Shallow-Water Stony Corals of Puerto Rico

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SHALLOW - WATER STONY
CORALS OF PUERTO RICO

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ABSTRACT

Periodic collection of shallow-water stony corals in Puerto Rican waters has yielded thirty eight species which are briefly described. All species can be found on the reefs at La Parguera, southwestern Puerto Rico.

At La Parguera, two lines of barrier-type reefs lie offshore and parallel to the shore. Patch reefs are found dose to shore. Most of the species are found near the east ends of the linear reefs in the open hack-reef waters.

Off the northeastern tip of Puerto Rico, a line of small cays have well-developed fringings reefs on their northeast sides and *patch reefs on* their southwest sides. Incomplete collecting in this area has yielded twenty species.

INTRODUCTION

This paper provides an illustrated checklist of the shallow-water stony corals of Puerto Rico. It has been compiled as an aid to biological and geological studies of the near-shore marine environments now' being initiated in Puerto Rico (Almy, 1962, editorial and pp. 18, 21 ; Heatwole, 1962) and it brings up to date previous listings of Puerto Rican corals (Vaughan, 1901, pp. 289-320). The list is presented with the understanding,: that additions will be made as work in the island's coastal waters progresses. However, the writers believe that all of the more common stony corals of the Puerto Rican reefs have been included in this report.

Although corals are found in most of the island's coastal waters and coral-supported reefs are well developed on the east, south, and southwest coasts, the greatest number of species (all of the ones listed here) is to be found on the reefs at La Parguera on the southwest coast, Furthermore, collection at La Parguera is facilitated by the presence of the Marine Laboratory of the Institute of Marine Biology, which is associated with the University of Puerto Rico at Mayaguez. Other areas of exceptional reef development arc found off the northeast corner of Puerto Rico among the islands near Las Croabas and east of La Parguera along the south coast.

Collections were made at several places along the coast. Collection was begun in July of 1961 and continued periodically until June, 1962, Specimens were collected by wading or skin-diving with snorkel only. Thus a maximum depth limit of thirty feet may be assumed for all specimens. Specimens were prepared by thorough washing with fresh water jetted through a garden hose as soon as possible after collection, They were then sun-dried, Photographs were made by the writers except where noted, The specimens are available for study in the Geology

Section of the University of Puerto Rico in Mayaguez, or at the Marine Laboratory at La Parguera.

As full, technical descriptions are present in the literature and as this paper is to serve as a check-list only, the writers have presented brief notes on the characters of each species rather than full descriptions. Notes on the habitat are also presented for many species. The user of this list is urged to supplement it with the references given at the end of the paper, Squires (1956, pp. 222. 224) discusses previous work and presents an extensive bibliography on corals of the West Indies.

The writers wish to thank Dr. Juan A. Ri. vero, director, and Dr. John E. Randall, acting director, Institute of Marine Biology at the University of Puerto Rico in Mayaguez, for their assistance, for making the facilities of the Institute available, and for supplying funds for the plates. The manuscripts was reviewed by Prof. John W, Wells of the Department of Geology, Cornell University, Ithaca, New York, and the writers are very grateful for his help. However, all errors rest with the writers alone. Support for the project was also given by the Geology Section and by the Institute of Caribbean Studies of the University of Puerto Rico at Mayaguez, Puerto Rico.

DESCRIPTION OF COLLECTING SITES

A narrow shelf surrounds the island of Puerto Rico (fig. 1). At Punta Rinc6n on the west end of the island, the shelf is a thousand yards wide. The shelf is one to two miles wide along the north coast, where the island is bordered by the Puerto Rican trench, The shelf is widest on the east where it extends away from Puerto Rico towards the other islands in the Antillean island arc. Along the south side of Puerto Rico, the shelf is eight miles wide and drops from 70 feet to 1800 feet at its margin. From this point the bottom slopes gently to the abyssal depths of the Caribbean sea floor. Southwest of the island, the shelf extends seaward for thirteen miles,

Winds and waves from the Atlantic strike the island from the east and northeast almost constantly. Oceanic currents flow along the north and south coast from east to west. However, Kaye (1959, pp. 54-56) discusses a periodic reversal of currents on the north coast. The north and east coasts are subjected to intense wind and wave action, whereas the south and west coasts are subjected to much gentler waves and winds except during major storms. The Cordillera Central trends east-west across the island and causes a considerable reduction of rainfall from northeast (200 inches in El Yunque) to southwest (30 inches at La Parguera). Thus high rainfall, high rate of run-off, the resulting high rates of erosion and sedimentation. and the long-shore currents that move mate. rial westward along the coast provide sufficient explanation of the lack of reef development along the western two-thirds of the north coast. However, individual colonies do occur alone this coast. One other factor is that the more intense wave action along the north coast must have beveled the shelf area quite thoroughly and removed any prelections above the bottom that would provide a suitable place above the sediment for reef growth. Reef growth occurs at San Juan and is increasingly better developed to the east. Reefs are especially well developed around the islands east of the northeast tip of Puerto R (La Cordillera and the islands in Vieques Sound).

Small reefs occur in great abundance all along the south coast. However, reef deve-lopment is maximum where rainfall is low, river influx is small. and waves and currents are strong. One other factor seems to be the presence of suitable sites slightly raised above the bottom on which the reefs might develop. Such an irregular bottom may have been formed on the south coast shelf prior to reef development because waves strike the south coast less directly and less forcibly (because of wider shelf and direction of approach) than they strike the north coast.

The reefs on the west coast seem to be dying because of an increase of sediment influx, water turbidity, and lack of strong wave action (Kaye, 1959, p, 107).

SOUTHWEST COAST

La Parguera (Plate I and fig. 1). The coast at the fishing village of La Parguera is in the form of a broad landward indentation. A low curved cuesta of southward dipping Cretaceus limestone occurs immediately north of the coast and seems to have controlled the shape of the coast, the shelf off La Parguera is approximately five miles wide. This shelf probably at one time was an erosion surface. subject either to wave action or to subaerial processes. The surface of the shelf therefore may depend for its shape upon the structure of the underlying rocks or upon the distribution of sand dunes along an old shore similar to those developed along the north coast (Kaye, 1959, pp. 79-82). Such considerations may provide a partial explanation of the linearity of the reefs as discussed below.

Upon the shelf some two miles from shore is a line of elongate reefs, the reefs arranged in *en echelon* fashion so that the line of reefs trends eastward, while each reef faces the incoming waves from the east-southeast. A second line of reefs occurs closer to shore and makes an arc, convex to the south, in front of La Parguera. These inner reefs are also elongated and also face the incoming waves from the east-southeast. In general, the reefs are not large, although certain ones such as Arrecife Margarita reach a length of almost two miles. The reefs represent poorly formed barrier reefs or ribbon reefs (Fairbridge, 1950, as quoted by Kaye, 1959, p, 106). South of the outer reef line to the edge of the shelf water depths are fifty to seventy feet with certain elongate ridges parallel to the coast interrupting the gradual

outward slope of the shelf, Between the outer and inner reefs, depths are also fifty to seventy feet. The channel bottoms here contain fine-to medium-grained calcareous sand, between the inner reef line and the shore, many small patch reefs are found in varying stages of development. The inner part of the shelf is now being raised to sea level and above by the fairly rapid growth of these patch reefs and the subsequent spread of mangroves over their surface, as well as by normal sediment accumulation.

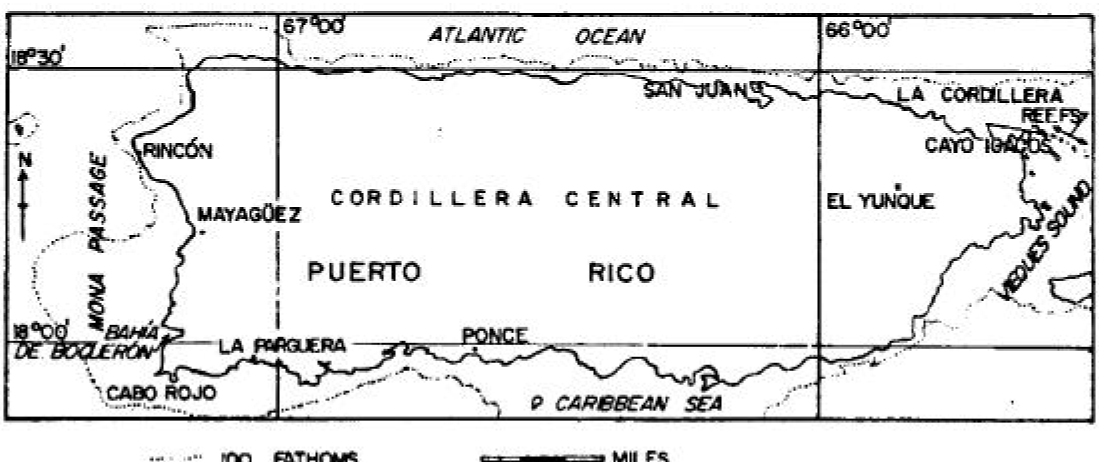


FIGURE I: INDEX MAP TO PUERTO RICO SHOWING LOCALITIES DESCRIBED IN THE TEXT

For a discussion of the general hydrographic conditions in the waters near La Parguera, the reader is referred to Coker and Gonzalez (1960, pp. 11-16). From that paper the following summary may be made:

1. There is one high and on low tide daily with a range of less than one foot.
2. La Parguera receives an average rain-fall of 30 inches annually which is offset by an annual average evaporation rate of 80 inches. The land area is semi-arid.
3. Salinity varies two to three parts per thousand during the year and averages 35.4 ppt.
4. Surface temperatures have a fairly small range that for 1958 was from 25.5°C to 32.0°C.
5. Winds are from the southeast or east-southeast and freshen in the forenoon.
6. Water movement is westward and parallel to the coast.

Of the outer reefs. Cavo Turrumote has the greatest variety of species on it. This reef is not as long as the reefs to the west of it (perhaps note should he made that there is a general increase of the length of the reefs to the westward).

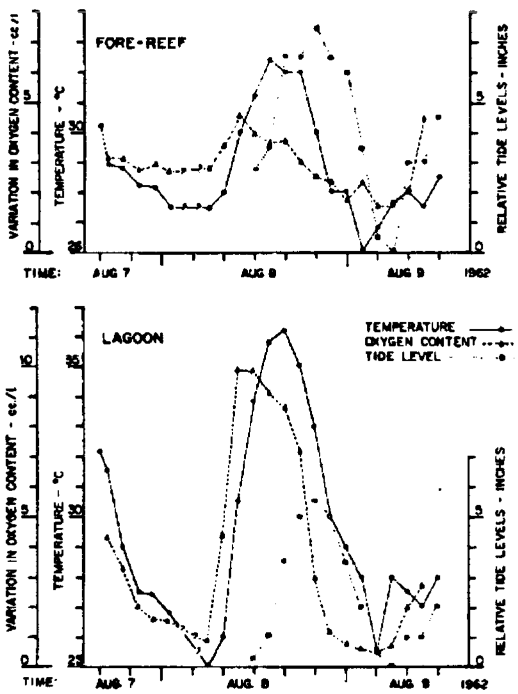


FIGURE 2
SAMPLE OF DAYLY VARIATION IN TEMPERATURE, OXYGEN CONTENT AND TIDE. LEVELS IN FORE-REEF AND LAGOON WATERS, CAYO TURRUMOTE, LA PARGUERA, PUERTO RICO

The reef proper is composed of large boulders of coral thrown up by the waves to an average height of about three feet. On the east end of the exposed part of the reef, the waves have piled the coral boulders to a height of six to eight feet. The exposed part of the reef is nowhere wider than 100 feet and nowhere longer than 1000 feet. The western half of the reef trends due east-west, whereas the eastern half is turned to the east-northeast and recurved northward at the eastern end. White man-groves have become established on the wider parts of the dry and rocky reef flat.

