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XXIX.—*Sketch of a Classification of Recent Brachiopoda ; based upon Internal Organization.* By THOMAS DAVIDSON, Member of the Geol. Soc. of France, &c.

THE numerous dredgings undertaken under different latitudes and in deep as well as shallow seas, have shown that recent Brachiopoda are more numerically abundant and varied in generic and specific forms than we formerly supposed. The best account of the species of this order is contained in the monograph by Mr. G. B. Sowerby, published in his 'Thesaurus Conchyliorum,' 1846. In that work fifty-seven recent species are described and arranged under five genera, viz. *Lingula*, *Terebratula*, *Orbicula*, *Crania* and *Thecidea*.

Of late years many other genera have been proposed, and in a minute investigation of the interiors of all the species of *Terebratula*, I found so much variation in the dispositions of the calcareous appendages, as to necessitate a complete subdivision and re-arrangement of the shells usually associated under that name. All the known and described species, with two or three exceptions only, are to be found in the magnificent collection of Mr. Cuming, who in the most obliging manner placed his specimens at my disposal for examination. I am also greatly indebted to Mr. Gray of the British Museum, and Prof. Forbes, for the means of examining the animal of many genera and species ; these investigations, undertaken along with Mr. Woodward of the British Museum, have proved of great assistance in enabling us to ascertain what relation the calcareous supports or appendages bear to the soft parts of the animal, and more especially to the arms, in the different genera.

It is not the object however of this paper to give descriptions and synonyms of the different species, which will be included in the catalogue of Brachiopoda Mr. Gray is about to publish for
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the British Museum. My only object is to point out how all the sixty-six or sixty-seven known species may be classed according to their structure and affinities. In drawing up any scheme for the arrangement of the Brachiopoda, due regard must be paid to the extinct species, which vastly outnumber those of the present seas. The family *Rhynchonellidæ* for example afford only two living species, whereas several hundred are known in a fossil state: and in the same manner the proposed subdivisions of *Terebratulidæ* become more important in reference to the number of species which no more exist. When we open and examine the numerous species possessed of calcareous appendages, we observe that these vary in shape and arrangement, and that under each form or type a number of species can be clustered all very similar in their structure; these form *genera* or *subgenera*, more or less intimately or distantly connected, as will be shown hereafter, and thus enable any one to know by the generic appellation, what is the form and disposition of the skeleton or loop in all the different species. The subdivisions of the great genus *Terebratula*, are based chiefly on the extent and form of the apophysary system or loop, and my object has been to ascertain how far the form of the loop can be associated with the modifications in the soft parts of the animal and in the more obvious external characters presented by the shell. The woodcuts which accompany this paper will serve to render the generic descriptions more complete and readily understood.

It can scarcely be expected that this first attempt to classify the recent species of living *Terebratulidæ* should be entirely successful, but such a classification has become not only desirable but necessary, and no good would be accomplished by delaying its publication. With these few preliminary observations I will propose the following arrangement.

Class BRACHIOPODA, *Dumeril*.

Order LAMELLIBRANCHIATA, *Blainv*.

Animal attached to submarine bodies by a muscular peduncle or by the substance of its ventral valve: furnished with a pair of ciliated arms, sometimes supported by a calcareous appendage: respiration performed by the vascular mantle, &c.

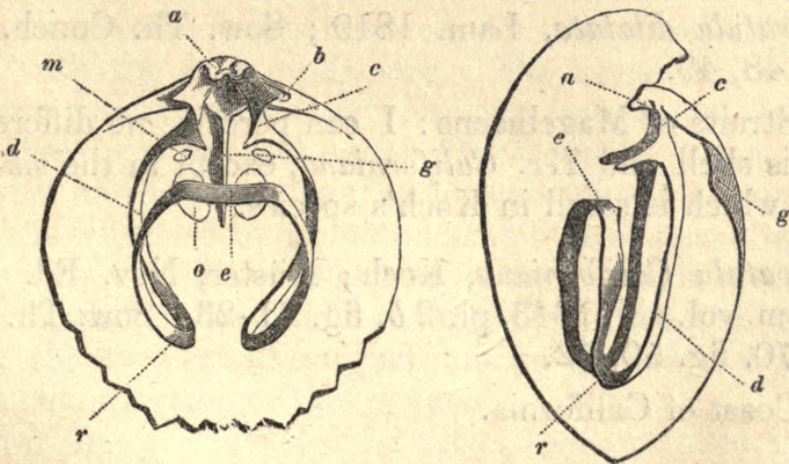
Typical Family. I. TEREBRATULIDÆ.

