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# BIOLOGICAL RESULTS OF THE SNELLIUS EXPEDITION XXVII. FAVIIDAE COLLECTED BY THE SNELLIUS EXPEDITION. II. THE GENERA *FAVITES, GONIASTREA, PLATYGYRA, OULOPHYLLIA, LEPTORIA, HYDNOPHORA* AND *CAULASTREA*

by

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With 1 text-figure and 8 plates

## Introduction

This paper forms the second part of the report dealing with the Faviidae collected during the Snellius Expedition. For the general introduction I refer to part I (Wijsman-Best, 1974). The genera dealt with in the present article, *Favites, Goniastrea, Platygyra, Oulophyllia, Leptoria, Hydnophora* and *Caulastrea* were with three exceptions collected at the same localities as the specimens of *Favia*. For the explanations of localities 1-17 I refer to article I. The additional three localities are (see map fig. 1):

18. Amboina (18 May 1830). By reef and shore collecting on 6th May some material was obtained at Wainitoe. From 2-8 May the mantri Erie accompanied Dr. P. H. Kuenen on his trip to the neighbouring island Haroekoe and collected animals on the shore and from the reefs.

19. Paleleh, north coast of Celebes (22 Aug. 1929). Collections were made on the reefs, which have a rich coral fauna. A finely branched *Millepora* is a very common form here. Some Gorgonids and Antipatharians were collected by diving.

20. Batoe Ata ("Hagedis Eiland"). As a result of the high tide very few animals could be obtained from the shore. By diving at some distance from the shore, at a depth of 6-8 m, corals and other animals were collected. Species of *Acropora* of a plate-like horizontal growth form with delicate branches occur here as common forms, they may attain enormous sizes (diameter of the colonies up to 3 m).

Of the genera here dealt with the following species have been collected:

*Favites pentagona* (Esper, 1794); *F. melicerum* (Ehrenberg, 1834); *F. rufa* Wijsman-Best, 1972; *F. chinensis* (Verrill, 1866); *F. acuticollis* (Ortmann, 1899); *F. abdita* (Ellis & Solander, 1786); *F. virens* (Dana, 1846); *F. flexuosa* (Dana, 1846); *Goniastrea retiformis* (Lamarck, 1816); *G. edwardsi* Chevalier, 1972; *G. spectabilis* (Verrill, 1872); *G. favulus* (Dana, 1846); *G. pectinata* (Ehrenberg, 1834); *Platygyra lamellina* (Ehrenberg, 1834); *P. daedalea* (Ellis & Solander, 1786); *P. sinensis* (H. Milne Edwards & Haime, 1849); *P. verweyi* nov. spec.; *P. pini* Chevalier, 1975; *Oulophyllia crispa* (Lamarck, 1816); *O. aspera* Quelch, 1886; *Leptoria phrygia* (Ellis & Solander, 1786); *Hydnophora exesa* (Pallas, 1766); *H. microconos* (Lamarck, 1816); *H. rigida* (Dana, 1846); *Caulastrea curvata* Wijsman-Best, 1972.

A complete synonymy of each species is given by Wijsman-Best, 1972;

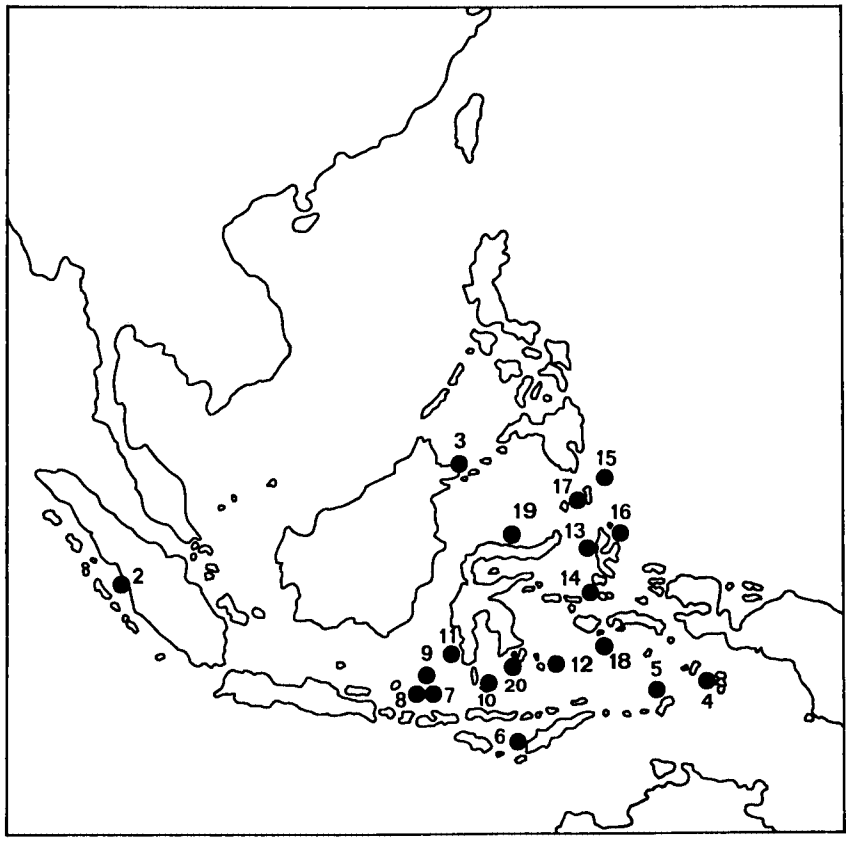


Fig. 1. Map of the Indonesian archipelago. The numbers indicate the localities where the material has been collected (see part I p. 249, part II p. 45).

unless changes or additions are indicated, this list remains valid. The same holds true for the general description of each species.

SYSTEMATIC PART

**Favites pentagona** (Esper, 1794) (pl. 1 figs. 1, 2)

Synonym: *Favites gailei* Chevalier, 1972.

Material: 9 colonies. Coel.: 8734 (2×) Binongko; 8736 (2×) Poeloe Toesa; 8735 Amboina; 8737 (2×) Karaton; 8733[a] Beo; 8733[b] Reinis.

The two ecotypes of this species as recognized in Wijsman-Best, 1972, viz., *pentagona* and *deformis*, are both present in the series of the Snellius expedition belonging to *F. pentagona*. Coel. 8735 and 8733[a, b] together with the specimens from Karaton belong to the ecotype *pentagona*. Coel. 8735 from the Bay of Amboina is a hillocky colony closely resembling the type of Esper (as figured in Esper, 1794, pl. 39). The large colony from Poeloe Toesa is more like the ecotype *deformis*; the characters (higher thecae, deeper corallites, little paliform structure, more pronounced dentation) suggest the corallum to come from an exposed site. Coel. 8734 represents more or less a transition between the ecotypes *pentagona* and *deformis*, which confirms my opinion, that these forms belong to one and the same species, although the data available for the present paper are not sufficient to give an ecological explanation for the variation within the species. For the rest, as far as the environmental factors are known the growth forms are as expected.

The species *Favites gailei* Chevalier (1972: 215), falls within the range of variation of the present species. The specimens examined by me in Paris (cf. Chevalier, 1972: pl. 22 fig. 1) correspond with the ecotype *pentagona* of deeper or quiet water. The specific characters according to Chevalier (i.e., smaller corallites, smaller number of septa, stronger dentation, less corallites per square unit) are better considered only quantitatively different. This ecotype *pentagona* is best included in *F. pentagona*, rather than to be regarded as a separate species. Chevalier states the species resembles *F. parvicella* Nemenzo, which I have also included in *F. pentagona* (see Wijsman-Best, 1972).

**Favites melicerum** (Ehrenberg, 1834) (pl. 1 fig. 3)

Material: 4 colonies. Coel.: 8739 (2×) Wotap; 8738 (2×) Beo.

This rare species is recorded here for the first time from the Indonesian Archipelago. Although there has been much controversy about the status of this species, which is closely allied to *F. pentagona*, the characters in these four specimens are clear enough to stress the opinion that the species is valid. The two rounded colonies from Wotap show the species to have a wider range of adaptability than known before. The growth form of the

species has hitherto only been described as encrusting. The characteristic "double" wall structure is in general very clear. Coel. 8738 contains two small encrusting colonies with closely set corallites and rather pronounced dentation; there the knob-like structure of the costae is less pronounced, although the other characteristics, e.g., the crown of paliform lobes and the small, round columella consisting of fine septal teeth, make the specimens easy to identify. Chevalier (1972: 215) mentions *F. melicerum* as a doubtful synonym of *F. pentagona*, but in his collection there were no specimens resembling "*melicerum*".

**Favites rufa** Wijsman-Best, 1972 (pl. 1 fig. 4)

Material: 3 colonies. Coel.: 8740 Binongko; 8741 (2×) Beo.

The first description of this species was based on a series of nine colonies from the same geographical locality (New Caledonia), so that the three specimens from the Indonesian Archipelago considerably extend its range. The characters as described by Wijsman-Best (1972: 30) could also be used for the present collection and do not widen the range of variability. Coel. 8740 is an encrusting colony from water on a protected reef. Especially the uneven thecal structures are remarkable. The other two specimens are hillocky colonies; the corallites are rather capricious of structure, the teeth formation of the deepest part of the septum and columella is very clear, showing the typical lace-like appearance. In my opinion the specimen C 48 h of Chevalier's collection from New Caledonia, which he identified as a *Goniastrea* (?) cf. *palauensis* var. *superficialis* can be considered *Favites rufa* as well (viz., Chevalier, 1972: pl. 28 fig. 9).

