THE
QUARTERLY JOURNAL
OF
THE GEOLOGICAL SOCIETY OF LONDON.
VOL. XLVII.

1. NORTH-ITALIAN BRYOZOA. By ARTHUR WM. WATERS, Esq.,
F.G.S. (Read June 4, 1890.)

[PLATES I., II., III., IV.]

CHILOSTOMATA.—The Bryozoa dealt with in this paper are, for the most part, from well-known localities in the Vicentine, as Val di Lonte, Montecchio Maggiore, and Brendola. Most of them have been described by Reuss, but at a time when chief attention was paid to the zoarial mode of growth (the shape of the oral aperture and other zoöcial characters being considered to be of secondary importance) and when the avicularia and ovicells did not receive the attention now given to them.

The first paper treating of North-Italian Bryozoa, of this series, is one by Reuss *, in which he refers to a number of species as from an unknown locality in the Vienna Basin; but these, he subsequently † found, came from the Val di Lonte, called also Val dell' Onte (but the exact position is Casa Fortuna), in the Vicentine. Although this correction has been made, references are constantly given which show that authors overlook this rectification.

From a similar marl in Montecchio Maggiore, a few miles further south, Reuss also described ‡ a number of others, and a couple from Brendola, in the Colle Berici, south of Vicenza; and from Crosaro, some distance to the north-east, a few which appear to be of nearly the same age. In the first three localities the marl contains a very

* "Die fossilen Polyparien des Wiener Tertiärbeckens," Haidinger's 'Naturwissenschaftliche Abhandl.' vol. ii.

† "Foss. Bryozoen des Oest.-Ung. Miocäns," Denkschr. Ak. Wissensch. Wien, vol. xxxiii.

‡ "Die fossilen Anthozoen und Bryozoen d. Schichtengruppe von Crosaro," Denkschr. Akad. Wissensch. Wien, vol. xxix. This paper is referred to in the following pages as "Bryoz. von Crosaro."

similar fauna ; and, having collected from all, I found the Brendola beds the most instructive, and there the preservation is the best *.

The late Dr. G. B. Gottardi † has also given a list of species from Montecchio Maggiore ; but he follows the generic and specific names given by Reuss, even where Reuss himself had subsequently introduced modifications, or reduced the synonymy ; and nothing is added to our knowledge of the characters, so that we do not know what qualifications Gottardi possessed for making the determinations.

Besides these already-known localities, I have collected from two in the Veronese which are of considerable geological interest ; and both are new localities. The first is Ferrara di Monte Baldo. The mountain is on the east of the Lake of Garda, and the deposit occurs at about 4670 feet above sea-level and about 1750 feet above the village (by the path leading to Madonna del Neve, past the Austrian frontier) as a thin bed, where, although the Bryozoa are numerous, they are very badly preserved ; and the same remark will apply to the second locality, Ronzo, near Mori, in the Tirol, north of the Lake of Garda.

[Since this paper was read, I have again visited North Italy, and collected from Malo and Priabona, both near Schio in the Vicentine : and also from near Ferrara di Monte Baldo. I did not, however, find the beds uncovered at the locality mentioned in the paper ; but about halfway between the village and the frontier (marked Novezzina in the Austrian maps) a blue marl attains to a considerable thickness, containing many Bryozoa. Besides the species mentioned, *Microporella distoma*, B., occurs at Malo and Novezzina. —A. W. W., Dec. 24, 1890.]

The Ferrara deposit lies above a series of beds commencing with those containing large *Nummulites*, as *N. Brongniarti*, &c., then beds with *Cancer punctulatus*, &c., then with *Serpula spirulea*,—in fact similar to the Vicentine series.

Many of the species are known from the Lower Tertiaries of other parts of Europe ; Reuss, in a series of papers, has given descriptions from several places in the north of Europe, as Söilingen, Latdorf, &c. ; and recently Koschinsky ‡ has published an important work on the South-Bavarian Tertiary Bryozoa. Pergens § also has given lists and some descriptions of species from Hungarian and other localities.

The Vicentine fossils are dark in hue, and this makes the study of them difficult and very fatiguing, especially as the marl is often hardened in the cavities, obscuring the characters. The specimens

* Grancona, alluded to in the paper, is near Lonigo, in the Colle Berici ; Bocca di Sciesa is between the two.

† "Briozoi Fossili di Montecchio Maggiore," Atti Soc. Trent. di Sc. Nat. vol. ix. pp. 297–308.

‡ "Bryozoenfauna der älteren Tertiärschichten des südlichen Bayerns," Palaeontographica, vol. xxxii.

§ "Les Bryozoaires du Syst. Montien," 1886 (Louvain) ; "Bryoz. Foss. de Kolosvar," "Bryoz. de Tasmajdan," Bull. Soc. Malac. de Belgique, vol. xxii. ; "Bryoz. von Wola Lu'zanska," Bull. Soc. Belg. Géol. Hydrol. &c. vol. iii.

have mostly been collected many years ago, and, when returning to the work, it has often been possible to further clean them by soaking in water, then brushing with a camel-hair pencil, drying, and repeating the process. Recently, however, I have obtained very much better results by placing the fossils in a saturated solution of sulphate of soda and allowing it to crystallize. When this is washed out it loosens the matrix within the apertures, and they are thus more thoroughly cleaned than would be possible by ordinary means.

Although all of Reuss's works were beautifully illustrated, the figures were rather the artist's than the naturalist's figures, one zoecium being drawn and then identically repeated several times; but this geometrical regularity does not often occur in nature. The figures now given are supplementary, to show the characters to which I allude.

Though considering a revision now required, I would point out how great an advance Reuss's work was upon what had been done before; and that he gave more attention to zoecial characters than his predecessors had, often forming groups according to the nature of the surface and the presence of oral spines or avicularia. It is true that very few of these groups will now stand, but in this way the study of the value of the characters has been made possible without adding to the number of generic names.

There are many cases of a species occurring in both the incrusting and erect form; some show considerable difference in zoarial shape, and there are interesting instances of great range, so that different parts of the same colony have widely divergent appearance.

Perhaps the most noticeable case is *Cellepora proteiformis*, which commences in a flat *Eschara*-form, on which, however, single zoecia may be raised (figure 14); but in later stages the zoecia are piled up irregularly, often several layers thick. *Lepralia bisulca* varies much in appearance; and *Porina coronata* may either have the zoecia distinct or scarcely distinguishable. There may be more or less of a peristome in front, and the number of large pores or avicularia around the aperture is very variable; further, the central avicularium may be absent, may be moderately large, or developed into a gigantic raised spatulate avicularium. When the aperture has a closure the appearance is further modified. *Porina papillosa*, with or without avicularia or prolonged zoecia, also has a very variable appearance. There are forms with *Lunulites*-mode of growth with the zoecia of *Membranipora*, *Cellepora*, and *Lepralia*.

As we thus obtain more exact acquaintance with the Bryozoa of past times, we shall in some cases be enabled to check the correctness of the principles of present classification and gain new ideas as to relationship; but fresh difficulties are brought before us.

Among the points brought forward, the discovery of *Catenicella* is of special interest as bearing upon the relationship of this genus.

Fedora excelsa is interesting, from the way in which it grows from the apex of the colony,—from occurring on both sides of the Alps,—and from the genus being represented by one recent form dredged by the 'Travailleur.'

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With regard to structure, the closure of *Porina coronata* and *Lepralia syringopora* by a plate with a tubule in the centre is somewhat surprising, as this structure was supposed to be exclusively characteristic of the *Cyclostomata*. The plate is at some distance above the oral aperture.

Some of the erect *Eschara*-forms have the zoecia at the side opposite, others alternate; and as this may be a useful specific character, it has been mentioned in the diagnosis; but it does not appear to have generic value.

The position of these Bryozoan beds has been fairly worked out. Suess*, in 1861, placed them above the Priabona beds and below those of Sangonini. They are the "F." of Bayan†, or Upper Eocene. Professors Hébert and Munier-Chalmas‡ have also examined the stratigraphical position of the Vicentine beds, and they place the "marne" of Brendola, &c., below the Crosaro and above the Granelle beds, but as part of a "même ensemble," considering the Brendola beds as Upper Eocene and equivalents of those of Biarritz. It will thus be seen that there is agreement in the views, and that the Bryozoa may be considered as of Bartonian age and may be called Upper Eocene. From their position the earlier writers called them Miocene. To some of these points I may have to refer more fully when dealing with the *Cyclostomata*.

1. ? CATENARIA TENERRIMA (Reuss). (Pl. I. fig. 11.)

Crisidia vindobonensis, Reuss, Foss. Polyp. Wien. Tert. p. 54, pl. vii. fig. 25.

Unicrisia tenerrima, Reuss, Bryoz. von Crosaro, p. 279, pl. xxxiv. fig. 7.

This is clearly not Cyclostomatous, as Reuss supposed, and, although it differs in some respects from any living *Catenaria*, it seems to find its place among them. It is not articulated, and the connecting tube is broken off in various positions. The aperture is terminal and seems to have a very wide sinus on the proximal border.

Loc. Val di Lonte (Rss.); Brendola; Montecchio Maggiore; Ferrara di Monte Baldo.

2. CATENICELLA SEPTENTRIONALIS, sp. nov. (Pl. I. figs. 1-8.)

The globulæ are amphora-shaped, perforated on the front, with an acute avicularium at each upper corner. Oral aperture nearly orbicular, with the lower margin emarginate; the region round the aperture somewhat elevated. The dorsal surface is sometimes very slightly keeled.

From Montecchio Maggiore there are several uni- and bi-globulæ; but besides there is one with three zoecial cells (fig. 3), and another with four (figs. 4, 5). This is most interesting, as showing that

* Atti della Soc. Ital. di Sc. Nat. di Milano, 1861; and "Ueber d. Gliederung des Vicent. Tert.," Sitz. k. Akad. d. Wissenschaft., 1868.

† "Sur les Tert. de la Vénét.," Bull. Soc. Géol. France, sér. 2, vol. xxvii.

‡ Comptes Rendus de l'Acad. des Sc. vol. lxxxv. p. 259 & pp. 320.

short internodes containing one, two, or even three zoecia must not be made an absolute generic character, although all living forms are built up of these short beads. The range in this case supports such forms as *C. internodia*, Waters, and *C. continua*, W., being placed with the *Catenicellidæ*. Fig. 8 is a long internode with very long ovicells, but the structure of the zoecia and of the dorsal surface is the same as in those with shorter nodes, so that we seem to have a series from the uniglobular (fig. 1); though it may be a question whether fig. 8 should not be called a variety.

Loc. Montecchio Maggiore.

3. CATENICELLA CONTINUA, sp. nov. (Pl. I. figs. 9, 10.)

Zoarium with long internodes, zoecia on the anterior surface distinct; vittæ at each side of the zoecium, and a small triangular avicularium at each outer corner. Oral aperture rounded above, straight below, and there is either a suboral pore or a portion of the wall is thinner below the aperture. On the dorsal surface there is a curved vitta about the middle of the zoecium. In the long internodes and in other respects this is closely allied to *Catenicella internodia*, Waters (Quart. Journ. Geol. Soc. vol. xxxvii. p. 318, pl. xvi. figs. 78, 79), fossil from Curdies Creek, Australia, a form which I placed under *Catenicella* on account of the distinct vittæ; and the discovery of *C. septentrionalis*, Waters, with occasional multilocular internodes indicates that I was probably right in not separating the Australian fossil from the *Catenicellidæ*.

Loc. Fossil: Montecchio Maggiore; Brendola.

4. SCRUPOCELLARIA ELLIPTICA (Reuss). (Pl. I. figs. 16, 17.)

Bactridium ellipticum, Reuss, Foss. Polyp. Wien. Tert. p. 56, pl. ix. figs. 7, 8.