Shell minutely punctate, inequivalve, usually subcircular and smooth or striated: the ventral or dental valve generally the largest, its beak notched or perforated for the passage of the peduncle: dorsal, socket, or receiving valve, furnished internally with a cal-

careous process or loop for the support of the arms. These vary in their dispositions and details in the different genera, but could not be protruded from the shell as they are united together by a membrane, which effectually maintains them in one invariable position; they have no connection with the opening and closing of the shell, as supposed by some authors, which is accomplished by special muscles passing from the centre of the perforated valve to the fulcrum of the smaller valve; thus in those genera possessed of a calcareous loop the disposition of the ciliated arms is not regulated or restrained by the form of the loop, a point I was not convinced of before having entered into the zoological details of these animals.

I. GENUS *TEREBRATULA*, Lhwyd, 1698 (restricted).

Shell usually oval, and convex, with the margins even or only slightly waved; valves articulating by means of two teeth in the larger and corresponding sockets in the smaller valve: beak of dental valve truncated and perforated by a circular foramen partly completed by a deltidium formed of one or two pieces. Loop or calcareous appendage variable in length, formed of two riband-shaped lamellæ fixed to the crural base, and more or less folded back on itself. The arms are partly supported by this appendage, but they do not strictly follow the same course; thus the form of the arms is the same in *Terebratula vitrea*, with a small loop, and in *Terebratula australis* which has a long one; the arms in both cases are united throughout by a membrane forming three lobes, of which the central one is spirally folded like the proboscis of a butterfly, but from its texture and relations it never could be moved or unrolled at the will of the animal; the sole use of the folding of the arms is to give increased surface for the disposition of the cilia.

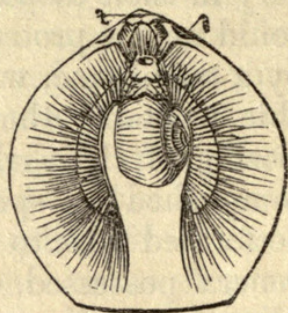


The letters in the diagrams of *Terebratula* and *Terebratella* are intended to facilitate a comparison of the same parts.

Section A. *Terebratulæ with a short loop.*

1. *Terebratula vitrea*, Linn. sp., 1773; Sow. Th. Conch. pl. 70. fig. 56. 59*.

Hab. Mediterranean, dredged by Prof. Forbes in 92 to 250 fathoms in nullipore mud. Many specimens of cretaceous *Ter. carnea* are undistinguishable from this living species.



2. *Terebratula uva*, Brod. 1833; Zool. Proc.; Sow. Th. Conch. pl. 70. fig. 53-55.

Hab. From the Gulf of Tehuantepec. I have never seen but one specimen of this species; its loop is broken, but I think it was similar to that of *T. vitrea*.

Section B. *Terebratulæ with a long loop.*

3. *Terebratula Cranium*, Muller sp., 1776; Zool. Dan. Prod.; Sow. Th. Conch. pl. 70. fig. 60-62.

Hab. Coast of Norway and North Sea; dredged by Dr. Fleming in deep water eastward of Bressay in Zetland.

4. *Terebratula globosa*, Lam. 1819; Sow. Th. Conch. pl. 71. fig. 99-101.

Hab. Unknown. Some uncertainty exists if the species of Lamarck (Ency. Méth. pl. 239. fig. 2) is the one figured by Sowerby from Mr. Cuming's collection.

5. *Terebratula picta*, Chemn. sp., 1785; Sow. Th. Conch. pl. 70. fig. 43, 44.

Hab. Java.

6. *Terebratula dilatata*, Lam. 1819; Sow. Th. Conch. pl. 70. fig. 48, 49.

Hab. Straits of Magelhaens: I can perceive no difference between this shell and *Ter. Californiana*, except in the size of the foramen, which is small in Koch's species.

7. *Terebratula Californiana*, Koch; Küster, Nov. Ed. Martini Chem. vol. viii. 1843, pl. 2 b. fig. 21-23; Sow. Th. Conch. pl. 70. fig. 50, 52.

Hab. Coast of California.

* For convenience, and to avoid referring to numerous works, we will in this short paper mention only the figures in Sowerby's 'Thesaurus Conch.' 1849.

8. *Terebratula lenticularis*, Deshayes, 1830 ; Sow. Th. Conch. pl. 72. fig. 108-110.

Hab. Cook's Straits, New Zealand, depth 15 fathoms : this species is found fossil in the island.

9. *Terebratula Grayii*, Dav. Zool. Proc. 1852.