**Favites chinensis** (Verrill, 1866) (pl. 2 fig. 1)

Material: 14 colonies. Coel.: 8746 (2×) Kera; 8744 (2×) Bone Tamboeng; 8743 (2×) Binongko; 8745 (3×) Poeloe Toesa; 8742 (5×) Beo.

The species is rather easy to recognize, and does not show much variation, apart from the general pattern of modification in the growth form depending on the different biotopes. Coel. 8746[a] and the two specimens from Bone Tamboeng are round, somewhat hillocky colonies with rather deep corallites; 8746[b] is a flat corallum with larger, shallow calices, probably coming from a deeper site.

Some of the specimens from Beo (Coel. 8742) show the same ecotype *complanata* (cf. Wijsman-Best, 1972: 31) from quiet water. The two specimens from Binongko have the typical characters of *chinensis*, and both come from the shallow reef habitat. The specimens from Poeloe Toesa, on the contrary, show very different growth forms. Coel. 8745[a], for instance, has a

very regular appearance, probably having grown under unfavourable conditions. The rather low number of septa is also in accordance with this speculation. Chevalier did not mention this species from New Caledonia, but he probably included it in *Favites halicora* (cf. Chevalier 1972: 200), because his var. *obtusata* corresponds to the present species.

**Favites acuticollis** (Ortmann, 1889) (pl. 2 fig. 2)

Material: 8 colonies. Coel.: 8748 Wotap; 8749 (2×) Kera; 8752 Sapoeka Besar; 8750 Sailoes Besar; 8747 Ake Selaka; 8751[a] Reinis; 8751[b] Beo.

This series of specimens belonging to *Favites acuticollis* is surprisingly homogeneous, considering the different environments where it was collected. The numerous equally developed thin and regularly dentated septa and the small rounded columella, so distinctly visible in the large colony from Sapoeka Besar, are characteristic for the present species. The depth of the calices, however, can change, but this is just a result of different ecological conditions. In view of this variability it can be noted that Chevalier (1972) also recognized *Favites yamanarii* Yabe & Sugiyama, 1936 as a synonym of *F. acuticollis,* as well as the var. *profunda* of Umbgrove, 1940. Coel. 8749[a] from Kera shows the very high thecae and consequently deep fossa (var. *profunda*) on the top of the large rounded corallum, while at the sides where conditions are less favourable the corallites are shallow. Coel. 8751[a] shows the same structure, suggesting the site of Reinis to be quite. The specimen from Ake Selaka is very irregular, the number of septa (normally about 35) is as low as 25; moreover, primary and secondary cycles can be distinguished (normally the cycles are equally developed).

**Favites abdita** (Ellis & Solander, 1786) (pl. 3 figs. 1-4)

Material: 16 colonies. Coel.: 8753 (2×) Sipankot; 8757 Wotap; 8755 (3×) Bone Tamboeng; 8756 (5×) Poeloe Toesa; 8754 Karaton; 8758 (4×) Beo.

This well-known and variable Indo-Pacific species is well represented in the present collection, as might be expected. The three ecotypes (*abdita, halicora* and *robusta*) as dealt with by Wijsman-Best, 1972, are present. Coel. 8757 is a large, compact corallum coming near the *halicora* growth form. The same holds for Coel. 8756[a], one of the five specimens from Poeloe Toesa (a locality with much variation in habitats). Coel. 8754 represents the *robusta* ecotype in having thick thecae and a strong dentation on all septa. The other representatives of this species belong to the common shallow reef ecotype *abdita*. One specimen from Bone (Coel. 8755[a]) has the same extremely high thecae (up to 12 mm) and the thin hardly dentated septa (as seen in "*Prionastrea seychellensis*" BMNH no. 28.9.1.282). The other extreme in this

hillocky ecotype is Coel. 8758[a], where, in contrast, the thecae are very low, sometimes no more than a few millimeters.

The interpretation of *F. abdita* and *F. halicora* by Chevalier is different from mine and will be discussed under *F. virens*.

**Favites virens** (Dana, 1846) (pl. 2 fig. 3)

Material: 11 colonies. Coel.: 8789 (2×) Paleleh; 8790 (2×) Wotap; 8785 Sapoeka Besar; 8786 Binongko; 8787 (4×) Poeloe Toesa; 8788 Karaton.

In the present collection this species, so controversially dealt with in literature, is represented by 11 colonies. The large amount of variation in the species, which causes the taxonomic problems, is very clear, and all ecotypes described by Wijsman-Best, 1972, are present. Coel. 8788 and 8790[a] belong to the ecotype *vasta*, the growth form of a rather exposed reef site, forming heavy rounded colonies with well developed dentation on the different parts of the skeleton. The growth form from a quieter site showing a less heavy corallum with smaller shallower corallites, ecotype *virens* in which the septa are regular and less dentated, is represented by Coel. 8789 from Paleleh, and Coel. 8785 from Sapoeka besar. Coel. 8786 is a part of a larger colony with a very light porous structure. Probably this specimen was collected in deeper water, during diving at Binongko. The four colonies from Poeloe Toesa show very diverse growth forms.

Chevalier (1972: 181) regards *virens* as a variety of *F. abdita*. Although the two species are closely related and may even overlap in their allround morphology (sibling species), they do exclude each other within the same site (clearly observed on the reefs at Heron Island — Great Barrier Reef, Australia). Examination of the present collection did not alter my opinion based on New Caledonian material.

Chevalier synonymizes *virens* with *abdita* and recognizes *abdita, halicora* as well as *complanata* as valid species, while I make two different species groups of them on basis of my material. Only an extensive ecological study might bring some more light in the exact delimitation of the species in this group of corals.

**Favites flexuosa** (Dana, 1846) (pl. 2 fig. 4)

Material: 5 colonies, Coel.: 8791 Wotap; 8792 Bone Tamboeng; 8793 (3×) Beo.

Chevalier (1972: 219) enters into a detailed discussion on this species that firmly establishes its validity. He recognizes also a larger "variety": *magnistellata* and a smaller one *ministellata* (cf. Wijsman-Best 1972: 37). Of the latter he remarks that the variety is typical for a rather exposed reef site. This corresponds with my observations. Coel. 8791 from Wotap also belongs

to this ecotype *flexuosa*. The ecological conditions in Wotap, as far as the data are known and the growth forms of other species indicate, are indeed those of an exposed inner reef site (small corallites, rather smooth septa, regular appearance). Coel. 8792 from Tamboeng has larger corallites, more pronounced septal dentation and shallower calices, so it comes closer to the variety of Chevalier's *magnistellata*, but is not typical being a rather transitional form. The three colonies from Beo have the extreme plocoid habit, that made Chevalier hesitate to include *flexuosa* in *Favites*; in this growth form one would consider it a *Favia*. But this phenomenon of adaptation to more spacing between corallites in deeper water is well known from different species.

**Goniastrea retiformis** (Lamarck, 1816) (pl. 4 figs. 1, 2)

Material: 19 colonies. Coel.: 8801 (3×) Kera; 8795 Bone Tamboeng; 8802 (5×) Poeloe Toesa; 8798 (8×) Ake Selaka; 8797 (2×) Reinis.

This highly adaptable but easily recognized species is well represented in the Indonesian Archipelago. Reexamination of the group of *Goniastrea* species with small corallites, however, showed that the group has to be divided into two species, viz. *G. retiformis* and *G. edwardsi* (see discussion of *Goniastrea edwardsi*).

The group of 19 colonies belonging to *G. retiformis* includes the two ecotypes *retiformis* and *parvistella* as discussed by Wijsman-Best (1972: 38), ecotype *retiforms* from a more exposed site and ecotype *parvistella* from a more sheltered one.

The colonies from Kera, Poeloe Toesa and Reinis belong to the ecotype *retiformis* with the regularly formed corallites and the thin thecae; the specimen from Bone Tamboeng belongs to the ecotype *parvistella* with the thicker thecae and larger corallites. The specimens from Ake Selaka are often capricious of form, in some instances as a result of encrusting animals. The variability in the skeleton characters, as a result of adaptation to different environmental conditons, is the reason why for so long the species now known as *G. edwardsi*, has not been recognized (viz. Foidart, 1970, 1972).

**Goniastrea edwardsi** Chevalier, 1972 (pl. 4 figs. 3, 4)

New name for *G. solida* sensu M. Edwards & Haime, 1848 non *Madrepora solida* Forskål (1775).

Material: 7 colonies. Coel.: 8800 (2×) Tanah Djampea; 8794 Binongko; 8796 (2×) Binongko; 8799 (2×) Karaton.

