KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 14. N:o 6

CONTRIBUTIONS

TO

THE ACTINOLOGY

OF

THE ATLANTIC OCEAN

BY

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WITH THREE PLATES.

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In the following pages I intend to give a list of the Corals from the Atlantic Ocean, belonging to the State Museum of Natural History at Stockholm, with a detailed description of such forms as appear to demand a more accurate investigation. The materials at my disposal, kindly placed in my hands by Professor SVEN LOVÉN, are chiefly due to the exertions of Swedish naturalists, at work, during the last ten years, in different parts of the area indicated. Thus the largest series of West-indian species is a fruit of the infatigable and discriminating zeal of Dr A. GOËS, for some years a resident in the Westindian possession of Sweden, St. Bartholomew. He explored the depths of the Westindian sea around that isle and the neighbouring ones, and several times sent home the valuable results of his dredgings. A very rich locality he found in 200—300 fathoms off Salt Island, one of the Virgin Islands. Besides the corals enumerated in this paper, Dr GOËS also collected a large series of beautiful specimens of Gorgonidæ. In 1869, the same year in which he made his richest harvest of corals, the Swedish Government sent a ship of the Royal Navy, the "Josephine", on an exploring expedition in the Atlantic Ocean. Professor SMITT and Dr LJUNGMAN accompanied it as naturalists. The corals collected during this expedition were chiefly dredged up off the shores of Portugal, and off the Azores, and also from a bank, discovered by the officers of the ship and named the Josephine Bank, situated off the coast of Portugal in 36° 46′ Lat. N., 14° 7′ Long. W. On this bank were found fragments of a Dendrophyllia and a Zoanthus, besides the species which are described below. I am also under great obligations to Professor CLEVE, who has largely contributed to this list by communicating specimens, which he presented to the State Museum, out of the beautiful collections, which he himself made, chiefly on the shores of St. Thomas. Some other Swedish naturalists, named below in connection with the corals they collected, have also added a few species. To these materials I have to join a series of specimens from Florida presented to the State Museum by Count POURTALÈS, who also had the kindness to lend me some other specimens of great value. His papers on Corals[1]), as well as that of Dr DUNCAN[2]) have been of much aid to me for the identification of several species.

[1]) Deep Sea Corals. Illustr. Cat. Mus. Comp. Zool., N:o IV, Cambr. 1871. — Zoological Results of the Hassler Expedition. I. Echini, Crinoids and Corals. Cambridge 1874.

[2]) A Description of the Madreporaria dredged up during the Expeditions of H. M. S. "Porcupine" in 1869 and 1870 (Transact. Zool. Soc. vol. 8. p. 5, 1873).

The results of the dredgings of the naturalists of the "Josephine" are of a high interest, as by them were brought up several species hitherto only known within the Westindian area and thus adding to our knowledge of the geographical distribution of the Atlantic Anthozoa. Seven species became thus known to occur on both sides of the Atlantic Ocean, viz.

1. **Caryophyllia? Pourtalesi** DUNCAN. Lat. 53° 54′ N., Long. 52° 11′ W. in 980 fms; off the Azores.

2. **Leptocyathus Stimpsoni** POURT. Coast of Florida; off the Azores and from the Josephine Bank.

3. **Deltocyathus Agassizi** POURT. Florida, Salt Island, Anguilla, off the Azores, the Josephine Bank.

4. **Amphihelia ramea** O. F. MÜLLER, p. p. Virgin Islands, Mediterranean.

5. **Stenocyathus vermiformis** POURT. Coast of Florida, Virgin Islands, Azores.

6. **Schizocyathus fissilis** POURT. Florida, Virgin Islands, East Atlantic (38° 10¼′ N. 9° 25′ W.)

7. **Diaseris crispa** POURT. Florida, Anguilla, St. Martin, Azores, the Josephine Bank.

These, added to the previously known species [1]), swell the list of corals common to both sides of the Atlantic to eleven. It may be remarked that all these corals, though not abyssal, belong to the deep regions of the sea, ranging from 100 fathoms to 980 fathoms. In looking closer at these widely distributed corals, it is remarkable to find that most of them offer so small an amount of variability. The specimens taken off the coast of Portugal resemble as nearly as possible those of the same species from the sea off the coast of Florida. Some again, as Deltocyathus Agassizi and Leptocyathus Stimpsoni, species variable in a very high degree within the same locality, present almost identical varieties on both sides of the Atlantic. This circumstance, that species of so wide a geographical range are not at all affected as to their variability or that the same species shows the same varieties everywhere within its area of distribution, points to the conclusion that the variability of many species does not depend on their being widely distributed nor on the nature of their habitats, but must be effected by other causes.

Bearing in mind the great variability of many other species, especially those living in moderate depths, it is evident that various difficulties obstruct the way of the naturalist, who in his endeavours to describe and identify these animals has received only a few specimens of each species, whereupon to make his researches. We are often groping in darkness as to their affinities, not only in regard to the fossil but also to the recent, so very little being known of the animals themselves in the living state, and nevertheless, there may be some tendency to generalize on too insufficient data. Our present knowledge of the Anthozoa may be compared with the state of the Malacology many years ago, when the mollusca were classed as shellbearing and naked,

[1]) Dr DUNCAN in his paper cites as common to the East and West Atlantic: Thecopsammia socialis POURT., Fungia symmetrica POURT., Caryophyllia clavus SCACCHI, Lophohelia prolifera PALLAS.

quite as the Anthozoa now generally are separated in the two large sections of Malacodermata and Sclerodermata. Now there are facts which clearly prove the close affinity between several species of both sections. So in the case of Caryophyllia clavus and Corynactis viridis[1]), the animals of which resemble each other in the highest degree. Moreover there are instances recorded of the young of Caryophyllia clavus which had attained a large size without showing the least trace of any coral[2]). Thus if their parentage had not been known, they had been classed amongst the Malacodermata, wide apart from their real congeners. On the other hand there are Anthozoa of the section Malacodermata interiorly provided with a kind of coral as Sagartia Schilleriana[3]), according to STOLICSKA resembling that of some Perforate Corals.

A sufficiently large material at once makes it evident how useless it is to employ such extremely variable parts as the epitheca (its absence or presence), the coral being attached or free, its forming compound polyparies or simple ones, the shape or number of the paluli etc. for creating new genera. In order to fix the specific and generic characters there is generally needed a rich series of specimens. Such wanting in several instances I have been obliged to leave some corals undescribed, especially from the shallow parts of the Westindian sea.

In enumerating the species I have generally followed the system of MILNE EDWARDS & HAIME, though there is a great uncertainty if such species as Schizocyathus fissilis and others are to be ranged amongst the Turbinolidæ, from which they differ in having a dissepiment. Such genera as Deltocyathus, Sabinotrochus, Trochocyathus ought perhaps to be classed in a group of their own, characterized by the coalescence of the secondary and tertiary septa between themselves. It is a feature which they share with the Fungidæ.

Several corals exhibit a peculiar mode of gemmation, which may be most aptly denominated basal gemmation, as in all known instances the new individual is seen to grow out from the basis of its parent. It occurs in Sphenotrochus intermedius MÜNSTER, Paracyathus arcuatus n., Stenocyathus vermiformis POURTALÈS and may be a modification of the propagation by stolons as seen in Zoanthus and in the Angiæ.

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[1]) GOSSE, Manual of British Actinology, p. 292.

[2]) Ibid. and Ann. & Mag. Nat. Hist. June 1859, p. 449—461.

[3]) Proceed. Asiatic Soc. of Bengal, 1868, p. 174.

1. **Calyptrophora Josephinæ** n.

Pl. 1, figs. 1—3.