Directly seaward from the exposed boulder. strewn reef flat, a pavement of *Porites porites* is developed over the very shallow submerged part of the fore-reef flat, especially to the west, *Millepora complanata, Acropora palmata,* and *Acropora prolifera* are intergrown intimately with the *Porites porites.* The .pavement, is about 60 feet across, slopes seaward, and at a water depth of two feet gives way to the dense growth of *Acropora palmata* in the surf zone. As the water deepens (5 to 10 feet), *Acropora palmata* mixes with *Millepora complanata,* and each shows a preferred growth position. *A. palmata* extends long fronds seaward into the oncoming waves, whereas *M. complanata* grows m large, upright, closely spaced plates. oriented at right angles to the direction of wave travel. Large massive boulders of *Montastrea annularis* appear also. At depths of thirty feet or more the number of species present increases greatly, although the density of growth decreases. Patches of coarse sand, partly coral derived, appear and show large nave ripple marks that measure approximately ten inches from crest to crest and four inches deep. Similar ripple marks were also observed on other reefs around Puerto Rico The sand was only faintly in motion on an average day with light winds. Gorgonians were abundant in this zone. Also at thirty feet, the slope down the reef becomes less steep.

On the back-reef side of Cayo Turrumote an open lagoon extends from the exposed part of the reef to a steep slope along the north edge of the reef. A little *Thalassia* and various algae grow along the inner edge of the lagoon next to the reef flat, Fine sand and some mud are associated with them. *Porites porites, Favia fragum,* and *,Siderastrea* radians floor the shallow parts of the lagoon and give way to medium-grained sand and widely spaced cm-al colonies in water deeper than two feet. Here large heads of *Dendrogyra cylindrus, Montastrea annularis, Siderastrea siderea, Diploria strigosa, Diploria labyrinthiformis,* large thickets of *Acropora prolifera,* and numerous small colonites of *Favia fragum* occur on the lagoon floor. On the back edge of the reef (north side) the gently sloping floor of the lagoon drops sharply from fifteen feet to a sand-covered hank at thirty-five feet. At the edge of the drop-off *Acropora palmata* grows in abundance, and below it, down the slope and along the edge of the hack-reef, there grow many species of stony corals.

The following salinity measurements were made by the writers on Cayo Turrumote:

Inside lagoon (four feet deep)	35.45 0/00
Outer back-reef (ten feet deep)	35.34 0/00
Fore-reef (surface water)	35.30 0/00
Fore-reef (thirty feet-on bottom)	35.30 0/00

Circulation is sufficient to maintain a salinity similar to that of the surrounding open sea water (see above, p. 136).

Unpublished data from the Institute of Marine Biology at Mayaguez (presented by Dr. Peter Glynn) on relative daily variations in temperature, oxygen content, and tide levels in the very shallow (18 inches) fore-reef and lagoon of Cayo Turrumote are presented in figure 2. Although the day presented is one of extremely high temperature and low wind velocity, the pattern of variation is representative of the more moderate conditions that generally prevail (Glynn, personal communication). In the deeper lagoon and fore-reef waters, variations are smaller and the extremes are not as high.

One may infer from the data that oxygen content and temperature vary in a similar manner throughout the day (both are dependent upon the sun) with a peak near noon. However, lagoonal variations are sharper and have the greater range because of restricted circulation in shallow water. Fore-reef variations are less because of the greater mixing of the water by wave-action. The date were not standardized, and only the relative variations in parameters can be compared.

The other outer reefs are generally not much wider, have the same shape, are built of coral boulders piled up by the waves with interstices filled by calcareous sand, have lagoonal floors composed primarily of calcareous sand, have rare patches of *Thalassia* (turtle grass), mud, and mangroves. Most show the floor of *Porites porites* on the western part of the submerged fore-reef flat and in the shallow lagoon, and all show the extensive development of *A. palmata* in the surf zone. A steep slope usually borders the south edge of each reef beginning at depths of about fifteen or twenty feet. A rich fauna and microscopic flora are always associated with the upper part of this slope. This slope extends downward to a trough at approximately 65 feet. The outer seaward side of the trough rises to the shelf floor at 55 to 60 feet water depth. This trough is especially well developed along the fronts and east ends of the longer outer and inner reefs. The troughs seem to be the result of overturn of the waves striking the reef front. Certain of the longer outer reefs also show evidence of buttressing as described by Goreau (1959) for certain Jamaican reefs Where buttressing is well developed, the trough is poorly developed,

In the longer reefs, circulation in the lagoon seems to be somewhat more restricted. There seems to be a slight variation in the faunal assemblages—it is noticeable in the corals—from reef to reef. The variations in organisms present on each reef, both qualitative and quantitative, and the causes and effects of such variations should form a most interesting and instructive study.

Of the inner reefs, Cayo Enrique is known best to the writers. It may be taken as representative of the inner reefs. Like the outer reefs, Cayo Enrique is long (approximately 1/2 mile) when compared to its width (,200 feet from the surf zone across the reef to the inner edge of the lagoon), Further-more, the length of the reef is oriented to the east-northeast so that the reef faces the incoming waves and currents, which are only partially blocked by the outer of reefs. Again, the major species comprising the reef in the surf zone are *Acropora palmata, Millepora complanata,* and *Montrastrea annu.laris.* The *A. palmata* and *M. complanata* display the same growth orientation as they show on the outer reefs.

Although this reef is similar to the outer reefs in being built of coral boulders thrown up by the waves, the wave action is some-what less forceful on the inner reefs. As a consequence, they rarely rise above the sea, except where the mangroves have trapped sediments. Only on the east ends of some of the inner reefs have boulders been piled up enough to be exposed.

As in the outer reefs, a drop-off is found in water about twelve feet deep along the edge of the back-reef. A barren sand-covered bank lies at the base of the drop-off at thirty feet below the water's surface. A very rich stony coral fauna occurs along the edge of the back reef, especially at the east end. Gorgonians are also abundant. As at Turrumote, the waves curl around the east and west ends of the reef and supply enough circulation to support such forms as *Acropora palmata* in small patches near the reef ends.

There are two major differences between the inner and outer reefs. On the inner reefs thick, extensive growths of red mangroves occur on the reef flat, especially near the east and west ends (the center is open, but only a few inches deep). Also, mud flats are well developed on the lagoonal side of the mangroves, and *Thalassia* is abundant in the shallow waters of the lagoon. The mud seems to be deepest near the mangrove foots (1 1/2 to 2 feet) and to thin and grade into fine-to medium-grained calcite sand towards the deeper water of the lagoon. When the water reaches about three feet in depth, the sand is dominant. The *Thalassia* grows thickest about five feet from the edge of the mangroves; it also thins, in terms of density of growth, and disappears when the water becomes three feet deep. In some areas, however, *Thalassia* continues growing out over the sand bottom to the back edge of the lagoon.

Such features as the thinness of the mud layer, the rapid growth of the red mangrove over the inner reefs (as noted by several workers at the Marine Laboratory), and the presence of dead colonies of *Porites porites* in growth position under the mud layer and the *Thalassia* zone indicate that the major differences between the inner and outer reefs may have developed quite recently. One factor involved in these differences may be that the less intense wave action on the inner reefs, as compared to that on the outer reefs, has permitted colonization of the inner reefs by the red mangrove before the reefs were raised above the surface of the water. The mangroves seem to exert some control over the distribution of the mud and the *Thalassia.*

Salinities across the inner reefs, like the outer reefs, show little variation and are quite similar to the values reported by Coker and Gonzalez (1959, p. 14) for the open Parguera waters. Oxygen and temperature data were not taken on the inner reefs. However, the open water and wave-action on the fore-reef side of the inner reefs suggest that the pattern and range of variation on the fore-reef would be similar to that of the outer reefs. However, the great expanse of protected shallow water, the lower density of organisms of limited tolerance such as corals, and the greater percentage of barren bottom suggest that oxygen and temperature, especially, vary to a greater extent in the inner lagoons of the inner reefs than in the same areas of the outer reefs.

North of Cayo Enrique, a third reef, Cayo Caballo Ahogado, rises to within one or two feet of the water surface, The reef breaks water during very low tides. the reef is parallel to Cayo Enrique and is approximately as long as Cayo Enrique. However, it is broken into three parts along its length by fairly deep channels (20-25 feet) that cross it in a north-south direction. *Montastrea annularis* and *Acropora palmata* form the reef front. *Porites porites* lies in the deeper water (fifteen feet) as does *Acropora cervicornis.* A reef flat has not been extensively developed, nor have any mangroves colonized the reef. Although waves and currents are sufficient to permit the corals to flourish and are strong enough to leave only coarse sand on the fore-reef and medium-grained sand on the back-reef, the zones of coral growth developed on the other reefs because of cur-rents and waves are more distinct than on this reef. That is, in these reefs, reduction of current and wave activity seems to correlate with reduction in sharpness of zoning of coral growth, even when one allows for the relative ages of the various reefs.

Reefs north of the inner line of reefs are of the patchreef type. They often have mangrove thickets in various stages of development. However, all are characterized by a restricted coral fauna, compared to the other reefs; an abundance of *Porites porites* over the shallow parts of the reef; and a poorly developed zone of *Acropora palmata* on the south side (seaward).

Porites porites var. *divaricata,* and also the other varieties of P. *porites,* commonly fringe the shoreline of the mainland or of the non-coral islands such as Isla Magueyes (location of the Marine Laboratory). The growth occurs just seaward of the mangrove zone.

,411 species listed in this paper have been found at La Parguera on one of the following reefs: Cayo Turrumote, Cayo Enrique, Cayo San Cristobal, Cayo Mario, or Cayo Caballo Ahogado.

Cabo Rojo and the west coast (fig. 1). West of La Parguera reefs are small and often do not break water, although coral growth is fairly abundant. In the small bay west of Cabo Rojo lighthouse, patches of coral alternate with Thalassia grass flats. The alternating zones are elongated towards deep water, The coral patches begin at various depths ranging from 8 to 15 feet. There is *Thalassia* in the shallower water between the coral patches and shore. The bottom is composed of consolidated calcareous sand and often has a thin veneer of fine sand or mud over it, especially in the *Thalassia* grass flats. Gorgonians occur in great abundance with the corals. Where the *Thalassia* is thin, gorgonians, corals and sponges are plentiful. The corals seen were as follows: *Acropora palmata, Diploria strigosa, Diploria clivosa, Favia fragum, Manicina areolata, Millepora alcicornis, Siderastrea* radians, and *Isophyllis sinuosa.*

However, no reefs are formed, except at the edge of the shelf. Here the shelf is approximately 60 feet deep, and the reef rises above it to within forty or thirty feet of the

surface. Several similar reefs occur from here northward along the shelf edge on the cast side of Mona Passage and provide fishing grounds for the local fishermen. As these reefs were below the writer's diving depth, they were not studied, North of Cabo Rojo along the west coast one finds a poorly developed reef across the mouth of Bahia de Boqueron and a better developed reef on the shelf to the west. From here northward, extensive shoal areas are found on the shelf with reefs poorly developed on them. Except for a large submerged reef near Mayaguez, reef development is largely restricted to small patch reefs, although coral growth itself is plentiful. From here northward, small patch reefs occur near shore.

NORTHEAST COAST

The best reef development on the north-east coast (p, 134), is found in the fringing reefs formed around the string of islands called La Cordillera that trends east-southeast from the northeasternmost tip of Puerto Rico. Of these, the writers have spent the most time on Cayo Icacos, largest of these islands. Other fringing reefs in the area are quite similar.

Cayo Icacos. The island itself is not reef built, but it is composed of calcareous oolite sand (Kaye, 1959, p. 97) which was deposited and the partially submerged at some time previous to the development of the reefs. These reefs have been developed along the east, north and northwest sides of the island, On the southwest side of the island, reef growth is observed to the northwest and southeast where currents from the waves breaking on the northeast side pass around the ends of the island. In between, sand and *Thalassia* dominate the shallower bottom. Individual corals of such species as *Manicina areolata* are commonly found.

Because of the roughness of the water, only brief observations were made on the fore-reef. The following features were observed: *Acropora palmata* and *Millepora complanata* were about equally important reef supporters in the surf zone; *A. palmata* grows more massively than on the south coast its branches are short, flat, and thick and the main trunk is short and quite thick; *M. complanata* differs little from its form on the south coast, except that the plates are somewhat shorter and thicker; and, in general, the density of growth of all organisms present is considerably greater than on the south coast reefs.

