

AN ABSTRACT OF THE THESIS of Michael John James Gawel for the Master of Science Degree in Biology presented April 12, 1977.

Title: The Common Shallow-Water Soft Corals (Alcyonacea) of Guam

Approved: Lucius G. Eldredge
Lucius G. Eldredge, Chairman, Thesis Committee

The common alcyonaceans of Guam were collected to depths of 40 meters. Specimens were preserved and their sclerites were extracted and mounted on permanent slides for microscopic examination. Keys to the alcyonacean genera of the shallow-water tropical Pacific and to the species of Guam are provided, based on observations, measurements of specimens and on literature review. Twenty-eight species are described and illustrated, all of which are new records for Guam. Their abundance, distribution, and habitats are discussed.

THE COMMON SHALLOW-WATER
SOFT CORALS (ALCYONACEA)
OF GUAM

by

MICHAEL JOHN JAMES CAMEL

A thesis submitted in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE
IN
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TO THE GRADUATE SCHOOL:

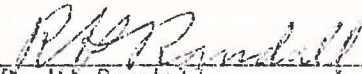
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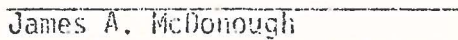


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INTRODUCTION

The anthozoan subclass Octocorallia consists of six orders, each represented by living species in the tropical Western Pacific area: Stolonifera, Teleostacea, Coenothecalia, Gorgonacea, Pennatulacea, and Alcyonacea. The Gorgonacea are the dominant octocorals in the tropical Atlantic, whereas Alcyonacea are dominant octocorals on tropical Pacific reefs. In some shallow coral reef habitats, these may even be the dominant organisms. Within the order Alcyonacea are seven families all found in the Western Pacific. Alcyoniidae, Asterozoniidae, Nephtheidae, Nidaliidae and Xenidae have been collected on Guam while Archicaulidae and Vigueriidae have not. These families have 43 genera and over 690 species recorded from the Indo-West Pacific, two of which have previously been recorded from Guam (Versoeldt, 1977 and Gavel, 1976). In order to identify the 28 shallow and 3 deep water species of Alcyonacea collected at Guam, one should review the descriptions of all these Indo-West Pacific species, which are scattered through more than a hundred papers, and which are sometimes questionable.

The author has not identified every species which he has found on Guam, some of which undoubtedly are new species. Each of the 28 shallow water species is described in detail, based on those characters used by other authors and in the style typical of taxonomic publications on Alcyonacea. Partial synonymies of identified species are given. The gross colony forms, living colors, polyps, and the calcareous sclerites occurring in different parts of each colony are described. Scaled drawings of the characteristic sclerites of each species, photographs

of typical preserved colonies of each, and, when possible, color photographs of living specimens in situ are provided. Brief notes on habitats, reef zonation, and information which may be of interest or of aid in identification are given for each species. Bathymetric distribution, zonation and local distribution at Guam are given for all species. For those species which have been identified, previously recorded geographic ranges are included.

MATERIAL AND METHODS

Alcyonacea specimens were collected by scraping them from the substrate or breaking off parts of the substrate to which they were attached while the collector was snorkeling or Scuba diving at depths from 1 to 40 m. Collection data recorded for each specimen includes date, location, zonation, depth, substrate, size, and living colors of colony and qualitative estimates of abundance of the species and of water turbulence. Often photographs of specimens were made before they were collected.

Fresh specimens were either immediately fixed and preserved in 95% ethanol or kept alive in aerated sea water and relaxed by adding magnesium sulfate before placing in 95% ethanol.

Sclerites were isolated from slips of tissue from four different locations of most specimens--the surface of the capitulum (the polyp-bearing part) of the colony, the interior of the capitulum, the surface of the sterile (bearing no polyps) stalk or base, and the interior of the sterile stalk or base. These slips were placed on depression slides where the soft tissue was dissolved with undiluted chlorine bleach (5% NaOCl), leaving only the sclerites of calcite. These sclerites were then washed several times with drops of distilled water, which were drained drop by drop from the depression without losing the sclerites. They were dried on a hot plate then mounted in a thick layer of Cover Bond resin and toluene. These prepared slides are labeled by India ink painted over with a thin layer of Cover Bond.

Sizes of sclerites were measured using an optical micrometer in the lens of a binocular compound microscope. Figures of sclerites were projected by a microprojector and traced onto mylar. Photographs were made of representative preserved specimens of all species.

GLOSSARY

anthocodia: the oral end of an octocoral polyp which contracts into a nonretractible lower portion.

anthostele: the thicker walled nonretractible base of a polyp into which the retractible anthocodia can withdraw.

autozoid: the normal alcyonarian polyp with fully developed tentacles.

barrel: a short cylindrical or barrel-shaped sclerite.

calyx: a projecting ring-like anthostele surrounding a retracted polyp.

capitulum: the polyp-bearing portion of an alcyonarian, distinguished from the lower basal portion which has no polyps.

capstan: see "dumbbell."

chevroned: shaped like the letter "V."

clavate: heavier and thicker at one end.

club: a sclerite that is enlarged at one end and narrow at the opposite end.

coenenchyme: mesoglocal mass of a colonial alcyonarian filling the spaces between polyps and usually bearing abundant sclerites.

crenulate: having a scalloped or toothed margin.

dimorphic: having two different kinds of polyps, autozooids and siphonozooids.

dumbbell: a sclerite with both ends of its axial rod greatly enlarged and warty while a smooth narrow waist bisects the ends; also called a capstan.

finger biscuit: a small, thin, fiat, rounded sclerite which is oval, oblong, or hour-glass shaped.

haft: the narrow end or handle of a club sclerite.

lacunae: small chambers containing sclerites in the mesogloea of *Asterospicularia*.

median constriction: a narrow, thin wartless region forming a band around the center of a warty spicule or spindle sclerite.

mesogloea: gelatinous substance between the inner and outer cell layers.

monomorphic: having only one kind of polyp.

pinnule: finger-like lateral process of an octocoral tentacle.

polyp: an individual animal of an alcyonarian colony.

sclerite: a calcareous body of any shape making up the endoskeleton of alcyonarians.

siphonozoid: a rudimentary alcyonarian polyp without tentacles and with reduced septa, found in dimorphic colonies.

spicule: an elongated sclerite that is round in cross section, broad in the middle and narrowed at both ends.

spindle: see "spicule."

spine: a pointed, cone-shaped protuberance on a sclerite.

stalk: the sterile basal part of certain soft coral species.

sterile: not bearing polyps, whether or not gametes are present.

stomodeal walls: walls of the tube connecting a polyp's mouth with its gastrovascular cavity.

supporting bundle: a cluster of generally parallel spicules supporting the polyp of a nephtheid.

wart: a truncated protuberance on a sclerite.

LIST OF SPECIES COLLECTED

- Asterospicularia randalli* Gaweł
Alcyonium utinomi Verseveldt
Cladiella pachyelados (Klunzinger)
Cladiella species 1
Cladiella species 2
Lobophytum archiplicatum Von Marenzeller
Lobophytum pauciflorum (Ehrenberg)
Sarcophyton glaucum (Quoy and Gaimard)
Sarcophyton trocheliophorum (Von Marenzeller)
Simularia arborea Verseveldt
Simularia densa (Whitelegge)
Simularia maxima Verseveldt
Simularia polydactyla (Ehrenberg)
Simularia species 1
Simularia species 2
Simularia species 3
Simularia species 4
Simularia species 5
Simularia species 6
Simularia species 7
Simularia species 8
Simularia species 9

Nephtea gracillima Thomson and Dean

Stereonephthya ulicoides Thomson and Dean

Stereonephthya unicolor Gray

Stereonephthya species 1

Anthelia glauca Lamarck

Sympodium coeruleum Ehrenberg

Key to Collecting Locations

1. Double Reef
2. Shark's Hole
3. Tanguisson Reef
4. Gun Beach Reef
5. Tumon Bay
6. Agana Reef
7. Asan Reef
8. Tepungan Channel
9. Glass Breakwater
10. Gabgab Beach Reef
11. Orote Peninsula and Blue Hole
12. Nimitz Beach Reef
13. Facpi Island
14. Toguan Bay
15. Maman Channel
16. Leeward Cocos Barrier Reef Terrace
17. Cocos Lagoon
18. Manell Channel
19. Pago Bay Reef
20. Toagam Point

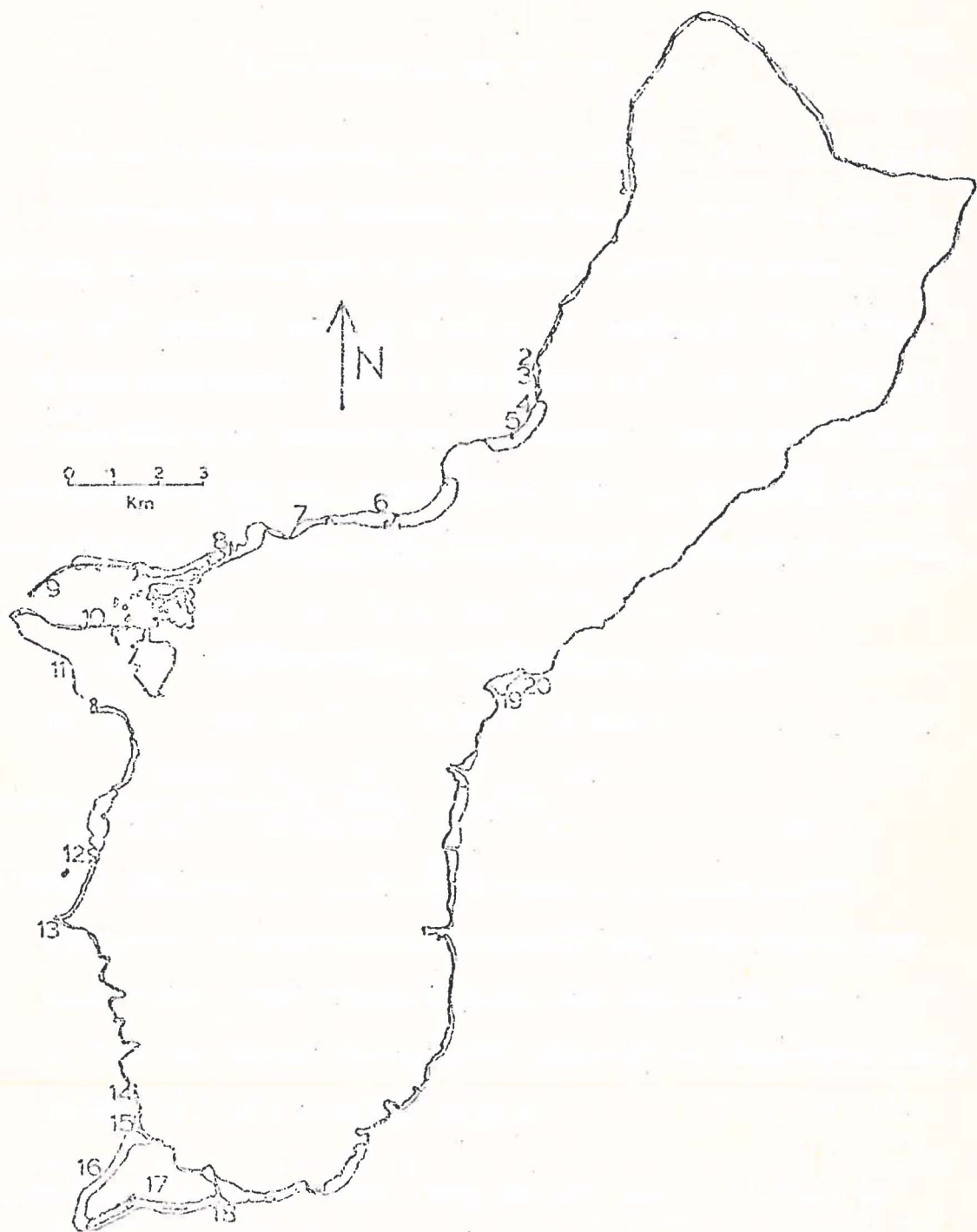


Fig. 1. Map of collecting locations.

SYSTEMATIC DESCRIPTIONS

ASTEROSPICULARIIDAE UTINOMI, 1951

The family Asteroespiculariidae was described in 1951 on the basis of a single specimen from southern Taiwan found in 1938. No other specimen has been mentioned in the literature until the author discovered and described numerous specimens of a second species of this family from Guam (Gawel, 1976). The family is distinguished from all others on Guam by its small (0.025 to 0.060 mm) star-shaped sclerites always present in the stalk and polyps. The colonies have a low base from which small sterile branches arise bearing the polyps on capitula.

ASTEROSPICULARIA RANDALLI GAWEL, 1976

Fig. 2, 3, 4, and 5. Plate I.

Asteroespicularia randalli Gawel, 1976:304.

MATERIAL: Holotype: U. S. National Museum 54134, Cocos Lagoon.

Paratypes: U. S. National Museum 54135 and 54136; Rijksmuseum

N. H. Leiden, Coel. 11523; Seto Mar. Bio. Lab., Type 267:

B. P. Bishop Museum, Hawaii, D475; University of Guam Marine Lab.,

MG 74.3.21.1, all from Cocos Lagoon.

DESCRIPTION: This small, soft, very flexible species is found in colonies with one to fifty capitula, each 5 to 10 mm in diameter. None of the capitula exceed 4 cm in height above the substrate. Most colonies have base diameters under 5 cm and few capitula,

although some are over 15 cm across with a proportionately higher number of capitula. Sterile stalks sometimes show external longitudinal grooves or creases below the expanded, polyp-bearing capitula. Most stalks arise separately from the encrusting colony base, not as branches of larger stalks.

The living color is beige to light pink with paler colony bases and sterile stalks. In alcohol specimens are white.

The monomorphic polyps have three rows of 4-to 8 pinnules irregularly arranged along each lateral side of every tentacle. The outermost row has the greatest number of pinnules. The pinnules of relaxed, preserved specimens are not as expanded as those of living ones in the field, but are finger-shaped, more or less tapering, up to 0.20 mm long and 0.08 mm wide at the base. No pulsation of live polyps is apparent, but pinnules, tentacles and polyps rapidly contract when irritated. The polyps can withdraw to expose only a ring of eight highly contracted tentacles but cannot be completely retracted into the coenenchyme like those of *Acyonium*, *Cladiella*, *Simularia*, *Lobophytum*, and *Sarcophyton*. However, they can withdraw and contract much more than any polyps of species in the family Xenidiidae.

No special arrangement of sclerites exists as armament on or around the polyps except that the inner sides and tips of tentacles, which are tucked in when contracted, bear small disc-like rounded sclerites 0.013 to 0.021 mm long, whereas the aboral exposed sides of contracted tentacles bear larger spiny stellate sclerites. These stellate sclerites average 0.05 mm in diameter with a range from 0.025 to 0.060 mm. They are found throughout

the polyp bases, coenenchyme between polyps, capitular stalks, and colony base, occurring in cavities (lacunae) which usually contain several sclerites each.

REMARKS: This species was discovered by the author in 1973, and its description published in 1976. Known only from Guam, it is similar to *Asterospicularia laurae* of Taiwan and is the only member of the family Asterospiculariidae in Guam.

DISTRIBUTION AND HABITAT: This species is most commonly found at depths close to the level of mean lowest low water, although some have been seen at depths to 7 m.

Asterospicularia randalli seems to be increasing in abundance in Guam, becoming more common in numerous shallow sublittoral reef areas. It seems to be most common on the windward barrier reef and patch reefs of Cocos Lagoon. Also it is abundant in various depressed but shallow leeward reef areas such as Tepungan Channel Mouth, Double Reef, and Shark's Hole.

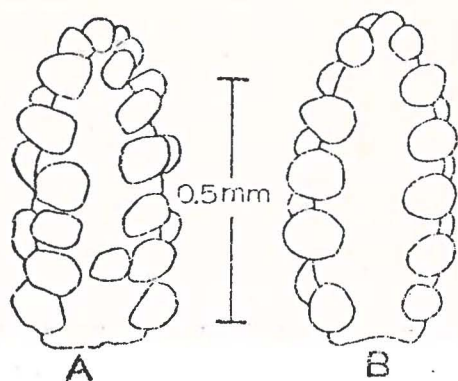


Fig. 2. *Asterospicularia randalli* Gawel, tentacle, X62. A, oral side; B, aboral side.

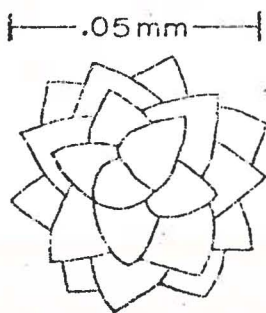


Fig. 3. *Asterospicularia randalli* Gawel, stalk sclerite, X840.

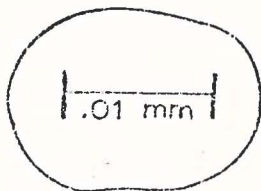


Fig. 4. *Asterospicularia randalli* Gawel, tentacle sclerite, X2000.

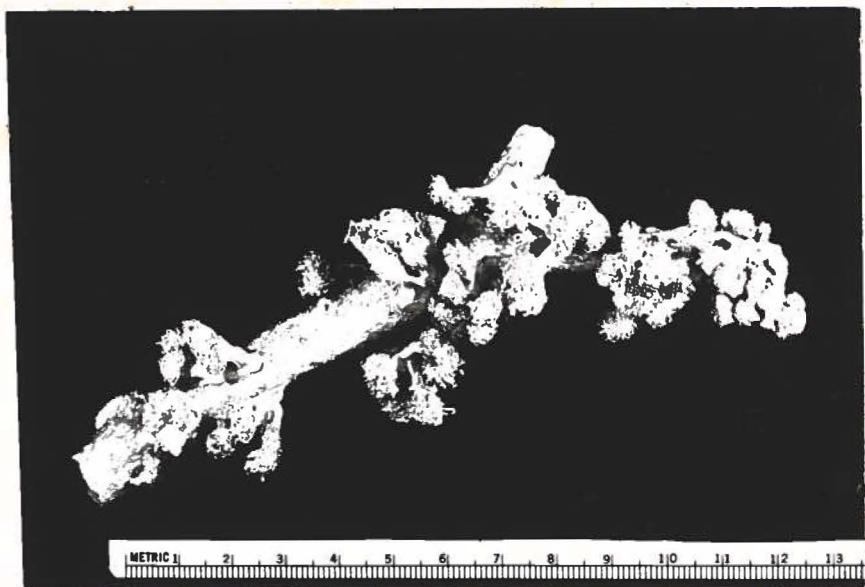


Fig. 5. *Asterospicularia randalli* Gawel, many colonies on a dead *Acropora* branch (MG 74.3.21.1).

ALCYONIIDAE LAMOUROUX, 1812

The family Alcyoniidae contains at least two hundred tropical Indo-West Pacific species in ten different genera. Twenty-one species in five genera have been found on Guam.

These species occur abundantly in shallow waters and include the most common species of octocorals of Guam. They occasionally form large colonies several meters in diameter. They may be low and encrusting or raised on stalks, and may be entire or lobed or branched. Even when profusely branched, the branches are not finely divided but contain masses of coenenchyme.

The species of Alcyoniidae are distinguished from soft corals of other families by their monomorphic or dimorphic polyps which are all fully retractible into the mass of coenenchyme. The coenenchyme contains numerous sclerites ranging from 0.03 to 8 mm in size. The sclerites are diverse in form but their shapes and sizes are characteristic in each species. The polyps are uniformly closely arranged on the capitulum which is above the sterile base.

KEY TO THE GENERA OF THE FAMILY ALCYONIIDAE
RECORDED FROM THE SHALLOW TROPICAL PACIFIC

1. Polyps are dimorphic, consisting of large autozooids and much smaller but more numerous siphonozooids 2
1. All polyps are of one kind 3
- 2(1). Capitulum has finger-like lobes. The autozooids are relatively small, never 10 mm tall. Basal interior sclerites are

- mostly cylinders less than 0.5 mm long with several encircling whorls of large warts *Lobophytum*
- 2(1). Edge of the capitulum may be smooth or folded but no lobes occur in its middle. The autozooids are usually large, even taller than 10 mm when expanded. Basal interior sclerites are usually spindles under 1 mm long, but up to 2 mm in one species, with warts which are not arranged in a few whorls *Sarcophyton*
- 3(1). Colony is in the form of a single unbranched upright cylinder, and is found in habitats deeper than 20 m. Color is usually bright red or orange *Bellonella*
- 3(1). Colonies have branches or lobes or subdivisions, and may occur in shallow water. Color is never bright red or orange 4
- 4(3). Sclerites are very regular, with capstans or dumbbells less than 0.2 mm long throughout the coenenchyme. The only other sclerites which may occur are finger-biscuit-like ones smaller than 0.1 mm long on the polyps of some species *Cladiella*
- 4(3). Sclerites are not capstans nor dumbbells. Some sclerites over 0.2 mm long are in the interior of the colony. Finger-biscuit-like sclerites do not occur 5
- 5(4). Sclerites are predominately spindles, less than 1 mm long in most species. No small club-shaped sclerites occur in the surface of the colony *Acyonium*

5(4). Warty spindle-shaped sclerites over 1 mm long always occur in the interior of the base. Small club-shaped sclerites under 0.3 mm long are abundant in the surface of the base and lobes *Simularia*

ALCYONIUM LINNAEUS, 1758

The genus *Alcyonium* has lobes or finger-like projections and monomorphic polyps. The sclerites are predominately spindles that can be blunt ended or pointed with warts or spines, often opaque in the center and less than 1 mm long.

ALCYONIUM UTINOMII VERSEVELDT, 1971

Fig. 6, 7, and 8.

Alcyonium utinomii Verseveldt, 1971:7.

MATERIAL: MG 74.4.11.1, MG 74.4.11.4, and MG 74.5.2.7, all from Cocos Lagoon.

DESCRIPTION: The sterile stalk of the living colony may be over 20 cm in diameter but is low, not growing taller than 4 cm. Monomorphic polyps arise on top of the base and on short primary and secondary lobes. Secondary lobes are rounded and about 5 to 12 mm in diameter and 3 to 20 mm long. Lobes and polyps contract when disturbed. Preserved specimens feel rubbery and flexible. Sometimes cup-like depressed areas form between the primary lobes on the capitulum.

Living color is pinkish beige, fading to white when preserved in alcohol.

Centers of polyps are 0.8 to 2.5 mm apart on secondary lobes and are about as dense elsewhere, even on the basal capitulum between primary lobes.

Around the base of each polyp are eight double rows of chevroned sclerites, ten to fifteen in a row. These sclerites are smooth, mostly round-ended rods up to 0.40 mm long.

The surface of the sterile base contains spindle-shaped sclerites mostly around 0.25 mm long, with the largest 0.8 mm long and 0.1 mm wide, all bearing infrequent low cone-like projections. They appear dark along the central axis.

The interior of the base has similar but larger spindles sometimes relatively thicker than the ones at the stalk surface but still with only low cone-like projections. These sclerites are 0.5 to 1.4 mm long. The large spindles appear opaque in their centers.

Smaller rods 0.08 to 0.12 mm long occur commonly at the surface of the lobes, while lobe interiors tend to have small spindles.

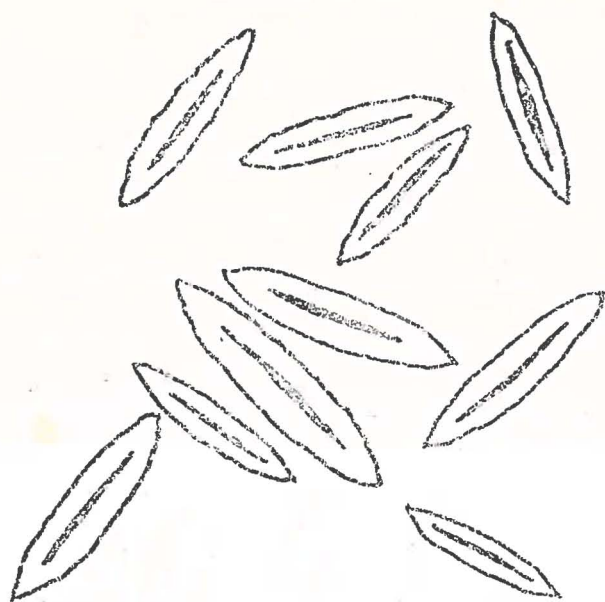
REMARKS: Specimens described by Verseveldt (1971) sometimes had oval and more or less hexagonal sclerites 0.10 to 0.18 mm long in the stalk interior, but these have not been seen in Guam specimens.

Their color, shape, and habitat may cause small colonies to be confused with those of various species of *Sinularia* or *Cladiella*. The distinctive sclerites of *Aloyonium utinomi* readily distinguish it from other species.

DISTRIBUTION AND HABITAT: This species has previously been recorded from Malagasy (Madagascar) and the Red Sea.

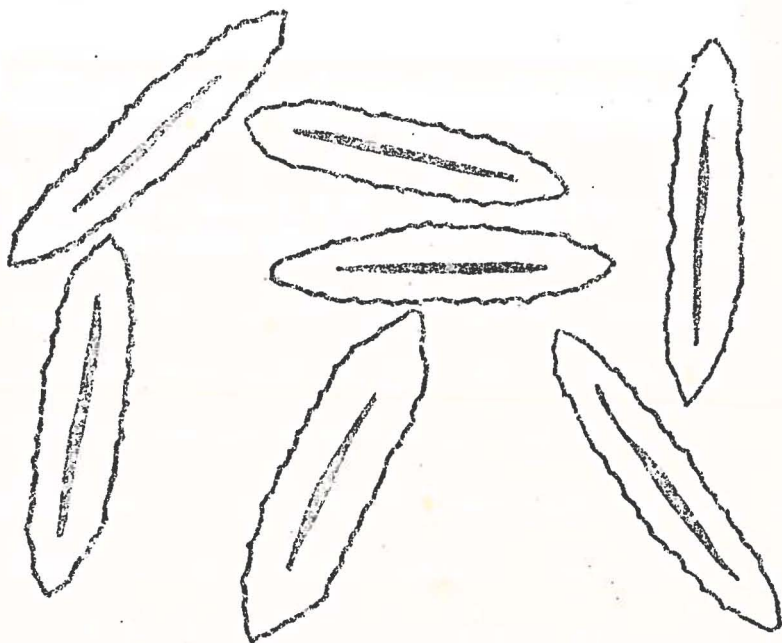
Specimens found on Guam were in shallow water 1 to 8 m deep but may range deeper, since a paratype specimen was collected at 40 m.

This species is occasionally seen where coral rock substrate is available for attachment at the patch reefs, reef shelf, and channel slopes of Cocos Lagoon.



—|—|—
0.10 mm

Fig. 6. *Aleyonium utinomi* Verseveldt, surface of base, XII6.



—|—|—
0.10 mm

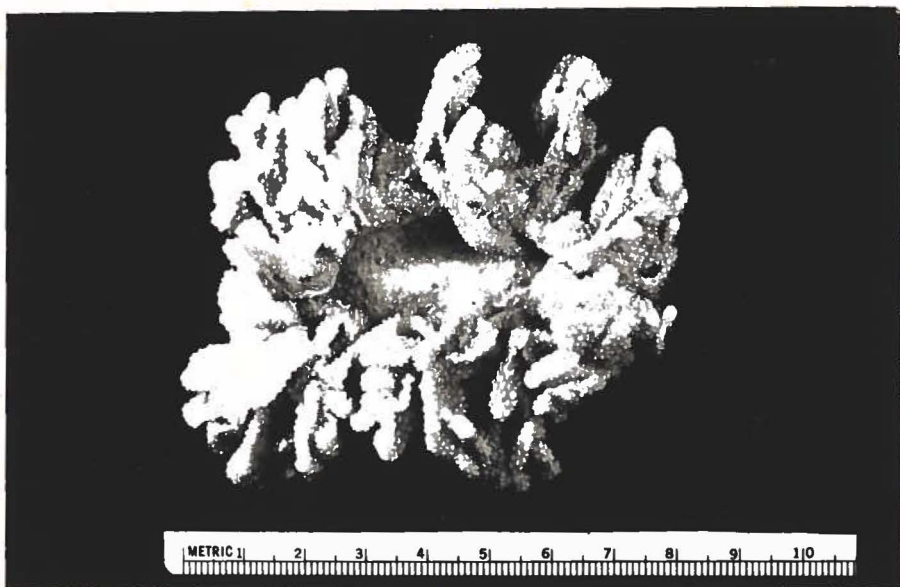


Fig. 8. *Aleyonium utinomi* Verseveldt, whole colony
seen from above (MG 74.4.11.1).

CLADIELLA GRAY, 1869

Colonies of *Cladiella* are always low, with a short, broad encrusting base and a capitulum crowded with very numerous small, short primary or secondary lobes. Sclerites consist only of abundant warty capstans (or dumbbells) less than 0.2 mm long and, in the polyps, finger-biscuit-like sclerites smaller than 0.1 mm long.

This genus has previously been called *Alcyonium*, *Lobularia*, *Sphaerella*, and *Microspicularia* by various authors, but Utinomi (1959: 310) has called it *Cladiella* as did Gray (1869). Most researchers now accept this name.

KEY TO THE GUAM SPECIES OF *CLADIELLA*

- 1. Lobes are not tightly crowded together but with open spaces between them. Small-ended dumbbells, 0.05 to 0.06 mm long, with large smooth waists are common on the base surface. The largest sclerites in the base interior are under 0.1 mm long *Cladiella* sp. 2
- 1. Lobes are tightly crowded together with no spaces between them. Sclerites at the surface of the base are large-ended dumbbells, mostly over 0.06 mm long. The largest sclerites in the base interior are over 0.12 mm long 2
- 2(1). The secondary lobes are hard, stiff, low, hemispherical, and less than 1 cm tall, when preserved. The sclerites at the interior of the base are dumbbells with distinct waists ...
..... *Cladiella* sp. 1

2(1). The secondary lobes are elongate, not hemispherical, and often over 1 cm tall. The sclerites at the interior of the base barely show a thin, bisecting waist

..... *Cladiella pachyclados*

CLADIELLA PACHYCLADOS (KLUNZINGER, 1877)

Fig. 9, 10, 11, 12, 13, and 14.

Aleyonium pachyclados Klunzinger, 1877:23; Pratt, 1903:534;

Luttschwager, 1922:522; Roxas, 1933b:357.

Microspicularia pachyclados, Macfadyen, 1936:29.

Lobularia pachyclados, Tixier-Durivault, 1948:219.

Sphaerella pachyclados, Tixier-Durivault, 1957:

Cladiella pachyclados, Tixier-Durivault, 1970a:202; Utinomi,
1959:308; Verseveldt, 1965:30.

MATERIAL: MG 74.5.2.15, and MG 74.5.2.16 from Cocos Lagoon.

DESCRIPTION: The low colonies are up to 7 cm in total height when preserved. A very short encrusting base under 2 cm tall gives rise to crowded primary and secondary lobes with slightly conical but rounded tips. Short primary lobes widen distally into secondary lobes 4 to 10 mm wide and up to 25 mm long. Lobes are soft and flexible in alcohol.

Living colonies have light colored or whitish surfaces with darker polyps which may be brown or beige.

The polyps are evenly distributed on all the lobes averaging about 1 mm between centers of adjacent polyps. When retracted they disappear and do not form crater-like calyx depressions.

The polyps contain finger-biscuit-shaped sclerites just under 0.05 mm long.

The surface of the lobes have dumbbell-shaped sclerites 0.05 to 0.09 mm long with smooth middle waists and irregular warts

on the expanded ends. Also some sclerites intermediate between the finger-biscuit-shaped ones and the dumbbell-shaped ones occur there.

The interior of the lobes have dumbbells 0.08 to 0.10 mm long with smooth waists and warty ends.

Although some smaller dumbbells with fewer warts occur on the surface of the base, most sclerites are very warty with only a thin smooth waist dividing the two warty ends and with a total length averaging 0.1 mm.

The interior of the base has larger sclerites from 0.09 to 0.13 mm long which often look like spheres covered with warts on all sides. However, close examination shows that there is a thin vestige of a waist dividing the sclerite in two, so that these are just extremely warty versions of the dumbbells. Their greatest width is 0.1 mm.

REMARKS: Without examining the sclerites, one cannot distinguish this species from *Aloyonium utinomi* and some *Sinularia* species. They even may occur in the same habitats.

DISTRIBUTION AND HABITAT: This species has only been reported from shallow locations 1 to 8 m deep. It has, thus far, been collected in Guam only at the mouth of Manell Channel of Cocos Lagoon, where the channel bisects the reef front.

It was previously reported from Zanzibar, Madagascar, and the Red Sea across the Indian and Pacific Oceans to Australia, to New Caledonia, Fiji, and Tahiti and north of the equator to Taiwan and the Philippines.

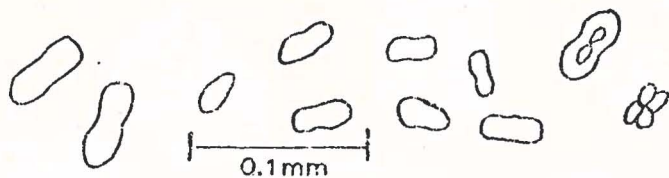


Fig. 9. *Cladiella pachyelados* (Klunzinger), polyps, X226.

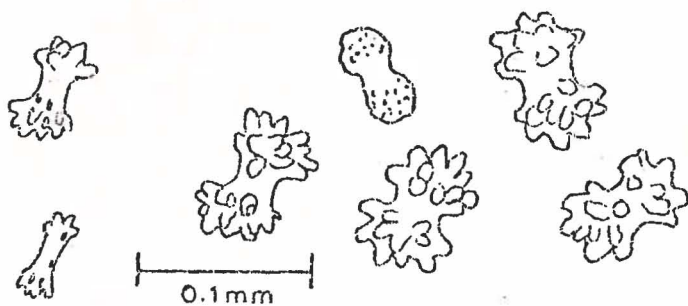


Fig. 10. *Cladiella pachyelados* (Klunzinger), surface of lobe, X226.

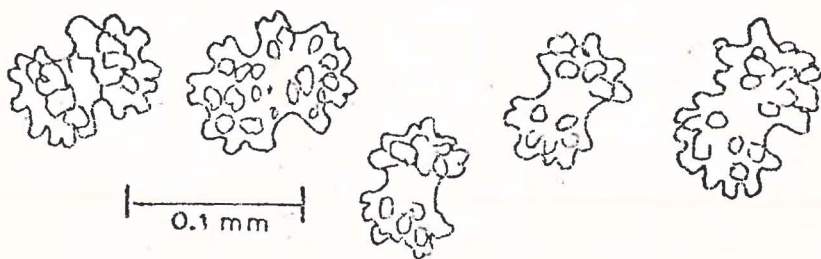


Fig. 11. *Cladiella pachyelados* (Klunzinger), interior of lobe, X226.

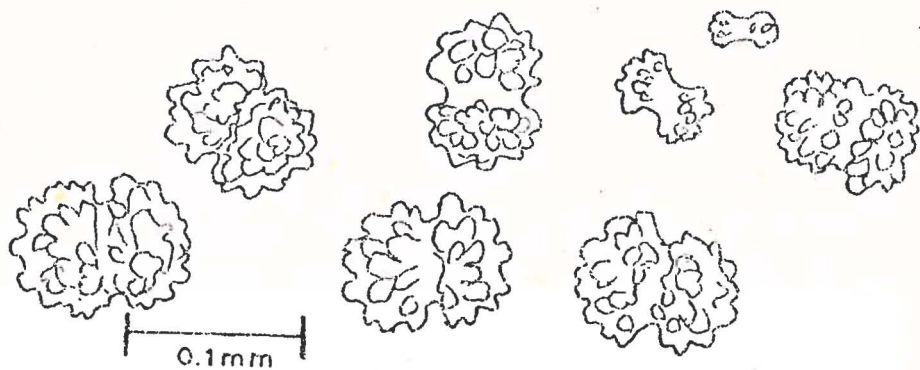


Fig. 12. *Cladiella pachyclados* (Klunzinger), surface of base, X226.

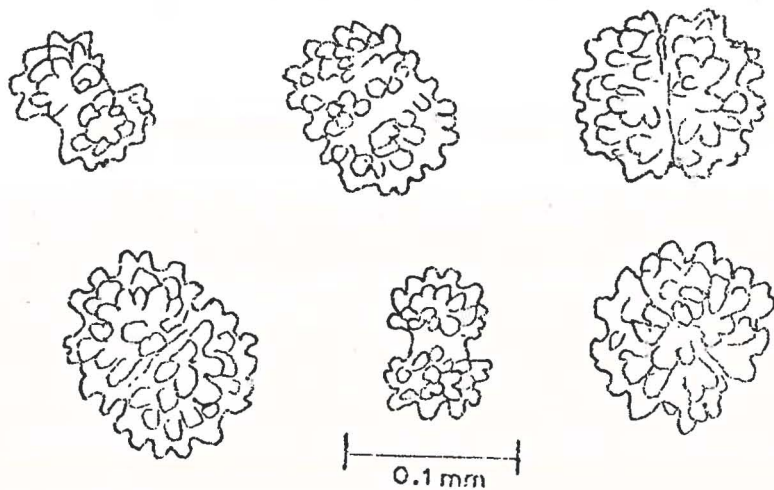


Fig. 13. *Cladiella pachyclados* (Klunzinger), interior of base, X226.



Fig. 14. *Cladiella pachyclados* (Klunzinger), whole colony (MG 74.5.2.15).

CLADIPHIA SPECIES 1

Fig. 15, 16, 17, 18, 19, and 20.

MATERIAL: MG 74.5.2.17 and MG 74.5.2.18, Cocos Barrier Reef;
MG 74.10.23.6, Tanguisson Reef terrace.

DESCRIPTION: The sterile base can be nonexistent or up to 1 cm tall. The primary lobes are short and tightly crowded, ranging from 3 to 15 mm wide. They give rise to hemispherical secondary lobes 2 to 8 mm wide and less than 10 mm high. The lobes are stiff and hard in alcohol.

Living colonies have a very light whitish color with a faint tinge of green or brown.

The polyps are evenly distributed on the lobes, averaging 0.6 to 0.8 mm between centers of adjacent polyps. The contracted polyps are about 0.3 mm in diameter. They are not surrounded by a distinct calyx ring but do appear as depressions when fully contracted.

The polyps contain finger-biscuit-shaped sclerites 0.03 to 0.05 mm long.

The sclerites at the surface of the lobes are mostly long-waisted dumbbells 0.08 to 0.10 mm long. However there are also some smaller, less-warty dumbbells and some sclerites intermediate in form between the finger-biscuits and dumbbells.

The interiors of the lobes have dumbbells about 0.1 mm long with shorter waists than those at the lobe surface.

The surface of the base has dumbbells 0.06 to 0.10 mm long with relatively long waists.

The interior of the base has dumbbells up to 0.13 mm long with distinct waists. Their greatest width is up to 0.08 mm.

REMARKS: This species has lobes shorter than those of *Cladiella pachyclados* but more tightly packed ones than those of *Cladiella* sp. 2.

DISTRIBUTION AND HABITAT: This species has been collected in Guam only at the mouth of Manell Channel of Cocos Lagoon and the shallow submarine terrace at Tanguisson. It was found at depths of 4 and 8 meters among live stony corals.

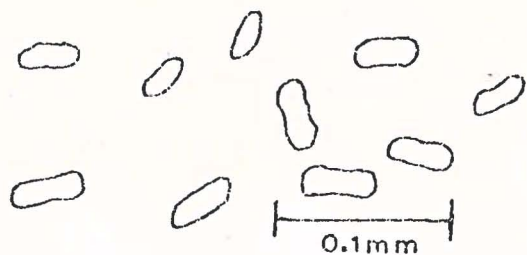


Fig. 15. *Cladiella* species 1, polyps, X226.

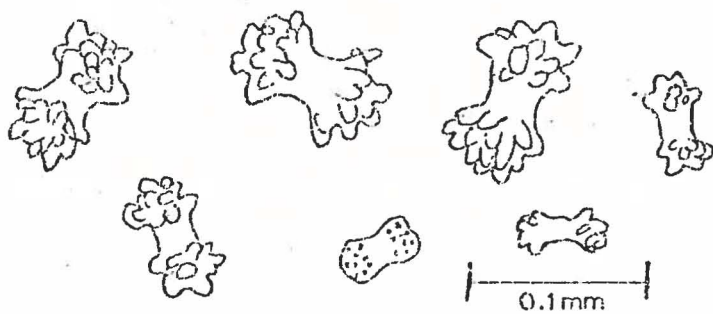


Fig. 16. *Cladiella* species 1, surface of lobe, X226.