This species, very closely allied to *G. retiformis*, has been interpreted by Chevalier (1972). I agree with the division of the controversial group of species of *Goniastrea* with small corallites "*retiformis-parvistella-solida*", into two species. Although it is still difficult to see the difference in the field or

on superficial examination of the skeleton structure, it is very apparent when a dissecting microscope is used. It is mainly the structure of the paliform lobes, together with the teeth formation that is characteristic. *G. edwardsi* has fewer, but thicker pali, and the granulation on this part of the skeleton is stronger. The theca is usually thicker. The latter character has been used for the separation of *G. parvistella* and *G. retiformis*, but specimens of *G. retiformis* can also form thick thecae (see under *G. retiformis*). The fact, that in most of his *G. edwardsi* specimens from the Togian Islands the corallites are larger, caused Umbgrove (1940) to assign these specimens to *G. pectinata*. In the Snellius collection the specimens of the present species are rather homogeneous. The two colonies from Tanah Djampea are heavy and rounded, and the corallites are large. Those from Karaton show the same features. The habitat of the colony from Binongko must have been different, probably more exposed, for the colonies show a more capricious growth form with more closely set corallites. It is peculiar that in the Snellius material the two species *G. retiformis* and *G. edwardsi* do not occur together in the same locality.

In the collection from New Caledonia (Wijsman-Best, 1972) there are three specimens belonging to *G. edwardsi*, wrongly identified by me as *G. retiformis*. But Chevalier (1972: 245) mentions numerous specimens of both species from the same locality on the reef.

**Goniastrea spectabilis** (Verrill, 1872) (pl. 5 fig. 2 )

Material: 9 colonies. Coel.: 8807 (2×) Wotap; 8806 (2×) Kera; 8805 Sailoes Besar; 8808 (4×) Beo.

This species does not present problems of identification, because of its characteristic regularity and the numerous paliform lobes. The ecotype "*mantonae*", from a sheltered reef habitat, as described by Wijsman-Best, (1972) is present in the locality Wotab. The two specimens from Kera are small colonies with a regular appearance and for this species rather much teeth formation. The specimen from Sailoes Besar is a small rounded colony, probably from shallow water with a sandy bottom. The material from Beo consists of four colonies, all belonging to the "*mantonae*" ecotype.

Chevalier (1972: 260) mentions this species, but gives it the name *G. incrustans* Duncan (1889) which, as I have noted is a junior synonym.

**Goniastrea favulus** (Dana, 1846) (pl. 5 fig. 1)

Synonym: *Goniastrea regularis* Chevalier, 1972.
Material: 11 colonies. Coel.: 8803 (3×) Bone Tamboeng; 8804 (8×) Reinis.

The most striking characters of this species are the small corallites (up to 6 mm diameter) and regular septa and paliform crown. This is very clear in

the colonies from Bone Tamboeng. The species is, however, still rather flexible in growth form. For instance, in the colonies from Reinis the thecae often are very unequal in height, even perforated at the top. The septa are more irregular and the teeth formation is stronger, so that these specimens more closely resemble the *aspera* ecotype (see Wijsman-Best, 1972: 41).

**Goniastrea pectinata** (Ehrenberg, 1834) (pl. 5 figs. 3, 4)

Material: 32 colonies. Coel.: 8810 Padang; 8811 Kera; 8812 (9×) Binongko; 8814 (5×) Poeloe Toesa; 8809 Ake Selaka; 8813 (15×) Beo.

*Goniastrea pectinata* is the most common species of the genus *Goniastrea* in the Indo-Pacific and is found there in many different niches of the reef areas. Because it is so adaptable the species is very variable in growth form. Both forms, *pectinata* and *planulata*, which are represented by flat as well as rounded colonies, are present in the Snellius collection. The specimens from Poeloe Toesa show the different growth forms very clearly, probably caused by the various ecological conditions present in this biotope. The specimens from Binongko are more homogeneous in shape, all being more or less rounded colonies with a rather regular skeleton structure. That the ecotype "*planulata*" is in the majority in the locality Beo is in accordance with the ecological data as provided by Boschma (see Wijsman-Best, 1974: 252); this was to be expected after studying the forms of other species found from that locality. Because this species is so common on the Indo-Pacific reefs, the extent its variability is well known. Therefore there has never been much controversy in the literature as to the recognition of the species.

Chevalier (1972: 246) includes in *G. pectinata* also the species *G. australensis* (H. Milne Edwards & Haime, 1857) [= *G. benhami* Vaughan, 1917]. It is true that the latter species comes close to certain forms of *G. pectinata*, but it is my experience (in New Caledonia and on the Great Barrier Reef) that in the field they are easily distinguished. *Goniastrea australensis* is not present in the Snellius collection.

**Platygyra lamellina** (Ehrenberg, 1834) (pl. 6 fig. 1)

Material: 10 colonies. Coel.: 8815 Sipankot; 8819 (4×) Bone Tamboeng; 8816 Binongko; 8817 (2×) Poeloe Toesa; 8818 Karaton; 8823 Beo.

The ten specimens representing this species do not show much variation. The characters are in accordance with those generally given in the literature. In most colonies the meanders are long, the thecae thin and the characteristic fusing of the septa with the columella rather clear. The height of the theca is variable.

Although the present species comes very close to *Platygyra daedalea*, I still believe that the two do not form one series. This is in contrast to the opinion of Chevalier (1975: 122). In the present collection *P. lamellina* and *P. daedalea* are found at the same locality, viz., Sipankot, Bone Tamboeng, Binongko, Poeloe Toesa, Karaton and Beo, and although the general habit of the colonies is similar, due to the influence of the same ecological conditions, the characteristics of the species remain apparent. Apart from this collection a field study by the author at Heron Island, Great Barrier Reef, Australia (October 1974), very clearly showed the differences of the two species living next to each other in the same habitat. Not only the form and colour of the polyp, also the form and characteristics of the skeleton structure, remain distinguishable. In an extensive series the distinction is hard to see, so I agree with Chevalier "que les deux espèces représentent en effet une extrème variabilité et pratiquement il est impossible d'opérer une séparation entre *P. daedalea* et *P. lamellina*"; but within one habitat the differences are clear. Only more detailed ecological work can solve the present problem and until then I prefer to keep the two species separate.

The specimens from the present species correspond closely with var. *lamellina*, var. *laticollis* and var. *lamellaxis* of Chevalier.

**Platygyra daedalea** (Ellis & Solander, 1786) (pl. 1 fig. 2)

Material: 30 colonies. Coel.: 8830 Sipankot; 8820 (3×) Wotap; 8826 Kera; 8825 Tanah Djampea; 8829 (3×) Bone Tamboeng; 8828 and 8831 Binongko; 8822 (7×) Poeloe Toesa; 8821 (3×) Karaton; 8832 (3×) Ake Selaka; 8824 (5×) Beo; 8827 Bay of Amboina.

The most common species of this genus is certainly *P. daedalea*, occurring in all habitats and therefore showing an extreme variability. The extent of variability of this series of 30 specimens does not exceed the range as described by Wijsman-Best (1972) and Chevalier (1975). In general the valleys are short, the theca wall varies from broad and low to thin and high, often perforated at the top. Most colonies are small and rounded, which is the general habit of a reef flat ecotype. Only those from Beo (Coel. 8824) are flat or encrusting and rather capricious of form. Most specimens of the present species correspond to the var. *astreiformis*, var. *edwardsi* and var. *esperi* of Chevalier.

The two species *P. lamellina* and *P. daedalea* form a good example of two sibling species, between which no distinction can be made in a randomly collected series, but which can be distinguished when the habitat is taken into account.

**Platygyra sinensis** (H. Milne Edwards & Haime, 1849) (pl. 6 fig. 3)

Material: 8 colonies. Coel.: 8835 and 8837 Binongko; 8838 (4×) Poeloe Toesa; 8834 Beo; 8839 Bay of Amboina.

Here again we deal with a well-defined biological species, in the range of variability of which coral students often include extremes of other (allied) *Platygyra* species, such as *P. daedalea* or *P. klunzingeri* (see below). This may be due to the fact that of the type series of M. Edwards & Haime, the syntypes in the MNHN (Paris) include specimens that according to me do not belong to *P. sinensis*.

With the present field experience and the collections at hand, the eight colonies form one species closely corresponding with the description given by M. Edwards & Haime for their species *P. sinensis*, based on the holotype. The conservative characters, viz., the narrow valleys (3-5 mm), the hardly exsert septa and the rather short meanders, remain entirely distinct throughout the series. The dentation is variable; only Coel. 8834 from Beo has a smooth and regular habit, the others are more irregular in dentation and form, due to the different ecological conditions.

Chevalier (1975: 144) discusses the species with its many varieties. His var. *ryukyuensis* may belong to *P. klunzingeri*, which according to Wijsman-Best (1972: 48) is a valid species; var. *lamellosa* may belong to *P. daedalea*. But also here these assumptions are useless, only detailed fieldwork can determine the real limits between these species.

**Platygyra verweyi** nov. spec. (pl. 6 fig. 4)

Material and types: 5 colonies. Coel.: 8833 Reinis (paratype); 9053a Poeloe Dapoer (holotype); 9053b Poeloe Dapoer (paratype); 9054 Hoorn Island, Bay of Batavia (paratype); 9984 Java Sea (paratype).

Only one specimen has been collected during the Snellius expedition, but three additional colonies, including the holotype were collected by Dr. J. Verwey in the Java Sea in June 1931. The species is named after Dr. Verwey because of the sound contributions he has made and is still making to our knowledge of this group of marine invertebrates.

Description of the species. — Corallum: all five colonies are rounded and solidly built, the colony formation is meandroid. The angular corallites are very regular, mostly monocentric, but short meanders do occur frequently. The diameter of the corallite or short meander is about 5 mm. The thecae are thin, sometimes perforated at their tops, the septa (about 10 per cm) are not or hardly exsert, they are thin and hardly dentated, there are no paliform lobes and the small columella consists of twisted trabeculae.

