KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 9. No 6.

A DESCRIPTION

OF THE

ANTHOZOA PERFORATA OF GOTLAND.

BY

GUSTAF LINDSTRÖM.

WITH PLATE.

PRESENTED TO THE ROYAL SWEDISH ACADEMY OF SCIENCES MAY 9, 1870.

STOCKHOLM, 1870.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE

Although insignificant in number, being only two well defined species[1]), some interest is nevertheless attached to the ancient Anthozoa Perforata, burried in the Upper Silurian strata of the isle of Gotland, in consequence of their geological range and their close affinity to Recent corals of the same order. Amongst the abundant cylindrical corals the collector is sure to find on every excursion in the neighbourhood of Wisby, there is one which at once strikes the sight by its peculiar shape, so much diverging from that of the others. The thin and scanty epitheca, here and there as it were left in shreds and the rest worn away, and especially the characteristic texture of the septa and the sclerenchyma of this coral, at once make it evident that it belongs to the Perforate Anthozoa. I had designated it as a new genus and species, naming it Calostylis cribraria, in the Öfversigt K. Vetenskaps-Akadem. Förhandl. 1868 p. 421 Pl. VI fig. 1—3. But I am now aware of its having been already some years ago named and figured by Prof. TH. KJERULF of Christiania, who in his »Veiviser ved Geologiske Excursioner i Christiania Omegn» 1865 pages 22 & 25 denominates it Clisiophyllum denticulatum, original specimens of which, kindly sent to me by Prof. KJERULF, are, as I have fully convinced myself, in every particular identical with the Gotlandic specimens. It differs however widely from the genus Clisiophyllum, being no Rugose coral at all, and must form a genus of its own, as I have formerly stated and am pointing out in this paper. It may then most properly be named

CALOSTYLIS DENTICULATA. KJERULF.

Plate, figs. 1—5.

Generally only single or independant polyparia are found, but this coral must nevertheless be considered a compound one. Sometimes large specimens occur showing rows of buds or gemmæ bursting forth, all from the same side of the parent coral. Still I never have been able to meet with large groups composed of such corallites in full size. The general shape of the coral is a straight or very slightly bent cylindrical polyparium, very slowly increasing in width towards the superior or calicular end, so as to continue almost of the same diameter for a great part of its length. The young individuals have attached themselves on other corals and shells, and their basis is expanded into flat, broad epithecal excrescences. The epitheca is, as stated, only a very thin and fragmentary coating, being evidently secreted only with interruptions, or, as it were, periodically, and disposed in detached zones without any continuity between them. Often the epitheca is completely wanting on well preserved specimens, that bear no indication whatever of having been worn or altered since their imbedding or previous to it. The exterior edges of the septa are in such specimens laid bare to the eye. This arrangement of the

[1]) The Anthozoa Rugosa of Gotland muster a strength of somewhat above fifty species in many varieties, and the Anthozoa Tabulata are quite as many.