On the southwest side the bottom slopes away from a sandy beach composed of calcite sand. At the northwest end the bottom is sand only, but has upon it scattered, wave-tossed boulders of fore-reef coral which have become covered with back-reef corals. To the southeast the sand bottom becomes over-grown with *Thalassia* in which *Manicina areolata* grows. Other corals are present too, if some bard object provides a site for growth above the bottom. A change in the vegetation of the island and in the beach material corresponds to the change in the bottom. Island vegetation changes from low scrub on the northwest to sea grapes and white mangrove on the southeast. The beach is composed of loose, white calcite sand on the northwest and of consolidated beachrock on the southeast,

The reef growth on the northwest is typical of the reef growth on the windward side of the island. Very little growth is observed behind the northwest reef.

The patch reef growth the southeast end is quite similar in many respects to coral deve-lopment on the reefs at La Parguera,

On the southeast end one observes the following sequence of changes in the bottom as one goes seaward from the beachrock shore:

I. Beach rock extends outward from shore for thirty feet and is covered by various algae. The water is one foot deep.
2. A sandy channel, fifteen feet wide and four feet deep, runs parallel to shore, On the seaward side of the channel the following corals are found: *Siderastrea radians, Diploria,* sp., *Porites porites, Favia fragum,* and *Millepora alcicornis.*
3. Seaward of the channel beachrock reap. pears at one foot depth. It is covered with *Thalassia,* which thins seaward and is gradually replaced by *Porites porites* var. *divaricata* and scattered *Millepora alcicornis.*
4. The bottom deepens gradually to three feet at a distance of 250 feet from shore. It then drops sharply to eight feet. The seaward edge is irregular and is partially supported by the massive and columnar corals. Gorgonians are abundant.
5. The bottom between the corals drops sharply and then slopes gently seaward, Sand covers the bottom to a distance of 400 feet from shore in water twelve feet deep. Here *Thalassia* reappears and extends over the sandy bottom into deeper water.

Approximately twenty species were re-corded in a reconnaissance of this area. The species are listed below- with the place found.

	Corals collected from Cayo Icacos, back-reef	SE end	Mid-back reef	NW end
1.	*Acropora cervicornis*	×		×
2.	*Acropora palmata*	×		×
3.	*Agaricis agaricites*	×		
4.	*Diploria clivosa*	×	×	×
5.	*Diploria labyrinthiformis*		×	
6.	*Diploria strigosa*		×	
7.	*Dendrogyra cylindrus*		×	
8.	*Favia fragum*	×	×	×
9.	*Favia* cf. *gravida* ?	×		×
10.	*Isophyllia multiflora*			×
11.	*Isophyllia sinuosa*	×		×
12.	*Manicina areolata*		×	
13.	*Meandrina meandrites*	×	×	
14.	*Millepora alcicornis*	×		
15.	*Millepora complanata*	×		×
16.	*Montastrea annularis*	×		×
17.	*Montastrea cavernosa*	×	×	
18.	*Porites astreoides*	×		
19.	*Porites porites* (three varieties)	×		
20.	*Siderastrea radians*	×		×
21.	*Siderastrea siderea*	×		×

Although few of the reefs in Puerto Rico are so massive or well developed as those of the Pacific Ocean or even other areas in the Caribbean, the variety of forms of the corals themselves and, even more important, the variety of ecological features associated with the areas of coral growth offer excellent areas of study.

DESCRIPTION OF SPECIES

The following descriptions arc notes on specimens from the collection made by the writers or from the collection of the Institute of Marine Biology (notation 1. M. B. at the end of the description).

In identifying the specimens and describing them, the writers have drawn heavily from Smith (1948, pp. 59-112) and less heavily from Duarte-Bello (1961, pp. 11-85), Squires (1958, pp 246-262), Vaughan (1901, pp. 289-320), and Wells (1956, pp. F329-F444). Those references used in describing each species are listed at the end of each description. For complete descriptions, the reader is referred to the above papers or to the references found in these papers.

All descriptions are based on specimens in hand. Measurements have been made by the writers, except where noted. Common names for the corals are taken from Smith, 1948.

Species are arranged in taxonomic order. An alphabetical list has been placed at the end of the descriptions.

CLASS HYDROZOA Owen, 1843.

ORDER MILLEPORINA Hickson, 1901.

Family Milleporidae Fleming, 1901.

1. *Millepora alcicornis* Linnaeus.
2. *Millepora complanata* Lamarck.

3. *Millepora squarrosa* Lamarck.

CLASS ANTHOZOA Ehrenberg, 1834,

ORDER SCLERACTINIA Bourne, 1900.

SUBORDER ASTROCOENIINA Vaughan and Wells. 1943.

Family Astrocoeniidae Koby, 1890.

Subfamily Astrocoeniinae Koby, 1890.

4. *Stephanocoenia michelini* Milne-Edwards and Haime.

Family Acroporidae Verrill, 1902

5. *Acropora cervicornis* (Lamarck).
6. *Acropora palmata* (Lamarck).
7. *Acropora prolifera* (Lamarck).

SUBORDER FUNGIINA Verrill, 1865.

SUPERFAMILY AGARICIICAE Gray, 1847.

Family Agariciidae Gray. 1847.

8. *Agaricia agaricites* (Linnaeus).
9. *Agaricia cucullata* (Ellis & Solander).

Family Siderastreidae Vaughan and Wells. 1943.

10. *Siderastrea radians* (Pallas).
11. *Siderastrea siderea* (Ellis and Solander).

SUPERFAMILY PORITCAE Gray, 1842.

Family Poritidae Gray, 1842.

12. *Porites asteoides* Lamarck.
13. *Porites porites* (Pall as).

SUBORDER FAVIINA Vaughan and Wells. 1943.

SUPERFAMILY FAVIICAE Gregory, 1900.

Family Faviidae Gregory, 1900.

Subfamily Faviinae Gregory, 1900.

14. *Favia fragum* (Esper).
15. *Favia cf. gravida (?)* Verrill.
16. *Diploria clivosa* (Ellis and Solander).
17. *Diploria labyrinthiformis* (Linnaeus).
18. *Diploria strigosa* (Dana**).**
19. *Manicina areolata* (Linnaeus).
20. *Colpophyllia amaranth us* (Muller).
21. *Colpophgllia natans* (Muller).

Subfamily Montastreinae Vaughan and Wells. 1943.

22. *Cladocora arbuscula* (Lesueur).
23. *Solenastrea bournoni* Milne-Edwards and Haime.
24. *Montastrea annularis* (Ellis and Solander).
25. *Montastrea cavernosa* (Linnaeus).

Family Rkizangidae d'Orbigny. 1851

26. *Astrangia solitaria* (Lesueur).
27. *Phyllangia americana* Milne-Edwards and Haime.

Family Oculinidae Gray, 1843.

Subfamily Oculininae Gray, 1847.

28. *Oculina diffusa* Lamarck.

Family Meandrinidae Gray, 1847.

Subfamily Meandrininae. Gray, 1847.

29. *Meandrina meandrites* (Linnaeus).

Subfamily Dichocoeniinae Vaughan and Wells, 1943.

30. *Dichocoenia stokesii* Milne-Edwards and Haime.
31. *Dendrogyra cylindrus* Ehrenberg.

Family Mussidae Oilman, 1890.

32. *Mussa angulosa* (Pallas).
33. *Isophyllastrea rigida* (Dana).
34. *Mycetaphyllia lamarckiana* (Milne-Edwards and Haime).
35. *Isophyllia sinuosa (Ellis* and Solander).
36. *Isophyllia multiflora* Verrill.

SUBORDER CARYOPHYLLINA Vaughan and Wells, 1943.

SUPERFAMILY CARYOPHYLLICAE Gray, 1847.

Family Caryophylliidae Gray, 1847.

Subfamily Eusmiliinae Milne-Edwards and Haime, 1857.

37. *Eusmilia fastigiata* (Pallas).

SUBORDER DENDROPHYLLINA Vaughan and Wells, 1943.

Family Dendrophylliidae Gray, 1847.

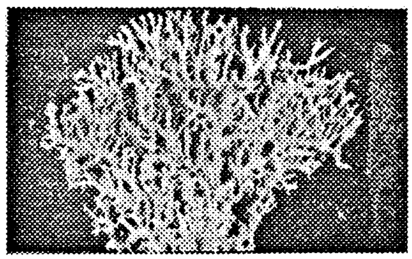
38. *Tubastrea aurea* (Quoy and Gaimard)

CLASS HYDROZOA Owen, 1843
ORDER MILLEPORINA Hickson, 1901
Family *Milleporidae* Fleming, 1901

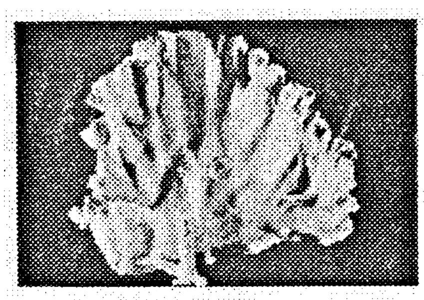
1. *Millepora alcicornis* Linnaeus, Plate Ha. (False or stinging coral)

Colonies are characterized mainly by their small profuse branches, which often have the appearance of tiny antlers. The surface is covered by minute microscopic holes which

PLATE II



a) *Millepora alcicornis* (Linnaeus)



b) *Millepora complanata* (Lamarck)

are arranged in groups of smaller dactilopores around a central larger gastropore. Color is brownish-yellow *in vivo.*

Note on habitat:

This coral is generally found in the shallow waters of the lagoon, either among other corals or *Thallasia.* It is very seldom found in the surf zone.

References: Vaughan, 1901, p. 318; Smith, 1948, p. 100; Squires, 1958, p. 259; Duarte-Belle, 1961, p.82.

2. Millepora complanata Lamarck, Plate 11 b. (False or stinging coral)

The colonies form vertical flattened plates which generally grow facing the direction of wave travel. The surface is covered with minute holes as in *M. alcicornis.* However, in *M. complanata,* the dactylopores and gastropores are nearly the same size and are easily confused. The color is brownish-yellow *in vivo.*

Note on habitat:

Generally very common in the surf zone of reefs in areas behind the surf zone the plates may grow in any direction but generally have some parallelism among themselves.

References: Squires, 1958, r. 259; Duarte-Bello, 1961, p. 84.

3. Millepora squarrosa Lamarck, Plate III a. (False or stinging coral)

Colonies are irregularly shaped stubby masses which show neither branching as *M. alcicornis* nor such well developed flattened plates as *M. complanata. As* in *M. alcicornis* the dactylopores are smaller than the gastropores and are arranged in the same fashion. However, the pores are more crowded. Co-for is pink or brownish-yellow *in vivo.*

Note on habitat:

Generally on back-reef. Rarely found, excgpt on the western submerged extension of the reef rise on Cayo Turnmote.

CLASS ANTHOZOA Ehrenberg, 1834
ORDER SCLERACTINIA Boume, 1900)
SUBORDER ASTROCOENIINA Vaughan
and Wells, 1934

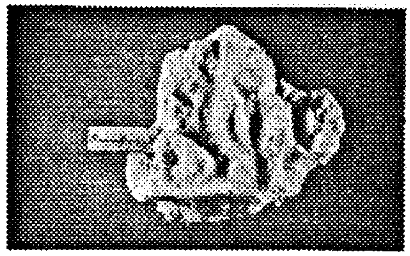
Family Astrocoeniidae Koby, 1890

4. *Stephanocoenia michelini* Milne-Edwards and Haime, Plate III b.

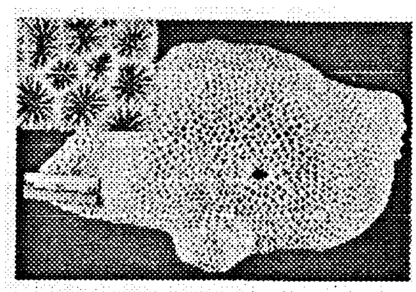
Coral forms small boulders or encrusting masses less than one foot in diameter. Its similarity with *Siderastrea radians* in the field is so great that careful sampling is needed to obtain specimens. Calices measure 2.3 mm. in diameter, usually polygonal.

When not crowded, the calices may be costate. Distance between calioes varies from less than 1 mm. in the center to 3 mm. near the edge of the colony. Twenty to twenty-four septa occur in three cycles. The first two cycles have corresponding pall. Septal margins are generally smooth, sometimes finely dentate, and laterally spinulose. The

PLATE 111



a) *Millepora squarrosa* (Lamarck)



b) *Stephanocoenia michelini* (Milne/Edwards and Haime). Inset shows details of calices

columella is styliform, somewhat compressed, and generally rises to the level of the surrounding pall.