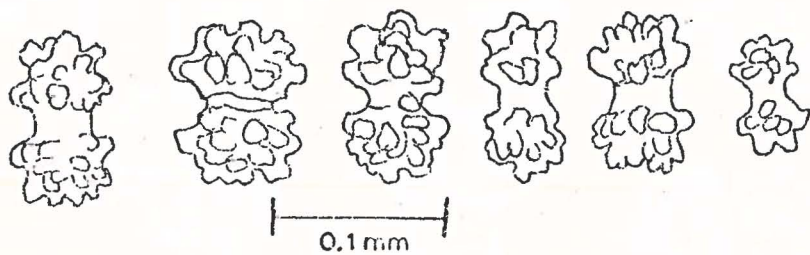


Fig. 17. *Cladiella* species 1, interior of lobe, X226.

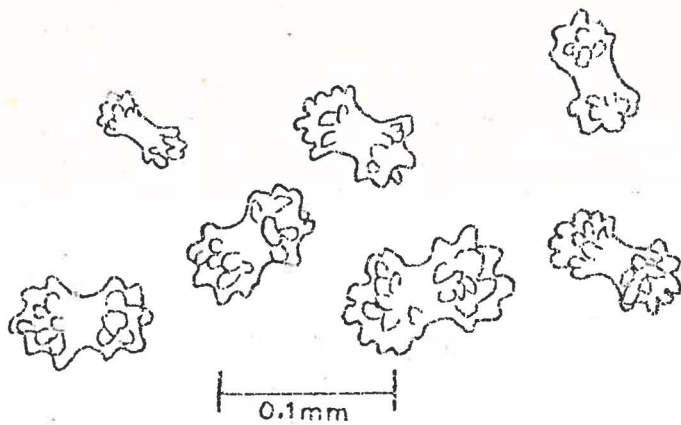


Fig. 18. *Cladiella* species 1, surface of base, X226.

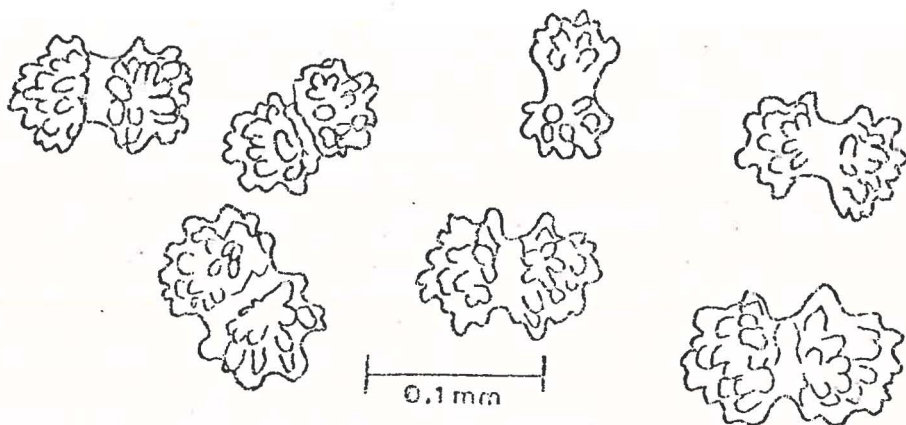


Fig. 19. *Cladiella* species 1, interior of base, X226.



Fig. 20. *Cladiella* species 1, whole colony seen from above (MG 74.5.2.18).

CLADIELLA SPECIES 2

Fig. 21, 22, 23, 24, 25, and 26; Plate II.

MATERIAL: MG 73.10.1.1, Taogea Point reef front; MG 74.10.23.8,
Tanguisson reef margin.

DESCRIPTION: The very low encrusting colonies are less than 2 cm tall when preserved. The sterile base is usually evident, but short and less than 1 cm tall. Most of the capitulum is covered with simple primary lobes a few of which bear secondary short rounded lobes. The lobes are not crowded together and range from 5 to 10 mm tall. The lobes are stiff and hard when contracted and preserved in alcohol.

Living colonies are grayish white with brown polyps.

The polyps are more crowded on the lobes, with 0.6 to 0.8 mm between their centers. The polyps are 0.8 to 1.6 mm apart between their centers. When fully contracted the polyps are 0.5 mm in diameter and sunken inside distinct pits.

The polyps contain finger-biscuit-shaped sclerites 0.03 to 0.04 mm long.

The surface of the capitulum contains sclerites intermediate between the finger-biscuits and the more common, warty dumbbells which average under 0.08 mm long. Their warts are relatively large and most have long smooth waists.

The interior of the lobes has dumbbells all under 0.1 mm long and averaging under 0.08 mm, with long waists and large warts.

Sclerites at the surface of the base are predominantly dumbbells with very long waists and very small warts on the ends and averaging 0.05 to 0.06 mm long. There are also larger dumbbells up to 0.1 mm long with larger warts at the surface of the colony base.

The interior of the base contains dumbbells of various sizes between 0.06 and 0.09 mm mostly with rather long waists. Their greatest width is 0.07 mm.

REMARKS: This species is distinguished from others on Guam by its lobes not being crowded tightly together and its largest sclerites being less than 0.1 mm long.

DISTRIBUTION AND HABITAT: This species has been collected in Guam only at the shallow windward reef front at Taogam Point and the reef margin at Tanguisson. Both areas are subject to strong wave surge.

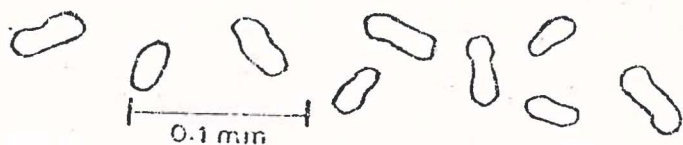


Fig. 21. *Cladiella* species 2, polyps, X226.

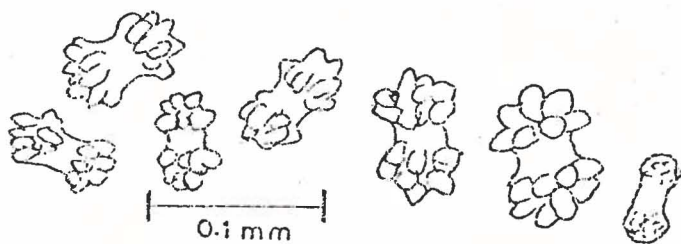


Fig. 22. *Cladiella* species 2, surface of lobe, X226.

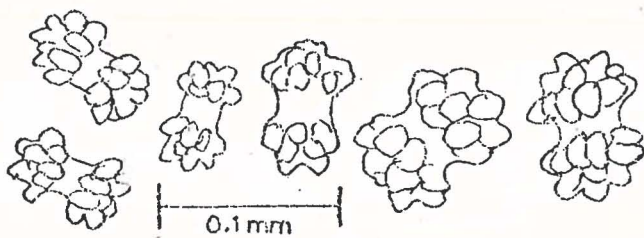


Fig. 23. *Cladiella* species 2, interior of lobe, X226.

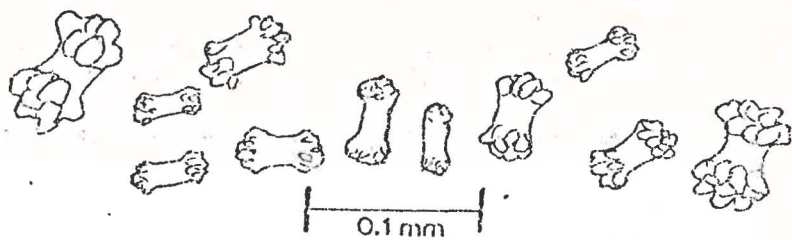


Fig. 24. *Cladiella* species 2, surface of base, X226.

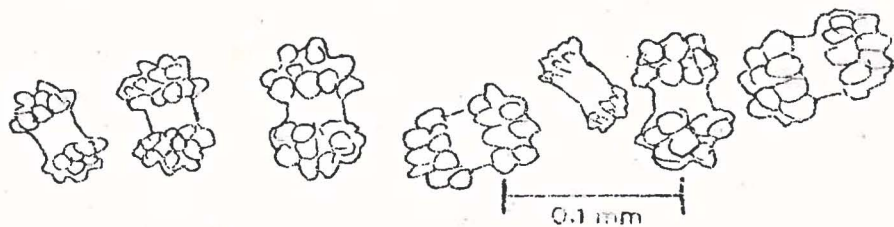


Fig. 25. *Cladiella* species 2, interior of base, X226.

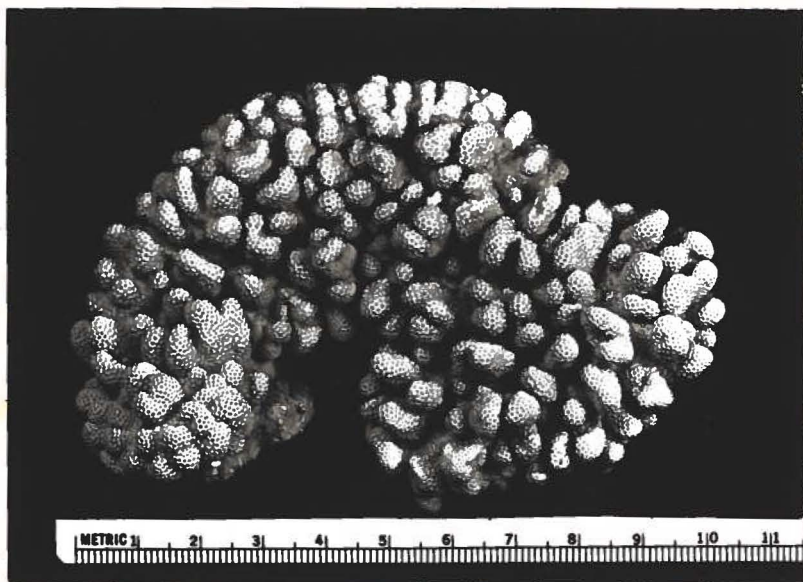


Fig. 26. *Cladiella* species 2, whole colony seen from above (MG 73.10.1.1).

LOBOPHYTUM VON MARENZELLER, 1886

Colonies of this genus are typically low with a capitulum giving rise to short primary lobes. The polyp-bearing capitulum is sharply distinct from the sterile base. Some species may be shaped like a typical *Sarcophyton* with folded edges but most specimens will have at least one projecting lobe inside the periphery of the capitulum.

The dimorphic polyps cover the capitulum. The siphonozooids are most numerous, regularly distributed among the sexual autozooids and not projecting above the capitulum surface. The larger autozooids expand above the surface when alive but also can retract completely within the capitulum coenenchyme. Autozooids are closer and more numerous on the lobes than in between the lobes.

Sclerites at the surface of the stalk and capitulum are various small spindles, rods, clubs, and barrels under 0.22 mm long. The rods may be smooth but the other forms bear warts in different amounts, arrangements and sizes.

Sclerites at the interior are typically short spindles or barrels about 0.2 mm long with large warts arranged in whorls around them. Larger warty spindles and needles up to 0.4 mm long occur in some species.

KEY TO THE GUAM SPECIES OF *LOBOPHYTUM*

1. The closest autozooids on the lobes have one or two siphonozoids between them and retract into holes less than 0.5 mm in diameter. Usually warts are irregularly arranged on the sclerites from the interior of the base
..... *Lobophytum crebriplicatum*

1. The closest autozooids on the lobes have two to five siphonozoids between them and retract into holes more than 0.5 mm in diameter. Usually warts are arranged in four whorls on the sclerites from the interior of the base
..... *Lobophytum pauciflorum*

LOBOPHYTUM CREBRIFLICATUM VON MARENZELLER, 1886

Fig. 27, 28, 29, 30, 31, and 32.

Lobophytum crebriflicatum Von Marenzeller, 1886:302; Roxas, 1933b:362; Macfadyen, 1936:45; Utinomi, 1953:156; Tixier-Durivault, 1958:167.

MATERIAL: MG 73.11.7.1 and 2, Gun Beach; MG 73.11.15.14, Toguan Bay; MG 74.10.21.4, Tanguisson Reef Terrace; MG 74.10.23.9, Tanguisson Reef Margin; MG 74.10.23.22, Double Reef.

DESCRIPTION: *Lobophytum crebriflicatum* normally has large, rounded, flattened, radially arranged, sometimes notched lobes usually 5 to 8 mm thick on its disc which usually widely overhangs the thinner, upright, sterile stalk. Sometimes the lobes are up to 3 cm high above the disc of preserved specimens and separated from those lobes along the periphery of the disc. Occasionally, no lobes seem to occur at all and the specimen looks exactly like a *Sarcophyton*. But, unlike most *Sarcophyton* specimens, the entire preserved specimen is hard and solid to the touch, not soft and only slightly flexible. Large colonies can be over 20 cm in diameter but their highest lobes are less than 8 cm above the substrate when contracted.

Most living colonies appear to be shades of beige with tannish or greenish polyps.

The autozooids are numerous and about 1 to 2 mm apart with one or two siphonozooids between two autozooids on a lobe and two or three siphonozooids between two autozooids elsewhere on the

disc. The siphonozooids and contracted autozooids are both smaller than those of *Lobophytum pauciflorum* with autozooids retracting into holes less than 0.5 mm in diameter.

The surfaces of lobes have some sclerites which are warty clubs just over 0.1 mm long but most are pointed spindles or blunt ended cylinders with numerous warts 0.02 to 0.03 mm wide, arranged irregularly and widely spaced or crowded.

The interiors of the lobes have more regular spindles up to 0.4 mm long with warts tending to form five or six whorls, but arranged irregularly on the ends.

The surface of the base has blunt or pointed spindles up to 0.4 mm long with smaller warts than on interior sclerites. Very rarely warty clubs appear that are close to 0.1 mm long.

The interior of the base also has blunt or pointed spindles 0.14 to 0.40 mm long with rough warts about 0.04 mm in diameter sometimes in whorls but usually irregularly arranged.

REMARKS: A greater variation in gross form is found than has been described before for this species.

DISTRIBUTION AND HABITAT: This is the most common *Lobophytum* in Guam, ranging in depth from low tide level to at least 13 m deep on leeward reefs. It has also been reported from Zanzibar, Australia, New Caledonia, Tonga, Palau, and the Bonin Islands.

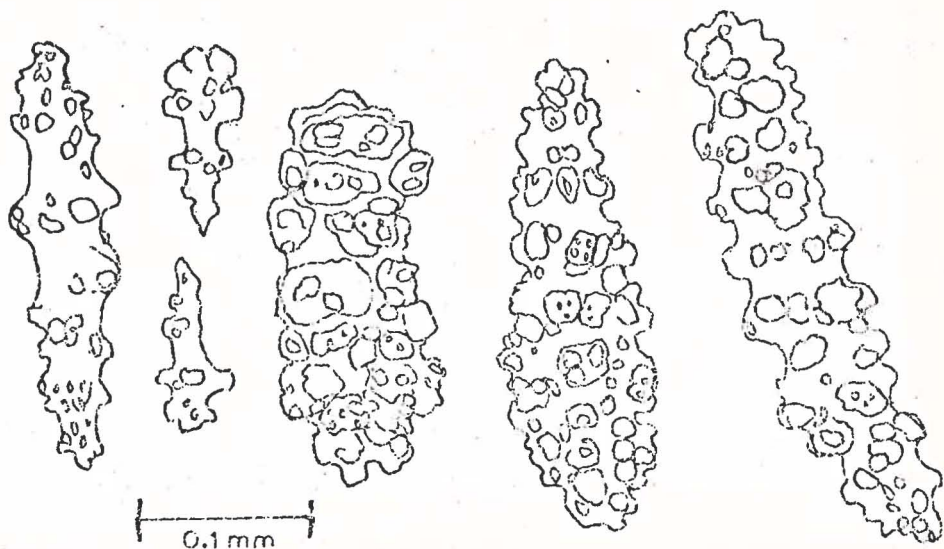


Fig. 27. *Lobophytum crebriplicatum* Von Marenzeller, surface of lobe, X225.

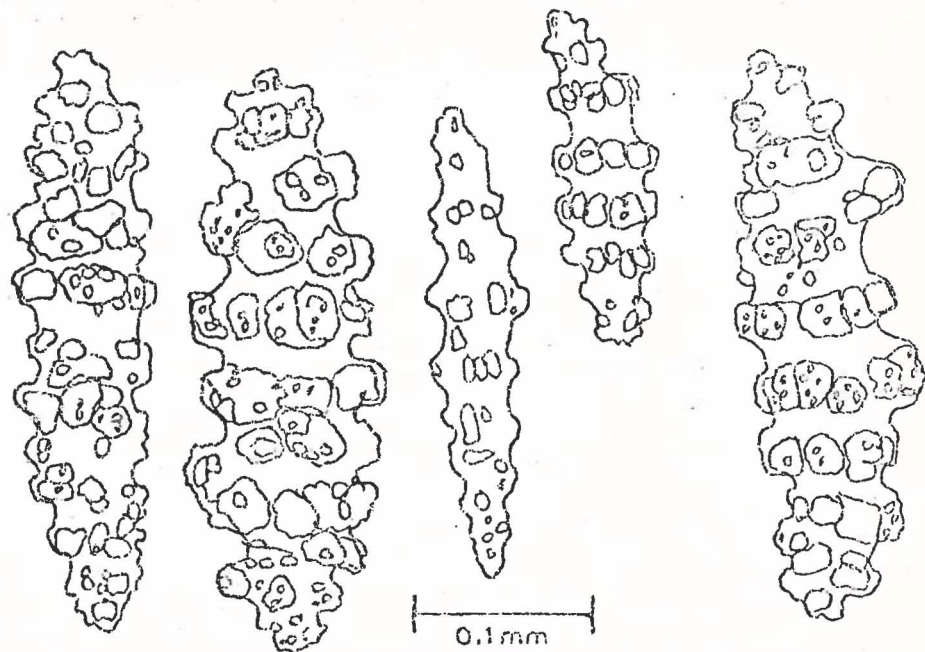


Fig. 28. *Lobophytum crebriplicatum* Von Marenzeller, interior of lobe, X226.

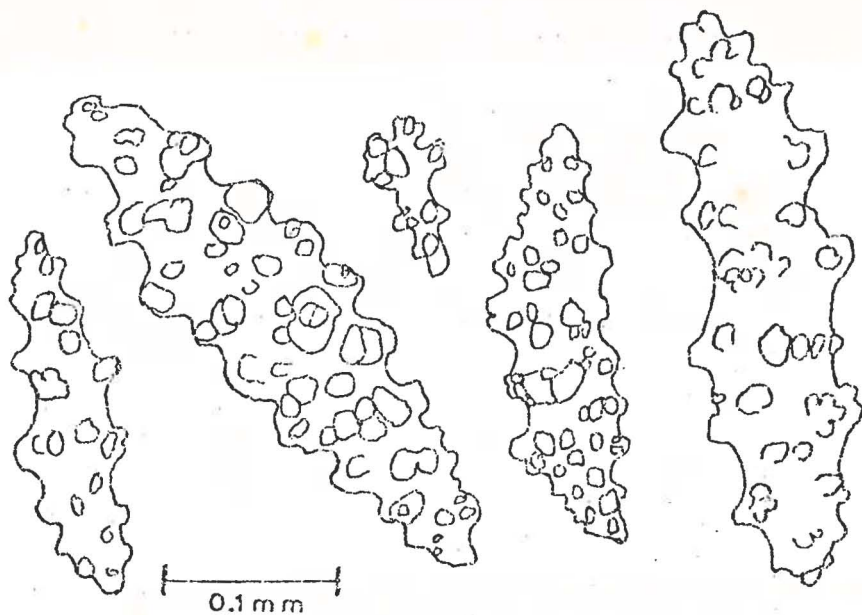


Fig. 29. *Lobophytum crebriplicatum* Von Marenzeller, surface of base, $\times 226$.

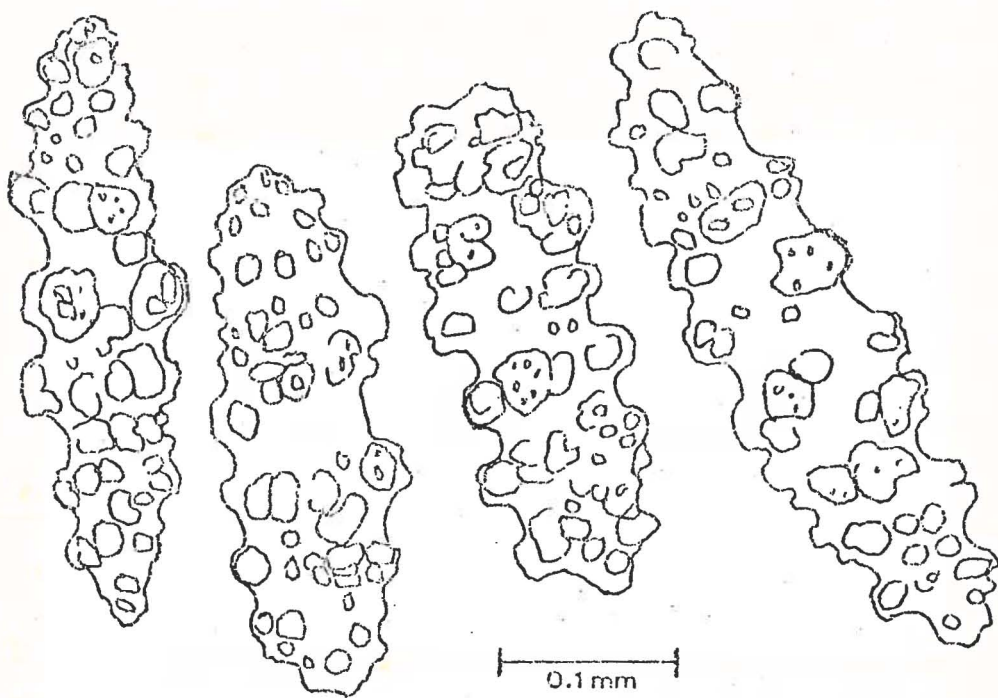


Fig. 30. *Lobophytum crebriplicatum* Von Marenzeller, interior of base, $\times 226$.



Fig. 31. *Lobophytum crebriplacatum* Von Marenzeller,
whole colony seen from above (MG 73.11.7.2).



Fig. 32. *Lobophytum crebriplacatum* Von Marenzeller,
whole colony with few lobes (MG 74.10.23.9).

LOBOPHYTUM PAUCIFLORUM (EHRENBERG, 1834)

Fig. 33, 34, 35, 36, and 37. Plate III.

Lobularia pauciflora Ehrenberg, 1834:58.

Sarcophytum pauciflorum, Klunzinger, 1877:29.

Lobophytum pauciflorum, Pratt, 1903:515; Thomson and Dean, 1931:69;
Roxas, 1933b:367; Utinomi, 1953:156; Tixier-Durivault, 1958:127;
Verseveldt, 1960:218, 1965:30, 1971:15.

MATERIAL: MG 73.11.4.3, south of Orote Point; MG 74.4.8.4, Mamaon
Channel; MG 74.6.14.2, west of Cocos Barrier Reef.

DESCRIPTION: The low sterile base is distinctly separate from the
polyp-bearing disc which overhangs the base like a rounded, down-
turned undulating lip. Folds, finger-like projections, and
various gradations between these two occur abundantly along the
disc margin except in the very small (under 5 cm diameter)
specimens, which are mushroom shaped. The center of the disc
bears projecting finger-like lobes up to 6 cm tall, which often
are arranged in radial rows or on ridges. Preserved specimens
are stiff, inflexible, and breakable. They may be over 20 cm in
diameter.

Living colors are light shades of gray or brown.

The autozooids are large and are most abundant on the lobes,
where there may be about 2 mm between their centers with two to
five small siphonozooids between the closest autozooids. The
autozooids are farther apart and have more siphonozooids between
them (over ten) at the depressions and margins of the disc. The

autozooids can contract into the disc but still show prominent holes over 0.5 mm in diameter. The siphonozooids do not seem to expand above the disc surface.

The surfaces of lobes contain spindles and cylinders up to 0.2 mm long with two to five whorls of large warts besides the caps of warts at each end. Some may be tapered at one end and enlarged at the other.

The interiors of lobes are filled with canals from the polyps lined with sclerites that are up to 0.4 mm long spindles with an average of four whorls of warts each.

The surface of the base has similar sclerites up to 0.25 mm long with larger warts in tightly crowded whorls.

The interior of the base is full of large parallel canals like those of the lobes with cylindrical sclerites often over 0.2 mm long with usually four whorls of large warts. Warts on all sclerites appear very rough.

REMARKS: Lobes are common, long and finger-like, tapering and usually not more than twice as wide as thick. Polyps are striking for their large size and wide spacing. The Guam specimens seem to have fewer but larger finger-like lobes than those described from elsewhere.

DISTRIBUTION AND HABITAT: In Guam, *Lobophytum pauciflorum* is not common or abundant but has been found from just below tide level in calm areas to 20 m deep. It has been collected from Orote Peninsula and the Cocos Lagoon area. Pratt (1903) reports specimens collected in the Maldives from as deep as 24 fathoms.

This seems to be the most common and most widely distributed species of *Iobophytum*, known from East Africa and the Red Sea to Australia and Southeast Asia to New Zealand to Tonga to the Marshall Islands to Japan.

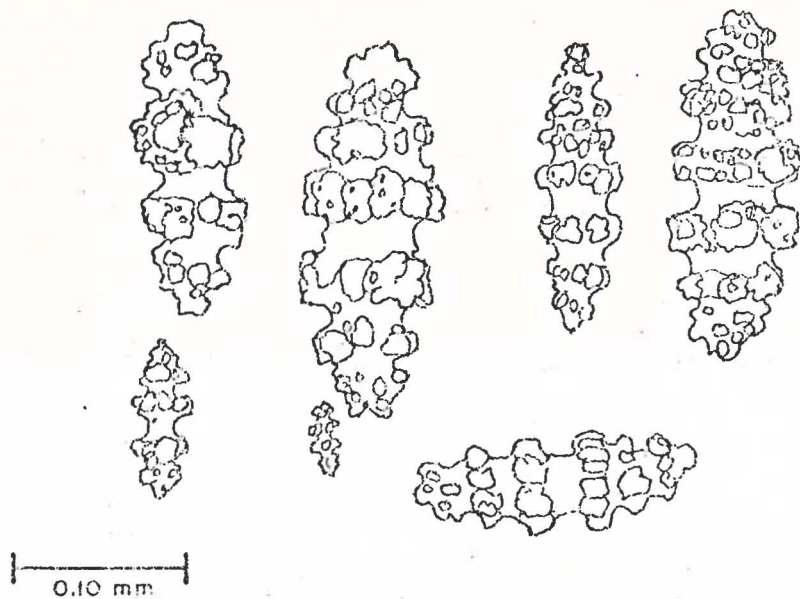


Fig. 33. *Lobophytum pauciflorum* (Ehrenberg), surface of lobe, X226.

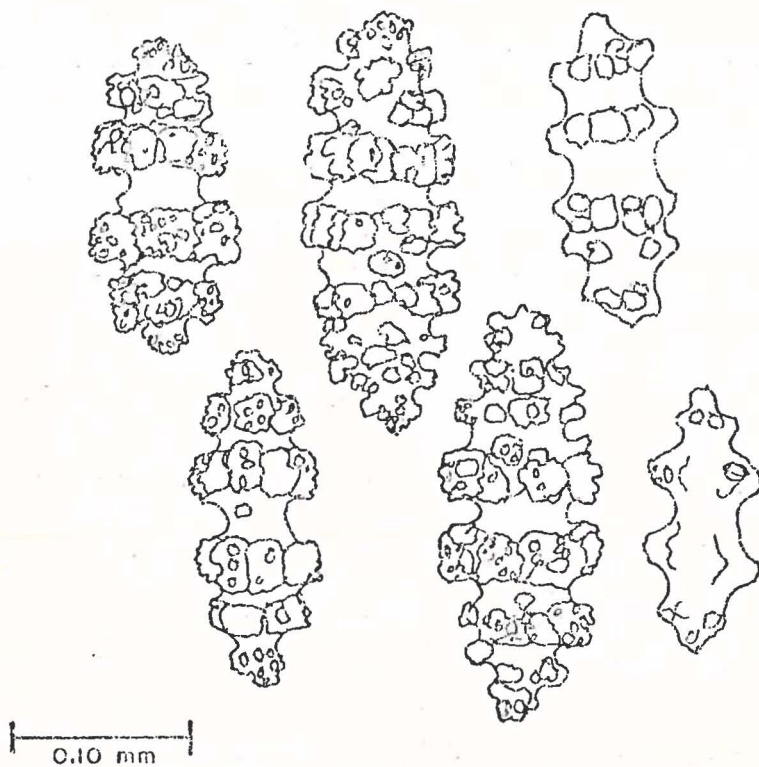
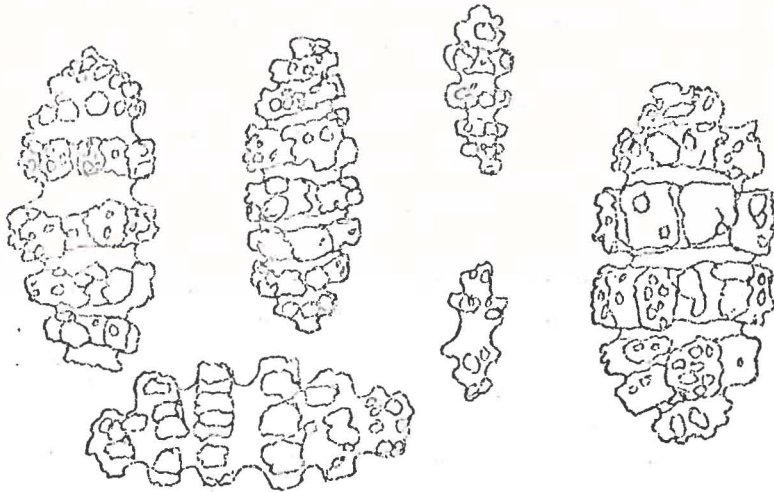
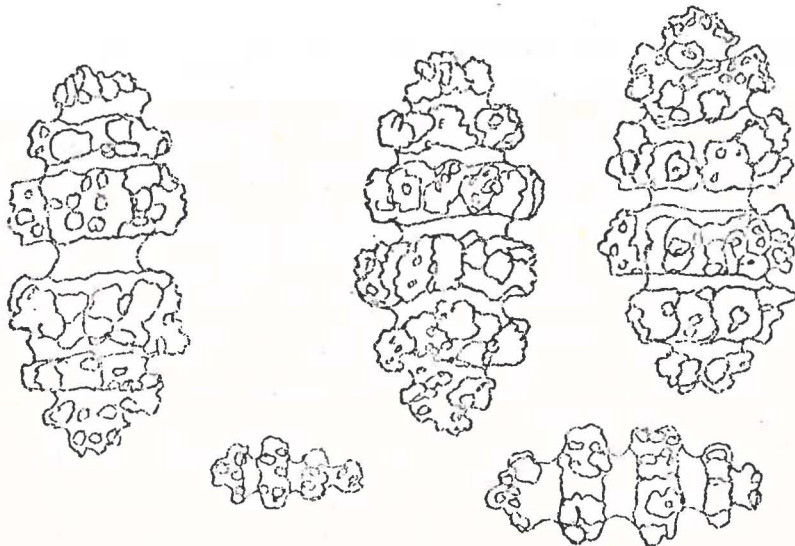


Fig. 34. *Lobophytum pauciflorum* (Ehrenberg), interior of lobe, X226.



0.10 mm

Fig. 35. *Lobophytum pauciflorum* (Ehrenberg), surface of base, X226.



0.10 mm

Fig. 36. *Lobophytum pauciflorum* (Ehrenberg), interior of base, X226.



Fig. 37. *Lobophytum pauciflorum* (Ehrenberg), part of colony (MG 74.6.14.2).

SARCOPHYTON LESSON, 1834

Colonies of this genus often are shaped like a mushroom, having a disc-like capitulum, which bears the polyps above a sharply distinct sterile base. The disc can be strongly folded along its periphery or smooth and rounded or intermediate in form.

The polyps are dimorphic, covering the upper surface of the disc. The siphonozooids are most numerous, regularly distributed between the sexual autozooids and not projecting above the disc surface. The much larger autozooids can extend greatly above the disc when alive but also can retract completely within the disc coenenchyme. Autozooids are closer and more numerous around the disc edges than in the middle.

Sclerites at the surface of the stalk and disc are usually little clubs 0.07 to 0.2 mm long or short rods 0.1 to 0.3 mm long. At the interior of the base are larger warty needle-like, spindle-like, or barrel-like sclerites between 0.1 to 2.0 mm in total length. Below the surface of the disc are usually long warty needles of various lengths but rarely exceeding 0.02 mm in diameter.

KEY TO THE GUAM SPECIES OF *SARCOPHYTON*

1. Living expanded autozooids are greater than 10 mm tall.
Sclerites from the interior of the base are long, pointed,
warty spindles up to 2 mm long
..... *Sarcophyton glaucum*
1. Living expanded autozooids are less than 10 mm tall. Sclerites
from the interior of the base are rounded, massive, short
and thick barrels with large warts covering their surface
and with lengths from 0.3 to 0.4 mm
..... *Sarcophyton tracheliophorum*

SARCOPHYTON GLAUCUM (QUOY AND GAIMARD, 1833)

Fig. 38, 39, 40, 41, and 42. Plates IV and V.

Aleyonium glaucum Quoy and Gaimard, 1833:270.

Sarcophyton glaucum, Pratt, 1903:509; Tixier-Durivault, 1958:61;
Burchardt, 1902:674.

Sarcophyton glaucum, Roxas, 1933b:381; Verseveldt, 1965:31.

MATERIAL: MG 73.11.4.2, south of Orote Point; MG 74.3.14.1 and
MG 74.3.14.2, both Maman Channel; MG 74.4.18.2, Toguan Bay;
MG 74.1.20.1 and MG 74.1.20.2, both Taogam Point reef terrace;
MG 73.11.16.5, south side of Facpi Island.

DESCRIPTION: The upright stalk bears a flattened disc that projects outward very far beyond the stalk. It is sometimes mushroom shaped, but often the disc has radial folds extending from the edge to the middle. Largest specimens may be over 1 m in diameter when expanded. Living and preserved specimens are very slimy. Even preserved specimens are always very soft and flexible.

Living colors are variable, including greenish gray, tannish beige, greenish yellow, and yellow-brown.

Autozooids are large, over 10 mm tall when expanded and often 2 mm in diameter with long tentacles easily visible to the naked eye. Siphonozooids are about one tenth the diameter of autozooids, without any projection above the surface of the disc. At the edges of the disc there are two to three siphonozooids between two autozooids, whereas there are four to nine in the middle of the disc.

The disc surface contains slender needle-like sclerites with few scattered bumps but fairly smooth and up to 0.4 mm long. Occasionally these are blunt and warty at one end. Less numerous are club-like sclerites pointed at one end and an average of 0.12 mm long.

The interior of the disc has mostly longer, needle-like sclerites, up to 0.8 mm long with scattered simple warts. Occasionally large spindles like those found in the base and smaller clubs occur.

The surface of the stalk has mostly club-like sclerites 0.08 to 0.20 mm long with warts over their entire length. These warts are rough but tapered from their base to their tops, not expanded on top.

The interior of the stalk has some of the needles described from the disc interior, but most of its sclerites are large (up to 2 mm) spindles with small (up to 0.03 mm diameter), sparse, crenulate warts often occurring in rows about 0.05 mm apart or else randomly scattered.

REMARKS: This species includes many variations that have been described as over ten different species by early authors. Tixier-Durivault (1958) agrees in her monograph that they should be combined in one.

DISTRIBUTION AND HABITAT: *Sarcophyton glaucum* is widely distributed throughout the Red Sea, Indian Ocean, and Pacific from Australia to Tonga to Guam to Japan and Southern Asia.

In Guam it is seen in small scattered groups throughout the leeward reefs, on deeper parts of the windward reefs, and in Cocos Lagoon and its channels. It occurs from just below low tide level to at least 20 m, in areas usually protected from wave action or surf.

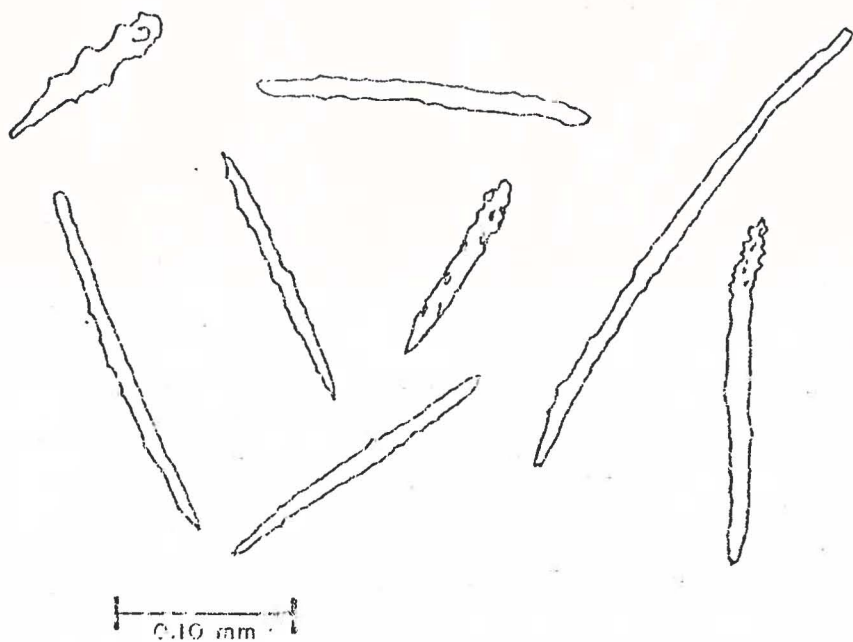


Fig. 38. *Sarcophyton glaucum* (Quoy and Gaimard), surface of disc, X226.

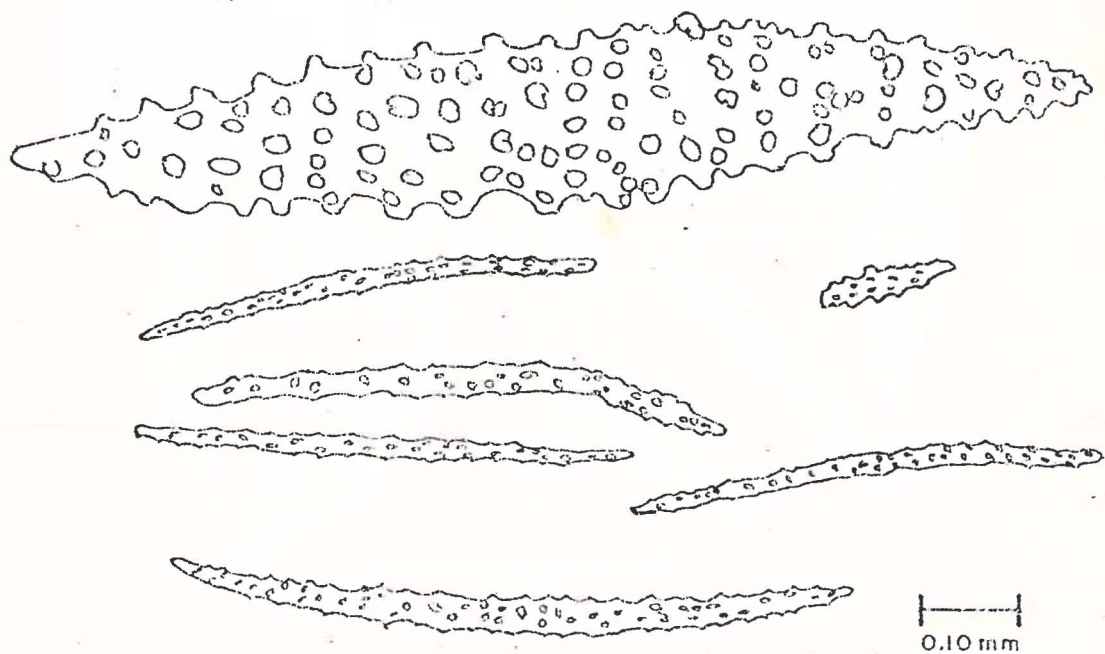


Fig. 39. *Sarcophyton glaucum* (Quoy and Gaimard), interior of disc, X125.