epitheca resembles very much what is seen in several of the Balanophylliæ, and also in some of the Recent and Mesozoic corals of the Anthozoa Aporosa. The epitheca partakes in some very peculiar expansions, which assume the shape of a sort of hooked appendices, and pour out from the calice the border of which is then bent down, towards the basis of the coral. As far as I am aware such expansions and enlargements of the calice beyond its boundaries are not to be seen in any living Perforate coral nor are they visible in any but the Palæozoic corals of the Rugose order, this ancient Perforate being the only exception known, and thus partaking in this palæozoic character of growth, and in its strangeness and excess surpassing most of the Rugosa. These expansions began by forming a small projecting corner or sinus in the border of the calice, then continued growing downwards, and in younger individuals attached themselves to other marine bodies, but in older ones ended on the sides of the coral, and by thus accumulating fresh layers on the older, always succeeding each other in the same direction, finally assumed the shape of an elevated ridge more or less scantily covered with an epitheca. These emanations from the calice sometimes continue a great way downwards, for instance in an individual of 43 millim. for 28 millim. from the calice, with which they at the time of their formation must have been in organic connection. The soft tissues of the animal in this way flowed down encroaching upon every coral or shell in its immediate vicinity, destroying their life, and at the same time strengthening its own position by the strong buttresslike offshoots from its own sclerenchyma. It was from these broad calicular expansions as their basis that the buds arose, and they are almost exclusively arranged on that side towards which the polype was leaning when attached to other bodies. The largest specimen I have seen was thus provided with no less than ten such gemmæ, all starting from hooked expansions. Buds are also growing directly from out the parent wall or the outside of the septa without the intervention of the expansions, quite as seen in the Recent Dendrophyllia, to which it bears a close resemblance. In a few instances there also seem to be calicular gemmulæ, but they are more easily to be confounded with those irregularities in growth, a peculiarity common to all Palæozoic corals excepting the Tabulata, and consisting in a restriction of the calice, the animal having diminished in volume, and formed a new but much smaller calice within the precincts of the old one. It may also be that the young larva attached itself to the interior wall of the calice of its parent, as so often is the case amongst the Recent corals [1]). Sometimes there exists a gradual tapering off in the circumference of the coral as the polype gained in height, indicating a decline in the secreting powers of the animal, which thus has been dwindling away till it had scarcely any room more left for itself in its own calice. A specimen for instance from having had a diameter of 13 millim. at last reaches only 5 millim.

The principal mass of the coral consists of the numerous septa, which are built up of porous and knotty sclerites having slender and thin branches with openings between them. The septa are very numerous, amounting to 140 in a specimen of 26 millim. in diameter. Judging by young specimens possessing 24 septa they seem to be arran-

[1]) Duncan, Student 1869 p. 84.

ged in four cycles, but it is very difficult to make out their order or to discern the different cycles. Nevertheless the peculiar arrangement of the septa of a younger order tending to coalesce with those of an older is clearly seen. The septa are incompletely united between themselves by synapticulæ or a kind of very imperfect dissepiments, so highly different from the true dissepiments of the rugosa. They are formed by slender and curved points, and branches which take their origin on the lateral surfaces of the septa. The septa rise above and beyond the rim of the calice, and are on their interior free edge regularly lacerated or denticulated, and their lamina is perforated like a network. In the grooves of the calicular expansions septa were formed in direct continuation to those on the inside of the calice. The exterior edges of the septa are by no means an independant structure deserving to be designated by a term of their own (»costæ»), and continue uninterruptedly from below upwards. They are so closely set at the periphery of the coral as to leave no place for the formation of any interseptal structure deserving the name of wall. Indeed I have in no instance in this coral met with anything at all resembling an independant wall. Towards the central axis of the coral or the calice the septa become, as it were, dissolved in a confused mass of spongious texture entirely composed of spiny and branching trabeculæ, thereby forming a large and very beautiful columella rising in the shape of a low, semiglobular cone in the shallow bottom of the calice. It occupies about two thirds of the surface of the calice.

In a transverse section of the coral two different strata may be distinctly discerned, the exterior of radiating elements composed of the septa and enclosing the more irregular central stratum consisting of the columellar tissue. These strata are not quite as well discernible in a longitudinal section, where the wavy lines of the successive growth follow each other, somewhat elevated in the middle and sunk towards the edges, again to be elevated at the rims of the calice.

Although possessing some Palæozoic features, as the calicular expansions and the gradual diminution of width, this coral shows its very close affinity to the Recent perforata in the structure of its septa and columella, in the formation of its epitheca, and its mode of reproduction. Amongst these corals this Palæozoic one may at once be placed in the division of the Eupsammidæ of MILNE-EDWARDS and HAIME. It possesses the mode of reproduction of the genus Dendrophyllia and of Cœnopsammia, the gemmæ budding forth from the sidewalls of the parent coral in the same way, it has the epitheca of Balanophyllia and septa of four incomplete cycles as Endopsammia and a spongious columella resembling that of the last mentioned genus. It thence seems to unite in itself many of the characteristics of genera, which have succeeded it in much later times, and to be in fact one of those types, which have been so aptly called »forerunners».