A splendid specimen of this new species was dredged up by Messrs. SMITT and LJUNGMAN in the Atlantic Ocean at 36° 46′ Lat. N., 14° 7′ Long. W. from a depth of 110—117 fathoms. Its total length is 5,5 decimeters and the greatest diameter at the basis 4 millim. The small twigs at their end only attain 0,5 mill. in diameter. It grows in erect and regularly dichotomizing branches. The innermost axis is elastic, somewhat brittle, of a brownish bronze colour, glossy or longitudinally furrowed and of a remarkable metallic lustre. In its lowest parts it is hard and almost entirely soluble in acetic acid leaving only an exterior soft sheath behind. This soluble carbonate of lime is crystallized in a mass which breaks up in irregular prisms. Higher up there is less of soluble matter and the axis retains its shape when subjected to the action of acids. It is composed of several concentric strata or thin laminæ which in a transverse section can be discerned by their different colour, some being of a deeper brownish hue. These laminæ consist of very slender, longitudinal fibres. When they are spread out, they are seen to be perforated by some large circular holes. On their surface there are often concretions or singularly convoluted ridges and elevated nodules in regular rows, more intensely coloured than the others. Between the axis and the exterior coenenchymatous covering of scales there is interposed a soft tissue, in which narrow, longitudinal rods, as it were, of a clear cartilaginous consistence, lie imbedded. Above them there are impressions of the covering, calcareous scales, surrounded by a frame of darker, granular matter. It is from this granular stratum that the polyps are budding forth.

In a certain way the scaly covering is a sort of coenenchyma, although formed of an element quite different from that which forms the coenenchyma in other corals[1]). The scales which compose this covering are imbricated, partially overlapping each other. After having been subjected to the agency of a solution of hydrate of potash, they may be spread out as to show their highly variable shape. They are square, cruciform, elon-

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[1]) Various observations, which I hope to be able to publish at another occasion, have led me to the conclusion, that the coenenchyma as well in the Heliolithidæ, as in the Poritinæ, Strombodes, Smithia etc. is formed by the excessive growth of the borders of the calicle and that the part, generally called the wall, in such compound genera is nothing else but an interior ring of intraseptal secretion, homologous to the interior wall of the Acervularidæ. The true or exterior wall is obliterated in these genera and consequently the outlines of the calicles are confluent.

gated, a few spindleshaped. They share the characteristics common to the scales of the polyps as well in this genus as in the genus Primnoa, viz. in the centre a white opaque nucleus, which is an accumulation of small, calcareous grains. From this nucleus rows of granules radiate towards all sides of the scale. These granules form interrupted lines or they are united into continuous ridges. The outside of the scale is ornamented by such rows of blunt nodules or spines and the inner surface is covered by irregular knobs or warts somewhat starshaped or scrobiculate. The margin is often notched or serrated in the direction of the radii of the superficial spines. The average size of these scales is 0,4 millim. The polyps are clustered in whorls, each containing five or sometimes more polyps. They are bent downwards with their apices and curved close inwards against the common stem. Their length is 1,6 millim. They are covered by three pair of scales. Close to the common axis there are two narrow, crescentshaped scales. Then there are two triangular scales one at each side of the body with their exterior edges projecting. Last there follow the largest scales, which cover the chief part of the polyp. They are also triangular and sometimes bifid. The margins of all these scales are undulating and crenulated. The inferior margins are irregularly notched by projecting teeth. The scales of the second and third pair are bent in a semicircle around the polyp. On the interior surface of the third pair in the vicinity of the axis there is a longitudinal septum, which projects some way inward. Seen from the side the large scales are cupshaped, narrow below and widening upward. The top of the polyp is closed by an operculum, consisting of eight valves, which are arranged somewhat in a whorl and overlap each other. They are almost all of the same shape, triangular, isoscelous, deeply sunk towards the median axis of the exterior surface. A large, prominent, very thin ridge, rounded at its apex corresponds on the interior surface to this depression. This interior septum is the point of attachment of strong muscles, which continue downwards, and no doubt are of importance for the movements of the opercular valves. When closed the opercula form a pointed apex.

This species differs from the closely allied C. trilepis POURTALÈS[1]) in having the whorls of the polyps more closely approached and in the large scales of the third pair being two, quite separated by a distinct partition line on their exterior side. In C. trilepis again these scales have coalesced into a tube and there is only left a narrow longitudinal line, indicating where the two, now united scales once were separated. In C. Josephinæ the covering of the axis consists of a multitude of small scales, whereas in C. trilepis there are only a few large ones. In the former species the basal scales project in a point on their exterior side, in C. trilepis there is only one rounded scale, without projecting edges.

The genus Calyptrophora is very nearly related to Primnoa in the peculiar shape of the coenenchymatous spicula, and of the scales covering the polyp, and in their mode of growth as well as in the general arrangement of the scales and the opercular valves. They may indeed form a family of their own, in which perhaps also are to be

[1]) Bulletin Mus. Comp. Zool. Cambr. 1868 p. 130.

included some other genera as for instance Stenella and Primnoëlla. I have not been able to ascertain the presence of such interior spicula in the body of the polyps of Calyptrophora, as are so easily found in Primnoa. Calyptrophora differs moreover from that genus in the more developed scaly covering of the axis, which is almost entirely wanting amongst the closely crowded polyps of Primnoa. The calicle of Calyptrophora consists only of three pair of scales, in Primnoa there are several rows of imbricated scales.

2. **Caryophyllia clavus** Scacchi var. **borealis.**

Duncan, Madrep. Deep. Sea p. 312, pl. 48, fig. 6.

A single specimen dredged up during the expedition of the "Josephine" in 109 fathoms at Lat. 48° 19′ N., Long. 8° 45′ W.

3. **Caryophyllia Berteriana** Edw. H.

There are two small specimens, the largest having only 10 paluli, but else corresponding with the descriptions and figures of Milne Edwards and Pourtalès. Off the Virgin-Islands (Salt-Island) in 200—326 fathoms amongst fragments of corals (Goës).

4. **Caryophyllia? Pourtalesi** Duncan.

Plate I, fig. 4.

Duncan, Madrep. p. 317, pl. 42, fig. 3—10.
? *Paracyathus thulensis*, Gosse Actinol. Brit. p. 319.

From the N.W. Atlantic in Lat. 53° 34′ N., Longit. 52° 1′ W. in 980 fathoms. Dredged up by Dr J. Lindahl during the expedition of H. M. S. "Ingegerd" to Greenland in 1871. Also a specimen off the Azores, Punta Delgada in 100 fathoms (Exp. of the "Josephine").

This coral cannot properly be classed with the genus Caryophyllia as there are no regular paluli and all such are entirely wanting in the North-Atlantic specimen. But my material is too scanty to decide the question.

As may be seen by the accompanying figure, carefully drawn by M. Westergren, the systems are very unequally developed, one for instance having no less than five cycles and the others only three. The North-Atlantic specimen has a columella which consists of a single plate, much bent and twisted and sending forth curved and wavy lamellar processes.

Length of the North-Atlantic specimen 6 mill., breadth also nearly 6 millim. The Azorean specimen is somewhat smaller. It is possible that this species already in 1860 was described by Gosse in Actinologia Britanica p. 319 as Paracyathus thulensis, with which it agrees in several important points.

5. **Leptocyathus? Stimpsoni** Pourtalès.

Pl. I, fig. 5—8.

Pourtalès, Deep Sea Corals p. 12, pl. III, fig. 1, 2, 3.

Off Villa Franca in the Azores in 200—600 fms, on the Josephine bank in 228 fms, in the Atlantic Ocean Lat. 36° 48½' N., Long. 14° 12½' W. in 162 fms. (Exp. of the "Josephine"). A specimen from the last locality has 5 mm. in breadth, 3 mm. in height.

This is quite the same species as the Westindian, though my specimens do not show the same irregularities in growth on the inferior surface as those sent me for inspection by Count Pourtalès. Still it is subject to much variation. Generally it is sphærical, but it also assumes a conical shape, elongated, 5 millim. in height and 4 millim. in breadth. There is then often a peculiar growth downwards of the rims of the calicle along the exterior sides of the corallum, and the septa continue downwards, as shown in the figure. In others again there has been an interruption of the regular growth and the animal has contracted its circumference within more narrow limits and there formed a new calicle (see fig. 7). There are no paluli, and the papillæ which compose the columella, may sometimes be mistaken for paluli. The septa are in five cycles of six systems.

This species, as well as the following, can not be classed with the Leptocyathi in the sense of Milne Edwards and Haime, but instead of causing more confusion by creating a new, perhaps unnecessary genus, I for the time rank them with Leptocyathus.

6. **Leptocyathus? halianthus** n.

Pl. I, fig. 9.

