeth beneath, or a little in front of the umbones; two to four remote lateral teeth parallel with the hinge line; pallial line simple; muscular scars two, anterior sometimes deeply excavated; posterior superficial; ligament external.

Some species have a narrow area between or behind the beaks.

Distribution, 42 species. Silurian—Devonian. N. America and N. Wales.

Sub-genus, *Megambonia*, Billings, 1858.

Synonym, Vanuxemia, Hall, 1858.

Shell ovate, beaks terminal, or nearly so; anterior extremity reduced to a small auriculate expansion, or obsolete.

Distribution, 11 species. Silurian. N. America.

* See p. 424.

Family V.—Trigoniadæ.*

? Ischyrina, Billings, 1866.

Type, I. Winchelli, Billings.

Shell equivalve, inequilateral, two strong ridges radiating from the beak in the interior of each valve.

Fossil, 2 species. L. and M. Silurian. Anticosti.

Family VI.—Unionidæ.†

Anthracosia, King, 1856 (see p. 470).

Etymology, anthrax, carbon, in allusion to the carbonaceous deposits in which the genus is usually found.

Type, A. Beaniana, King. Coal Measures, Newcastle.

Shell equivalve, inequilateral. *Teeth* one in each valve below the umbone, rather low and massive; crown of tooth of right valve excavated anteriorly and ridged posteriorly; crown of tooth of left valve ridged anteriorly and sloped posteriorly. *Umbonal ligamental fulcra*, each a furrow excavated in the hinge-plate, between the umbone and tooth. *Scars of the anterior set of pedal muscles*, situated above the anterior adductor muscular impressions.

Anthracosia differs from *Unio*, to which genus the majority of the Unioniform shells have been referred, in its simpler dental system and in the absence of supplementary pedal muscles. It has no relation to *Cardinia*, in which genus others of the Unioniform species have been placed; whilst other members of genus possessing the outward appearance of certain aviculoid forms of *Modiola* have been ranged in the genus *Myalina*.

Distribution, 61 species. Devonian—Carboniferous. Westphalia, Saxony, Russia, Belgium, Great Britain, N. America.

Carbonicola, M'Coy, 1855 (see p. 470).

Synonym, Prisconaia, Conrad, 1867.

Example, Unio acutus, Sow.

Cardinal tooth in right valve diverging obliquely towards the posterior side; lateral 1-1, long and lamellar; no lunate impression on the ventral margin of the anterior adductor as in *Unio*.

This genus is related to *Anthracosia*, but differs in having lateral teeth.

Distribution, about 20 species. Coal Measures. Europe, United States.

* See p. 430. † See p. 432.

Family VIII.—Hippuritidæ.*

Genus :—Hippurites.

Sub-genus, *D'Orbignya*, Woodward, 1862.

Type, H. bi-oculatus, Lamk. ; no "ligamental inflection" of the outer shell.

Fossil, 4 species. Middle Chalk. Europe.

Barrettia, Woodward, 1862, dedicated to Mr. Lucas Barrett, late Director of the Geological Survey of the West Indies.

Type, B. monilifera, Woodward. "Hippurite Limestone." Jamaica. No "ligamental inflection" as in *D'Orbignya*, but presents the further peculiarity of an indefinite number of pallial duplicatures extending all round the margin of the lower valve.

Family XI.—Lucinidæ.†

Loripes, Poli, 1791 (Jeffreys) (see p. 456).

Etymology, *lorum*, a strap ; and *pes*, a foot.

Example, Tellina lactea, Linné.

Animal with the margin of the mantle notched; incurrent tube long.

Shell almost equilateral, cancellated, or sculptured by flexuous striæ; lunule short; cartilage *quite internal;* teeth, one cardinal in the right, and two in the left valve; laterals remote, and sometimes indistinct.

Distribution, species. Atlantic, Mediterranean, West Indies.

Fossil, species. Eocene ——. France.

Axinus, J. Sowerby, 1821 (see p. 431).

Synonyms, Thysaira, &c., Leach; Bequania, Leach; Cryptodon, Turton; Ptychina, Philippi; Thiatyra, G. Sowby.; Clausina, Jeffreys.

Example, Tellina flexuosa, Montagu.

Animal with the mantle margin thickened, open, not prolonged into tubes; foot long, sub-cylindrical, and very slender.