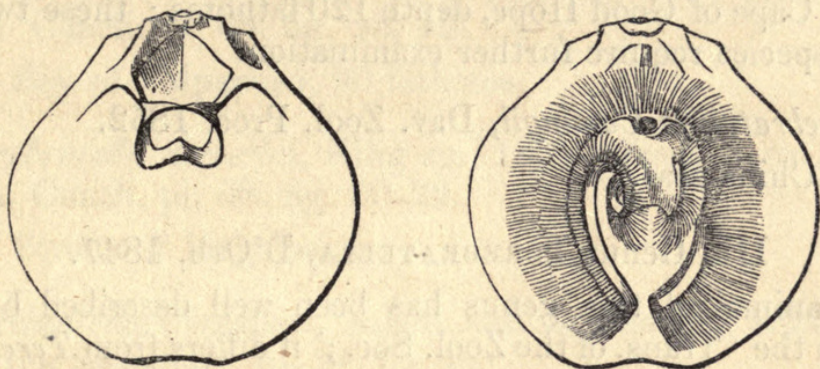
Hab. Straits of Korea.

10. *Terebratula australis*, Quoy, 1834 ; Sow. Th. Conch. pl. 69. fig. 25, 34.

Hab. In shallow seas, depth 4 feet ; according to Quoy. *Ter. flavescens* and *dentata*, Lam. 1819, and *T. recurva*, Quoy, are only varieties and malformations.

II. Genus TEREBRATULINA, D'Orb. 1849.

Closely allied to *Terebratula*, but differing in the union of the crural processes, which form a shelly band behind the mouth of the animal, whereas the reflected border of the loop is always in front (below in the figure) of the mouth : in young specimens of the recent *T. Caput-serpentis*, the crural processes are not joined,



showing an intimate relation to *Terebratula vitrea*. The disposition of the ciliated arms is the same as in *T. vitrea* and *australis* : the figure has been taken with the cilia a little out of their proper place to show some points more clearly, and especially for comparison with the type of *Argiope*. The arms are united by a membrane which forms a flat disc in *Argiope*, but here forms three lobes as described under *Terebratula*. Apart from the peculiarity of the loop, the *Terebratulinae* form a small group, so well characterized by form and sculpture as never to be confounded with any other. The beak is truncated, and the foramen partly encircled by a deltidium united or disunited in different species ; the two ear-like expansions on the sides of the umbo are also characteristic of this genus.

A great many recent species have been proposed by various authors, but after a minute comparison of these, they must I fear be reduced to five or six.

11. *Terebratulina Caput-serpentis*, Linn. sp., 1773 ; Sow. Th. Conch. pl. 68. fig. 1-4, &c.

Hab. Many parts of the Scottish coast, &c., in from 10 to 50 fathoms : this species is likewise found fossil in all the strata from the chalk upwards.

12. *Terebratulina septentrionalis*, Couthouy sp. ; Sow. Th. Conch. pl. 68. fig. 5, 6, 1846.

Hab. Coast of Maine, Massachusetts.

13. *Terebratulina Japonica*, Sow. sp., 1846 ; Th. Conch. pl. 68. fig. 7, 8.

Hab. Seas of Japan.

14. *Terebratulina cancellata*, Koch sp. ; Küster, Neur. ed. Martini Chemnitz, vii. 1. t. 2 b. fig. 11-13.

Hab. Unknown.

15. *Terebratulina abyssicola*, Adam and Reeves, sp. 1850, Voy. of Samarang.

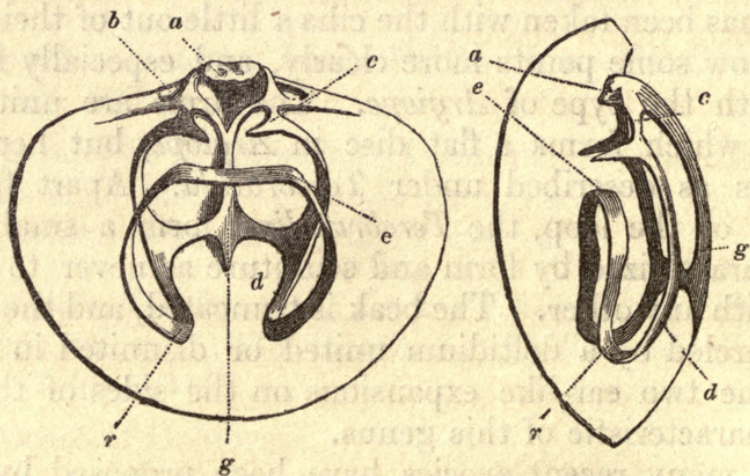
Hab. Cape of Good Hope, depth 120 fathoms ; these two last-named species require further examination.

16. *Terebratulina Cumingii*, Dav. Zool. Proc. 1852.

Hab. China seas.

III. Genus TEREBRATELLA, D'Orb. 1847.

The animal of this genus has been well described by Prof. Owen in the 'Trans. of the Zool. Soc. ;' it differs from *Terebratula* by its loop being doubly attached ; the lamellæ proceeding from the crural base, before attaining their greatest length, give off a



flat, wide, more or less horizontal process, likewise affixed to a more or less elevated longitudinal septum, the lamella proceed-

ing again and doubling itself in the shape of a loop as in *Terebratula*. The variations in the details and in the position of the lamella and septum in some species of *Terebratella*, such as *T. crenulata*, *Evansii* and *Cumingii*, connect this genus with *Magas*, so that the last genus will *not* form a separate family as generally supposed.