The present species differs from the other species belonging to *Platygyra*

by the short and for the greater part monocentric corallites, with a very regular appearance. Within this small series little variation can be seen: The holotype Coel. 9053 and paratype Coel. 9053b were collected on Poeloe Dapoer, Thousand Islands, Java Sea by J. Verwey in June 1930; the paratype Coel. 8833 is from Reinis, Karakelong, Talaud Islands, collected in June 1930 during the Snellius expedition; the paratype Coel. 9054 was found at the Island of Hoorn, Bay of Batavia, Java Sea, collected by J. Verwey in June 1931; the paratype Coel. 9984 is from the "Java Sea", collected by H. Kuhl and J. C. van Hasselt (1820-1823). It is quite possible that the specimens may fall within the variability of a closely allied *Platygyra* species. The species which it most closely resembles *Platygyra klunzingeri* Matthai, 1928 and *Platygyra sinensis* (Milne Edwards & Haime, 1849). From the type of the first it differs by not having long meanders, but the low number of non-exsert septa makes the two species resemble each other. *P. sinensis* is in general more irregular, the septa are more variable and exsert and it has narrower collines. As long as we do not have more ecological data to throw light on the variability and ecological preference of the species, I prefer to separate this series of *Platygyra* specimens and consider it a distinct species.

In other collections I have never met with specimens, which possibly could be included in this species, so the only region from which it is known is the Indonesian archipelago.

**Platygyra pini** Chevalier, 1975 (pl. 7 fig. 1)

Material: 8 colonies. Coel.: 8836 Karaton; 10721 (7×) Beo.

Although the colonies at hand do not convince me completely that they do not represent a mere ecotype of e.g. *Platygyra daedalea*, I am of the opinion that as long as there is no ecological proof to the contrary these colonies can best be regarded as constituting a valid species. Because they correspond in many respects to the description and type specimens of Chevalier's *P. pini*, they are placed in the present taxon.

The description of the species by Chevalier is extensive. The most striking characters by which it is easily distinguished from *P. daedalea* are the mostly monocentric corallites with the very irregular septa, which give the colony a spiny appearance. The present series shows resemblance to var. *isolata* of Chevalier; there is not much variability.

**Oulophyllia crispa** (Lamarck, 1816) (pl. 7 fig. 2)

Material: 3 colonies. Coel.: 8844 Sipankot; 8840 (2×) Poeloe Toesa.

The present species of the genus *Oulophyllia* is well known in literature, although it is never abundant on the reefs. The three specimens from the

Indonesian archipelago resemble the type specimen of Lamarck, only the twisted trabeculae in the fossa (according to Chevalier, 1975: 166, the most striking character of the species) are not so clear. Often this species is connected with *Oulophyllia aspera* Quelch, which comes very close and which might be a real synonym, ecotype of the present. But on the basis of the material which I have studied this question can not be decided, therefore provisionally I keep the two species as yet separate.

**Oulophyllia aspera** Quelch, 1886 (pl. 7 fig. 3)

Synonym: *Oulophyllia cellulosa* Quelch, 1886.
Material: 5 colonies. Coel.: 8841 Wotap; 8843 (3×) Binongko; 8842 Karaton.

As I stated in the discussion on *Oulophyllia crispa* the two *Oulophyllia* species come very close to each other, but can be separated by some skeleton characters, mainly the presence of trabeculae between the centers in the latter species. This may be merely a result of ecological conditions, but in the present series of five colonies these structures are absent. The other two characters Chevalier regards as differences, viz., number and height above the theca of the septa, are not convincing because these two characters are very variable. The variability within the series of *O. aspera* is large, the theca can be very low as in Coel. 8841 (see pl. 7 fig. 3) or very high (up to 15 mm) as in Coel. 8842.

**Leptoria phrygia** (Ellis & Solander, 1786) (pl. 7 fig. 4)

Material: 10 colonies. Coel.: 8851 Suvadiva; 8846 (2×) Sipankot; 8850 (3×) Wotap; 8847 Binongko; 8848 Ternate; 8849 Poeloe Toesa; 8845 Karaton.

This easily recognized species does not present any problems. The latest authors (Wijsman-Best, 1972 and Chevalier, 1975) agree that *L. gracilis* is synonymous with *L. phrygia*.

The variability to be seen in the present series agrees with what has been described by the above mentioned authors.

**Hydnophora exesa** (Pallas, 1776) (pl. 8 fig. 1)

Material: 21 specimens. Coel.: 8858 (4×) Wotap; 8854 (3×) Bone Tamboeng; 8855 (3×) Batoe Ata; 8857 (10×) Poeloe Toesa; 8856 Beo.

The specimens representing *Hydnophora exesa* often are only branches of a broken colony. The four specimens of Coel. 8858 belong probably to two different colonies, because two by two they form different growth forms: the *gyrosa* ecotype and a growth form with much narrower branches. The same applies to the ten specimens from Poeloe Toesa, three of which correspond to the *tenella* ecotype, the other specimens more to the *gyrosa* eco-

type. Coel. 8856 from Beo shows very thin branches, resembling in this respect *H. rigida.*

The different habitat-induced growth forms and ecotypes due to environmental conditions also in different parts of the same colony due to the influence of the micro-environment have been described by Wijsman-Best, (1972: 51) and Chevalier (1975: 175). The only difference between statements of the two authors is that Wijsman-Best includes *H. grandis* in the range of variability of the present species while Chevalier considers it a valid species.

**Hydnophora microconos** (Lamarck, 1816) (pl. 8 fig. 2)

Material: 3 colonies. Coel. 8859 (3×) Reinis.

In general the species is easy to recognize; the general description can be applied to the three specimens from Reinis with their rounded colonies and their small pointed monticules. There is very little variation in the small series.

**Hydnophora rigida** (Dana, 1846) (pl. 8 fig. 3)

Material: 8 colonies. Coel.: 8853 (2×) Wotap; 8852 (6×) Poeloe Toesa.

The present species always has colonies with fine branches. The six specimens from Poeloe Toesa are probably parts of one colony. The colonies of this species are fragile and, accordingly, in most collections present only as fragments. Also for the present species a field study has to be carried out to determine the intracolonial and the intraspecific variability. The present specimens or fragments are thin branches and the skeleton characteristics resemble those of Dana's type specimen. We have to be very careful, however, when basing conclusions about coral species (especially branching forms) on colony fragments, in view of the well known intracolonial variability. Concerning this last statement, I would like to make a remark concerning *Merculina laxa* (Dana, 1846), which Chevalier (1975: 197) changes into *Hydnophora laxa* in the second part of this studies on the corals from New Caledonia. I studied Dana's types of both species in the Smithsonian Institution in Washington, D. C., *Hydnophora rigida* USNM no. 148 from the Fiji Islands and *Merulina laxa* USNM nos. 128-4501 from the Sulu Sea. Judging by these type specimens alone, it is possible to conclude that we are dealing here with growth forms of one and the same *Hydnophora* species. But the type specimens of *Merulina laxa* are small fragments, which accordingly do not help solving the problem of the limits of the two "biological species". In the very extensive coral collection from the Philippines, collected by G. B. Steere and present in the USNM, the two species are present as

many small, but rather complete colonies. The specific differences are very apparent. The *Merulina laxa* colonies show especially in the lower parts of the branches the typical *Merulina* structure of the septa, in the top branches the structures becomes more like the "monticule" appearance of a *Hydnophora*. This phenomon has also been described by Boschma, 1924: 37. The *Hydnophora rigida* specimens in all parts have the "monticule" structure. These data from a field collection contradict the above cited conclusions based on a study of the types only. Now it seems likely that we are dealing here with two species belonging even to two different genera. Originally the two species were described as two *Merulina* species, at the moment — 130 years later — they are regarded (by Chevalier) as two *Hydnophora* species, being moved from one family to another. The problem of the generic and specific status of the two forms can only be solved through the study of good field collections.

**Caulastrea curvata** Wijsman-Best, 1972 (pl. 8 fig. 4)

Material: 5 colonies. Coel. 8860 (5×) Poeloe Toesa.

The five small specimens (probably all taken from one colony) present in this collection correspond very well to the original description (Wijsman-Best, 1972: 56). The corallites are relatively small and the branches are not strongly curved. There are no other *Caulastrea* species present in the Snellius collections, so that no comparative remarks can be made as to other species of this genus.

## Ecological comments

As already stressed in my first paper on the Faviidae of the Snellius Expedition (Wijsman-Best, 1974), there are few indications regarding the exact ecological conditions under which the collected material has developed. However, many specimens of different species (see below) coming from the same locality show a more or less similar morphological adaptation. This may be due to the modifying influence of the environment on the phaenotypical features. Such a conclusion can only be drawn when collecting has been restricted to a particular site. As examples, in the former paper, the localities Wotap and Beo have been discussed. When we consider Wotap (5) again, now with regard to the species of the seven genera here discussed, we see that *Favites melicerum* (Coel. 8739), *F. abdita* (Coel. 8757), *F. acuticollis* (Coel. 8748), *F. virens* (Coel. 8790), *F. flexuosa* (Coel. 8791), *Platygyra daedalea* (Coel. 8820), *Oulophyllia aspera* (Coel. 8841), *Leptoria phrygia* (Coel. 8850), all show growth forms of a shallow exposed reef site. Only

*Goniastrea spectabilis* ecotype *mantonae* (Coel. 8807), shows very regular skeleton features.