Shell globular, posterior side furrowed or angulated, umbones much recurved; lunule short or indistinct; ligament usually and to a certain extent external, placed in a groove on the hinge line, and outside the hinge-plate; teeth altogether wanting.

In *A. flexuosus*, the hinge-plate is indented in the right valve immediately below the beaks, and slightly reflected in the left,

* See p. 440. † See p. 455.

which gives that valve the appearance of having an indistinct or obscure cardinal tooth.

Distribution, 4 species. Europe.

Fossil, Tertiary. Two of the three British species occur in a fossil state in the Coralline Crag.

SPORTELLA, Deshayes (see p. 457).

Example, Psammotea dubia, Defrance.

Shell oblong, smooth, depressed, sub-equilateral; valves closed. Hinge narrow, with two unequal, diverging teeth in the left valve, one in the other; the lateral teeth are wanting. Muscular scars large, oval, nearly equal; pallial line simple. Ligament external.

Fossil, 17 species. Tertiary. Paris basin.

Possibly some of the Liassic species referred to *Unicardium* belong to this genus.

CORBICELLA, Morris and Lycett, 1853.

Etymology, diminutive of *Corbis*.

Type, C. subæquilatera, Lycett.

Shell destitute of ornament, ovately elongated, rather compressed; anterior side small; hinge characters differ from those of *Corbis*, in the absence of the anterior lateral tooth, and in the oblique internal ridge passing downwards behind the anterior muscular scar.

Corbicella is intermediate between *Corbis* and *Tancredia*; and from the latter, to which it is more nearly allied, it is separated by its more ovate form, and by the absence of the posterior oblique angle, and in the possession of a lengthened hinge-lamina and depressed remote posterior lateral tooth.

Fossil, 7 species. Upper part of Inferior Oolite—Oxfordian. England; France.

[FAMILY KELLIIDÆ.]

LASÆA, Brown, 1827.

Etymology, possibly a corrupt derivation of λαισήϊον, a shield.

Type, Cardium rubrum, Montagu.

Synonyms, Poronia, Recluz; Cylcadina, pars; Kellia, pars; Bornia, pars.

Animal with the mantle folded on the anterior side so as to form a wide but incomplete incurrent tube; the excurrent tube is inconspicuous, placed on the opposite side; foot long.

Shell minute and roundish oval; beaks straight; cartilage long, placed at the shorter end of the shell, contrary to that in *Kellia; left* valve with a minute thorn-like cardinal tooth; and in each valve two remarkably strong lateral teeth.

The genus is intermediate between *Montacuta* and *Kellia*.

Distribution. "The *Lasœæ* usually inhabit the littoral zone, where they congregate in vast numbers at the roots of small sea-weeds, in the crevices of rocks, and in empty shells. *L. rubra*, a British species, is viviparous, and lives as much out of the sea as in it. Other species occur in various parts of the world."—Jeffreys.

Family XII.—Cycladidæ.*

In addition to the genera enumerated in W. M. ii., p. 461 *et seq.*, the following belong here:—

Galatea (see p. 486), and—

Fischeria, Bernardi, 1860.

Dedicated to M. Fischer, one of the editors of the *Journal de Conchyliologie.*

Type, F. Delesserti, Bern., inhabiting the rivers of the Gaboon, W. Africa.

Shell differs from that of *Galatea* in the rudimentary condition of the lateral cardinal teeth of the right valve, and by the elongated lateral teeth being compressed, as in *Cyrena;* and from *Cyrena* by its fewer cardinal teeth, depth of the pallial sinus, and by the absence of lateral teeth in the right valve.

Family XIII.—Cyprinidæ.†

Cypricardella, Hall, 1857.

Shell ovate, subelliptical, or subquadrate; concentrically striated; hinge of right valve with two cardinal teeth; the anterior tooth beneath the beaks; posterior tooth turned obliquely backwards, leaving a triangular pit, which is probably occupied by a tooth in the other valve. Anterior cardinal margin with a long narrow groove, apparently for the reception of a slender projection of the other valve; posterior side beveled from above, edge thin; ligament external, in a deep cavity; muscular scars distinct, shallow; pallial line simple.

Fossil, 4 species. Carboniferous. Indiana.

* See p. 461. † See p. 463.