Scrupocellaria elliptica, Reuss, Bryoz. von Crosaro, p. 260, pl. xxix. fig. 3; Foss. Bryoz. Oest.-Ung. Mioc. p. 148, pl. xi. figs. 1-9.

Bactridium granuliferum, Reuss, Polyp. Wien. Tert. p. 56, pl. ix. fig. 6.

The specimen figured from Montecchio Maggiore has an avicularium below the aperture; but other specimens with the characteristic dorsal surface have no suboral avicularium, and it is an open question whether they should be specifically separated. In recent *Caberea* we find parts of the same colony with an avicularium to each zoecium, while in other parts they are only occasionally found. I cannot agree with Mr. Hincks in identifying the British form with the fossil, and would suggest that the former stands as *S. inermis*, Norm.

Loc. Val di Lonte (*Rss.*); Gaas, S. France; Austrian and Hungarian Miocene; Montecchio Maggiore.

5. SCRUPOCELLARIA GRACILIS, Reuss. (Pl. I. figs. 12, 13.)

Scrupocellaria gracilis, Reuss, Bryoz. von Crosaro, p. 260, pl. xxix. fig. 4; Reuss, "Fauna von Gaas," Sitzungsber. Ak. Wissensch. Wien, vol. lvii. p. 466.

A specimen from Montecchio Maggiore seems to be of this species. It is without avicularia on either surface ; but at the outer angle of each zoecium there has been a vibraculum (or strong spine), and the vibracular chamber is tubular. There has been a scutum over the front. I do not find in any of my specimens of *Scrupocellaria* from North Italy that there has been an avicularium at the outer angle. Reuss seems to have taken the vibraculum for an avicularium.

Loc. Val di Lonte and Gaas (*Rss.*); Montecchio Maggiore.

6. *SCRUPOCELLARIA BRENDOLENSIS*, sp. nov. (Pl. I. figs. 14, 15.)

The opesia aperture is about one half of the length of the zoecium ; near the middle on the inner side the aperture is contracted, no doubt by the base of the scutum ; below the aperture there is a triangular avicularium directed outwards ; at the upper outer angle there has been a vibracular appendage or a spine. On the dorsal surface there is a vibraculum to each zoecium, with the base attached in a small semicircular chamber near the inner edge of the zoecium.

This would seem related to *S. scabra*, but differs from it in not having any avicularium at the outer upper angle.

Loc. San Clementa (Montecchio Maggiore); Brendola.

7. *SCRUPOCELLARIA MONTECCHIENSIS*, sp. nov. (Pl. I. figs. 21, 22.)

The specimen figured cannot be identified with any of the others, and it therefore seems advisable to give it a name, though at best the determination of fragments of *Scrupocellariæ* is not very satisfactory.

The aperture is very large ; there has been no scutum ; and the vibracular chamber on the dorsal surface is very large, so that the external prolongation is also seen from the front.

Loc. Montecchio Maggiore.

8. *BACTRIDIDIUM HAGENOWI*, Reuss. (Pl. I. figs. 18, 19.)

Bactridium Hagenowi, Reuss, Foss. Polyp. Wien. Tert. p. 57, pl. v. fig. 28 ; Bryoz. von Crosaro, p. 266, pl. xxxi. figs. 5, 6.

The aperture is Schizoporellidan, with a wide sinus. The groove on the dorsal surface is usually very wide and deep, as figured by Reuss, but at other times there is not more than a divisional line.

In the mode of growth this seems nearly related to *Urceolipora* and to *Ichthyaria oculata*, B.

Loc. Val di Lonte (*Reuss & Waters*); Brendola ; Montecchio Maggiore ; Malo ; Lower Eocene of Mons (*Mun. & Perg.*).

9. *CELLARIA REUSSI*, d'Orb.

Cellaria marginata, Reuss (pars), Foss. Polyp. Wien. Tert. p. 59, pl. vii. fig. 29.

Vincularia Reussi, d'Orbigny, Pal. Fr. vol. v. p. 60.

Salicornaria Reussi, Reuss, Bryoz. von Crosaro, p. 261, pl. xxix. fig. 5.

There are only small fragments of this, which are without ovicells or avicularia, so that it is difficult to say which are its nearest allies; and in the absence of these characters there is nothing to distinguish it from *C. bicornis*, B., and *C. tenuirostris*, B., or *C. ovicellosa*, W.

At first Reuss united it with *C. fistulosa*; but he afterwards saw that they were distinct. Manzoni, however, subsequently considered them synonymous; but in this I cannot agree.

Loc. Val di Lonte and Montecchio Maggiore (*Rss.*); Miocene of Vienna (*Rss.*); Brendola; Crosaro.

ONYCHOCELLA.

Several attempts have been made to group the Membraniporæ into fresh genera, but there has been very little success, as divisions have so often been based, not on fresh characters, but only on variation in degree of common ones—as, for instance, the sloping inwards of the wall of the area, though no doubt fresh characters will ultimately be found permitting of a division of the genus.

There is, however, one section which may be separated, even though the limits scarcely admit of exact definition at present. It is only represented by two or three* living species; but was extremely abundant in Cretaceous times. Jullien† first attempted separation, based upon the nature of the large vicarious avicularia, of which the mandible is attached to the membranous cover, and there is no bar across the calcareous avicularian opening; also, as I have pointed out‡, there are free chitinous appendages at each side of the base of the mandible. The avicularian opening is, therefore, simple, and usually oval, or nearly round, and the mandibles, as far as known, are winged, and this also obtains in *Membranipora permunita*, *Micropora lepida*, H., and *Foveolaria falcifera*, B.

Jullien established a family, of which the generic divisions were based principally upon the outline shape of the zoarium, and partly upon the shape of the opesia; but these are very uncertain characters for generic divisions, as may be seen from my figure of the recent *Membranipora angulosa* §, and also in fossil specimens. On this account, I am quite unable to follow Jullien with regard to the other genera into which he divides his family, and only accept the genus *Onychocella*. Besides the points to which Jullien drew attention, I would add that in *Onychocella angulosa* there are trabeculæ bordering the operculum. This is general in *Cellaria*, as pointed out by Mr. Busk; and I have shown that it also occurs in *Selenaria maculata* ||; but when we go back to the Chalk we have in *Escharella argus*, d'Orb., a form which shows in a somewhat unexpected way the connection between *Onychocella* and *Cellaria*; for, in a specimen which I collected from Maastricht, there are teeth in the

* *Membranipora angulosa*, *Rss.*, and *Melicerita dubia*, Busk.

† "Nouv. Div. des Bryoz. Cheil.," Bull. Soc. Zool. France, vol. vi. 1881.

‡ Journ. R. Microsc. Soc. ser. 2, vol. v. p. 106, fig. 42.

§ Ann. Mag. Nat. Hist. ser. 5, vol. iii. pl. xiii. fig. 3.

|| Suppl. 'Challenger' Report, p. 37.

aperture, both on the proximal and distal edge. Although the "onychocellaires" (vicarious avicularia) are not quite as simple, and a tongue projects into the avicularian opening, yet in the main they agree with those of *O. angulosa*. From general appearance we should not have imagined a connection between the now widely separated genera *Cellaria* and *Onychocella*; but, having obtained the key in these minute characters, we seem to find the connection in other species as well.

Koschinsky* has made a genus, *Rhagasostoma*, which, it would seem, should be considered a synonym. The clefts (Spalten) shown at the side of the oral aperture in Koschinsky's figures are more marked than in any specimens which I have examined, and usually in *O. angulosa* there is nothing of the kind; but it sometimes occurs, and is then caused by the greater development of the lower lip. The slits at the side of the oral aperture in *Aspidostoma* are filled by the operculum, but this is not here the case.

10. *ONYCHOCELLA ANGULOSA* (Reuss), (non d'Orb.).

(a) Incrusting.

Cellepora angulosa, Reuss, Foss. Polyp. des Wien. Tert. p. 93, pl. xi. fig. 10.

Membranipora angulosa, Reuss, Bryoz. von Crosaro, pp. 253, 262, 291, pl. xxix. figs. 9-11; Foram. Anth. u. Bryoz. von Oberburg, p. 30; Bryoz. Oest.-Ung. Mioc. p. 185 (45), pl. x. figs. 13, 14; Foss. Fauna d. Olig. von Gaas, p. 470; Manzoni, Brioz. di Castrocaro, p. 8, pl. i. fig. 11; Brioz. foss. Ital. pt. 4, p. 9, pl. ii. fig. 10; Waters, Ann. Mag. Nat. Hist. ser. 5, vol. iii. p. 122, pl. xiii. fig. 3; Pergens, Plioc. Bryoz. von Rhodes, p. 16.

Membranipora antiqua, Busk, Quart. Journ. Micr. Soc. vol. vi. p. 262, pl. xx. figs. 1, 2.

? *Mollia antiqua*, Smitt, Floridan Bryozoa, p. 12, pl. ii. fig. 73.

? *Membranipora hexagona*, Busk, Quart. Journ. Microsc. Soc. vol. iv. p. 308, pl. xii. fig. 4.

Onychocella antiqua, Jullien, Bull. Soc. Zool. de France, vol. vi. p. 9.

Onychocella Marioni, Jullien, loc. cit. p. 7, woodcut.

Amphiblestrum angulosum, Pergens, Bryoz. von Wola Lu'zanska, Bull. Soc. Belg. de Géol. vol. iii. p. 67.

? *Rhagasostoma hexagonum*, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 30, pl. v. figs. 5-7.

(b) In *Vincularia* stage, Pl. I. fig. 20.

Eschara excavata, Reuss, Foss. Polyp. Wien. Tert. p. 72, pl. viii. fig. 36.

Biflustra excavata, Manzoni, Brioz. foss. Mioc. d'Aust. ed Ung. p. 67, pl. xiii. fig. 44.

Vincularia rojana, d'Orb. Pal. Fr. p. 108, pl. 602. figs. 12, 13, pl. 673. figs. 2, 3.

* Bryoz. ält. Tert. südl. Bayerns, p. 29.

Eschara Lamarcki, Hagenow, Bryoz. Maast. Kreide, p. 74, pl. ix. figs. 2, 3, 4.

Vincularia geometrica, Rss. Bryoz. von Crosaro, p. 276, pl. xxxiii. fig. 16.

Periteichisma geometrica, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 25.

Vincularia disparilis, Beissel, Bryoz. Aachener Kreide; Verh. Hollandsche Maat. d. Wetenschappen, pt. xxii. 1865, p. 15, pl. i. figs. 7, 8.

Comparative measurements of the zoecia show no difference between the incrusting form called *angulosa*, and the erect form named *excavata*; and Reuss (Bryoz. von Crosaro, p. 79) refers to *M. angulosa* in the *Biflustra*-stage.

From Brendola and the other localities there are many specimens which are at first incrusting, and then free in the *geometrica*-form; but the almost cylindrical *M. excavata* passes by gradations into compressed *Biflustra*-like forms. The *M. sexangularis*, Goldf., of the Maastricht Chalk is of about the same size, and at one time I was inclined to unite them; but the surface of the zoecium is almost flat in *sexangularis* instead of depressed, and the zoecia being proportionally shorter, there results a more regular hexagonal appearance.

Probably, besides the above synonyms, many others should be added, as *Vincularia excavata*, d'Orb. *loc. cit.* p. 69; *V. santoniensis*, d'Orb., p. 73; *V. leda*, d'Orb., p. 88; *Eschara acmon*, d'Orb., p. 115; *E. allica*, d'Orb., p. 125; *E. arcas*, d'Orb., p. 127; *E. actæa*, d'Orb., p. 116; *E. arethusa*, d'Orb., p. 127.