Our knowledge of the geological history of the Eupsammidæ is very fragmentary, and a great break intervenes between this Upper Silurian Calostylis denticulata and its next congeners, Balanophyllia Gravesi MICH. and the Stephanophylliæ of the Lower Chalk, these being the first known successors to Calostylis.

Calostylis denticulata is found abundantly in the beds of shale and limestone at Wisby, Isle of Gotland, and it ranges over an extent of three Swedish miles (above eighteen english) along the shore of the Baltic. It is also, as above stated, found in Norway in the

Upper Silurian strata of Malmö, a small island near Christiania. — Length 135 millim. width at the calice of the same specimen 34 millims.

On the annexed plate (fig. 14) I have figured the section of a fossil which I leave without a denomination as it is still only known in a few fragments, but nevertheless shares in some of the characteristics of the Perforate corals. The fragments were found at Djupvik, Eksta. The exterior shape is cylindrical, curved and almost smooth, not showing the least trace of costæ nor of lines of growth. It has a wall of large thickness, solid and compact and without any indication of a peculiar structure. No septa are to be seen. The central mass is filled with a very lax tissue of trabeculæ which, as seen laterally, are arranged in a sort of irregular network, as that in the Perforate corals. Diameter 5 millim [1]).

COENOSTROMA DISCOIDEUM. LONSDALE.

Plate, figs. 6—13.

One of the most striking features in the uppermost calcareous beds of Gotland are the bands of large spherical or elliptical balls, which bands attain a thickness of at least five swedish feet. They are nowhere more prominent than on the eastern coast of the island at Östergarn. There is a little cliff some 90—100 feet above the sea, named Grogarnsklint and from its northernmost point such a stratum of large balls, loosely cemented together by a soft marl containing Brachiopoda and other fossils, can be followed for half a swedish mile (three english miles) along the shore, gradually dipping towards southeast, untill at its southernmost point it is at a level with the sea. There the balls may be examined at leisure and are found to consist of an organic structure more easily seen in prepared slices, if ground down and polished for the microscope. This extensive bed is indeed a conglomerate of such large balls, of which some measure above one english yard in length. This same stratum is spread far and wide over the island and found, exactly in the same position as at Östergarn, in the hill of Thorsburg, so renowned in the old legends of the natives and distant more than a swedish mile from Östergarn. The balls are moreover the chief components of those detached rockpillars [2]) left behind as remnants of denudated strata of the limestone. Wherever in the hard limestone, which is entirely made up of fragments of crinoids and corals, there are seen some of

[1]) Since the above was printed Prof. AL. WINCHELL has kindly sent me specimens of Idiostroma cæspitosum, described by him from the Devonian strata of Michigan, and I find that my fossil is nearly related to it, although differing from it and other Perforata in the immense thickness and thorough compactness of its walls.

[2]) HELMERSEN in »Geologische Bemerkungen auf einer Reise in Schweden» says p. 12 of these rock pillars: »Die Hauptmasse bildet Stromatopora concentrica» and he gives a figure of balls measuring 4 feet in length. Sir RODERICK MURCHISON in »The Silurian Rocks of Sweden» (separately printed from Qu. Journ. Geol. Soc. 1847) p. 20 calls them »ballstones» and also figures some pillars. These pillars are by far more numerous on the east coast of Gotland and are renowned since the times of LINNÆUS (Gotländska Resa p. 218) They have the native name of »Raukar», an old word probably derived from the icelandic »hraukr», signifying something elevated or what rises in the air, a roundish heap or knoll.

