BRYOZOA (POLYZOA), FROM THE PLIOCENE OF BRUCCOLI (SICILY).*

By Arthur Wm. Waters, F.G.S.

In Sicily there are deposits consisting of broken shells and a large number of Bryozoa, having the general appearance of the English Crag. In the parts of Sicily which I visited this "Crag" is much harder than the underlying beds of the Messinian formation, so that as soon as denudation has cut through this harder rock it rapidly cuts deep valleys in the soft marl. The consequence is that these nearly horizontal beds are seen as flat tops to the hills which rise to many hundred feet, in some places much over a thousand feet, above the sea level. And as nearly all the villages are built on these "Crag" flats it will readily be imagined that this is a very characteristic feature, as the landscape shows isolated villages perched as mountain strongholds all over the country, and the pedestrian has to pay for this by great delay, for in passing from one village to another, although the distance may be only a quarter of a mile, it often happens that the ascent and descent will occupy some hours.

I, however, believe, from the section furnished to me by Dr. Fuchs, that those now to be described are older. They were collected by Dr. Theodore Fuchs, of Vienna, who lent them to me, and I have for a long time been anxious to complete a description of them, but circumstances have hindered, but now take the earliest opportunity in order that I may return them to the owner, and show him that I do not intend to break the eighth commandment, and I gladly

* Bruccoli, or Brucoli, is near Lentini, which is between Catania and Syracuse.

avail myself of the occasion not only to thank him for lending them, but also for not complaining of the unavoidable delay.

The following section, by Dr. Fuchs, will explain the position of the beds in descending order :—

(*a.*) Upper pliocene sand, gravels, and limestone, with Cerithium vulgatum, C. scabrum, Murex trunculus, Rissoa, Turbo, Trochus, Monodonta, Ostrea, &c.

(*b.*) Yellow sands without fossils.

(*c.*) Blue marl with Buccinum semistriatum, Natica helicina, Dentalium elephantinum, Chenopus pes pelicani, Nucula, &c.

(*d.*) Bryozoa beds with corals, Brachiopoda, Pecten opercularis, &c.

From the works of Sequenza it seems that the Bryozoa described by Manzoni, from Sicily and Calabria, are also lower pliocene.

I must repeat the excuse of early efforts for the drawings, which I regret are not better finished.

Cheilostomata.

1. Salicornaria farciminoides, Ell and Sol.

As this species is most widely distributed, both in the living and fossil state, it has been examined by many observers, and consequently possesses a long list of synonyms. These have been tabulated by Reuss, in his Foss. Bryoz. des Oest-Ung. Miocäns, and it is not necessary to repeat it. This species is, however, considered to be the same as S. sinuosa (Hassall), and among the fossil forms the same as Vincularia and Cellaria marginata (of Goldfuss and Reuss). It occurs now in the seas of Norway, Spitzbergen, &c., to the Mediterranean, where it is very common. It is also found in the North American seas, Madeira, and South Africa (in Algoa Bay).

Fossil it has been found in the Bartonian (Upper Eocene) of the Vicentine (North Italy), in the Oligocän of North

Germany, in the Miocene of Austria and Hungary, in the Pliocene Coralline Crag of England; and in the Pliocene of Italy it seems to be so generally distributed that there is no object in repeating a list of some twenty or thirty localities; but although I found this common in beds of this age in Sicily and Calabria, there was only one small fragment in the collection submitted by Dr. Fuchs. This species is found at Naples from 10-20 fathoms and deeper, but is there smaller than the Sicilian fossils.

2. Membranipora bidens, Hag. Die Bryozoen der Maastrichter Kreidebildung, 1851. Syn; Cellepora hippocrepis, Rss. Foss. Polyp. des Wiener Tertiärbeckens. Haidinger's Abh. II. s. 1, 1847.

The specimen from Bruccoli, with high powers shows fine sulcation, or granulation of the walls. The "teeth" are in most cells scarcely distinguishable, but in others are more clearly seen.

I am inclined to think that Membranipora Rosselii, Aud. as figured by Manzoni in his 4ª Contribuzione, is really bidens, or perhaps a variety, as from the large size of the aperture it entirely differs from the Rosselii which I collected at Naples. We may, however, thus see a connection between these two, which are perhaps related to the group of which calpensis may be taken as the type.

This has been found fossil in the upper chalk at Maestricht and Rügen, in the Helvetian (upper Miocene) of Austria and Hungary, in the English Crag, in the Pliocene of Castrocaro (Italy), and is now living in the Arctic Seas of Europe.

2A. Membranipora Lacroixii, Savigny.

The Membranipora, from Bruccoli, which I believe to be M. Lacroixii, has the zooecia much more separated than in those figured by Busk, so that there is a distinct space between the cells, which are regularly oval. The walls

bordering the cells are distinctly ornamented with radial lines.

Loc. Fossil in the Miocene of Austria and Hungary; Pliocene-Voltura; and a closely allied form of Membranipora Savartii, occurs in the English Crag. This is now found common in the European seas, Florida, and according to Busk, doubtfully in Australia.

A variety, diadema, Rss., has been described from Immendorf.

Fig. 3.

3. Membranipora andegavensis, Mich.
var, papyracea.

As the shape of the zooecia correspond more with papyracea of Rss than with his gracilis, it will be best to call this only a variety. As it is impossible, from the figure and description of Goldfuss, to decide if gracilis is the same as andegavensis, I have not followed Reuss in using the name given by Goldfuss. This has a pore just behind the mouth on each side, and in most cells there is another smaller pore behind this, as shown in the figure. The surface is decidedly concave, with perforations, the space between the perforations is granular, as seen in the enlarged portion of the surface; the marginal ridges are sulcate or granular. At each side of the mouth in most cells the marginal ridge thickens. This is unfortunately not shown in the drawing.