Loc. Cretaceous: Maastricht; Royan, &c. Lower Tertiary: Val di Lonte; Brendola; Montecchio Maggiore; Crosaro; Priabona; Novezzina; Malo; Oberburg; Gaas; Nussdorf, near Vienna (*Manz.*); Götzreuth; Wola Lu'zanska; Dego; Turin, &c. Pliocene: Italy; Sicily; Rhodes. Living: Mediterranean; Madeira; Ile de France; Florida (?).

VIBRACELLA, gen. nov.

The *Flustrellaria trapezoidea* of Reuss is an extremely interesting form, as in respect of the zoecia it seems connected with *Onychocella*; but, instead of the vicarious avicularia, there are cells scattered among the zoecia, which I should call vicarious vibracular cells. The beak-like prolongation is wanting, and instead one side of the vicarious cell is very much raised, indicating a vibracular appendage, similar to that of *Cupularia*, in which genus the one side is in the same way usually "auriform." The *F. trapezoidea* cannot, on account of these vibracula, be placed with *Onychocella*, as at present defined; to leave it with *Membranipora* after removing *Onychocella* could only be a provisional arrangement; and *Flustrellaria* was made to include free-growing forms of the *Onychocella* type; so that, although reluctant to do so, until we know more of its allies, I propose the genus *Vibracella* for forms in which the zoecia have moderately large opesial openings, and in which there

are vicarious eared vibracular cells. The only species is *V. trapezoidea* (Reuss).

11. VIBRACELLA TRAPEZOIDEA (Reuss). (Pl. I. fig. 23.)

Cellepora trapezoidea, Reuss, Foss. Polyp. Wien. Tert. p. 96, pl. xi. fig. 21.

Flustrellaria trapezoidea, Reuss, Bryoz. von Crosaro, p. 268, pl. xxix. fig. 14.

The most important points have been dealt with when describing the genus.

As a rule, the zoarium is discoid or conical, but from some specimens it would seem to sometimes grow in larger flat pieces. Reuss, in his first description, says "incrusting;" but in his second he figures and describes it as free. One specimen from Brendola is incrusting, but all the others are free.

Selenaria miocenica, Seguenza, may be this or *Onychocella angulosa*; also *Flustrellaria hexagona*, d'Orb., from the Senonian, seems very closely allied; but in the absence of vibracula or avicularia it is in both cases impossible to say whether they are identical.

Loc. Val di Lonte (Reuss and my collection); Brendola; Montecchio Maggiore; Bocca di Sciesa; Ferrara di Monte Baldo; Malo.

12. MEMBRANIPORA MACROSTOMA (Reuss).

Cellaria macrostoma, Reuss, Foss. Polyp. Wien. Tert. p. 64, pl. viii. figs. 5, 6.

Bifustra macrostoma, Reuss, Bryoz. von Crosaro, p. 274, pl. xxxiii. figs. 12, 13.

Flustrellaria macrostoma, Manzoni, Brioz. foss. Mioc. d'Aust. ed Ung. p. 67, pl. xiii. fig. 46.

? *Membranipora macrostoma*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 323, pl. xiv. figs. 18, 19; Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 22.

Vaginopora texturata, Reuss, Foss. Polyp. Wien. Tert. p. 73, pl. ix. fig. 1.

Flustrellaria texturata, Reuss, Foss. Fauna von Wieliczka, p. 119; Manzoni, Brioz. foss. Mioc. d'Aust. ed Ung. p. 67, pl. xiii. fig. 45.

Bifustra papillata, Stoliczka, Foss. Bryoz. Orakei Bai, p. 154, pl. xx. fig. 14.

From Brendola there is a fragment of *M. concatenata*, Rss., either in a single free layer or with two layers back to back; and, as pointed out by Koschinsky, the zoecia are the same as those of *M. macrostoma*, both in shape and size. There are also some fragments with squarer zoecia, which should perhaps be called *M. Savartiæ*, Aud.

Loc. Val di Lonte; Montecchio Maggiore; Brendola; Ferrara di Monte Baldo; Ronzo; Nussdorf, &c. (Manz.); Wieliczka (Rss.); Götzreuth (Kosch.).

13. MEMBRANIPORA TENUIROSTRIS, Hincks.

Membranipora tenuirostris, Hincks, Ann. Mag. Nat. Hist. ser. 5,

vol. vi. p. 70, pl. ix. fig. 3; *op. cit.* vol. x. p. 7; Waters, Journ. R. Microsc. Soc. ser. 2, vol. v. p. 755, pl. xiv. fig. 41.

Membranipora Flemingii, Waters, Ann. Mag. Nat. Hist. ser. 5, vol. iii. p. 122, pl. xiii. fig. 2.

Loc. Living: Mediterranean; Madeira; Queen Charlotte Island. Fossil: Val di Lonte; Montecchio Maggiore.

14. MEMBRANIPORA DUMERILII (Aud.). (Pl. II. fig. 4.)

For synonyms, see Hincks, Brit. Mar. Polyz. p. 156.

Membranipora Dumerilii, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 21.

Membranipora bicornis, Manzoni, Form. Terz. di Reggio, p. 80, pl. viii. fig. 10.

The Vicentine specimens may be taken as fairly typical, *M. Dumerilii* having two avicularia above the ovicell, and zoecia without an ovicell, having either one or two avicularia. This is very similar in shape to *M. appendiculata*, but is much smaller, the opesia being only about 0.35 millim. long. I described a fossil from New Zealand (Quart. Journ. Geol. Soc. vol. xliii. p. 45) as *M. Dumerilii*, although somewhat divergent from the type.

Loc. Living: European Seas. Fossil: Crag; Pliocene of Calabria; Waipukerau, New Zealand (?); Brendola; Montecchio Maggiore; Val di Lonte; Götzreuth (*Kosch.*).

15. MEMBRANIPORA ROSSELLI (Aud.). (Pl. II. figs. 1, 2.)

Flustra Rosselli, Audouin, in Savigny's 'Egypte,' p. 240, pl. x. fig. 11.

Membranipora Rosselli, Waters, Ann. Mag. Nat. Hist. ser. 5, vol. iii. p. 121; Hincks, Brit. Mar. Polyz. p. 166, pl. xxii. fig. 4 (which work see for synonyms).

Cellepora deplanata, Reuss, Foss. Polyp. Wien. Tert. p. 96, pl. xi. fig. 20.

Membranipora deplanata, Reuss, Bryoz. von Crosaro, p. 263, pl. xxix. fig. 12.

Periteichisma deplanatum, Koschinsky, Foss. Bryoz. südl. Bayerns, p. 26.

A colony from Brendola has a slightly raised small hood-like ovicell. There are a few zoecia (fig. 1 *a*) nearly double the width of ordinary zoecia, and they cannot be considered ovicelligerous, seeing that there are ovicells; but perhaps irregularities on the surface on which they are growing has caused this difference in size. There are, besides, in some specimens raised giant zoecia, occupying about the space of three zoecia. As the living *M. Rosselli* is pretty regular, perhaps we should call this var. *deplanata*.

Loc. Living: Britain; Mediterranean. Fossil: Pliocene of Italy and Sicily; Miocene of Vienna Basin; Val di Lonte; Montecchio Maggiore; Brendola; Götzreuth (*Kosch.*).

16. MEMBRANIPORA PATELLARIA (Moll).

Eschara patellaria, Moll, Die Seerinde, p. 75, pl. iv. fig. 20.

Diachoris simplex, Heller, Bryoz. Adriat. Meeres; Verh. k. k. zool.-Bot. Gesellsch. vol. xvii. 1867, p. 94, pl. i. fig. 4.

Mollia patellaria, Smitt, Floridan Bryoz. p. 12, pl. ii. fig. 72.

Diachoris patellaria, Waters, Ann. Mag. Nat. Hist. ser. 5, vol. iii. p. 120, pl. x. figs. 6-9.

The fossil from Montecchio Maggiore is a very typical *M. patellaria*, with six connecting-tubes.

Loc. Living: Naples; Florida. Fossil: Montecchio Maggiore.

17. MEMBRANIPORA APPENDICULATA (Reuss). (Pl. II. fig. 3.)

Cellepora appendiculata, Reuss, Polyp. Wien. Tert. p. 96, pl. xi. fig. 22.

Membranipora appendiculata, Reuss, Fauna deutsch. Oberoligoc. p. 631, pl. ix. fig. 4; Oest.-Ung. Mioc. p. 181, pl. ix. figs. 13-16; Foram. Anth. Bryoz. Septarienthones, p. 171; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 504, pl. xxii. figs. 2-5; Seguenza, Form. Terz. Prov. di Reggio, Accad. dei Lincei, vol. cclxxvii. p. 80; Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 23.

Membranipora cyclops, Busk, Catal. Mar. Polyz. p. 61, pl. lxx. fig. 3.

Membranipora monopora, Reuss, Bryoz. von Crosaro, p. 262, pl. xxix. fig. 7.

A specimen from Montecchio Maggiore has wide (0.5 millim.) oval opesia, below which there is a single raised avicularium placed laterally. The determination of simple *Membraniporæ* is seldom very satisfactory, and in the present case it is doubtful whether this is not the same as *M. rhynchota*, Busk.

Loc. Brendola; Val di Lonte (*Rss.*): Montecchio Maggiore.

18. MEMBRANIPORA HOOKERI, Haime.

Membranipora Hookeri, Reuss, Bryoz. von Crosaro, p. 252, pl. xxix. figs. 6, 8, and my coll.

The opesia are about 0.35 millim. long and 0.2 millim. wide.

Loc. Crosaro (*Rss.*); Val di Lonte (*Rss.*); Montecchio Maggiore (*Rss.*); India (*Haime*).

19. MICROPORA CORIACEA (Esper). (Pl. II. fig. 9.)

Micropora coriacea, Hineks, Brit. Mar. Polyz. p. 174 (which see for synonyms).

Membranipora gracilis, Reuss, Bryoz. von Crosaro, p. 291, pl. xxix. fig. 13.

Besides those specimens with elliptical zoëcia, there is one from Val di Lonte with the sides parallel, and this I suppose must also be united with the *M. gracilis* (von Münster).

Loc. Living: Britain; Florida; Azores. Fossil: Brendola; Montecchio Maggiore; Val di Lonte; Pliocene of Calabria (*Manz.*).

20. *MICROPORA POLYSTICHA* (Reuss). (Pl. II. fig. 7.)

Cellaria polysticha, Reuss, Foss. Polyp. Wien. Tert. p. 61, pl. vii. fig. 33.

Eschara polysticha, Reuss, Bryoz. von Crosaro, p. 269, pl. xxxii. fig. 3.

? *Steganoporella similis*, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 34, pl. i. figs. 8-10.

The zoaria vary considerably in the number of rows of zoecia. The zoecia are elongate, and about the same size and shape as those of *Micropora parallela*, but differ from that species in the absence of avicularia and in having opesiules. The opesiules in some parts are not apparent, and in different specimens vary in position, occurring sometimes about the middle of the zoecium, but more usually only about one quarter of the way down.

Although the zoecia of *Steganoporella similis*, K., are a trifle larger, the characters are similar, and probably they should be united.

Loc. Val di Lonte (*Rss.*); Brendola; Ferrara di Monte Baldo; Montecchio Maggiore; Götzreuth (*Kosch.*).

21. *MICROPORA PARALLELA* (Reuss). (Pl. II. fig. 8.)

Eschara parallela, Reuss, Bryoz. von Crosaro, p. 272, pl. xxxiii. fig. 2.

