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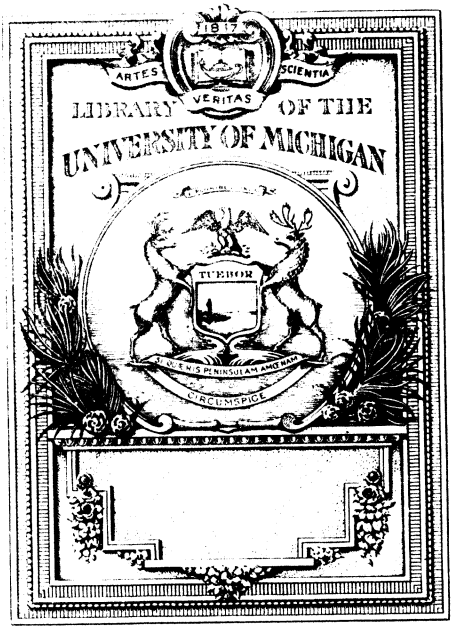
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OF

Porto Rico and the Virgin Islands

VOLUME III—Part 3

Fossil Corals of Porto Rico, with Descriptions also of a Few Recent Species—*H. N. Coryell and Violet Ohlsen*

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FOSSIL CORALS OF PORTO RICO

With Descriptions also of a Few Recent Species

By H. N. Coryell and Violet Ohlsen

CONTENTS

(Those subtitles marked by an (*) were prepared jointly by H. N. Coryell and Violet Ohlsen and the remaining by the senior author.)

INTRODUCTION

Purpose and Résumé

The essential purpose of this paper is to include a specific and generic description of the corals collected by Doctors Chester A. Reeds and Bela Hubbard. Sixty-seven species and 24 genera are described. Thirteen of the species are new. Thirty-eight of the 67 species were from the San Sebastian, 13 from the Lares, 19 from the Cibao, 2 from the Los Puertos, 2 from the Quebradillas, 39 from the Ponce and 14 from the Pleistocene and Recent.

Every old species was identified by the aid of the original descriptions and figures, and their names have been corrected under the Laws of Nomenclature.

The correlation of the Porto Rican coral fauna with the stratigraphic distribution of other similar faunas in the Caribbean Region is given in Table No. I, pages 172-3. In Table II, page 175, are shown the probable

equivalents of the formations of Porto Rico in other islands of the West Indies and in the subtropical and tropical portions of North America.

Collections Studied

In 1915 Dr. Chester A. Reeds and Mr. P. B. Hill visited Porto Rico for the purpose of making one of the most elaborate scientific collections of fossils that had ever been assembled from that island. Their work was to form the basis of a publication on the fossil fauna. Some of the groups of forms collected by them have already been studied by different students, and the results have been published either as separate numbers of the Scientific Survey of Porto Rico or have been incorporated within other reports of this survey.

The coral specimens were shipped to Washington, D. C., to Dr. T. Wayland Vaughan. He was recognized as an authority on Tertiary corals and was selected as the proper person to undertake the work, but Dr. Vaughan's other duties left no time for the identification and description of the specimens, many of which were similar to those he had already described. So after a few years they were returned to the headquarters of the New York Academy of Sciences and later forwarded to Columbia University, where they have been stored since 1927.

Dr. Bela Hubbard's geological studies on the Lares area of Porto Rico were published in 1923 after he had presented a report on the results of his field observation before the New York Academy of Sciences in 1917. The corals of his collections were forwarded from Porto Rico directly to Dr. T. Wayland Vaughan, Washington, D. C. They were set aside there with Dr. Reeds' specimens and later forwarded to New York and stored in Columbia University.

Nothing more was done with these two collections until the spring of 1928. At that time the work which has resulted in the present paper was initiated and the specimens gathered by both parties were studied.

Previous Work on West Indian Coral Fauna

The writers who have made incidental mention of the fossil corals of the West Indies are indeed very numerous. Those who have obtained a few specimens from the Islands and inserted a description of a new species or variety in a stratigraphic discussion of the Caribbean Region are less numerous, but yet make up a considerable list. Detailed reference to these students is given in the specific and generic descriptions.

The zoological and paleontological students who have made a systematic classification and study of the coral fauna of the lands around

the Caribbean Sea are few. One of the earliest of these was Duncan, an English paleontologist, who obtained several collections of corals from the West Indies. He began his publications as early as 1884 in the Zoological Journal of the Linnean Society of London and followed these with a series of publications in the Quaterly Journal of the Geological Society of London, which appeared in volumes XIX to XXVIII.

A. E. Verrill was an enthusiastic worker in unravelling the life history of reef-making corals and in reorganizing the classification of the Hexacoralla. He published many genera and species from the Porto Rican region in the Transactions of the Connecticut Academy of Arts and Science for 1901.

The work of Dr. T. Wayland Vaughan in Bulletin 103 of the U. S. National Museum for 1919 probably ranks as the best organized systematic paper on fossil corals of the Caribbean Province among the several papers that he has published. It is the one found most useful in the work of identifying the Reeds and Hubbard collections.

Acknowledgments

The writers wish to take this opportunity to express their gratitude especially to Doctors Chester A. Reeds and Bela Hubbard, who collected the Porto Rican specimens, to Miss Marjorie Elton for her splendid assistance, to Miss Amy Hepburn for making available the numerous references and to Professor Howard A. Meyerhoff for many useful suggestions.