ANISODONTA, Deshayes, 1860.

Type, A. conplanatum, Dh. Eocene. Paris basin.

Shell transversely elongated, compressed, inequilateral; hinge thick; a large conical and a triangular socket in each valve; ligament external. Anterior adductor scar very small, and comprised between two prominent ribs (one parallel and the other transverse to the anterior border); posterior scar subcircular, superficial; pallial line faint, entire.

Distribution, 2 species. Bourbon.

? MATHERIA, Billings, 1858.

Dedicated to Mr. Mather, of the Geological Survey of New York.

Type, M. tenera, Billings. Trenton limestone, Canada.

Shell transverse, equivalve; beaks near the anterior end; two small obtuse cardinal teeth in the left valve, and one in the right; ligament external.

CONCHODON, Stoppani, 1865.

Etymology, *conchos*, a shell, and *odos*, a tooth.

Type, C. infraliasicus, Stop. Lower Lias. Lombardy.

Shell equivalve, symmetrical, very thick, cordiform, closed; beaks large, angulated, involute. Ligament internal, very long, marginal, attached to the posterior half of the hinge-plate. Hinge massive; in the right valve, one large rounded tooth in front (placed above a dental pit), and two transverse cardinal teeth; left valve with a large circular socket, bounded below by a curved lamellar tooth; two transverse and one curved teeth beneath the umbo.

DICEROCARDIUM, Stoppani, 1865.

Etymology, *diceras*, having two horns, and *cardium*.

Shell equivalve, symmetrical, closed, free; umbones very prominent, elongated, or spiral. Hinge-plate broad, thick, separated by an interval of varying width from the edge of the valve, and prolonged into the umbonal cavity. Left valve with a compressed cardinal tooth, corresponding to a socket in the right valve; valves furrowed by ligamental grooves. Ligament external.

Fossil, 4 species. Upper Trias. Lombardy, North-West Himalayas.

CYPRIMERIA, Conrad, 1864.

Type, Cytherea excavata, Morton. Cretaceous. North America.

Shell lentiform; hinge of right valve broad, with a bifid oblique cardinal tooth and two oblique acute anterior teeth, with an intermediate pit for the reception of the tooth in the opposite valve.

DOSINIOPSIS, Conrad, 1864.

Derivation, *Dosinia*, a generic name, and *opsis*, like.

Type, D. Meekii. Eocene. United States.

Shell exteriorly like *Dosinia*. Cardinal teeth three in each valve; posterior tooth of right valve bifid; in the left valve, a thick rugose lateral tooth fitting into a cavity in the opposite valve; under the umbo is a pit; cartilage plate granulated; pallial sinus deep and angular.

Distribution, 3 species. Eocene. United States.

CONCHOCELE, Gabb.

Type, C. disjuncta, Gabb. Miocene? California.

Shell irregularly quadrate, very inequilateral, angulated posteriorly; presenting some analogies to *Edmondia*, *Unicardium*, and *Cardiomorpha*. Ligament external; hinge with a long, sharp tooth running from the beaks parallel with the cardinal margin, almost to the posterior end; pallial line simple.

ASTARTE. Subgenus, *Astartella*, Hall and Whitney, 1858. *A. vera*. Coal Measures. Illinois and Indiana. The anterior tooth of the right valve has a longitudinal pit in the summit.

[FAMILY CARDITÆ.]

WOODIA, Deshayes, 1860.

Dedicated to Searles V. Wood, a distinguished palæontologist of England.

Example, Tellina digitaria, Linné.

Shell small, rounded, equivalve, equilateral; valves closed, smooth, or ornamented with oblique, curved striæ; hinge thick; right valve with a single, large, median, triangular tooth, depressed or channelled in the middle; left valve with two narrow, unequal, diverging teeth; lateral tooth wanting or rudimentary. Ligament internal, small; muscular scars small, equal, oval or ovate; pallial line simple.

Distribution, 1 species. Mediterranean; also fossil in the

Crags of England, in that of Anvers, and in the Pleistocene deposits of Palermo.

Fossil, 8 species. Eocene, Miocene, Pliocene. France, England, Germany. *W. lamellosa*, Sandb., is inequilateral.

LUTETIA, Deshayes, 1860.

Example, L. Parisiensis, Deshayes.