On the other hand, the 67 specimens of the sixteen species collected in the localities Beo and Reinis (16) all, in general, represent the quiet and deeper water ecotype.

Because of the present interest about the origin of the morphological plasticity in corals (e.g., Weber, 1974), it is useful to discuss once more the term ecotype as I use it in my systematic studies. Dealing with the form *parvistella* of the species *G. retiformis*, it is indicated here as ecotype *parvistella*. This is not to stress any genetic implication and the term ecotype is used as an equivalent of "habitat type". Although the possibility cannot be excluded that certain genotypes, which facilitate the adaptation of the local population to its environment, are due to a process of natural selection, it seems more in the line with present knowledge of variation in corals to regard these forms as phenotypic modifications. This is in fact the reason why the category varieties was not applied, which is often used to indicate individuals differing from the nominate form in only a discrete number of genes (as in the case of genetic polymorphism). Mayr (1963) advices not to use the term "variation" altogether. The term forma might be used but would not stress the parallelism in the adaptive differentiation of different species. Ecotype just seems to be a practical term.

Some new points as a result of the study of the present part of the Snellius collection are: (1) The geographical range of the species *F. rufa* is considerably extended and the species is firmly established on the basis of additional specimens to the type series from New Caledonia. (2) *Goniastrea regularis* Chevalier, 1972, is regarded a synonym of *G. favulus* Dana, 1846; *Favites gailei* Chevalier, 1972, is regarded an ecotype of *Favites pentagona* from deep or quiet water. (3) The species *G. edwardsi* Chevalier, 1972, is present in Indonesia and the characters separating it from the related *G. retiformis* have been redefined. The three specimens from New Caledonia referred to *G. retiformis* by Wijsman-Best, 1972 turn out to belong to *G. edwardsi*. (4) A new species *Platygyra verweyi* has been described. (5) The species *Platygyra pini* described for the first time by Chevalier, 1975, from New Caledonia, has also been found in the present collection from the Indonesian archipelago.

Several times in this paper the species problem in corals has been discussed in relation to the limited samples in Museums without sufficient data and the frequently not convincing type material. Often when intraspecific variability is concerned the Museum collection cannot give any help, because sibling species sometimes can only be distinguished when the habitat is taken into account (e.g. *Platygyra daedalea, P. lamellina; Oulophyllia crispa, O. aspera*),

this is why their species limits or specific status can only be determined with a carefully probed field collection. The degree of intracolonial variability (especially in branching colonies) causes that type specimens (especially when consisting of only parts of a colony) are not sufficient to determine the specific name (e.g. *Hydnophora rigida, Merulina laxa*).

But I remain convinced that Museum collections can help our knowledge of the diversity of the coral species, mainly because the taxonomy of many coral groups is still on a rather basic level.

## References


BOSCHMA, H., 1924. On the different growth forms of *Merulina laxa*, Dana. — Zool. Meded., Leiden, 8 (1) : 36-38, pl. 1.

——, 1936. Biological data. — The Snellius-Expedition in the eastern part of the Netherlands East-Indies 1929-1930, 6 : 1-29.

CHEVALIER, J. P. 1972(1971). — Expédition française sur les Récifs coralliens de la Nouvelle Calédonie, 5 : 1-307, pls. 1-38.

——, 1975. Expédition française sur les Récifs coralliens de la Nouvelle-Calédonie, 7 : 1-407, pls. 1-42.

FOIDART, J., 1970. Rapport scientifique de l'Expédition Belge à la Grande Barrière d'Australie en 1967. Madréporaires : I. Etude morphologique et systématique comparée de Goniastrea retiformis (Lam.) et Goniastrea parvistella (Dana). — Ann. Soc. Roy. Zool. Belg., 100 (1-2) : 85-114.

——, 1972. Révision de l'holotype de Goniastrea parvistella (Dana). — Ann. Soc. Roy. Belg., 102(1-2) : 35-46.

MAYR, E., 1963. Animal species and evolution. (Harvard University Press. Cambridge, Mass.).

UMBGROVE, J. H. F., 1940. Madreporaria from the Togian reefs (Gulf of Tomini, North-Celebes). — Zool. Meded., Leiden, 22 : 265-310, text-figs. 1-3, pls. 21-35.

WEBER, J. N., 1974. Basis for skeleton plasticity among reef-building corals. — Geol., 2(3) : 153-154.

WIJSMAN-BEST, MAYA, 1972. Systematics and ecology of New Caledonian Faviinae (Coelenterata-Scleractinia). — Bijdr. Dierk., 42(1) : 1-90, pls. 1-14.

——, 1974. Biological results of the Snellius Expedition. XXV. Faviidae collected by the Snellius Expedition. I. The genus Favia. — Zool. Meded., Leiden, 48(22) : 249-261, pls. 1-4.

## Explanation of the plates

### Plate 1

1, 2, *Favites pentagona* (Esper): 1, Binongko, RMNH Coel. 8735; 2, Poeloe Toesa, RMNH Coel. 8736; 3, *Favites melicerum* (Ehrenberg), Beo, RMNH Coel. 8738; 4, *Favites rufa* Wijsman-Best, Beo, RMNH Coel. 8741. × 2.

### Plate 2

1, *Favites chinensis* (Verrill), Beo, RMNH Coel. 8742; 2, *Favites acuticollis* (Ortmann), Sailoes Besar, RMNH Coel. 8750; 3, *Favites virens* (Dana), Sapoeka Besar, RMNH Coel. 8785; 4, *Favites flexuosa* (Dana), Beo, RMNH Coel. 8793. × 2.

### Plate 3

1-4, *Favites abdita* (Ellis & Solander): 1, Wotap, RMNH Coel. 8757; 2, Karaton, RMNH Coel. 8754; 3, Bone Tamboeng, RMNH Coel. 8755; 4, Beo, RMNH Coel. 8758. × 2.

### Plate 4

1, 2 *Goniastrea retiformis* (Lamarck): 1, Bone Tamboeng, RMNH Coel. 8795; 2, Reinis, RMNH Coel. 8797; 3, 4, *Goniastrea edwardsi* Chevalier: 3, Karaton, RMNH Coel. 8799; 4, Binongko, RMNH Coel. 8796. × 3.

### Plate 5

1, *Goniastrea favulus* (Dana), Reinis, RMNH Coel. 8804; 2, *Goniastrea spectabilis* (Verrill), Wotap, RMNH Coel. 8807; 3, 4 *Goniastrea pectinata* (Ehrenberg), Beo, RMNH Coel. 8813. × 3.

### Plate 6

1, *Platygyra lamellina* (Ehrenberg), Karaton, RMNH Coel. 8818, × 2; 2, *Platygyra daedalea* (Ellis & Solander), Tanah Djampea, RMNH Coel. 8825, × 2; 3, *Platygyra sinensis* (H. Milne Edwards & Haime), Beo, RMNH Coel. 8834, × 0,2; 4, *Platygyra verweyi* nov. spec., Poeloe Dapoer, RMNH Coel. 9053[a], × 2.

## Plate 7

1, *Platygyra pini* Chevalier, Beo, RMNH Coel. 10721, × 2; 2, *Oulophyllia crispa* (Lamarck), Poeloe Toesa, RMNH Coel. 8840, × 1,3; 3, *Oulophyllia aspera* Quelch, Wotap, RMNH Coel. 8841, × 1,5; 4, *Leptoria phrygia* (Ellis & Solander), Wotap, RMNH Coel. 8850, × 1,5.

## Plate 8

1, *Hydnophora exesa* (Pallas), Wotap, RMNH Coel. 8858, × 1; 2, *Hydnophora microconos* (Lamarck), Reinis, RMNH Coel. 8859, × 2,5; 3, *Hydnophora rigida* (Dana), Wotap, RMNH Coel. 8853, × 1,5; 4, *Caulastrea curvata* Wijsman-Best, Poeloe Toesa, RMNH Coel. 8860, × 1,5.