4. Membranipora Angulosa, Rss.

This is a species which has had a wide range in tertiary times.

Loc. Bartonian (Upper Eocene)—Oberburg (Styria), Val di Lonte. Miocene—Austria, Hungary, Moravia, Turin, Dego. Pliocene—Castrocaro, Castellarquato, Pisa, Arno, Sicily. Living—Mediterranean.

In living specimens the cell is seen to be covered with a thick membrane obscuring the calcareous wall, and this extends over the large aperture, but near the distal end of

the aperture is the small movable lip through which the polypide protrudes.

There are probably a number of species which should be reduced to synonyms of this form, and it should be noticed that in the chalk there are several so-called Escharae described, which have cells like the above, but which would now be Biflustra.

The large avicularian cells are the same in the Bruccoli fragments and in those dredged in the Bay of Naples as those well drawn by Manzoni in his description of Castrocaro and in other places.

5. Lepralia ciliata, Pall.

Cellepora crenilabris, Rss. foss. Polyp. Wien. Beck. tab. x f. 22, p. 88.

Loc. Miocene—Austria and Hungary. Pliocene—Crag, Reggio, Castrocaro, Castelarquato, Canitello (Calabria), Parlascio (Pisa), Castelviscardo, Darsena (Leghorn). Living —Northern seas, British coasts, France (Joliet), America, Adriatic (Heller). At Naples it is common. I dredged it in 40 fathoms, but received specimens often from shallower water.

Fig. 2.

6. Lepralia Morrisiana, Busk.

The oral aperture is smaller than is shown in the figures of Reuss and Manzoni, but otherwise there seems no difference. Although this was abundant at Bruccoli, there are only two or three ovicells to be seen on the various fragments.

Loc. Pliocene—Cor. Crag, Leghorn (Manzoni's 2ª Cont.). L. pleuropora and inamoena, Rss., are apparently closely allied to this species.

Fig. 22.

7. Lepralia vulgaris Moll.

Busk. Quart. Journ. Micro. Sc., vol. vi., 1858, p. 127, tab. xviii., fig. 3.

Cellepora otophora, Rss. Foss. polyp. d. Wien. Tertiärbeckens, p. 90, tab. 11, fig. 1.

Lepralia otophora, Rss. Foss. Bry. des Oest-Ung Miocäns p. 164, tab. 8, fig. 5.

(?) Lepralia tumida, Manz. Briozoi di Castrocaro, p. 25, tab. iii., fig. 33.

Lepralia intermedia, Rss. Oest-Ung Mioc. p. 160, tab. 8, fig. 11.

I think there cannot be any doubt that this is the same species as Reuss figures from the Miocene as otophora. The figure given by Manzoni of Lepralia tumida seems to correspond better with Reuss' otophora than does fig. 30 from Castrocaro. This is closely allied to Heller's Lepralia Botterii, found at Lesina, and may be the same, but I am unacquainted with this species.

At Naples the vulgaris does not seem to be common, as I only found it upon re-examining some material brought home.

In the Bruccoli specimens the surface is finely granular, the vibracula turn slightly inwards, and in many cases show the hinge; there is a distinct sinus in most cells, and the upper part of the aperture is surrounded by spines.

In the recent species, the rostrum is very variable, in some cases being almost invisible, in others long and prominent.

Loc. Miocene—Austria and Hungary, Lapugy (Siebenbürgen), Modena (Italy). Oligocän—varieties at Crefeld and Sollingen. Pliocene—Castrocaro. Living—Madeira, Mediterranean.

It is possible that L. Morrisiana is a variety.

8. Lepralia coccinea, Abild.

Syn. L. Ballii, John. Hist. Brit. Zooph., 2nd Ed. tab. lvi. fig. 5.

There were several specimens of this most beautiful Bryozoa in the material collected by Dr T Fuchs.

In some specimens there are nearly always two avicularia, in another there is usually one on each side, while one fragment shows that while some cells have avicularia, a large number have none. When the aperture is viewed from above there is often visible a denticle, as seen in the Eschara figured as No. 4.

Loc. Crosaro, Val di Lonte, Miocene of Eisenstadt (Hungary). Pliocene—Castrocaro Canitello, &c., Sicily.

Living—Northern seas, Britain, France, Mediterranean.

At Naples I received this from quite shallow water to the deeper water of 40-50 fathoms.

9. Lepralia innominata, Couch.

Loc. Pliocene—Castrocaro (rare), Crag. Quaternary—Reggio (A. W.)

Living—Mediterranean, Florida, Roscoff (Joliet L'histoire nat. des Bryozoaires Lacaze-Duthiers, Arch. 1877), British seas.

This I dredged at Naples at depths from six fathoms to considerable depths, where Gorgonia is plentiful.

10. Lepralia arrecta, Rss.

Cellepora arrecta, Rss. Foss. Polyp. d. Wiener Tertiärbeckens, p. 81, tab. ix., fig. 23.

Lepralia arrecta, Rss. Die Bryozoen des Oest-Ung Miocäns, p. 164, tab. ii., fig. 11.

The aperture of the zooecia, in the pieces I have from Bruccoli, is variable, and I believe shows that L. disjuncta, Manzoni. is the same species. This last is described by Manzoni from Castrocaro and Castellarquato, and I have it also from Reggio.