those flinty balls, by the islanders called »eitlar» [1]) one may in almost every instance feel assured that it is a detached or worn fragment of the same fossil. This fossil is thus found almost everywhere, as well in the oldest shale beds as in the youngest limestone cliffs and in the most distant parts of the island. Being of so wide a range both in a vertical and a horizontal sense it is not surprising that the fossil has assumed a great variety of shapes. The various ways in which it has been preserved or metamorphosed by chemical agencies also give a deceptive appearance to its exterior and interior structure. The organic tissue is, especially in the large ball-stones of Östergarn, sometimes, as it were, almost effaced, and it is only by inference, from other balls and by faint indications of the calices one is able to conclude that they once had the same origin as the unaltered balls. In the same ball changes also can be traced from the regular coralline structure to an inorganic mass of limestone, where no indication is left of the totally changed coenenchyma. At first sight it is highly doubtful whether to consider those specimens found at Wisby identical with them from Östergarn or more particularly from Kräklingbo, but having compared a large number and examined sections of the interior structure I can see no specific differences, but only such unessential as arise from local fluctuations in the mode of growth, influenced by occasional exterior agencies. I shall then first describe what I think to be the more typical and regular variety of this coral, as found at Wisby, then to notice the other varieties. The coral is compound, and forms large, flat masses shaped like lenticular disks. The basal surface is nearly flat or a little uneven, concentrically wrinkled by the successive lines of growth, as common among the compound corals. It is also coated with a very thin layer of epitheca. The upper surface is more or less hemispherical and tending to increase most rapidly in the middle, thereby gaining in height in that part so as to be more or less conical. At somewhat regular distances of about 3 millim. it is provided with irregular stellular openings or calices of six, but also seven or eight much branching and subdivided rays, which meet very closely in their centre, and leave only a very insignificant opening between them. The width of the calices varies between 5 and 10 millimeters. The calicular rays become at their ends confluent with the abundant coenenchyma of which the chief mass of the coral is made up. It consists of a spongious tissue formed by interlaced sclerites branching and coalescing amongst themselves. In its growth it has had regular periods of rest, so as to form separate layers of sclerenchyma of the utmost thinness, which layers generally are without connection with each other. Sometimes nevertheless several thin layers are intermingled and soldered together in thicker strata. Owing to the formation of such concentric strata the ballstones break up in a mass of concentric laminæ when exposed to the agency of the air. The thin layers are often scarcely amounting to half a millimeter. — The coral had almost always affixed itself to other marine animals, evidently living and for a time struggling with their fast spreading and overwhelming invader. So it often happens that the surface of Coenostroma is elevated into regularly distributed conical prominences, caused, as easily seen through a section, by Cyathophylla that had been surrounded by the Coenostroma and overgrown by it, having striven for a while in vain till they were

[1]) »Eitel» pl. ar, a gland or kernell, from the icelandic »eitill» a hard knob.

completely overpowered by their mighty foe. On the surface of some colonies of Coenostroma small Serpulæ had fixed their shells and the next stratum of sclerenchyma was of so extreme a thinness as not at once completely to cover these tiny shells. It was only by adding fresh layers that Coenostroma with its deadly embrace forced the parasites to direct the mouth of their shell upwards causing them to modify the shape of their integument at the same time its own surface was altered thereby.

It is from thus fixing itself on living Cyathophylla, and growing alongside their stems and around the then living corals, that the peculiar shape of the Coenostroma from Kräklingbo is derived. They resemble as nearly as possible the hills of the termites, being conical, tapering, and ending in several points. When these points are broken a Cyathophyllum is invariably found enveloped in their middle. These conical Coenostromas attain a height of two feet or more. The variety which forms the ballstones originates in such a way, that it at first attaches itself to fragments, most of the cylindrical Rugosa, and grows completely round them without forming diskshaped colonies. By then adding new layers around the central ones such large masses at last arise, entirely composed of concentrical layers, and, judging by their bulk, they seem to have been the most thriving of all varieties. Coenostroma occurs, besides at the localities already mentioned, also on Klinteberg, Stora Carlsö, Hoburg and many other places.