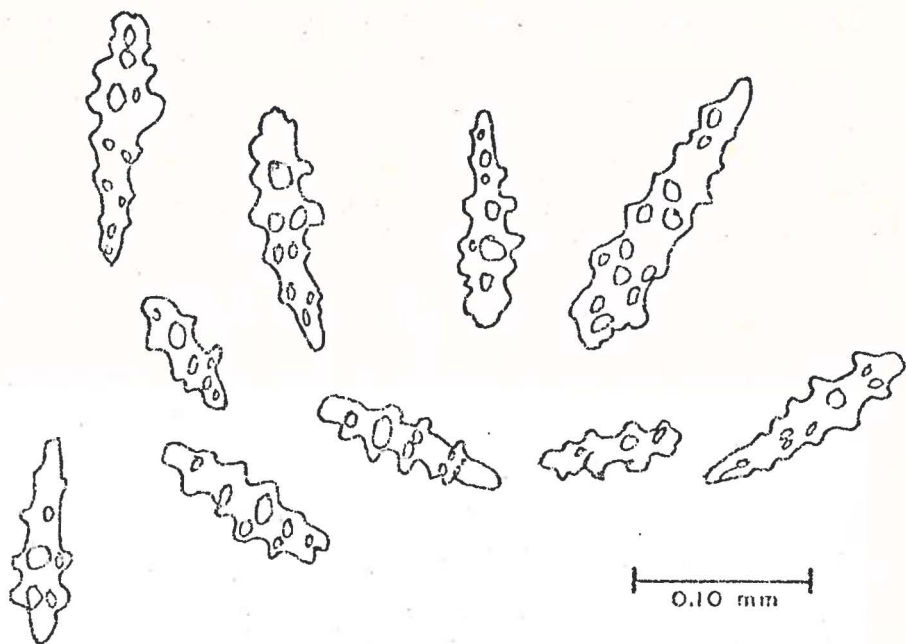


Fig. 40. *Sarcophyton glaucum* (Quoy and Gaimard), surface of base, X226.

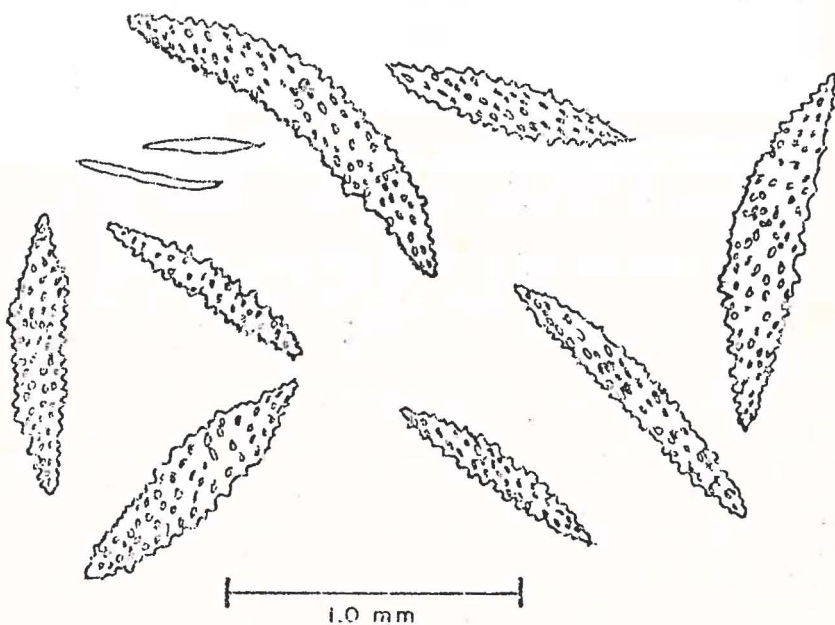


Fig. 41. *Sarcophyton glaucum* (Quoy and Gaimard), interior of base, X39.



Fig. 42. *Sarcophyton glaucum* (Quoy and Gaimard), part of a colony (MG 74.3.14.1).

SARCOPHYTON TROCHELIOPHORUM (VON MARENZELLER, 1886)

Fig. 43, 44, 45, 46, and 47. Plate VI.

Sarcophyton trocheliophorum Von Marenzeller, 1886:359; Tixier-Durivault, 1958:75.

Sarcophyton trocheliophorum, Macfadyen, 1936:42; Utinomi, 1953:155; Verseveldt, 1960:232, 1971:25.

MATERIAL: MG 73.9.20.15, MG 74.5.2.6 and MG 74.10.17.1, all from Cocos Lagoon; MG 74.10.23.23, Double Reef.

DESCRIPTION: The disc bearing the polyps is raised on an upright stalk. In large colonies the disc may be over 1.2 m in diameter extending far beyond the stalk. The margin of the disc can be greatly folded or can be smooth and round, but usually several folds occur and form tongue-like lobes between them that are curved down toward the stalk.

Preserved colors range from white to yellow to greenish to brown to black. Living colors are variable and may show shades of green, rose, brown, and gray.

The autozooids at the middle of the disc are 1 to 3 mm apart with seven to ten siphonozooids between each adjacent pair in large colonies. At the periphery and in small colonies there may be only one or two siphonozooids between each two autozooids. The autozooids are not relatively large but are less than 10 mm tall when extended.

The sclerites of this species contain minor amounts of smooth needles at the disc surface and cylinders with two or four

whorls of large warts at the disc interior both typical of the genus. The commonest sclerites are very distinctive. At the surface of the disc and the stalk or base are mostly small clubs under 0.1 mm in length with a few warts and long flat longitudinal ridges at the head, which takes up half of the length. At the interior of the stalk or base are massive sclerites mostly 0.3 to 0.4 mm long shaped like rugby balls but resembling raspberries because of the large warts covering their surfaces.

REMARKS: The forms of this widespread species have been described as several different species and several varieties. Different sized colonies look so different in shape that the sclerites must always be observed to determine the species.

DISTRIBUTION AND HABITAT: In Guam *Sarcophyton trocheliophorum* is often in shallow protected reef areas from just below low tide to 8 m. It is found in many areas including Cocos Lagoon, Apra Harbor, Double Reef, and Piti Bay. It must be attached to a solid substrate. Sometimes it is found on depressed areas of reef flats.

It is widespread in the Indian Ocean and in the Pacific from Australia to Tonga to the Marshall Islands to Japan.

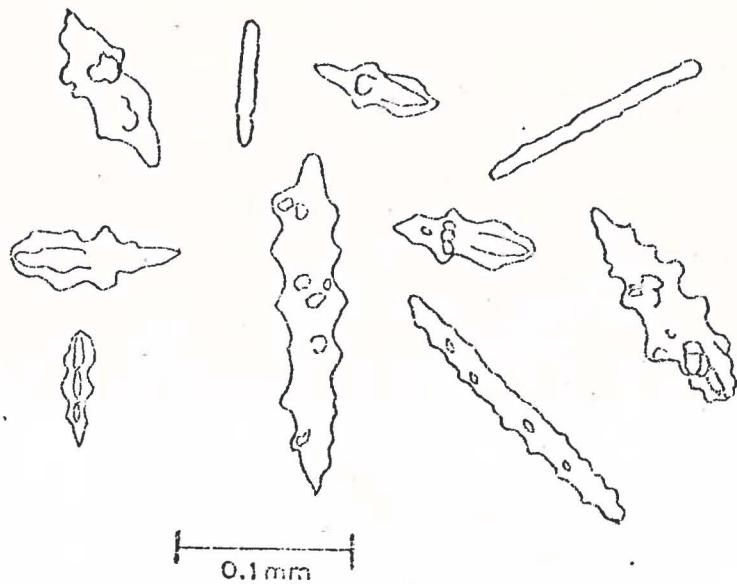


Fig. 43. *Sarcophyton trocheliophorum* Von Marenzeller, surface of disc, X226.

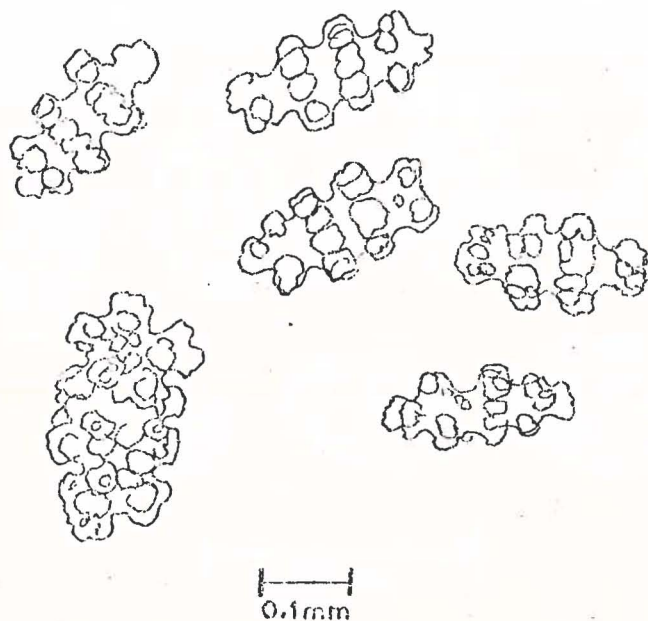


Fig. 44. *Sarcophyton trocheliophorum* Von Marenzeller, interior of disc, X125.

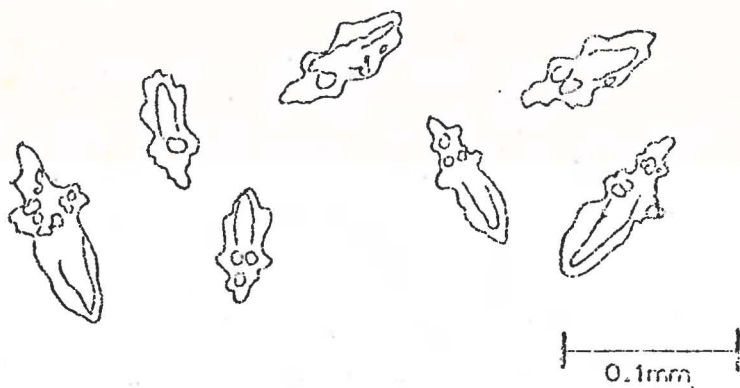


Fig. 45. *Sarcophyton trocheliophorum* Von Marenzeller, surface of base, X226.

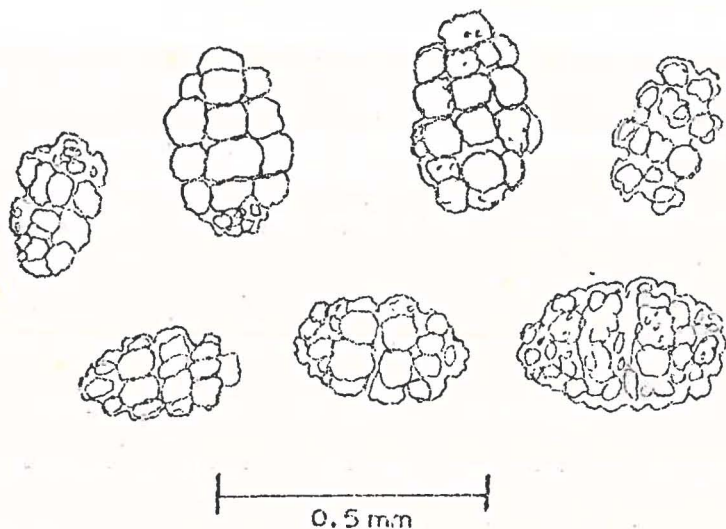


Fig. 46. *Sarcophyton trocheliophorum* Von Marenzeller, interior of base, X70.



Fig. 47. *Sarcophyton trocheliophorum* Von Marenzeller, whole colony (MG 74.5.2.6).

SINULARIA MAY, 1898

Colonies of *Sinularia* may be very large and massive or arborescent or encrusting. They always have a distinct solid base and some form of lobes arising from the base. The colony is usually in the form of a sterile stalk supporting the polyp-bearing capitulum formed of numerous primary lobes which may be simple or else branching into finger-like or cylindrical secondary lobes and sometimes tertiary lobes.

The polyps are monomorphic, entirely retractile, very abundant and evenly distributed over the whole capitulum or decreasing towards the sterile stalk. There is no distinct line of demarcation between capitulum and stalk or base.

A well-developed transverse system of internal canals is located just below the surface of the capitulum and interconnects with the longitudinal canals extending from the polyps gastrovascular cavities down into the base of the colony.

Sclerites on the surface of the stalk and capitulum are predominantly small clubs, 0.05 to 0.30 mm long, with distinct handles or hafts, and enlarged heads with various spines, warts or projections. Some rods and needle-like sclerites longer than the clubs also may be present.

Internally in the lobes and base, larger sclerites occur which are mostly warty spindles up to 7 mm long. In every species of *Sinularia* such spindles at least 1 mm long, and usually longer than 2 mm are very abundant.

KEY TO THE GUAM SPECIES OF *SINULARIA*

1. Interiors of the base and lobes contain warty spindle-shaped sclerites, most of which are 0.5 to 1.0 mm long. The colony is low and encrusting with crowded primary lobes less than 1 cm tall *Sinularia* sp. 7
1. Interiors of the base and lobes contain warty spindle-shaped sclerites, most of which are over 1.0 mm long 2
- 2(1). Surfaces of the base and lobes contain club-like sclerites with heads bearing twenty to fifty simple, uniform, smooth, small, finger-like warts which mostly project away from the haft of the club (Fig. 103). The colony is tree shaped with a branched capitulum on a tall stalk ...
..... *Sinularia* sp. 8
- 2(1). Surfaces of the base and lobes contain club-like sclerites that do not have such small, numerous finger-like warts but irregular or flattened warts which are less numerous
..... 3
- 3(2). Surfaces of the base and lobes contain club-like sclerites which have usually four longitudinal rows of flattened, plate-like projections on their heads forming an outline like a lobed leaf (Fig. 58) 4
- 3(2). Surfaces of the base and lobes contain club-like sclerites which do not have flattened, plate-like projections but are covered with warts of irregular sizes and shapes
..... 6

- 4(3). Sclerites of the stalk interior are tightly packed together, up to 4 mm long, and often have warts densely crowded together. The primary and secondary lobes, and often the sterile stalk, are not vertically upright but bent over to one side *Simularia maxima*
- 4(3). Sclerites of the stalk interior are separated by soft tissue, under 3.5 mm long, and their warts are never densely crowded together. Primary and secondary, and in one species tertiary, lobes tend to be upright 5
- 5(4). Sclerites of the stalk interior are up to 3.5 mm long. The leaf-like clubs of the surface average 0.1 mm long. The capitulum forms an overhanging rim and bears uncrowded primary lobes with some secondary lobes
..... *Simularia* sp. 9
- 5(4). Sclerites of the stalk interior are under 2.5 mm long. The leaf-like clubs of the surface average under 0.06 mm long. The capitulum is covered with crowded primary, secondary, and tertiary lobes
..... *Simularia* sp. 6
- 6(3). The capitulum does not bear rounded lobes that are cylindrical or bulbous or tongue-like. Its lobes are wavy, short, bent, corrugated-like, and covered with angles, edges, and facets *Simularia* sp. 3
- 6(3). The capitulum bears rounded lobes that are cylindrical or bulbous or tongue-like 7

- 7(6). Sclerites at the surfaces of the base and lobes typically are clubs with a prominent, central, terminal wart at their head end 8
- 7(6). Sclerites at the surfaces of the base and lobes typically are irregularly warty clubs without a prominent, central, terminal wart at their head end 9
- 8(7). Colonies form a low, encrusting, flattened, rimmed disc bearing widely spaced, tongue-like primary lobes with some low secondary lobes. They are hard and stiff
..... *Simularia densa*
- 8(7). Colonies bear tightly packed primary and secondary lobes covered with long cylindrical tertiary lobes. They are soft and flexible *Simularia polydaetylia*
- 9(7). Primary branches arise from the sterile stalk without polyps on their lower areas. The polyps remain partially expanded and protruding when preserved and are often 2 to 3 mm apart. Sclerites of the interiors of base and branches are long and sinuous, up to 4 mm, with sparsely distributed warts. They are never abundant nor densely packed in the basal tissue *Simularia* sp. 5
- 9(7). Primary branches arise from the polyp-bearing, capitulum region. The polyps contract into the coenenchymal mass when disturbed and are usually 0.5 to 1.0 mm apart. Sclerites of the interiors of base and branches are abundant and densely packed together 10

- 10(9). Terminal lobes on the primary and secondary lobes are expanded like bulbs and average about 5 mm in diameter. The sterile stalk is at least three times as wide as it is high *Simularia* sp. 4
- 10(9). Terminal lobes are not expanded like bulbs and are less than 5 mm in diameter. The sterile stalk is at least as high as it is wide 11
- 11(10). Terminal lobes are long and flexible, 2 to 3 mm in diameter and up to 25 mm long in preserved specimens. Hafts of the club sclerites from the colony surfaces are thin and smooth with no large warts *Simularia arboorea*
- 11(10). Terminal lobes are short and stiff, 2 to 6 mm in diameter and mostly under 7 mm in preserved specimens. Hafts of the club sclerites from the colony surfaces are thick and ringed by large warts 12
- 12(11). Preserved colonies are dark blackish brown in color. Terminal lobes are broadly rounded and over 4 mm in diameter. Basal interior sclerites often have median constrictions and their warts average over 0.05 mm in diameter
..... *Simularia* sp. 1
- 12(11). Preserved colonies are light in color. Terminal lobes are small and tapered and often under 4 mm in diameter. Basal interior sclerites do not have median constrictions and their small warts average 0.04 mm in diameter
..... *Simularia* sp. 2

SINULARIA ARBOREA VERSEVELDT, 1971

Fig. 48, 49, 50, 51, and 52.

Sinularia arborea Verseveldt, 1971:46.

MATERIAL: MG 73.9.20.4 and MG 73.12.6.1, both from Cocos Lagoon;
MG 73.11.15.12 and MG 73.11.15.13, both from Toguan Bay.

DESCRIPTION: The hard upright sterile stalk has vertical grooves on its surface. The capitulum is greater in diameter than the stalk and is made up of primary lobes which are shorter than the sterile stalk and numerous thin long secondary lobes which are 2 to 3 mm in diameter and up to 25 mm long in preserved specimens. The lobes are fairly stiff but somewhat flexible. Sometimes separate sterile stalks may arise from a single base.

The living colors are shades of cream, tan, light brown, gray, and white. One specimen had yellowish white polyps on creamy tan branches. Polyps may be darker than branch surfaces and the stalk often is lighter than the branches.

The polyps are densest on the secondary lobes where they have 0.4 to 1.2 mm between their centers. They are under 0.7 mm in diameter and, when fully contracted, may show traces of a slightly protruding calyx.

The lobe surfaces have stout clubs 0.10 to 0.25 mm long with long tapering pointed hafts and large, irregular, warty heads up to 0.1 mm wide. Also warty rods slightly larger than the clubs may occur but are not as abundant as the clubs.

The interior of the lobes contain straight, curved, or branched spindles often with median constrictions and averaging 1.5 to 2.0 mm long. They may have pointed, blunt or branched ends and are covered with small warts 0.05 to 0.06 mm wide.

The surface of the stalk or base contains the same types of clubs and rods as the surface of the lobes, except that the hafts of the clubs are thicker.

The interior of the stalk or base contains the same types of spindles as the interior of the lobes but some of them may be longer, up to 6.5 mm long. They are often very irregular and some look like several spindles fused together.

REMARKS: The Guam specimens sometimes have longer and larger secondary lobes and longer clubs in the colony surface than those found in Verseveldt's (1971) type specimens.

DISTRIBUTION AND HABITAT: This species has previously only been found in north-western Madagascar at depths of 2 to 23 m.

In Guam this species has been found on the lagoon shelf and patch reefs of Cocos Lagoon at 1 to 3 m depths and slightly deeper on the Toguan Bay reef front.

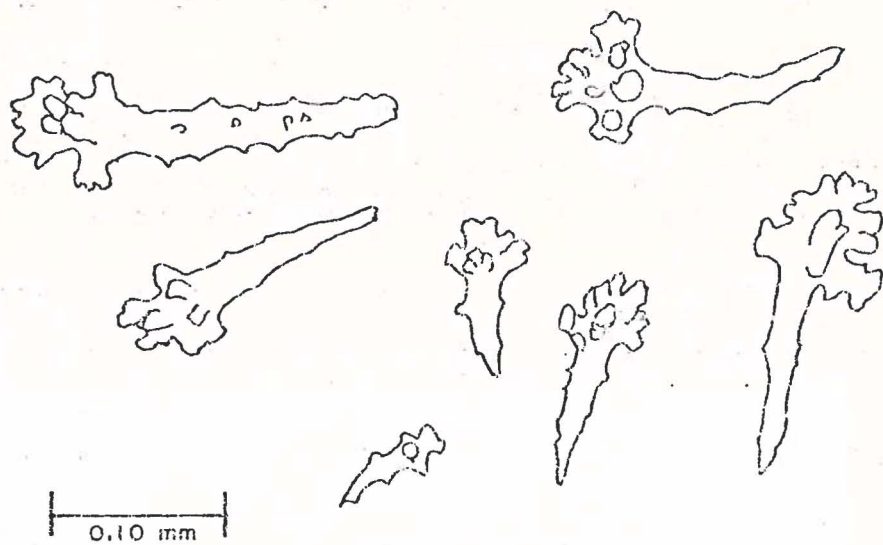


Fig. 48. *Simularia arborea* Verseveldt, surface of lobe, X226.

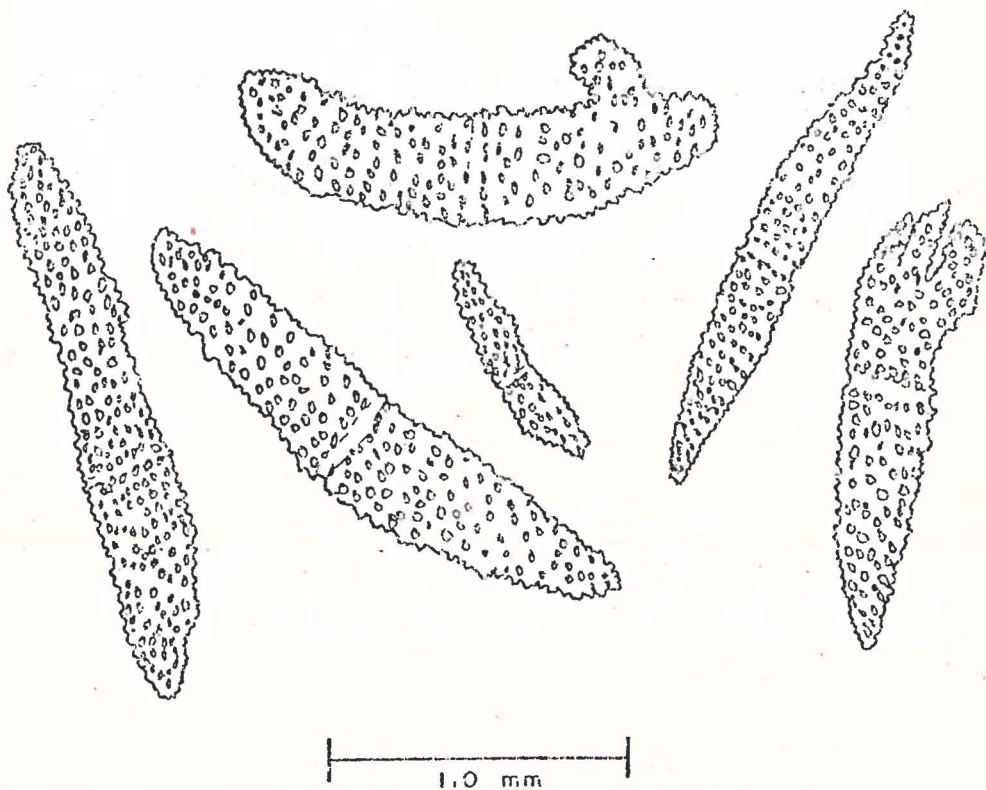


Fig. 49. *Simularia arborea* Verseveldt, Interior of lobe, X39.

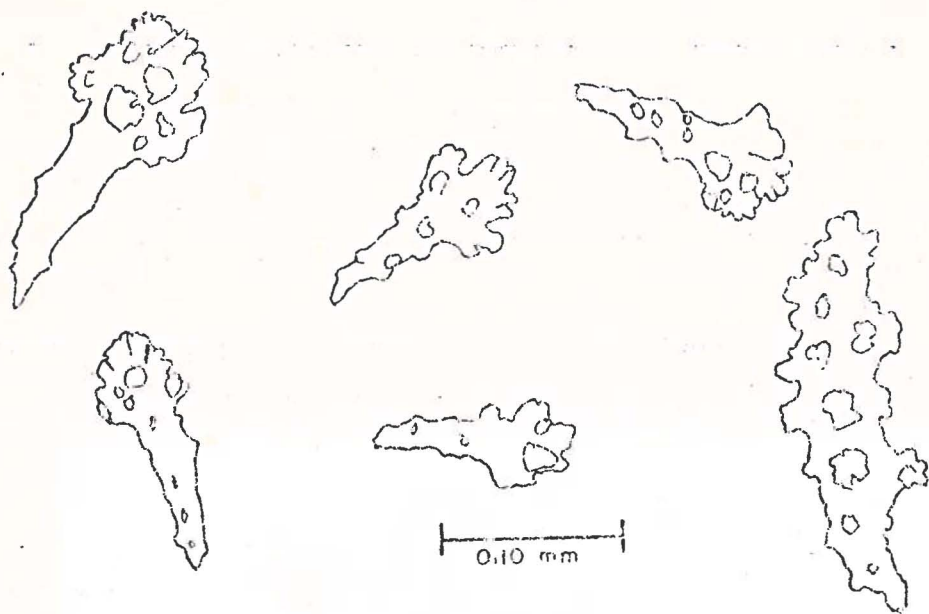


Fig. 50. *Simularia arborea* Verseveldt, surface of base, X226.

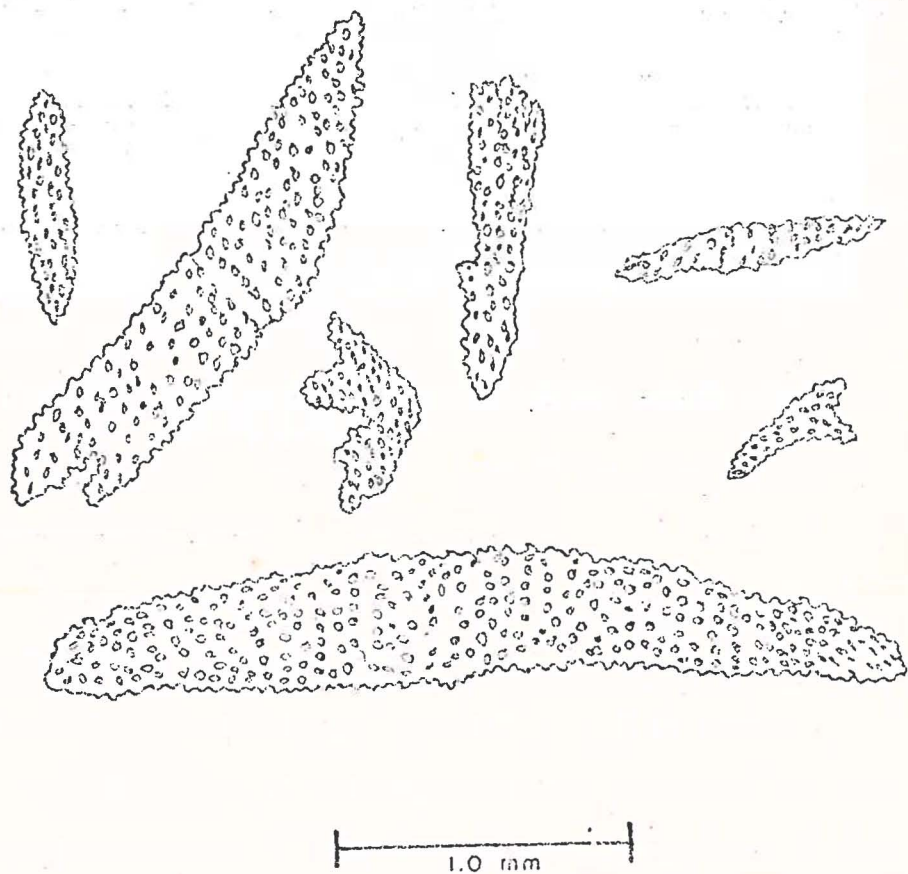


Fig. 51. *Simularia arborea* Verseveldt, interior of base, X226.

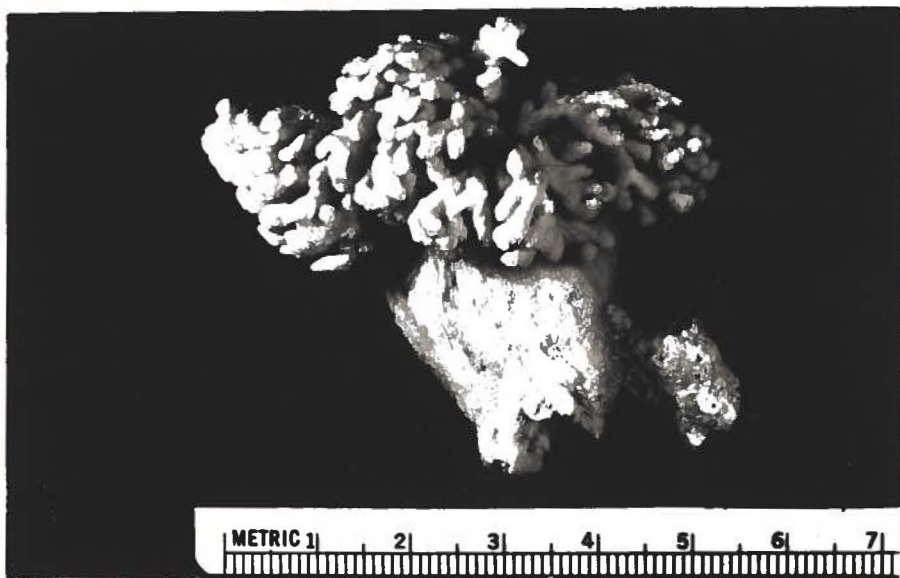


Fig. 52. *Simularia arborea* Verseveldt, whole colony
(MG 73.9.20.4).

SIMULARIA Densa (WHITELEGGE, 1897)

Fig. 53, 54, 55, 56, and 57. Plate VII.

Lobophytum densum Whitelegge, 1897:219.

Sclerophytum densum, Pratt, 1903:521; Thomson, Simpson, and Henderson,
1909:6.

Simularia densa, Tixier-Durivault, 1951:38; 1970b:149.

MATERIAL: MG 74.5.2.13, Manell Channel; MG 74.10.23.1, Double Reef;
MG 73.11.16.6, Facpi Island.

DESCRIPTION: The colony is very low or encrusting and flattened. The sterile stalk flares outward to form a distinct overhanging rim where it meets the capitulum, similar to the shape of a large *Sarcophyton*. However, primary lobes and sometimes secondary ones are usually present but widely spaced on the surface of the flat capitulum disc. The lobes are mostly simple, rounded, flattened, tongue like, up to 60 mm tall, and to 25 mm wide by 3 to 7 mm thick.

Living and preserved colonies are very hard and brittle with a rough surface. Their colors tend to be shades of brown with beige or gray tones.

The polyps are 0.5 mm in diameter and average about 1 mm between their centers. In some flat areas between widely separated lobes the polyps may be 1.5 to 2 mm apart.

The sclerites of the surface of the capitulum are mostly clubs 0.10 to 0.17 mm long with warty hafts pointed at their ends.

The heads of the clubs sometimes have a central terminal wart and often have many irregular warts.

At the interior of the lobes are straight and curved warty spindles but no branched or forked ones. Their tips are usually rounded and warts are variable but not crowded, often crenulated and from 0.03 to 0.07 mm in diameter. The sclerites are mostly 1 to 3 mm long and tightly packed together.

The surface of the sterile base has clubs similar in size and shape to those of the capitulum surface.

The interior of the base has sclerites like those at the interior of the lobes but some of them show traces of a median constriction.

REMARKS: This uncommon soft coral of Guam tends to have more flat space between its short lobes than those specimens described from elsewhere. Some unusual colonies may look like a low *Sarcophyton* because they have no lobes at all, but they have distinctly large sclerites which indicate that they belong to the genus *Simularia*.

DISTRIBUTION AND HABITAT: This has previously been reported from the islands of the Indian Ocean, South East Asia and Tuvalu, but not Micronesia.

It ranges from low tide level to at least 60 m among live stony corals on both windward and leeward Guam reefs.

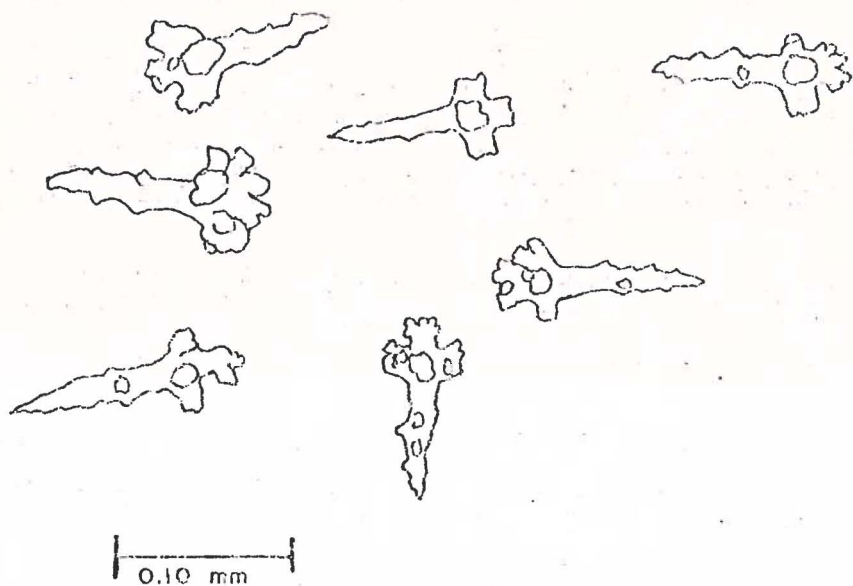


Fig. 53. *Simularia densa* (Whitelegge), surface of lobe, X226.

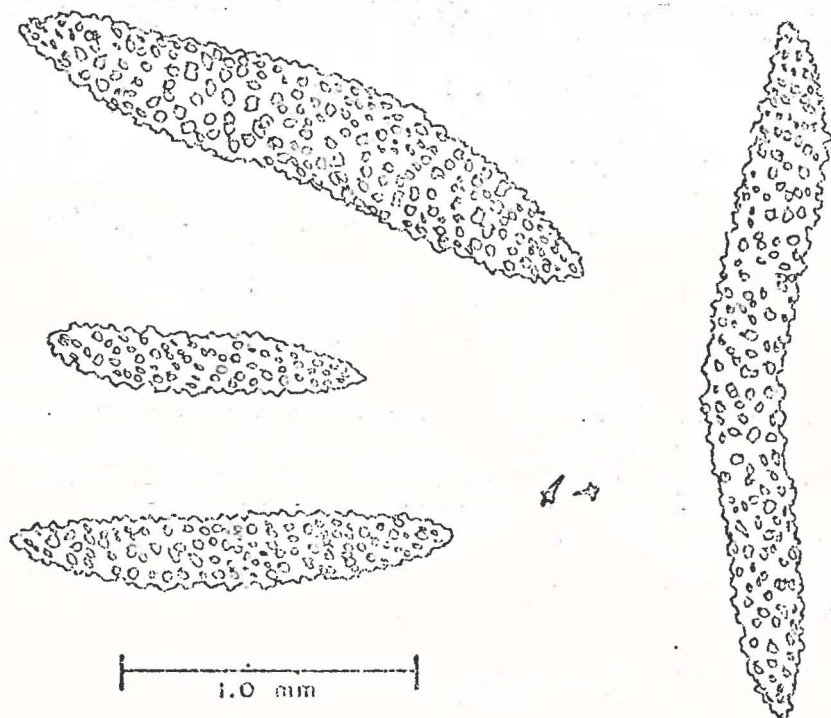


Fig. 54. *Simularia densa* (Whitelegge), interior of lobe, X39.

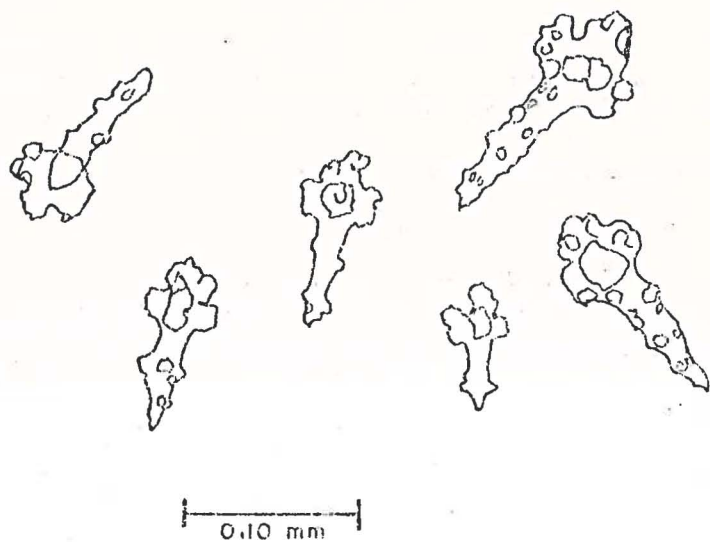


Fig. 55. *Simularia densa* (Whitelegge), surface of base, X226.

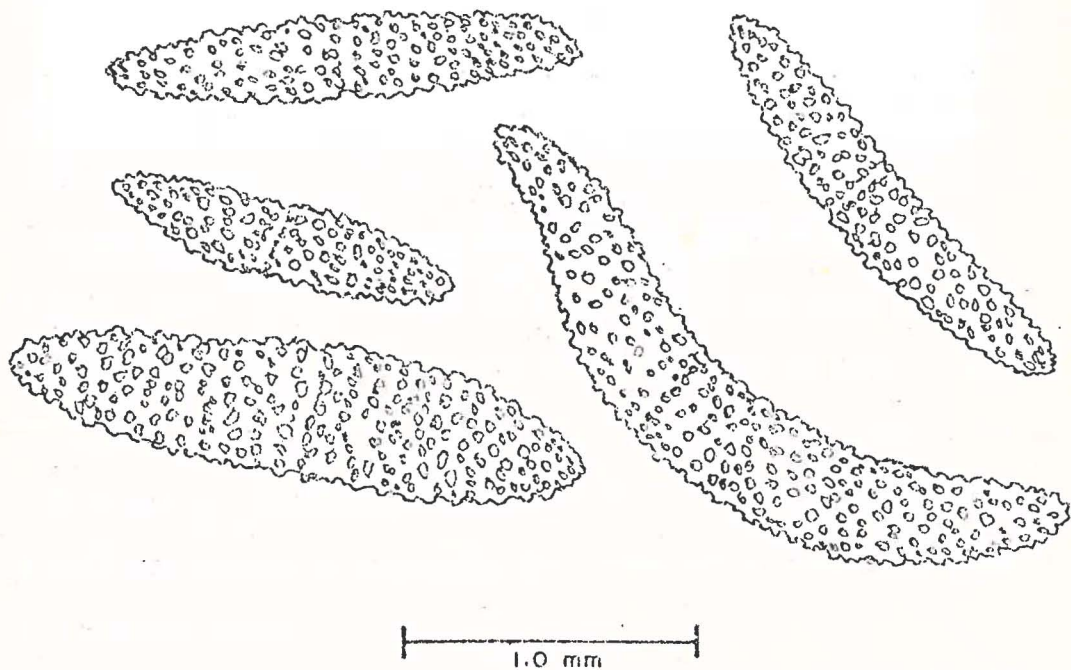


Fig. 56. *Simularia densa* (Whitelegge), interior of base, X39.

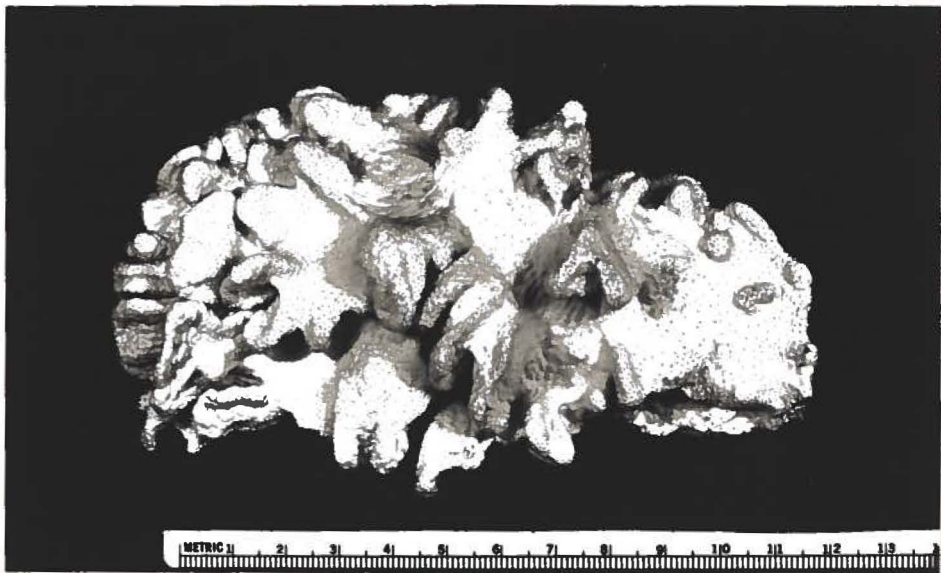


Fig. 57. *Sinularia densa* (Whitelegge), half of a colony
seen from above (MG 74.5.2.13).