When properly cleaned a small triangular avicularium near the oral aperture, directed downwards, is distinctly seen. Ovicell not much raised, wider than a zoecium; apparently there has been an area on the front. When sections are being made, the shell just above the avicularium is seen to be thinner than the surrounding parts, often giving the appearance of a peristomial notch, and this can also be seen in some specimens without preparation. Zoecia at the side of the zoarium alternate.

The avicularia were overlooked by Reuss, and since they do not occur on all zoecia, and may be covered by the matrix, it often appears as if there was only a pore, as described by Reuss; and Pergens, thinking this was the case, has made the genus *Houzeauvina* for a fossil which he considered the same as the *E. parallela* of Reuss. This is probably not identical with the Vicentine fossils, as M. Pergens writes that the hole was "complet," and that there was no avicularian chamber; and no doubt I may be allowed to say that, after seeing a specimen from my collection, he agrees with my view.

Loc. Val di Lonte; Brendola; Montecchio Maggiore; Crosaro; Novezzina.

22. *MICROPORA ARTICULATA*, sp. nov. (Pl. II. figs. 5, 6.)

Specimens from Montecchio Maggiore are about the same size as the recent *M. ratoniensis**, Waters, from New Guinea. Although

* It should have been *katowensis*, but the name of the locality was read Raton, and there does not now seem any reason to change it. Mr. Whitelegge informs me that he has found it recent from Singapore.

the zoecia are not always arranged quite as diagonally as in that recent form, yet the diagonal arrangement is usually seen. The fossil differs from the recent species in the shape of the "special organs," which, instead of being a small triangular avicularium placed diagonally, seems to have been a vibraculum; at any rate, below the zoecial area there is an eminence with two almost equal pores in the line of the zoarial axis.

There is a suboral slit on one side only of the area. The zoecia are usually arranged on the four sides of the axis; but in one case they are only on two sides, in this respect resembling *Diplodidymia complicata*, Reuss., from the "Oligocän" of Gaas, and the *Cellularia diplodidymoides* of Meunier and Pergens from the Chalk. We have thus four closely allied forms, with similar-shaped zoecia, placed diagonally, with a long suboral slit on one side and a special organ below the aperture.

23. MICROPORA CUCULLATA (Reuss).

Cellaria cucullata, Reuss, Foss. Polyp. Wien. Tert. p. 60, pl. vii. fig. 31.

Vincularia cucullata, Manzoni, Brioz. foss. Mioc. d'Austr. ed Ung. p. 69, pl. xv. fig. 50, pl. xvi. fig. 53.

Eschara costata, Reuss, loc. cit. p. 72, pl. viii. fig. 37.

Eschara Reussi, Stoliczka, Olig. Bryoz. von Latdorf, p. 88; Reuss, Fauna des deutschen Oberoligocäns, p. 36.

Vincularia Haidingeri, Reuss, Bryoz. von Crosaro, p. 275, pl. xxxiii. figs. 14, 15.

Biflustra sulcata, Gottardi, Brioz. foss. di Montecchio Maggiore; Atti d. Soc. Veneto-Trentina di Sc. Nat. vol. ix. fasc. ii. p. 305, pl. xiv. fig. 2.

Steganoporella elegans, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 33.

? *Eschara elegans*, M.-Edw. Ann. Sc. Nat. sér. 2, vol. vi. p. (17) 337, pl. xii. fig. 13.

Micropora cucullata, Pergens, Bryoz. von Wola Lu'zanska, p. 67.

Salicornaria (Cellaria) cucullata, Gioli, Brioz. Neogenici dell' Isola di Pianosa; Atti Soc. Tosc. Sc. Nat. vol. x. p. (10).

Besides the erect zoaria in the *Vincularia*-form, there are incrusting specimens from both Val di Lonte and Brendola. In the erect and incrusting zoaria the ordinary zoecia are similar in size and shape; but the zoecia which we conclude are ovicelligerous are somewhat larger and wider in the incrusting specimens; perhaps, however, this is to be accounted for by the conditions of growth. The large zoecia have a large shelf above the aperture. The proximal edge in the ordinary zoecia is much thinner than the distal border, but is continuous, so that the appearance is entirely that of *Micropora*; on the other hand, the broad ovicellular cells are like those of recent *Steganoporella magnilabris*, and I am unable to find grounds for separating these two genera.

A specimen of *Eschara Egæa*, d'Orb., from Royan has similar larger ovicelligerous cells.

Loc. Several Miocene localities in Austria and Hungary. Val di Lonte; Brendola; Montecchio Maggiore; Ferrara di Monte Baldo; Ronzo; Crosaro; Priabona; Malo; Götzreuth (*Kosch.*), Latdorf; Wola Lu'zanska; Astrupp (Miocene), Pianosa (Miocene).

24. CRIBRILINA RADIATA (Moll).

There is considerable variation in the appearance of various specimens, caused by difference in the number of costæ; and in some cases vicarious avicularia are present; also some specimens from Val di Lonte and Brendola have the lower lip somewhat raised, and at each side of the aperture there is a small avicularian or vibracular opening, giving the appearance of *C. puncturata* of Busk.

The pores between the costæ are more numerous than in *C. Haueri*, Reuss, though, when crushed, they look like Reuss's figure 16, pl. xxxii., which he calls *E. Haueri*, but I have only seen this shape of zoecia in incrusting forms; and stems of other Bryozoa are often so completely covered that without careful examination they might be taken for erect specimens.

Loc. Living: Cosmopolitan. Fossil: Val di Lonte; Brendola; Montecchio Maggiore; Novezzina; Söllingen; Wola Lu'zanska; various Austrian and Hungarian Miocene localities. Pliocene: Crag; Italy; Sicily; and Rhodes. Recent, Australia.

25. CRIBRILINA CHELYS, Koschinsky. (Pl. II. fig. 10.)

Celleporaria radiata, Reuss (*non* Moll), Bryoz. von Crosaro, p. 292, pl. xxx. fig. 9.

Cribrilina chelys, Koschinsky (nom. nov.), Bryoz. ält. Tert. südl. Bayerns, p. 36; Pergens, Bryoz. von Wola Lu'zanska, p. 70.

There is a large oval avicularium at one or both sides of the zoecium, and the large pores around the area are irregularly placed. What Reuss described as the large pore above the aperture is an avicularium, that of one zoecium often being situated above the aperture of its neighbour. There are also a few very large vicarious avicularia. The ovicell is very large, but slightly raised, and has an irregularly perforated area on the front, and reminds us of the ovicell of *Leprulia occlusa*, B. The ovicell and vicarious avicularium are added to fig. 10 from different parts of the colony. There is considerable difference in the appearance of various parts of the colony, as in some parts the avicularia are very numerous, but elsewhere absent, and there are sometimes irregular pores at the side of the zoecium; but in no case have I seen the regularity figured by Reuss, and probably a worn specimen was examined, and then the artist used his imagination. I have specimens incrusting other objects in a single layer; but, as a rule, there are several layers superimposed.

Loc. Priabona (*Rss.*); Brendola; Val di Lonte; Grancona; Götzreuth (*Kosch.*); Wola Lu'zanska (*Perg.*).

26. CRIBRILINA CRENATIMARGO (Reuss).

Cellaria Haueri, Reuss, Foss. Polyp. Wien. p. 63, pl. viii. fig. 9.

Eschara crenatimargo, Reuss, *op. cit.* p. 72, pl. viii. fig. 38.

Cribrilina crenatimargo, Pergens, Bryoz. von Wola Lu'zanska, p. 69.

Eschara Haueri, Reuss, Bryoz. von Crosaro, p. 271, pl. xxxii. figs. 14-16.

The zoecial characters are very similar to those of *C. radiata*, Moll, but the zoecia are more elongate, the costæ are nodulated, and the number of pores between the costæ is fewer than in the fossil *C. radiata*. The front is often depressed, as shown by Reuss, *op. cit.* pl. xxxii. fig. 15; but this seems to arise from the front wall being thin and pressed in. The erect form of *Cribrilina* is unknown living; but it is possible that this should be looked upon as erect *C. radiata*, Moll.

The specific name *Haueri* has been given to another *Cribrilina*, the *Lepralia Haueri*, Rss. (Bryoz. Oest.-Ung. Mioc. p. 170, pl. i. figs. 1, 2), and it therefore seems better to drop the name *Haueri*.

Loc. Val di Lonte; Brendola; Montecchio Maggiore; Ferrara di Monte Baldo; Malo; Wola Lu'zanska (*Pergens*); Pap-Patak, Hungary (*Perg.*); Siebenbürgen (*Perg.*).

27. MONOPORELLA SPARSIPORA (Reuss). (Pl. II. fig. 11.)

Lepralia sparsipora, Reuss, Bryoz. von Crosaro, p. 263, pl. xxx. fig. 1.

Homalostega exsculpta, Marsson, Die Bryoz. der weiss. Schreibkreide der Insel Rügen, p. 95, pl. x. fig. 2.

From Val di Lonte this occurs both in an incrusting and in a compressed *Eschara*-form; from Montecchio Maggiore it is in the *Eschara*-form, and from Brendola it is incrusting. Ovicells plain, very wide, globose, moderately raised. *Lepralia nuda*, Reuss (Oest.-Ung. Mioc. p. 33), appears closely related.

Loc. Priabona (*R.*); Val di Lonte; Brendola; Montecchio Maggiore; Ferrara di Monte Baldo; Malo; Rügen (Cretaceous, *Marsson*).

28. LEPRALIA SUBCHARTACEA (d'Arch.). (Pl. II. fig. 12.)

Eschara subchartacea, d'Arch. Mém. Soc. Géol. France, sér. 2, vol. iii. p. 410, pl. ix. fig. 2; Reuss, Bryoz. von Crosaro, p. 269, pl. xxxii. fig. 4.

Eschara chartacea, d'Arch. *op. cit.* vol. ii. p. 196, pl. v. fig. 13.

Cellaria stenosticha, Reuss, Foss. Polyp. Wien. Tert. p. 64, pl. viii. fig. 10.

Eschara stenosticha, Reuss, Bryoz. von Crosaro, p. 269, pl. xxxii. fig. 2.

The thin compressed form described by Reuss as *subchartacea* is fairly common in Brendola, but not in the other localities; and to some zoecia there is a small avicularium within the depression for the oral aperture, and also there is sometimes an avicularium on the middle of the zoecium. The branches spread out in a somewhat fan-shaped manner, at first being about 2 millim. wide, and

expanding to about 10 millim. The cylindrical form, which may be also with or without avicularia, is less common, and was described as *E. stenosticha*. Lateral teeth are seen within the oral aperture. Zoecia at the side alternate.

Loc. Val di Lonte and Pyrenees (*Rss.*); Brendola; Montecchio Maggiore; Pap-Falvi-Patak, Hungary (*Perg.*).

29. *LEPRALIA SEMILÆVIS* (Reuss).

Eschara semilævis, Reuss, Bryoz. von Crosaro, p. 270, pl. xxxii. figs. 7, 8.

Eschara larva, Reuss, Foss. Polyp. Wien. Tert. p. 69, pl. viii. fig. 29; Pergens, Bryoz. von Wola Lu'zanska, p. 70.

Eschara Suessi, Reuss, Bryoz. von Crosaro, p. 270, pl. xxxii. fig. 9; Pergens, *op. cit.* p. 70.

Eschara intermedia, Gottardi, Bryoz. foss. di Montecchio Maggiore; Atti della Soc. Veneto-Trentina di Sc. Nat. vol. ix. p. 307, pl. xiv. fig. 6.

At the side of the aperture there is usually on one or both sides a narrow spatulate avicularium, placed either slightly diagonal or directed straight upwards. The characteristic avicularia and ovicells occur in specimens both with the zoarial growth of *semilævis* and *Suessi*, showing that Reuss was right in thinking that these two might be only varieties of growth. In one specimen the bases of five spines round the aperture are very distinct, the lower two being the largest, and these two are figured by Gottardi in his *E. intermedia*.