Loc. Miocene—Eisenstadt (Hungary).

11. Lepralia ansata, John. var. porosa, Rss.

Syn. Busk—Lepralia unicornis. Crag Polyzoa.

With this group it is very difficult to know which name to use, as the ansata, unicornis, spinifera, can scarcely be

determined by the description and figures given by Johnston. It is necessary to take one of this group and make these nearly allied varieties, as is done by Reuss, who makes unicornis and spinifera into var porosa. Heller makes spinifera the type of four varieties, but retains ansata. As pointed out by Heller, the ansata of Johnston may be coccinea, and not what we now understand by ansata. Smitt has called spinifera and ansata varieties of his Mollia vulgaris.

Loc Oberoligocene of Doburg. Miocene of Austria and Hungary. Crag (as unicornis). Living Mediterranean. Naples.

12. Lepralia auriculata, Hass.

One specimen from Bruccoli entirely corresponds with fig 4 of Plate lxxxix. of Busk's catalogue; and there is also one which I think must be placed with auriculata, though it does not quite correspond with any of the figures of this specimen, or with any I have from Naples, and I therefore describe it as a variety.

Fig. 5.

13. Lepralia auriculata, var. Leontiniensis.*

Encrusting Pecten, eight or nine layers superimposed, cells irregularly rhomboidal, ovate, elongate, immersed, surface covered with distinctly raised warts punctured in the centre, mouth obicular with a sinus below, avicularia deeply immersed, zooecia separated by a wide distinct line.

The avicularia are sometimes absent, and when present are very variable, in most cases having the appearance merely of an imperforate portion of the shell. This is best seen in the lower cell, marked *(a)*, which represents the general character of the majority of cells. When sections are prepared the shell is seen to consist of two layers connected by short tubes. A similar structure has been pointed out to me by Mr. Chas. Stewart, F.L.S., M.A., in a recent

* From Lentini, the Leontinoi of the Greeks.

specimen from the Mauritius, which I hope he will shortly describe.

L. auriculata is found in the northern seas to the Mediterranean.

Fig. 6.

14. Lepralia cupulata, Manzoni.

Manzoni, Bryozoi foss. Ital., 3a contrib., p. 13, tab. iv., fig. 21, Sitzb. d. k. Akad. d. Wiss Wien LIX.-LXI 1869, 1870.

There are two or three small Trochi, probably Montacuti, covered with the Lepralia, which I believe must be the same as that figured by Manzoni. Except on one the Bryozoa are too much rolled to see the form clearly. The cells are arranged quincuncially, rather regularly except where the uneven surface causes irregularity, ovate rhombic, surface but slightly raised perforate, aperture elongate, contracted in the middle, below and to the side of the aperture on each side a distinct callosity; margin of cells very distinct.

In the Bay of Naples the smaller species of Trochus are frequently covered with this Lepralia. The recent form may be L. Kirchenpaueri, Heller; and is closely allied to L. lata of Busk but is not quite the same.

The shell of Trochus so soon becomes the habitation of hermit crabs that they are rolled about, and, in consequence, the Bryozoa incrusting them are much damaged.

Loc. Miocene—Hills of Turin, Sassuolo; Pliocene—Val d'Era. Living—Naples.

15. Lepralia Bowerbankia, Busk.

Busk: Crag Polyzoa, p. 50, tab. vii., fig. 4.

Manzoni: Bry. foss. Ital. 1ª contrib., p. 3, tab. i., fig. 5.

The specimen is not very well preserved, but I think sufficiently well to leave no doubt of its determination. The aperture is orbicular, with a sinus below, prominent umbo, surface coarsely punctate: the cells are more elongate than those figured by Manzoni, but are placed in very regular rows quincuncially.

Loc. Coral. Crag, Castellarquato (North Italy.)

Fig. 7.

16. Lepralia resupinata, Manzoni. I Briozoi del Plioc. antic. di Castrocaro, p. 20, tab. ii., fig. 26.

The specimen from Bruccoli is growing on a piece of Cellepora, and fairly closely resembles that from Castrocaro. It will be seen from the figure that the avicularia are sometimes very large, in other cases quite small; when small, there are usually two, and these are situated near the aperture of the cell. There are four oral spines. The situation of the ovicell behind the zooecium is characteristic.

Loc. Pliocene, Castrocaro.

17. Lepralia scripta, Rss.

Syn. L. megacephala, Rss. Poly d. Wiener Tertiärbeckens, p. 82, tab. ix., fig. 28.

This is beautifully preserved at Bruccoli, but as it has been very well figured by Manzoni as a Mediterranean species in his Supplemento alla Fauna dei Bry. Medit. Sitzb Akad Wirsench. Wien. lxiii., 1871, it is not necessary to give a figure now, although the zooecia are slightly more elongate.

Loc. Miocene—Hill of Turin, Eisendstadt (Hungary). Pliocene—Piacenza, Tuscany, and Sicily. Living—Mediterranean. From the Bay of Naples I have some specimens.

18. Lepralia Pallasiana, Moll.

Probably several fossil species are Pallasiana which have received other names.

Loc. Pliocene—C. Crag, Sicily. Living—British coasts and Mediterranean.

19. Cellepora coronopus, S. Wood.

There is no genus which causes so much difficulty and uncertainty in the determination as this, and there may be other species among the numerous pieces collected at Bruccoli, but I am not able to determine at present any others

than the three enumerated. As Cellepora varies so much in different stages, it is doubtful whether several of the existing species should not be united.