SINUŁAKIA MAXIMA VERSEVELDT, 1971

Fig. 58, 59, 60, 61, and 62.

Sinułakia maxima Verseveldt, 1971:50.

MATERIAL: MG 73.11.16.2 and MG 74.5.2.11, both from Cocos Lagoon channels.

DESCRIPTION: The sterile stalk and most lobes are bent over to one side, not vertically upright. The length of the grooved stalk from substrate to capitulum is 2 to 5 cm. Primary lobes are wide, flattened, not crowded, not upright and up to 7 cm tall. They bear shorter secondary lobes that are irregular but mostly large, flattened and up to 3 cm tall. Colonies grow larger than 10 cm in diameter. They are soft and flexible when preserved in alcohol.

Living colors observed were rosy gray with tan polyps and brownish flesh color.

The polyps contract but remain protruding above the colony surface even when killed. Those few that are not protruding seem to have a raised ring-like calyx around the holes of the sunken polyp. Polyp stalks are 0.5 mm in diameter and are most crowded on the lobe tips, where centers of adjacent polyps are 0.6 mm apart. The polyps between primary lobes are much widely spaced and gradually disappear where the capitulum blends into the sterile stalk.

The surface of the capitulum contains clubs 0.06 to 0.08 mm long with longitudinal leaf-like projections on their large heads

and usually a single ring of warty rods 0.12 to 0.26 mm long, with pointed tips.

The interiors of the lobes contain slender spindles with large or small warts. Sclerite lengths are variable from less than 0.5 mm up to 4 mm.

The surface of the basal stalk has slightly larger leafy clubs 0.07 to 0.09 mm long and warty rods that are more massive than those of the capitulum and have larger warts and sometimes have branches. Some sclerites intermediate between the clubs and rods also occur.

The interior of the basal stalk has thicker spindles with larger warts that are 0.05 to 0.08 mm wide and sometimes densely packed. These sclerites may be blunt or pointed and up to 4 mm long and 0.6 mm wide. Needle-like spiny sclerites 0.25 to 0.50 mm long also are in the colony interior.

DISTRIBUTION AND HABITAT: This species has previously only been reported from northwestern Madagascar.

In Guam it was found on the margin and slopes of the channels through the Cocos Barrier Reef, growing among live stony corals.

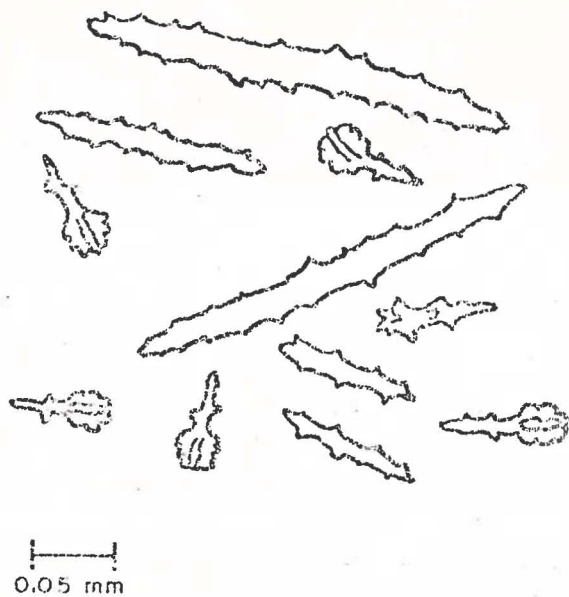


Fig. 58. *Simularia maxima* Verseveldt, surface of lobe, X226.

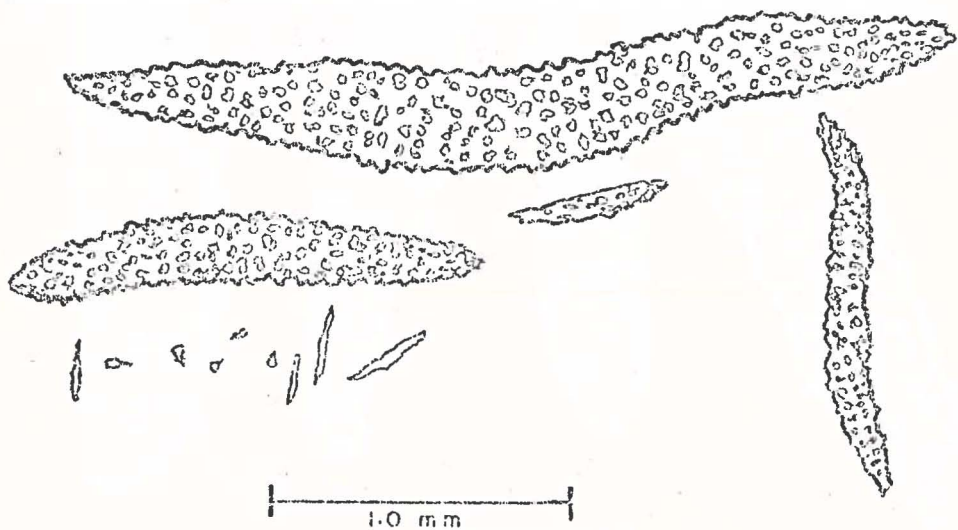


Fig. 59. *Simularia maxima* Verseveldt, interior of lobe, X39.



Fig. 60. *Simularia maxima* Verseveldt, surface of base, X125.

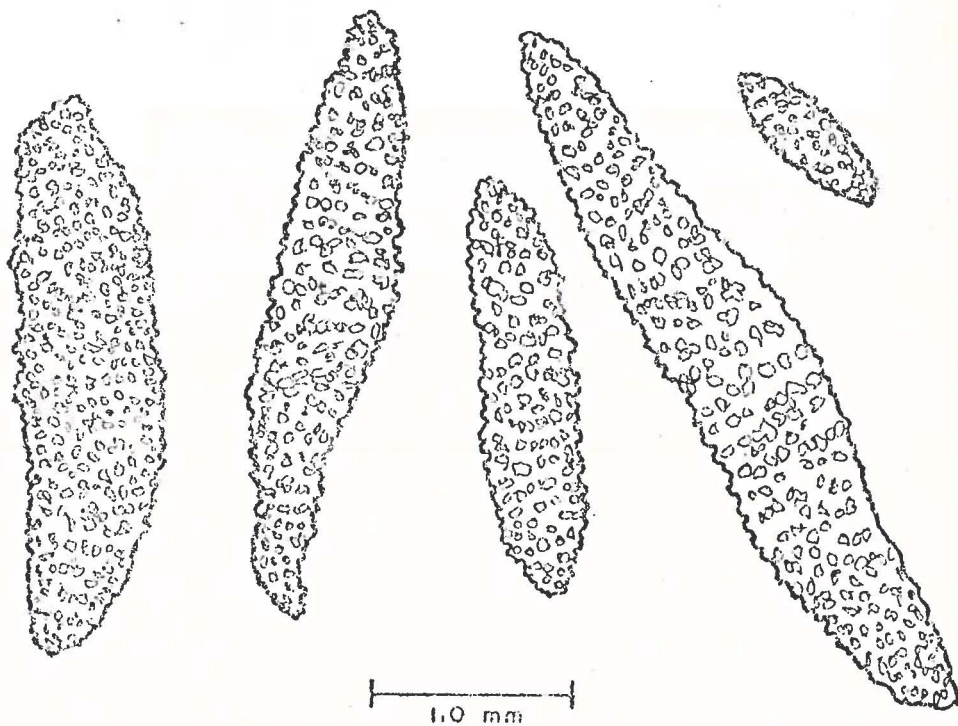


Fig. 61. *Simularia maxima* Verseveldt, interior of base, X25.



Fig. 62. *Sinularia maxima* Verseveldt, whole colony
(MG 74.5.2.11).

SINULARIA POLYDACTYLA (EHRENBERG, 1834)

Fig. 63, 64, 65, 66, and 67. Plate VIII.

Lobularia polydactyla Ehrenberg, 1834:58.

Alcyonium polydactylum, Dana, 1846; Klunzinger, 1877:26; Burchardt,
1902:663.

Sclerophytum polydactylum, Pratt, 1903:524; Thomson, Simpson, and
Henderson, 1909:5.

Sinularia polydactyla, Thomson and Dean, 1931:47; Roxas, 1933b:353;
Macfadyen, 1936:38; Tixier-Durivault, 1951:50; 1966:185;
Verseveldt, 1960:240.

MATERIAL: MG 73.9.20.6, MG 73.9.20.18, MG 74.3.21.2 and MG 74.4.10.1,
all from Cocos Lagoon; MG 73.12.27.1, Asan Reef.

DESCRIPTION: The size and shape of the colony is highly variable in
this species although it typically has long finger-like tertiary
and secondary lobes crowded on long upright primary lobes born on
an encrusting or a massive stalk. The entire colony may be over
1 m in diameter and is often attached to spicular rock consisting
of fused, pointed spindle sclerites (spicules) which were formed
in the base of living *Sinularia polydactyla* colonies. The stalks
are sometimes vertically grooved and gradually intergrade with
the capitula so that there is usually no distinct line separating
the sterile from the polyp bearing parts of the colony. The
cylindrical tertiary lobes vary from 2 to 6 mm in diameter and are
up to 40 mm long in preserved specimens. The lobes are stiff but
flexible. A single colony may contract its base and lobes to such

a great extent that it shrinks to less than one-tenth of its expanded height.

The living color is quite variable and ranges from a light yellowish tan to shades of gray to greenish, brownish, purplish, and even blackish.

The polyps are densest on the tertiary lobes, where they have 0.5 to 1.2 mm between their centers. They average 0.5 mm in base diameter when expanded but can be contracted completely under the surface of the lobe. In different specimens, contracted polyps may appear as bumps or depressions or be nearly invisible. Living colonies extend long tentacles which appear like a thick coat of hair.

The surfaces of the lobes contain variously shaped warty clubs that are up to 0.2 mm long. One kind, that is typical of this species, averages 0.13 mm long and has a central terminal wart with three similar sized warts adjacent to it but radiating outward in a plane perpendicular to the axis of the club and with additional smaller warts on the handle of the club. Warty rods are less common but also present.

The interiors of the lobes are densely filled with large warty spindle shaped sclerites that have pointed or rounded tips and occasionally have a median constriction. They range up to 3 mm long and may have crowded or scattered warts that may be 0.03 to 0.10 mm in diameter. Some are irregularly branched.

The surface of the base contains the characteristic clubs with central warts and three radiating warts. Other irregular

warty clubs and rods also occur there. Many of these rods are larger than those at the surface of the lobes and may be over 0.3 mm long.

The interior of the base has large warty spicules like those of the lobe interior. They may be up to 5 mm long, however. Some specimens have many forked and irregularly branched interior spicules.

REMARKS: This species is a source of spicular rocks, the only significant fossil records of Alcyonacea. These are formed as tissue as the base of the colony dies, leaving the large warty spicules which fuse together. Such rocks can be very massive and solid or fenestrate. Some at Cocos Lagoon are over a meter tall. In areas where this species is the dominant organism, it has been measured to cover over 18 percent of the substrate (Randall et al., 1975). It significantly contributes to the formation of reefs, as shown in Cary (1931).

DISTRIBUTION AND HABITAT: This species is very common and widespread throughout the Indo-West Pacific. It is reported from East Africa and the Red Sea eastward to Tahiti. In the North Pacific it has been previously recorded from the Philippine, Marshall, and Palau Islands.

This species commonly is found on the reef moats, reef flats and shallow shelves of Guam, especially at Cocos Lagoon, Piti, and Asan. Although it is most abundant at sandy flats with depths just below lowest tides it can also be found at depths to 20 m among live hard corals.

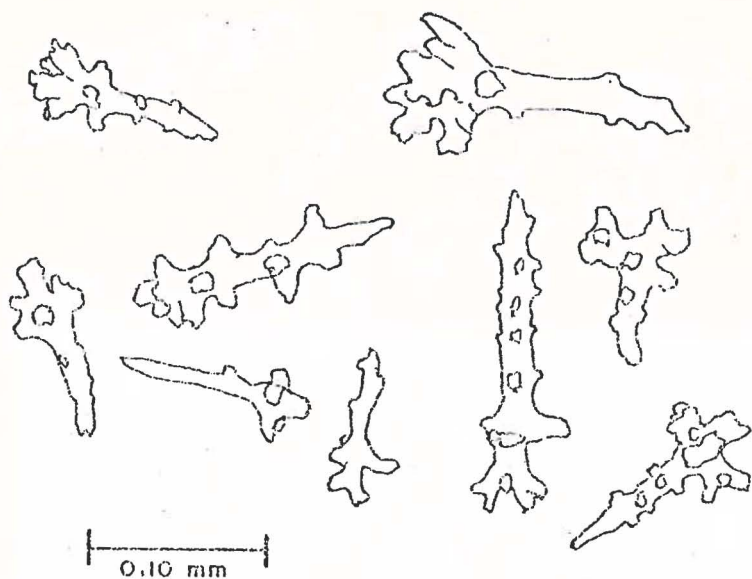


Fig. 63. *Simularia polydactyla* (Ehrenberg), surface of lobe, X226.

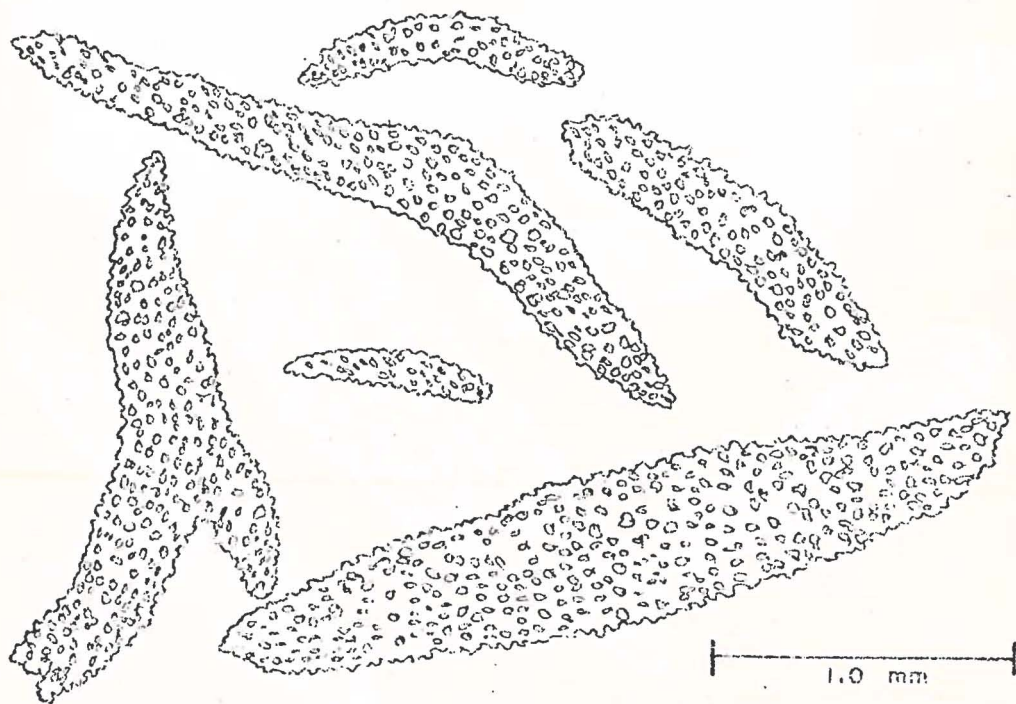
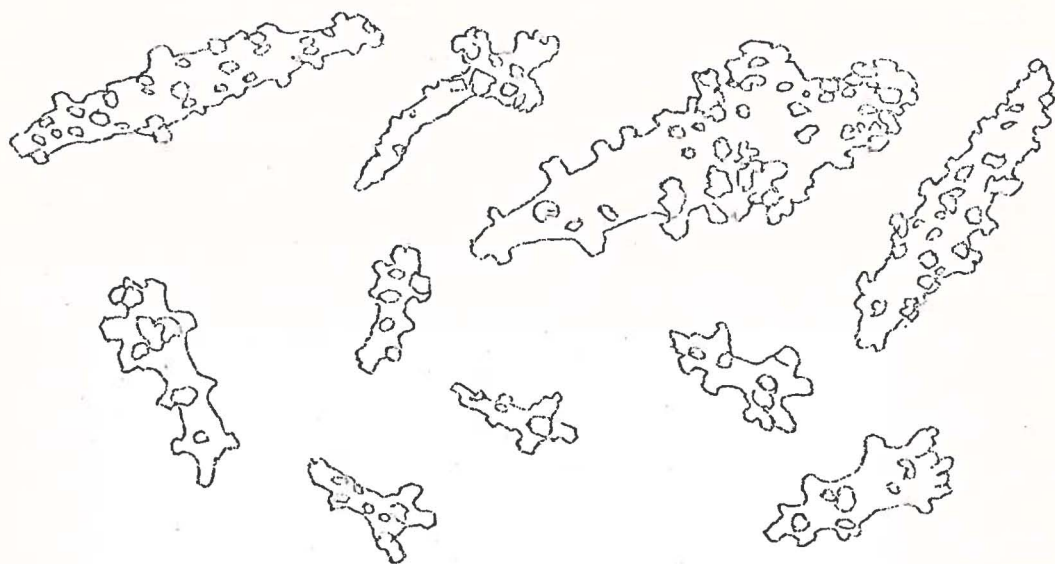
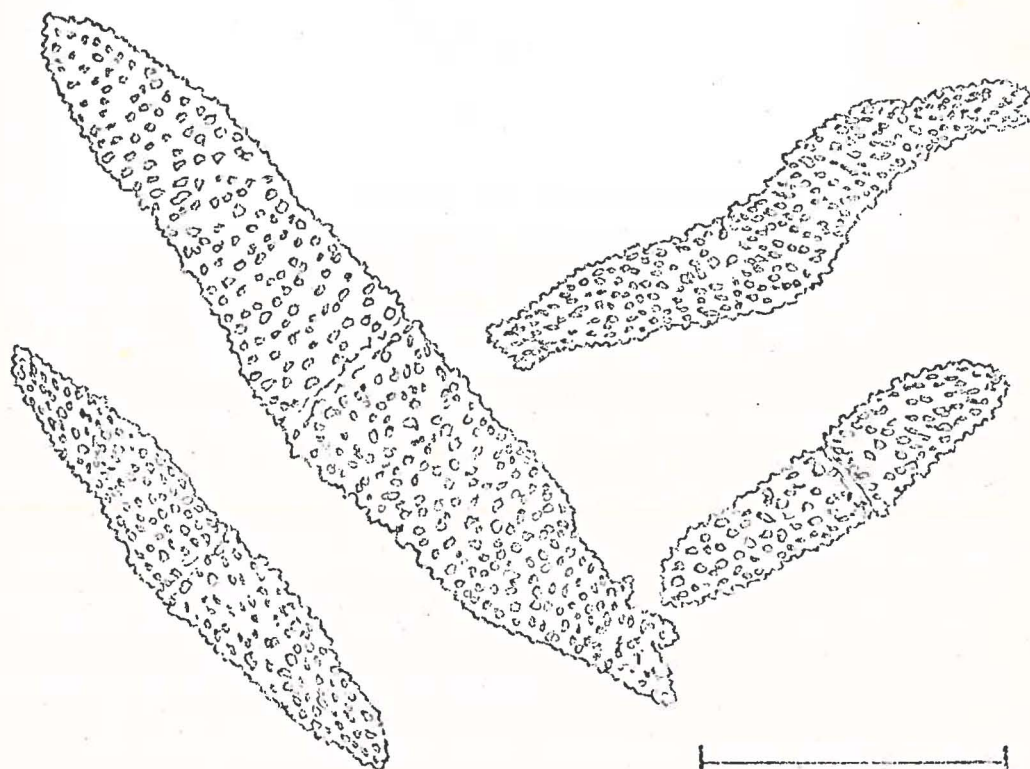


Fig. 64. *Simularia polydactyla* (Ehrenberg), interior of lobe, X39.



0.10 mm

Fig. 65. *Simularia polydactyla* (Ehrenberg), surface of base, X226.



1.0 mm

Fig. 66. *Simularia polydactyla* (Ehrenberg), interior of base, X39.

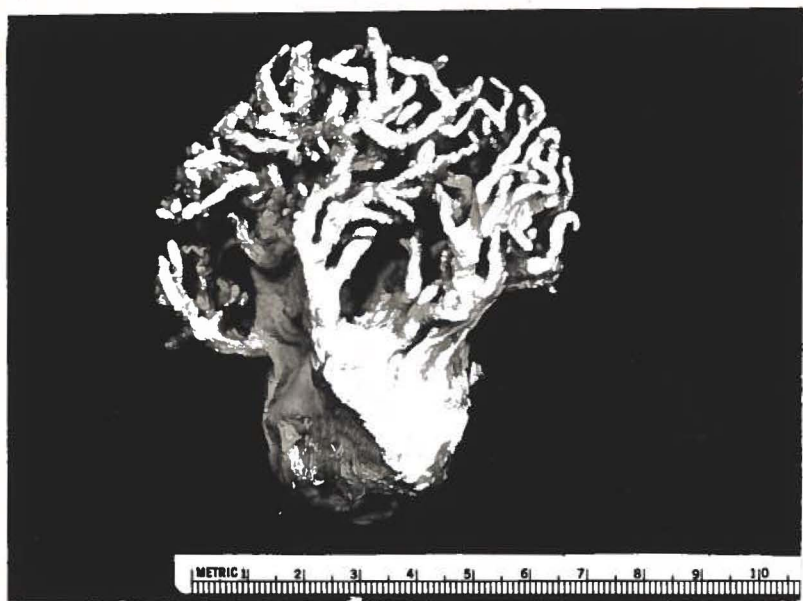


Fig. 67. *Sinularia polydactyla* (Ehrenberg), part of colony (MG 74.3.21.2).

SINULARIA SPECIES 1

Fig. 68, 69, 70, 71, and 72.

MATERIAL: MG 74.5.2.8, MG 74.5.2.12, and MG 74.6.14.2, windward and leeward outer terraces of Cocos Barrier Reef; MG 74.10.23.7, Tanguisson terrace; MG 74.10.23.13, Double Reef terrace.

DESCRIPTION: The hard upright sterile stalk is narrowed in the middle and wider at the base and at the top where it divides into short sterile primary lobes. The primary lobes bear short, polyp-covered, secondary and tertiary lobes. Total colonies are up to 10 cm tall with roughly half the height made up of the unbranched part of the sterile stalk. The polyp-bearing lobes are 2 to 12 mm long, rough and only slightly flexible in preserved specimens.

Living specimens appeared to be gray, light rosy-gray, creamy-beige and one was brown and yellow when expanded but pink and green when contracted. The preserved specimens, no matter how light their living colors, always changed to a blackish brown color, which is a good distinguishing character.

The polyps are tightly clustered on the distal lobes where they have 0.5 to 1.0 mm between adjacent centers. They often remain partially expanded in preserved specimens but when contracted form holes 0.2 to 0.3 mm in diameter and usually surrounded by a raised ring or calyx.

The lobe surfaces have very irregular, very warty, club-like sclerites from 0.10 to 0.16 mm long. Their heads average 0.05 mm in diameter. Also present are numerous rods with small warts.

These sclerites are 0.05 to 0.10 mm long and 0.009 to 0.020 mm thick.

The interiors of all lobes are densely packed with large spicule-shaped sclerites with medium sized uncrowded warts and often median constrictions. They are often straight with pointed tips and are up to 3 mm long.

The surface of the base has club-like sclerites like those on the lobes but stouter with more and larger warts. Their heads average 0.064 to 0.07 mm in diameter.

The interior of the base has large spicules, sometimes with median constrictions, and often straight with tapered points at the ends. They range from 1.0 to 3.2 mm long and 0.18 to 0.56 mm thick.

REMARKS: This species is readily distinguished by the size of its polyp-bearing lobes, the presence of sterile primary lobes, its characteristic dark color in alcohol, and its habitat.

DISTRIBUTION AND HABITAT: This uncommon species is widespread but not abundant at any location. It has thus far only been found on terraces of exposed reef areas greater than 5 m deep and down to 15 m. It was collected at the windward outer terrace of Cocos Barrier Reef, and the upper submarine terraces at Tanguisson and Double Reef.

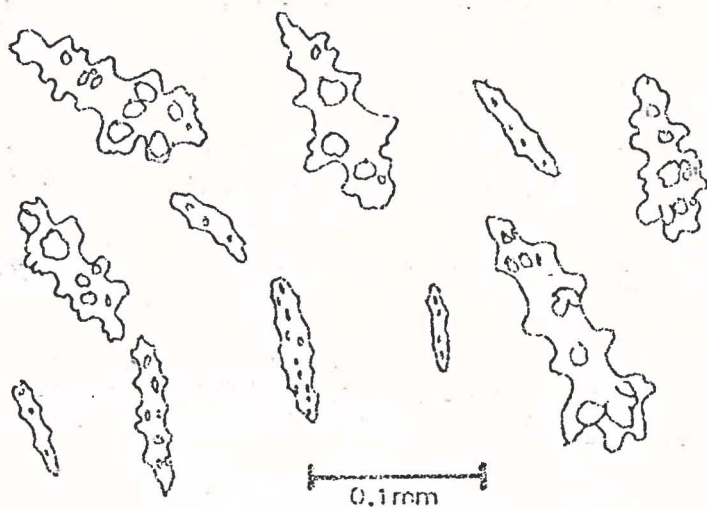


Fig. 68. *Simularia* species 1, surface of lobe, X226.

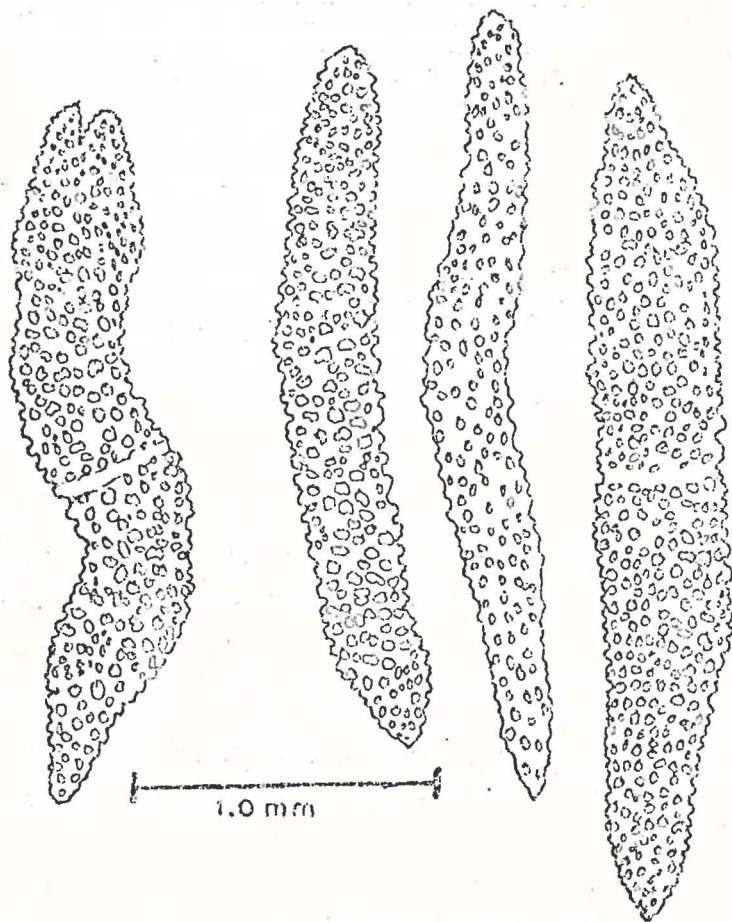


Fig. 69. *Simularia* species 1, interior of lobe, X39.

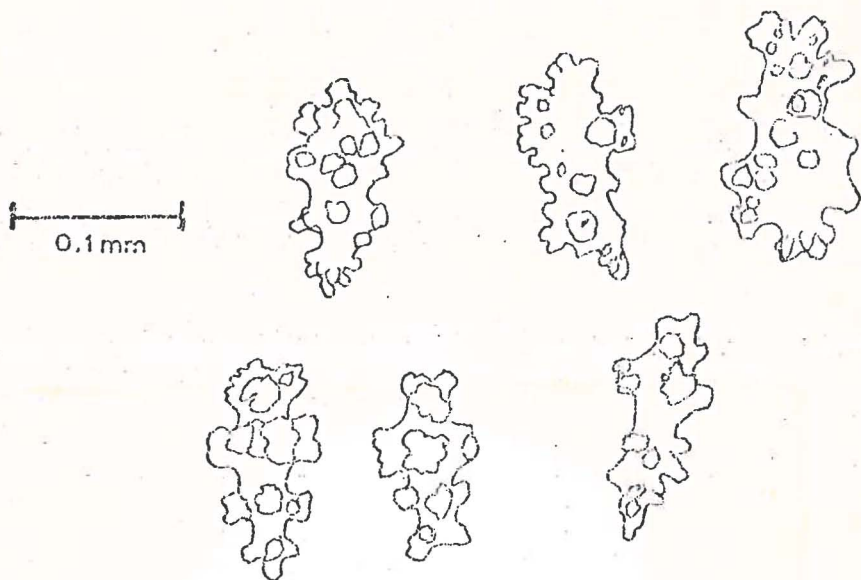


Fig. 70. *Simularia* species 1, surface of base, X226.

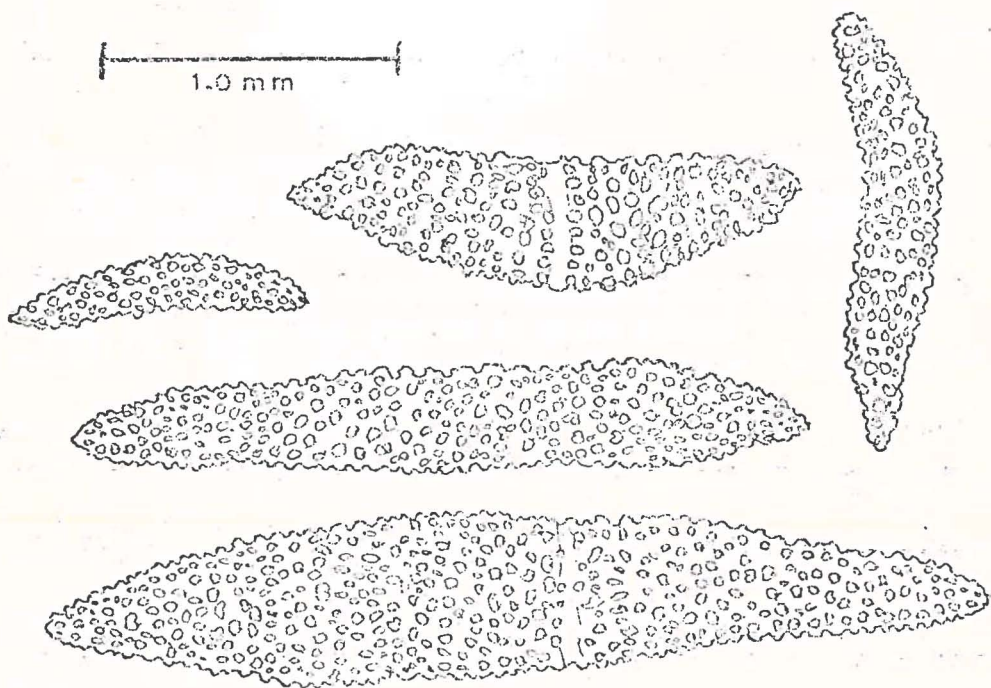


Fig. 71. *Simularia* species 1, interior of base, X39.

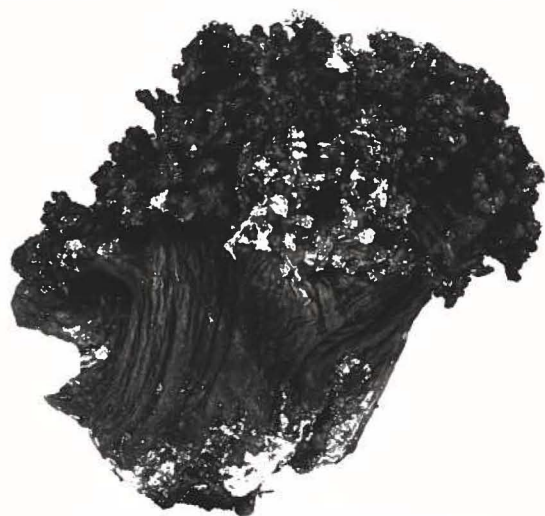


Fig. 72. *Simularia* species 1, whole colony
(MG 74.5.2.12).

SINULARIA SPECIES 2

Fig. 73, 74, 75, 76, and 77.

MATERIAL: MG 73.10.11.2, Cocos Lagoon.

DESCRIPTION: An upright sterile stalk with vertical grooves bears a capitulum of rather long, crowded primary lobes with short secondary and tertiary lobes. The stalk of the single specimen is 1 to 5 cm tall and about 5 cm in diameter. The primary lobes are 5 to 20 mm long while the secondary and tertiary lobes are 2 to 12 mm long and 2 to 8 mm thick in the preserved specimen.

Living color was not recorded.

The polyps contract to form depressions 0.3 mm in diameter with 0.4 to 0.9 mm between centers of adjacent ones.

The surfaces of the lobes contain club-shaped sclerites with long warty hafts. Their heads do not show any regular arrangement of warts. The majority of these clubs are 0.08 to 0.17 mm long with heads 0.03 to 0.06 mm wide.

The interiors of the lobes contain mostly long pointed sclerites sometimes irregular and branched but without median constrictions. They are 1 to 3 mm long and always have numerous very small warts all over.

The surface of the base has very irregular clubs with large warts. They are somewhat stouter and have shorter hafts than the clubs of the lobes. They average just over 0.1 mm long with heads 0.05 mm across.

The interior of the base has irregular spindles that are sometimes bent and branched. They are 1.5 to 3.5 mm long and

covered with small warts that average 0.04 mm in diameter, as shown in the enlargement in Fig. 76.

REMARKS: The single colony of this species was found near colonies of *Sinularia polydactyla*, which it resembles in gross morphology, but its sclerites are noticeably different. Like *S. polydactyla*, this species seems to be forming spicular rock at its base.

DISTRIBUTION AND HABITAT: This has been found on exposed rock surrounded by sand on the lagoon terrace at the southwestern end of Cocos Lagoon in about 2.5 m of water.

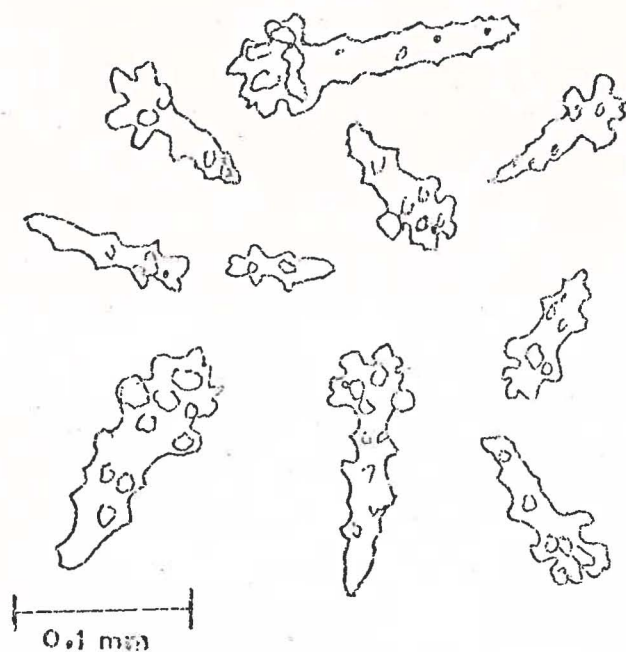


Fig. 73. *Simularia* species 2, surface of lobe, X226.

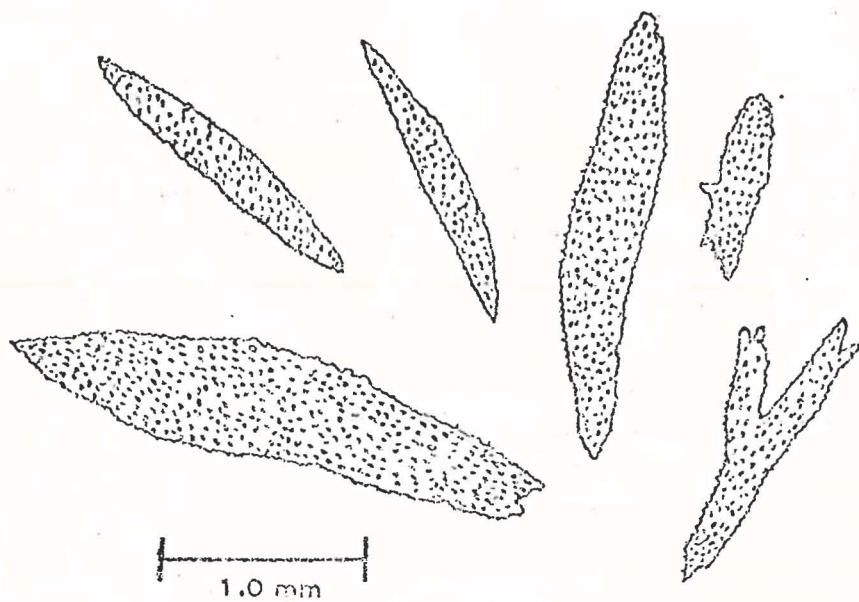


Fig. 74. *Simularia* species 2, interior of lobe, X26.

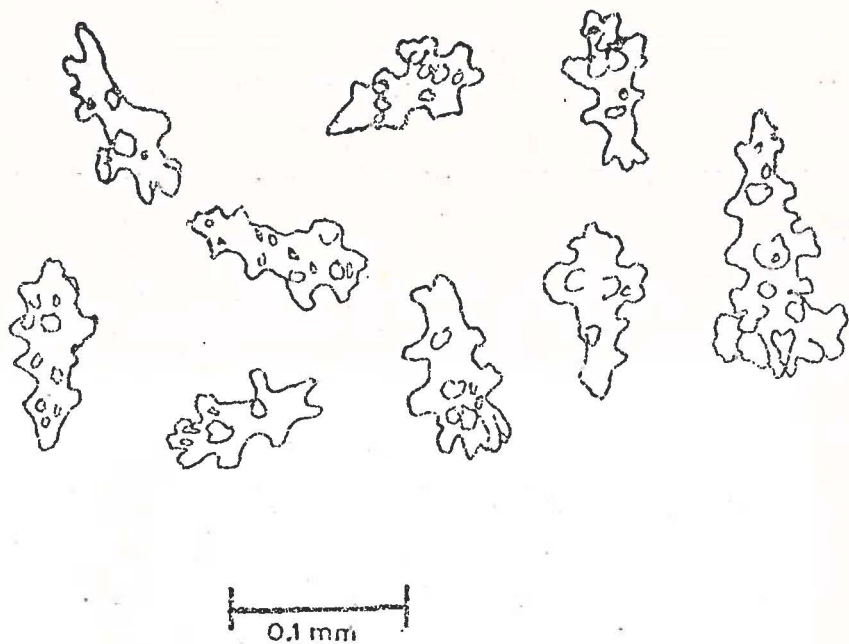
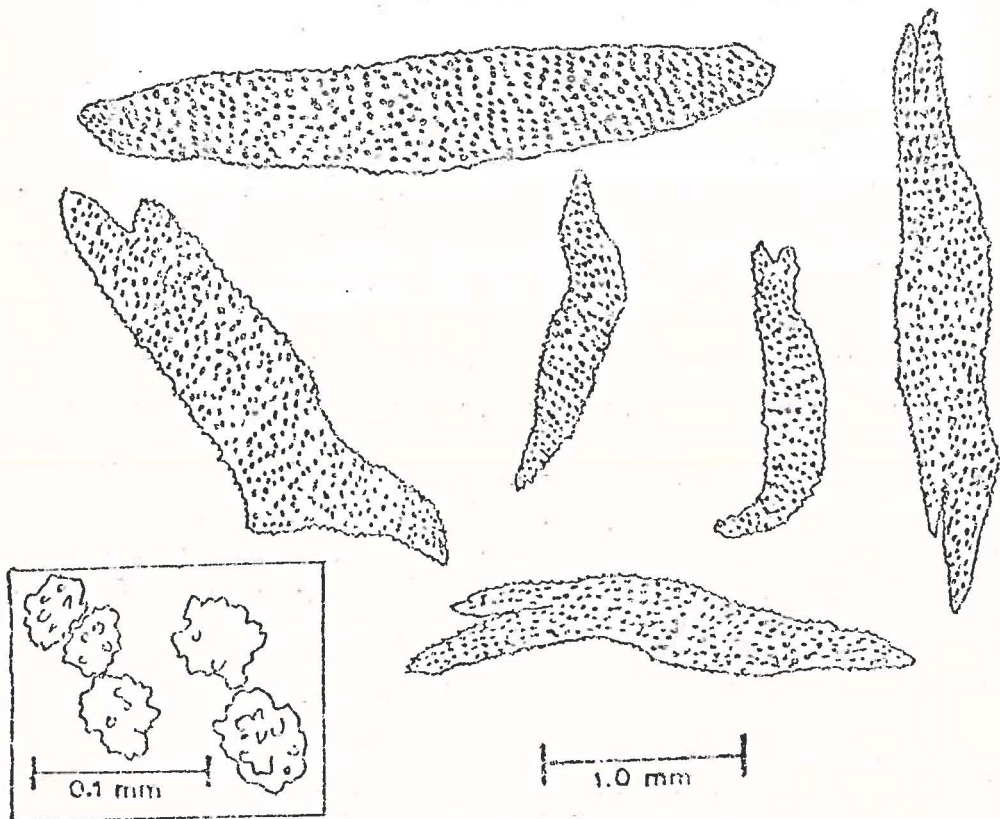


Fig. 75. *Sinularia* species 2, surface of base, X226.