Dredged up during the expedition of H. M. S. "Eugenie" (in 1852) off Cap Frio (41° 41' W., 22° 47' S.) in 30 fathoms. Breadth 11 mm. height 5 mm.

It is largely affixed with a broad basis on Pectens and fragments of other bivalve shells. It is simple. The wall is either naked or partially provided with a thin epitheca towards the basis. The animal covers the whole coral to its basis and there accumulates around itself grains of sand and fragments of shells. The costæ are covered by some sparse or rare warts or spines, which on old, eroded specimens when broken off leave a small pit on their site, thereby indicating that they are interiorly hollow. Septa in six systems of five orders, all systems alike. Those of the third order unite at their base with the septa of the second order and, again, those of the 4th and 5th orders are united with those of the third. They are all moderately exsert, covered with regular, oblique rows of granulations on the lateral surfaces, their superior edge is also finely dentate or granulated. The columella is formed by about 30 small, slender papillæ, styliform, angular, encroaching on the basis of the septa, and there forming, as it were, a semblance of paluli. This species is only provisionally to be ranged in the genus Leptocyathus as there seems to be a great discrepancy in the arrangement of the secondary and tertiary septa, which do not coalesce or unite in the previously known species.

7. **Paracyathus arcuatus** n.

Pl. I, fig. 10—12.

From the Josephine Bank in 110—112 fathoms; off Punta Delgada in 50—100 fms.
Length 15 millimeters, breadth of calicle 5 millim.

Turbinate, curved, basal apex free, narrow. Epitheca smooth, sometimes wanting or in detached zones. Costæ narrow, finely punctuate, confluent with the septa near the calicle in a narrow line of zigzag. Calicle circular with large borders, moderately deep. Septa not elevated, of six systems and five cycles. Paluli irregular, of variable size, columella of small crowded papillæ. In a specimen from Punta Delgada the septa are more exsert, but else it seems to belong to the same species. There is a specimen with basal gemmation.

8. **Deltocyathus Agassizi** Pourtalès.

Pl. I & II, fig. 13—20.

Pourtalès, Deep Sea Corals p. 15, pl. II, fig. 1—5, pl. V, fig. 9—10. — Hassler Exped. p. 35, pl. VI, fig. 11.

? *Sabinotrochus apertus* Duncan, Madrep. p. 320, pl. 41, fig. 6—9.

Trochocyathus Rawsoni Pourtalès, Hassler Exp. p. 35, pl. VI, fig. 7—10 may perhaps also belong to this species, being provided with septa and columella of the same shape.

This species has a very wide range, as now to its former known habitats can be added, that it has been dredged up by Dr Goës off Salt-Island in 200—300 fathoms and one specimen off Anguilla in 400 fathoms. During the expedition of the "Josephine" it was collected by Ljungman and Smitt in several specimens off Villa Franca in the Azores, in depths between 200—600 fathoms, and on the Josephine Bank in 110—120 fathoms.

This species is extremely variable, the varieties in the Westindian seas being almost the same as those off the shores of the old continents. In the Westindian seas the hexagonal form prevails with the apices of the six primary septa projecting, and it gradually passes into the variety *calcar* of Pourtalès, of which there is a specimen from Anguilla with spurs of 1,5 millim. in length, the diameter of the entire coral being only four millim. But generally there are 10 millim. between the spurs, the diameter proper being 8 millim. There is also a single Westindian specimen, quite circular, without projecting primary septa, and broadly attached with its basis to a pebble. Such specimens, which were attached till a certain period and then became free, are almost the only ones found in the East Atlantic depths. Some show however a tendency towards the variety "calcar" in having the costæ of different size, viz. six large primary ones, forming the characteristic star, with smaller ones between them. In others the costæ are of equal size, meeting in the centre, where a small tapering apex points down. Or there is a central space, quite free of all costæ, a scar, as it were, marking the former extent of the attached surface. All are ornamented in the same way as the Westindian specimens with small irregular granular points. As to the calicular surface there are still greater variations. In all varieties there is a strongly developed Fungian character in the coalescence of the septa of a younger order with those of an older. Those of the 4th and 5th orders coalesce with those of the third and these again with the secondary septa. In the Westindian D. calcar there is a peculiar formation of a sort of paluli near the basis of the septa of the second to the fifth orders inclusive and these paluli also unite towards the centrum of the coral, broadly bridging over the subjacent interseptal spaces. The paluli of the first order are very large, angular, wider at their crest than at their basis, and somewhat bent towards one side. The columella consists of tapering points. The whole interior part of the paluli and their excrescencies is white, whilst all septa of the second order and the paluli of the first septa are brown. Now there are East Atlantic specimens which are attached, but show the same arrangement and configuration of septa and paluli as the last mentioned Westindian ones. But commonly they have the septa not so dense, nor are the paluli so large, and the walls are also very thin. Such specimens resemble very much Sabinotrochus apertus DUNCAN and it is probable that they are identical. Besides these there is an abnormal form with very thick borders and rather more elongated than the others, 12 millim. in breadth and 3 millim. in height, another specimen 10 millim. in breadth and 5 millim. in height, whilst the common variety attains 6 millim. in breadth and only 2 millim. in height. In old specimens this cupshaped form is much exaggerated by their being often deeply excavated through erosion.

In the smallest specimen I have seen, of only 0,7 millim. there are *four* septa of the first order, towards each of which two of the second order are growing and with these, again, the smallest belonging to the third order unite. But to judge by a specimen, which is a little bigger (1,5 millim.) and has six regular septa of the first order, the law of substitution, as expressed by LACAZE-DUTHIERS (Arch. de Zoologie expérimentale Tome I, page 368) comes into play and of the six apparently primary septa four may have been developed out of secondary ones, only two of the original four resting in their old position as septa of the first order, the two others being, as it were, pushed aside and degraded into secondary ones.

9. **Sphenotrochus auritus** POURTALÈS var.

Pl. II, fig. 21—22.

Off St. Bartholomew in 12 fms (GOËS) and off Tortola (CLEVE).

It is regularly conical, compressed without any excrescencies at the basal parts and seems to be identical with the variety described by POURTALÈS (Hassler Exped. p. 37) from Brazils and which he considers as the young ones of the others. In consequence of the great variation amongst the corals especially as to their exterior shape and ornamentation, I do not hesitate to unite these forms in the same species, the more so as the specimens dredged up from the same spot by Dr GOËS show considerable difference in their costæ; some being provided with regular costæ, others having only irregular nodules in their stead.

10. **Sphenotrochus intermedius** MÜNSTER p. p.

Off Villa Franca in the Azores in 30—50 fathoms (Exp. of the "Josephine"). Several specimens of the same form as those delineated in the work of Dr DUNCAN (Madrep. p. 320, pl. 41, fig. 1—5). There is a specimen bearing two calicles at the opposite ends or rather there is that basal gemmation to which I before have alluded: a smaller coral grows straight out from the basis of a larger. This is quite as in Stenocyathus vermiformis POURTALÈS (Deep Sea Cor. p. 9, pl. III, f. 11) or as already mentioned in Paracyathus arcuatus.

11. **Desmophyllum Calletti** DUCHASSAING & MICHELOTTI.

Off Salt Island in 200—326 fathoms. My specimens resemble more the figure and description given by POURTALÈS (Deep Sea Corals p. 16, Pl. I, fig. 17 & 18) than those of the first mentioned authors.

12. **Flabellum laciniatum** PHILLIPPI.

Phyllodes laciniatum PHILLIPPI, Neues Jahrbuch für Min. & Geol., IX, p. 662, pl. II, fig. B[2].

Flabellum laciniatum EDW. & H. Ann. Sc. Nat. 3 Sér. vol. IX, p. 273. — Hist. N. Cor. vol. 2, p. 92. — DUNCAN, Madrep. p. 322, pl. 39, fig. 11, 14—18.

Ulocyathus arcticus SARS, Reise i Lofodden p. 21. — Fauna lit. Norv. 2 heft. 1856, p. 73, pl. X, fig. 8—27. — GOSSE, Actinologia Brit. p. 329.

Flabellum Mac Andrewi J. E. GRAY, Proc. Zool. Soc. March 1849, pl. II, fig. 10—11.