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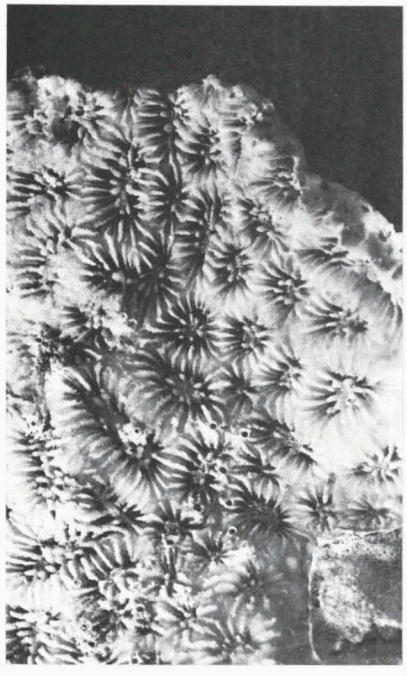

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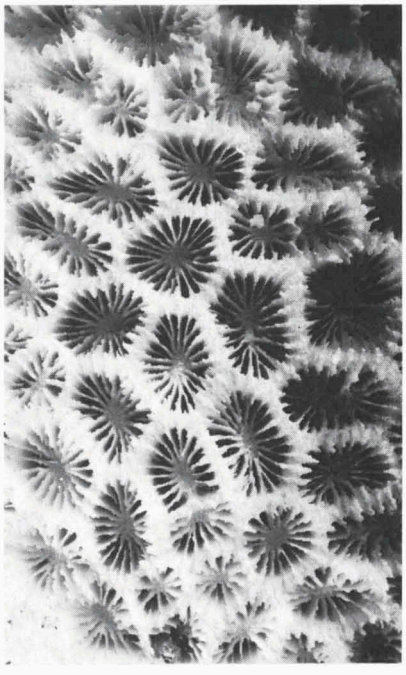

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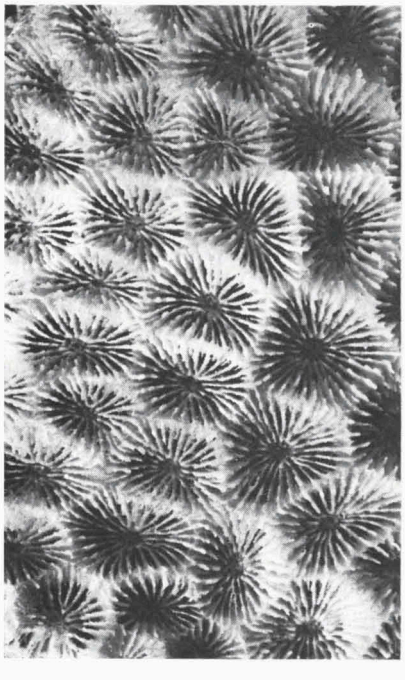

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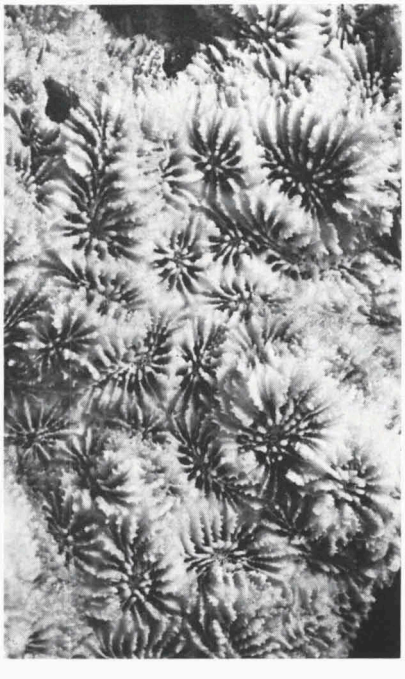

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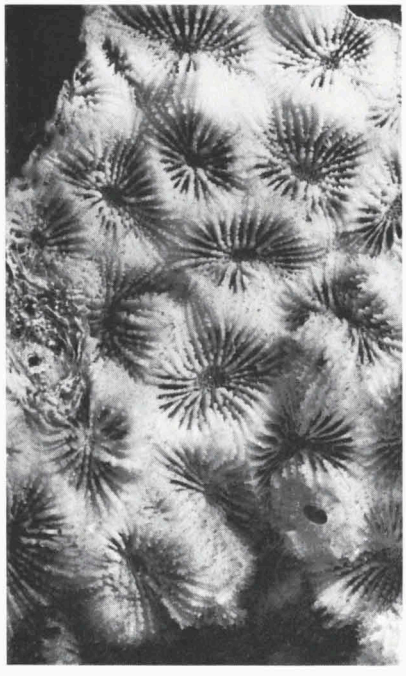

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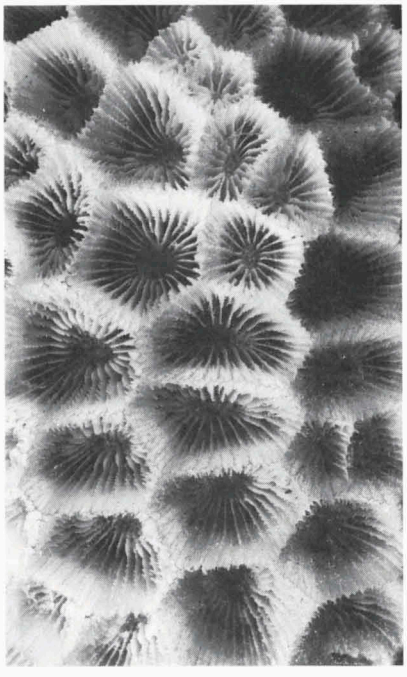

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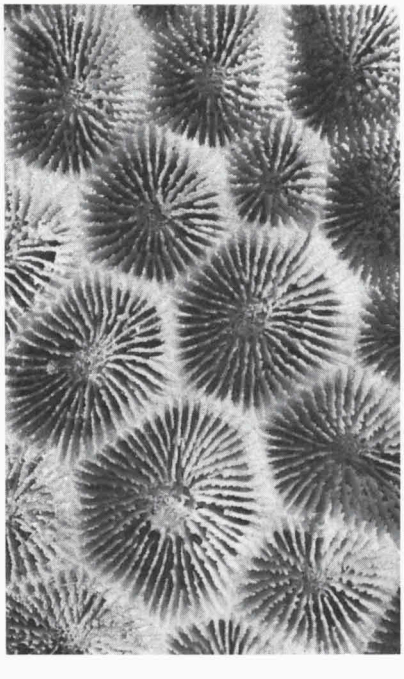

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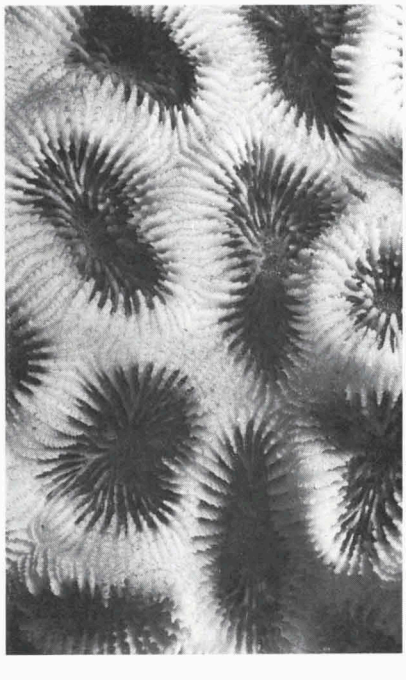

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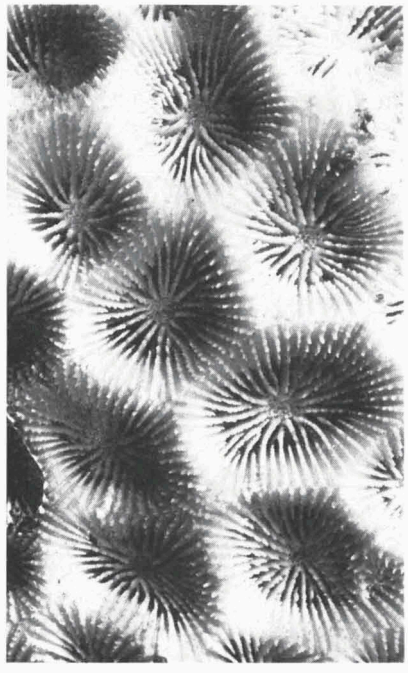

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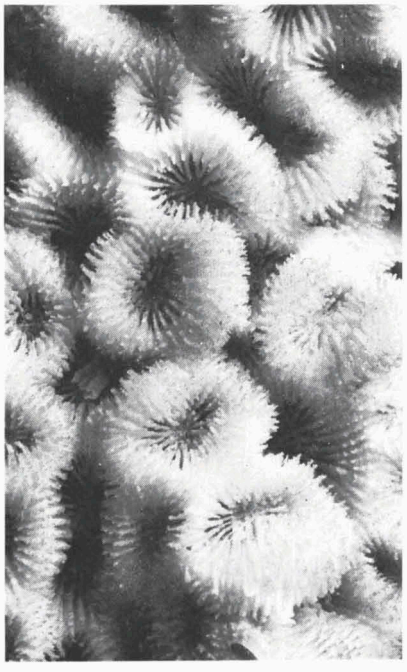

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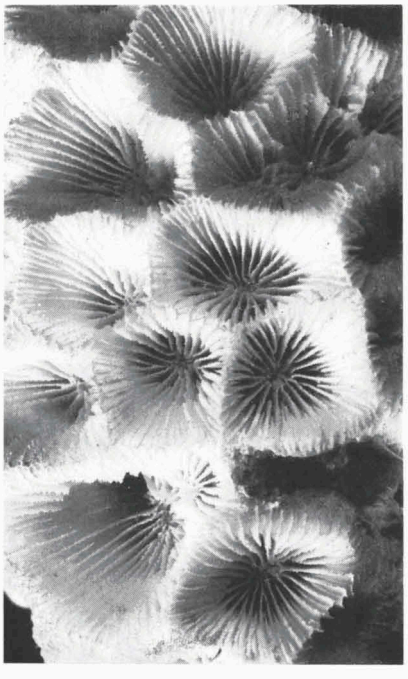