If we now try to make out the affinities of this important coral, which so largely contributes to the formation of the solid rocks of Gotland, we meet with the greatest affinity as to the structure of the sclerenchyma in that family of the Anthozoa Perforata called Poritidæ by MILNE-EDWARDS. It is indeed very difficult to see any difference between the spongious mass of the Poritidæ and Coenostroma if not that the former do not commonly show any strata or interruptions in growth, but consist of one uniform body. Some hemispherical Porites nevertheless exhibit such strata of different growth. There exists also exactly the same appearance of the starlike calices in the tribe of the Montiporinæ, especially in the genus Psammocora, as may at once be seen by glancing at the figures given by MILNE-EDWARDS and HAIME (Histoire Nat. Corall. plate E 3, fig. 3 b, Psammocora obtusangula). Besides having its coenenchyma more dotted with asperities, Psammocora is provided with a sort of columella, like a small rounded knob. In consequence of what seems to point at real affinities I propose that Coenostroma be ranged in the vicinity of the genus Psammocora of the Perforate family Montiporinæ. Then all Recent subfamilies of the Anthozoa Perforata, with exception of the Madreporinæ, have representative genera in the Palæozoic formations. Thus the Eupsammidæ were preceded by Calostylis, the Turbinariæ by the genus Prisciturben, lately founded by Dr KUNTH of Berlin [1]), the Poritinæ by Stylaræa in the Lower Silurian formation, and the Montiporinæ by Coenostroma in the Silurian and Devonian, and probably also in younger formations. A great many fossils both Palæozoic and especially from younger formations possess such irregular stellate figures on certain parts of their surface as seen in the Montiporinæ. They are to be found in the group of fossils commonly called Petrospongiæ by the authors. The genera amongst them that most resemble our Silurian fossil are Stellispongia

[1]) Beiträge zur Kenntniss fossiler Korallen, Zeitschrift d. Deutschen Geol. Gesellschaft, 1870 p. 82. I cannot see any difference between the intimate structure of the Recent genus Millepora L. (M. Edw. & H. Hist.

D'ORB. and especially Actinofungia FROMENTEL, which, as may be seen in the work of this author (Introd. à l'étude des ép. foss. Pl. IV fig. 8), is provided with radiate oscula closely resembling those of the Silurian Coenostroma, and moreover with a coenenchyma as that species. But most of them must without doubt be considered as sponges as they consist entirely of silica, and, what is decisive, have the spiculæ of the true Spongiæ. The calice of the Montiporinæ indeed indicates a coral of a very low type, where the septal apparatus, the most distinctive part of the Anthozoa is so feebly developed as to be confounded with the openings or oscula (»oscules étoilés» FROMENTEL) seen in so many Spongiæ. A large, compound, siliceous Silurian sponge of a genus not yet described shows on its protuberances almost the same stellate rays as so many of the Montiporinæ. On the other side what most decidedly militates against the Coenostroma being considered a sponge is the very characteristic tissue of its coenenchyma, developed as in the Poritidæ, that it consists chiefly of carbonate of lime and is totally devoid of anything that might be considered as spongian spiculæ. As far as I am aware from the recent researches of Prof. HÆCKEL on the calcareous Spongiæ [1]) not a single species of these numerous low structured animals is provided with anything but few and scattered and loosely connected spiculæ, which have a decided spongian character, and no species is in possession of a sclerenchyma coherent in a mass, so as to resemble a polyparium when the soft tissues of the animals have disappeared. It may nevertheless be that several amongst the Montiporinæ show a great spongian affinity, such as one now might not be unprepared to find amongst the Anthozoa, since the researches of HÆCKEL and MIKLUCHO have shown anthozoan affinities amongst several Spongiæ.

The idea of the spongian affinities of Coenostroma was already foreshadowed by GOLDFUSS who (Petref. Germ. Vol. I p. 215) says that the Stromatoporæ are »schwammartige Zoophyten». BLAINVILLE also (Dict. Sci. Nat. Vol. 60 p. 378) doubted whether it were a true coral or a fragment of a Spherulites. Lastly M. FROMENTEL (Introduction à l'étude des éponges fossiles p. 37) has placed the Devonian species of Coenostroma amongst his »Spongitaria osculata» in the new genus Sparsispongia.