Flabellum alabastrum MOSELEY, Nature vol. 8, p. 400.

A single specimen from the expedition of H. M. S. "Josephine" was dredged up in 200—300 fathoms off Villa Franca and it agrees in all particulars with the figures and descriptions of DUNCAN and MOSELEY.

The animal of the Azorean specimen seems, to judge from those preserved in alcohol, to be more deeply coloured than the Norwegian ones. The coral of the former is more smooth and glossy in the exterior wall and the edge of the septa is almost straight, while in the later they are bent in a continuation of small wavelets.

13. **Duncania barbadensis** POURTALÈS.

Pl. II, fig. 23.

POURTALÈS in Results of the Hassler Exped. p. 44, pl. IX, fig. 5—7.
Dredged up by Dr GOËS off St. Martin in 40—50 fathoms, off Salt Island in 250—300 fms, off Anguilla in 200 fms.

This remarkable and beautiful little coral corresponds in its general form and some details with the description given by POURTALÈS, but there are some differences in the structure, which may be here annotated. The specimens from the above stated localities are smaller than those from Florida, as the largest specimen from Anguilla measures only 15 millim. in height and 8 millim. in breadth.

The total number of the septa varies between 18—21 and none of them can be singled out as belonging to the first order: they are rather all alike. Only those which have paluli in front of them are a little shorter. There seems to be no reason to class this species amongst the Rugosa, which commonly are considered to have four septa of the first order[1]). In making a thin section of the apex of a Duncania, I distinctly saw six septa of the first order, which meet in the centre. The diameter of this basal section was only one millimeter. The apex of the coral is filled with solid calcareous matter of quite the same nature as that which, in an earlier paper[2]) I have called stereoplasma. This is a secretion of the basal membrane of the animal, in some way superseding or supplementing the dissepiment. The dissepiment may nevertheless exist in a calicle and later be absorbed by the slower advancing stereoplasma, as is the case in this Duncania. There are specimens (see fig. 23) which have two dissepimental rings near the outer wall, although the exterior one is partially covered up by the septal rim or border. The dissepiment is vertical.

This species seems to enjoy a sort of propagation by schiziparity; at least most specimens show fragments of an older calicle, from which they bud.

As to the name of this genus it may be remarked that DE KONINCK already, in 1872, in his "Recherches sur les animaux fossiles de la Belgique" p. 107, pl. XI, fig. 1, founded a new genus of Rugose Corals under that denomination. In case now this fossil really proves to be a new genus and not, as seems likely, only a Zaphrentis, such as they often occur at Tournay, altered, and without any dissepiments, and with a central ring of stereoplasma, the genus Duncania of POURTALÈS is to be abolished and a new name given. But until this point is settled, it is advisable to retain it, instead of adding to the confusion by creating a new name, which in the consequence may prove unnecessary.

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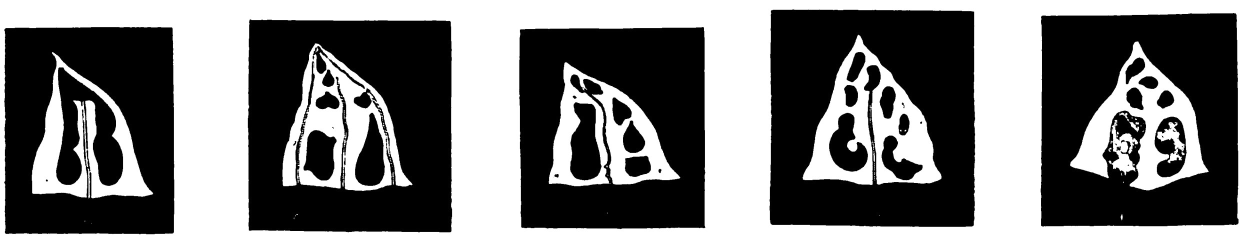
[1]) There are indeed very few of the Silurian corals that have four primary septa. Excepting Stauria there is scarcely any. Goniophyllum, in which the foursidedness is so strongly expressed, has in the beginning only one septum. Even specimens of the tiniest size, such as I have found for instance of Palæocyclus porpita L., of only 1,3 millim. in diameter, are already provided with 20 septa.

[2]) Öfversigt af Vetenskaps-Akademiens Förhandlingar 1873, Svenska Under-Siluriska koraller sep. p. 30.

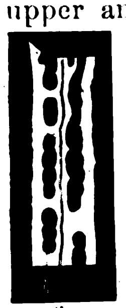
third. Those of the first order are thick, their superior edge is narrow and much curved in a line of zigzag, the undulations of which continue on the lateral surface of the septal laminæ. These are covered with small, sparse granules. These septa never reach the centrum of the calicle and their vertical or interior edge ends before they are hemmed in between the septa of the second order. Between each septum of the first order there are two septa of the second, which are more narrow and not so high as the former. They continue with their innermost edge very low and finely crenulated towards the centre of the calicle, where those which are situated on each side of a primary septum unite and coalesce along their whole interior margin. Thus every septum of the first order when seen from above is enclosed within a V shaped figure formed by its neighbouring septa of the second order. The lateral surface of the last is also covered with short spines and granulations. The loculi between the septa are quite open and free till the bottom of the calicle (see woodcut fig. 1). But if a segment of the coral, consisting of a primary septum and its two circumambient secondary ones is taken apart and longitudinal and transversal sections of it are made, it is soon perceived that the septa



1. 2. 3. 4. 5.

Transverse sections of the same segment taken at different heights, fig. 1 being the uppermost, close to the bottom of the calicle, fig. 5 the lowest. *a.* Principal part of the septum, *b.* stereoplasma, *c.* loophole in the outer wall, perforating the epitheca. In fig. 5 there are deeper layers of stereoplasma obliquely shaded, from which an isolated point stretches upwards.

frequently unite by means of a kind of synapticula, which indeed are nothing else but the spines or granulations of the lateral surfaces, that have grown from each septum towards the others, thus forming a kind of lattice work. Being more sparse in the upper and interior parts of the loculi, these junctions in the lower parts and still more so in the vicinity of the exterior wall become so dense and so entangled that it sometimes is difficult to unravel what is the septum and what the uniting parts. In the close vicinity to the outer wall these synapticula assume a most regular arrangement and form, as it were, pairs of two synapticula, one on each side of a primary septum (fig. 7 and pl. III, fig. 34), those of the same longitudinal row separated from each other by little round loopholes. These openings are then the only traces left of the loculi, and give origin to those peculiar dots and holes, which are seen on the outside of the epitheca. There are dots when the lacunæ are covered by the thin pellucid epitheca; there are holes when this thin covering is worn away. The contrast between the irregularity of these synapticula in the interior and their regularity near the epitheca is indeed very striking. As may be seen above from the figures 2 & 4 the loculi are sometimes almost closed up with this solid endotheca, by means of which the three septa are firmly soldered together into one compact segment.



6.

7.

Longitudinal sections of a segment of three septa, 6 being near the centre of coral, 7 near the wall. Letters as before.

It may be as well here to make some remarks on the structure of a septum of this species, as seen in thin sections and the more so, as the same septal structure prevails in most other corals, whether living or fossil, whether palæozoic or neozoic. In such a section there is visible a narrow central line, very thin, imbedded in a more dull white, compact endotheca. That central line is bent and twisted quite independently of the bendings and projecting parts of the ambient endotheca. Its independence of this and its being the chief and principal part of the septum is clearly indicated by the circumstance that it never is wanting in any septum, whether the dull white endotheca is present or not. Seen by transmitted light it is black and by reflected light it has a peculiar intense cream colour. At the exterior wall, where the stereoplasmatic synapticula are mingled together into a continuous mass, there is only this narrow central line left as the sole independent portion of the septum and the rows of the small loopholes between the septa are the sole remnants of the once empty interseptal chambers.