Note on habitat:

This coral was found in protected areas above the bottom in the deeper back-reef waters. How-ever, Squires (1958, p. 227) reports that S rrudwlini occurs as encrusting mats on the exposed areas. of the West Rabbit Cay in Bimini, Bahamas.

Specimens of this coral have been collected at Cayo Laurel, Cayo Mario, Cayo Media Luna, and Cayo Caballo Ahogado, always on the back-reef,

The similarity between *S. michelini* and *Siderastrea radians* probably explains the difference in collecting sites. *S michellini may* have a widespread distribution as *SiderasTrea radians* but it may have been overlooked because of the similarity.

References: Smith, 1948, p, 74; Squires, 1958. p. 246; Duarte-Bello, 1961, p. 80.

Family Acroporidae Verrill, 1902

5. Acropora cervicornis (Lamarck), Plate IV a.

(Staghom coral)

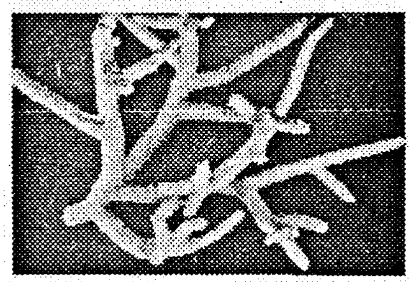
This coral is characterized by its loosely branched colonies. Its surface is covered with small protruding tubular cups which are usually oriented towards the point of growth. The branches have a circular cross-section, measure up to 25 mm. in diameter, and are generally thicker than those of *A. prolifera.* Specimens with branches of much larger diameter have been observed by Carridn-Torres in Florida. The branches of *A. cervicornis are discreet and do not fuse.*

Note on habitat:

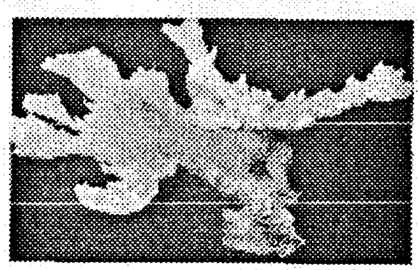
A. cerviconis is very common on the inside of the lagoon. On the windward side of reefs it usually occurs at depths greater than ten feet These investigators have never found this species growing on organic rich substrate or near Thallassia beds.

References: Vaughan 1901 P. 312; Smith, 1948, p. 75; Duarte-Bello, 1961, P. 12.

PLATE IV



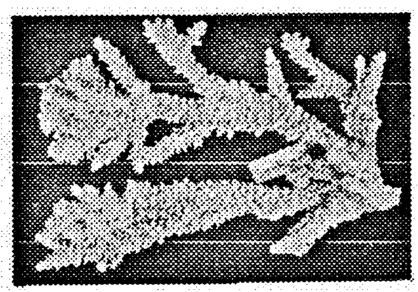
a) *Acropora cervicornis* (Lamarck)



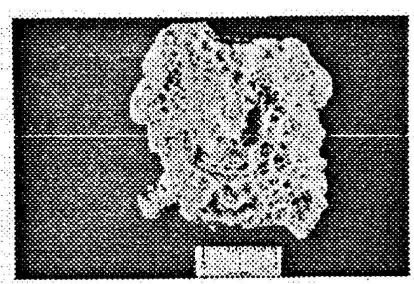
b) *Acropora palmata* (Lamarck)

6. Acropora palmata (Lamarck), Plate IV b. (Elk horn coral)

PLATE V



a) *Acropora prolifera* (Lamarck)



b) *Agaricia agaricites* var. *crassa* (Verrill)

Colonies form *flattened, branching plates* of variable extent. The branches extend outward from a short, thick trunk. All other characteristics are similar to those of *A. cervicornis.*

In the back-reefs small finger-like branches similar to those of A. *prolifera* form at the edge of the flattened plates. Currently, there is some discussion over the species *of Acropora,* especially between *A. palmata* and *A. prolifera*

This is probably the commonest coral on the windward side of Puerto Rican reefs. It is also common in the open waters of the back-reef.

References: Vaughan 1901 .312; Smith, 1948, p. 75; Duarte-Belle, 1961, p. 14.

7. Acropora prolifera (Lamarck), Plate V a. (Staghorn *coral)*

Similar to *A. cervicornis.* It may be distinguished by its more intensely branched colonies and by the fusion of its branches where they cross or where they grow laterally close together. Its branches are round in cross-section, measure up to 12 mm. in diameter, and are thinner than those of *A. cervicornis,* and interlace.

The environment seems to be an important factor in controlling the form of growth of this particular species. Behind the reef the individual colonies may attain a height of two to three feet, are *loosely branched,* and rarely show fusion between the branches. In the surf zone, however, the corallites *form small plates, by the fusion of adjacent branches,* as illustrated in plate V a.

Note on habitat:

Practically on all reefs, on open back-reef or behind surf zone on fore-reef.

References: Vaughan 1901 p. 313; Smith, 1948, p. 76; Duarte-Bele, 1961, p. 12.

SUBORDER FUNGIINA Verrill, 1865

SUPERFAMILY AGARIICAE Gray, 1847

Family Agariciidae Gray, 1847

8, Agaricia agaricites (Linnaeus) Plates V-VI.

Corals usually form foliaceous or frondose colonies. Calices normally appear on both surfaces of the frond and are generally arranged in groups between more or less parallel collines. Septa up to 36 per calice.

Three varieties of this species were collected:

Agaricia agaricites var. crassa Verrill, Plate Vb.

This variety is distinguished by its small irregular encrusting or gibbose colonies. Certain walls are more prominent than others and sometimes are parallel, but more often enclose five to ten prominent walls or corallites.

Agaricia agaricites var. *purpurea* Lesueur, Plate Via.

In this variety the corallum generally spreads out from a small stalk (pedicelled). The calices are arranged in linear groups more or less parallel to the edge of the colony and occur on the upper surface of the frond only.

Agaricia agaricites var. *fragills* Dana, Plate VIb.

Wells (personal communication) regards the species *Agaricia fragilis* Dana as a variety of *Agaricia agaricites* (Linnaeus).

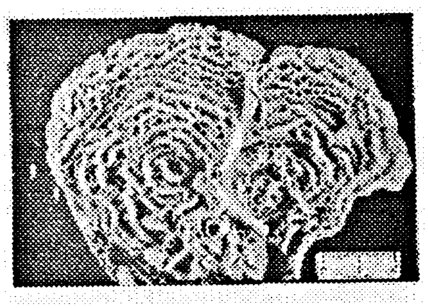
Specimens from our collection are distinguished by their thin and delicate colonies. The coralla usually spread out from a small base and sometimes have a saucer-like, concave appearance. The calices occur on the upper surface only and average 2 mm. in diameter. The septa are thin, serrulate, and commonly number up to 24 per calice. The collinies are somewhat inclined towards the edge of the corallum, except those at the center.

Note on habitat:

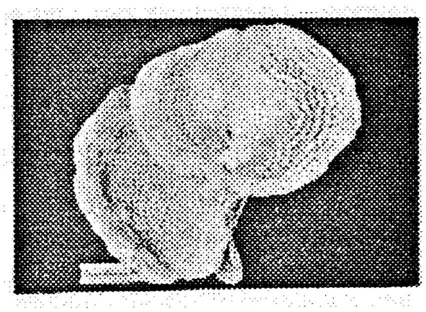
Mostly encrusted over stone or dead corals. Sometimes attached to mangrove roots. Often grows in protected places, generally in close association with larger corals on the open back-reef or deeper fore-reef. Common on all reefs.

References: Vaughan, 1901, p. 310; Verrill, 1903, pp. 140-150; Smith, 1945, pp. 76-77; Duarte-Bello, 961, pp. 16.22.

PLATE VI



a) Agaricia agaricites, var. *pupurea* (Lesueur)



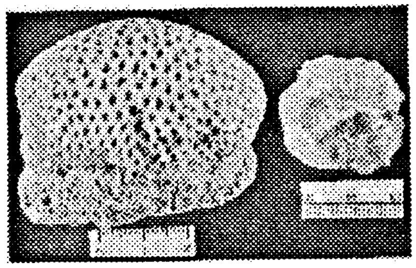
b) *Agaricia agaricites*, var. *fragilis* (Dana)

9. *Agaricia* cucullata (Ellis and Solander). Plate VIIa.

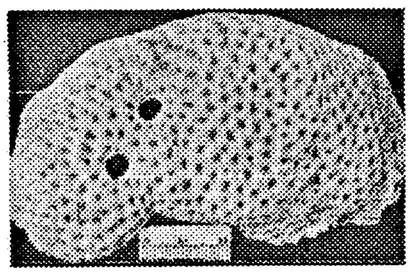
This coral grows in a thin frond, intermediate between *Agaricia agaricites* var. *fragilis* and A. *agaricites* var. *purpurea* in thickness. Corallum spreads from a stalk. Calices are restricted to the upper surface, The under surface of the corallum is lightly marked by fine costal striations. Corallites are irregularly arranged singly or in small groups of three to six which are generally parallel to the edge of the colony. The calices are 3.5 to 5 mm. in diameter and are separated by prominent, rather short collines which face the edge of the frond. The septa and associated costae occur in two sizes which alternate and which are oriented in radial fashion with respect to the center of the colony. Septa number *14* to *48* per calice. Usually there are 36 to 48 septa in the larger calices.

Specimens agree closely with descriptions and figures given by Vaughan (1901) for *A. elephantotus* and by Verrill (1903) for A. no-*bills.* Wells (personal communication) after

PLATE VII



a) *Aguaricio cucullatu* (Ellis and Solander)
b) *Siderastrae radians* (Pallas)



c) *Siderastrae siderea* (Ellis and Solander)

inspection of the specimens places them in *A. cucullata,* evidently because of problems of synonomy (see above references).

Note on habitat:

Habitat similar to A. *agaricItes.* Often grows in nooks and crannies in the large heads of such forma as *Montastrea annularis.*

References: Vaughan, 1901, p 310 *(Agaricia elephantotus*) Verrill, 1903, p. 150 (*Agaricia nobilis*): Smith, 1948, pp. *77-78* (*Agaricia nobilis*).

Family Siderastreidae Vaughan
and Wells, 1943

10. *Siderastrea radians* (Pallas), Plate VIIb, (Starlet coral)

Corallum forms rounded masses which may attain a length of 30 cm. or more. When young, it maybe encrusting. Calices may be polygonal in shape from crowding, 2-3.5 mm. across and 1-2 mm. deep, with inner walls perpendicular. The walls between each corallite are formed by several rings of synapticulae. The septa number 36 to *40,* are arranged in four incomplete cycles, are marginally dentate and are laterally spinose. The columella is small and solid.

Note on habitat:

Very common on all back-reefs and patch reefs, even in very shallow water or tidal pools where water temperature as well as other conditions are extreme for most corals,

References. Vaughan, 1901, p. 309; Smith, 1948, pp. 78-79: Squires, 1958, pp. 248-249; Duarte.Bello, 1961, p. 72.

11. *Siderastrea siderea* (EIlis and Solander), Plate VIIc. (Starlet coral)

Coralla form convex boulders which may attain several feet in diameter or may be encrusting when young. Calices are larger than those of S. *radians* and measure 5 mm. across and up to 3 mm. deep. The upper portion of the costal margins between calices is nearly flat, but sepal margins slope steeply into the calices. Septa occur generally in four complete cycles and are dentate, marginal and spinulose. The columella is small and papillary.

Note on habitat:

On all back-reefs and patch reefs. Sometimes on the fore-reef in water deeper than fifteen feet.

References: Vaughan. 1901, pp. 309-310: Smith, 1948, p. 79; Squires, 1958, pp. 249-250: Duarte-Bello, 1961, p. 74.

SUPERFAMILY PORITICAE Gary, 1842

Family Poritidae Gray, 1842

12. *Porites astreoides* Lamarck, Plate VIII a. (Porous coral)

Coral forms encrusting or convex gibbose masses which may measure up to two feet across. The calices measure from less than 1 to 1.5 mm. in diameter, may be crowded or as far apart as 1.5 mm., and are deeper than *Porites porites.* Septa are 12, spiny, and porous. Pali are almost indistinct. The columella is sometimes styli form and gene-rally very small.