Coenostroma discoideum was first described by Mr LONSDALE in Sir ROD. MURCHISON's Silurian System (Vol. II p. 688 pl. 16 fig. 1) with the name of Porites discoidea, but

---

N. Cor. III, p. 225) and the very characteristic sclerenchyma of all the Perforate Corals. On the other hand the Recent Tabulata of the genera Pocillopora, Seriatopora and Heliopora have a compact, not trabecular sclerenchyma, quite as the fossil Tabulata, and there is a distinct wall around their calice. Millepora does not show the least affinity to the other genera which are ranged amongst the Milleporidæ. Its calices are entirely void of a wall and consist only of tubular perforations in the spongious tissue. They are moreover very irregularly and indistinctly septate, what does not obtain in the Palæozoic and other Tabulata. I then think that Millepora had to he placed rather amongst the Perforate, than amongst the Tabulate Corals. Its being provided with tabulæ is no conclusive evidence as to its affinity to the Tabulata, as there are several true Rugosa (Columnaria, Cystiphyllum, Pholidophyllum etc.) with well developed tabulæ and the septa much reduced. Thence all conclusions that may be derived from the polyps of Millepora ought not to be applied to the fossil Tabulata, the true living representatives of these being, in my opinion, Pocillopora and Seriatopora, the polyps of which are still unknown. — The genus Axopora (formerly Holaræa) EDW. & H. seems also to share the peculiarities of Millepora.

[1]) HÆCKEL, Ueber den Organismus der Schwämme, Jenaische Zeitschr. für Medicin und Naturwissenschaft 5:r Bd. p. 207.

it has never since been mentioned [1]) under that denomination until lately when it again is registered amongst the corals by Prof. DUNCAN in the list of fossils appended to the last edition of Siluria (p. 510) and named Heliolithes? discoideus. In the mean time this very species, as far as I may judge from good figures and descriptions, had been confounded with a Silurian fossil of quite another type and described several times by various authors under different names. As this commixtion of the two distinct fossils may be traced back to the first author on closely allied Devonian fossils, GOLDFUSS, I may as well try to unravel what he described in his grand work, Petrefacta Germaniæ. Under the name of Stromatopora polymorpha GOLDFUSS united (p. 215 Vol. I) three distinct types. One is Stromatopora concentrica figured pl. 8 fig. 5 (pag. 21) which as far as the good figures show is something widely different from the others. Then there is Ceriopora verrucosa (p. 33 pl. 10 fig. 6) which fossil coincides with what since commonly is considered as Stromatopora concentrica and is decidedly of the same genus with the Upper Silurian Stromatop. striatella LONSDALE (Siluria 4:th edit. pl. 41 fig. 31.) The third type is called by GOLDFUSS Tragos capitatum (Pl. 5 fig. 6 pag. 26) which later by him has been identified with the fossil that he (p. 215, plate 64 fig. 8) gives as a variety of Stromatopora polymorpha, his own lucid descriptions as well as his excellent figures showing how widely different this type is from the rest, although he considers them all only as mere varieties of each other, and the starlike figures as due to weathering. The last mentioned Stromatopora polymorpha is so closely allied to the Silurian Coenostroma, that it must be ranged in the same genus and considered one of the Montiporinæ. In thus separating the Stromatopora (Coenostroma) polymorpha from Stromatopora concentrica and striatella and uniting it with Coenostroma discoideum, I only follow the arrangement of Prof. WINCHELL, who in the Proceedings of the American Association, Aug. 1866 (printed at Cambridge 1867) page 91, in a paper on the affinity of the Stromatoporidæ creates the genus Coenostroma out of Stromatopora, and I think he is right in retaining that name for what generally has been considered the typical form of GOLDFUSS's genus. But I differ from him in not considering Stromatopora a coral because it does not exhibit any characteristics at all proper to that group. It may easily be seen that the body of this fossil mainly consists of thin strata or plates regularly united by short connecting tubes running vertically between them, and on the surface of the plates no cellular openings nor star-shaped calices are seen, only the heads of the thickly set small tubes, which give to the surface a punctuated appearance (See fig. 15). It is more probable, as stated by Dr CARPENTER and other eminent english naturalists, that it is akin to the ancient Eozoon canadense and another example of primeval, gigantic foraminifera. No doubt the manner of growth being alike both in Coenostroma and Stromatopora with its concentric, thin layers, and the occurence of both in large balls and moreover the circumstance, that strata of the one genus have grown on those of the other so as to be intimately commingled in the same handpiece, has caused their being so long confounded. After all Coenostroma is by far the most common of the two fossils, at least in Gotland. It is only