It is this central line and its two thicker sideportions, which have caused M. EDWARDS and so many other authors to start the view that a septum is composed of two laminæ, the partition between them being at first empty and later filled up by a calcareous deposition. The true state of the things is, however, quite the reverse: the central, narrow stripe is the principal and original, simple septal lamina and the deposition around it is the endothecal structure, which I have called stereoplasma[1]), and which is formed not only around the septal lamina, but also fills the loculi with dissepimental matter. What also strengthens my view of the composition of the septum, is the circumstance that as well in this species as in many others, the uppermost or, what is identical, the youngest border or edge all around the septum is a very thin lamina, wavy or bent in zigzag, and that the septum increases in thickness only a little below this by deposition of stereoplasma. The discoveries of LACAZE-DUTHIERS[2]) on the development of Astroïdes do not in the least favour the theory of a bilamellar septum. According to him the septum is at first deposited in a single line in the midst of a loculus, far from the muscular laminæ and without any connection with them. It is true that sometimes weathered and exposed old specimens, especially fossil ones, look quite as if they had septa consisting of two laminæ, but this is only owing to the central or original lamina having been dissolved and its place left empty. This again proves that there must be some intimate structural difference, not appreciable by means of the microscope or of chemical agents, and which causes one part of the corallum to be more easily destroyed than others. Thence it is conceivable that, as M. EDWARDS states, the two laminæ of the septum are visible at the basal end of Flabellum and others.

The septa of the third order deviate in Schizocyathus much from the others. They are wedged in between two septa of the second order, quite loosely, without any connection with them excepting the very scanty one which is effected by the common thin epitheca. They are best developed in the smallest specimens or low down at the bottom of the calicle, and decrease, as seen in Pl. II, fig. 26, till they completely

[1]) Öfversigt af Vet. Akad. Förhandlingar 1873, p. 30 in sep. paper.
[2]) Archives Zool. expérim. & générale, I, p. 368.

disappear in calicles which have attained a few millimeters in length and their place is left empty. Thence the septal formula in small specimens is (two systems taken):

$$\ldots\ldots 3 + 2 + 1 + 2 + 3 + 2 + 1 + 2 + 3 \ldots\ldots$$

and in adult specimens:

$$\ldots\ldots 0 + 2 + 1 + 2 + 0 + 2 + 1 + 2 + 0 \ldots\ldots$$

The interior margin of the septa of the third order is very closely serrated by minute teeth. The partitions between this septum and the neighbouring ones are distinctly marked on the outside of the coral. They are narrow at the base of the coral, where the septum is largest, and diverge from each other the higher they reach and the smaller the septum grows. When the epitheca is peeled off, there are formed narrow longitudinal slits, and when nothing else holds the septum attached to the nearest septum the coral is ready to split or to break up in segments, a catastrophe in the life of the polyp, no doubt much accelerated by the increase of bulk of the animal itself, in consequence of which the loosely coherent segments of its coral are pushed apart. When this happens the coral may be severed in twelve quite independent segments, viz. the six septa of the third order detached from their feeble hold between the secondary ones, and again six segments formed by the primary septa and their enclosing secondary ones, forming almost a compact mass, being as above described connected by the lateral processes in the locula. When this dissevering of the component segments of the coral happened, it is evident that the animal remained attached to one or more of these fragments and began to form a new calicle around itself and this grows up anew, the fragments of the old calicle firmly attached to it (Pl. III, figs 30 & 31). I think it is rather a continuation of the same individual, growing from the fragments left, than a gemmation of a new individual from a parent, the calicle of which it breaks up. There are many instances evidently indicating that the calicle thus formed on the top of a split coral as to a moiety consists of a new formed wall and new septa (Pl. III, fig. 33). The new calicle in this instance encloses two old systems and four new ones. All the old septa are in uninterrupted continuation, the new ones only a little more narrow and shorter than the older. Moreover there are specimens having the new calicles attached to two or even three segments of the old coral, widely apart from each other as shown in figure 30. This seems to point out the suddenness with which the cleaving of the coral took place, and that the animal still clung to the wrecks of its old coral, and was able to keep them together while it formed a new calicle. If there had been a small bud inside the calicle, it could not have been able to embrace and attach to itself two dissevered segments and less so three. It is, however, very difficult to draw a line of distinction between such an interruption of growth in the same individual and an intracalicinal gemmation. It may be, that these two changes in the life process of the coral sometimes merge into each other. In several Palæozoic genera as Acervularia, Ptychophyllum and also in some recent ones, there is a row of buds inside the calicle, and these embrace within their new calicle one or two septa of the parent coral, so that this young calicle encloses partly old septa, partly new ones. But quite the same thing happens also when the polyp is decreasing in volume and is forming a partially new calicle inside the old, using one segment of its old walls as before and building up a new segment in connection with this. In Schizocyathus there are specimens, where a very small calicle shoots forth from the calicinal part of a detached segment and grows out from it in an acute angle and there may in this case be a real gemmation. Although there is no direct evidence of the fact, it may also be that in this coral it occurs a sort of fissiparity, more essential than in other corals, and that there are budding forth new individuals from each of the detached segments, parts of the parent polyp having been affixed on them. The destruction of the old coral has in some instances begun very early, for instance a specimen having a detached section only 2 millims. in length attached to a complete calicle of 1 millim. in length. Some specimens have attained a length of 8 millimeters before splitting. There are no instances of the calicle having been in such a way renewed more than twice. Generally it happens once. There is also a specimen in which a new calicle is forthcoming inside an older, without having fractured it.

Some other corals besides this show the same peculiar mode of growth or gemmation; as for instance a Jurassic species, which QUENSTEDT has given the commonplace name Turbinolia impressæ (Der Jura p. 587, Tab. 73 f. 87, 88). Flabellum matricida KENT (Proceed. Zool. Soc. 1871, p. 276, pl. XXIII, figs 2, 2*a*) also increases or propagates by the destruction of the old calicle and there it seems to be a real gemmation. That the splitting of Schizocyathus is not a gemmation but an interrupted and then continued growth of the same individual is corroborated by similar processes of growth in others having a very thin and brittle wall as Flabellum laciniatum, Diaseris crispa and several others of the Fungidæ.

When quite young this coral is attached by a broad basis to small pebbles, from which it liberates itself without any traces of having ever been so fixed.

From Salt Island (in 200 fathoms) there is a very distinct variety. It resembles in all particulars the others excepting in having a thick, very spiny and hirsute epitheca, and the septa much more granulated. The septal systems are also complete, and the third septum is never wanting.

As to the affinities and systematic position of this species I think it is at present very difficult to state anything with certainty as long as the animal itself is unknown and it is only provisionally it may retain its place amongst the Cyathinæ. It may be questioned whether there is not an Eupsammidean character in the way in which the septa of the second order enclose those of the first order, quite as in the young Dendrophylliæ (Pl. III, fig. 40) and perhaps the holes in the wall point in the same direction.

24. **Stenocyathus vermiformis** POURTALÈS.

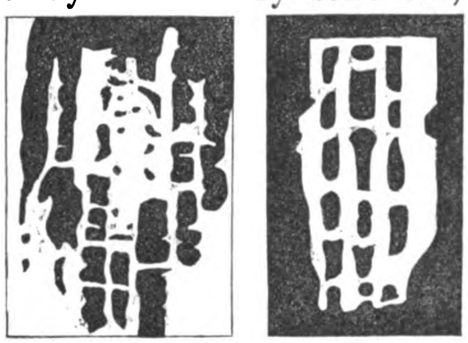
Pl. III, fig. 35, 36.

POURTALÈS in Deep Sea Corals p. 10, pl. I, figs. 1 & 2, pl. III, figs. 11--13.

Off Salt Island in 200—320 fathoms (Dr GOËS). Also two small specimens off Villa Franca in the Azores in 200—300 fathoms (Exp. of the "Josephine"). My specimens differ very much in their exterior shape from those described by POURTALÈS in being of a regular, turbinate growth and never assuming the vermiform shape. They are regular, slowly tapering, curved horns, attenuated towards the basis. Length 9 millimeters, width of calicle 4 millim.

The epitheca is thick and transversally wrinkled by fine lines, in the Azorean specimens of the same zigzag curved shape as in the Floridan. It is never wanting, even not in a Floridan specimen, which Count POURTALÈS sent to the Stockholm Museum.