Loc. Pliocene—C. Crag, Ficarazzi. Living—Naples.

Fig. 20-21.

20. Cellepora tubigera, Busk.

Fig. 20 shows a portion when the cells are decumbent, and in such cases there are no tubular process, while in the same piece where the cells are erect there ure usually some processes. Fig. 21 will show the shape of the ends of the cell when erect, but unfortunately this figure is a failure and does not show the shape of the cells. It seems to me probable that C. retusa, Manz. is only a variety.

Loc. Pliocene—Pezzo, Canitello, Carrubare (all Calabria), C. Crag. Living—British and French coasts, and Mediterranean.

21. Cellepora ramulosa, Linn.

Loc. Pliocene—C. Crag, Pezzo, Canitello (Calabria), Castrocaro. Living—Scandinavia, Britain, France, Mediterranean. This I dredged at Naples, in 40 fathoms.

22. Hippothoa catenularia, Jameson.

Busk—Cat. Marine Polyzoa, p. 29, tab. xviii., figs. 1 & 2. Manzoni—Bry. fossili Ital., 4ª contrib., p. 6, tab. i., fig. 4.

Loc. Pliocene — Reggio (Calabria), Canitello, Pezzo. Living—Seas of Europe, in Adriatic at Lesina, Lissa, common (Heller.) At Naples I found it several times. Devonshire, common in deep water; found at 60 fathoms on Pinna by Hincks.

Fig. 9.

23. Eschara lunaris nov. sp.

This Eschara I have been unable to correlate with any described species; but as it occurs in the Mediterranean, and the Pliocene of Sicily at various places, it must have been often seen, if not described.

I believe that it is the same as Porina labiata (Roemer),

from the oberoligocän of Lattdorf, although the lip is not as prominent in those from Naples. It is only in the terminal or younger cells that the aperture projects, so that if the above supposition is correct, Roemer's labiata would be taken from a young cell.

There also seems very good reason for believing that Eschara columnaris, Manzoni (Bryozoi di Castrocaro, tab. v., 65) is the same, but as that is evidently taken from a badly-preserved fragment it is somewhat uncertain. The cells near the base have just the form and shape drawn by Manzoni, and the avicularia are often obliterated, though in a piece as large as that figured I should expect some cells to show a trace of its existence.

Stem cylindrical, dividing dichotomously, cells at the growing extremity ovate, near the base hexagonal, mouth orbicular, young cells projecting, old cells deeply immersed, four oral spines on the upper margin of the aperture, semi-lunar pore below the mouth, avicularium on one side of the cell, with extremely long mandible (often the length of nearly two cells), surface coarsely punctured, ovicell finely punctured. The cells in Figure 7 are in a medium stage, being neither the recently-formed or obliterated cells. The figure showing the natural size is from a recent specimen dredged at Naples. The description is also taken from recent specimens.

Loc. Pliocene—Rametto (Sicily), San Domenica (near Rametto), Parere (Calabria), in my collection.

Living—Naples, 40 fathoms in the Secca, &c.

The form of the zooecia is much the same as in Eschara flabellaris (Busk) from Algoa Bay, but that is not cylindrical.

The name is given from the semi-lunar pore, which occurs frequently in Lepralia, but there are few Escharæ with it. This would be called Porellina ciliata by Smitt.

24. Eschara cervicornis, Ell and Sol.

Several pieces of this Eschara were among those collected at Bruccoli. Manzoni is doubtful of the identity of a frag-

ment from Castrocaro, but thinks it may be Eschara undulata Rss., in which I think he may very likely be correct.

Through the kindness of Prof. Guiscardi I was enabled to examine a few Bryozoa from the Pliocene of Sicily, which were probably collected by the elder Costa; and there were some fragments of cervicornis from Canitello (Sicily). I found it abundant in the Pliocene beds in Sicily and Calabria, already mentioned.

Loc. If as undulata, in the Miocene of Austria and Hungary. Pliocene—Sicily and Calabria, abundant; living, Mediterranean, very abundant in a depth of 30 fathoms and deeper; Roscoff (Joilet), 30-40 metres, British, Start Point, &c.

Fig. 8.

25. Eschara biaperta, Mich.

forma Eschariformis nov.

As Lepralia.

Michelin—Icon. Zooph, p. 330, pl. lxxix., fig. 3.

Busk—Crag Polyzoa, p. 47, tab. vii., fig. 5.

Manzoni—Briozoi di Castrocaro, p. 21, tab. ii., fig. 28.

Polzoarium erect foliaceous, zooecia quincuncial and serial, surface smooth, margin of cell indistinct, orifice obicular sinus seldom visible, an avicularian or vibracular process on one side of the top of the cell, sometimes a mamelon on the other side.

The irregular surface of the zooarium scarcely shows the outline of the zooecia, but their position can always be made out by the conspicuous aperture and process. In the specimen from Bruccoli the processes on one side of the zooarium are always on the right, on the other on the left. I suppose that this line indicates the centre of the colony, and have, in consequence, filled in with a dotted line what I assume may have been the width of the branch.

This form of cell has been found as Lepralia in the Crag, in the miocene of Douè (France); and Manzoni figures L. biaperta from the pliocene of Castrocaro (N. Italy), with two vibracular processes and an avicularium on the side of the cell.

This is a case which is frequent of finding Lepralia and Eschara with similar cells, and I have thought it best to signify its relation to Lepralia biaperta and its growing as an Eschara by retaining Michelin's name, and showing its form by calling it variety Eschariformis.