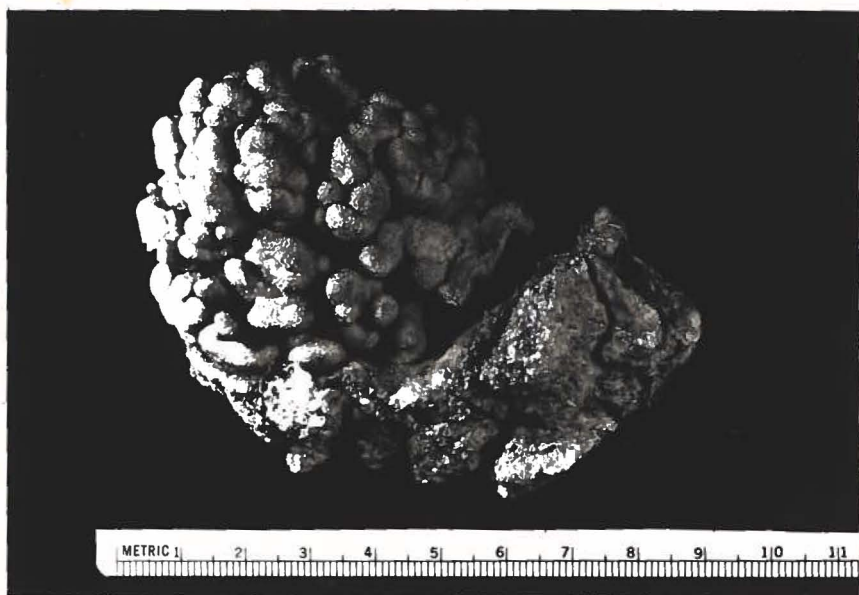


Fig. 77. *Sinularia* species 2, part of a colony on rock substrate (MG 73.10.11.2).

SINULARIA SPECIES 3

Fig. 78, 79, 80, 81, and 82.

MATERIAL: MG 74.10.23.10, Tanguisson reef front.

DESCRIPTION: This short species has a hard upright sterile stalk with vertical folds. The stalk is narrow in the middle and wider at its base and where it blends into the capitulum. The polyps are born on wavy, bent, corrugated-like lobes which are not rounded but covered with angular edges and facets. These primary and secondary lobes are tightly packed together and range from 1 to 2 cm tall.

The living colony was a mixture of beige and dirty yellow colors. After preservation, the colony turned dark brown.

In the preserved specimen polyps are retracted into pits about 0.1 mm in diameter and 1.0 mm between their centers. They seem to be evenly distributed throughout the capitulum.

The sclerites at the surfaces of the lobes are predominantly small clubs with irregular warts but occasionally a central terminal wart. Most of these are about 0.1 mm long, but some have long hafts, making them up to 0.2 mm long. Also some rods up to 0.2 mm long with small sparsely distributed warts are found.

The interiors of the lobes have scattered spindles with rounded or pointed tips and uncrowded small warts. These sclerites can range from 1 to 2 mm in total length and do not show median constrictions nor forking.

The surface of the base contains clubs similar to those on the lobes but more robust. They also have lengths of 0.1 to 0.2 mm

but can have heads up to 0.07 mm across and hafts up to 0.04 mm wide.

The interior of the base has spindles like those inside of the lobes but they are densely crowded together in the base and much more abundant.

REMARKS: The angular surfaces of lobes and small size of the internal spindles distinguish this species from other *Simularia* of Guam.

DISTRIBUTION AND HABITAT: This has only been found in a shallow surge channel on the reef front at Tanguisson, where it was subject to heavy wave action and good circulation. It was not in the area influenced by thermal effluent from the power plant.

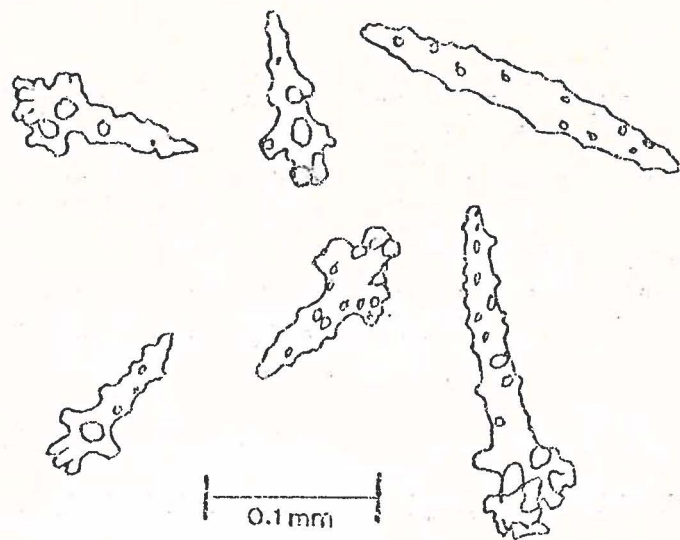


Fig. 78. *Simularia* species 3, surface of lobe, X226.

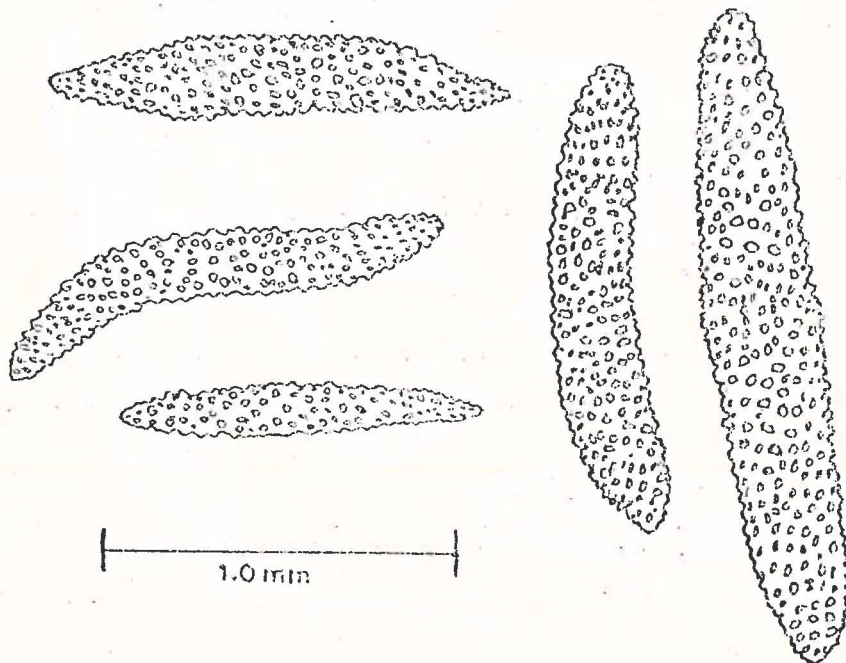


Fig. 79. *Simularia* species 3, interior of lobe, X46.

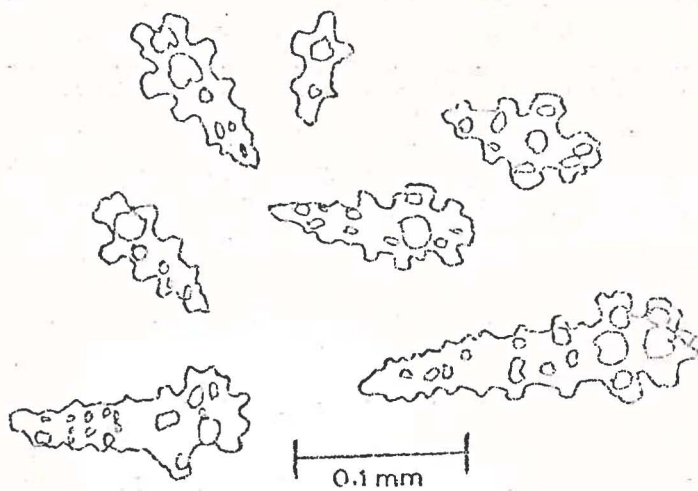


Fig. 80. *Simularia* species 3, surface of base, X226.

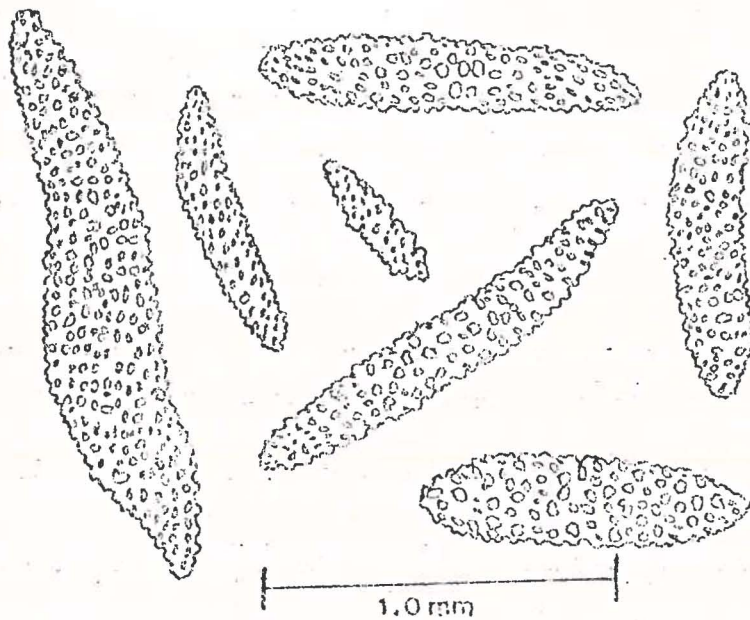


Fig. 81. *Simularia* species 3, interior of base, X46.



Fig. 82. *Sinularia* species 3, whole colony
(MG 74.10.23.10).

SINULARIA SPECIES 4

Fig. 83, 84, 85, 86, and 87.

MATERIAL: MG 74.6.14.1, Leeward Cocos Barrier Reef terrace;
MG 74.10.23.14, Double Reef terrace.

DESCRIPTION: A low sterile stalk averaging about 2 cm tall widens into an overhanging capitulum. Large primary lobes spaced widely apart in the center of the capitulum are taller than the stalk and often over 5 cm tall in preserved specimens. These primary lobes, the spaces between them, the few short secondary lobes, and the periphery of the capitulum are covered with round short lobes, mostly less than 1 cm in diameter and height, very crowded and often looking like inflated bulbs on constricted stems. Preserved colonies are stiff and hard and may be over 15 cm across.

Living specimens appeared pinkish beige.

The polyps are crowded on the tips of the lobes and the periphery of the capitulum, with only 0.5 to 0.7 mm between their centers. Between the lobes, adjacent polyp centers may be over 1.5 mm apart. All retracted polyps are in pits 0.2 mm in diameter.

The surfaces of the lobes contain mostly irregular warty clubs about 0.11 mm long and 0.05 mm wide across their heads. Some may be up to 0.2 mm long. Some short rods, about 0.1 mm in length and with small warts, are also occasionally found.

The interiors of the lobes contain large spindles with uncrowded warts and sometimes median constrictions. The largest sclerites grow to 3 mm long and 0.65 mm thick. All these spindles have rounded or obtusely pointed tips.

The surface of the base has clubs the same as those on the lobes. The occasional warty rods are slightly larger than those of the lobes.

The interior of the base has warty spindles, like those of the lobes, but most of these have median constrictions, and some may be branched.

REMARKS: The sclerites of this species are not very distinctive, but the gross shapes of the lobes are unique.

DISTRIBUTION AND HABITAT: The two specimens were collected at far north and far south ends of the leeward reefs of Guam. Others probably occur at locations between these. Both were on submarine terraces about 16 m deep, but additional specimens were seen on shallower terraces.

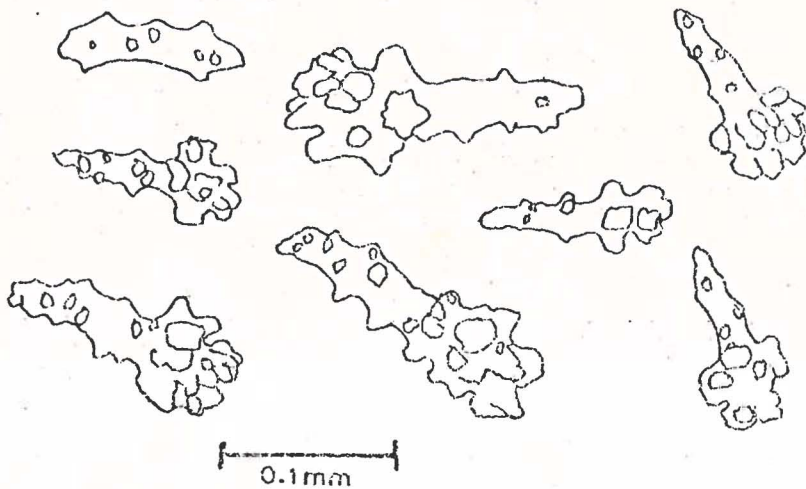


Fig. 83. *Simularia* species 4, surface of lobe, X226.

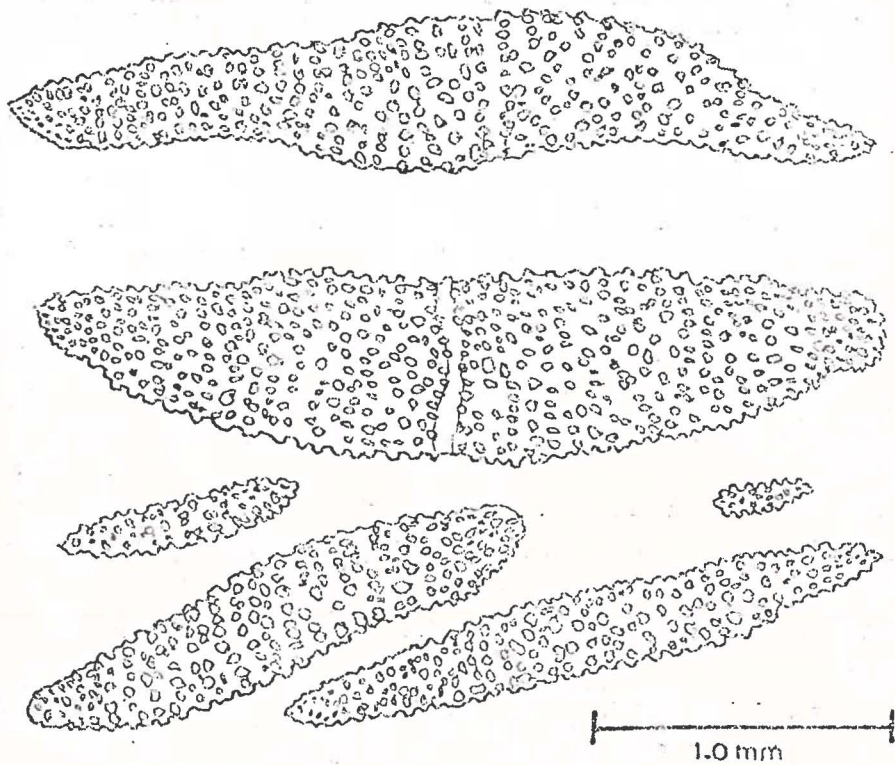


Fig. 84. *Simularia* species 4, interior of lobe, X39.

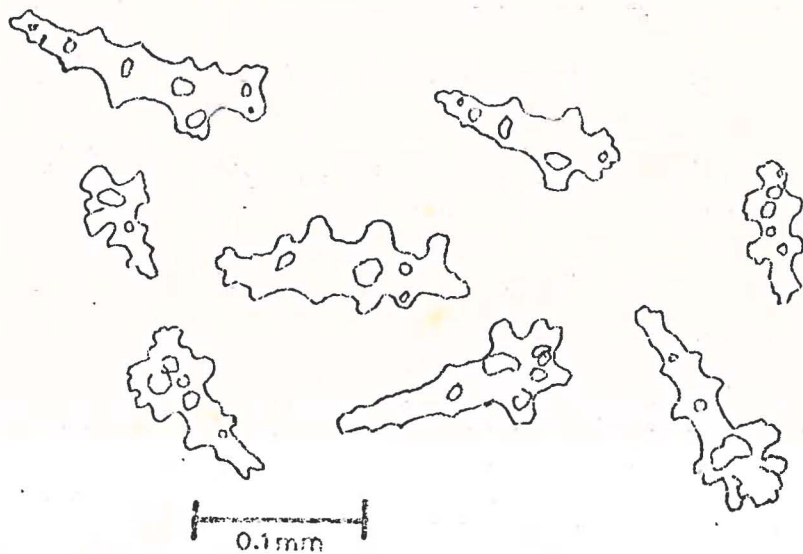


Fig. 85. *Simularia* species 4, surface of base, X226.

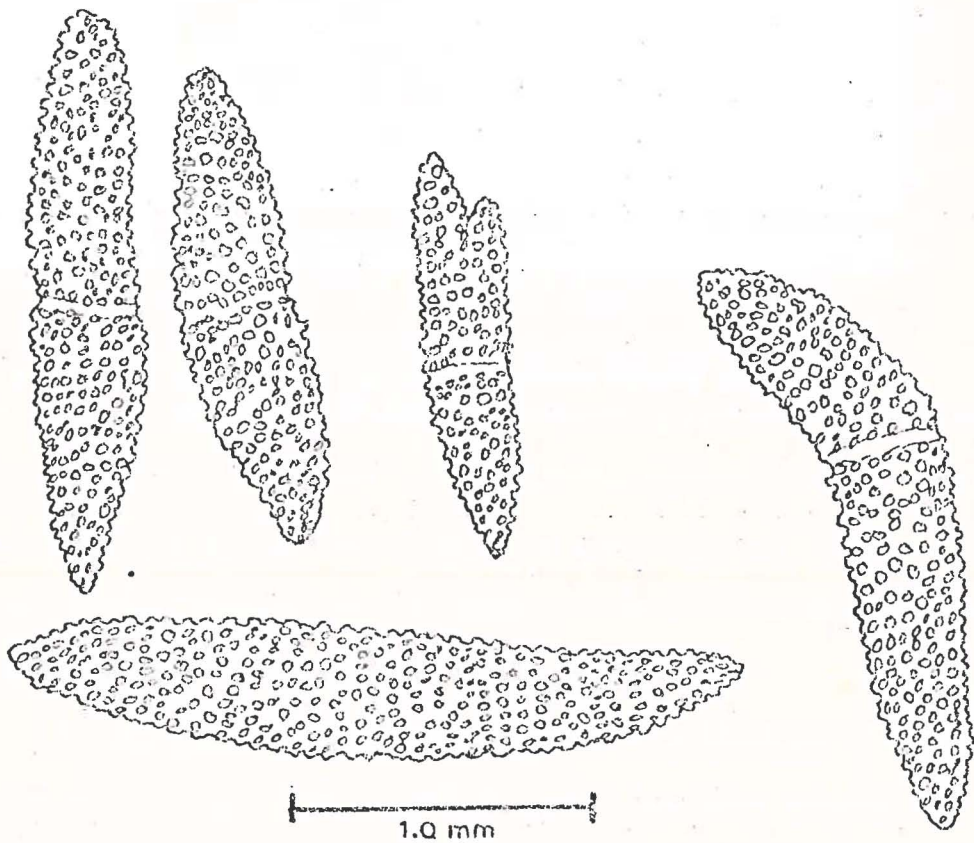


Fig. 86. *Simularia* species 4, interior of base, X39.



Fig. 87. *Simularia* species 4, whole colony seen from above (MG 74.10.23.14).

SYNOLARIA SPECIES 5

Fig. 88, 89, 90, 91, and 92.

MATERIAL: MG 73.11.30.1, Taogam Point reef terrace; MG 74.2.3.4, Gabgab reef front, Apra Harbor.

DESCRIPTION: From a relatively small area of attachment to the substrate a high branching sterile stalk arises, widening as it branches and merges into the capitulum. The first branches of the sterile stalk may start up to 3 cm above the basal attachment. Polyps may be found at the bases of some primary branches, but peripheral branches often show no polyps on their outer surfaces except at the level of secondary branching. The primary, secondary and tertiary branches are not crowded. Terminal branches, whether secondary or tertiary, do not appear longer than about 10 mm in preserved specimens. Total height of whole colonies in alcohol has been up to 10 cm, among those collected thus far. The stalk and branches are very soft and flexible.

Live colors are pinkish beige and pinkish brown.

Polyps in preserved specimens remain expanded and protruding, with only their tentacles retracted. They are 0.5 mm in diameter and distantly spaced through most of the capitulum, often 2 to 3 mm apart. They are more crowded on branch tips, where they may have only 0.65 mm between their centers.

The surfaces of the branches have warty clubs as sclerites. These do not show central terminal warts and have relatively small heads and sometimes very long hafts with rounded ends. The

length ranges from 0.09 to 0.16 mm with head diameter up to 0.05 mm.

The interiors of the branches have long sinuous spicules with pointed tips and sparse warts. They may reach 4 mm in length and 0.4 mm in diameter, often with sharp bends in their centers.

The surface of the base has clubs similar to those in the branches, but some of them are much longer and stouter, reaching lengths of 0.25 mm and head widths of 0.065 mm.

The interior of the base has long spicules like those inside the branches, but some of these also show median constrictions. They are not as densely distributed as in most *Simularia*.

REMARKS: This species is distinctive in its incomplete contraction of polyps and wide spacing between them. Also, it seems to initiate branching below the capitulum, within the sterile stalk zone. Its stalk is softer than that of other species of *Simularia*.

DISTRIBUTION AND HABITAT: This has been found only at depths of 9 to 13 m on reef fronts and terraces among live hard corals at both the exposed windward coast and the protected parts of Apra Harbor.

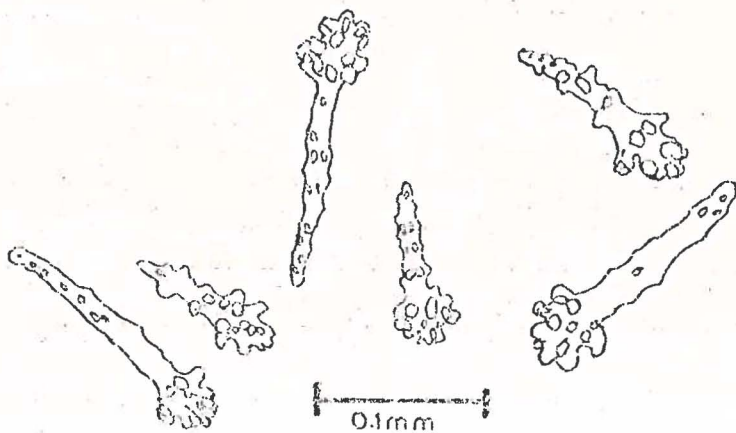


Fig. 88. *Simularia* species 5, surface of lobe, X226.

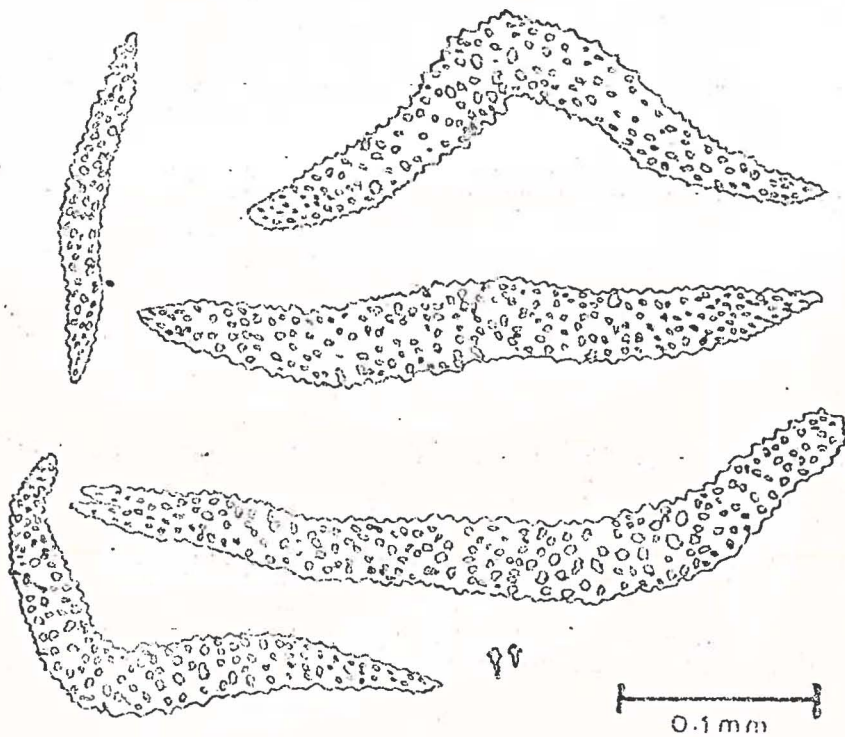


Fig. 89. *Simularia* species 5, interior of lobe, X26.

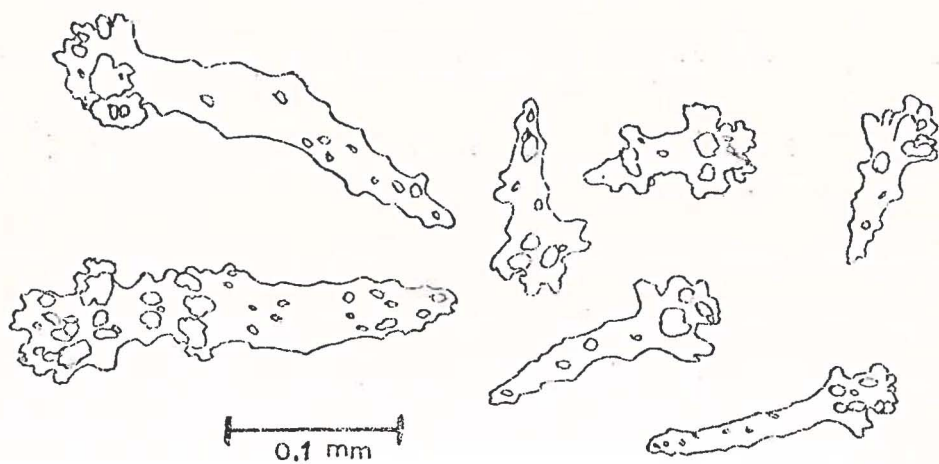


Fig. 90. *Simularia* species 5, surface of base, X226.

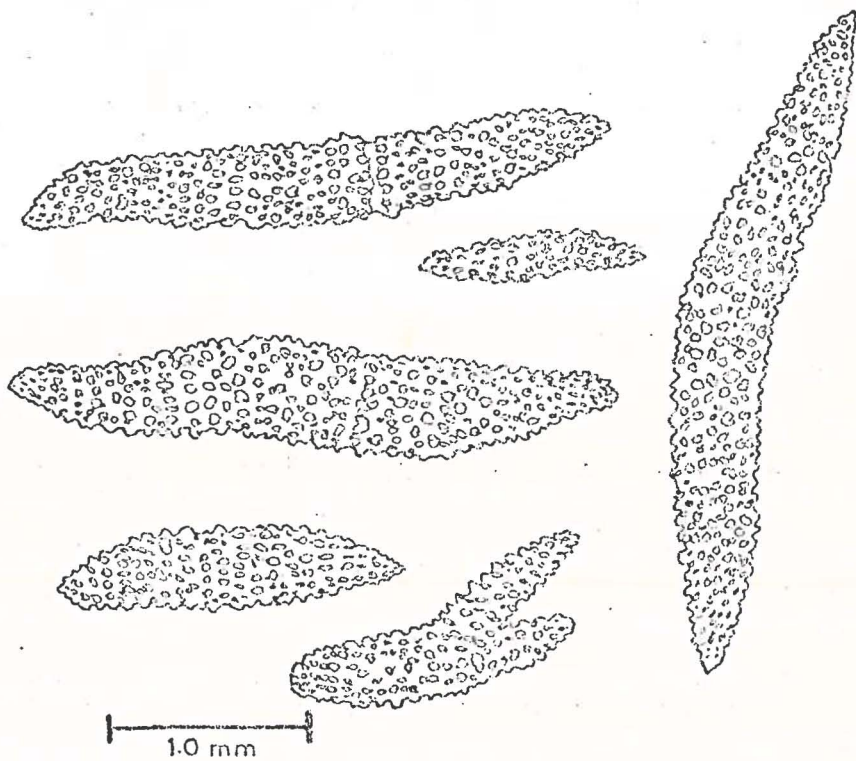


Fig. 91. *Simularia* species 5, interior of base, X26.

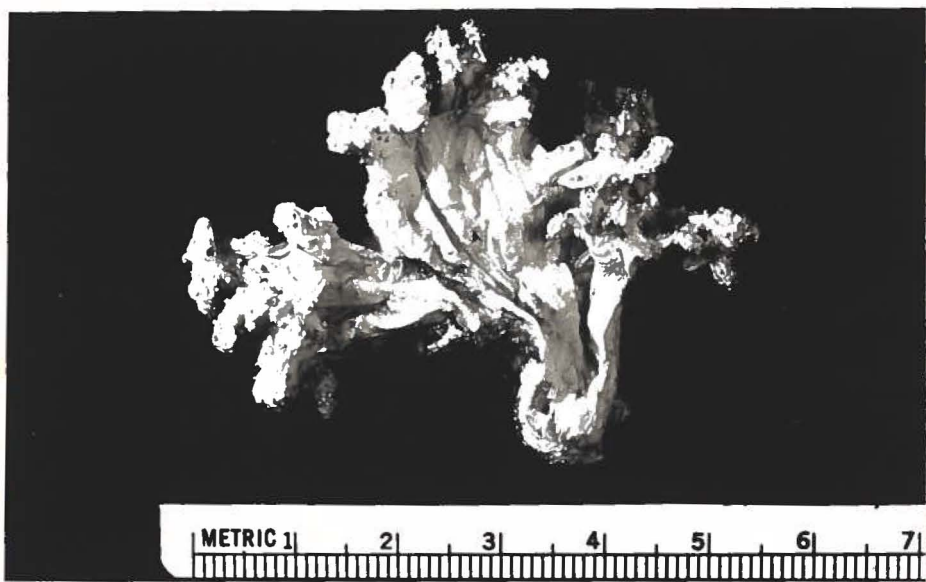


Fig. 92. *Simularia* species 5, whole colony
(MG 74.2.3.4).

SINULARIA SPECIES 6

Fig. 93, 94, 95, 96, and 97. Plate IX.

MATERIAL: MG 73.9.20.8 and MG 73.12.6.3, Cocos Lagoon.

DESCRIPTION: Long primary, secondary, and tertiary lobes are borne on an upright sterile stalk. The total preserved colony may be over 15 cm tall. The lobes are upright and crowded together. Terminal lobes of preserved specimens range from 1 to 5 cm tall and 4 to 8 mm wide with broadly rounded tips. They are sometimes flattened and sometimes cylindrical. Both lobes and stalk of the preserved specimen are somewhat soft and flexible.

The living color observed was pinkish tan with yellow-tan polyps. The preserved specimens are a brownish cream color.

The polyps are most crowded at the tips of the lobes where their centers are 0.03 to 0.08 mm apart. They retract into pits only 0.1 mm in diameter. On the primary lobes and lower capitulum, the polyps are much farther apart, as much as 1.2 mm.

The surfaces of the lobes characteristically contain variously shaped clubs 0.048 to 0.066 mm long. Many of these have a leaf-like arrangement of warts on their heads but some are irregular and none have a central terminal wart. Warty rods up to 0.2 mm long also occur, some of them with warts enlarged at one end to resemble the head of a club-like sclerite.

The interiors of the lobes contain rod-like spindles from 0.5 to 1.0 mm long, ranging from 0.1 to 0.3 mm wide and with uncrowded warts.

The surface of the base has clubs that are almost all leaf-headed and the same size as those on the lobes. Also it has warty rods like those on the lobes.

The interior of the base has large spindles up to 2.5 mm long with pointed tips and uncrowded warts. Some of these spindles have median constrictions and some are irregular and forked or branched.

REMARKS: The only time that specimens were collected of this species was when they were thought to be additional colonies of the very common *Sinularia polydactyla*. It apparently can form large colonies in very dense populations.

DISTRIBUTION AND HABITAT: This species is only known from Cocos Lagoon where it may be common on the lagoon shelves and patch reefs at depths down to 5 m.

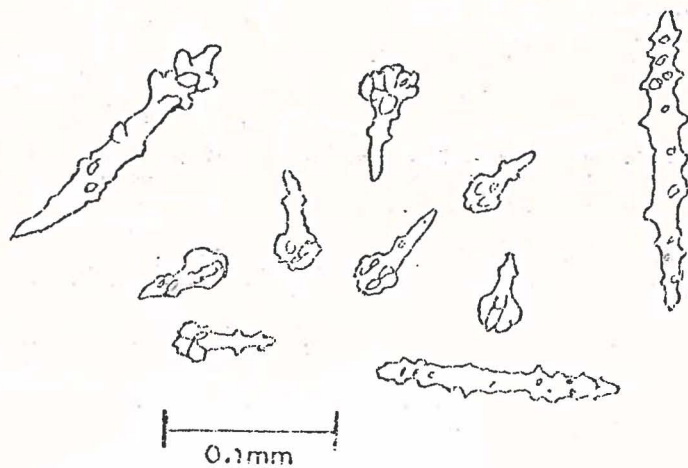


Fig. 93. *Simularia* species 6, surface of lobe, X226.

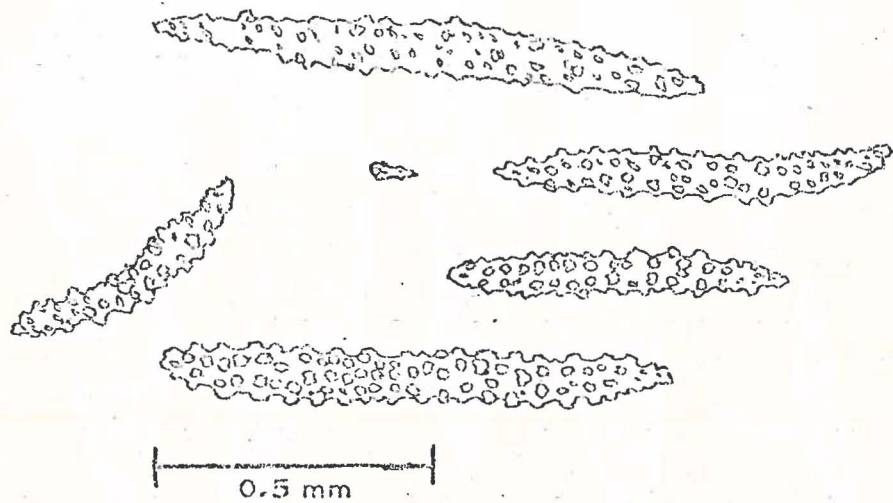


Fig. 94. *Simularia* species 6, interior of lobe, X72.

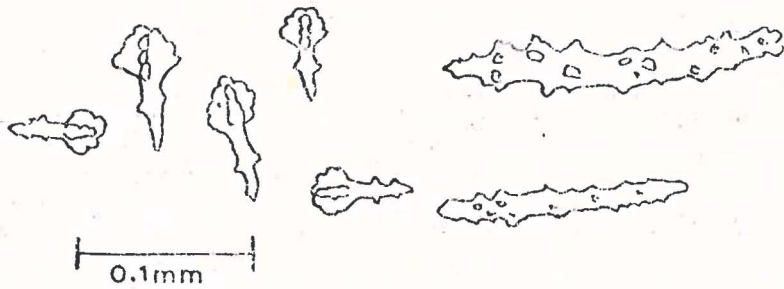


Fig. 95. *Simularia* species 6, surface of base, X226.

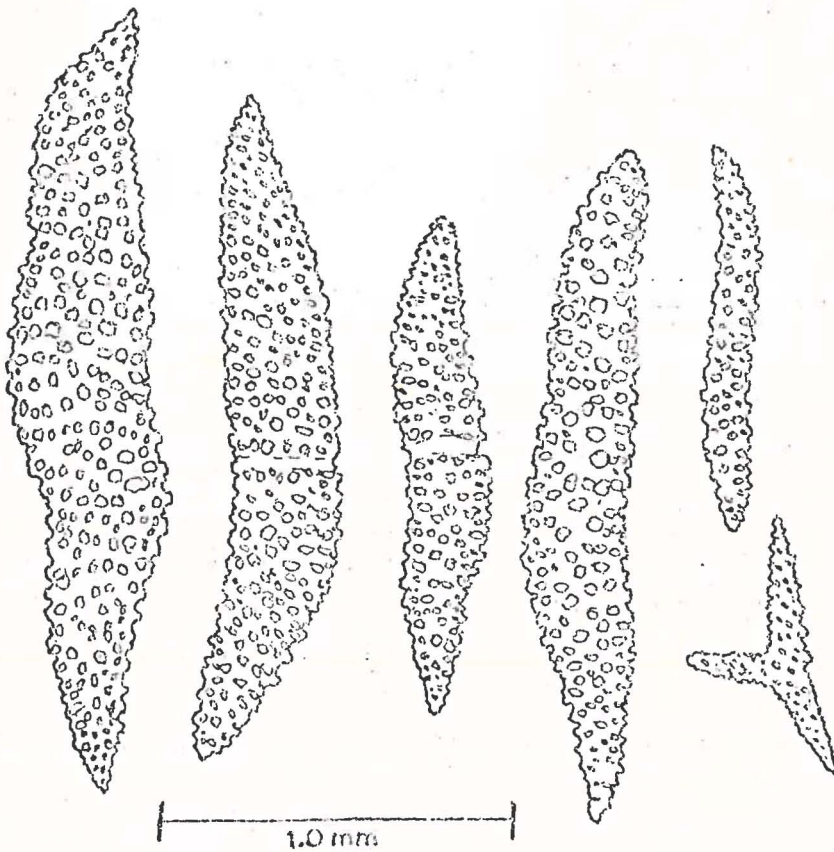


Fig. 96. *Simularia* species 6, interior of base, X46.

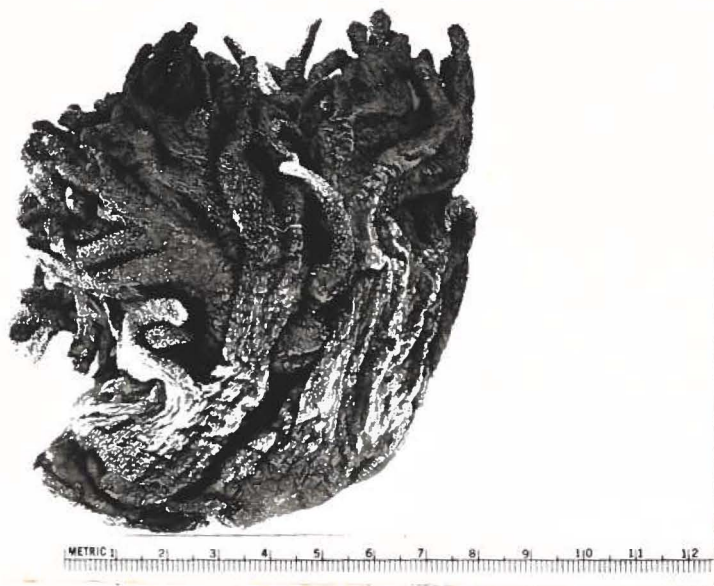


Fig. 97. *Simularia* species 6, whole colony
(MG 73.12.6.3).

SINUARIA SPECIES 7

Fig. 98, 99, 100, 101, and 102.

MATERIAL: NG 76.11.16.1, Agaña Reef margin.

DESCRIPTION: This very low encrusting species seems to reach a maximum height of only 2 cm but can form very large colonies over a meter in diameter. The sterile base averages less than 1 cm high. Primary lobes, all less than 1 cm tall, are irregularly shaped, but rounded and crowded tightly together. The widest ones are up to 7 mm thick. Some long sinuous ridges of lobes reach lengths over 2 cm. Live specimens and preserved ones are very hard and stiff.