One small specimen is attached to a stone by a much expanded basis. There are no costæ, only longitudinal rows of dots of a paler colour than the other epitheca of which they are integrating parts. There are no tubercles as described and figured by POURTALÈS. These rows of dots have the same appearance as in Schizocyathus, but the epitheca is never lost and consequently there are no holes. Their presence is due to quite the same cause as in that species. The calicle is circular. The septa are in six systems of three cycles and there are six paluli in front of the secondary septa, one for each. The septa are longer than in the Floridan specimens and the paluli are not so close together. The paluli consist of a lamella having its superior border twisted in the shape of an S. In the Azorean variety the septa are thinner and not so spiny as in the Westindian. In specimens with a wide calicle more space is left in the middle for a columella to develop itself and it is seldom wanting, although it is only faintly indicated by some few, low papillæ on the bottom, which never attain the same height as the paluli. Between the septa in the loculi there is a dense network of dissepiments, which are developed out of the spines or tubercles of the lateral surfaces of the septa. These dissepiments or synapticula are towards the wall arranged in regular rows and the empty spaces left between them are transparent through the pellucid epitheca and the pale dots on this are situated exactly on such empty spaces, whilst the epitheca around them covers the dense, coalesced septa and the dissepiments uniting them. Thus these dots, which I never have seen elevated above the surface as tubercles, have the same origin as the resembling ones in Schizocyathus and can in no way be considered as homologous to the hollow rootlets in Rhizotrochus, Thecocyathus and several other corals. As may be easily ascertained such rootlets are formed, when the calicle is young and short, from its border, from which a lip or hollow process is growing out, and by means of which the coral is attached to foreign bodies. This process is in direct continuation with the calicle as the septa often are seen stretching out in its prolongation. By the growth of the coral this offset is covered up with epithecal and mural depositions, while the calicle is rising above it and perhaps again shoots forth a new rootlet. They are thus formed when the calicle itself was forming, whereas the dots on the epitheca of Schizocyathus and Stenocyathus are only visible long after the calicle is formed, or not until the loculi have been completely filled with dissepiment, leaving a few la-



8. 9.

Longitudinal sections near the centre (8) and close to the exterior wall (9).

cunæ empty. As I know Trochocyathus only by figures, it may be that the tubes of its basis require another explanation than I have given, but, however, it cannot be considered as having "tubercles" of the same kind as Schizocyathus or Stenocyathus.

25. **Parasmilia fecunda** Pourtalès.

Coelosmilia fecunda Pourtalès, Deep Sea Corals, p. 21, pl. I, fig. 12, pl. III, figs 4 & 5, pl. VI, figs 14—15.

Off Salt Island in 200—300 fms; off Anguilla in 180—270 fathoms, Goës.

This species varies much as to its columella, which in some is entirely absent, in others abundant. The compound corals generally do not arise through gemmation. The young have attached themselves on the surface or epitheca of the old, as may be easily observed by cautiously removing one of them from its base, when they are seen to be in no intimate connection with the subjacent coral. It cannot be placed in the genus Coelosmilia, as M. Edwards expressly states that none of its species has a columella. It may be that the presence or absence of that variable part of the coral cannot weigh much, but when on the other hand the genus Parasmilia is characterized as being provided with a columella and Pourtalès himself says that his specimens have one, it is best to follow the precedence of M. Edwards. The genus Coenosmilia of Pourtalès belongs also, according to my opinion, to Parasmilia as there is no other distinctive character besides that of its propagating by buds.

26. **Parasmilia? punctata** n.

Pl. III, figs 37—38.

Off Anguilla in 200 fathoms (Goës).

As there is only one specimen I with some diffidence place it in the genus Parasmilia. It is broadly affixed to what seems to be a fragment of another specimen of the same species. Length 10 millimeters, breadth of calicle in one part 9 millim., in another at right angles to the first 8 millim. There is no epitheca, the wall is densely covered with small tubercles, which are arranged in regular longitudinal costal lines in the vicinity of the calicle. Septa, especially those of the first order highly exsert, thin, lamellar, with entire edges and the lateral surfaces ornamented by perpendicular rows of small tubercles. The septa are in six systems, of which four systems consist of five cycles and two opposite systems of only four cycles of smaller size. The columella is composed of a few twisted papillæ, four of which are detached and placed opposite the interior ends of the secondary septa so as to resemble paluli.

27. **Euphyllia aspera** M. Edw. & Haime.

St. Thomas (Cleve) and St. Bartholomew (Goës).

28. **Dichocoenia Stokesi** Edw. H.

Bartholomew[1]).

29. **Pectinia disticha** Duchassaing & Michelotti.

Bartholomew.

30. **Pectinia mæandrites** L.

Bartholomew.

31. **Isophyllia spinosa** E. H.

Bermudas, Th. Palme.

32. **Isophyllia guadalupensis** Edw. H.

Bartholomew.

33. **Colpophyllia gyrosa** Ellis & Solander.

St. Thomas (Cleve).

34. **Mæandrina labyrinthiformis** Dana.

Bartholomew.

35. **Mæandrina clivosa** Dana.

Bartholomew.

36. **Mæandrina sinuosissima** M. Edw. H.

Bartholomew.

37. **Mæandrina filograna** Dana nec M. Edwards.

? Bartholomew.

38. **Manicina areolata** L.

Bartholomew. St. Thomas (Cleve).

39. **Manicina crispata** E. H.

Bartholomew.

40. **Diploria cerebriformis** Lamark.

St. Thomas (Cleve).

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[1]) Unless otherwise stated all specimens from this place were collected by Dr Goës.

41. **Favia porcata** Esper.

St. Thomas (Krebs).

42. **Favia incerta** Duchass. & Michelotti.

St. Thomas.

43. **Favia conferta** Verrill.

Pernambuco (Forssell).

44. **Orbicella (Heliastræa) annularis** Ellis & Solander.

Bartholomew.

45. **Orbicella cavernosa** Esper.

St. Thomas (Cleve).

46. **Cladocora arbuscula** Lesueur.

Porto Rico (Hjalmarson), Bartholomew (Drs Middleship & Goës).

47. **Astrangia neglecta** Duch. & Mich.

St. Thomas (Cleve).

48. **Diaseris crispa** Pourtalès.

Pl. III, fig. 39.

Pourtalès, Deep Sea Corals p. 47, plate V, fig. 1 & 2.

Off Anguilla in 200—380 fathoms. Off St. Martin in 200—300 fathoms (Goës). Off Villa Franca in 200—300 fathoms and from the Atlantic Ocean (38° 7′ Lat. N., 9° 18′ Long. W.) in 550 fms also on the Josephine Bank in 228 fathoms.

Of all specimens there are only detached segments. The superior border of the septa is serrated with long slender, recurved and compressed spines. The ornamentation of the lateral surfaces of the septa, which is in direct communication with the basis of the spines, is much variable, some with oblique rows of dots, some with elevated ridges, and some quite smooth.

49. **Agaricia agaricites** Pallas.

St. Thomas (Krebs), Bartholomew.

50. **Siderastræa radians** Pallas.

Bartholomew, St. Thomas (Cleve).

51. **Siderastræa stellata** Verrill.

Pernambuco (Forssell).

52. **Dendrophyllia Goësi** n.

Pl. III, figs 40—42.

Off St. Martin in 40—150 fathoms (GOËS).

This species has not yet been found in regular, branching polyparies formed by gemmation, whence there may be some uncertainty, whether to place it amongst the Balanophylliæ or the Dendrophylliæ[1]). There are only small specimens attached to the larger ones on their epitheca. The largest specimen has 40 millim. in length, breadth at the calicle 13 millim. The basis is broad and spreads out over its support. It has quite the same squamose, cellular structure which is prevalent in other Dendrophylliæ. A little above this basal portion some costal striæ are visible, smooth or only faintly projecting, often united by the same sort of scaly covering as at the basis. Calicle elliptical (13 millim. in one direction and 11 millim. in the other) and very deep (13 millim. from the border). The columella is narrow, spongious, only slightly elevated and fills the whole bottom. In the smallest specimen I have seen (2 millim.) there are twelve septa; six primary ones, more pointed and shorter than the secondary ones, which are lower and join in three pair around the interior border of three of the former. As may be seen by fig. 41 there is evidence that also the remaining three primary septa become in the same way enclosed. These are thus hemmed in by the secondary ones, which continue in a single lamina from their point of junction. In larger specimens there are six systems and five cycles. The septa of the first two cycles are lamellar, thin, imperforated, interior edge entire, without indentations and the lateral surfaces almost smooth without any tubercles, only showing regular lines of growth. In comparing an adult specimen (fig. 42) with younger ones (figs. 40 & 41) it is evident that the six primary septa in the young not are identical with the six septa of the first cycle or order in the adult, as the former have been arrested in their development and have been supplanted by younger ones. Very thin septa were entirely dissolved in diluted acetic acid, without leaving the least trace of any organic membrane behind.