Fig. 4.

26. Eschara Pertusa, M. Ed.

The figure 4 is most unsuccessfully drawn, but I think it will explain the point to which attention should be called. When the broken ovicells are examined there is found to be a calcareous film covering the interior, but in some cases this is broken away, revealing a deep furrow just above the oral aperture, and at the bottom of this furrow are two or three distinct perforations. In some cells a denticle is visible. Four lateral and two distal rosettenplatte.

Loc. Miocene—Douè. Pliocene—Crag, and in my collection from Reggio, Gerace (Calabria), Rametto (Messina).

27. Eschara Foliacea Lam.

var Fascialis.

Although foliacea and fascialis are considered synonyms, it may be useful to retain the distinction as to the form of growth, and therefore, instead of following Heller (Die Bryozoen des Adriatischen Meeres. Sitzb. Akad. Wien., 1867), and calling them distinct species, the smaller size of the foliations is indicated as above. This has in the distal wall two "rosettenplatte," and four in the lateral wall.

Loc. Pliocene—Castrocaro, Ficarazzi, Leghorn, Pesso, Canitello (Manzoni), and a specimen in the Naples museum collected probably by Costa from Amati is this species.

Living—Brit. (common), France, Mediterranean (common).

Fig. 1.

28. Biflustra rynchota, nov. sp.

Polyzoarium foliaceous, two layers of cells opening in opposite directions, cells quincunxcially arranged, margin thickened at the proximal end of the cell, no thickened

margin at the distal end, aperture large, suborbicular, straight below, or subquadrilateral, sometimes nearly as large as the cell, avicularia on the front of the cell below, opening of the avicularia elongate narrow.

The cells of this species seem to have the characters of Membranipora rynchota as figured by Busk, and is another of those cases of getting similar zooecia in erect and the encrusting forms.

The avicularia in most cells much more nearly resembles those of rynchota in the Crag Polyzoa than is shown in Fig. 1. This is related to the recent Membranipora minax (Busk) and Pouilletii (Aud.)

29. Retepora cellulosa, Linn.

This species has a wide range in space and time, and is now common in the Mediterranean and many other seas.

Loc. Miocene—Eisenstadt (Hungary), Astrupp, Superga, Angers, Douè, Vihier, St. Laurent des Mortiers, Angles, Vedennes, L'Etang de Thau (Herault). Pliocene—Pezzo, Canitello (Sicily), Parere (Calabria), (A.W.), Messina, (A.W.), C. Crag. Living—In all the northern seas, Britain, coast of France, Mediterranean, N. America, Cape Horn, Australia. Found at from 20 fathoms to deep water.

30. Myriozoon truncatum, Pall.

Reuss—Vaginopora polystigma Rss. Die foss. Polyp. des Wiener, Tertiärbeckens, p. 73, tab. ix., fig. 2.

Reuss—Myriozoon punctatum Rss. Zur fauna des deutsch Oberolig, p. 50, tab. ix., fig. 2, and Bry. d. deutsch. Septarienthon, p. 190.

Manzoni—I Briozoi fossili del Mioc. d' Aust. ed Ung., pt. ii. Denk. K. Ak. d Wiss. xxxvii., 1877. p. 22, tab. xv., f. 52; tab. xvii., fig. 55.

This genus was originally placed by Reuss in the family Vincularidea, but that is clearly a mistake, though the affinities do not seem clear. It appears sometimes to have been placed with Cyclostomata, but as it has such a well developed operculum, this is somewhat strange. At Naples

it is fairly abundant at depths from about 30 fathoms. Abundant at Bruccoli.

Loc. Miocene—(as punctatum) Eisenstadt, Portzteich, and other places in Austria and Hungary. Pliocene—Castrocaro, Mt. Titano, Darsena, Parlascio, Leghorn, Amato (A.W.), Canitello (A.W.), Asti, Bonpas, Vedennes, Villeneuve-lez Avignons (Gard), Chaux de Fonds (Suisse), and generally in the Pliocene of Sicily. Living—Mediterranean common, and probably in many other localities under synonyms.

31. Cupularia Reussiana, Manzoni.

Bryozoi Pliocenici Italiani 1ª contrib. Sitz. Akad. d Wissensch. Wien, 1869, vol. lix., p. 11, tab. ii., fig. 19.

Cupularia doma, d' Orb. Smitt Floridan Bryozoa. Kongliga Svenska Vetens. Akad. Handlingar 1872, vol. ii., pt. 2, tab. iii., 81-84a.

The Bruccoli specimen is exactly the same as that figured by Manzoni, which he points out is closely related to Cupularia denticulata and Owenii, which have been found in the Miocene of Williamsburg, Crag of Suffolk, and living on the coast of Africa, Canary Isles, and Madeira.

A specimen in the Naples collection, already referred to, is marked Trocopora brutia, Costa; but I am not aware whether Costa published a description of it, which was probably collected by him, and was from the pliocene of Amato (Sicily).

This is the same species as Smitt figures as Cupularia doma, d' Orb but upon what grounds Smitt thinks this is the same as Discoflustrella doma of d'Orbigny (Pal. cret p. 561), I am unable to understand, as the figure and description of d'Orbigny are insufficient for determining any recent species.

Although the form of the zooecia agrees with the figures of Manzoni and Smitt the shape of the zooarium is more depressed, and the description of the Bruccoli specimen should be polyzoario depresso-conico, instead of hemispherico.

Loc. Castell-Arquato, Orciano, Mt. Mario, Rhodes. Living —Florida.