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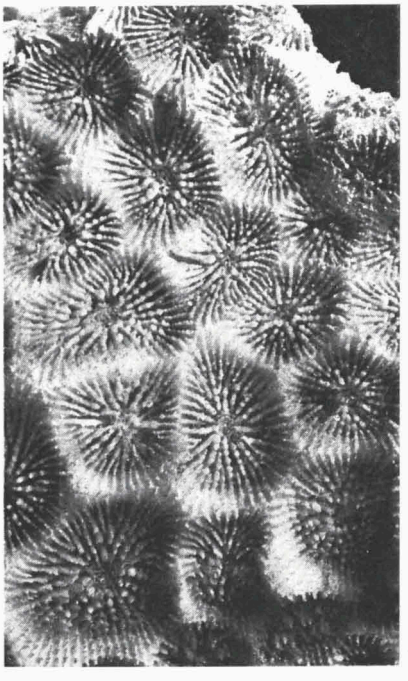

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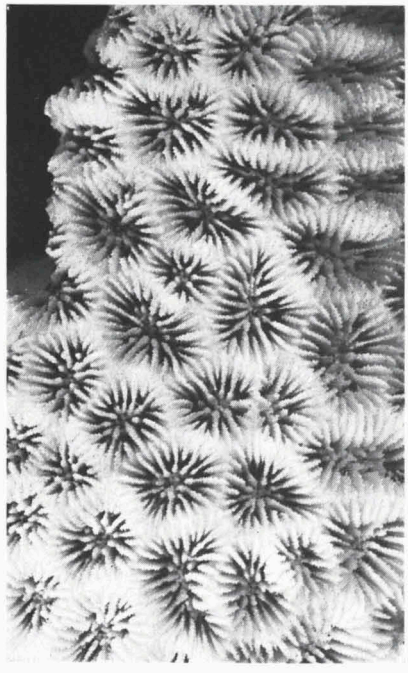

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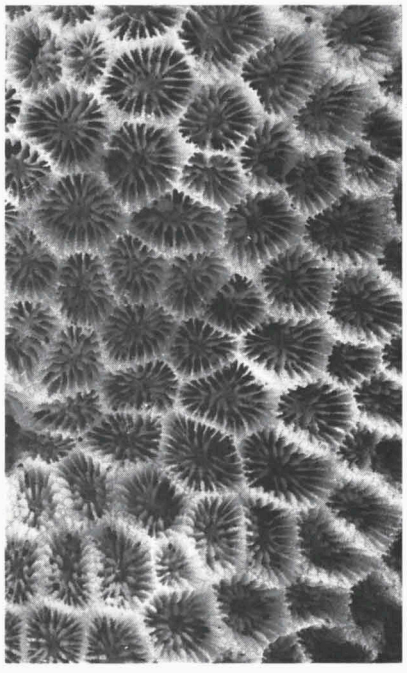

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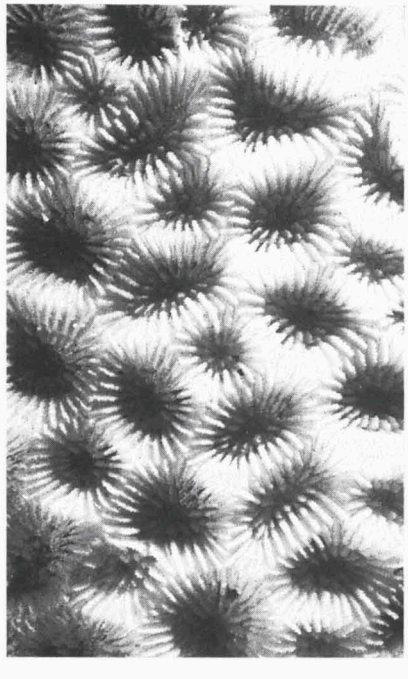

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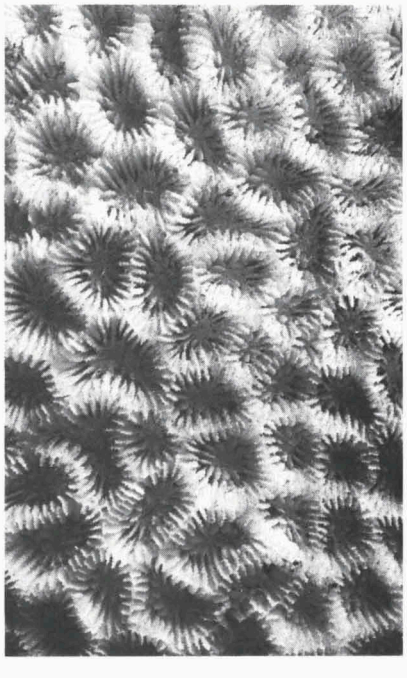

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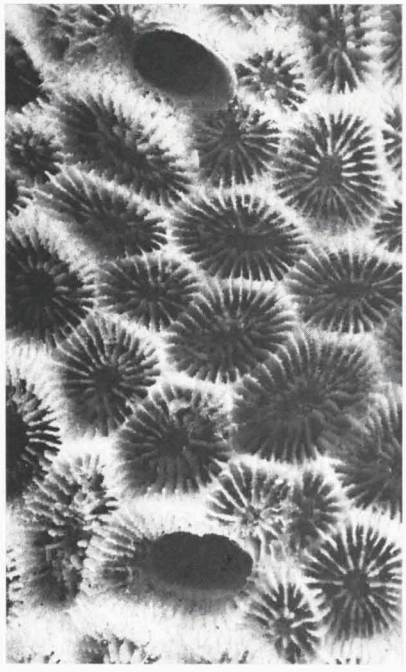

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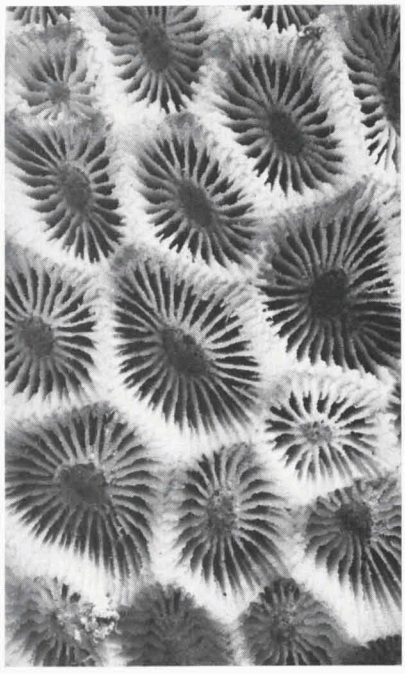

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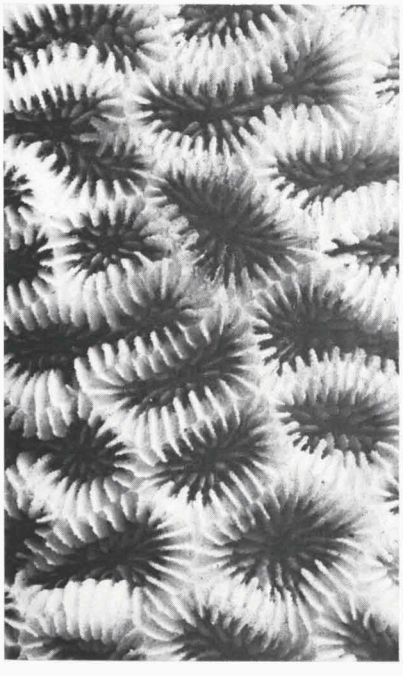

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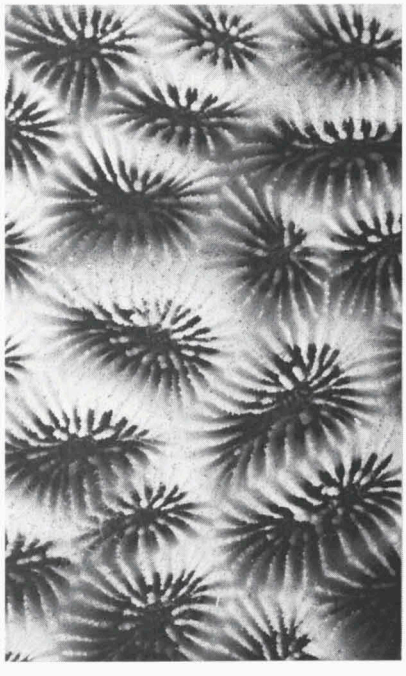

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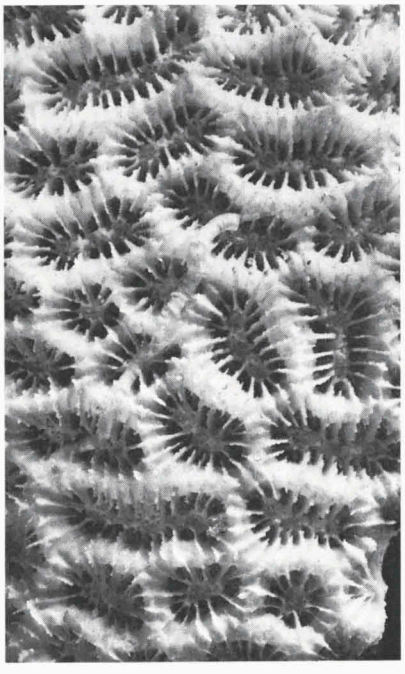