Living colonies are brown in color.

Polyps retract deeply into pits which are 0.3 to 0.4 mm in diameter. Distance between the polyp centers on the lobes varies from 0.4 to 0.7 mm. They are less densely distributed between the lobes.

The surfaces of the lobes contain sclerites which are predominantly very warty stout clubs. They are 0.1 to 0.2 mm long and 0.06 mm across their heads. Their hafts have rounded ends and abundant warts. Central terminal warts do not occur on the heads. Smaller numbers of warty rods up to 0.2 mm long also occur.

The interiors of the lobes have thick rounded spindles 0.33 to 0.90 mm long and averaging 0.25 mm in diameter. They are covered with evenly distributed but uncrowded warts.

The surface of the base has clubs like those of the surfaces
of the lobes but with thicker hafts. Also, the less common warty

rods are thicker at the surface of the base than at the surface of the lobes.

The interior of the base has very thick but short warty spindles with rounded ends and sometimes blunt short branches. These sclerites range from 0.5 to 1.1 mm long and 0.10 to 0.33 mm in diameter.

REMARKS: All other species of *Sinularia* yet found at Guam have basal sclerites much longer than those of this species. Growth form and habitat allow this species to be confused with *Cladiella* sp. 2, but its sclerites easily distinguish it as a *Sinularia*.

DISTRIBUTION AND HABITAT: This species seemed to be extensively present on the reef margin at low tide level near the Agaña Boat Basin, where waves normally break heavily. It may occur in similar habitats around Guam but sampling has not been made extensively in such rough areas.

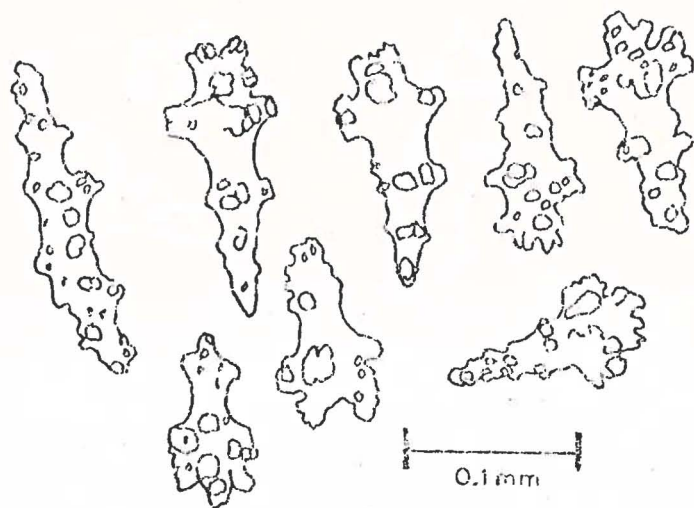


Fig. 98. *Simularia* species 7, surface of lobe, X225.

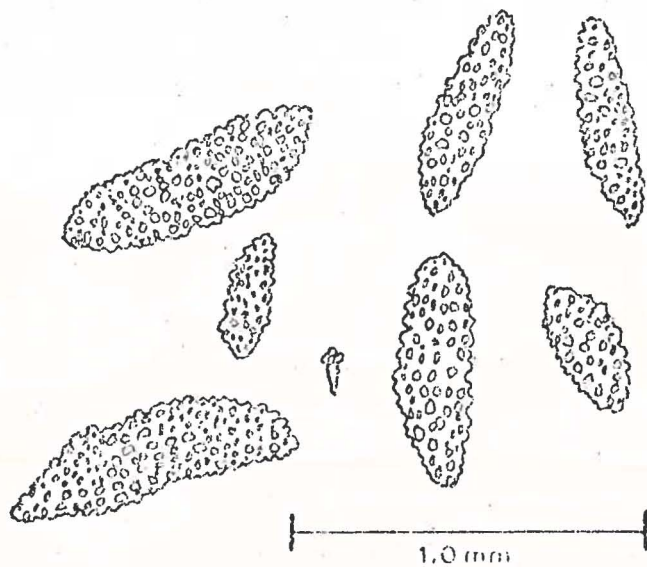


Fig. 99. *Simularia* species 7, interior of lobe, X46.

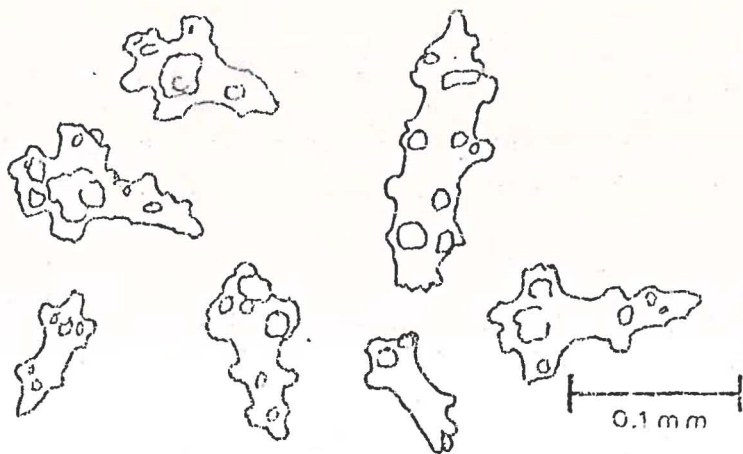


Fig. 100. *Simularia* species 7, surface of base, X226.

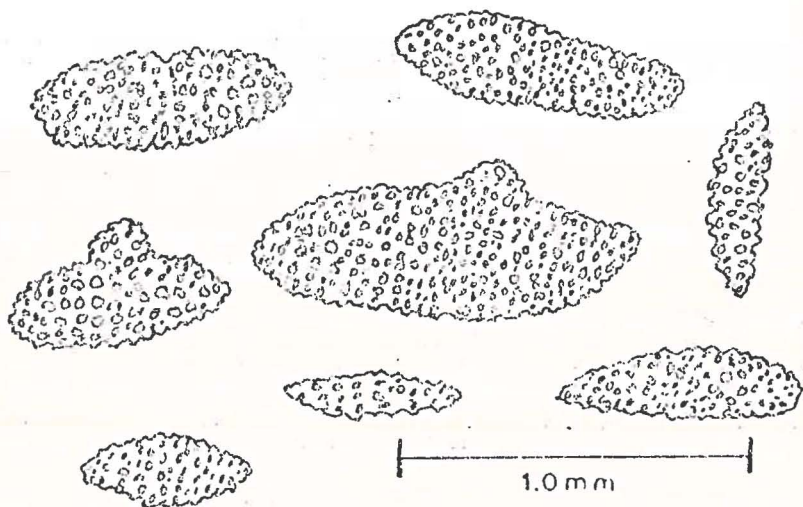


Fig. 101. *Simularia* species 7, interior of base, X46.

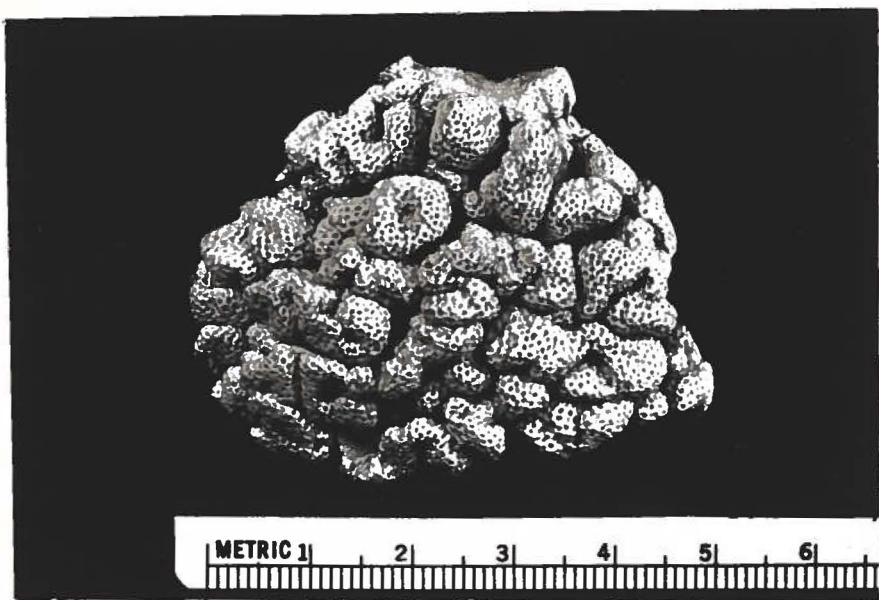


Fig. 102. *Simularia* species 7, part of a colony seen from above (MG 76.11.16.1).

SINULARIA SPECIES 8

Fig. 103, 104, 105, 106, and 107.

MATERIAL: MG 74.4.18.6, Toguan Bay; MG 74.10.23.18, Double Reef.

DESCRIPTION: The upright stalk is 2 to 6 cm tall and 15 to 20 mm in diameter with vertical folds. It narrows slightly towards the top but may branch into primary lobes just below the capitulum. The capitulum contains long cylindrical secondary and sometimes tertiary lobes which always are 4 to 5 mm in diameter and can range up to 25 mm long in preserved specimens. These lobes are not very crowded and spread in all directions from the top of the stalk like the crown of a tree.

The living color is not known, but preserved specimens have dark brown stalks and lighter lobes.

The polyps are spaced with 0.7 to 1.2 mm between their centers all over the lobes. They are more widely spaced at the bases of the lobes. When the polyps are fully contracted they leave pits about 0.2 mm in diameter.

The surfaces of the lobes contain sclerites which are mostly clubs averaging 0.1 mm long with narrow shafts and enlarged heads covered with small warts that are long and thin and radiate outward. There are dozens of these warts crowded onto each club head. A small number of warty rods also occur and may be over 0.2 mm long.

The interiors of lobes contain warty spindles up to 2.7 mm long with rounded and pointed tips. Their warts are neither crowded nor large.

The surface of the stalk contains clubs like those on the lobes but slightly stouter. It also has larger clubs with larger, more irregular warts and some spindle-like rods which have large warts and can be over 0.2 mm long.

The interior of the stalk has warty spindles like those of the lobes. None seem to have median constrictions.

REMARKS: The shape and size of this species, as well as the peculiar clubs with many small projecting warts crowded on their heads, distinguish it from others.

DISTRIBUTION AND HABITAT: This uncommon species has been found on deeper leeward submarine terraces growing among communities of hard corals both at Toguan Bay and Double Reef.

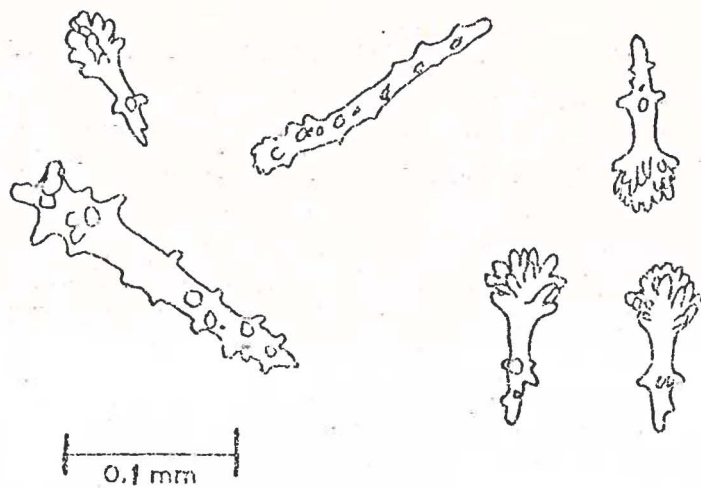


Fig. 103. *Simularia* species 8, surface of lobe, X225.

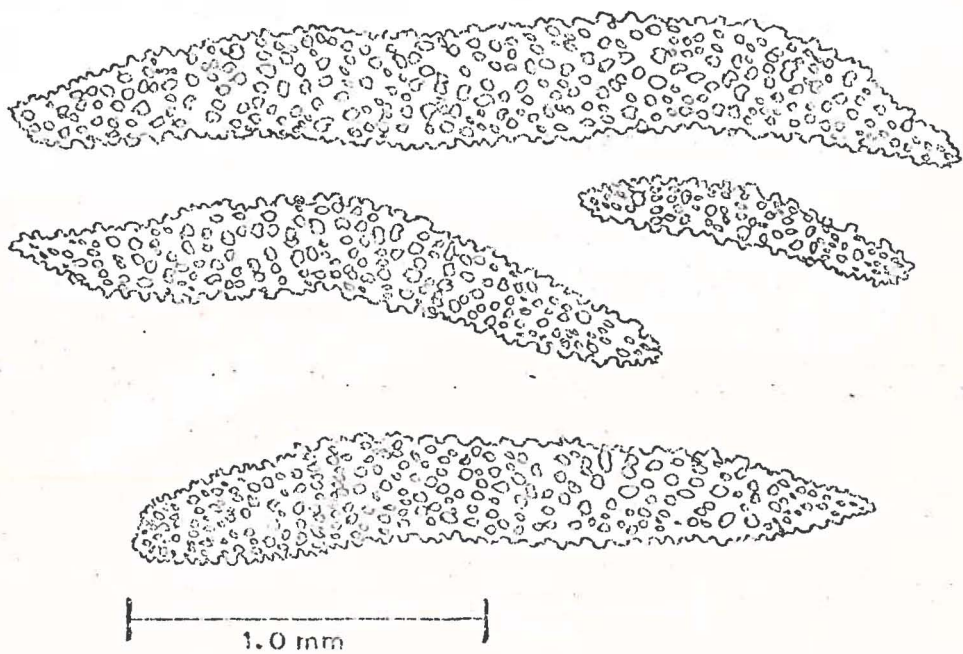


Fig. 104. *Simularia* species 8, interior of lobe, X46.

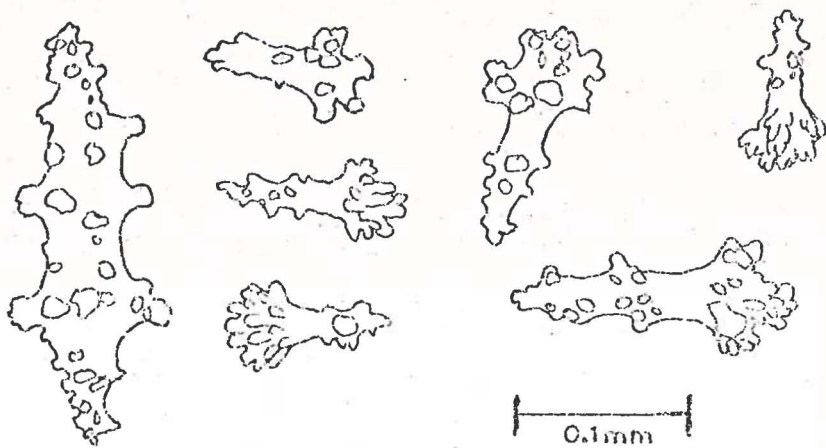


Fig. 105. *Simularia* species 8, surface of base, X225.

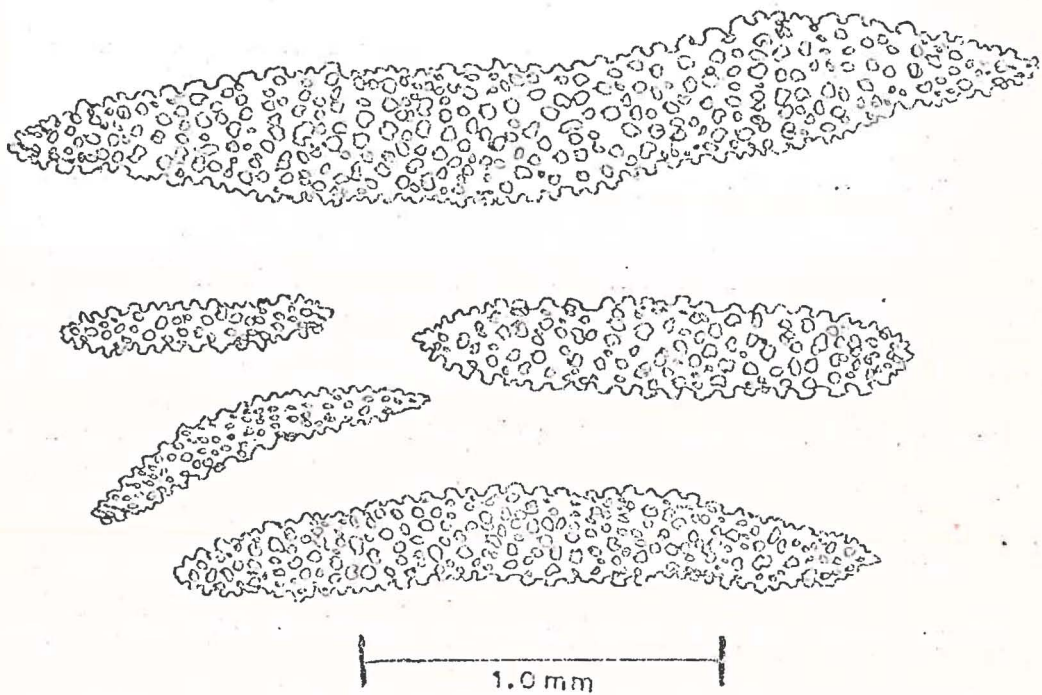


Fig. 106. *Simularia* species 8, interior of base, X46.



Fig. 107. *Simularia* species 8, whole colony on rock substrate (MG 74.4.18.6).

SINULARIA SPECIES 9

Fig. 108, 109, 110, 111, and 112. Plate X.

MATERIAL: MG 74.1.20.3, Taogam Point terrace.

DESCRIPTION: The sterile base averages 4 cm tall after preservation and has vertical grooves. The capitulum forms an overhanging rim at the top of the sterile stalk. Primary lobes are widely spaced, leaving broad flat areas between them. Cylindrical or flattened secondary lobes commonly branch off various levels of the primary lobes. These terminal lobes are 6 to 12 mm wide and 4 to 8 mm thick. Total length of combined lobes reaches up to 6 cm above the inter-lobe base in the preserved specimen.

The living color was grayish rose.

The polyps are evenly distributed over the entire capitulum with an average of 1 mm between their adjacent centers. They retract into depressions 0.2 to 0.4 mm in diameter.

The surfaces of the lobes contain clubs averaging 0.1 mm long with leaf-like longitudinally flattened lobes on their heads and one or two circles of small warts around their hafts. A small number of irregular clubs and large ones over 0.2 mm long also occur.

The interiors of the lobes contain spindles up to 3.0 mm long. These have uncrowded crenulate warts and may have rounded or pointed tips. They are curved or straight but not branched nor forked and have no median constrictions.

The surface of the base has clubs like those on the lobes but more robust and slightly bigger.

The interior of the base contains mostly pointed spindles up to 3.5 mm long. They are curved or straight but lack median constrictions, forks and branches. Their medium-sized, crenulate warts are not crowded.

REMARKS: This species resembles certain species of *Lobophytum* because many of its lobes are simple and uncrowded on a disc-like capitulum, but it has only monomorphic polyps and contains sclerites characteristic of *Sinularia*.

DISTRIBUTION AND HABITAT: The author has collected this species only on the windward submarine terrace off Taogam point in 18 m of water. It appears very uncommon and grows among colonies of corals. It may have been seen at another location in southern windward Guam.

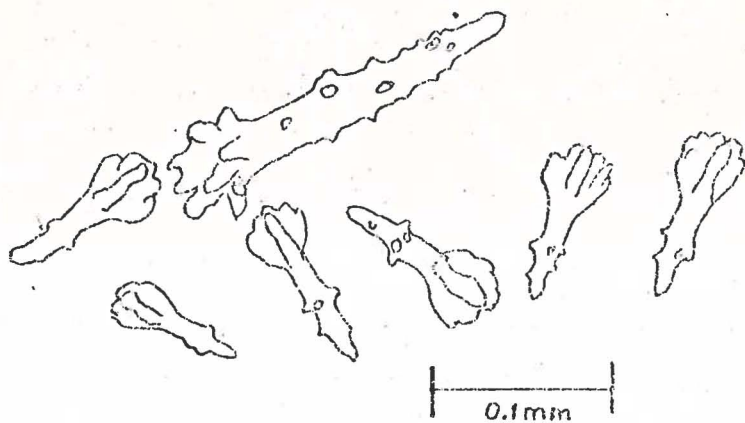


Fig. 108. *Simularia* species 9, surface of lobe, X226.

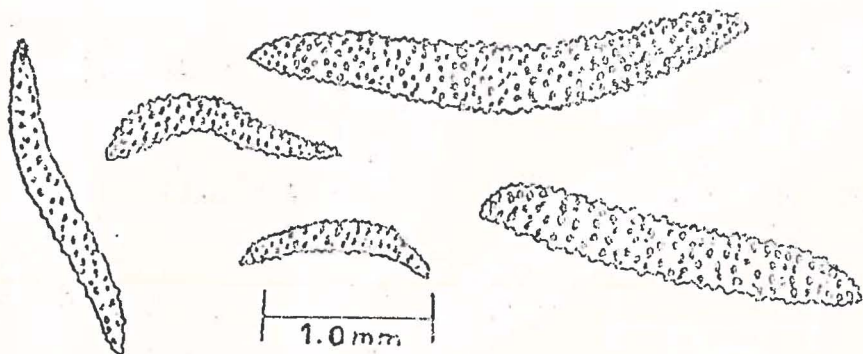


Fig. 109. *Simularia* species 9, interior of lobe, X39.

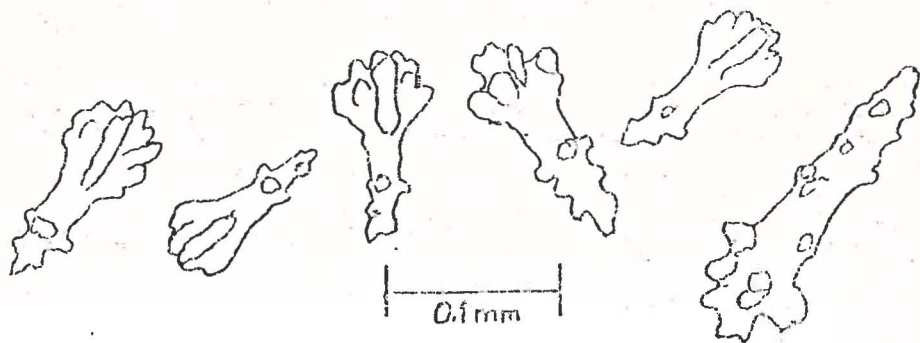


Fig. 110. *Simularia* species 9, surface of base, X226.

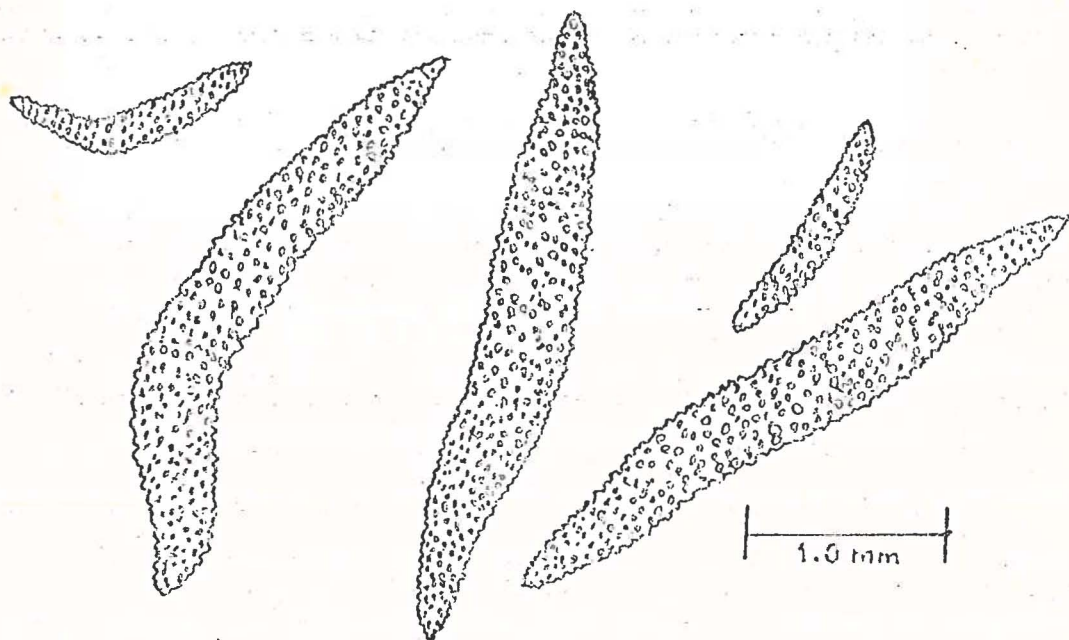


Fig. 111. *Simularia* species 9, interior of base, X39.



Fig. 112. *Simularia* species 9, whole colony
(MG 74.1.20.3).

NEPHTHEIDAE GRAY, 1862

The family Nephtheidae contains at least three hundred Indo-West Pacific species in fourteen different genera. Six species in three genera have been found on Guam, where they are uncommon and limited in distribution to specific depths and substrates.

Nephtheids have sterile stalks bearing branches which may be subdivided. Their monomorphic polyps are usually on their ultimate branches and are not retractible, except in the genus *Paralemmalia*. They are arranged singly or in clusters. Large warty spindles are densely arranged in the outer layer of the stalk but are sparse in the stalk interior. The polyps often contain characteristically arranged small spindles.

KEY TO THE GENERA OF THE FAMILY NEPHTHEIDAE
RECORDED FROM THE SHALLOW TROPICAL PACIFIC

1. Polyp is supported by a group of large well-developed sclerites (called a "supporting bundle") located on the outer side of the polyp stalk (Fig. 117) 2
1. Polyp is without a supporting bundle of large well-developed sclerites on the outer side of the polyp stalk 4
- 2(1). Polyps are on small lobes only and arranged closely and orderly on the lobes (Fig. 116) *Nephthea*
- 2(1). Polyps are separate or in small groups scattered on branches as well as on lobes 3

- 3(2). Polyps are arranged in bundles or groups
..... *Dendronephthya*
- 3(2). Polyps are not in groups, but arise singly (Fig. 127)
..... *Stereonephthya*
- 4(1). Interior of the stalk is not heavily filled with sclerites;
stalk and branches are soft and flexible
..... *Litophyton*
- 4(1). Interior of the stalk is heavily filled with sclerites; stalk
and branches are hard and stiff 5
- 5(4). Polyps are crowded onto the lobes *Capnella*
- 5(4). Polyps arise singly or in small groups 6
- 6(5). Polyps are located on unbranched finger-like mainstalks
..... *Paralimnalia*
- 6(5). Polyps are located on secondary or terminal branches; main
stalks are very much branched 7
- 7(6). Numerous sclerites occur in the tentacles and in the stomodaei
walls of the polyps *Lemnalia*
- 7(6). Very few sclerites occur in the tentacles and none occur in the
stomodaei walls of the polyps *Lemnalioides*

NEPHTHEA AUDOIN, 1828

Species of *Nephthea* characteristically have their polyps crowded together on only the terminal branches of their compoundly branched colonies. In addition, all polyps have a supporting bundle of spicules. Finally, the internal canals, connected to the polyp gastrovascular cavities, have very thin walls.

NEPHTHEA GRACILLIMA THOMSON AND DEAN, 1931

Fig. 113, 114, 115, and 116.

Nephthea gracillima Thomson and Dean, 1931:93; Macfadyen, 1936:57.

MATERIAL: MG 75.6.13.1, inside Glass Breakwater, Apra Harbor.

DESCRIPTION: This species can grow to over 22 cm tall. It produces numerous upright stalks from a low base which starts branching at a height of only 1 to 4 cm. The polyp-bearing branches are 6 to 22 mm long and 1 to 2 mm wide. They arise from the large primary sterile stalks or secondary sterile branches and are very numerous and crowded. The sterile branches and stalks are stiff but polyp-bearing branches are flexible in preserved specimens.

The living color is a light pinkish beige. Specimens became white in alcohol.

Polyps are only on the terminal branches, where they are 0.5 to 1.0 mm apart. Their stalks are 0.5 mm long, measured from the inner side of the polyp to the branch. The anthocodia are usually slanted at acute angles towards their stalk origins at the branches. They average about 0.5 mm tall and 0.5 mm in diameter. Their supporting bundle consists of straight or curved spiny spicules, 0.25 to 1.25 mm long, ensheathing the base of the polyp but not projecting in most cases. Spicules under 0.25 mm long are sometimes arranged in irregular formations like chevrons on the polyp.

On the surfaces of the branches are straight or curved spicules with large or small spines or warts. They range from

0.2 to 1.0 mm long. The base of the colony contains stouter spicules with greatly enlarged tooth-like projections, longer on one side, giving a very asymmetrical appearance. Their projections may be over 0.1 mm long but sclerite lengths remain under 1 mm.

REMARKS: This sole species of *Nephthea* from Guam is easily distinguished from other species and genera by its gross shape, sclerites, polyp arrangement, and location.

DISTRIBUTION AND HABITAT: The distribution in Guam seems to be limited to the surfaces of sunken vessels in Apra Harbor at depths greater than 12 m, especially the sunken barges on the slope near the outer end of Glass Breakwater.

It is also known from Indonesia and the Great Barrier Reef of Australia.

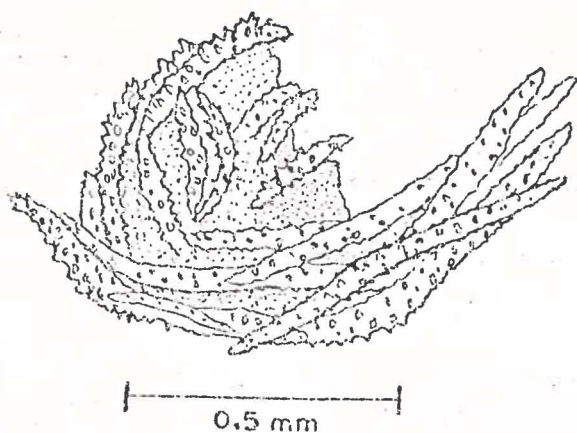


Fig. 113. *Nephthea gracillima* Thomson and Dean, polyps, X72.

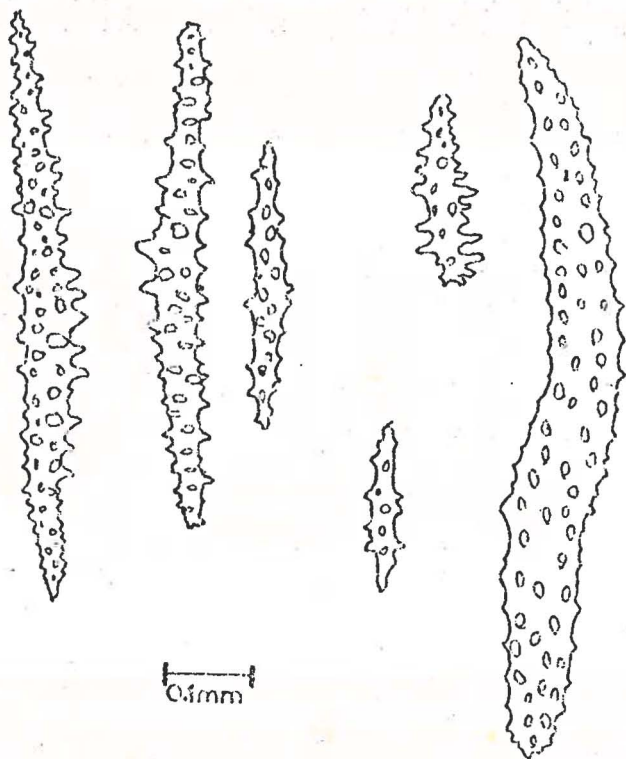


Fig. 114. *Nephthea gracillima* Thomson and Dean, surface of branch, X116

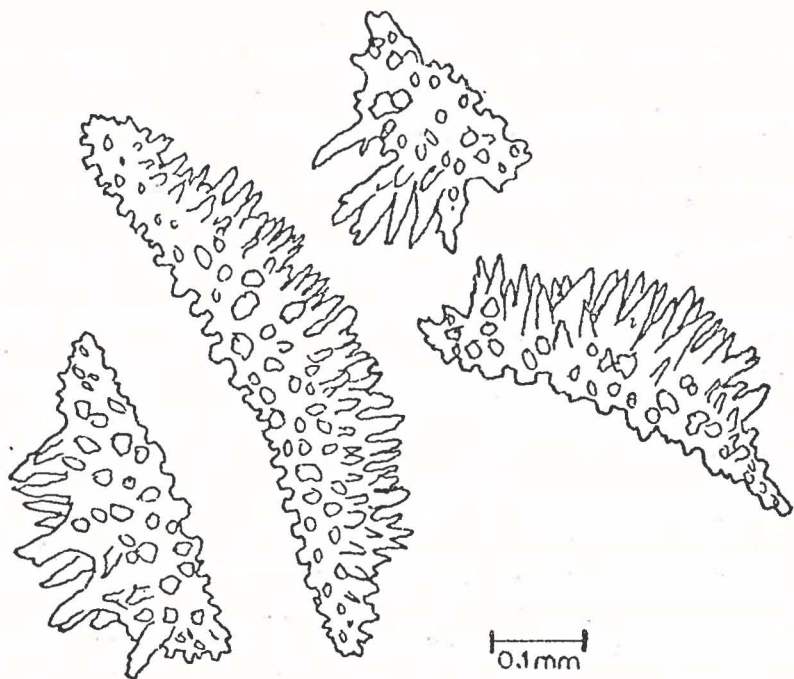


Fig. 115. *Nephthea gracillima* Thomson and Dean, surface of base, X116.

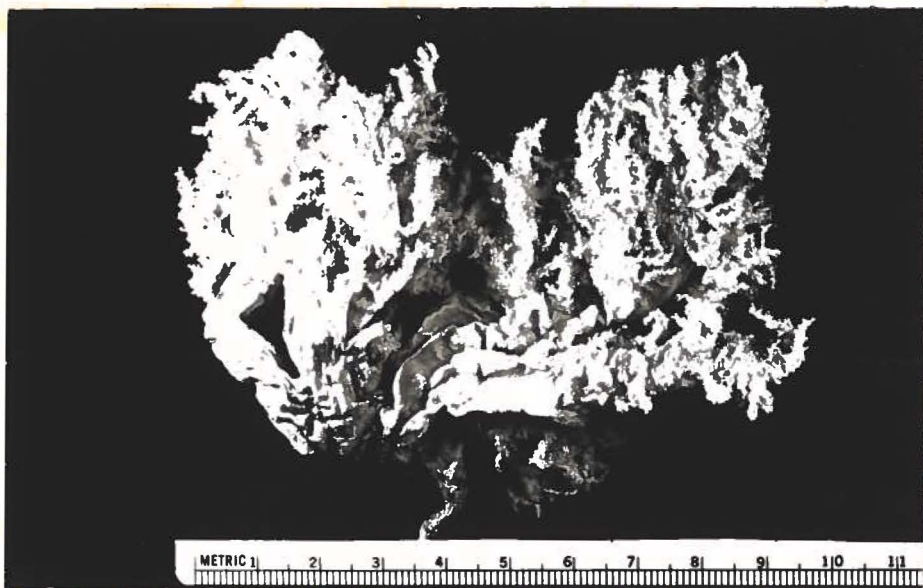


Fig. 116. *Nephthea gracillima* Thomson and Dean, whole colony
(MC 75 6 22 1)

STEREONEPHTHYA KUKENTHAL, 1905

This genus consists of those nephthoids made rigid by large sclerites in the surface of their branches or stems and whose polyps are provided with a supporting bundle. Their polyps are neither aggregated on lobes nor in isolated bunches but are arranged singly or in small scattered groups on stems that may not give rise to main branches.

KEY TO THE GUAM SPECIES OF *STEREONEPHTHYA*

1. Polyps are generally perpendicular to their stalks and only 0.2 to 0.3 mm tall at their tallest part, in preserved specimens. Polyp sclerites are never over 0.2 mm long
..... *Stereonephthya unicolor*
1. Polyps are slanted toward their stalk origins at an acute angle with their stalks and are 0.7 to 1.3 mm tall at their tallest part, in preserved specimens. Polyp sclerites are usually over 0.4 mm long and occasionally over 1 mm long ..
..... 2
- 2(1). Average width of the contracted polyps is 0.5 mm. Some polyp sclerites are long and clavate with their thickened ends projecting beyond the polyp. Their typical habitat is the shallow reef front, less than 5 m deep
..... *Stereonephthya ulicoides*
- 2(1). Average width of the contracted polyps is 0.7 mm. No long clavate sclerites occur in the polyp. Their typical habitat is the deep reef slope, over 10 m deep
..... *Stereonephthya* sp. 1

STEREONEPHTHYA ULICOIDES THOMSON AND DEAN, 1931

Fig. 117, 118, and 119.

Stereonephtya ulicoides Thomson and Dean, 1931:149; Verseveldt, 1966:77.

MATERIAL: MG 74.10.17.2, Nimitz Beach Reef.

DESCRIPTION: The Guam specimen was about 5 cm tall when live and expanded. Records from the literature (Verseveldt, 1966; Thomson and Dean, 1931) indicate that preserved colonies are usually 3 to 7 cm in height with a breadth greater than or equal to height. The sterile stalk makes up less than one third of the colony height before giving rise to primary branches 5 to 7 mm thick and up to 25 cm high and secondary branches usually 3 to 5 mm thick and 5 to 10 mm long. Sometimes polyp-bearing branches arise directly from a low encrusting base. They are stiff when contracted but soft and flexible when expanded.

The preserved specimen is pinkish and white and was pinkish beige when alive. Polyps are white but some stalk sclerites are pink.

Polyps are single, not clustered, and scattered over primary and secondary branches. They have very short stalks, under 1 mm long from the branch to the inner side of the polyp. The anthocodia are slanted towards their stalk origins at the branches at very acute angles. The heights of the anthocodia along their outer sides vary from 0.8 to 1.3 mm. They are narrower at their bases and widen distally to 0.5 to 0.8 mm diameter. The average

The supporting bundle consists of several curved spiny spicules up to 3 mm long. Usually two to four of these project beyond the anthocodium for a distance of 0.2 to 1.5 mm. The largest spindles may be over 0.2 mm in width, including spines. On all sides but the inner side of the polyp, the anthocodial sclerites consist mainly of spiny spindles up to 0.5 mm long, some of which are curved and bent. They are usually arranged irregularly but somewhat longitudinally. Sometimes they are in chevrons with five to nine spindles in each double row. The uppermost of these sclerites are longer, clavate, projecting, pointed spindles sometimes over 1 mm long, with their enlarged tips sometimes extending over 0.2 mm beyond the rest of the anthocodial sclerites. The larger and outermost non-clavate anthocodial spindles have numerous long spines. The sclerites on the inner side of the anthocodium are smaller and less numerous or even absent. Intermediate sclerites between the clavate and non-clavate spindles occur, as well as short (less than 0.1 mm), opaque, oblong sclerites around the bases of tentacles. Very small (0.05 to 0.13 mm), flattened, rod-shaped sclerites can occur in the tentacles and inner side of the polyp stalk.

On the surface of the branches are curved spiny or warty spindles up to 2.3 mm long. The surface of the base of the colony contains a range of sclerites varying from spiny and warty spindles 7 mm long to shorter sclerites that are cylindrical, spindle-shaped, clavate or knee-like, with long, often branched thorns, to very irregular large-spined sclerites as small as 0.05 mm long.

REMARKS: Until more specimens are found, the range of variations of Guam specimens cannot be determined.

DISTRIBUTION AND HABITAT: As in previously described specimens from elsewhere, the Guam sample was found in shallow water only 3 m deep among hard corals. The single specimen grew on the reef front at Agat. Most other nephtheids of Guam are in deeper, darker, more protected habitats.