CYCLOSTOMATA.

32. Diastopora flabellum, Rss.

Die foss. Poly. der Wien, Tertiär, p. 51, tab. vii., fig. 9.

Manzoni—I Briozoi foss. d. Miocene d'Aust., pt. iii.; Denk. Ak. Wien, 1877; p. 14, tab. xiii., fig. 52.

Diastopora simplex, Busk (non d'Orb.), Crag Poly., p. 113, tab. xx., fig. 10.

From the specimens from Bruccoli I feel sure that flabellum and simplex are synonyms. Dr. Busk, in naming his species simplex, has apparently overlooked the fact that d'Orbigny had already given this name to another species, which he subsequently changed to Discosparsa simplex, but which would now, according to the catalogue of the Cyclostomata, be Diastopora.

Loc.: Miocene—Eisenstadt, Wildon, &c. Pliocene—Crag; Living—Naples., &c.

33. Alecto major, Landsb.

Syn. A repens, S. Wood.

Loc. Pliocene—Crag (red and coralline), Douè (?), Castrocaro. Living—Arctic seas to Mediterranean, Florida; at Naples, on Terebratula vitrea, also from other localities, as a deep water form.

34. Pustulopora proboscidea, M. Ed.

Loc. Living, Shetland seas, Mediterranean, Teneriffe, Canaries, and Madeira. (Busk's Cat., pt. iii.)

This I dredged at Naples in 30 fathoms and deeper water,

Fig. 15.

35. Pustulopora rugosa, d'Orb.

Entalophora rugosa, d'Orb; Pal. Franc.: p. 795, tab. 754. fig. 18-20.

Pustulopora rugulosa, Manz.; I Brioz foss. del Miocene d'Austria e Ungheria; parte iii., p. 11, tab. x., fig. 38; Denk. Ak. Wiss, Wien, xxxviii., 1877.

Colony composed of cylindrical branches covered with tubular projecting cells, the tubes and interspaces rugose; in old branches tubes closed at the base by a diaphragm; surface finely punctured.

I am unable to see any difference between the living, the chalk, and the miocene species as far as can be gathered from the figures and description.

It is only in well preserved specimens and with a fairly high power that the punctures in the surface can be seen, so that this character would often be wanting in fossils. The figure, natural size, is from a specimen dredged at Naples, where it is not rare, at depths from 30 fathoms downwards. I have also taken the license of adding, from a recent specimen, two tubes on the right-hand side, to show the length they attain. In the specimen from Bruccoli the ends are broken off.

Loc. Chalk, ètage 22e, as rugosa, Vendôme, Trôot (Loir et Cher), Veules (Seine Inf.) Miocene—Kostel, Lapugy, Wildon, St. Nicholai, Gartschenthal, Steinabrunn, Niederleis, Nussdorf, Grussbach.

Figs. 11, 12.

36. Discoporella mediterranea, Blain.

Busk's Cat. Marine Polyzoa, pt. iii, 1875, p. 33, tab. xxxiv, fig. 4.

Lichenophora Mediterranea, Blain, Man. d'Actin. p. 407.

In the material collected by Dr. Fuchs, from Bruccoli, there are a few fragments adnate and one stipitate, and it would seem that the mode of growth should not be used as a generic character. This view would lead to the addition of Defrancia to Discoporella, and as this is a very variable species it seems possible that Defrancia lucernaria is only a variety. The cells of the rays are in some much raised, in others the rays are less distinct.

Loc. Fossil—Astezan, Vaucluse. Pliocene—Asti (Mich.), Pruma (Calabria), my collection. Living—Naples, lami-

narian zone (A.W.); Mediterranean, on shell (H.M.S. Porcupine), (Busk).

Dr. Busk, in his catalogue, speaks of this being found in the Miocene, but he probably quotes the localities on the authority of Michelin. The Asti beds are Pliocene, and I think the other two localities are of the same age, but have no exact information.

37. Discoporella radiata, Aud.

Discosparsa patina, Heller, Die Bryoz. des. Adriat Meeres, p. 122. Verh. der k.k. zool-botan. Gesell. Wien, tom. xvii., 1867.

Loc. Living—Venice, Crivizza, Lessina, Lissa, Cuzela, South Devon; Naples, on Laurencia papillosa, abundant, and on other seaweeds.

Heller speaks of it occurring in from 20-55 fathoms, but at Naples I found it in shallower water.

Figs. 13, 14.

38. Diastopora cupula d'Orb.

Discosparsa cupula. Paleont. Franc. vol. v., p. 823, tab. 758, fig. 1-5.

Colony discoidal, cup shaped regular, thick under surface, marked with concentric lines, and rayed striae, cells immersed, free at the end, composed of three or four layers of cells.

Only one specimen found at Bruccoli, in which I am unable to find any variation from that described by d'Orbigny from the lower white chalk.

It is possible there was a thin border, as in Discoporella. There is another species, Discosparsa laminosa d'Orb., which is closely allied to this.

Loc. Turonian Angoulême.

39. Frondipora reticulata, Blain.

forma, verrucosa.

From dredgings at Naples I have specimens which exactly correspond with both F. reticulata and verrucosa, Lamx,

and also one with both characters, showing that there is only one species. Professor Smitt calls this forma, verrucosa, and to show the mode of growth I have followed him.

Loc. Mediterranean, Kamschatka, Spitzbergen.

In the Geological Museum of Naples I believe some fragments from Canitello and Amato, and marked Retepora cellulosa, are Frondipora reticulata.

Fig. 17, 18, 19.