[1]) MM. MILNE-EDWARDS and HAIME only give it a passing notice in their work »Polypiers fossiles des terrains paléozoïques» p. 470, where they say that it and some others »paraissent être des Spongiaires».

when the organic structure is completely changed to a uniform, crystalline limestone that it is impossible to make out its identity.

After comparing the various authors on Silurian fossils, I have no hesitation in drawing up the following list of the synonyms of the fossil in question.

Gen. COENOSTROMA WINCHELL

C. DISCOIDEUM LONSDALE. — Porites discoidea LONSDALE in Silurian System p. 688 pl. 16 fig. 1.

Stromatopora constellata HALL, Palæontology of NewYork Vol. II. p. 324 pl. 72 fig. 2.

Stromatopora concentrica MICHELIN p. p. Iconographie zoophytologique pl. 49 fig. 4, p. 190.

Stromatopora polymorpha var. constellata EICHWALD Lethæa Rossica p. 346. pl. 22 fig. 13 a. b. (fig. 20 pl. 26 is a true Stromatopora).

Heliolithes? discoideus DUNCAN in Siluria 4:th Ed. p. 510.

From this list it is easily seen that this species is widely distributed in the Silurian beds, and it ranges from the isle of Oesel (Hoheneichen) in the east, over Gotland, probably also over Norway (Christiania) to England (Wenlock) and to the Silurian region of Shohàrie in NorthAmerica.

The Silurian species was succeeded by the Devonian Coenostroma polymorphum so abundantly found in the Eifel mountains, and both are very closely related to each other. It would be worth the while to make out whether many more fossils, numbered amongst the Petrospongiæ, although consisting of a calcareous skeleton, be true Spongiæ or not rather corals of the order Montiporinæ or allied to it. There are several described and figured by MÜNSTER, LAUBE, FROMENTEL and D'ORBIGNY in their respective works, and the genus Stellispongia of the last mentioned author is in all probability only a congeries of such forms. Thus there is Stellispongia variabilis MÜNSTER, (FROMENTEL Introd. à l'étude d. ép. foss. in Mém. Soc. Linnéenne de Normandie Vol. XI. Pl. II. fig. 9) from the Triassic strata (»salifèrien»), and the genus Actinofungia with the species A. astroïtes LAUBE (Die Fauna der Schichten von St. Cassian in Denkschriften d. Ak. Wissensch. Wien 1865 p. 243. Tab. II. fig. 6.) also Triassic. But another species of the later genus, Act. pediculata FROM. (l. c. p. 49 Tab. IV f. 8) resembles in a still higher degree the Palæozoic Coenostromæ, and yet, if I understand M. FROMENTEL rightly, it is found in strata so distant in time, as the Lower Cretaceous (»étage Néocomien de Germigney»).

EXPLANATION OF THE PLATE.