The zoecia seen at the side of the colony are alternate.

Loc. Val di Lonte (*Rss. & Waters*); Brendola; Montecchio Maggiore; Priabona; Novezzina; Ronzo; Wola Lu'zanska in Galicia (*Perg.*); several localities in Hungary (*Perg.*).

30. *LEPRALIA BISULCA* (Reuss). (Pl. II. figs. 16-18, & Pl. III. fig. 1.)

Eschara bisulca, Reuss, Bryoz. von Crosaro, p. 270, pl. xxxii. fig. 10.

? *Schizoporella bisulca*, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 49.

Eschara microdonta, Reuss, *op. cit.* p. 271, pl. xxxii. fig. 13.

Eschara fenestrata, Reuss, *op. cit.* p. 290, pl. xxxii. fig. 5.

This is an extremely interesting form on account of the great difference in shape between the ordinary and ovicelligerous zoecia. In the aperture there is usually an avicularium; and in this respect, and also in the elevation at the side of the aperture, it resembles *Smittia* (*Porella*) *cervicornis*. Sometimes this avicularium takes a spatulate form, and may be depressed (as in Pl. II. fig. 17), or may be much elevated (fig. 16). In many other species, in the same way, a small oral avicularium is sometimes replaced by a large spatulate one, as for instance in *Schizoporella auriculata* and *Porella cervicornis*, &c. Occasionally, instead of the elevation at the side of the aperture, two teeth are formed within it (Pl. III. fig. 1).

The ovicelligerous zoecia, instead of being parallel with the axis of the zoarium, turn at right angles to it, and are much raised in their distal end, with the ovicell somewhat recumbent behind the peristome. In the form of the aperture and the ovicells this is closely related to *L. nodulifera* (Rss.). Pl. II. fig. 16 is the *L.-microdonta*-form, with the row of fine linear pores round the border, and the separating ridges running in to the aperture, with the avicularia and ovicells resembling those of more typical *L. bisulca*.

I do not feel at all sure from the description that Koschinsky had the same thing before him.

Loc. Val di Lonte and Montecchio Maggiore (*Rss. & Waters*); Brendola (*Waters*); Ferrara di Monte Baldo (*W.*); Novezzina; Malo; Ronzo (*W.*); Crosaro (*W.*); Götzreuth? (*Kosch.*); several Hungarian localities (*Perg.*).

31. *LEPRALIA NODULIFERA* (Reuss). (Pl. II. figs. 13, 14.)

Eschara nodulifera, Reuss, Bryoz. von Crosaro, p. 271, pl. xxxii. figs. 11, 12.

Periteichisma noduliferum, Koschinsky, Foss. Bryoz. ält. Tert. südl. Bayerns, p. 27.

Amphiblestrum noduliferum, Pergens, Bryoz. von Wola Lu'zanska, p. 67.

The aperture is slightly rounded below, and sometimes the thick calcareous growth of the divisional walls extends round the aperture, but sometimes it only occurs above the aperture. In some cells the proximal end is raised, and in one colony there are ovicells behind the aperture of such zoecia. In one case there seems to be a raised avicularium at the border of the zoecium, but I cannot speak with certainty about it.

This seems to have nothing in common with the other *Periteichismæ* of Koschinsky; and the genus appears based on the nature of the calcification rather than upon characters of much value; in fact some have an opesial opening, but in others, as in *nodulifera*, the aperture has, no doubt, been closed by an operculum.

Loc. Val di Lonte and Montecchio Maggiore (*Rss.*); Brendola (*Waters*); Ferrara di Monte Baldo (*W.*); Ronzo (*W.*); Priabona; Götzreuth (*Kosch.*); Wola Lu'zanska (*Perg.*).

32. *LEPRALIA IMPRESSA* (Reuss). (Pl. II. fig. 15.)

Vincularia impressa, Reuss, Bryoz. von Crosaro, p. 276, pl. xxxiv. fig. 2.

Amphiblestrum impressum, Pergens, Bryoz. von Wola Lu'zanska, p. 67.

On a specimen from Brendola there is a raised round ovicell above the aperture, perforated with pores somewhat more crowded than those on the front of the zoecium. In some cases there is an avicularium at one side below the aperture, and then it looks like an early stage of *Cellepora proteiformis*, Rss.

Loc. Val di Lonte; Brendola; Wola Lu'zanska (*Perg.*).

33. *LEPRALIA EXCENTRICA*, Reuss.

Lepralia excentrica, Reuss, Fauna deutsch. Oberoligoc. p. 28, pl. xv. fig. 4; Fauna des Septarienthones, p. 175, pl. viii. fig. 2; Bryoz. von Crosaro, p. 256.

? *Cumulipora angulata*, Reuss, Fauna des Septarienthones, p. 179, pl. viii. fig. 12.

A cylindrical zoarium from Montecchio Maggiore, with the zoecia distinct, with broad radial grooves round the border, and a raised suboral pore, would seem to be the *L. excentrica* of Reuss; but so many species have been described with similar zoecia that no doubt there are many synonyms. The specimen from Montecchio Maggiore has large spatulate vicarious avicularia.

Loc. Söllingen; Oberoligocän of Doberg; Crosaro (*Rss.*); Montecchio Maggiore.

34. *LEPRALIA* (?) *SYRINGOPORA* (Reuss). (Pl. III. figs. 2, 3, 4.)

Eschara syringopora, Reuss, Foss. Polyp. Wien. Tert. p. 68, pl. viii. fig. 23; Bryoz. von Crosaro, p. 269, pl. xxxii. fig. 1.

Schizoporella perspicua, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 49, pl. iv. fig. 3.

? *Eschara minor*, Reuss, Bryoz. von Crosaro, p. 272, pl. xxxiii. fig. 4.

? *Eschara polystomella*, Reuss (*non* Manz.), Foss. Polyp. p. 70, pl. viii. fig. 28.

? *Eschara semitubulosa*, Reuss, Bryoz. von Crosaro, p. 272, pl. xxxiii. fig. 3.

This is an extremely interesting species on account of the peculiar bar across the aperture.

Zoarium in the *Eschara*-form; branches small, compressed, with the zoecia of the two layers opposite. Zoecia elongate, the upper end slightly projecting, and a row of large pores down each side of the zoecium. In the central cells these rows are near together, but in the outer zoecia there is a considerable space between them. About the middle of the oral aperture on each side there is a pore, and in many cases a bar across, as figured by Stoliczka in his *Escharifora ornatissima* (Bryoz. von Latdorf, p. 86, pl. ii. fig. 7), but the shape of the zoecia in that species is hexagonal.

Reuss in his second paper figures his *E. syringopora* with the oral pores lower than the aperture; and sometimes when the aperture is somewhat broken down it has this appearance.

There are sometimes also other large pores on various parts of the surface, usually one about halfway down, and these may be avicularian.

In some specimens there are "closures" over the aperture, and these have a tubule in the centre similar to those of so many *Diatopora*, &c. This is at a higher level than the operculum.

It is abundant at all the stations.

Loc. Val di Lonte and Montecchio Maggiore (*Rss.*); Brendola;

Ferrara di Monte Baldo ; Ronzo ; Priabona (*Kosch. & W.*) ; Götzreuth (*Kosch.*) ; Malo.

35. *LEPRALIA* (?) *BERICENSIS*, sp. nov. (Pl. III. fig. 18.)

From Bocca di Sciesa, Colle Berici, there are specimens with *Cupularia*-growth, the disks measuring 10–15 millim. in diameter.

The zoecia are ovoid to hexagonal, separated by a distinct ridge, with a row of large pores round the border ; and in a few zoecia there is a small avicularium at one or both sides of the aperture. The oral aperture is rounded on the distal edge, and the proximal border curves inwards, reminding us of the aperture of *Lepralia castanea*, Busk.

36. *LEPRALIA* (?) *LONTENSIS*, sp. nov. (Pl. III. fig. 5.)

Zoarium very thin and delicate, with the zoecia at the side of the colony opposite. Zoecia long, bordered by a row of pores, with the peristome projecting in a tubular form, within the wall of which there is on one side a small tube, which may be avicularian, and reminds us of the avicularian tube of a group of *Celleporæ* represented by *C. granum*, H.

I am unable to identify this with any of Reuss's species, though, as it is abundant, it must have come into his hands. At first, I thought it was his *semitubulosa*. It also looks very much like the *Eschara syringopora* of Reuss in Foss. Polyp. Wien. Tert. pl. viii. fig. 3 ; and it seems somewhat doubtful whether he then had the *E. syringopora* of his later paper before him. *Eschara fistulosa*, Rss., in the same paper may be this species.

Loc. Val di Lonte ; Montecchio Maggiore ; Brendola ; Ronzo ; Ferrara di Monte Baldo ; Crosaro ; Malo.

37. *SMITTIA COCCINEA* (Abild.). (Pl. III. fig. 8.)

Several incrusting specimens from Brendola and Montecchio Maggiore show great range in the size of the avicularia ; some having a small one at each side, while others have them directed forwards as in fig. 8.

Widely distributed, both living and fossil.

38. *SMITTIA COCCINEA* (Abild.), var. *ALIFERA* (Reuss). (Pl. III. fig. 7.)

Eschara alifera, Reuss, Bryoz. von Crosaro, p. 274, pl. xxxiii fig. 11.

Mucronella alifera, Pergens, Bryoz. von Wola Lu'zanska, p. 71.

The branches from Brendola are pretty uniform in breadth, but those from Val di Lonte are irregular in size. The pores round the borders of the zoecia are much more distinct than is usually the case in *M. coccinea*, although they occur in living forms. In most zoecia there is an avicularium at each side, but in others there is only one, and there is considerable difference in size and direction. Ovicell usually very much immersed, sometimes more exposed and recumbent.

In the size of the zoecia the living and Eocene forms agree, and

the incrusting *Mucronella loricata* of Koschinsky and *M. prestantis*, H., are closely allied. It is considered a variety of *S. coccinea* on account of its erect growth, and may be said to be *S. coccinea* in the *Eschara*-form; but it is *Mucronella* for those who retain that genus.

Loc. Val di Lonte; Brendola; Montecchio Maggiore; several localities in Hungary (*Pergens*); Wola Lu'zanska (*Pergens*); Ferrara di Monte Baldo; Ronzo; Malo.

39. SMITTIA LANDSBOROVII (Johnst.), var. *CHEILOPORA*, Rss. (Pl. III. fig. 12.)

Cellepora cheilopora, Reuss, Polyp. Wien. Tert. p. 91, pl. xi. fig. 4.

Lepralia cheilopora, Reuss, Foss. Bryoz. Oest.-Üng. Mioc. p. 168, pl. iv. fig. 1.

Peristome considerably raised, and within the aperture a projecting avicularium. There are pores around the border of the zoecium, and on the round raised ovicells there are also a few large pores.

This seems closely allied to the recent form from New South Wales which I described (Ann. Mag. Nat. Hist. ser. 6, vol. iv. p. 16, pl. iii. figs. 14 and 15) as *S. malleolus*, and both are about the same size, but the recent form is punctured over the surface.

Loc. Satschan (Moravia); Brendola.

40. SMITTIA PORRIGENS (Reuss). (Pl. III. fig. 9.)

Lepralia porrigens, Reuss, Foram. Anth. und Bryoz. des Septarienthones, p. 175, pl. vii. fig. 15.

There are incrusting specimens from Montecchio Maggiore and Brendola, which are probably the *S. porrigens* of Reuss, but have perhaps received various other names. It has a wide lyrula plate in the aperture and a round suboral avicularium; pores round the border of the zoecia very indistinct; ovicell globular, recumbent or partly immersed, and punctured.