Note on habitat:

P. asteroides is very common in all back-reef areas of the fringing reefs, and on the patch reefs. It occurs both in the sandy-bottomed areas as well as in the *Thalassia* zones.

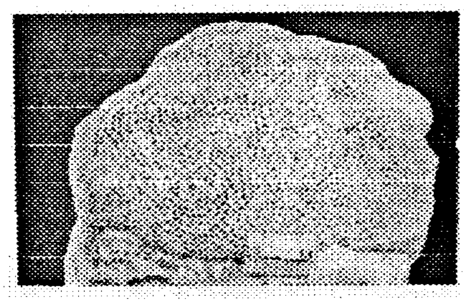
Reference: Vaughan, 1901, pp. 3 12-318: Smith, 1948, pp. 79-80: Squires, 1958, pp. 250-251: Duarte-Bello, 1961, p. 64.

13. *Porites porites* (Pallas), Plates VIII and IX. (Finger coral)

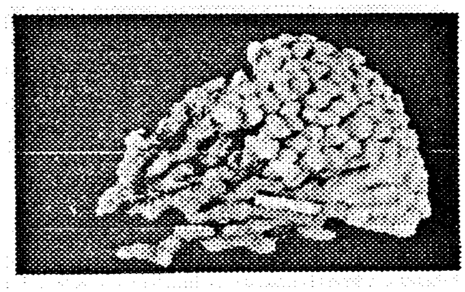
Corolla form loose to thick clumps of irregular branches. Growth is commonly so ex-tensive that a pavement is formed on the bottom in shallow waters. The branches may measure up to 25 mm. in diameter. Calices are very crowded and measure from 1.25 to 2 mm in diameter. Septa are 12, spiny, and porous. A well developed styliform columella is generally present. Squires, 1958, and Duarte-Belle, 1961, described three varieties of *Porites ponies.* The main features that di-vise the varieties as studied by the writers are as follows:

1. *Porites porites* var. *clavaria* Lamarck stands out from the other two varieties in that its branches are larger and sometimes have swollen ends. Also each cup has six pali which generally surround the columella. Plate IX a.
2. *Porites porites* var. *furcata* Lamarck may be identified by its tendency to have its branches without swollen ends. Calices very seldom exceed 1.5 mm. across and have only five pali surrounding the columella. Plate IX b.

PLATE VIII



a) Porites asteroides (Lamarck)



b) *Porites porites. var. divaricata* (Lesueur)

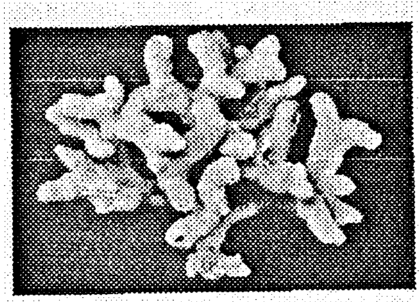
3. Porites *porites* var. *divaricata* Lesueur is perhaps the easiest of the three varieties to identify, because of its fragile appearance. It generally occurs in small, round clumps which rarely exceed 15 cm. in diameter. Its branches are very slender up to 6 mm. in diameter. Calices are similar to those of *P. porites* var. *furcata* but shallower. Plate VIII b.

Note on habitat:

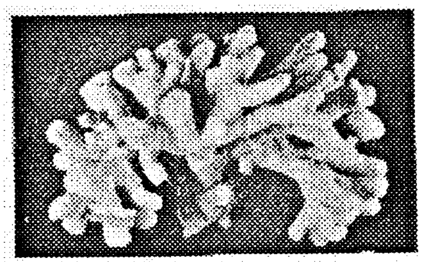
P. parties var. furcata is found in the shallow waters of the back-reef on all reefs at La Parguera It covers the bottom in the shallow lagoon waters and may be intergrown with some *Thallasia* and *Mille-pora alcicornis*. On certain reefs it also grows quite dense and forms a pavement that extends seaward over the fore-reef to depths of two feet.

P. porites var. davarla was found in loose clumps in ten feet of water in the fore-reef aide of Cayo Caballo Abogado.

PLATE IX



a) Porites porites, var. *clavaria* (Lamarck). Notice difference in scales when comparing *P. porites*, var. *clavaria* with *P. Porites* var. *furcata*



b) *Porites porites*, var. *furcata* (Lamarck)

Porites porites var. *divaricata* is frond in clumps on or rear the *P. porites* var. *furcata* along the shore or around the patch reefs. It occurs in very shallow water, slightly raised above the bottom. Less frequently it forms a pavement in back-reefs similar to *P. porites* var. *furcata* (Cayo Icacos).

References: Vaughan, 1901, pp. 314-3 16; Smith, 1948, pp. 80.81; Squires, 1958, pp. 251-252; Duarte-Bello, 1961, pp. 66-70.

SUBORDER FAVIINA Vaughan
and Wells, 1943
SUPERFAMILY FAVIICAE Gregory, 1900
Family Faviidae Gregory, 1900 *Subfamily Faviinae* Gregory, 1900

14. Favia fragum (Esper), Plate X a. (Star coral)

Colonies form small, hemispherical masses up to 50 mm. Colonies are sometimes encrusting. The calices are of various shapes, from elongated to round, and measure up to 6.5 mm. long by 4.5 mm. wide when there is no evidence of fission. The calices generally do not have more than one calicinal center except when fission is occurring. The circular calices measure up to 3 mm. in diameter and may or may not be slightly exsert. The thickness of the walls between the corallites varies from merely a separating rim to 2 mm. or even more. The septa number 36-40 in three to nearly four complete cycles. Septal and costal margins are dentate. Columella is large and of loosely interlocked trabeculae. Plate X a shows the range in variation of *F. fragum* at La Parguera.

Note on habitat.

This species is wide-spread and occurs in most of the different environments on all reefs. It has been found growing attached to mangrove roots among algae and in tidal pools where conditions for coral growth are extreme. It occurs in equal abundance on sand bottoms, attached to hard surfaces in Thalassia, and in the fore-reef.

References: Vaughan, 1901, pp. 303.304: Smith, 1948, p 82: Squires, 1958, p. 253: Duarte-Bello. 1961, p. 40.

15. *Favia cf. gravida (?)* Verrill, Plate X a

Corallum is similar to *F. fragum* in general shape. Calices are exsert up to 3 mm., united by peritheca, and variable in shape when crowded. Circular calices are rarely over 8 mm. in diameter, average 4.5 mm., and oval calices are up to 10 mm. long and 4 mm. wide. Neighboring thecae do not fuse. Septa occur in four complete cycles. According to a description by Matthai (1918) the septa of this species are strongly dentate on their inner margins. Our specimens differ in that the septa are strongly dentate both inside and outside. The well separated, definitely exert calices containing four complete cycles of septa suggest *Favia gravida.* However, that species Is restricted to Brazil, according to the literature. Wells (personal communication) suggests that these specimens are variations of F. *fragum.* The specimens belonging to this description form a more discreet group than do the other variations of *Favia* grouped under *F. fragum.*

Note on habitat:

Habitat seems to be slightly more restricted than *F. fragum.* This species has been collected from the lagoons of Cayo Turrumote, Cayo Enrique, and Cayo San Cristobal.

References: Vaughan, 1901, pp. 303-304; Matthai, 1928, p. 86; Smith, 1948, pp 82-83.

16. *Diploria clivosa* (Ellis and Solander), Plate X b. (Brain coral)

This coral forms a relatively large and heavy meandroid colony which may show irregular knobs over its surface. The valleys are sinuous near the center but lose their sinuosity toward the edge of the colony. The valleys are 2-4 mm. deep and 2.5 to 6 mm. (average 4 mm.) wide. The collines are sharper than in *Diploria strigosa* and never show a groove. The septa, which are spiny and bear teeth, occur in two alternate sizes and are continuous over the colline. The septa number 30-40 per cm. The columella is well developed and spongy.

Note on *habitat:*

On all reefs. mainly on the lagoon side. Some-times in *Thalassia* beds or attached to old mangrove roots.

References: Smith, 1948, p. 83; Squires, 1956. p. 253: Duarte-Belle, 1961, p. 35.

17. *Diploria labyrinthifarmis* (Linnaeus), Plate XI a. (Brain coral)

Corallum forms a large, heavy, hemispherical boulder which shows sinuous, continuous valleys over most of its surface. Valleys measure up to 8 mm. in width and 5 mm in depth. The collines are thick and show a rather deep groove of variable dimensions. The groove may be deeper and wider than the valley. The septa number 14-17 per cm. and have the following features: exsert, dentated, and slightly spinulose on the sides. The columella is well developed and spongy.

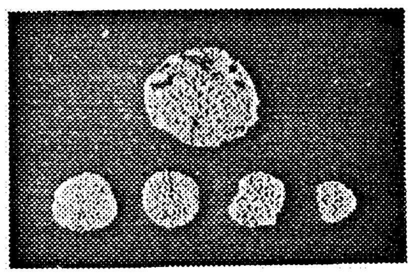
Note on habitat:

Very common on back-reefs, where boulders several feet in diameter may be formed.
References: Smith, 1948, p. 84: Duarte-Belle, 1961, p. 36.

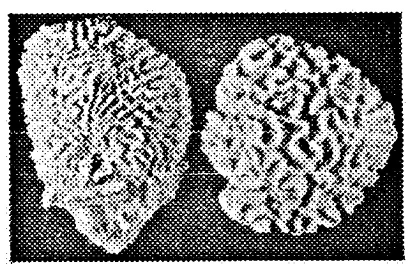
18. *Diploria strigasa* (Dana), Plate X b. (Brain coral)

Corallum forms evenly convex boulders with may reach several feet in diameter. The valleys are very sinuous and are deeper and wider than *D. clivosa.* The valleys measure up to 7 mm. deep and 4-10 mm.

PLATE X



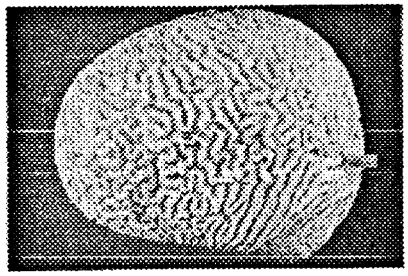
a) *Favia fragum* (Eper) (1), (2)
Favia cf. *gravida* (Verrill) (3)



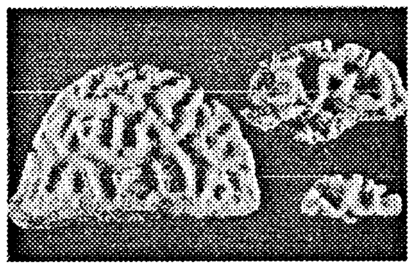
b) *Diploria clivosa* (Ellis and Solander) (1)
Diploria strigosa (Dana) (2)

wide. The collines are not as sharp as in *D. clivosa.* Sometimes they may show a very narrow, indistinct groove. Septa are continuous over the colline, spiny, and denticulated. Septa number 15-20 per cm. The columella is continuous and spongy.

PLATE XI



a) *Diploria labyrinthiformis* (Linnaeus)



b) *Manicina areolata* (Linnaeus), variation 1
var. *hispida* (Verrill) (1)
Manicina areolata (Linnaeus), var. 2
var. *laxfolia* (Verrill) (2)
Manicina areolata (Linnaeus), var. 3
Manicina mayori (Wells) (3)

Note on habitat:
Same occurrence and habitat as D. c*livosa*.
References: Vaughan, 1901, pp. 306-308: Smith, 1948, P. 25: Duarte-Bello, 1961, p. 34.

19. *Manicina areolata* (Linnaeus), Plate XIb. (Common rose coral)
Colonies are generally small (100 to 200mm. long), oval to circular, and stalked. Usually the single meandroid valley is 8 to 20 mm. wide and 7 to 10 mm. deep. Collins are developed in the valley sinuosities or in those specimens with several valleys, are 3 to 10 mm. thick, and are grooved when thick, Septa number 12 to 18 per centimeter and are porous, slightly exert, spinulose on the sides, and dentate on the edges. Columella is trabeculate and up to 4 mm. wide.