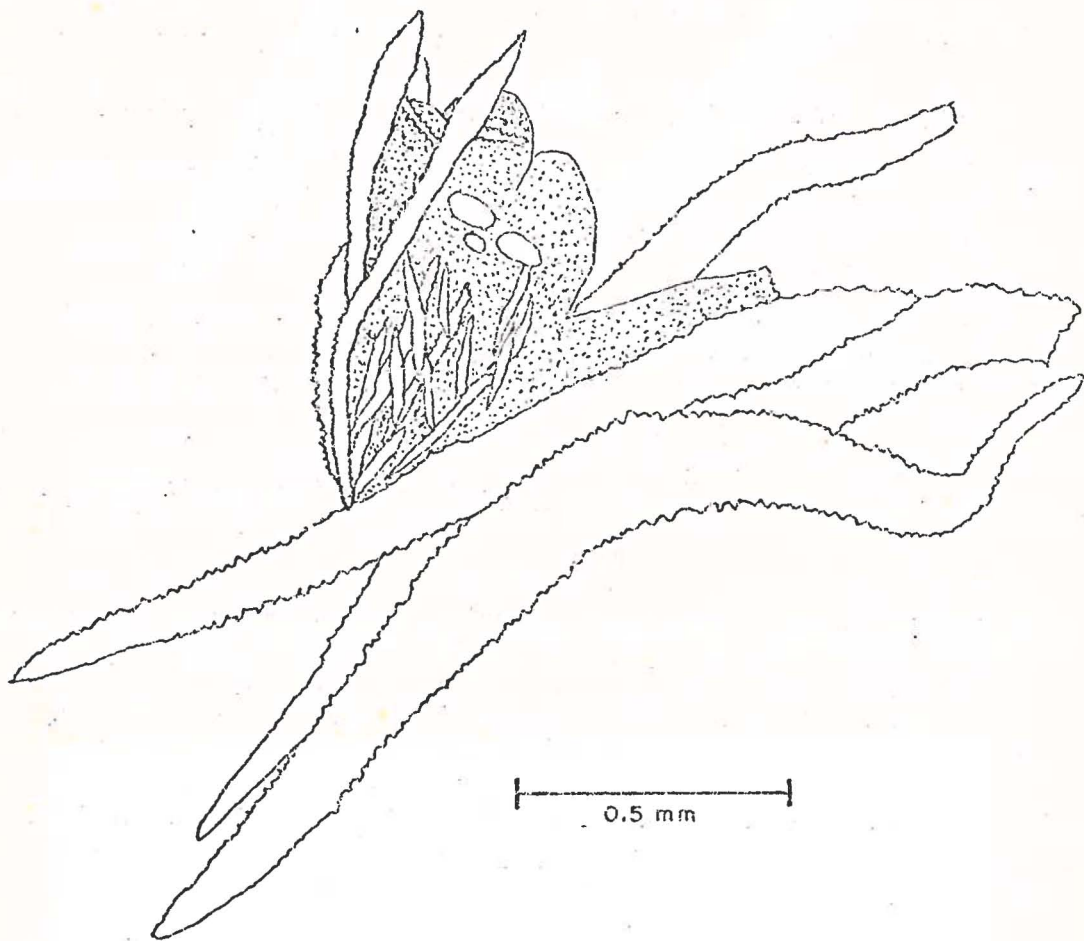


Fig. 117. *Stereonephthya ulicoides* Thomson and Dean, polyp, X72.



1.0 mm

Fig. 118. *Stereonephthya ulicoides* Thomson and Dean, surface of base, X46.



Fig. 119. *Stereonephthya ulicoides* Thomson and Dean, part of a colony (MG 74.10.17.2).

STEREONEPHTHYA UNICOLOR (GRAY, 1862)

Fig. 120, 121, 122, and 123.

Spongodes unicolor Gray, 1862:29; Kukenthal, 1905:700.

Stereonephtya unicolor Macfadyen, 1936:64.

MATERIAL: MG 74.5.2.2 and MG 74.5.2.3, Manell Channel.

DESCRIPTION: The tallest colonies have a height of 10 cm after preservation. The sterile base is low and small, giving rise to very large primary lobes (up to 8 cm tall) with shorter secondary and very short tertiary lobes and sometimes quaternary ones. These terminal lobes are usually hemispherical, covered with evenly distributed polyps, and 5 to 7 mm in diameter. The lobes and base are stiff but slightly flexible.

Preserved specimens are white, while living ones appeared rosy-gray in color.

Although the polyps are more heavily concentrated on the terminal lobes, they are also scattered over the surfaces of the primary and secondary lobes. The stalk of each polyp averages 0.5 mm long. The anthocodia are very short, only 0.2 to 0.3 mm tall and an average of 0.6 mm in diameter in preserved specimens.

The strong supporting bundle spreads around the sides of the polyp stalk like a hand holding the polyp. Two to ten of the spiny spicules project beyond the anthocodium up to 0.3 mm. Their total length ranges from 0.5 to 1.2 mm and greatest width is about 0.1 mm. The anthocodial sclerites are irregularly arranged with spiny spicules slightly over 0.1 mm long on the outer side and

smaller ones under 0.1 mm long on the inner or stalk side of the polyp.

The surfaces of the branches contain warty spicules mostly 1.5 to 2.2 mm long but sometimes much smaller. The base surface has similar but more irregular warty spicules which may be branched or have long tooth-like projections on only one side.

REMARKS: This species is more robust than other Guam *Stereonephthya* and has much shorter anthocodia. Its sclerites lack the colors of the others.

DISTRIBUTION AND HABITAT: This species has thus far been found only at the submerged margin of Manell Channel outside the windward Cocos Barrier Reef at a depth of 8 m.

It was previously known from the Australian Great Barrier Reef, New Caledonia, and the Solomon Islands. This is its first record north of the equator.

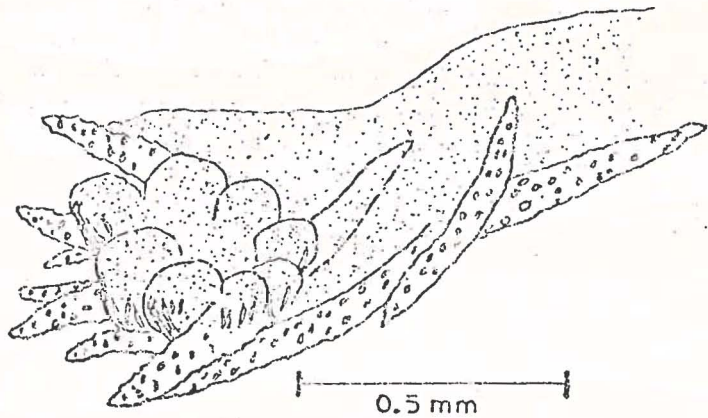


Fig. 120. *Stereonephthya unicolor* (Gray), polyp, X70.

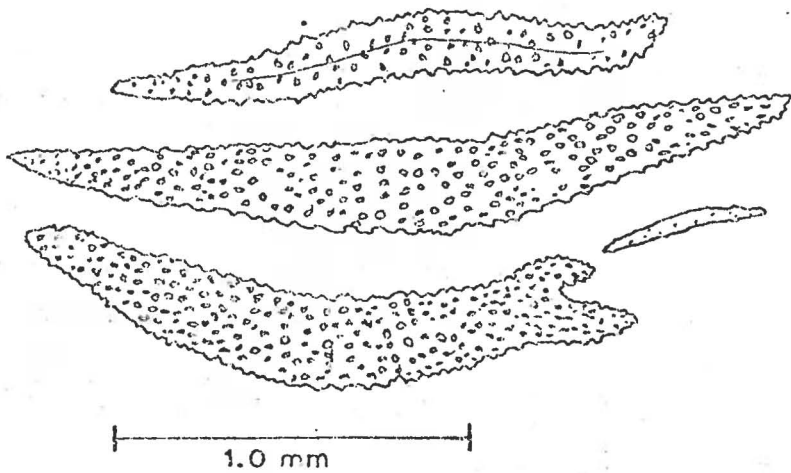


Fig. 121. *Stereonephthya unicolor* (Gray), surface of branch, X46.

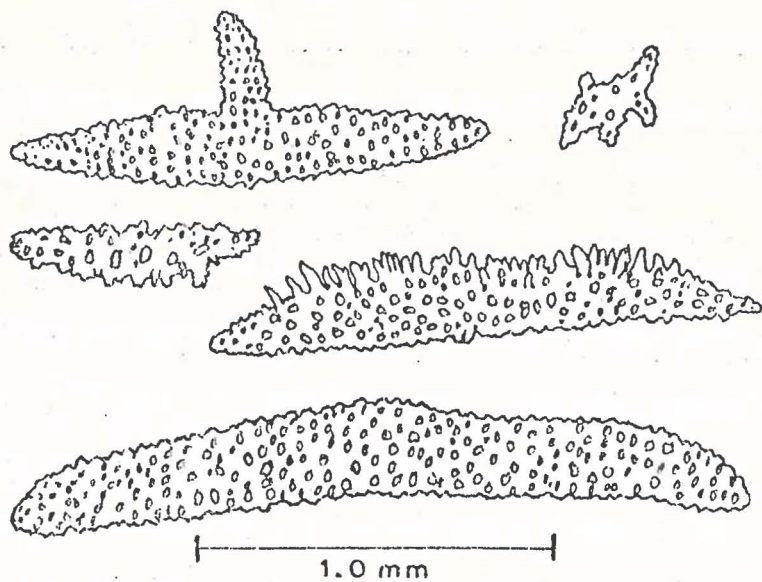


Fig. 122. *Stereonephthya unicolor* (Gray), surface of base, X46.

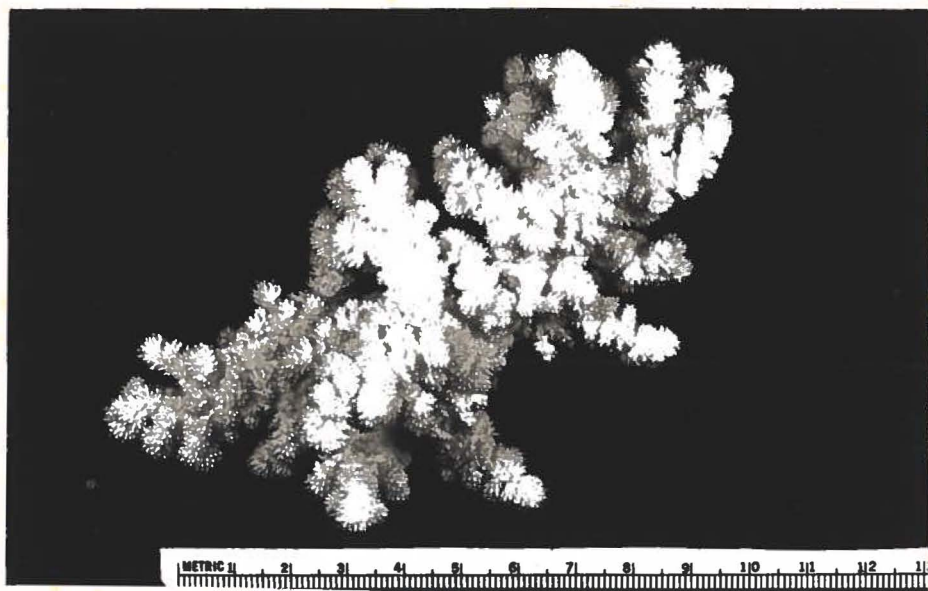


Fig. 123. *Stereonephthya unicolor* (Gray), whole colony (MG 74.5.2.2).

STEREONEPHTHYA SPECIES 1

Fig. 124, 125, 126, and 127.

MATERIAL: MG 73.11.4.4, MG 73.11.4.5, MG 76.11.18.1, and MG 76.11.18.2, all from Tantapalo Point.

DESCRIPTION: The largest living colonies observed were less than 10 cm tall. These may have single main vertical stalks with polyps and primary branching scattered thereover or may have multiple main stalks that are all connected at their bases. Colonies often have both primary and secondary branches which contain individual polyps and arise from as low as 5 mm above the base attachment to the substrate. These branches can be up to 3 cm long. Average preserved primary branches are about 5 mm in diameter, excluding the polyps. Average secondary branches are close to 3 mm in diameter and 9 mm in length. The branches can be oriented at all angles relative to their stalk, but sometimes tend to orient in a vertical planar formation. The branches and base are stiff and sharp even when alive.

The preserved specimens range from yellowish white to brownish green to reddish purple in color. Living specimens also range through these colors. Sclerites of the stalk are mostly light yellow in color but some are pinkish.

The polyps are single, not clustered and scattered all over the primary and secondary branches and the stalk. Polyp stalks range from 0.6 to 1.2 mm in length, measured from the branch to the inner side of the polyp. The anthocodia are almost all slanted at acute angles towards their stalk origins on the branch

bearing them. The heights of preserved anthocodia along their outer sides vary from 0.7 to 1.0 mm. Their average diameter is 0.7 mm and they are slightly narrower at their bases.

The supporting bundle consists of several curved spicules 1.0 to 2.5 mm long covered with small spines. Usually one, two, or three of these project beyond the base of the anthocodium for a distance of 0.7 to 1.1 mm. The largest of these may be just over 0.3 mm in width. The anthocodial sclerites are all spiny spicules between 0.15 to 1.0 mm long, with the longest occurring on the outer side and smaller ones on the inner side, towards the branch bearing the polyp stalk. Most are simply curved while some may be straight and others recurved. They are generally oriented longitudinally and sometimes form chevrons with two to four spicules in each of the double rows.

On the surface of the branches are long thin spiny spicules that are straight, curved, or recurved. They range from 0.4 to 3.0 mm in length and up to 0.15 mm thick. The surface of the base of the colony contains numerous sclerites identical to those on the surface of the branches.

REMARKS: Specimens of this species have been examined by Dr. J. Verseveldt, who believes that they represent an undescribed species.

DISTRIBUTION AND HABITAT: This species has only been found on the steep submarine slopes outside of Orote Peninsula, Guam, opposite Tantapalo Point, at depths from 9 to 40 m.

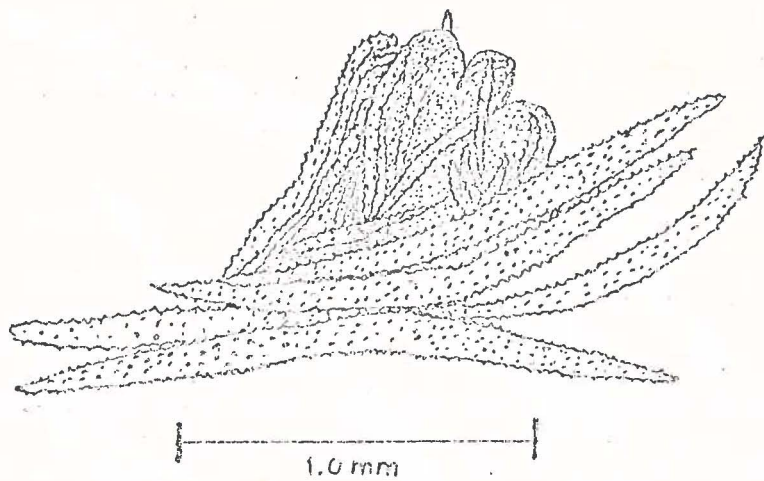


Fig. 124. *Stereonephthya* species 1, polyp, X46.

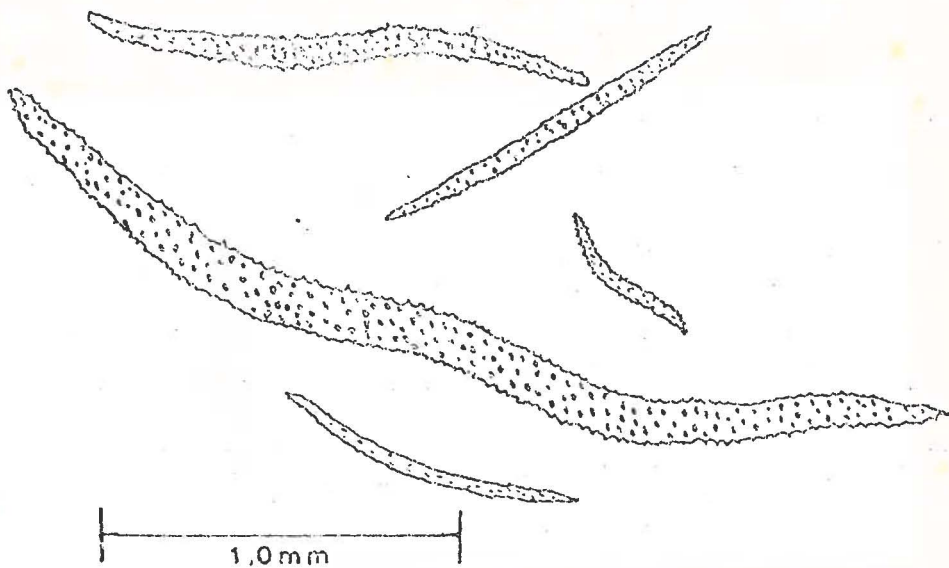


Fig. 125. *Stereonephthya* species 1, surface of branch, X46.

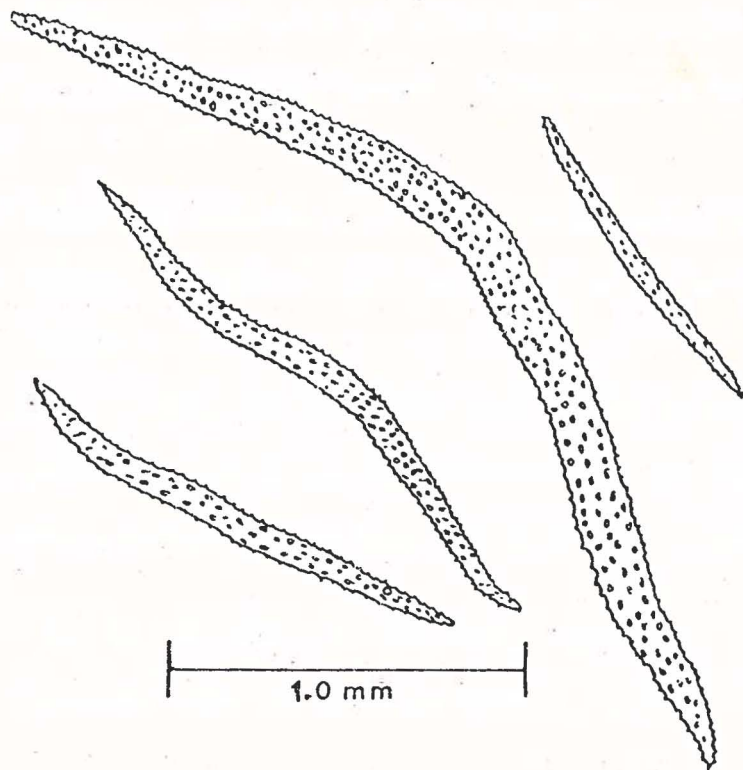


Fig. 126. *Stereonephthya* species 1, surface of base, X46.

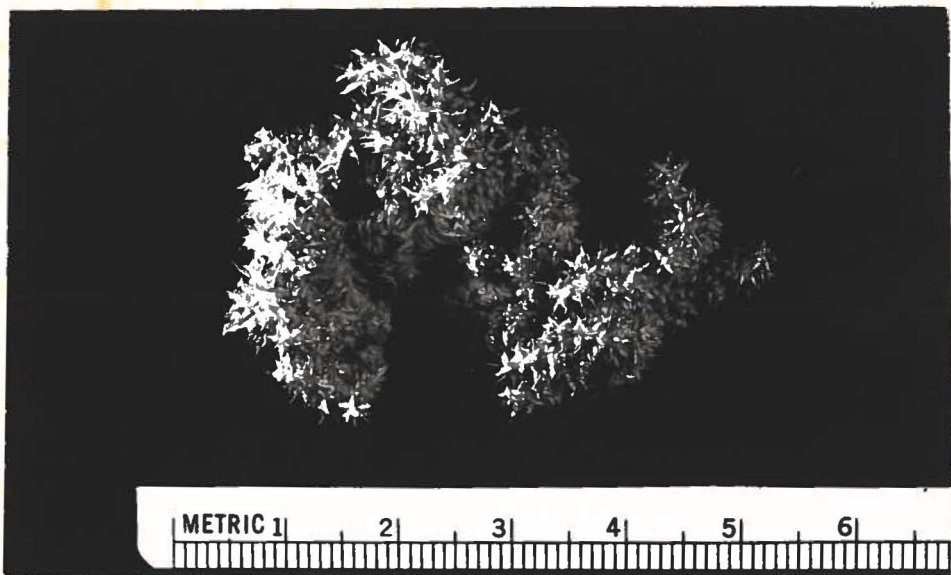


Fig. 127. *Stereonephthya* species 1, whole colony (MG 76.11.18.2).

XENIIDAE

The family XenIIDae contains at least eighty tropical Indo-West Pacific species in six different genera. Three species have been found on Guam.

Those of Guam bear numerous soft polyps which unite together in either a flat encrusting base (*Sympodium* and *Anihelia*) or an upright sterile stalk (*Xenia*).

Guam species are distinguished from soft corals of other families in that their polyps are large and less retractile, and their spicules are all very small, normally much less than 0.05 mm in length.

KEY TO THE GENERA OF THE FAMILY XENIIDAE

RECORDED FROM THE SHALLOW TROPICAL PACIFIC

1. Polyps are dimorphic: large autozooids with pinnules on their tentacles and smaller siphonozooids without pinnules on their tentacles *Heteroxenia*
1. Polyps are monomorphic: all autozooids with pinnules on their tentacles 2
- 2(1). Polyps arise from a thin, encrusting membrane, less than 5 mm thick, not a fleshy or stalk-like base 3
- 2(1). Polyps arise from a raised fleshy or stalk-like base 4
- 3(2). Polyps are less than 1 mm tall and retractable into the basal membrane. Sclerites are small and disc-like, less than 0.03 mm in diameter *Sympodium*

- 3(2). Polyps are taller than 2 mm, sometimes over 45 mm tall excluding tentacles. Sclerites, if present, are either rounded discs or elongate blunt-ended cylinders, usually 0.030 to 0.055 mm long *Antheia*
- 4(2). Stalk may be branched or not, with polyps all arising at the same level on the expanded top of the stalk (on the capitulum) *Xenia*
- 4(2). Stalk is branched with no distinct capitulum and with polyps arising at different levels on stalk branches *Cespitularia*

ANTHELLIA LAMARCK, 1816

Polyps arise from a membranous base. Size and distribution of sclerites are the same in the anthocodia and in the anthostele. Sclerites, if present, are minute flattened rods with rough or toothed margins and are evenly distributed throughout the surfaces of the polyp. Some species lack sclerites completely.

ANTHELLIA GLAUCA LAMARCK, 1816

Fig. 128, 129, and 130. Plate XI.

Anthelia glauca Lamarck, 1816:407; Ehrenberg, 1834:54; Klunzinger, 1877:45; Thomson and Mackinnon, 1910:170; Thomson and Dean, 1931:9; Roxas, 1933a:67; Verseveldt, 1960:247; Tixier-Durivault, 1966:349.

MATERIAL: MG 73.11.16.3, Facpi Island; MG 74.3.4.1, Nimitz Beach Reef.

DESCRIPTION: Colonies are not stalked, but have a thin encrusting base usually less than 3 mm thick and 10 cm in diameter giving rise to large polyps which may be up to 4 mm apart but more often have no space between the polyp bases when alive. Living polyps may be as much as 1.5 cm tall. They do not regularly pulsate.

Living color is white or pinkish white.

Pinnules occur in one, two, or three rows on each lateral side of each tentacle with ten to eighteen pinnules in the outer row. If two or three rows occur, the inner ones have fewer pinnules. The largest pinnules are in the middle of the outer row and may be up to 0.6 mm long on preserved specimens.

The tentacles are 0.5 to 1.6 mm wide at their base and 3. to 7 mm long.

Polyps are 8 to 16 mm tall, excluding tentacles. Sclerites are present in the form of rough-surfaced rods 0.035 to 0.050 mm long by 0.012 to 0.015 mm wide. They are very numerous on the tentacles.

REMARKS: This species is quite variable in its numbers of pinnules and rows of pinnules. Its sclerites and colony shape are good distinguishing characteristics.

DISTRIBUTION AND HABITAT: *Anthelia glauca* has been found on reef fronts of leeward Guam from 2 to 12 m deep among living stony coral communities.

It has been previously reported from the Red Sea, Madagascar, Indonesia, and the Philippines.

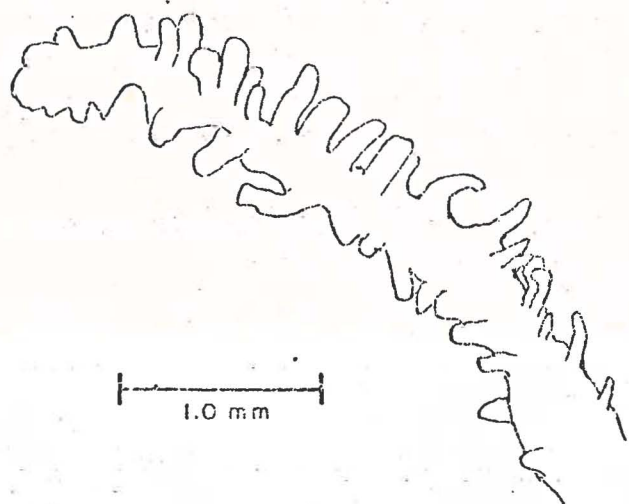


Fig. 128. *Anthelia glauca* Lamarck, tentacle, X26.

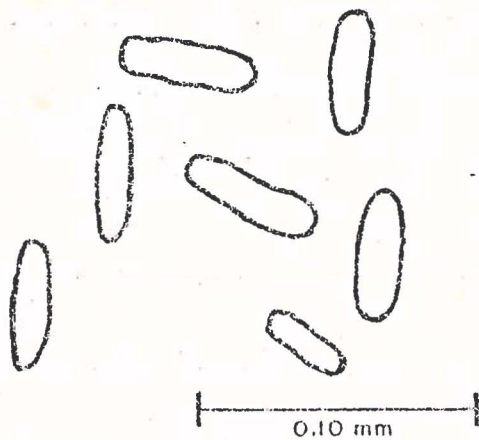


Fig. 129. *Anthelia glauca* Lamarck, sclerites, X360.

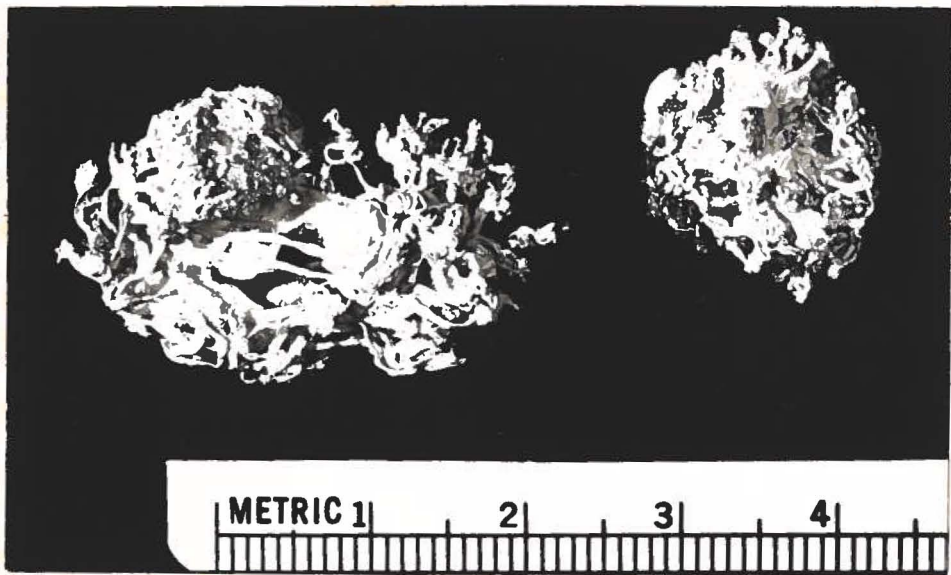


Fig. 130. *Anthelia glauca* Lamarck, two colonies on rock substrate (MG 73.11.16.3).

SYMPODIUM EHRENBERG, 1834

Polyps arise from a thin membranous base. They are monomorphic, numerous, evenly distributed, retractile, and are sunk deeply into the basal membrane. The sclerites are oblong, flattened, and less than 0.03 mm long.

SYMPODIUM COERULETUM EHRENBERG, 1834

Sympodium coeruleum Ehrenberg, 1834:61; Klunzinger, 1877:42; Wright and Studer, 1889:270; Hickson, 1931:174; Roxas, 1933a:107.

MATERIAL: MG 74.5.2.1, Cocos Barrier Reef.

DESCRIPTION: The thin, encrusting membranous colony is only a few millimeters thick, with no lobes or projections. It is smooth and soft.

Living specimens are white with a sky-blue tinge.

Numerous short polyps are variably distributed. There are about 0.8 to 2.0 mm between closest polyp centers. The polyps are about 0.6 mm in diameter and seem to be under 1 mm tall and partly retractile into the colony coenenchyme.

The sclerites are extremely small, flat, oval, or hexagonal discs 0.015 to 0.025 mm long.

REMARKS: Besides being very thin, this membranous species only seems to grow a few centimeters in diameter. Therefore, it is easily overlooked. It has the smallest sclerites of any of the Guam Alcyonacea.

DISTRIBUTION AND HABITAT: This species has been found eight meters deep at the Manell Channel margin outside Cocos Barrier Reef and four meters deep at the reef front of Tumon Bay. It grows among living stony corals and coralline algae.

It has also been reported from the Red Sea, the Philippines, and Australia.

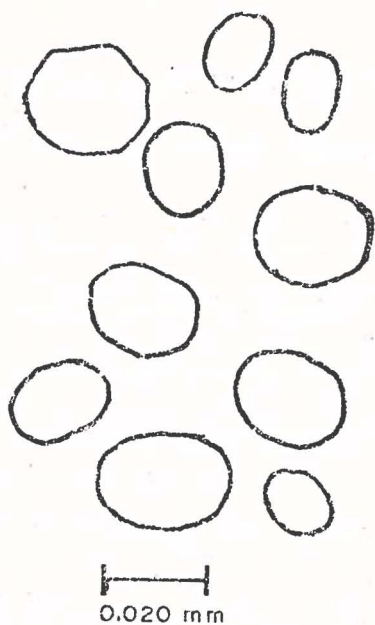


Fig. 131. *Sympodium coeruleum* Ehrenberg, sclerites, X700.

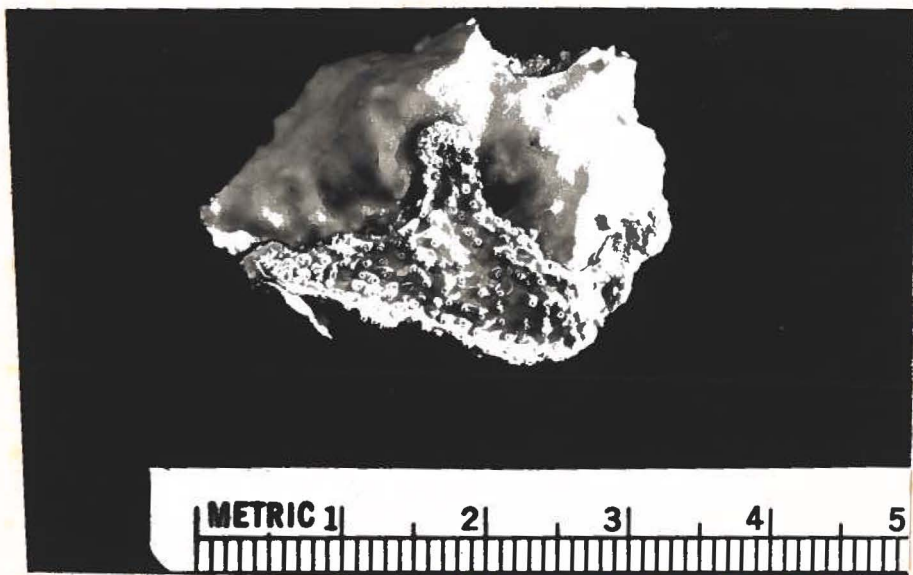


Fig. 132. *Sympodium coeruleum* Ehrenberg, whole colony on rock substrate with coralline algae (MG 74.5.2.1).

Two soft corals dredged from depths greater than 35 m at Guam have been identified as:

DENDRONEPHTHYA (ROKASIA) MIRABILIS HENDERSON, 1909:49.

DENDRONEPHTHYA (ROKASIA) DICHOTOMA HENDERSON, 1909:62.

These have never been seen by the author while diving and probably do not occur in shallower environments of Guam. Therefore, they are not included in the descriptions and discussions of this paper.

A single species of the family Nidaliidae, identified as:

SIPHONOGORGIA VARIABILIS (HICKSON) 1903:488.

has also been dredged off Guam and was observed on deep dives at depths over 30 m.

CONCLUSIONS

An evaluation was made of characters useful for the determination of genera and species of soft corals from shallow waters of the tropical Pacific. Those characters considered include: gross morphology, color, dimorphism, size and arrangement of polyps, of tentacles, and of pinnules of tentacles, nematocysts, vascular canal systems, rhythmic polyp movement, surface texture, sclerites, habitat, reef zone, and depth. Nematocysts are uniform rhabdoid heteronemes in all soft coral species. All other characters considered were taxonomically useful to various degrees. The most important of all were sclerites and gross morphology.

The family *Asterospiculariidae* is comprised of only one genus and two species, which are distinguished by the kinds of sclerites in different parts of the polyps and the presence or absence of pinnules on the tentacles.

The family *Alcyoniidae* is divided into genera on the basis of gross shape of the colony, dimorphism, size, and arrangement of the polyps, size and shape of the sclerites, and depth of distribution. Genera of Guam include *Alcyonium*, *Cladiella*, *Lobophytum*, *Sarcophyton*, and *Sinularia*. *Alcyonium* is monotypic on Guam. The three *Cladiella* species are distinguished by the size and shape of their sclerites and gross colony shape. The two *Lobophytum* species of Guam are identified by their sclerite shape and their polyp size and arrangement. The two *Sarcophyton* species of Guam have very different sclerites and polyp sizes. The thirteen species of Guam *Sinularia* are separated by their

differences in gross colony shape and in sclerites from both the surfaces and the interiors of their bases and lobes.

The genera of the family Nephtheidae are distinguished by polyp arrangement, sclerite distribution, and gross morphology. Only the genera *Nephthea* and *Stereonephthya* were collected in shallow Guam waters. A single species of *Nephthea* is found at Guam. The three species of Guam *Stereonephthya* differ in orientation and size of polyps, kinds of sclerites, and depth distribution.

The genera of Xenidae, which are monotypic on Guam, are determined by their gross morphology, polyp size or dimorphism, and kind of sclerites. *Anthelia*, *Symplegium*, and probably *Xenia* are found at Guam.

The gross shapes and colors of living specimens of most species of Guam soft corals are extremely variable. Microscopic examination of the sclerites of each specimen is required for most species identification.

Zonation and depths are not strictly delineated for most species. However, *Sinularia* species 1 and *Stereonephthya* species 1 are always found deeper than 5 m, while *Asterospicularia randalli*, *Sinularia polydactyla*, and *Sinularia* species 6 are typically found close to low tide level.

Guam's soft coral fauna does not show any close affinity to that of other areas that have been studied. The very widespread common species occur in Guam while two Guam species have been previously recorded in only the Red Sea and the western Indian Ocean and at least two others are endemic species.

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Table 4. Worldwide distribution records of species of Alcyonacea collected at Guam.

Location Species	Red Sea	Madagascar	Indian Ocean Islands	Indonesia	Great Barrier Reef	Fiji	Tonga	New Caledonia	Polynesia	Tuvalu	Marshalls	Palau	Philippines	Bonins	Japan	Taiwan	Viet Nam	Ceylon
<i>Asterospicularia randalli</i>																		
<i>Alcyonium utinomi</i>	X	X																
<i>Cladiella pachyclados</i>	X	X	X	X				X					X			X		X
<i>Lobophytum crebrifoliatum</i>								X				X	X	X	X			
<i>Lobophytum pauciflorum</i>	X	X	X	X				X		X	X		X		X		X	X
<i>Sarcophyton glaucum</i>	X	X	X	X		X		X		X		X	X			X	X	
<i>Sarcophyton trocheliophorum</i>		X	X	X		X		X		X	X	X	X		X	X	X	
<i>Simularia arborea</i>		X																
<i>Simularia densa</i>	X	X	X	X					X	X							X	X
<i>Simularia maxima</i>		X	X															
<i>Simularia polydactyla</i>	X	X	X	X				X	X		X	X	X			X	X	X
<i>Nephthea gracillima</i>				X														
<i>Stereonephthya ulicoides</i>				X														
<i>Stereonephthya unicolor</i>								X										
<i>Anthelia glauca</i>	X	X	X	X									X					
<i>Sympodium coeruleum</i>	X												X					

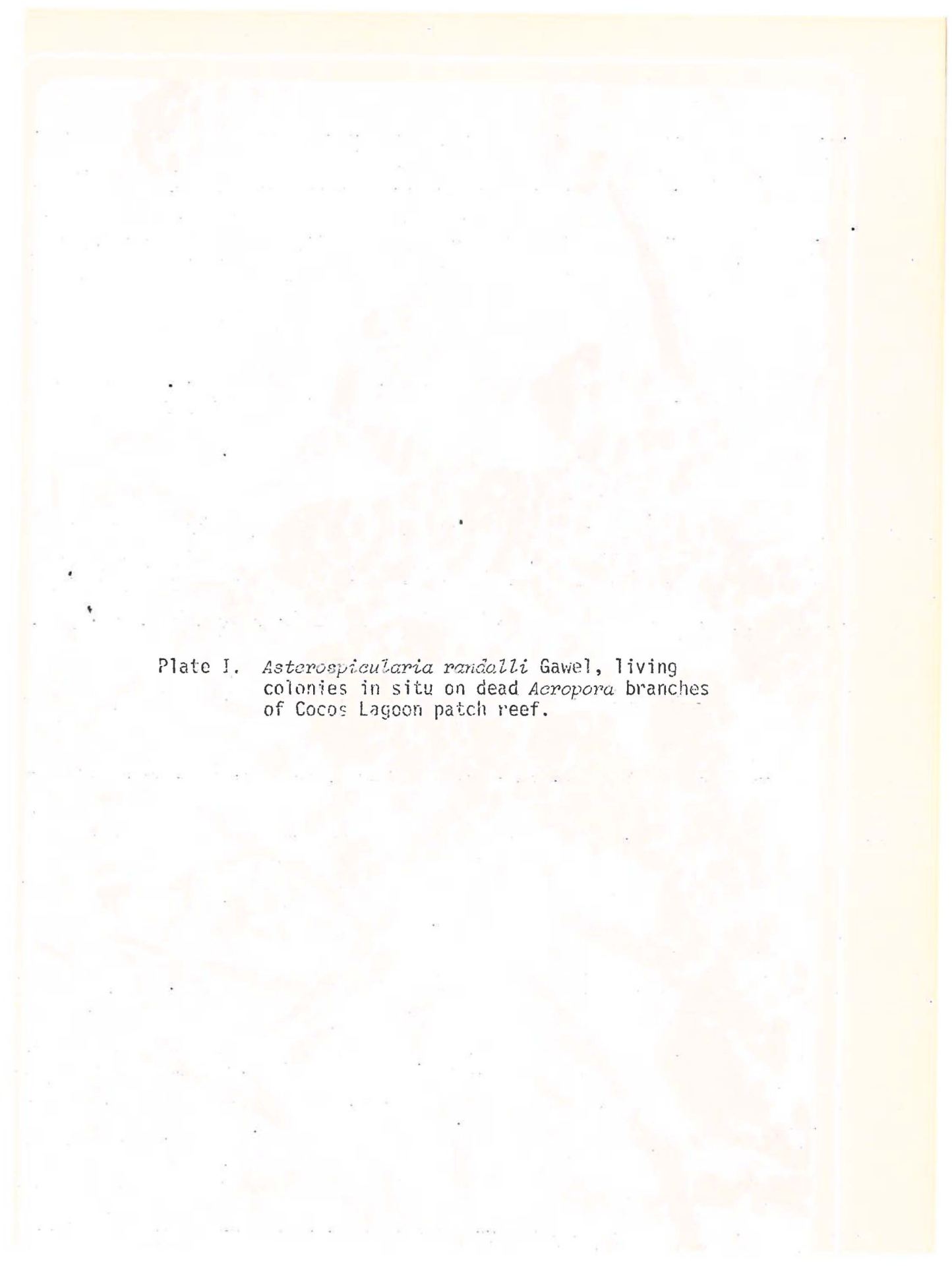


Plate I. *Asterospicularia randalli* Gawel, living colonies in situ on dead *Acropora* branches of Cocos Lagoon patch reef.



Plate II. *Cladiella* species 2, living colony in situ
at Taogam Point reef front.