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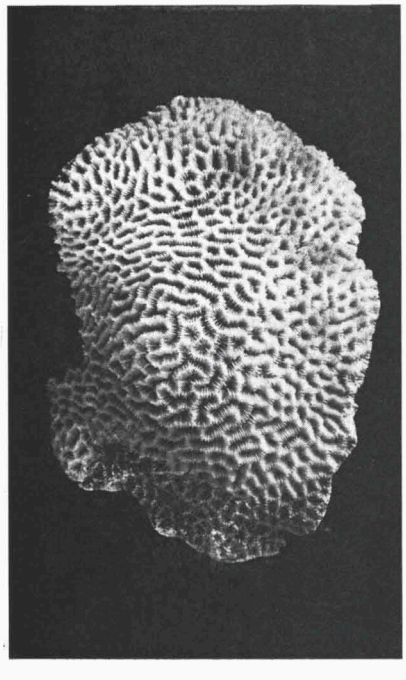

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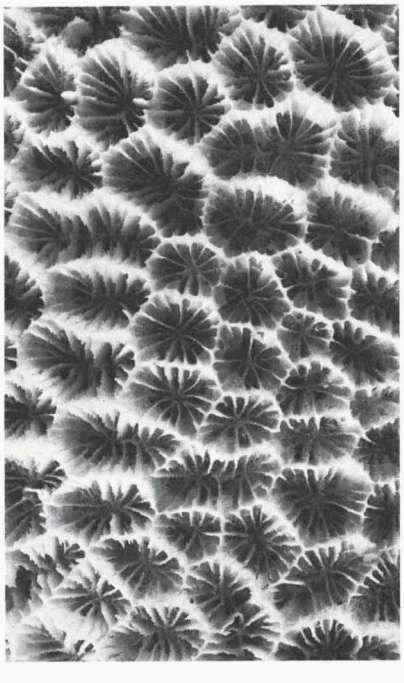

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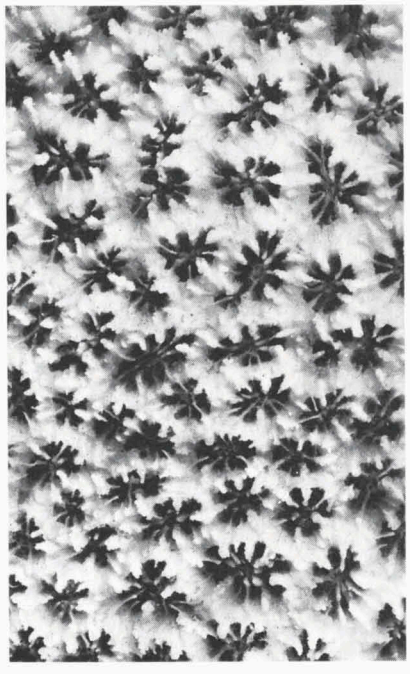

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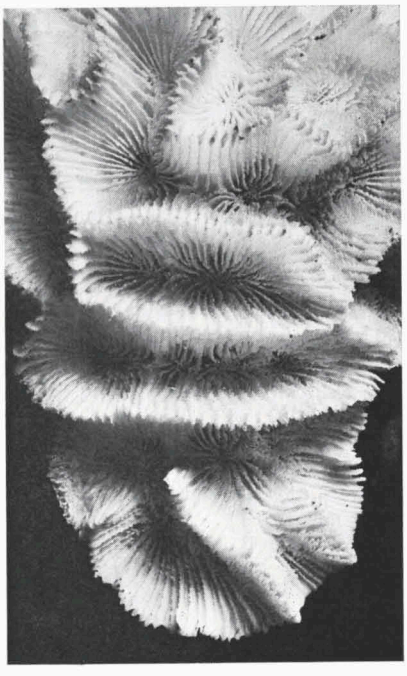

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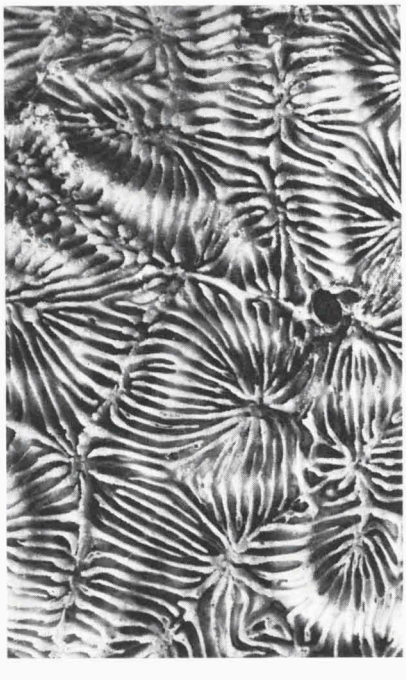

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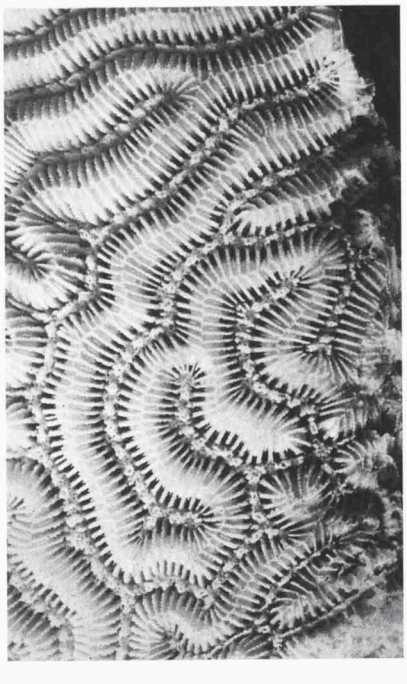
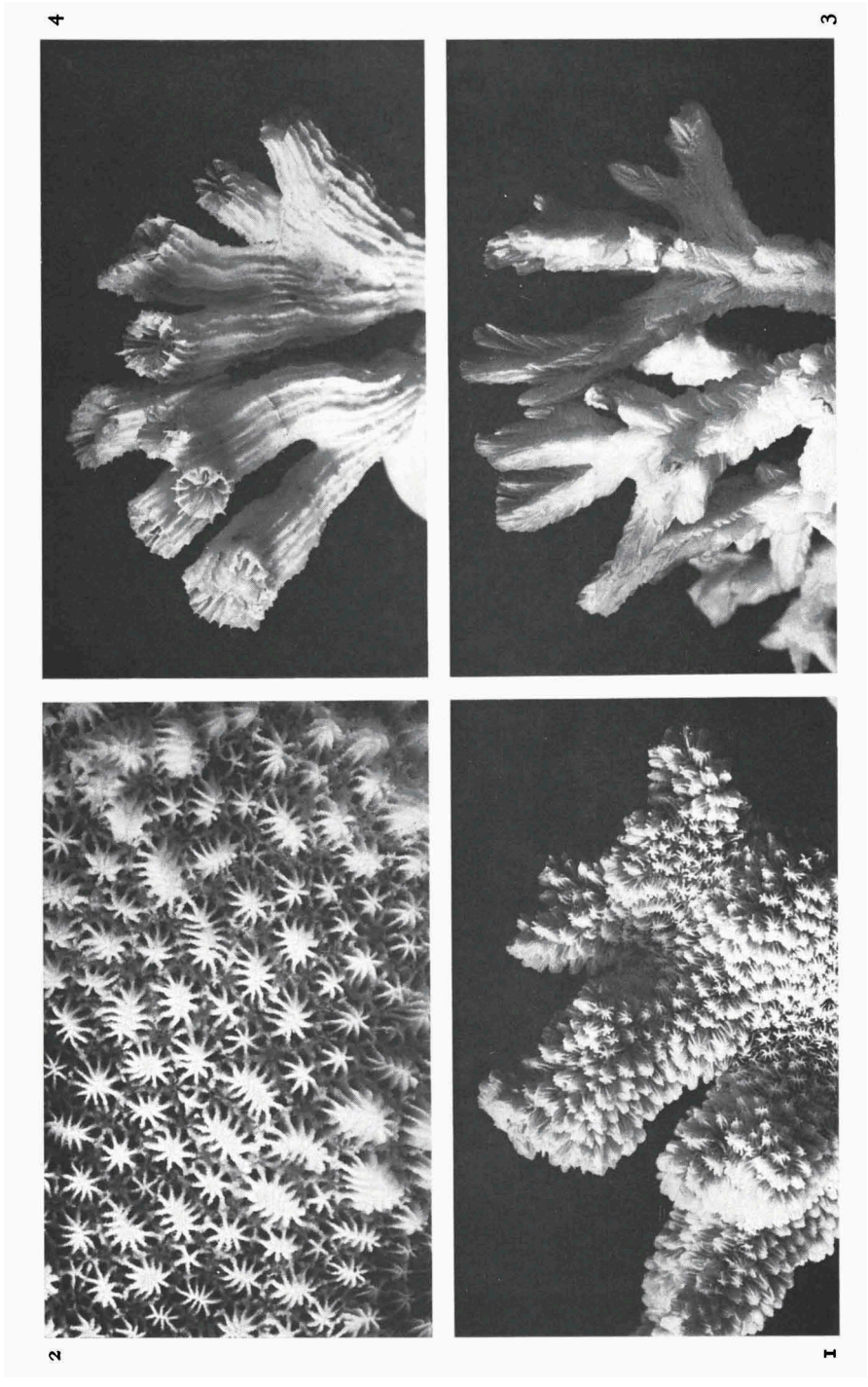


4


4
3
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