As to the soft parts of the animal it may be remarked that the basis of the tentacles, where they cover the superior border of the septa is almost entirely clustered with parcels of nematocysts, each parcel sheltered within a rhomboid cavity with hyaline walls. Such parcels of nematocysts form the peculiar warty surface, seen on the tentacles of so many Caryophylliæ. This species differs from other Westindian Dendrophylliæ by its smooth, not exsert septa and its very narrow and depressed columella.

53. **Madrepora prolifera** E. H.

Porto Rico (HJALMARSON).

54. **Madrepora flabellum** LAMK.

Bartholomew, very common.

55. **Porites clavaria** LAMK.

Bartholomew.

56. **Porites (Neoporites) astræoides** LAMK.

Bartholomew.

[1]) It is questionable whether there really is any difference between these two genera, as the only distinctive character is that trifling one of Balanophyllia containing simple species and Dendrophyllia compound ones.

Explanation of plates.

Plate I.

Calyptrophora Josephinæ n.

Fig. 1. Calicle in its natural position, a. b. c. the three pairs of scales, d. the opercular valves.
» 2. One of the scales of the third pair.
» 3. Part of axial covering, showing the shape and position of the scales.

Caryophyllia? Pourtalesi DUNCAN.

Fig. 4. Calicle of specimen from the North Atlantic.

Leptocyathus? Stimpsoni POURT.

Fig. 5. Side view of globular specimen.
» 6. The same from below.
» 7. Specimen from the Atlantic off the Azores with constricted calicle.
» 8. Specimen from the same locality with expansions of the border of the calicle.

Leptocyathus? halianthus n.

Fig. 9. Calicle from above.

Paracyathus arcuatus n.

Fig. 10. Coral from the side.
» 11. Calicle from above.
» 12. Specimen propagating by basal gemmation.

Deltocyathus Agassizi POURT.

Fig. 13. West Indian specimen from below.

Plate II.

Deltocyathus Agassizi POURT.

Fig. 14. Same specimen as fig. 13 from above.
» 15. Specimen from the East Atlantic off the coast of Portugal.
» 16. Another variety from the same locality.
» 17. The same from below.
» 18 & 19. Transverse sections of Westindian specimens.
» 20. Specimen found off Salt Island, 0,7 millim. in diameter, having four septa of the first order.

Sphenotrochus auritus POURT.

Fig. 21. Calicle from above.
» 22. Lateral view of coral showing the irregular costæ.

Duncania barbadensis POURT.

Fig. 23. A somewhat fragmentary calicle, showing the dissepimental rings.
» 24. *Cryptohelia virginis* n.
» 25. Unknown coral, belonging to the tribe of the Stylasteridæ.

Schizocyathus fissilis POURT.

Fig. 26. A cloven coral of three systems, showing how the septa of the second order hem in those of the first. III, septum of the third order.
» 27. Calicle from above. I, septum of the first order. II, ditto of the second order.

Plate III.

Schizocyathus fissilis POURT.

Fig. 28. Specimen growing at right angles from a detached segment of an older coral.
» 29. Specimen growing in direct continuation from a segment and having a bud or contracted calicle within.
» 30 & 31. Calicles growing from two segments.
» 32. Outside of epitheca showing the regular rows of pale dots and the transparent (white) longitudinal partition lines between a septum of the third order and those of the second, the septum being in the middle decayed.
» 33. A specimen consisting partly of an old calicle and partly of a new one.
» 34. Thin section near the wall; a. the chief or original part of the septum; b. the later formed stereoplasma or dissepiment, which entirely fills the loculi excepting where the lacunæ (c) are left as regular rows of holes, which on the transparent epitheca cause the longitudinal lines of dots.

Stenocyathus vermiformis POURT.

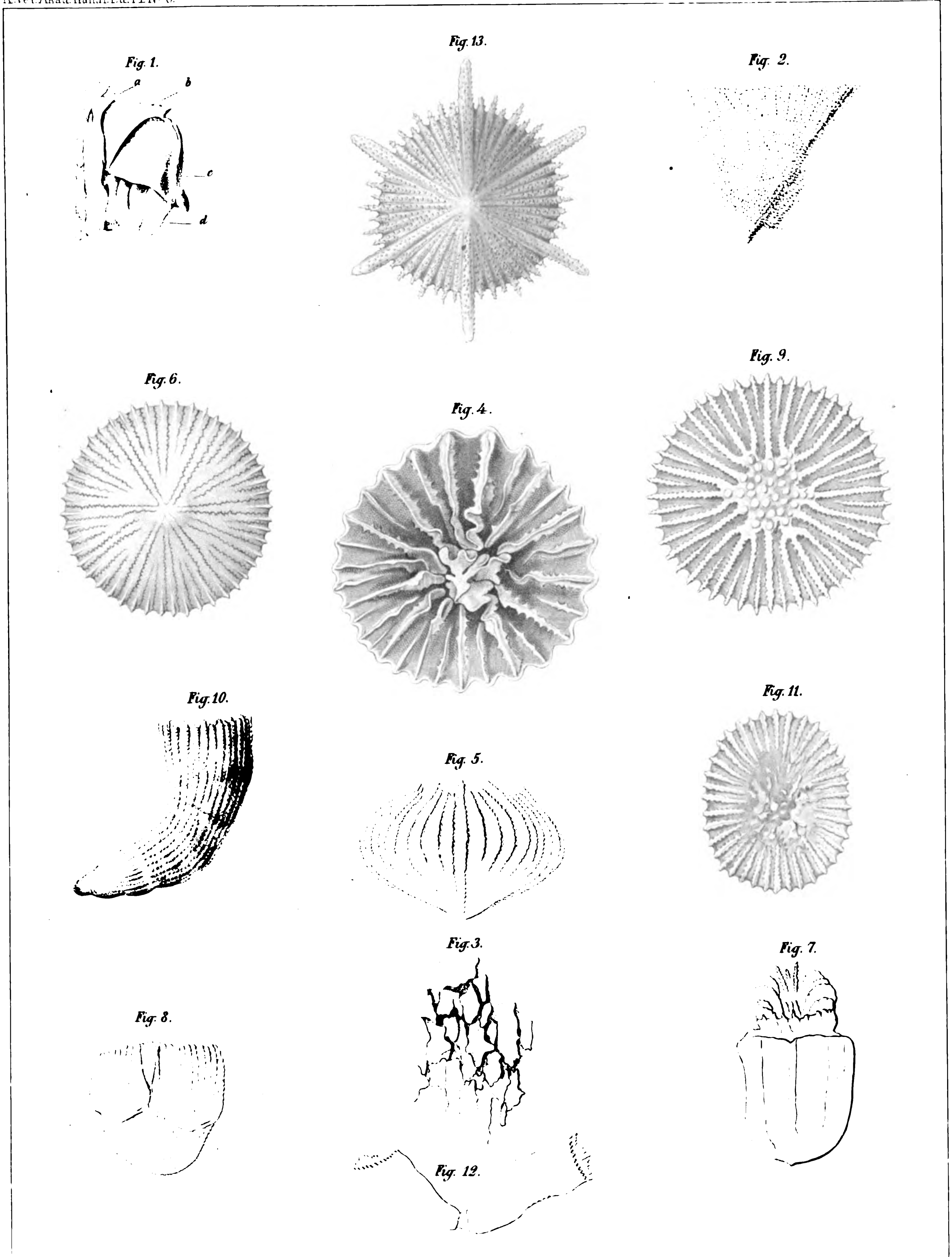
Fig. 35. Calicle from above.
» 36. Outside of the wall with rows of pale dots.
» 37 & 38. *Parasmilia punctata* n.

Diaseris crispa POURT.