Three distinct growth variations were collected. Two of these are correlated with varieties listed by Verrill (1903) and the other is *Manicina mayori* Wells (which Wells currently considers as a variety of *Manicina areolata).* As the writers do not know to what extent these varieties are accepted currently, they are listed below as variations on the shove description.

Variation 1: Similar to *M. areolata* var. hispida Verrill.
Corallum circular with a short stalk, convex surface, and meandriform collines. Collines have a rather shallow groove. Walls of collines are distinctly raised to give a rectangular shape to the valley cross-section. Plate XIb (I).

Variation 2: Similar to *Manicina areolata* var. *laxifolia* Verrill.
Corallum oval with a surface flat to slightly convex and with a better developed stalk than Variation 1. Plate Xlb (2).

Variation *3: Manicina mayori* Wells.

Wells (personal communication) now considers M. *mayori* a variety of *M. areolata.* The only specimen collected by the writers has no stalk, is dome-shaped, and measures 178 mm. across at the base. Collines are meandriform, 2 mm. wide, and 13 mm. (range. 12-19 mm,) apart. Valleys are 10 mm. deep. Collines show a shallow groove. Plate XIb (3).

Variation may be caused by age differences or by environmental differences (inferred from Squires, 1958, p. 256).

Note on *habitat:*

Variation I: Generally found on the back-reef in areas of rich cord growth. Strongly attached to dead corals, Cayo Enrique is a good collecting site.

Variation 2: In *Thalassia* beds on the back-reef. Grows free on the organic-rich substrate in shallow water. Commonest of the three forms. Found in all areas studied where *Thalassia* grows.

Variety 3: Well-circulated back-reef waters of Cay. Turrumote. Grows free on the partly indurated, calcareous bottom in eight feet of water in zone of rich coral growth.

References: Duarte.Belle, 1961, p. 48; Smith, 1948, p. 28; Squires, 1958, pp. 254.255; Vaughan, 1901, p. 305.

20. *Colpophyllia amaranths* (Muller), Plate XII a.

Colonies are meandroid, convex masses which grow from a short stalk. No specimens larger than 30 cm, were collected. Depth of valleys averages 15 mm. when compared to C. *natans,* the valleys are shorter, more discontinuous, and somewhat straighter. The width of Valleys varies from 15-20 mm. in the center of the colonies to 37 mm. at the edge of the colonies. The collines are grooved, and the grooves are bounded on each side by upward extensions of the theta. Dentated septa number 10-12 per cm. and show very few spines on the sides near the base.

Note on habitat:

Practically on all back-reefs. Mostly among species of *Diploria* and other boulder-like corals. Usually attached by its stalk to pieces of dead coral or rock,

References: Smith, 1948, p. 85; Duarte-Bello, 196f, p. 26.

21. *Colpophyllia natans* (Muller), Plate XII b.

Colonies form light, meandroid, convex masses much larger than those of C. *amaranthus* and with longer, more sinuous, shallower valleys. The distance between collines averages 12 to 20 mm. and may reach 40 mm. near the edge. The collines are grooved as in C. *amaranthus.* Valleys measure up to 16 mm, in depth. The 8-9 septa per cm. are dentated and somewhat exsert. The septal sides are slightly spinulose. Coralla have no stalks, although the larger colonies develop and overhanging edge.

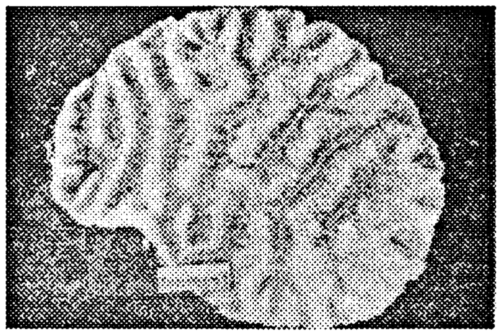
Note on habitat:

Similar to C. *amaranthus,* except that C. *natans* has no stalk and forms very largc boulders similar in size to the larger heads of *Diploria strigosa,*

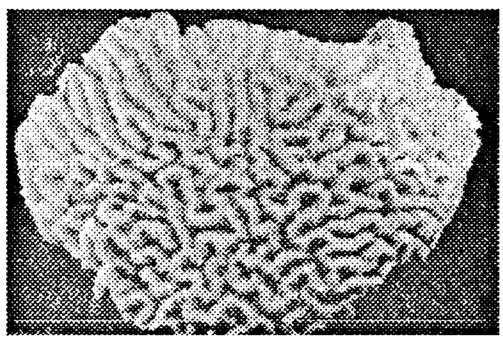
Montastrea annularis, and *Siderastrea siderea* Found in the open back-reef waters.
References: Smith, 1948, p. 86; Duarte-Belle, 1961, p. 26.

Subfamily Montastreinae Vaughan
and Wells, 1943

PLATE XII



a) *Colpophyllia amaranthus* (Muller)



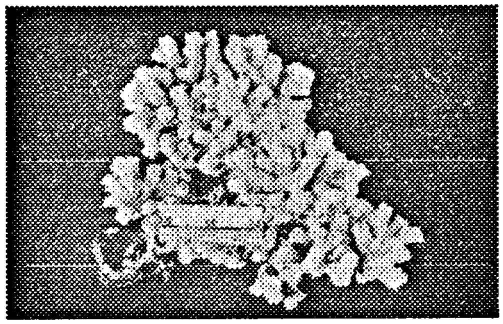
b) *Colpophyllia natans* (Muller)

22. Cladocora arbuscula Lesuer, Plate XIII a. (Tube coral)

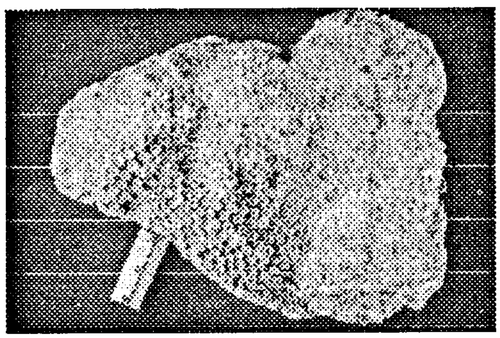
Corallum consists of a small branching co. lony with a corallite forming the end of each branch. Fine costal ridges extend down the outside surface of each corallite. Calices are from 2.5-3.5 mm. in diameter and usually have 36 dentated septa.

Note on habitat:
Taken by dredge from the outer shelf at La parguera in 70 feet of water.

PLATE XIII



a) *Cladocora arbuscula* (Lesueur)



b) *Solenastrea bournoni* (Milne-Edwards and Haime)

References: Vaughan, 1901, p. 298; Smith, 1948. p. 87; Duarte-Belle, 1961, p. 24.

23. Solenastrea bournoni Milne-Edwards and Haime, Plate XIII b. (Star coral)

Coralla form small irregular boulders or convex masses which may attain a length of two feet. The calices are round, slightly exsert, from 1 to 3 mm. apart, and from 2 to 2.5 mm. in diameter. Exotheca is generally blistered. Septa occur in three complete cycles. Only those of the first two reach the columella and have corresponding pali. The septa are dentate and have granulose sides. The columella is small and sometimes tuberculate.

Note on habitat:

Solenastrea bournoni is known to the writers from one colony occurring on the west end of Cayo

Caballo Abogado in about five feet of water. The coral was very well cemented to the substrate and had a lunate shape. Its growth was being checked by a larger colony of *Montastrea annularis* which was growing next to it.

It is also found in the shallow open *Thalassia* grass-flats in four feet of water on the south side of Bahia de Boqueron, where it grows on the crests of low ridges formed parallel to shore. Specimens were taken at 150 feet from shore.

References: Smith, 1948, p. 88; Duarte-Bello. 1961, p. 76.

24. *Montastrea annularis* (Ellis and Solander). Plate XIV a. (Common star coral)

Coral forms big boulders, covered with circular calices which measure 1.5-5 mm. and average 3 mm. in diameter. The calices may rise 3 mm. above the peritheca. Distance between calices varies from 0.5 to 3 mm. The septa are in three cycles and the first two fuse with the columella. The septa have toothed edges and grainy sides. Costae meet those of other calices across the peritheca. The columella is large and well developed and is composed of loosely interlocked trabeculae.

Note on habitat:

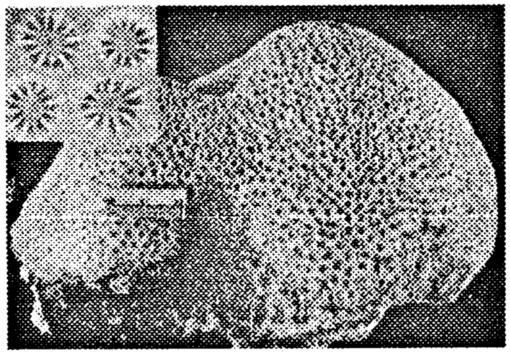
Very common in the back-reef, and forms large boulders in deeper water (5 feet to 25 feet) in the fore-reef.

References: Vaughan, 1901, p. 365; Smith, 1948, p. 89; Squires, 1958, p. 256; Duarte-Belle, 1961, p. 54.

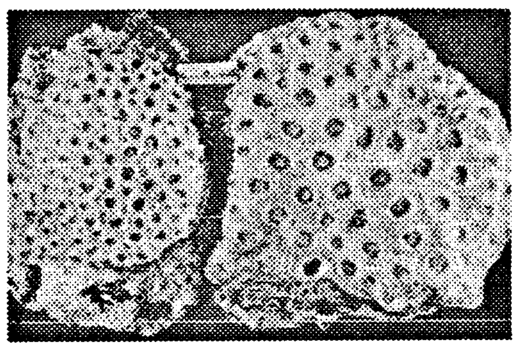
25. *Montastrea cavernosa* (Linnaeus), Plate XIV b (1, 2) (Large star coral)

Colonies form boulders which may attain a great size (up to 5 feet across - Smith). The surface is covered with large calices which are from 5 to 11 mm. in diameter, up to 3 mm. deep, either crowded or separated by as much as 6 mm., and always exsert. The costae are very well developed and meet the costae of other calices. There are 48 septa in four complete cycles. Septa of the first three cycles reach the columella. The septal edges are finely serrulated. The columella is well developed and is composed of interlocked trabeculae.

PLATE XIV



a) *Montastrea annularis* (Ellis and Solander)
Inset shows detail of calice



b) *Montastrea cavernosa* (Linnaeus)

1) Commonest growth form.
2) Form with blistered ephiteca. Listed as *M. braziliana* (Verrill in Smith), 1948, p. 90

**Montastrea braziliana* (Verrill), plate XIV b (2), is known from La Parguera from one specimen and is here included in *M. cavernosa* on the advice of Wells (personal communication) and from the following considerations. Although the calices are larger, averaging 10 mm. in diameter, 2-4 mm. deep, and 5-7 mm. apart, these measurements fall into the range determined from the collected specimens of *M. cavernosa.* All other characteristics are the same for both species, except *M. braziliana* has a highly blistered exotheca that commonly hides the costae.

Note on habitat:

On all back-reef flats among other corals or by itself fixed to a calcareous sand bottom. *Montastrea cavernosa* becomes less common as one approaches the patch reefs near the mainland

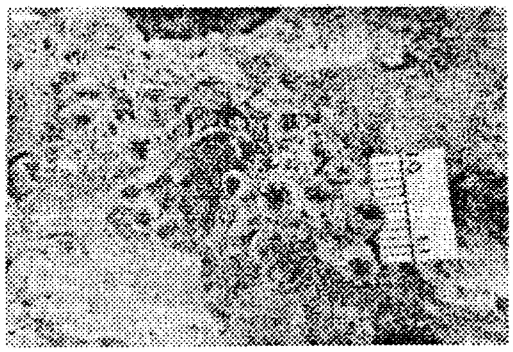
References: Smith, 1948, p. 90; Squires, 1958, pp. 255-256; Duarte-Bello, 1961, p. 52.

*I. B. M. - collected by J. Rivers Lopez, 1957, at La Parguera.