Probably this is *Lepralia Seguenzai*, Reuss (Bryoz. von Crosaro, p. 254, pl. xxxvi. fig. 11).

Loc. Söllingen; Montecchio Maggiore; Brendola.

41. SMITTIA EXARATA (Reuss). (Pl. III. fig. 6.)

Cellaria exarata, Reuss, Foss. Polyp. Wien. Tert. p. 61, pl. vii. fig. 32.

Vincularia exarata, Reuss, Bryoz. von Crosaro, p. 276, pl. xxxiv. fig. 1.

The zoecia are slightly rounded, and there is a row of pores close to the border. The oral aperture is at some distance from the surface, and I have been able to make out a wide denticle within it; but the proximal edge of the peristomatal aperture also bends inwards, and might be called a mucro. The ovicells are short and usually considerably immersed. This may be allied to *Brachybridia geometrica* (Rss.).

Loc. Val di Lonte (*Rss. & Waters*); Montecchio Maggiore; Brendola; Ferrara di Monte Baldo.

42. *PORELLA IMBRICATA* (Reuss). (Pl. III. figs. 16, 17.)

Eschara imbricata, Reuss. Foss. Polyp. Wien. Tert. p. 69, pl. viii. fig. 26.

Zoarium incrusting; but, when completely covering the branch of some other species, it at first appears to be free. In my specimens it is difficult to see the structure of the younger zoecia; but the proximal edge is straight, with a small central avicularium within the aperture; this, however, is not visible in the older zoecia. In the older zoecia the transverse shape of the aperture is very curious and often triangular, caused by an infolding of the proximal edge. The pores round the border are readily distinguished in some zoecia, but not in all. Ovicell recumbent, distinct, not much raised, punctured.

Fig. 16 represents a rather abnormal zoecium, in which there are large pores at the border.

Loc. Val di Lonte (*Rss. & Waters*); Brendola; Montecchio Maggiore.

43. *PORELLA MARSUPIUM*, MacG., var. *PORIFERA*, Hincks. (Pl. III. fig. 13.)

Porella marsupium, MacG., var. *porifera*, Hincks, Ann. Mag. Nat. Hist. ser. 5, vol. xiii. p. 24, pl. iv. fig. 4; Waters, Quart. Journ. Geol. Soc. vol. xliii. p. 63.

Fossils from Brendola have the central avicularium somewhat lower than in Hincks's figure. The two "pores" at the side are the ends of tubes; and in a few instances these only are visible, and the central avicularium is sometimes wanting. The ovicell is small and somewhat immersed. The preservation of this species is not good; but I feel little doubt that, even if not quite identical with the var. *porifera*, it is closely allied.

Loc. Living: Victoria; Bass's Straits; Queen Charlotte Island. Fossil: Waipukerau; Napier (New Zealand); Brendola; Ferrara di Monte Baldo.

44. *RHAMPHOSTOMELLA BRENDOLENSIS*, sp. nov. (Pl. III. figs. 10, 11.)

Zoarium incrusting. Zoecia distinct, oval to hexagonal; surface smooth, with large pores round the edge; peristome raised, with a peristomial notch either central or slightly to one side; on one side of the peristome a small triangular avicularium and in some parts of the zoarium also large elliptical avicularia on one side of the zoecium, directed laterally. Sometimes the zoecia are separated by a wall which is considerably raised vertically, and in some cases the subradiate lines on the surface are very distinct. Within the peristome there is an expanding lyrula; but the cardellæ are indistinct. Ovicells wide, raised or partly immersed, widely open in front, apparently not perforated.

Rhamphostomella is a genus established by Lorenz*, and of which Mr. Hincks† has given a revised diagnosis; from this the present fossil differs in having pores round the border of the zoëcia, and in apparently not having the ovicell perforate. It is, however, so clearly allied to forms placed under *Rhamphostomella* that the diagnosis of the genus must be altered to include it. It is not, however, yet quite certain that the genus is based upon satisfactory characters.

Loc. Fossil: Brendola; Montecchio Maggiore (?); Val di Lonte.

45. *PORINA* (?) *CORONATA* (Reuss). (Pl. IV. figs. 1-5, 15.)

Cellaria coronata, Reuss, Foss. Polyp. Wien. Tert. p. 62, pl. viii. fig. 3.

Eschara conferta, Reuss, *op. cit.* p. 71, pl. viii. fig. 32.

Acropora coronata, Reuss, Bryoz. von Crosaro, p. 277, pl. xxxiv. figs. 3-5.

Porina coronata, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 42, pl. iv. figs. 7-9.

This is a most variable species, and the study of better-cleaned specimens and the preparation of further sections have led me to alter my views very materially. I have found it extremely difficult to satisfy myself as to the suboral pore, since the tube from the suboral avicularium and the suboral pore end close together, near to the oral aperture; but I have at last obtained sections showing that, contrary to what I thought from earlier preparations, the suboral pore enters the zoëcial cavity just below the oral aperture. This is very important, as it shows that, if we are to consider the position of the suboral pore as of first moment, this species must be removed from *Porina*; and as the position of the pore is nearly the same in *Tubucellaria cereoides*, we may have to remove it to *Tubucellaria*.

There is considerable variation in the shape of the zoarium, it being sometimes cylindrical, at others compressed; and there is also great variation in the pores or avicularia round the aperture, which are sometimes scarcely distinguishable from those covering the front of the zoëcia; in other cases they are very distinct; and there is usually a triangular avicularium directed distally just below the oral aperture and above the suboral pore. In some zoaria there are a few large raised avicularia with broadly spatulate openings, and these seem to be merely suboral avicularia modified.

Sections of the interior show the tubular connections from zoëcia to zoëcia, to which I referred in my 'Challenger' Supplementary Report, p. 32. The branches dichotomize; and in a few cases there are at the distal end of the branch openings for the chitinous tubes, showing that there has been articulation. In the specimen fig. 4 a fracture has taken place where the stem becomes thinner, presumably after death. In the slender forms, such as fig. 5, there

* "Bryozoen von Jan Mayen, Internationale Polarforschung," Akad. Wissensch. vol. iii. p. 93.

† Ann. Mag. Nat. Hist. ser. 6, vol. iii. p. 424.

is sometimes a calcareous basal attachment; but in the stouter forms I have seen nothing to indicate how it is attached. In some specimens a calcareous disk forms a closure over the aperture; and from this calcareous growth a tubule rises up in the middle (figs. 2 & 15).

A closure with a tubule occurs in several *Cyclostomata*, as in *Diastopora*, &c.; but I had always looked upon a closure of this kind as confined to the *Cyclostomata*, whereas we now find it in *P. coronata* and *Lepralia syringopora*.

There are a number of slender specimens (fig. 5) in which the proximal part of the peristome is often raised; and this appears to me like the *Cellaria labrosa* of Reuss (Foss. Polyp. Wien. Tert. pl. vii. fig. 38); but Reuss seems subsequently to have considered that this figure represented *Porina duplicata*.

Loc. Val di Lonte; Montecchio Maggiore (*Rss. & Waters*); Brendola; Crosaro; Ferrara di Monte Baldo; Ronzo; Malo; Priabona; Götzreuth (*Kosch.*); Wola Lu'zanska (*Perg.*); Eocene of Hungary (*Perg.*).

46. *PORINA* (?) *DUPLICATA* (Reuss). (Pl. III. fig. 14.)

Cellaria duplicata, Reuss, Foss. Polyp. Wien. Tert. p. 62, pl. vii. fig. 34.

Eschara duplicata, Reuss, Bryoz. von Crosaro, p. 273, pl. xxxiii. figs. 8-10.

Eschara heterostoma, Reuss, *op. cit.* p. 274, pl. xxvi. fig. 5.

Most of the specimens in my collection have the zoarium in the *E. duplicata* shape; but, according to our present ideas, there is no reason for separating this from *E. heterostoma*.

At the side of the peristomatal aperture there is a large triangular avicularium, forming a part of the peristome. The ovicell is recumbent, not much raised, or subimmersed. We are not yet acquainted with the oral aperture of this species; but Kirkpatrick has shown that *Gigantopora lyncoides* has a Schizoporellidan aperture. The large peristomial pore occurs in *Gigantopora lyncoides*, Ridley*, *Hippothoa fenestrata*, Smitt†, and *Porina* (?) *columnata*, Waters‡, and cannot be looked upon as a good generic character.

Loc. Val di Lonte and Montecchio Maggiore (*Rss. & Waters*); Brendola; Ferrara di Monte Baldo (*W.*); Ronzo (*W.*); Malo; Pap-Patak, Hungary (*Pergens*), as *E. heterostoma*; Kolos-Monostor (*Pergens*).

47. *PORINA* (?) *PAPILLOSA* (Reuss). (Pl. III. fig. 19.)

Eschara papillosa, Reuss, Polyp. Wien. Tert. p. 68, pl. viii. fig. 22; id. Foss. Foram. &c. von Oberburg, p. 31, pl. x. figs. 7-8; id. Bryoz. von Crosaro, p. 268, pl. xxxi. figs. 11-17.

* Proc. Zool. Soc. 1881, p. 47, pl. vi. fig. 3; Ann. Mag. Nat. Hist. ser. 6, vol. i. p. 77, pl. vii. fig. 5.

† Floridan Bryozoa, p. 47, pl. vi. fig. 142.

‡ Quart. Journ. Geol. Soc. vol. xxxvii. p. 334, pl. xviii. fig. 88.

Porina papillosa, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 37.

The zoarium is narrow at the base, and here there are numerous openings, showing that there was an attachment by means of chitinous tubes*. The zoecia, as seen at the side, are alternate.

In the best cleaned specimens I have but very rarely been able to find any suboral pore, though certainly occasionally there is a pore larger than the others, and in imperfectly cleaned specimens the lower part of the avicularium might be mistaken for a pore. Neither have sections revealed any such pore. We may, however, remember that in *Tubucellaria cereoides* the pore can be distinctly seen on the surface in some zoecia, but not in all, though sections show that in all cases there is below the aperture a pore wider than the others and readily distinguished in structure.

At the side of the zoecia, resting on the peristomial projection, there is a long acute avicularium.

The peristome is often very much raised, forming a long tubular projection, which may entirely curve over (fig. 19, *a*), and then the opening is wide and slit-like. Neither Reuss nor Koschinsky has fully appreciated this, and they have merely described these cells as closed, which is sometimes the case. A similar prolongation occurs in various *Tubucellaria*, and has been described and figured by both Busk and myself (see Ann. Mag. Nat. Hist. ser. 5, vol. xx. p. 190, pl. v. fig. 10). Very often one row has all the zoecia prolonged, the next plain, and the following one again raised, and so on; so that the raised rows are easily seen with the naked eye.

Sections show that just above the oral aperture the peristome expands internally on the proximal side, as if there had been a small chamber, thus reminding us, on a smaller scale, of the ovicell of *Turritigera stellata*, B.

Pergens gives this as a synonym with *Eschara cervicornis* (Plioc. Bryoz. von Rhodes, p. 25); but they are very different things.

In the recent *Tubucellaria cereoides* there is only one of the glands to which I referred in my 'Challenger' Suppl. Report, pp. 2 & 27; and to these glands I hope shortly to refer elsewhere, having cut sections of a number of species with the object of finding how they occur.

Both this and *P. coronata* present us with so many difficulties with regard to characters, showing relationship with *Tubucellaria*, that the recent *Tubucellaria* must be re-examined with this object.

Loc. Brendola; Montecchio Maggiore; Val di Lonte; Ronzo; Crosaro; Malo; Götzreuth; Oberburg; Neustift (*Kosch.*).