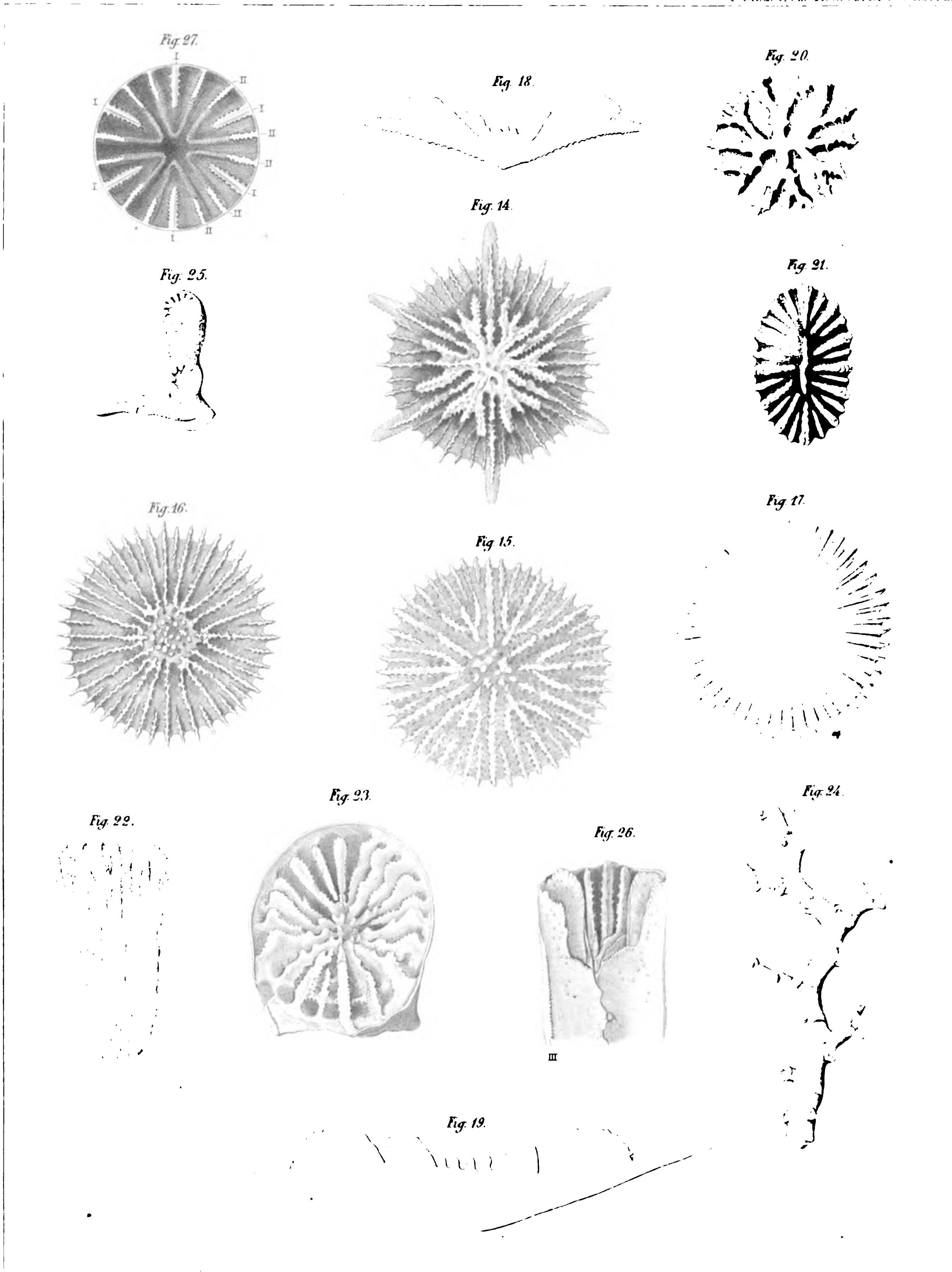
Fig. 39. Outline of a septum.

Dendrophyllia Goësii n.

Fig. 40. Calicle of small specimen in which three septa of the first order are enclosed by those of the second.
» 41. Larger specimen. *a*. Septa of the first order enclosed between those of the second and thus stopped in their growth.
» 42. Calicle of adult specimen. *a*. Later developed septa, forming the first cycle in the adult calicle.



A. M. Westergren del. Fig. 1-2 4-13. G. Lindström del. Fig. 3. W. Grohmann sc. Berlin



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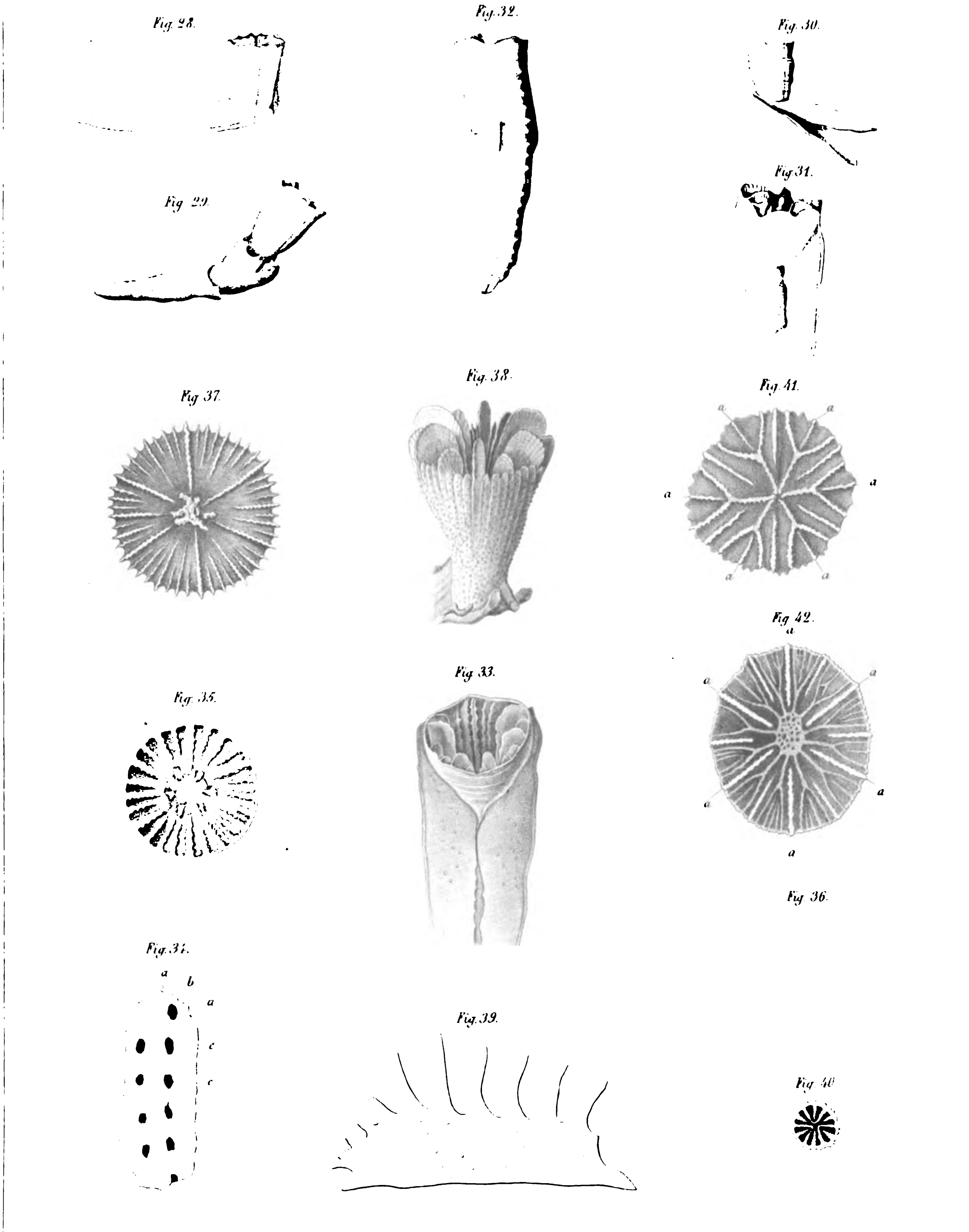

F. W. Bergren del. W. Grohmann sc. Berlin.