Fourteen or fifteen species of recent *Terebratella* have been described and figured, all in general characterized by a longitudinal depression in the smaller valve; but some of the species enumerated differ so little from one another as to make me doubt the propriety of retaining them all under distinct appellations.

17. *Terebratella dorsata*, Lam. sp., 1819; Sow. Th. Conch. pl. 68. fig. 15, 16, 17.

Hab. Straits of Magelhaens.

18. *Terebratella flexuosa*, King sp., Zool. Journ. vol. v.; Sow. Th. Conch. pl. 69. fig. 23, 24.

Hab. Straits of Magelhaens, in the vicinity of Port Famine.

19. *Terebratella Chilensis*, Brod. sp., 1833; Zool. Proc.; Sow. Th. Conch. pl. 68. fig. 18, 19.

Hab. Bay of Valparaiso, 90 fathoms.

20. *Terebratella Sowerbii*, King sp., 1835; Zool. Journ.; Sow. Th. Conch. pl. 68. fig. 20-22.

Hab. Straits of Magelhaens.

21. *Terebratella Coreanica*, Adam and Reeves sp., 1850, Voy. of the Samarang, pl. 21. fig. 3.

Hab. Corean Archipelago. This species is beautifully strigated with bright red, which distinguishes it from *T. Bouchardii*, which is of a uniform yellow colour.

22. *Terebratella Bouchardii*, Dav. 1852; Zool. Proc.

Hab. Unknown.

23. *Terebratella rubicunda*, Sow. sp., 1846; Zool. Journ.; Sow. Th. Conch. pl. 70. fig. 45, 46, 47.

Hab. Abundant in the seas near New Zealand; its colour is vivid red or white. *T. inconspicua*, Sow., seems to be only a young and ill-grown specimen of this species.

24. *Terebratella Zelandica*, Desh. sp., 1830; Sow. Th. Conch. pl. 72. fig. 111-113.

Hab. Cook's Straits, New Zealand, depth 15 fathoms. This

is the *Ter. sanguinea*, Leach (not Chemnitz), *Ter. rubra*, Sow., by mistake Th. Conch. pl. 68. fig. 9-11, not *T. rubra*, Pallas.

25. *Terebratella crenulata*, Sow. sp., 1846, Th. Conch. pl. 71. fig. 96-98.

Hab. Santa Cruz and Korea. In this species the loop is doubly attached as in all *Terebratellæ*, but the central septum forms an elevated plait almost reaching the larger valve; the form of the loop is similar to that of *T. Evansii*, but slightly different in its details.

26. *Terebratella Evansii*, Dav.; Zool. Proc., 1852.

Hab. New Zealand.

27. *Terebratella Labradorensis*, Sow. sp., Th. Conch. pl. 71. fig. 89, 90.

Hab. Labrador (Goodsir).

28. *Terebratella Algoensis*, Sow. sp., Th. Conch. pl. 71. fig. 91, 92.

Hab. Algoa Bay. Only the larger or perforated valve is known, but by analogy I suppose it to be a *Terebratella*.

29. *Terebratella transversa*, Sow. sp., 1846, Th. Conch. pl. 72. fig. 114, 115.

Hab. Unknown.

30. *Terebratella rubella*, Sow. sp., 1846, Th. Conch. pl. 69. fig. 40, 42.

Hab. Java. Mr. Sowerby states the loop to be simply attached as in *australis*; this however appears to me to be a mistake, as Mr. Cuming has specimens showing traces of the double attachment.

31. *Terebratella? sanguinea*, Chemnitz sp., 1785; Sow. Th. Conch. pl. 71. fig. 71, 73.

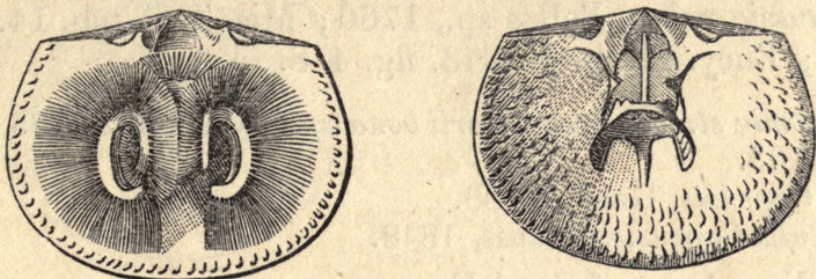
Hab. Island of Zebu. This species appears to have the loop attached somewhat as in *Megerlia*.

32. *Terebratella Cumingii*, Dav.; Zool. Proc. 1852.