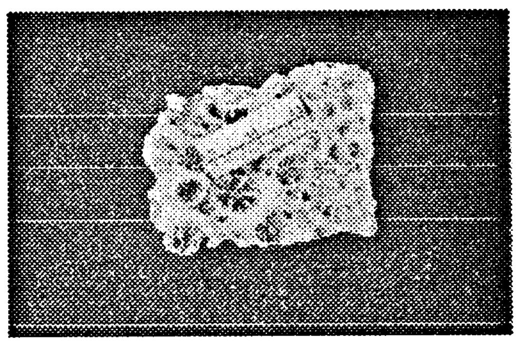
Family Rhizangidae d'Orbigny, 1851

26. Astrangia solitaria (Lesueur), Plate XV a. (Dwarf coral)
This species occurs in the form of small solitary coralites which usually grow attached to rocks of the under-surface of other corals. Generally, several corallites occur fairly close

PLATE XV



a) *Astrangia solitaria* (Lesueur)



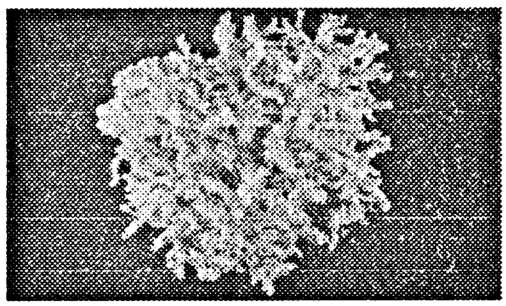
b) *Phyllangia americana* (Milne-Edwards and Haime) together and have their bases connected by a thin coenosteum. Tre calices are cylindrical and measure about 4 mm. across and 6 mm. high. All of the septa have small teeth on their edges. Septa are in four distinct cycles and the first two only reach the columella.

Reference, Vaughan, 1901, p. 298.

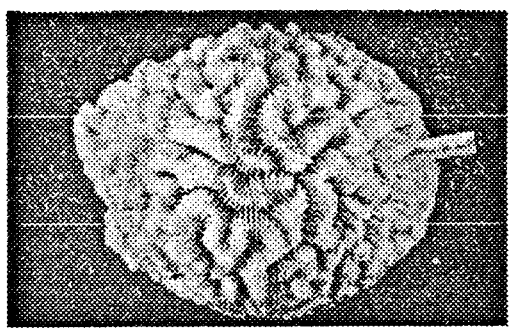
27. •Phyllangia americana Milne-Edwards and Haim, Plate XV b.

This coral occurs in small groups of cylindrical corallites which measure up to 10 mm. across, 8 mm. deep, and 12 mm. high. Often corallites are interconnected by a basal coen.osteum. The septa occur in four distinct cycles of which only the first two reach the

PLATE XVI



a) *Oculina diffusa* (Lamarck)



b) *Meandrina meandrites* (Linnaeus)

* I. B. M. collected by Dr. J. A. Rivero, September 27, 1958, at Cayo Caballo Ahogado, La Parguera.

columella. First cycle septa are almost non-dentate; rest, finely dentate. Septal sides are spinulose. The columella is formed by loosely interlocked trabeculae.

It grows attached to hard surfaces.

Reference: Wells, 1956, p. F409.

Family Oculinidae Gray, 1843
Subfamily Oculininae Gray, 1847

28. Oculina diffusa Lamarck, Plate XVI a. (Ivory bush coral)

Coralla form densely branching colonies which may measure up to 33 cm. in diameter. The branches are usually less than 10 mm. thick and have a finely granulated surface. The calices are 3-4 mm. in diameter and distant as much as 15 mm. from each other, The septa are in three complete cycles, are slightly exsert, have finely serrulated edges, and have spinulose sides. Pali occur in front of the first two cycles of septa. The costae do not extend very far from the septa. The well developed papillose columella may be easily confused with the pali. The branches may rise directly from the bottom, or they may rise from a basal plate formed of fused branches.

Note on habitat:

This coral is more common on the patch reefs and fringing reefs where it occurs on the bottom or attached to hard surfaces. La a lumps (up to 33 cm. in diameter) occur on the shallow open calcareous sand bottom of the lagoon on Cayo Enrique.

References: Smith, 1948, p. 91; Squires, 1958, pp. 256-257; Duarte-Belle, 1961, p. 60.

Family Meandrinidae Gray, 1847 *Subfamily Meandrininae* Gray, 1847

29. Meandrina meandrites (Linnaeus), Plate XVI b. (Brain coral)

Coral forms big and heavy convex boulders which have no stalks. The valleys are long, meandroid, continuous, 8-14 nun. in width, and 6-12 mm. in depth, According to Smith and Duarte-Belle, the collines have a groove which may be up to 4 mm. wide and up to 5 mm. deep. However, in the specimens studied by the investigators, the groove is only rarely well developed, and never so large. The septa have the upper margin smooth. They are sometimes continuous over the colline and are exsert to 1.5 mm. The septa occur in two sizes which alternate. There are 6-8 larger septa per cm. The laminar columella is generally discontinuous, and rarely well developed.

Note on habitat:

M. meandrites occurs on the back-reef, especially along the outer edge, in water deeper than five feet where circulation is good.

References: Vaughan, 1901, *pp. 296-297;* Smith, 1948, pp. *92-93;* Duarte-Belle, 1961, p. *50.*

Subfamily Dichocoeniinae Vaughan
and Wells, 1943

30. *Dichocoenia stokesii* Milne-Edwards and Haime, Plate XVIIa. (Star coral)

The colonies are small, heavy, convex boulders (up to 1 foot in diameter, according to Smith) with corallites of various shapes (circular, oval, or <Yu shaped). The calices are exsert, are separated by a granulated peritheca, and are single or short meandrine with two or three centers. Distance between collines is 5 mm. The valleys measure 12 mm. in length, 2-5 mm. in width, and 4-6 mm. in depth. The septa are exsert, alternate in size, hear no teeth, reach the columella, and number 18-20 per cm.

Note on habitat:

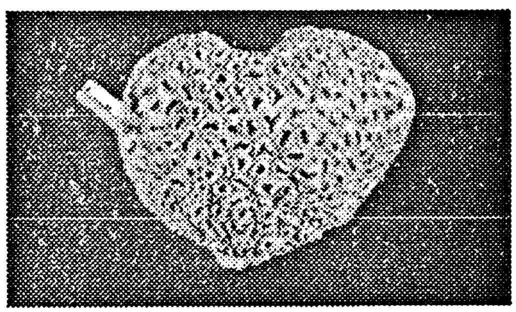
D. stokesii occurs on the back-reef, especially along the outer edge, in well circulated water deeper than five feet.

References: Smith, *1948,* p. *93;* Duarte-Belle, *1961, p. 30.*

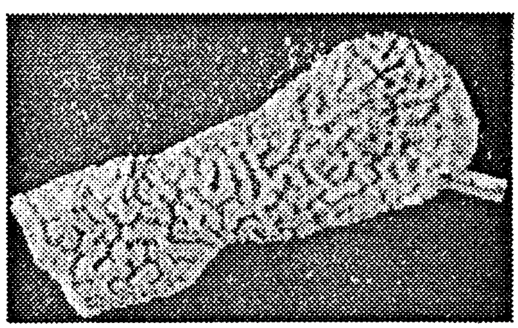
31. *Dendrogyra cylindrus* Ehrenberg, Plate XVII b. (Pillar coral)

Colonies form heavy, branching, columnar cylinders which rise vertically from the bottom of the sea. Corallum may attain a height of three meters. The valleys are winding and measure 2-3 mm. deep on the sides and 3-6 mm. deep at the tip of growth. Distance between collines is 3-9 mm. on the sides and up to 10 mm. on the growing ends. Collins vary in thickness as follows: they are 2-4 mm. wide on the sides and less than one to one mm. wide on the growing ends. Collines have a shallow groove. The septa are slightly

PLATE XVII



a) *Dichocoenia stokesii* (Milne-Edwards and Haime)



b) *Dendrogyra cylindrus* (Ehrenberg)

exsert and of two alternated sizes. The longer septa usually meet the columella. The septa are not denticulated and average 7-10 per cm.

Note on habitat:

This coral is found on all reefs, especially in open back-reef waters.

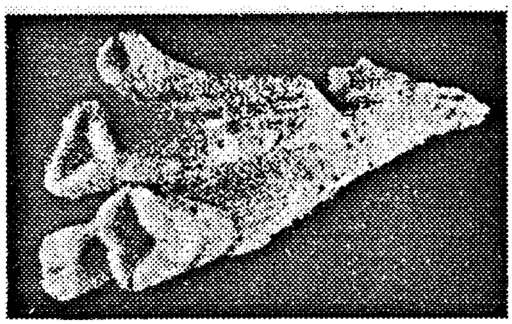
References: Smith, *1948,* p. *94;* Duarte-Belle, 1961, p. *28.*

Family Mussidae Ortman, 1890

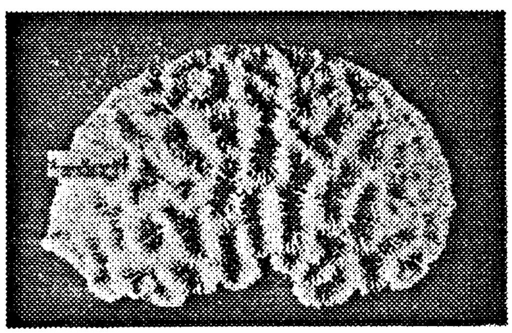
32. Mussa angulosa (Pallas), Plate XVIII a. (Large flower coral)

Colonies consist of short, thick, divergent branches which end in calices. The calices may be up to 12 cm. long and *4.6* cm. wide. The corallites occur singly or in small groups not larger than three when in process of di-vision. `The septa generally number eight per cm. and are exsert up to *6* mm. The septal margins are strongly dentate and generally bear nineteeth which are oriented upward. There are two teeth on the exsert

PLATE XVIII



a) ***Mussa angulosa*** **(Pallas)**



b) ***Isophyllastrea rigido*** **(Dana)**

portion of the septa. Septal sides are spiny. The costae extend down the branches. The costae, like the septa, also have teeth which are oriented upward. The columella is well developed and formed by interlocked trabeculae.

Note on habitat:

M. angulosa occurs in the lagoons of Cayo Enrique, Cayo San Cristobal, and Cayo Caballo Abogado. The specimens collected have been found in areas of dense coral growth. One specimen had its lateral expansion restricted. because of large boulders of growing coral on either side Of. the colony This specimen differs from the others in that its branches are longer and more pillar-like.

Competition with *surrounding* forms for circulating water may have been an influence in the development of this form of growth. Generally, the writers found *M. angulosa* in large clumps (up to 2' in diameter) growing on the bottom or only loosely associated with other corals. The branches in these casses were considerably shorter. However, small colonies, with short branches, were found attached to other corals in close association.

References: Smith, 1948, p. 96; Duarte-Belle, 1961, p. 56.

33. Isophyllastrea rigida (Dana), PI ate (Rough star coral)

Colonies are *small* to medium-sized, heavy, convex masses which grow from *a* short stalk. The surface is covered with irregularly shaped calices which tend to be polygonal. Gene-rally the Calices have one, two, or rarely three centers. Valleys are discontinuous, from 8 to 10 mm. in width, and from 10 to *12* mm. in depth. The length of the valleys is variable, very rarely exceeding *40* mm. Septa number *25-30* in single calices and have *6-8* teeth on their margins. Where the septa are not continuous over the colline, a narrow groove is developed. The columella is Of loosely interlocked trabeculae and appears to be poorly developed.

Note on habitat:

Well-circulated shallow back-reef and deeper fore-reef waters of both outer and inner reefs.

References; Smith, 1948, p. 96; Squires, 1958, p. 258; Duarte-Belle, 1961, r. 44.

34. *Mycetophyllia lamarckiana* (Milne-Edwards and Haime), Plate XIX a.(Large cactus coral)

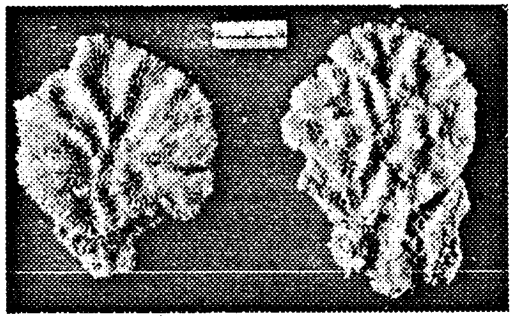
Corallum forms encrusting or stalked plates which may attain a length of several feet. Its surface is usually flat and very spiny in appearance. The valleys are long, sinuous, and always interconnecting. The valleys are from 12-15 mm. wide and up to 42 mm. in depth, average 10 mm. When colline is pre-sent, as in younger specimens, it may be 2-3 mm. thick (up to 5 mm. - Smith) and shows an indistinct groove. The septa number 8-10 per cm. Those forming the colline continue over it. The septa are exsert and dentated. Septal sides are spinulose. Columella is absent, although some of the septa reaching the center are interconnected by 2 or 3 lamellae.