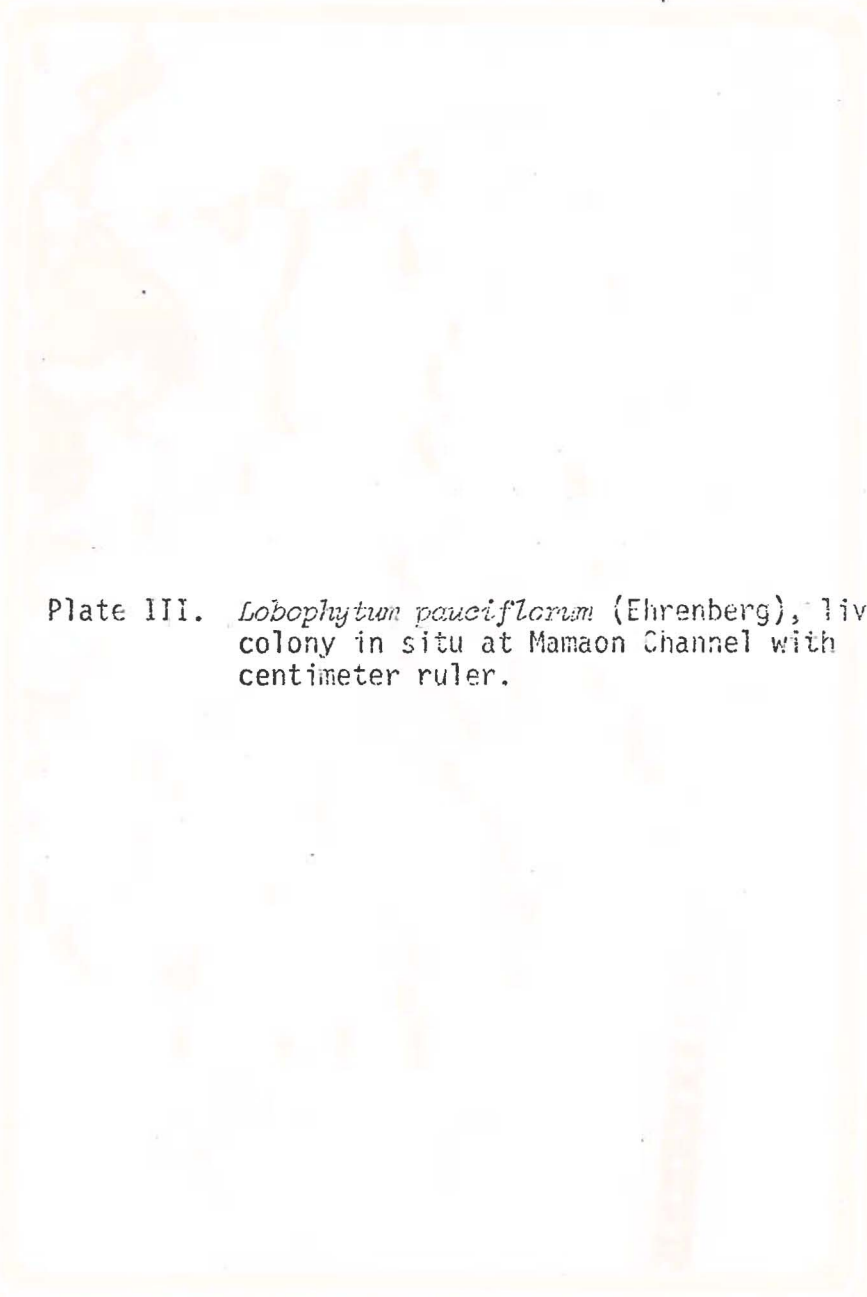
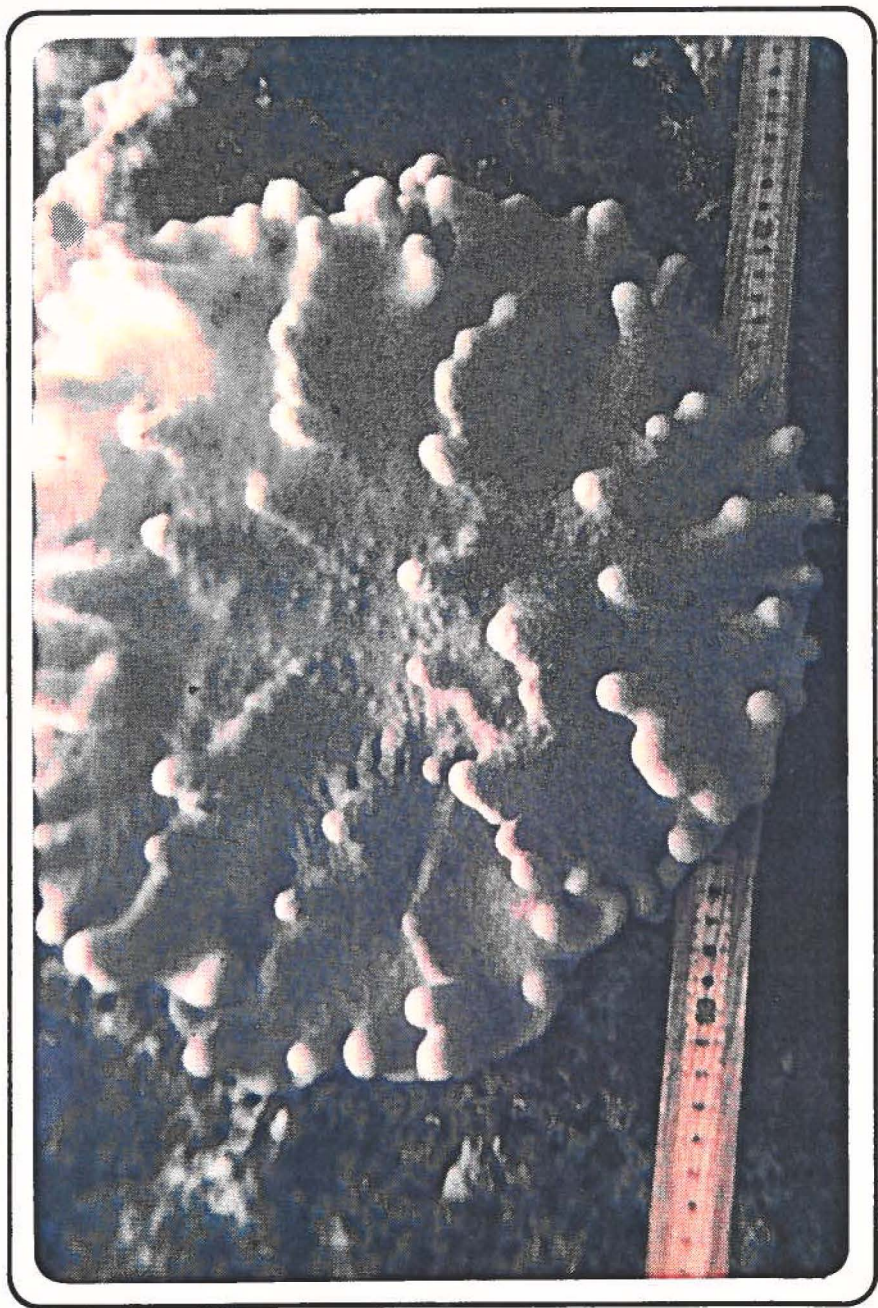


Plate III. *Lobophytum pauciflorum* (Ehrenberg), living colony in situ at Mamaon Channel with centimeter ruler.



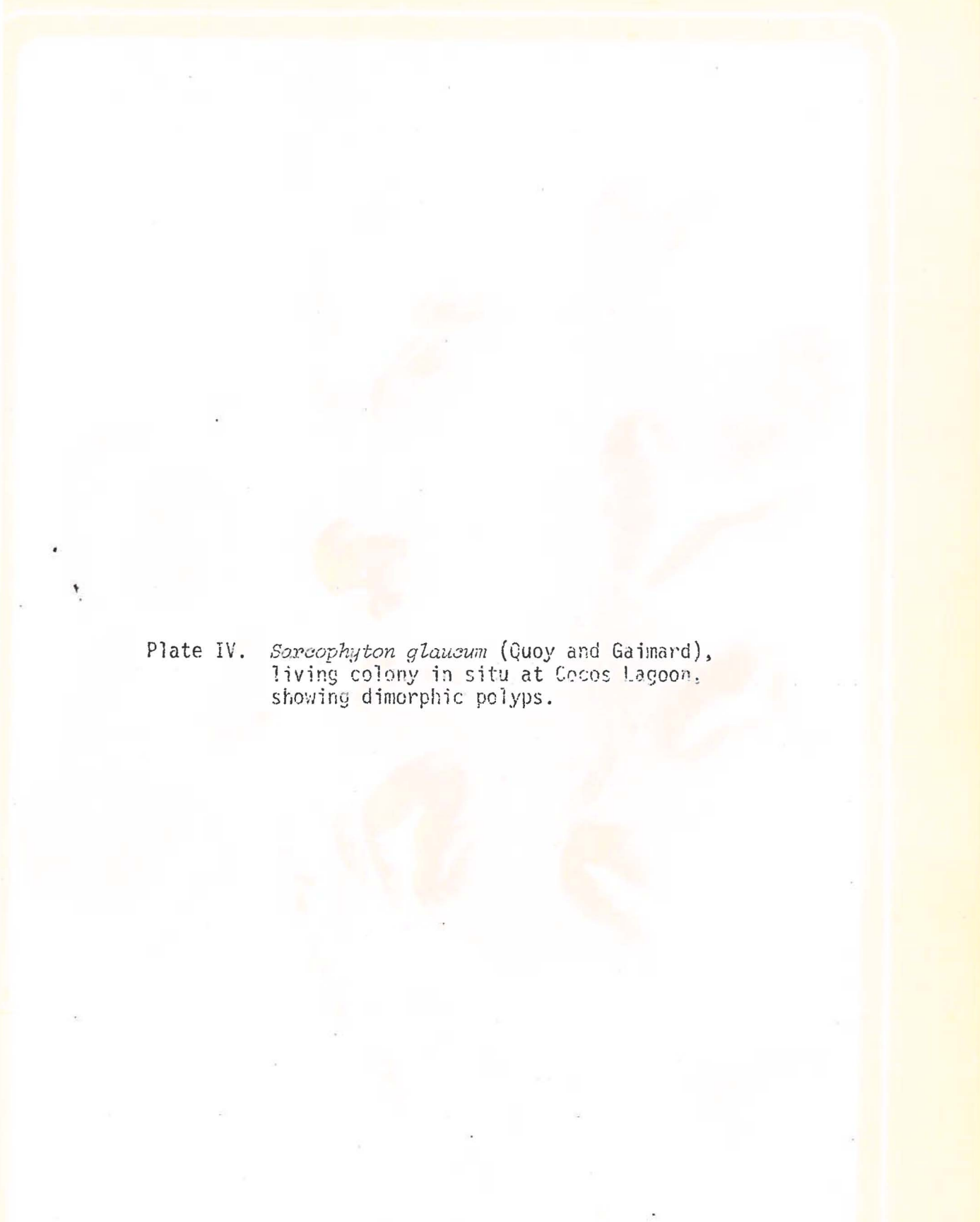


Plate IV. *Sarcophyton glaucum* (Quoy and Gaimard),
living colony in situ at Cocos Lagoon,
showing dimorphic polyps.

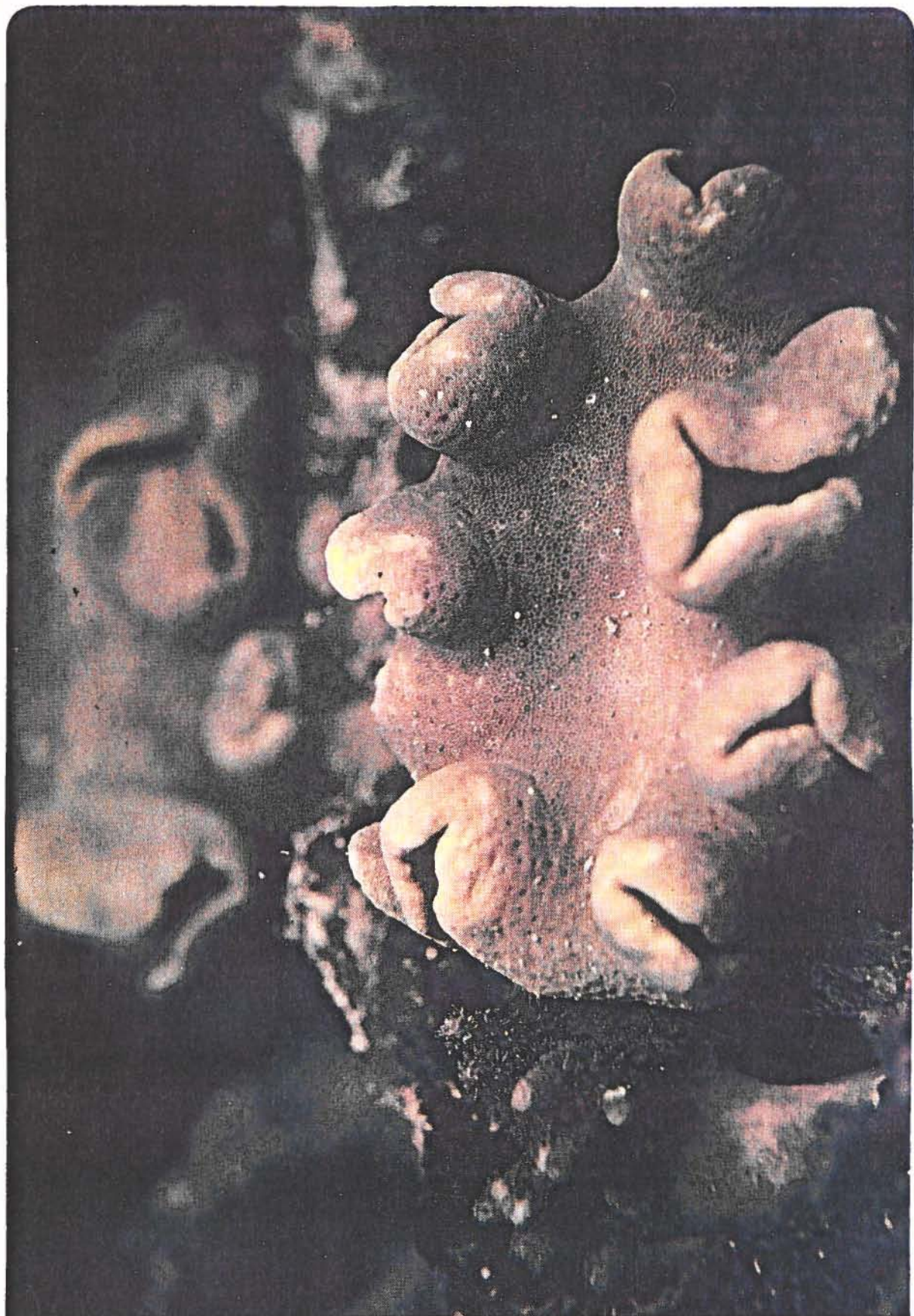


Plate V. *Sarcophyton glaucum* (Quoy and Gaimard),
living colonies in situ at Facpi Island
terrace, showing expanded and contracted
examples.

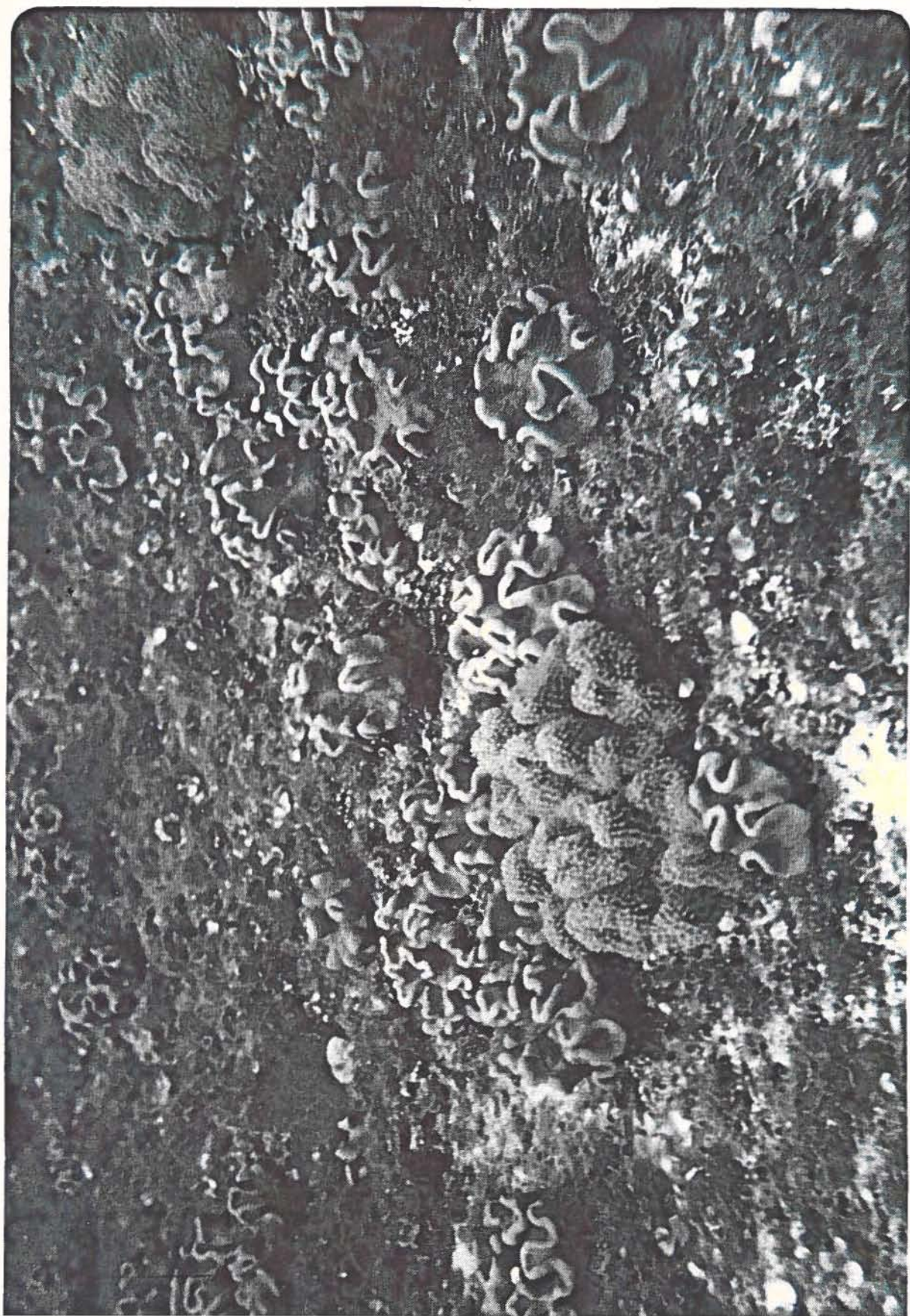
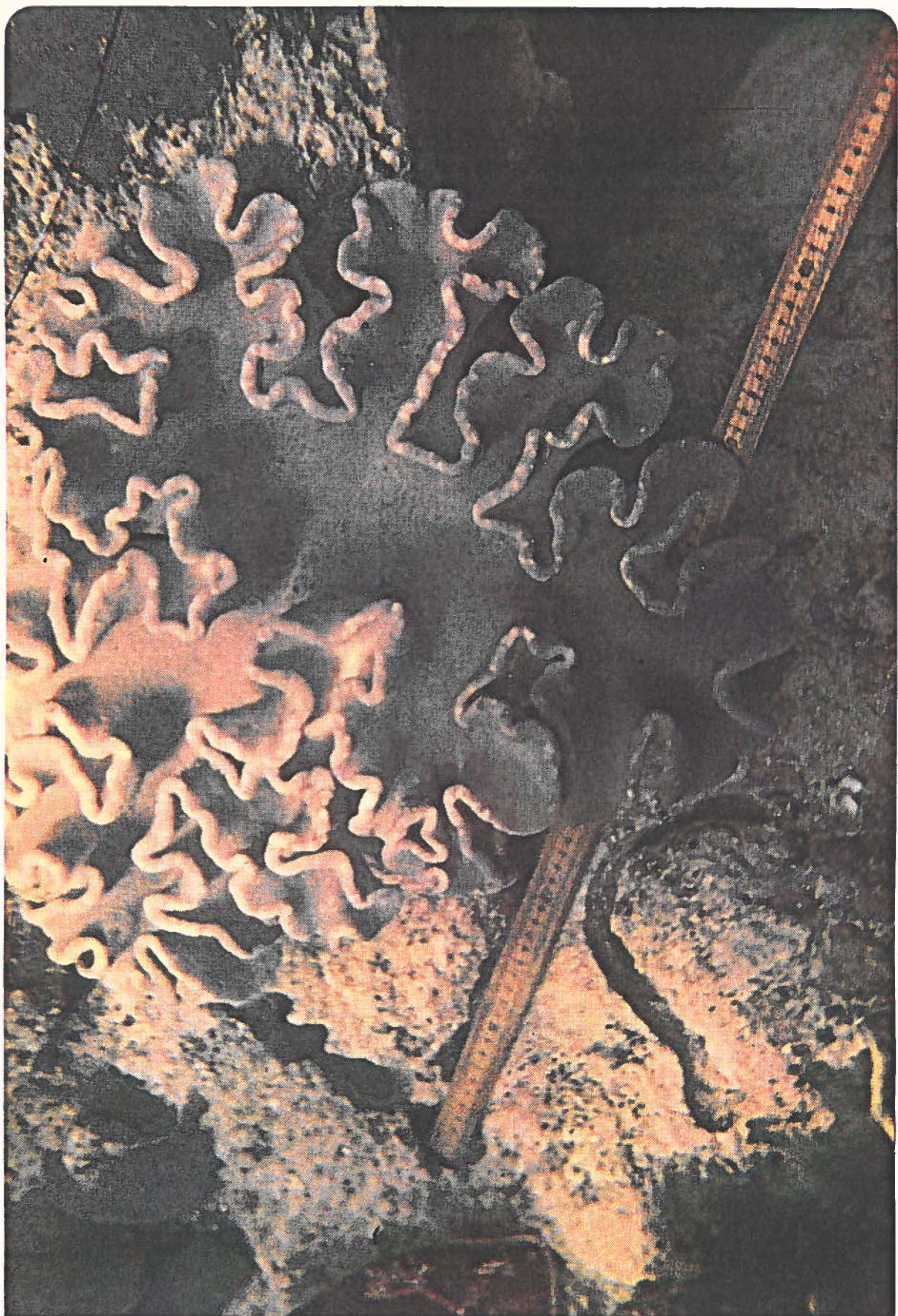


Plate VI. *Sarcophyton trocheliophorum* (Von Marenzeller),
living colony in situ at Mamaon channel with
centimeter ruler.



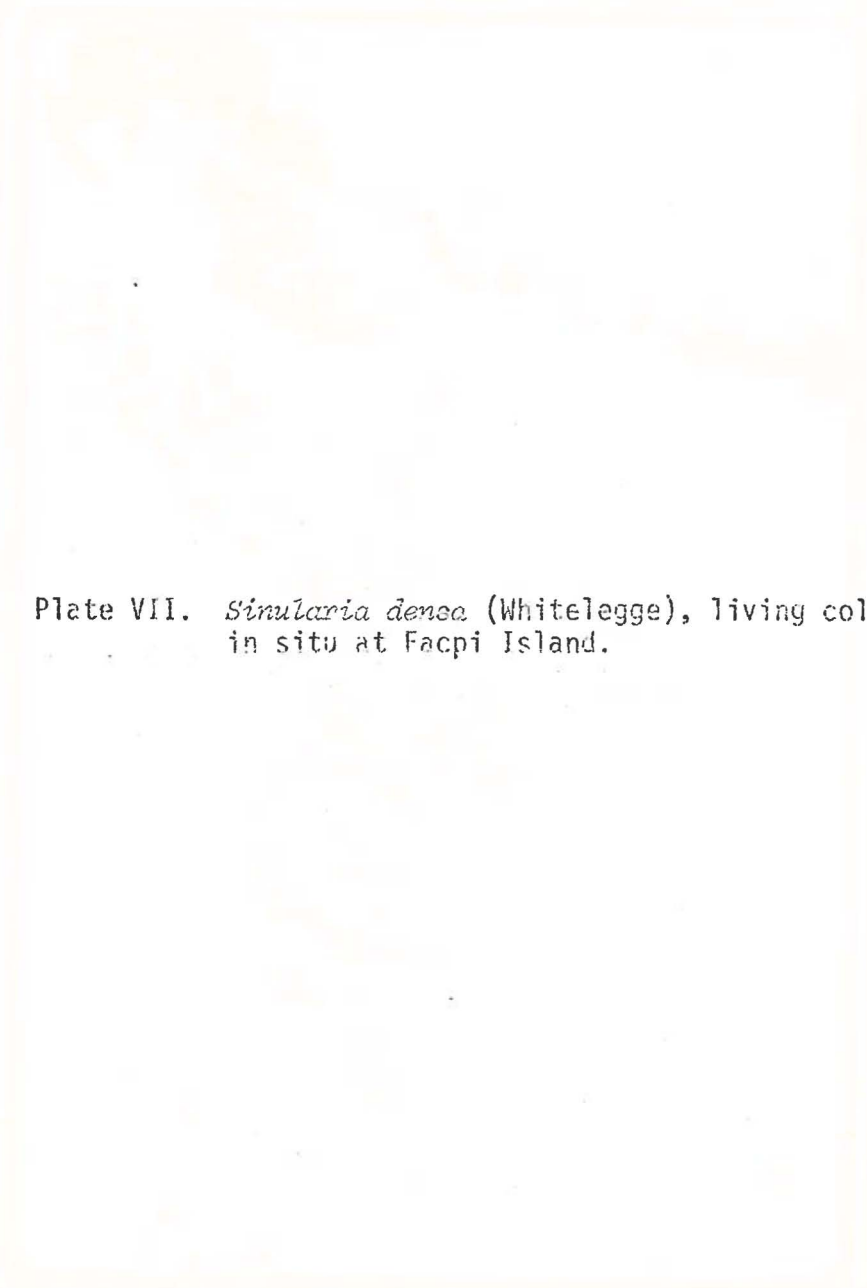
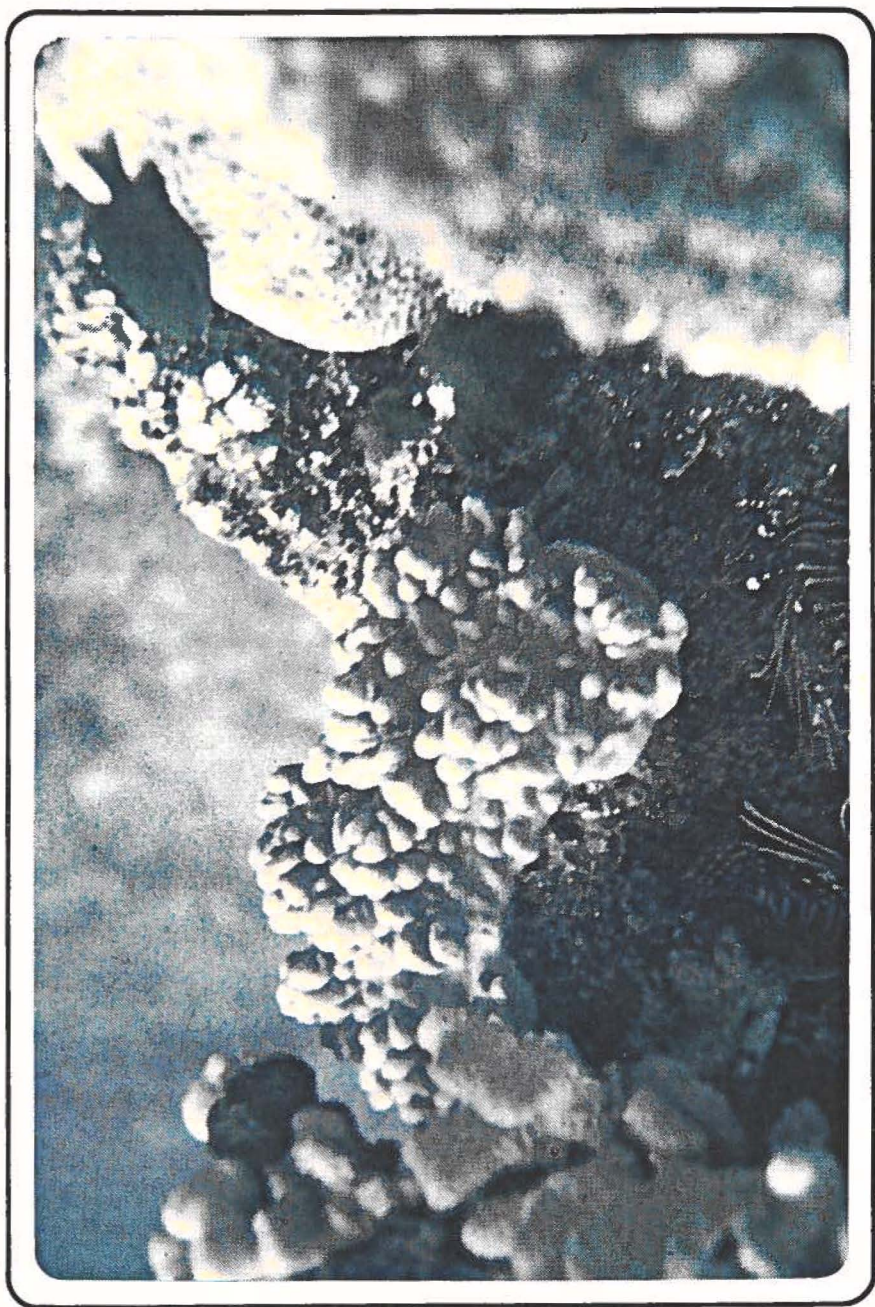


Plate VII. *Simularia densa* (Whitelegge), living colony
in situ at Facpi Island.



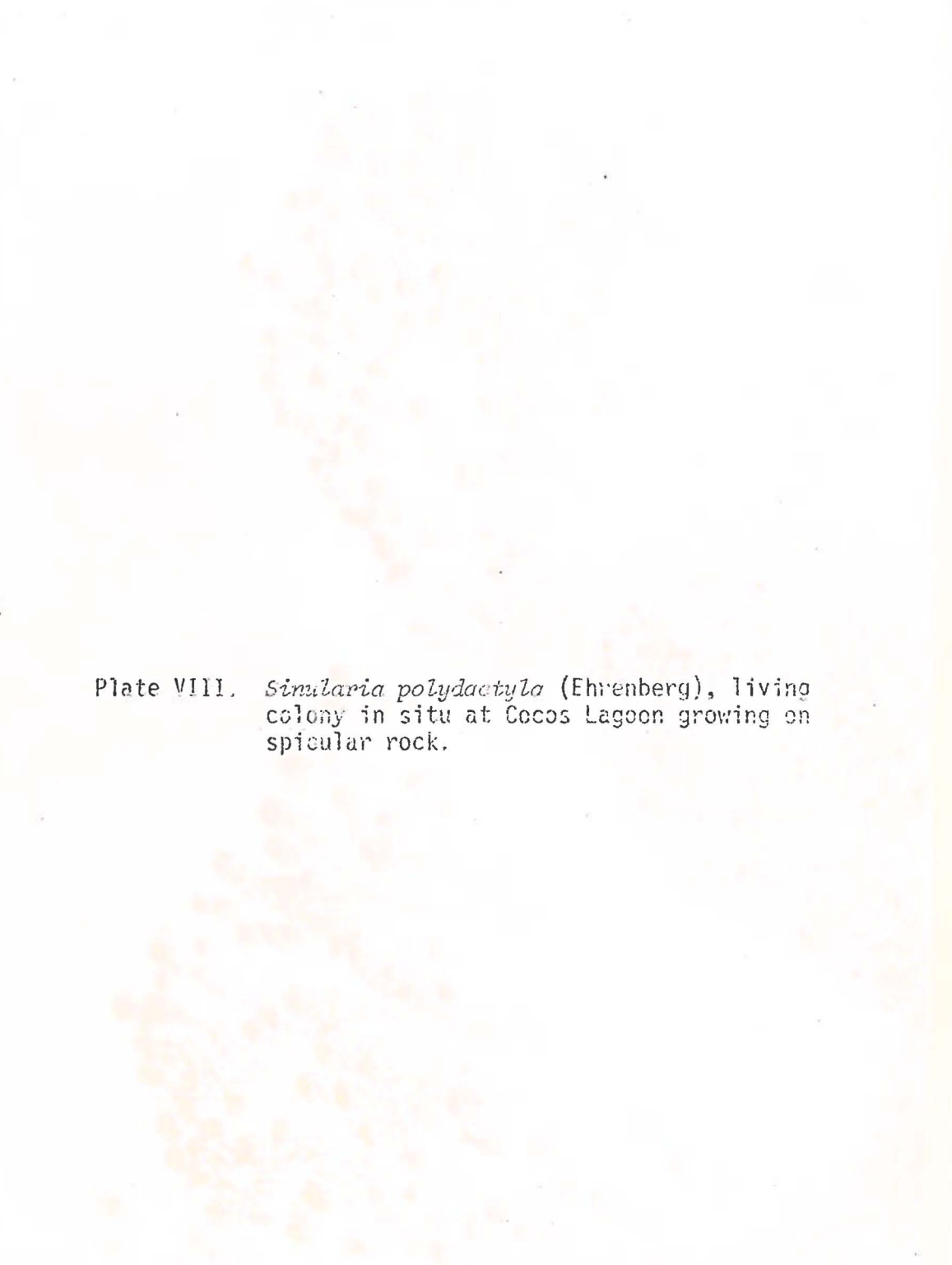


Plate VIII. *Simularia polydactyla* (Ehrenberg), living colony in situ at Cocos Lagoon growing on spicular rock.

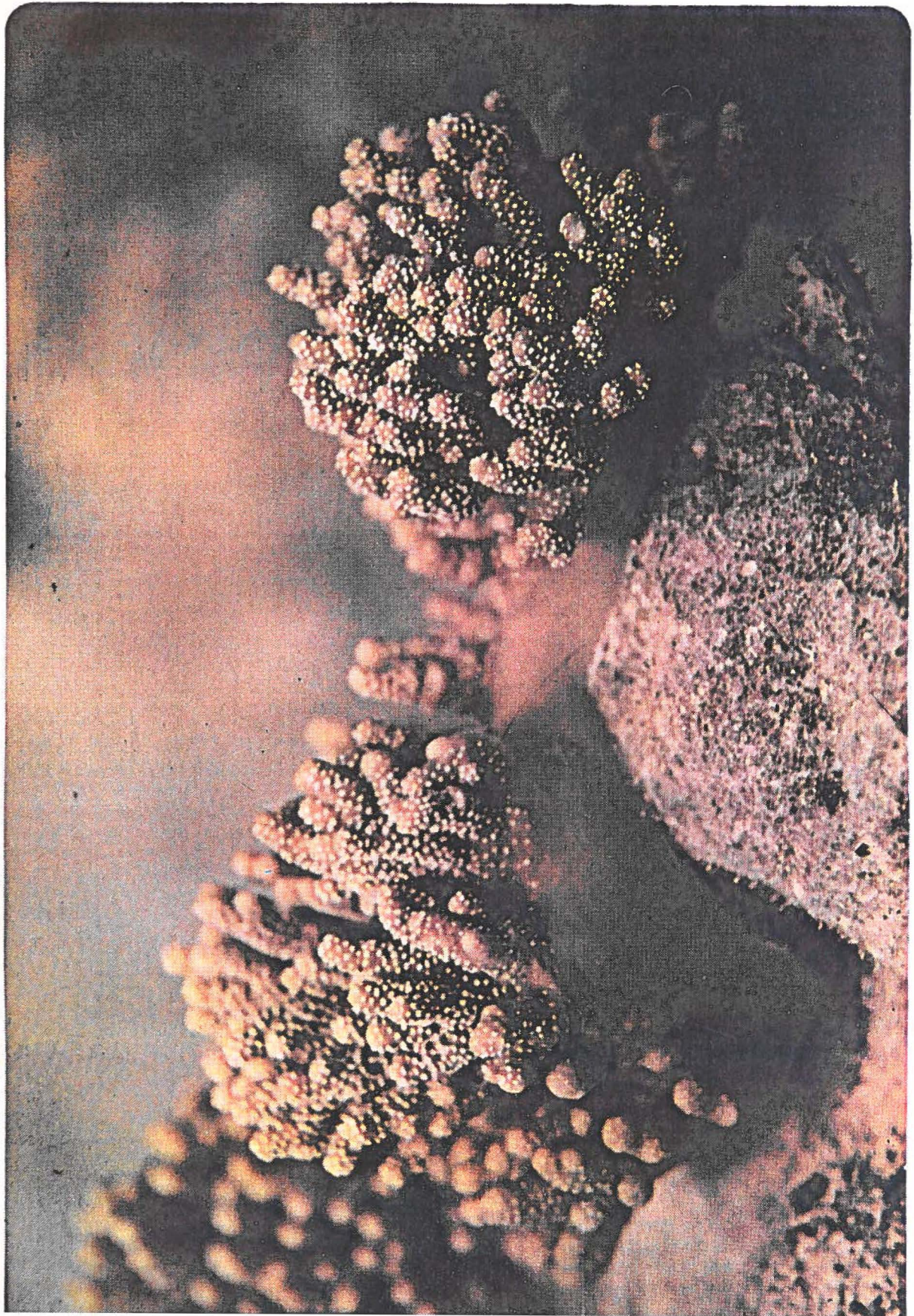


Plate IX. *Sinularia* species 6, living colony in situ
at Cocos Lagoon with polyps contracted.



Plate X. *Similaria* species 9, living colony in situ
at Cocos Island reef.

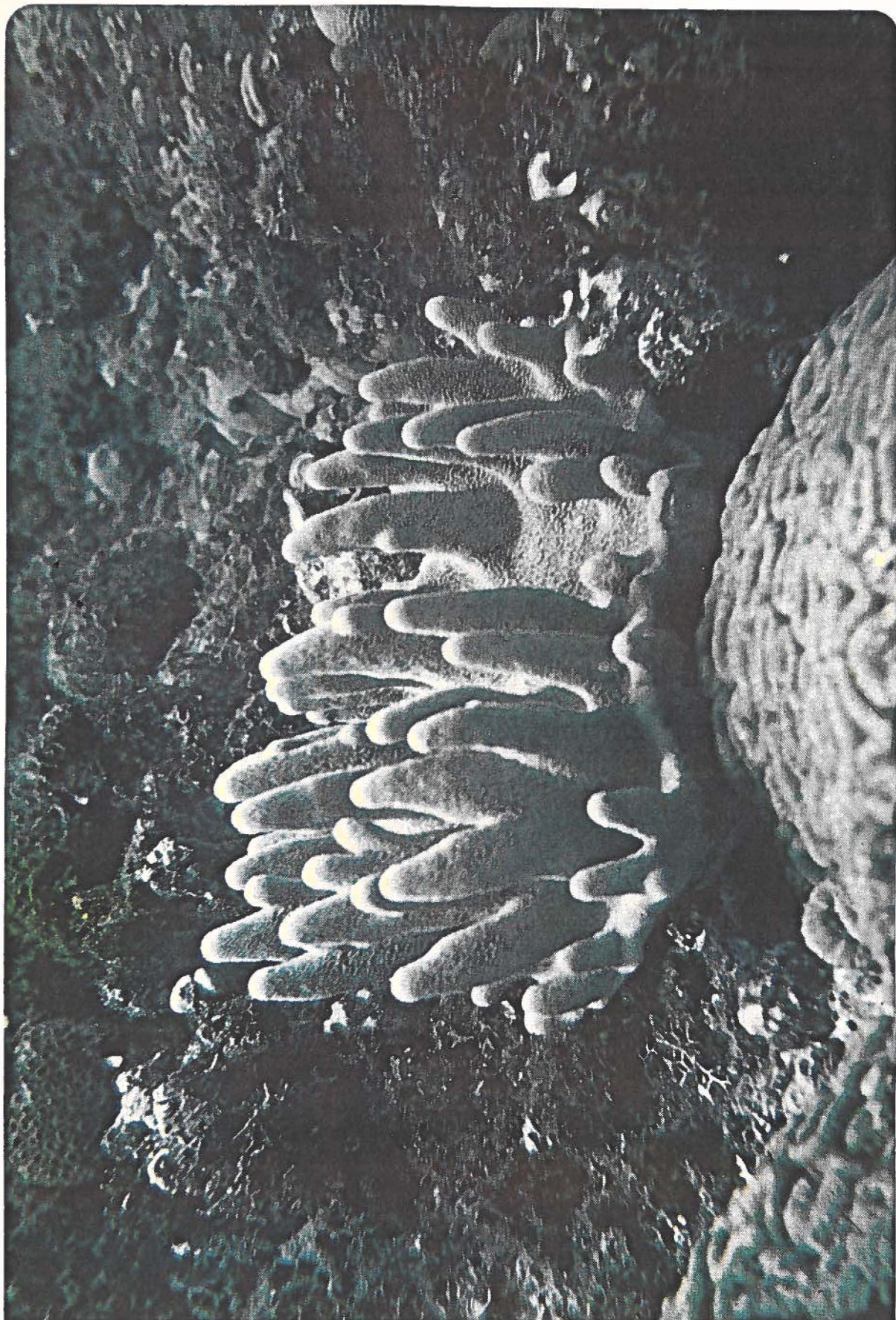


Plate XI. *Anthelia glauca* Lamarck, living colonies in
situ at Facpi Island.