Hab. New Zealand. I am quite at a loss what to do with this form, which possesses many of the characters of *Magas*, *Bouchardia* and *Terebratella*; for the present I therefore leave it under the latter genus, from whence it may be removed if future discoveries render this necessary.

IV. GENUS *MEGERLIA*, King, 1850.

In this section a slightly elevated medio-longitudinal crest proceeds from under the muscular fulcrum to less than half the length of the valve, near the extremity of which two short central diverging branches arise and support the calcareous loop, which consists of two ribband-shaped lamellæ, first attached to the inner side of the socket walls or crural base, afterwards extending to the extremity of the diverging branches to which they are affixed before proceeding on both sides in the same direction to their extremity, under the shape of two nearly parallel longitudinal lamellæ, which are afterwards folded back as in *Terebratula*, forming a loop, but giving off two processes, which affix themselves also to the extremity of the diverging branches above described ; perhaps in time it will be found necessary to consider



this genus as a section of *Terebratella* : two recent species of this genus are known, and it occurs in the fossil state.

33. *Megerlia truncata*, Linn. Gmel. sp., 1788 ; Chem. 1785 ; Sow. Th. Conch. tab. 71. f. 64-67.

Hab. Coast of Sicily, &c., depth from 60 to 105 fathoms ; found fossil at Gibraltar.

34. *Megerlia pulchella*, Sow. sp., 1846, Th. Conch. pl. 71. fig. 105-107.

Hab. Attached to corals at Calapan, Island of Mindoro, &c.

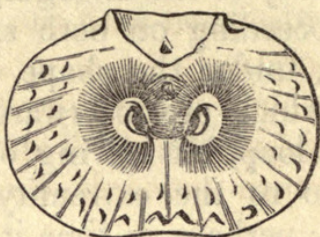
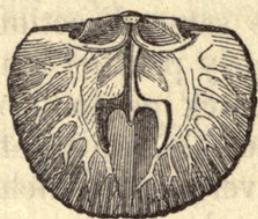
V. GENUS *KRAUSSIA*, Dav. 1852.

Shell subcircular, with a nearly straight hinge-line ; beak truncated ; foramen large, round ; deltidial plates small, not united ; beak ridges well defined, leaving a flat false area between them and the hinge margin ; in most species a longitudinal depression exists in the smaller valve ; the inferior pedicle muscles are large, leaving two wide eye-shaped impressions close to the hinge, and between the inner walls of the socket ridges, a small slightly elevated mesial ridge extends to about half the length of the valve, at the extremity of which arise two small forked diverging lamellæ expanded at their extremity.

The ciliated arms are unusually small, their fringes not extend-

ing to more than half-way towards the border of the shell; in the first part of their course from the mouth forwards, the cilia are few or wanting; the whole brachial apparatus is supported by the small forked process above described, no other part of the apophysary system being calcified.

Obs. The animal of this genus has been examined in two species, and differs from *Megerlia* in the relative small size of the ciliated arms: five recent species are known.



35. *Kraussia rubra*, Pallas sp., 1766; Mis. Zool. tab. 14. fig. 2, 11; Ency. Méth. pl. 243. fig. 4-8.

SYN. *Anomia striata promontorii bonæ spei*; Chemnitz, 1785, tab. 77. fig. 103.

Anomia Capensis, Gmel., 1788.

Terebratula Capensis, Krauss, 1848.

Hab. Near Cape of Good Hope.

Obs. Most authors have misunderstood this form; Sowerby, in his 'Th. Conch.' tab. 68. figures as *T. rubra* (Pallas), a specimen of *T. Zelandica*, which is now in the Collection of the British Museum, and figured by Leach under the false name of *sanguinea*, which is not Chemnitz's species. *T. Capensis*, Adam and Reeves, is not the *T. Capensis* of Chemnitz, and therefore not the *T. rubra* of Pallas.

36. *Kraussia cognata*, Chemnitz sp., 1785; Sow. Th. Conch. pl. 68. fig. 12-14.

Hab. South Africa.

37. *Kraussia pisum*, Lamarck sp., 1819; Sow. Th. Conch. pl. 69. fig. 37-39.

Ter. natalensis, Küster, 1843; Krauss, 1848.

Hab. Cape of Good Hope.

38. *Kraussia Lamarckiana*, Dav. 1852; Zool. Proc.

Hab. Sidney and New Zealand.

39. *Kraussia Deshayesii*, Dav. 1852; Zool. Proc.