48. PORINA (?) BIUCULATA, sp. nov. (Pl. III. fig. 15.)

A small specimen from Brendola is incrusting. Zoecia not much raised, with peristome prolonged into a kind of neck, on the front of which are two large pores. On one side, about halfway down

* Koschinsky says, p. 37, that "Sie sind mit verbreiteter Basis festgewachsen;" but this I have never found to be the case.

the zoecium, there is an avicularium directed inwards; and there is a row of pores around the border of the zoecium. Ovicell recumbent.

This is clearly related to *Porina larvalis*, MacGillivray, which also has two large pores on the front of the peristome, and has an avicularium about halfway down the zoecium. This last occurs fossil in Mount Gambier and Bairnsdale (Australia).

49. SCHIZOPORELLA HOERNESI (Reuss). (Pl. IV. fig. 8.)

Eschara Hoernesii, Reuss, Bryoz. von Crosaro, p. 273, pl. xxxiii. figs. 6, 7.

Schizoporella Hoernesii, Koschinsky, Bryoz. ält. Tert. südl. Bayerns, p. 47.

Cellaria scrobiculata, Reuss, Foss. Polyp. Wien. Tert. p. 63, pl. viii. fig. 4.

Now that we know the shape of the oral aperture, it would seem that *S. Hoernesii* is the same as the *Schizoporella submersa* which I described from Curdies Creek (Quart. Journ. Geol. Soc. vol. xxxvii. p. 340, pl. xviii. fig. 85).

Loc. Val di Lonte; Montecchio Maggiore; Brendola; Götzreuth (*Kosch.*); Curdies Creek, S.W. Victoria; Kolos-Monostor (*Perg.*).

50. SCHIZOPORELLA SQUAMOIDEA (Reuss).

Lepralia squamoidea, Reuss, Fauna des deutschen Oberoligocäns, p. 19, pl. xv. fig. 5; Fauna des Septarienthones, p. 172, pl. vii. fig. 3; Bryoz. von Crosaro, p. 254.

The small zoecia (0·3 mm. long) have small pores over the surface, and this sometimes shows indications of slight furrowing; the small aperture has a wide sinus; ovicells wide, globose.

The *Lepralia rugulosa*, Rss., differs from this in not having pores on the surface, and *S. hyalina* shows the same difference and a larger ovicell, but no doubt they are closely allied.

Loc. Bünde and Sölingen (*Rss.*); Val di Lonte; Montecchio Maggiore; Brendola; Crosaro (*Rss.*).

51. SCHIZOPORELLA UNICORNIS (Johnst.).

Cellepora tetragona, Reuss, Polyp. Wien. Tert. p. 78, pl. ix. fig. 19.

Schizoporella unicornis, Hincks, Brit. Mar. Polyz. p. 238 (which see for synonyms).

Loc. Living: widely distributed. Fossil: Montecchio Maggiore; Austrian and Hungarian Miocene; Crag; Pliocene of Italy.

52. SCHIZOPORELLA SERRULATA (Reuss).

Cellepora serrulata, Reuss, Polyp. Wien. Tert. p. 85, pl. x. fig. 12.

A specimen from Montecchio Maggiore more nearly corresponds with Reuss's original figure than with those in Bryoz. Oest.-Ung. Mioc. p. 167, pl. ii. figs. 2, 3, pl. iv. fig. 4. In a young zoecium the

oral aperture is seen to have a wide round sinus. In older zoëcia there is a plate inside the proximal part of the aperture sloping inwards, as shown in Reuss's recent figure, pl. iv. fig. 4, called *S. crassilabris* on the plate. The ovicell is small and hood-shaped, as shown in the first figure, and also in fig. 4, pl. iv. Just above the peristome, or ovicell, there is an opening on one or both sides, which may have been vibracular.

Loc. Eisenstadt (*Rss.*); Montecchio Maggiore.

53. SCHIZOPORELLA OMBONI (Gottardi).

Lepralia Omboni, Gottardi, Brioz. foss. di Montecchio Maggiore, Atti Soc. Veneto-Trentina di Sc. Nat. vol. ix. p. 305, pl. xiv. fig. 1.

Zoarium incrusting; zoëcia distinct, separated by a raised line; on the surface there are a few large pores mostly near the border, and there is a triangular avicularium about halfway down the zoëcium, sometimes one on each side. The ovicell is not prominent, and looks like a cap to the aperture. The sinus is wide.

This is closely allied to *S. Hoernesii*, *Rss.*, and it is doubtful whether it should be separated on account of the mode of growth and the distribution of the pores over the surface. It differs from *Eschara fissimargo*, *Rss.*, in having a row of pores. Probably *Lepralia monopora*, *Rss.* (Bryoz. von Crosaro, p. 45), is described from a worn specimen of the present species.

Loc. Montecchio Maggiore (*Gottardi*); Brendola; Val di Lonte; Malo.

54. SCHIZOPORELLA PHYMATOPORA (Reuss).

Eschara phymatopora, Reuss, Bryoz. von Crosaro, p. 272, pl. xxxiii. fig. 1.

From Australia I have described similar cylindrical forms as *S. phymatopora*. They differ in usually having the avicularium placed much lower, but the position is not constant (see Quart. Journ. Geol. Soc. vol. xxxvii. p. 338, pl. xv. figs. 31, 32; vol. xxxviii. p. 510; vol. xli. p. 300).

Loc. Val di Lonte (*Rss.*); Brendola; Lower Eocene of Mons (*Munier & Pergens*).

55. SCHIZOPORELLA SCHREIBERSI (Reuss).

Cellaria Schreibersi, *Rss.* Foss. Polyp. Wien. Tert. p. 63, pl. viii. fig. 8; Bryoz. von Crosaro, p. 262, pl. xxiv. figs. 5, 6.

The aperture has a wide round sinus; the presence of avicularia is not quite constant, but there is usually one on each side, sometimes raised, but usually flat with the surface. Closely allied to *S. australis*, Woods (see Quart. Journ. Geol. Soc. vol. xxvii. p. 341, pl. xiv. fig. 15). The zoarium is only about 0.4 millim. wide.

Loc. Val di Lonte and Montecchio Maggiore (*Rss.*); Brendola; Pap-Falva and Kolos-Monostor, Hungary (*Perg.*).

56. SCHIZOPORELLA TERNATA (Reuss). (Pl. IV. figs. 11, 12.)

Lepralia ternata, Rss. Bryoz. Oest.-Ung. Mioe. p. 167, pl. iii. fig. 11, pl. vii. fig. 5.

There is a projection at the side of the aperture, frequently supporting an avicularium; and in one specimen there is also an avicularium below the aperture, rather to one side. The ovicell is small and globular. None of the specimens are well preserved; and probably many names have been given to this species.

Loc. Nussdorf; Eisenstadt; Brendola; Val di Lonte; Montecchio Maggiore.

57. FEDORA EXCELSA (Koschinsky). (Pl. IV. fig. 6.)

Kionidella excelsa, Koschinsky, "Bryozoenfauna der ält. Tert. südl. Bayerns;" Palæontographica, vol. xxxii. p. 68, pl. vii. figs. 5-12.

I have one specimen from the Bocca di Sciesa, Colle Berici, and another from Brentonico*, Mt. Baldo, which differ in a few particulars from Koschinsky's description; but the differences do not seem sufficient to separate them specifically. As far as can be seen, the zoarium is throughout a solid cylinder and not tubular; there is a kind of hood above the aperture, and usually a large lanceolate avicularium at each side. The ovicell is large, wide, raised, and perforated, apparently somewhat like the ovicell of *Schizoporella tuberosa*; but the state of preservation is not sufficient to permit or a full description.

This is no doubt the *Fedora* of Jullien †; but Dr. Jullien described and figured it upside down, as the growth is from the tip of the zoarium (the right-hand side of his fig. 39). I give a figure (fig. 7) of the operculum of *Fedora Edwardsi*, Jullien, showing that the zoœcial characters are Lepralian.

Specimens from Spiassi (halfway between Caprino and Ferrara di Monte Baldo) have a small conical zoarium (3-4 millim. long); and from the shape I thought it was *Batopora conica*, Hantk.

Loc. Götzreuth, Bavaria (*Kosch.*); Brentonico; Bocca di Sciesa; Colle Berici; Spiassi; Malo.

58. RETEPORA TUBERCULATA, Reuss.

Retepora tuberculata, Reuss, Bryoz. von Crosaro, p. 267, pl. xxxi. figs. 9, 10.

There is a pit below the aperture, which may be avicularian; but in the Brendola specimens these pits do not occur with the regularity figured by Reuss, and there are also other small avicularia scattered about in various positions, and occasionally an enlarged avicularium.

Loc. Val di Lonte (*Rss.*); Brendola.

* Brentonico is on the north part of the Monte Baldo range, a few miles south of Mori.

† "Dragages du Travailleur," Bull. Soc. Zool. de France, vol. vii. p. 17.

59. RETEPOREA ELEGANS, Reuss. (Pl. IV. figs. 9, 10.)

Retepora elegans, Reuss. Foss. Polyp. Wien. Tert. p. 48, pl. vi. fig. 38.

There are only unbranched fragments from Brendola. The sub-oral pore is at the end of a groove. The ovicells are recumbent; and there is sometimes a ligulate avicularium on the front of the zoecium. The zoecia are wide at the distal end, but narrow at the proximal; the lateral zoecia are obliquely arranged; and this gives the dorsal surface a very characteristic appearance, with the zoecia turned alternately to the right and the left.

Loc. Reuss's description is from a specimen from the Val di Lonte; Brendola.

60. CELLEPORA PROTEIFORMIS, Reuss. (Pl. IV. figs. 13, 14.)

Eschara diplostoma, Reuss (*non* Phil.), Foss. Polyp. Wien. Tert. p. 71, pl. viii. fig. 34.

Celleporaria proteiformis, Reuss, Bryoz. von Crosaro, p. 264, pl. xxx. figs. 2, 6-8.

Cellepora diplostoma, Pergens, Bryoz. von Wola Lu'zanska, p. 72.

This is one of the holostomatous* *Celleporæ*, with a large triangular avicularium at one side below the aperture, and with a large globular ovicell, perforated in the same way as the surface of the zoarium. At present only two *Celleporæ* are known living from the northern hemisphere having the lower edge of the oral aperture straight, namely *C. sardonica*, Waters, and *C. pertusa*, Smitt; but the group is better represented in the southern hemisphere; and it is interesting to find this species very abundant in the Lower Tertiaries. In one specimen I have found a large spatulate vicarious avicularium.

In the specimen, fig. 14, on one side all but three zoecia are flat, with large pores on the surface; but the three are raised in a somewhat ovoid shape, and are at once seen to resemble the zoecia of *C. proteiformis*. Turning the fragment over, we find that on the other side about one-half of the zoecia are raised above the surface, like big ovicells; and there is now no difficulty in recognizing this as a stage of *C. proteiformis*. It was only, however, at the eleventh hour that the flat, compressed form, and the cylindrical one, consisting of several layers, were seen to be stages of the same species.

The description and figure of *E. diplostoma* are so insufficient that

* MacGillivray proposes to leave these to form the genus *Cellepora*, while he calls those with a schizostomatous aperture *Schismopora*. As the latter were the earliest known, it might have been better to give a new name to the holostomatous group, but this is not a matter of much importance. In 1881 I pointed out that there were a number of *Celleporæ* with the oral aperture straight below, and that, perhaps, they should form a subgenus. For a long time workers have recognized that *Cellepora*, as understood, could not stand; and, therefore, when Jullien reproaches us for retaining the genus, it shows an imperfect acquaintance with our work; and I still maintain that science has been better served by showing relationship and collecting facts than by premature classification.