40. Mesenteripora, sp.

On a piece of Myriozoon there is a growth like Diastopora, which rises into the foliaceous form, as seen in fig. 19. The surface is decidedly rugose, whereas in Mesenteripora meandrina, although there is a tendency to rugosity, none of my specimens from Naples could be called so, and some are quite smooth. The cells are mostly immersed, with free terminations. As there is only this one small piece it would not be safe to say if this is meandrina or a new species.

41. Hornera frondiculata, Lam.

M. Edwards—Hornera affinis, M. Ed. Ann des Sc. Nat. 2e ser., vol. ix.

Michelin—H. Andegavensis, Icon. Zooph. 318, lxxvi., fig. 8.

Loc. Pliocene—Sceaux, Douè, Crag, Sicily, Castrocaro, Ficarazzi (Sicily), Pruma and Gerace (A.W.) Living—Adriatic, on Nullipores and Corals, at considerable depths. (Heller). Dredged at Naples in the deeper dredgings.

Fig. 16.

This seems the same as Manzoni (Briozoi di Castrocaro) has figured as Aetea sica, but I do not see from his figure why he does not call it Alecto, and believe it is the same which usually grows with more cells along the line of growth, and which he figures as Alecto repens.

Nearly all of those which are not put down as existing at the present time are represented by species very closely allied, and the number of living will undoubtedly be largely

increased by further collection of Bryozoa and by a reduction of the synonyms.

There are four species which I am unable to distinguish from those figured as fossil in the chalk: 2 are Upper Eocene, 15 Miocene; 30 have been found in Pliocene deposits; 30 are now known living, all of which I collected at Naples.

It will have been seen that the greater number of this list are those which inhabit the deeper zones, and we may conclude that these beds were deposited in a depth of not less than 40 fathoms. Of course there may have been changes of level, and some lived in shallower waters, but not less than 40 fathoms may be taken to be the general indication, which is also apparent from the Terebratulae on which many of them grew.

In considering the number of species, we must remember that they were not collected by anyone who went purposely to collect Bryozoa, but I presume casually with other fossils, and that many might thus escape detection; and this is borne out by only finding one imperfect fragment of Idmonea and one of Salicornaria, both of which we may, from the examination of neighbouring deposits, conclude were abundant, and when we also think how large a proportion of the Bryozoa are incapable of or are seldom fossilized, it is apparent that these seas were inhabited by a large Bryozoan fauna.

In considering more in detail some of the species, I have already noticed that there are many cases where Eschara and Lepralia have similar zooecia (cells), and that in this small collection two cases of the kind occur—the one Lepralia biaperta, as an Eschara, and the other Biflustra rynchota, with cells like a Membranipora from the Crag. There are also cases where Lepralia can grow as an erect form for a short space, and such suggest the consideration as to how far Eschara and Lepralia are satisfactory genera, and I must say the conclusion I have arrived at is that they are very

artificial. A great part of zoological and paleontological classification must be artificial, and may often be none the less useful, and I therefore hope that until there is much more information on what to base classification, that they will be retained, and regret some attempts which I regard as premature to largely subdivide these into new genera.

D'Orbigny based his classification upon many characters, without understanding their zoological signification, and the consequence was that some forms could actually belong to several genera, and the confusion of his classification was in some cases very great. Since then, Busk, Reuss, and others have rescued these animals from the confusion of classification in which they then were: however, there are some principles introduced by D'Orbigny which might have perhaps well been retained. D'Orbigny attached much greater importance to the form of the cell than to the mode of aggregate growth, and in some cases signified the form of a colony by an affix, so that there was Eschara and Repteschara, the first erect and the second encrusting, so that on this principle, with such a form as fig. 8, the one from Bruccoli might be described as Eschara biaperta, and the ordinary one from the crag as Repteschara, and at once would be apparent not only what was the form of the colony but also of the cells.

A Swedish naturalist, Smitt, one of the most careful observers of the Bryozoa, attaches much more importance to the form of the cell (by which I mean the characteristic points in the aperture, the position and nature of the avicularia and vibracula, &c.) in generic classification than has been done by some in this country, and undoubtedly revision must some time be made of these groups of Lepralia, Eschara, and Membranipora, which have now, by the addition of so many new forms, living and fossil, become inconveniently large.