Note on habitat:

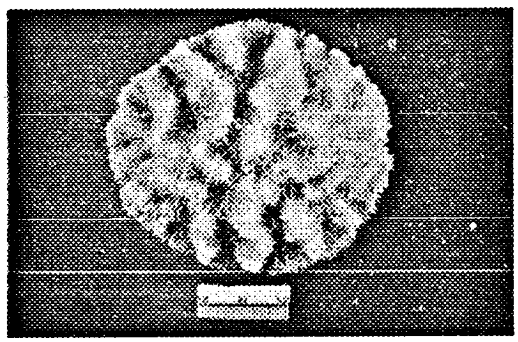
Probably on all back-reefs. It generally grows in protected areas among other corals. It is mostly found growing encrusted on the sides, very near the base, of large boulders of corals.

References: , Smith, 1948, pp. 97-98; Duarte-Bello, 1961, p. 58.

PLATE XIX



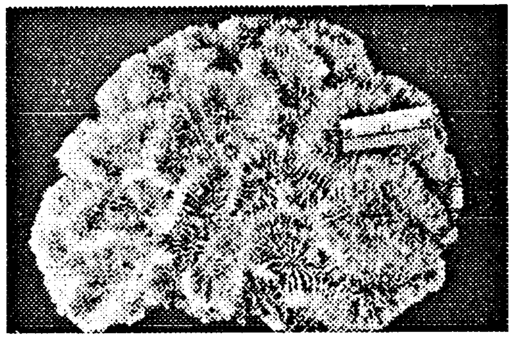
a) *Mycethophyllia lamarckiana* (Milne-Edwards and Haime)



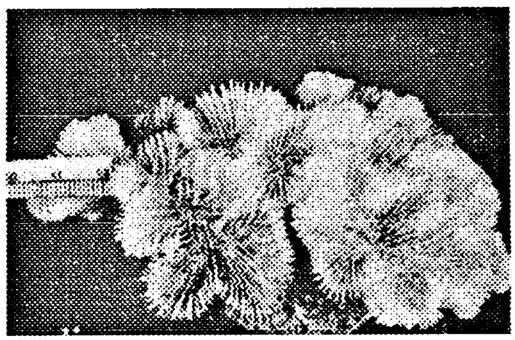
b) *Isophyllia multiflora* (Verrill)

35. *Isophyllia sinuosa* (Ellis and Solander), Plate XX. (Cactus coral)
Colonies form medium-sized, convex masses supported by a short stalk and covered with sinuous valleys or enclosed calices having up to three centers. Valleys average 25 mm wide (up to 35 mm.) and 8 to 10 mm. deep. In young specimens, the valleys have a radial arrangement which is lost in older colonies as valleys become enclosed. Colline may be indistinctly grooved. Septa are nine per centimeter, spinulose, dentate, and exert to 4 mm. They may meet at the colline groove, extend into neighboring calices, or form costae. Septal teeth are well developed and point obliquely upwards within the cali-

PLATE XX



a) *Isophyllia sinuosa,* var. *dipsacea* (Dana)



b) *Isophyllia sinuosa,* var. *fragilis* (Dana)

ces. Columella is well developed and made of interlocked trabeculae. Costae are dentate and extend down the length of the corallum.

Verrill (1903, p. 121) recognized two species of *Isophyllia* which now are listed under *Isophyllia sinuosa* as varieties (Matthai, 1928, p. 237; Smith, 1948, p, 98). Both have been collected by the writers from the reefs at La Parguera.

1. *Isophyllia sinuosa* var. *dipsacea* (Dana), Plate XX a.

   Little or no tendency towards discreet branching, thus edge of colony not scalloped. Septa somewhat thicker and more spinulose than *I. sinuosa* var. *fragilis,* 7 to 9 per cm. Columella is somewhat denser than in I. *sinuosa* var. *fragilis.*

2. *Isophyllia sinuosa* var. *fragilis* (Dana), Piate XXb.

   Essentially phaceloid corallum of short (30 mm.), thick (20 mm.), partially fused branches rising from a short central stalk. Calices from the same or different branches are generally fused. Periphery of corallum is scalloped. Calices may contain as many as three centers joined by trabecular linkage. Maximum size of calices is 55 mm. long, 37 mm. wide, and 20 mm. deep. Continuous valleys are fewer than in I. *sinuosa* var. *dipsacea.* Septa number 9 to 12 per centimeter and bear approximately 16 teeth on their margins. The teeth point horizontally to obliquely upwards within the calices and vertically upwards over the theca. Columella is formed of loosely interlocking trabeculae.

Note on habitat:

This coral is generally found on all back-reefs and around the submerged western extension of the reef rise on Cayo Turromote. Common on the outer and inner reefs and less common on the patch reefs and fringing reefs near shore.

I. *sinuosa* var. *fragilis is* known from only one specimen found attached to the base of a large colony of *Acropora palmata* on the southwest end of Cayo Caballo Ahogado in five feet of water. The specimen was, protected by heads *of Mo ta.strea annularis* which were two to three feel high and were growing near the base of the *A. palmata.* The specimen was one foot above the bottom.

References: Duarte-Bello, 1961, p. 44; Matthai, 1928, *p. 237;* Smith, *1948,* p. *98;* Squires, 1958, pp. *257-258;* Verrill, 1903, p. 121.

36. *Isophyllia multiflora* Verrill, Plate XIX b. (Lesser cactus coral)

Coral forms colonies with short stalks. Its similarity with I. *sinuosa* is so great that in the field the two may be easily confused. The valleys are shallower (5-10 mm., average 7 mm.), fewer and narrower (10 mm. up to 20 mm.) than I. *sinuosa.* The septa are exert to 2 mm., number from 11-12 per cm., and have their margins dentated. Septal teeth are directed obliquely upward. The septal sides may have a few small spines. The col-lines are thin and commonly grooved. The columella is well developed and made of fine, interlocking trabeculae. Costae dentate.

Note on habitat:

This coral is probably on all reefs in the open back-reef arms. The specimens collected were found on the western submerged extension of the reef rise of Cayo Turrumote. They were attached to hardened projections of calcareous rock ~ on a clear, open, white sand bottom at a depth of approximately 10-15 feet.

References: Smith, 1948, p. *99;* Duarte-Bello, 1961, p. 44.

SUBORDER CARYOPHYLLINA Vaughan
and Wells, 1943
SUPERFAMILY CARYOPHYLLIICAE
Gray, 1847
Family Caryophylliidae Gray, 1847
Subfamily Eusmiliinae Milne-Edwards and Haime, 1857

37. Eusmilia fastigiata (Pallas), Plate XXIa. (Flower coral)

Corallum branches dichotomously, and each branch bears a round or oval corallite with one, two, or three calicinal centers. The septa number 15-18 per cm., 7-9 principals, and have the following characteristics: exsert, not dentated, spinulose on the sides. The costae have small teeth and extend along the greater length of each branch. The calices are 8-28 mm. long (Smith's maximum is 35 mm.), 8-13 mm. wide, 7-9 mm. deep.

Note on habitat:

Usually on the back-reef. It may occur in the open, or under the overhangs of the larger stalked corals.

References: Smith, 1948, p. 99; Duarte-Bello, 1961, p. 83.

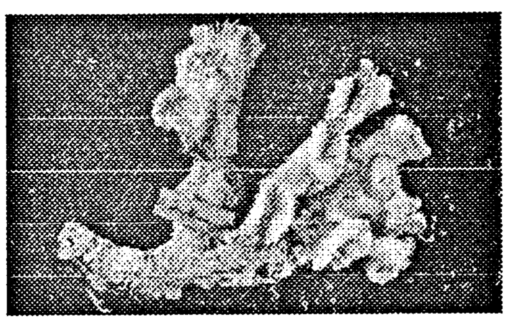
SUBORDER DENDROPHYLLINA Vaughan
and Wells, 1943
Family Dendrophyllidae Gray, 1847

38. **Tubastrea aurea? (Quoy* and Gahnard?). Plate XXI b.

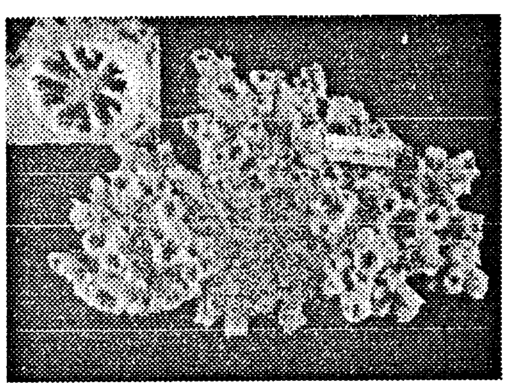
Coralla occur in small clumps. The cylindrical corallites are up to 10 mm. in diameter, 22 mm. in height, united nearly to their summits by peritheca, and pink. Inner edges of the walk are perpendicular. The septa occur in four incomplete cycles. The first two cycles are always complete. The septa of the first cycle always reach the columella. The columella is formed of loosely interlocked trabeculae and sits deep in the calix as compared with a drawing of *T. tenuilamellosa* (Milne-Edwards and Haime) in Wells, 1956. fig. 338 (7), p. F434.
Reference: Wells, 1956, p. F436.

*I. M. B. - collected and identified as *T. tenuilamellosa* by T. F. Goreau, January 10, 1960, at Cayo Media Luna, La Parguera, P. R. Wells (personal communication) believes this may be *T. aurea* from the study of a photograph.

PLATE XXI



a) *Eusmilia fastigiata* (Pallas)



b) *Tubastrea aurea* (Quoy and Gaimard)

SHALLOW WATER STONY CORALS
OF PUERTO RICO
Alphabetical List

*Acropora cervicornis (*Lamarck).
Acropora palmata (Lamarck).
Acropora prolifera (Lamarck).
Agaricia agaricites var. *crassa* (Linnaeus).
Agaricia agaricites var. fragilis (Dana).
Agaricia agaricites var. *purpurea* (Linnaeus).
Agaricia cucullata (Ellis and Solander).
Astrangia solitaria (Lesueur).
Cladocora arbuscula (Lesueur).
Colpophyllia amaranthus (Muller).
Colpophyllia natans (Muller).
Dendrogyra cylindrus Ehrenburg.
Dichocoenia stokesii Milne-Edwards and Haime.
Diploria clivosa (Ellis and Solander).
Diploria labyrinthiformis (Linneaeus).
Diploria strigasa (Dana).
Eusmilia fastigiata (Pallas).
Favia fragum (Esper).
Favia cf. gravida ? Verrill.
Isophyllastrea rigida (Dana).
Isophyllia multiflora (Verrilll).
Isophyllia sinuosa var. *dipsacea* (Dana).
Isophyllia sinuosa var. *fragilis* (Dana).
Manicina areolata (Linnaeus).
Meandrina meandrites (Linneus).
Millepora alcicornis (Linnaeus).
Millepora complanata Lamarck.
Millepora squarrosa Lamarck.
Montastrea annularis (Ellis and Solander).
Montastrea cavernosa (Linnaeus).
Mussa angulosa (Pallas).
Mycetho hyllia lamarckiana (Milne-Edwards and Haime).
Oculina diffusa Lamarck.
Phyllangia americana Milne-Edwards and Haime.
Porites astreoides Lamarck
Porites porites var. *clavaria* Lamarck.
Porites porites var. divaricata Lesueur.
Porites porites var. furcata Lamarck.
Siderastrea radians (Pallas).
Siderastrea siderea (Ellis and Solander).

Solenastrea bournoni Milne-Edwards and Haime.
Stephanocoenia micheline Milne-Edwards and Haime.
Tubastrea aurea (Quoy and Gaimard).

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