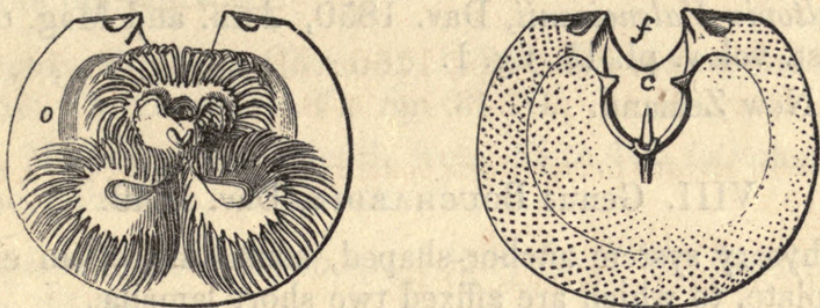
Ter. Capensis, Adam and Reeves (non *T. Capensis*, Gmelin), &c.

Hab. Korea.

VI. Genus MORRISIA, Dav. 1852.

Shell minute, circular, depressed; foramen large, round, encroaching equally on both valves; larger valve with a small straight hinge area; deltidium plates minute, widely separated; smaller valve deeply notched at the umbo; apophysary system consisting of two branches, originating at the base of the dental sockets, and united to a small elevated process arising from the centre of the valve.

Animal furnished with two subspiral or *sigmoid* arms, fringed with comparatively large cilia: these arms originate above the mouth (as shown in the figure) supported by the crural processes, and after passing forwards and converging in front of the mouth they again turn outwards, each having the shape of the letter S.



The shell is of a dark green colour, with bright orange ovaries, contrasting with the brilliant white of the ciliated arms. The cilia (more properly *cirri*) are grouped in pairs, as we believe to be the case in the *Terebratulæ* generally.

40. *Morrisia seminulum*, Philippi sp., Enum. Moll. Siciliæ, 1836, pl. 6. fig. 15.

Ter. depressa, Forbes, Rep. of the Mol. of the Ægean Sea, 1843.

Hab. Mediterranean, depth 95 fathoms (Forbes).

Obs. Philippi's species has been mistaken by Sowerby, who gave the name *seminulum* to another form which we have called *Argiope Forbesii*. The original figures of *seminulum* are circular, and clearly exhibit the deep notch in the umbo of the smaller valve characteristic of the genus, and not to be found in any species of *Argiope*: according to Küster the shell under notice has received the name of *Ter. Neapolitana* from Scacchi, Oss. Zool. ii. p. 18; but not having been able to find the paper alluded to, I have retained Philippi's name.

VII. Genus MAGAS, Sow. 1818.

The genus *Magas* is characterized by the peculiar shape of its apophysary system, composed of an elevated longitudinal septum in the imperforated valve, to which are affixed two pairs of

calcareous lamellæ differently disposed : the lower pair are ribband-shaped, attached first to the crural base. They direct themselves by a gentle curve to near the anterior portion of the septum, to the sides of which they are affixed : the second pair arise on either side of the upper edge of the septum, extending in the form of two triangular-shaped lamellæ.

No true recent *Magas* has been discovered ; but some forms, placed for the present in *Terebratella*, such as *T. Cumingii*, possess characters of this genus.

Subgenus WALTONIA.

Apophysary system consisting of a pair of ribband-shaped lamellæ fixed to the crural base and to an elevated plate.

41. *Waltonia Valenciennii*, Dav. 1850, Ann. and Mag. of Nat. Hist. vol. v. pl. 15. fig. 1.

Hab. New Zealand.

VIII. Genus BOUCHARDIA, Dav. 1849.

Apophysary system anchor-shaped, consisting of an elevated central plate, to which are affixed two short lamellæ.

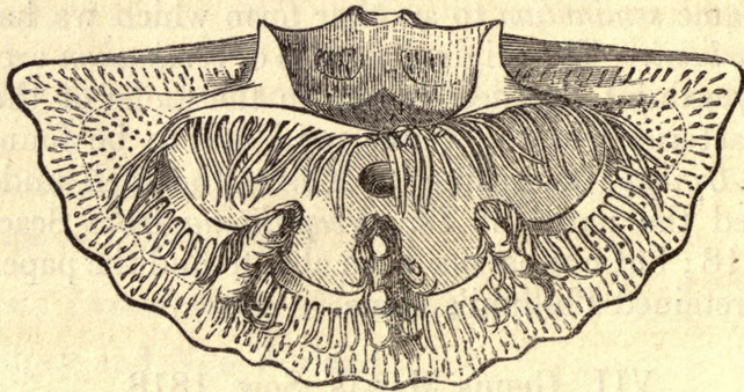
42. *Bouchardia rosea*, Humphrey sp. ; Dav. Bull. Soc. Géol. de France, vol. vii. 2nd ser. pl. 1. fig. 1-6, 1849.

Hab. Rio in 13 fathoms.

Obs. *Magas*, *Waltonia*, and *Bouchardia* are related to *Terebratella* by such species as *Terebratella crenulata*, *Evansii* and *Cumingii*.

IX. Genus ARGIOPE, Deslongchamps, 1842.

Megathyris, D'Orb. 1847.