Shell small, orbicular, globose, equivalve; valves closed; border simple and entire; hinge narrow; cardinal teeth three in each valve, two diverging; the third large and obliquely placed between the others; muscular scars small, oval, submarginal, equal; pallial line simple; ligament external.

Fossil, 2 species. Eocene. Paris.

GOODALLIA, Deshayes, 1860.

Example, Erycina miliaris, Defrance.

Shell small, trigonal, equivalve, inequilateral; valves closed; cardinal teeth in the right valve two, diverging, separated by a triangular socket; in the left valve, one triangular, sometimes bifid; lateral wanting, or rudimentary; ligament *external*, very short; pallial line simple.

Fossil, 8 species. Eocene. Paris.

GOODALLIOPSIS, Raincourt and Munier, 1863.

Type, G. Orbignyi, Rainc. and Mun. Eocene. Fercourt.

Shell oval, flattened, equivalve, inequilateral, smooth, slightly dilated in front, and compressed behind; valves closed; hinge with two cardinal teeth, separated by a triangular socket, in each valve; lateral teeth distinct and elongated, one in each valve. Other characters those of *Goodallia*.

FAMILY XIV.—VENERIDÆ.*

PSATHURA, Deshayes, 1860 (see p. 456).

Etymology, ψαθυρὸς, friable.

Type, Erycina fragilis, Lamk. Eocene. Paris basin.

Shell oval, inequilateral, thin, transparent, fragile; hinge teeth, in the right valve, two equal and deeply bifid; left valve, two unequal, entire; ligament external; anterior adductor scar narrow, claviform; posterior subquadrangular; pallial simple, thus differing from *Clementia*, to which it is related by the hinge characters.

* See p. 472.

ISODOMA, Deshayes, 1860.

Type, I. cyrenoides, Deshayes. Eocene. Paris basin.

Shell transversely oval, very thin; hinge similar to that of *Cyrena*, but the pallial line is sinuous.

FAMILY XVI.—TELLINIDÆ.*

SOWERBYA, D'Orbigny, 1850 (see p. 478).

Dedicated to Sowerby, author of "British Mineral Conchology," &c.

Type, S. crassa, D'Orb., Prodrome I., p. 362.

Synonym, Isodonta, Buvignier, 1851.

Shell equivalve, subequilateral; right valve with two oblique, diverging, cardinal teeth separated by a mesial trigonal socket, and two lamellar lateral teeth separated from the hinge border by longitudinal grooves; left valve with a conical tooth between two oblique pits; laterals two; longitudinal lamellar and projecting, and united to the superior border; ligament external.

Fossil, 8 species. Lower Lias—Portlandian. England, France, Germany.

QUENSTEDTIA, Morris and Lycett, 1853 (see p. 481).

Dedicated to Professor Quenstedt, the veteran palæontologist of Wurtemberg.

Type, Pullastra oblita, Phillips.

Shell like that of *Psammobia;* hinge with an obtuse *transverse* cardinal tooth in the left, and a cardinal pit in the right; ligament external, in a narrow elongated groove; posterior adductor scar rounded, anterior elongated, sinuated; pallial sinus smaller than in *Psammobia* or *Sanguinolaria*.

Fossil, 3 species. Inferior Oolite—Great Oolite. England, France, Germany.

? PALÆOMYA, Zittel, 1861.

Shell triangular, depressed, nearly equivalve, inequilateral; right valve with two cardinal teeth, the posterior larger and in front of the cartilage pit; left valve with a single cardinal tooth; a prominent posterior lateral tooth in each valve; muscular and pallial impressions very faint.

Fossil, 1 species. Coral Rag. Glos, Normandy.

* See p. 479.

Family XV.—Mactridæ,*

Includes Vauganella (p. 479), Lutraria (p. 479), Mactra (p. 477), Gnathodon (p. 478), Heterocordia, Anatinella (p. 479), Cardilia (p. 469), and

Pseudocardium, Gabb.

Type, Cardium Gabbi, Remond. Miocene and Pliocene. California.

Etymology, *pseudo*, false, and *cardium*, a generic name.

Shell thick, heavy, resembling *Lævicardium* externally; ligament internal; lunule cordate; left valve with a large cartilage pit and a V-shaped tooth, which articulates in a corresponding depression in the right valve; 2 lateral teeth in each valve, very strong and prominent.