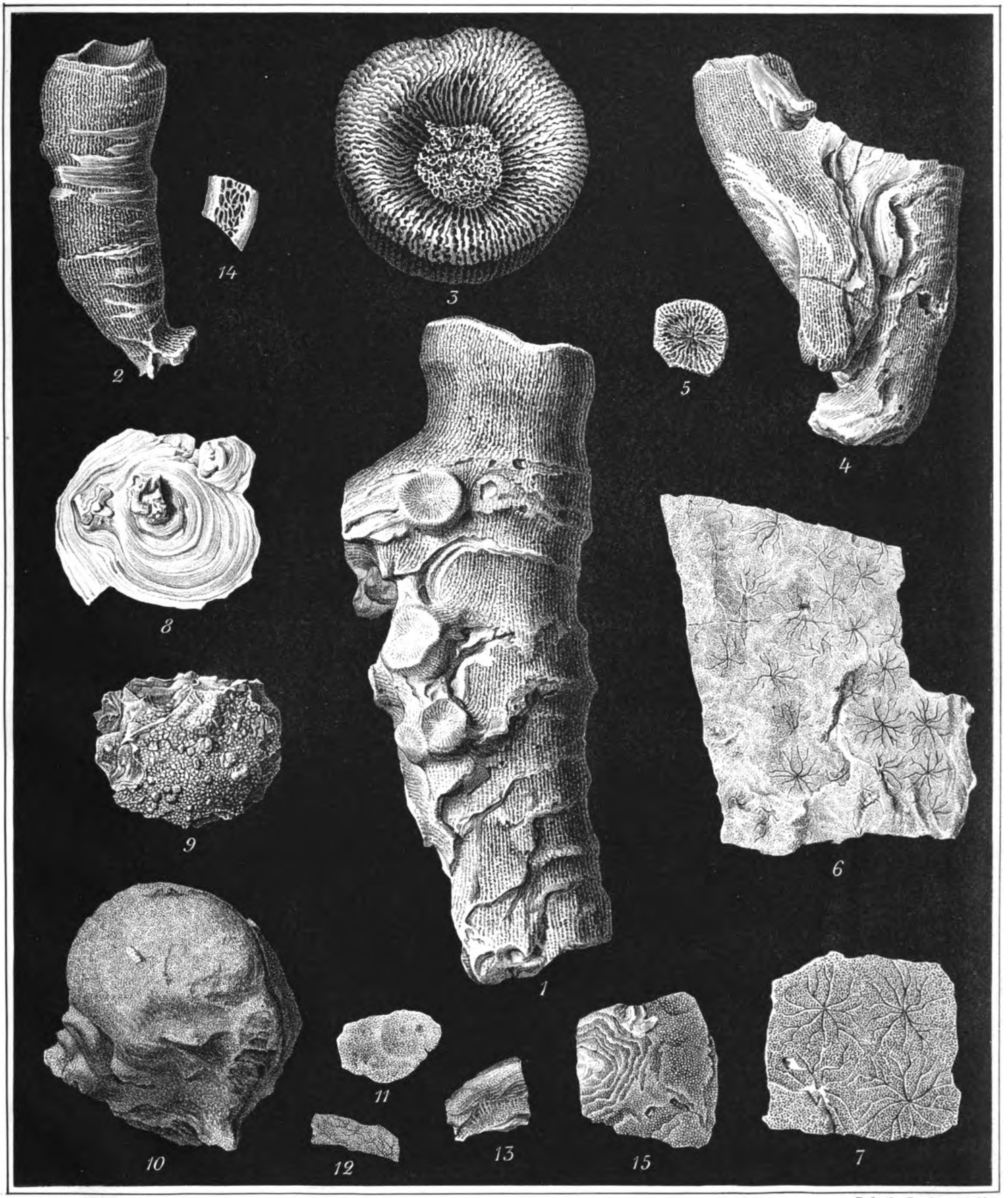
Calostylis denticulata KJERULF.

Fig. 1. Large specimen with lateral buds.
» 2. Specimen showing the epitheca.

Fig. 3. Calice from above, magnified.
» 4. Two specimens coalesced and provided with large calicular expansions.
» 5. Calice of a small specimen magnified.

Coenostroma discoideum LONSDALE.

Fig. 6. Specimen nat. size from Östergarn.
» 7. Part of same magnified.
» 8. Polyparium from below, showing the epitheca.
» 9. Variety from Wisby.
» 10. Variety from Klinteberg.
» 11 & 12. Transverse sections.
» 13. Longitudinal section.
» 14. Longitudinal section of an unknown coral.
» 15. Upper surface of Stromatopora striatella D'ORBIGNY, from Wisby.



Höglind ad nat. lith. Tr. h. Abr. Lundquist & C:o