In the imperforated valve one or more prominent septa ; apophysary system consists of a distinct loop, originating at the base of the dental sockets and furnished with converging crural

processes: the loop is folded into two or more lobes occupying the interspaces of the radiating septa, to which they adhere on their inner side. The mantle adheres closely to the shell, as in *Terebratula* proper, and is not seen, except as a part of the shell: its margin is simple and not ciliated; the arms originate as in *Terebratula* on the anterior side of the mouth, and diverge right and left parallel with the margin of the shell, but at some little distance from it: when they arrive at the raised septa they turn inwards, forming one or more lobes on each side of the middle line: the outline of the arms is therefore four-lobed in *A. decollata*; whilst in other recent species, such as *A. cistellula*, which has only one, there is only one lobe to each arm. The arms are relatively connected, as in *Terebratula*, by a membrane filling up the whole interior space.

43. *Argiope decollata*, Chem. sp. 1785; *detruncata*, Gmel. 1788. Sow. Th. Conch. pl. 71. fig. 68, 70.

Hab. Mediterranean: depth from 45 to 105 fathoms; fossil. Miocene, Gibraltar. (James Smith.)

44. *Argiope cuneata*, Risso sp., 1826; Sow. Th. Conch. pl. 70. fig. 83, 84.

Ter. Pera, Mühlfeld.

Hab. Mediterranean: depth from 28 to 69 fathoms (Forbes).

Obs. This species has only a single median septum. The lobes of the loop are free for one half their extent in the specimen examined, and then blend with the shell, as we have noticed in some specimens of *A. decollata*.

45. *Argiope Forbesii*, Dav. 1852.

T. seminulum and *lunifera* of Sow. Th. Conch. pl. 71. fig. 85-88 (non *T. seminulum*, Philippi).

Hab. Mediterranean: depth from 60 to 105 fathoms (Forbes).

Obs. In this form the same longitudinal septum exists, but the loop was imperfect in the specimens at my disposal.

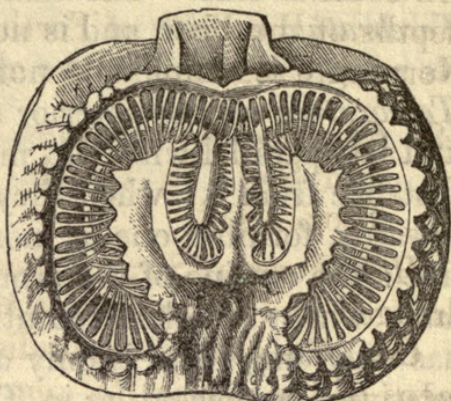
46. *Argiope cistellula*, S. Wood, sp. 1840; Mag. and Ann. of Nat. Hist. vol. v., and Forbes and Hanley, Hist. of Brit. Moll. pl. 57. fig. 9, 1849; Dav. Mon. of Tertiary Brach. Pal. Soc. part 1. p. 10. f. 2.

Hab. Off Skye, Zetland, &c., Scotland; in 40 fathoms (M'Andrew).

Obs. In this species the same mesial septum coexists with a complete two-lobed loop; in my specimen of this species the animal is preserved, and differs only from *A. decollata* in having two lobes instead of four.

X. Genus *THECIDEA*, Def. 1828.

Thecidea has a calcareous loop folded into two or more lobes, and lying in hollows of corresponding form excavated in the substance of the small valve. This loop, or apophysary ridge, supports the branchial membrane, whose thickened and ciliated margin is apparently attached to the inner sides of the grooves. The cilia are very long, especially the outer series, which are directed inwards in the dried specimens.



47. *Thecidea mediterranea*, Risso, 1826; Hist. Nat. des Princ. Prod. de l'Europe Mer. fig. 183; Sow. Th. Conch. pl. 73. fig. 30-32.

Hab. Mediterranean.

2. Family *SPIRIFERIDÆ* (extinct).

Shell furnished with spiral calcareous processes for the support of the oral arms. Usually trilobed and winged.

3. Family *RHYNCHONELLIDÆ*.

Shell not punctate, usually tetrahedral and sharply plaited; oral arms spiral, supported only by short curved processes.

XI. Genus *RHYNCHONELLA*, Fischer, 1809.

Shell variable in shape; beak acute, more or less recurved, no true area; foramen variable in its dimensions and form, placed under the beak, exposed or concealed, entirely or partially surrounded by a deltidium in two pieces; apophysary system in smaller valve composed of two short flattened and grooved lamellæ separate and moderately curved upward, attached to the inner side of the beak of smaller valve, and to which were affixed the free fleshy arms.

Obs. Not having had the advantage of examining the animal of this genus, I can only refer to Prof. Owen's anatomy of *R. psittacea* in the Zool. Trans. vol. i. 2nd part: two species of recent *Rhynchonellæ* are known.