	Crag.	Pliocene	Miocene	Eocene	Chalk.	Living.	
1. Salciornaria farciminoides, Ell. and Sol.	+	+	+	..	+	+	Naples
2. Membranipora bidens, Hag.	..	+	+	..	..	+	Naples
2A. —— Lacroixii, Sav.	..	..	..	..	..	+	..
3. —— andegavensis ..... var. papyracea	..	..	+ ?	..	..	..	..
4. —— angulosa, Rss.	..	+	+	+	?	+	Naples
5. Lepralia ciliata, Pall	+	+	+	..	..	+	Naples
6. —— Morrisiana, Busk....	+	+	..	..	..	..	..
7. —— vulgaris. Moll.	..	+	+	..	..	+	Naples
8. —— coccinea, Abild.....	?	+	+	+	..	+	Naples
9. —— innominata, Couch ..	+	+	..	..	..	+	Naples
10. —— arrecta, Rss.	..	+ ?	+	..	..	..	..
11. —— ansata, John.	+	+	+	..	..	+	Naples
12. —— auriculata, Hass	..	..	..	..	..	+	Naples
13. —— do. var. Leontiniensis	..	..	..	..	..	..	..
14. —— cupulata, Manz.	..	+	+	..	..	+	Naples
15. —— Bowerbankia, Busk..	+	+	..	..	..	..	..
16. —— resupinata, Manz. ..	..	+	..	..	..	..	Naples
17. —— scripta, Rss.	..	+	+	..	..	+	Naples
18. —— Pallasiana, Moll.	+	+	..	..	..	+	Naples
19. Cellepora coronopus, S. Wood	+	+	..	..	..	+	Naples
20. —— tubigera, Busk.....	+	+	..	..	..	+	Naples
21. —— ramulosa, Linn.	+	+	..	..	..	+	Naples
22. Hippothoa catenularia, Jame.	..	+	..	..	..	+	Naples
23. Eschara lunaris, nov. sp...	..	+	..	..	..	+	Naples
24. —— cervicornis, Ell. & Sol.	..	+	+ ?	..	..	+	Naples
25. —— biaperta, Mich. .... var. eschariformis	..	..	..	..	..	..	..
26. —— pertusa, M. Ed.	+	+	+	..	..	..	..
27. —— foliacea, var. fascialis.	..	+	..	..	..	+	Naples
28. Biflustra rynchota, nov. sp.	..	..	..	..	..	..	..
29. Retepora cellulosa, Linn...	+	+	+	..	..	+	Naples
30. Myriozoon truncatum, Pall.	..	+	+	..	..	+	Naples
31. Cupularia Reussiana, Manz.	+ ?	+	..	..	..	+	Naples
32. Diastopora flabellum, Rss..	+	+	+	..	..	+	?
33. Alecto major, Landsb.	+	+	..	..	..	+	Naples

	Crag.	Pliocene	Miocene	Eocene.	Chalk.	Living.	
34. Pustulopora proboscidea, M. Ed.	..	..	..	..	..	+	Naples
35. —— rugosa, d'Orb.	..	..	+	..	+	+	Naples
36. Discoporella Mediterranea, Blain	..	+	..	..	..	+	Naples
37. —— radiata, Aud.	..	..	..	..	..	+	Naples
38. Diastopora cupula, d'Orb.	..	..	..	..	+	..	..
39. Frondipora reticulata forma verrucosa	..	..	..	..	..	+	Naples
40. Mesenteripora, sp.	..	..	..	..	..	..	..
41. Hornera frondiculata, Lam.	+	+	..	..	..	+	Naples
42. Idmonea, sp.	..	..	..	..	..	..	..
43. Caberia Boryi. Aud.	..	..	..	..	..	+	..

EXPLANATION OF FIGURES.

FIG. 1. Biflustra rynchota, nov.
FIG. 2. Lepralia Morrisiana, Burk.
FIG. 3. Membranipora andegavensis.—var papyracea.
FIG. 4. Eschara pertusa, M. Ed.
FIG. 5. Lepralia auriculata.—var Leontiniensis, $\frac{3}{1}$
FIG. 6. —— cupulata, Manz.
FIG. 7. —— resupinata, Manz.
FIG. 8. Eschara biaperta.—var eschariformis.
FIG. 9. —— lunaris, nov.
FIG. 10. Membranipora Lacroixii.
FIG. 11. Discoporella mediterranea, M. Ed.
FIG. 12. —— ditto
FIG. 13, 14. Diastopora, cupula, d'Orb.
FIG. 15. Pustulopora rugosa, d'Orb.
FIG 16. Alecto.
FIG. 17. Mesenteripora, sp. end of frond.
FIG. 18. —— showing rugose surface.
FIG. 19. —— small frond.
FIG. 20, 21. Cellepora tubigera, Busk.
FIG. 22. Lepralia vulgaris, Moll.

Bryozoa from Brucoli

Fig. 4

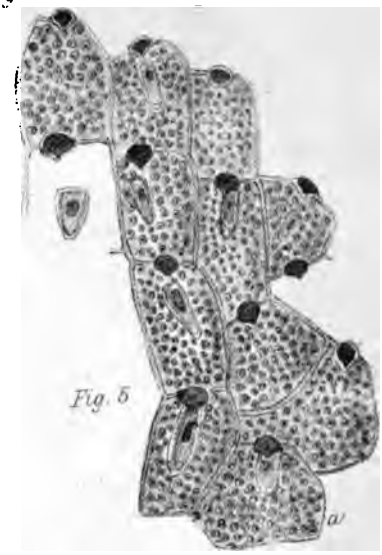

Fig. 5

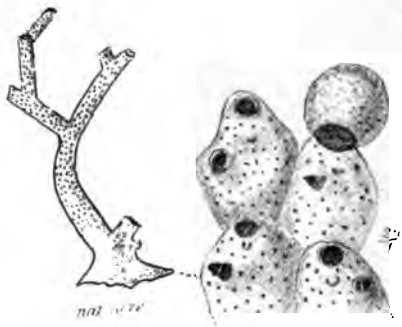

Fig. 9.

Fig. 11

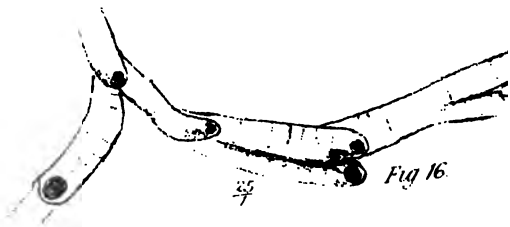

Fig 16.

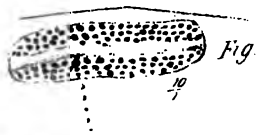

Fig. 17

Fig 18

Fig. 19