Reuss, in my opinion, was justified in giving it another name; moreover, "*diplostoma*" had already been used by Philippi.

Pergens is mistaken in supposing that it has been found in the Vienna Tertiaries, though, as mentioned, the Val di Lonte material was for a time supposed to come from the Vienna Basin.

Loc. Val di Lonte and Montecchio Maggiore (*Rss.*); Brendola; Ferrara di Monte Baldo; Ronzo; Wola Lu'zanska.

61. *CELLEPORA OLIGOSTIGMA*, Reuss.

Lepralia oligostigma, Reuss, Bryoz. von Crosaro, p. 257, pl. xxxvi. fig. 10.

There are two incrusting specimens from Montecchio Maggiore; and the ovate zoecia are in one case arranged in a radiate manner. The peristome is raised, and an avicularium at the side forms part of it, just as in *Porina duplicata*; but there is no suboral pore, the avicularian chamber is larger, and the shape is more distinctly seen from the outside, thus causing greater irregularity of appearance. The ovicells are globular, recumbent, perforated. The oral aperture is, no doubt, nearly round; but it has not been possible to see the exact shape: probably *oligostigma* belongs to the *Schismopora* group.

Loc. Crosaro (*Rss.*); Montecchio Maggiore.

62. *CELLEPORA PERTUSA*, Smitt.

Orbitulipora lenticularis, Reuss, Bryoz. von Crosaro, p. 289, pl. xxx. figs. 12-14; Pergens, Foss. Bryoz. von Wola Lu'zanska, p. 72.

In a specimen from Val di Lonte, not well preserved, the ovicells are broken down, but the oral apertures are nearly straight below and about 0.15 millim. wide. I have mentioned a subglobular *C. pertusa* from Aldinga (Quart. Journ. Geol. Soc. vol. xli. p. 305). Marsson (Bryoz. Schreibkreide der Insel Rügen, p. 101) says that *O. lenticularis*, Reuss, is the *Cellepora accumulata* of Hagenow; though, from the description and figures, it is impossible to be sure of this.

A cylindrical specimen from Montecchio Maggiore also has the *pertusa* aperture and a suboral avicularium; but neither is the preservation of this satisfactory.

63. *STICHOPORINA SIMPLEX*, Koschinsky. (Pl. IV. figs. 16-18.)

Stichoporina simplex, Kosch. Bryoz. ält. Tert. südl. Bayerns, p. 64, pl. vi. figs. 4-7.

From Brendola this occurs in a disk form; in *Cupularia*-form; and in flat pieces which must have been from a larger growth.

The zoecia are raised and rounded, with the oral aperture slightly coarctate, nearly central, somewhat depressed; on the right side of many zoecia there is a large triangular avicularium with a bar across. Out of a number of specimens, I have only found one zoecium with an avicularium on the left side. Some pieces have an avicularium to almost every cell, others only to one or two zoecia.

In one small specimen (fig. 18) there is above many zoecia a thick curved bar, somewhat thicker at the base; but, as the cells are a good deal crushed, I am not sure to what extent the appearance may be due to this. As there is matrix between the zoecia, the drawing is in certain parts a restoration. This small specimen shows a relationship to *Stichoporina crassilabris*, Koschinsky; but in other specimens the relationship is not so apparent.

The dorsal surface shows the base of each zoecium as a much raised rounded area, with a few large pores.

There are two specimens (fig. 17) with rather smaller zoecia, but with a similarly shaped aperture, but slightly smaller; and, as a rule, there are no avicularia, though zoecia with ovicells have a small avicularium on one or both sides. The ovicell is not very much raised, partly immersed, and is merely an enlargement of the distal end of the zoecium. This might perhaps be called var. *minor*.

Zoecia seen laterally, as on the free border of the zoecium, show a contraction about a quarter of the height from the base; and there are here two rosette plates or pores to each zoecium.

This is allied to *S. protecta* and *S. crassilabris* from Götzreuth; and the zoecia resemble those of *Kionidella obliquiseriata*, Kosch., *op. cit.* pl. vii. fig. 13 b; and it would seem that the two genera should be united. At first, when I had only examined specimens which were not thoroughly cleaned, I took this for *Cupularia bidentata*, Reuss, as the avicularia are very prominent. I have not found *C. bidentata* in either locality, and feel in doubt about it*.

Loc. Götzreuth (Kosch.); Brendola; Ronzo; Pap-Falvi-Patak.

64. BATOPORA MULTIRADIATA, Reuss.

Batopora multiradiata, Reuss, Bryoz. von Crosaro, p. 265, pl. xxxi. figs. 1-4.

The zoecia are barrel-shaped, with a semicircular aperture, straight below (about 0.1 millim. wide), and a recumbent ovicell, which, however, is directed towards the apex of the zoarium.

In the shape of the zoecia, the aperture, and the ovicell, this is very similar to the *Orbitulipora* of the Chalk and Lower Oligocene; and the two genera are clearly closely allied even if separation is necessary.

In *Orbitulipora petiolus* (Lonsd.) the ovicell is also directed towards the centre of the zoarium. It is difficult to understand how *Batopora* grew, for it does not seem to start from the large round cell at the apex, as there is a layer of zoecia below that. It appears

* [A specimen sent me by Dr. Pergens from Pap-Falvi-Patak as *Cupularia bidentata*, Reuss, is *S. simplex*, K. Since this paper was read Mr. R. Kirkpatrick, of the Natural-History Museum, has submitted to me a specimen, from Murray Island (15-20 fath.), of recent *Stichoporina*, which I should call *S. simplex*. The aperture is rather wider and rounder than in the fossils, and it may have to be separated as a variety on this account, though the shape of the zoecia, the position of the avicularium, and the structure of the dorsal surface are the same in both. Mr. Kirkpatrick informs me that he has also had it from the Cape of Good Hope and Malacca; and we may look for a description from his pen very shortly. —A. W. W., December 24th, 1890.]

more probable that it grows from a central basal cell, gradually forming a nearly globular zoarium; and then from the apex of this a second layer is formed, and perhaps a third. Some specimens are thus partially capped with a growing layer. (See woodcut.)

Section of Batopora multiradiata, Reuss.

Loc. Val di Lonte and Priabona (*Rss.*); Brendola (*Waters*); Ferrara di Monte Baldo (*W.*); Montecchio Maggiore (*Gottardi & W.*); Ronzo (*W.*); Malo. Eocene of Bavaria (*Pergens*). Various Hungarian localities (*Pergens*).

65. BATOPORA? STOLICZKAI, Reuss.

Batopora Stoliczkai, Reuss, *Bryoz. deutsch. Unteroligoc.* p. 223, pl. ii. figs. 2-4.

The globular zoaria from Brendola vary from 1 millim. to 3 millim. in diameter, and at first I thought the small ones might be young zoaria of *Batopora multiradiata*; but the size of the larger specimens shows that this cannot be the case. The aperture is not round, but flattened on the lower side, so that it does not differ much from that of *B. multiradiata*, Reuss.

Loc. Unteroligocän of Calbe (*Rss.*); Montecchio Maggiore (*Gottardi*); Brendola.

66. LUNULITES QUADRATA, Reuss.

Cellepora quadrata, Reuss, *Foss. Polyp. Wien. Tert.* p. 95, pl. xi. fig. 17.

Lunulites quadrata, Reuss ("tetragona" on the plate), *Bryoz.* von Crosaro, p. 278, pl. xxviii. fig. 18.

In a large specimen from between Grotte and Sarego, Colle Berici, the proximal edge of the aperture is straight, and the avicularia are larger than figured. There are no doubt many synonyms for this (see *Quart. Journ. Geol. Soc.* vol. xxix. p. 442).

Q. J. G. S. No. 185.

D

EXPLANATION OF PLATES I.-IV.*

The figures are magnified 25 times, except those otherwise marked.

PLATE I.

- Figs. 1-6. *Catrinicella septentrionalis*, sp. nov. a, aperture, magn. 85 times.
(Fig. 5, dorsal surface.)
7, 8. ———, var. (Fig. 7, dorsal.)
9, 10. ——— *continua*, sp. nov. (Fig. 10, dorsal.)
Fig. 11. *Catenaria tenerrima*, Reuss. (a, aperture, magn. about 50 times.)
Figs. 12, 13. *Scrupocellaria gracilis*, Reuss. (Fig. 13, dorsal.)
14, 15. ——— *brendolensis*, sp. nov. (Fig. 15, dorsal.)
16, 17. ——— *elliptica*, Reuss. (Fig. 17, dorsal.)
18, 19. *Bactridium Hagenovi*, Reuss. (Fig. 18, dorsal.)
Fig. 20. *Onychocella angulosa*, Reuss; form *excavata*, Reuss.
Figs. 21, 22. *Scrupocellaria montecchiensis*, sp. nov. (Fig. 22, dorsal.)
Fig. 23. *Fibracella trapezoidea*, Reuss.

PLATE II.

- Figs. 1, 2. *Membranipora Rosselii*, Aud., var. *deplanata*, Reuss.
Fig. 3. ——— *appendiculata*, Reuss.
4. ——— *Dumerillii*, Aud.
Figs. 5, 6. *Micropora articulata*, sp. nov.
Fig. 7. ——— *polysticha*, Reuss.
8. ——— *parallela*, Reuss.
9. ——— *coriacea*, Esper.
10. *Cribrilina chelys*, Koschinsky. The ovicell and vicarious avicularium are added from different parts of the colony.
11. *Monoporella sparsipora*, Reuss. From Montecchio Maggiore.
12. *Lepralia subchartacea*, d'Arch.
Figs. 13, 14. ——— *nodulifera*, Reuss. From Brendola.
Fig. 15. ——— *impressa*, Reuss.
Figs. 16-18. ——— *bisulca*, Reuss. From Brendola.

PLATE III.

- Fig. 1. *Lepralia bisulca*, Reuss. From Brendola.
Figs. 2-4. ——— *syringopora*, Reuss.
Fig. 5. ——— *lontinensis*, sp. nov.
6. *Smittia exarata*, Reuss.
7. ——— *coccinea*, Abild., var. *alifera*, Reuss. From Brendola.
8. ——— *coccinea*, Abild.
9. ——— *porrigens*, Reuss.
Figs. 10, 11. *Rhamphostomella brendolensis*, sp. nov. (Fig. 10 a, magn. 50 times.)
Fig. 12. *Smittia chilopora*, Reuss.
13. *Porella marsupium*, var. *porifera*, Hincks.
14. *Porina* (?) *duplicata*, Reuss.
15. ——— *bioculata*, sp. nov.
Figs. 16, 17. *Porella imbricata*, Reuss.
Fig. 18. *Lepralia* (?) *hericensis*, sp. nov.
19. *Porina papillosa*, Reuss. a, tubular curved peristome.

PLATE IV.

- Figs. 1-3. *Porina coronata*, Reuss.
Fig. 4. ———. Termination, showing openings for articular tubes.
5. ———. Small form, like *labrosa*, Reuss.
6. *Fedora excelsa*, Koschinsky. (Fig. 6 a, magn. twice.)
7. ——— *Edwardsi*, Jullien. Operculum.
8. *Schizoporella Hoernesii*, Reuss.
Figs. 9, 10. *Retepora elegans*, Reuss. (Fig. 9, dorsal.)
11, 12. *Schizoporella ternata*, Reuss.
13, 14. *Cellepora proteiformis*, Reuss.
Fig. 15. Diagrammatic section of *Porina coronata*, Reuss.
Figs. 16-18. *Stichoporina simplex*, Koschinsky.

* These have been drawn at the Author's expense.

A.W. Waters del.
M.P. Parker lith.

Mintern Bros. imp.

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