48. *Rhynchonella psittacea*, Chem. sp., 1785; Sow. Th. Conch. pl. 71. fig. 78, 79, 80.

Hab. Labrador, in the mud on the shore at low water: dredged alive at Melville Island, throughout the arctic seas, from low

water to 100 fathoms : obtained by Prof. King from the depth of 30 fathoms at a distance of twenty-five miles from the northern coast of Northumberland, and by Laskey by dredging in the depths of the Frith of Forth. This species is found fossil in the Norwich Crag, and in the glacial formation of the Clyde.

49. *Rhynchonella nigricans*, Sow. sp., 1846 ; Proc. of Zool. Soc. and Sow. Th. Conch. pl. 71. fig. 81, 82 ; also Dav. Zool. Proc. 1852.

Hab. Foveaux Straits, about five miles N.E. of Ruapuke Island, dredged in 19 fathoms by Mr. F. J. Evans, R.N., New Zealand.

Obs. This species is undistinguishable from half-grown specimens of the oolitic *Rh. concinna*, Sow., but probably never became so globular as that species is found, when adult.

4. Family ORTHIDÆ (extinct).

Arms spiral ; ? destitute of calcareous supports, attached or not by a pedicle.

5. Family CALCEOLIDÆ (extinct).

6. Family CRANIADÆ AND ORBICULIDÆ.

Shell horny or calcareous, minutely tubular, attached by the ventral valve, or by a pedicle passing through a fissure in it ; no hinge or apophysary system ; animal with its oral arms fixed to a process of the lower (ventral) valve. The lower valve in both *Crania* and *Orbicula* correspond to the perforated valve of *Terebratula*, so that while those two genera form an exception to the invariable rule that the shell of the Brachiopod is fixed by means of the *ventral* valve, they differ very remarkably from other genera in having the oral arms fixed to the ventral or attached valve.

XII. Genus CRANIA, Retzius, 1781.

Shell calcareous, tubular ; ventral or fixed valve with a central process, to which the spiral arms are attached ; dorsal or upper valve free, limpet-like, with two diverging muscular processes. No hinge or calcareous appendage, no perforation for the passage of a pedicle of attachment ; arms fleshy.

50. *Crania ringens*, Høeningh., 1828 ; Sow. Th. Conch. pl. 73. fig. 10, 11.

Hab. Mediterranean in from 40 to 90 fathoms ; also near Sydney, New South Wales.

51. *Crania personata*, Lam. 1819 ; Sow. Th. Conch. pl. 73. fig. 9.

Hab. India.

52. *Crania anomala*, Müll. sp., Zool. Dan. 1776. *C. norvegica*, Sow. Th. Conch. pl. 73. fig. 15-17.

Hab. Scotland, adhering to stones, &c. in deep water in Zetland, in 20 fathoms off Arran, in from 30 to 80 fathoms in Loch Fyne, &c.; also in North Sea.

53. *Crania rostrata*, Høeningh., 1328; Sow. Th. Conch. pl. 73. fig. 12-14.

Hab. Mediterranean.

XIII. Genus ORBICULA, Cuvier, 1789.

Shell horny; upper valve limpet-like, without any internal processes; ventral or lower valve perforated for the passage of the pedicle, and furnished with a central process for the attachment of the ciliated arms.

54. *Orbicula lamellosa*, Brod. Zool. Proc. 1833, p. 124; Sow. Th. Conch. pl. 73. fig. 1.

Hab. Coast of Peru.

55. *Orbicula laevis*, Sow. 1818; Trans. Zool. Soc. vol. viii., and Sow. Th. Conch. pl. 73. fig. 2, 3.

Hab. Off Conception, Chili; attached to *Mytili*; depth 6 fathoms.

56. *Orbicula Cumingii*, Brod. Zool. Proc. 1833; Sow. Th. Conch. pl. 73. fig. 6.

Hab. Payta, St. Elena and Panama.

57. *Orbicula strigata*, Brod. Zool. Trans. vol. i. pl. 23. fig. 1, 1833; Sow. Th. Conch. pl. 73. fig. 7.

Hab. Island of Canna, Guatemala, Malacca, &c.

58. *Orbicula striata*, Sow. 1818, Trans. Zool. Soc.; Sow. Th. Conch. pl. 73. fig. 8.

Hab. Unknown.

59. *Orbicula tenuis*, Sow. 1846; Sow. Th. Conch. pl. 73. fig. 4, 5.

Hab. Unknown.

60. *Orbicula Evansii*, Dav. 1852; Zool. Proc. 1852.

Hab. Bodegas.

7. Family LINGULIDÆ.

Almost equivalved, rudimentary branchiæ developed from the mantle.





Davidson, Thomas. 1852. "Sketch of a classification of recent Brachiopoda, based upon Internal Organization." *The Annals and magazine of natural history; zoology, botany, and geology* 9, 361–377.

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