Family XVIII.—Myacidæ.†

Poromya, Forbes, 1843 (see p. 491).

Passing into the genus *Mya*.

Example, P. granulata.

Synonyms, Eucharis, Recluz; Embla, Lovèn; *Cumingia parthenopœa*, Tiberri (*non* Thetis, Sby.).

Animal with unequal siphons, clothed with numerous filaments, foot narrow and slender.

Shell sub-orbicular, sub-equivalve, and inequilateral, thin, transparent, slightly nacreous within; valves closed, surface granulated; teeth, in right valve, a short but strong cardinal, and in the left a minute triangular cardinal and a ridge-like lateral on the posterior side.

Distribution, 10 species. Britain, Scandinavia, Mediterranean, Tropical America.

Fossil, 13 species. Eocene. France, Germany, England, United States.

Corbulomya, Nyst, 1846 (see p. 490).

Derivation, *Corbula* and *Mya*.

Examples, Corbula complanata, Sowerby; Lentidium Mediterraneum, Jan and Cristofori.

Shell oval, transverse, depressed, closed, inequivalve, subinequilateral; right valve the larger, with one pyramidal tooth,

* See p. 477. † See p. 489.

and a narrow and deep socket; left valve with two unequal teeth separated by a large socket. Ligament internal, pallial impressions simple, slightly inflected posteriorly.

Animal with the mantle united behind, margins of the mantle with duplicate foliaceous tentacles; foot compressed, triangular; siphons short, united at the base, the incurrent tube the larger and more elongated, the opening of which is surrounded by arborescent tentacles.

Distribution, 3 species. Mediterranean.

Fossil, 7 species. Eocene. France, Belgium, England.

ANTHRACOMYA, Salter, 1861.

Etymology, *anthrax*, coal, and *mya*, a generic name.

Synonym, Naiadites, Dawson.

Type, A. Adamsi, Salter.

Shell thin, equivalve, the right valve rather larger; valve close, oblong, wider behind, where there is a blunt siphonal ridge; rounded anteriorly, with a byssal sinus on the anterior ventral edge. Beaks small, anterior, and slightly prominent, with an obscure lunette; posterior hinge line with a narrow interior ridge; ligament external. Epidermis strongly wrinkled.

Animal unknown; probably had a closed mantle and respiratory siphons.

Distribution, 9 species. Coal Measures, associated with marine animals. Great Britain, Nova Scotia.

FAMILY XIX.—ANATINIDÆ.*

RIBEIRIA (see p. 497).

Mr. Billings describes in this genus, "beneath and in front of the umbo, a small aperture of a semicircular shape, which appears to be the entrance to a tubular passage running backwards over the transverse plate into the general cavity of the body." He regards it as a byssal orifice.

Mr. J. W. Salter referred this genus to the class Crustacea.

Fossil, 4 species. L. Silurian, Portugal; Canada, England.

FAMILY XXI.—PHOLADIDÆ.†

XYLOPHAGA (see p. 506). Sub-genus, *Xylophagella*, Meek, 1864.

Type, X. elegantula. Cretaceous. Dax.

* See p. 494. † See p. 503.

Shell having the form and ornamentation of *Xylophaga*, but possesses an oblique internal postero-dorsal ridge; burrows, apparently, without a shelly lining.

MARTESIA (see p. 505). Sub-genus, *Diplothyra*, Tyron, 1862. *D. Smithii*, Staten Island, burrowing in oyster-shells.

Shell with a double accessory valve; the principal plate directly over the umbones, with a smaller anterior one adjoining.

TEREDO (see p. 506). Sub-genus, *Calobates*, Gould. (*T. furcelloides*, Gray). Siphonal palettes large, long, stilt-shaped; siphons adherent, only becoming free at the tips.

Distribution, 2 species. Burmack, Australia.

Nausitora, Wright, 1864. *N. Dunlopi* (freshwater, India). Siphonal palettes, outer surface convex, covered with thick scale-like striæ, inner flat or slightly concave.

Distribution, 2 species, burrowing in wood. Bengal, Australia.

INDEX TO APPENDIX.

The synonyms are printed in *italics*, and the pages where the genera are described are indicated by an asterisk (*).

THE END.

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