As the junior author was able to collaborate only during the study of a portion of the Reeds collection, those genera, species and pages of discussion that were prepared jointly are designated by an asterisk (*) preceding the subtitles, both in the index and the text.

CORRELATIONS BASED ON THE CORAL FAUNA

The Tertiary and later formations in Porto Rico are arranged in a series of irregular "off-lapping" beds upon a median eastward-westward axis of older rock. The youngest beds are along the north and south shores with the older members outcropping in irregularly parallel bands farther inland, leaving the older sediments and igneous masses exposed in the interior.

The detailed classification of the various divisions of the Tertiary are still under discussion as to their proper position in the geological time scale. Some of the determinations are based upon faunal evidences

primarily, while others lay claim to their position upon the interpretation of the structural features.

The work on the coral collections here presented should not be expected to add much that is new to the stratigraphy. It should aid, however, in the correlation of the horizons determined in Porto Rico with those from which other coral faunas have been collected. One of the available works to form a basis for a correlation is that of Dr. T. Wayland Vaughan in Bulletin 103 of the U. S. National Museum.

The following table gives the range of the Tertiary and later corals of the Reeds and Hubbard collections in the Porto Rico formations and their occurrence in other formations as determined by Vaughan.

TABLE I

Species from Porto Rico	Porto Rican Horizons								Vaughan, Bull. 103, U.S.N.M.						
	Quebradillas.	Los Puertos.	Cibao.	Lares.	San Sebastian.	Ponce.	Juana Diaz.	Pleistocene & Recent.	Antigua	Anguilla.	Emperador.	Chattahoochee.	Culebra.	Bowden.	Pliocene, Pleistocene & Recent.
Acropora crassa, n. sp.						x		x							
Acropora palmata								x							x
Acropora panamensis				x	x	x			x		x				
Agaricia agaricites crassa								x							
Agaricia irregularis, n. sp.			x												
Agaricia sinuata, n. sp.			x			x									
Antiguastrea cellulosa		x		x	x	x	x	x	x	x					
Antiguastrea cellulosa curvata					x				x						
Astreopora antiguensis						x			x						
Astrocoenia decaturensis			x	x	x	x			x						
Astrocoenia guantanamensis					x				x						
Astrocoenia meinzeri						x			x						
Astrocoenia ornata					x										
Astrocoenia portoricensis				x	x	x			x						
Calamophyllia dendroidea, n. sp.						x									
Calamophyllia portoricensis, n. sp.		x		x	x	x									
Cyathomorpha antiguensis				x	x				x						
Cyathomorpha tenuis					x	x	x	x	x						
Diploastrea crassolamellata				x	x	x			x						
Favites expansa, n. sp.					x										
Favites irregularis, n. sp.					x										
Goniastrea crassa, n. sp.															
Goniastrea pectinata								x							
Goniopora canalis				x	x					x	x				
Goniopora cascadensis					x	x			x	x			x		
Goniopora clevei					x				x	x	x				
Goniopora decaturensis					x	x			x						
Goniopora decaturensis silicensis				x		x						x			

TABLE I (*Continued*)

Species from Porto Rico	Porto Rican Horizons								Vaughan, Bull. 103, U.S.N.M.						
	Quebradillas.	Los Puertos.	Cibao.	Lares.	San Sebastian.	Ponce.	Juana Diaz.	Pleistocene & Recent.	Antigua.	Anguilla.	Emperador.	Chattahoochee.	Culebra.	Bowden.	Pliocene, Pleistocene & Recent.
Goniopora hilli					x	x					x				
Goniopora imperatoris					x	x				x	x				
Goniopora jacobiana						x								x	
Goniopora panamensis					x	x				x	x				
Goniopora portoricensis				x	x				x						
Goniopora regularis					x	x			x						
Hydnophora hubbardi					x										
Lamellastraea crassa, n. sp								x							
Latomeandra lata, n. sp					x										
Leptoria areolata hispida								x							
Leptoria phrygia								x							
Maeandra antiguensis				x	x				x		x				
Maeandra labyrinthiformis								x							
Manicina willoughbiensis					x				x						x
Metastraea planulata, n. sp						x									x
Orbicella annularis	x					x									
Orbicella cavernosa					x	x									
Orbicella costata				x	x	x	x		x	x			x		
Orbicella limbata						x								x	
Orbicella tampaensis				x	x	x				x					
Pironastraea anguillensis					x				x	x					
Pironastraea antiguensis				x		x			x						
Pocillopora portoricensis, n. sp						x									
Porites anguillensis				x	x	x				x	x				
Porites astreoides			x			x									
Porites baracoaensis						x								x	
Porites douvillei			x	x	x	x	x				x				
Porites (Synaraea) macdonaldi					x					x	x				
Porites panamensis				x	x	x					x				
Porites porites								x							x
Porites toulai				x	x	x					x				
Stylophora affinis				x	x	x								x	
Stylophora goethalsi			x								x		x		
Stylophora granulata						x								x	
Stylophora macdonaldi	x			x		x					x				
Stylophora panamensis					x						x				
Stylophora ponderosa				x		x			x						
Stylophora portobellensis						x									
Siderastrea conferta					x				x	x			x		

Of the 67 species identified here, 42 occur in the Oligocene and Miocene beds as tabulated by Vaughan.

The Antigua is represented by 23 of the 42 species, 8 of which extend into the Anguilla or Emperador beds. The Antiguan corals were col-

lected from the base of the formation. Of the 23 species, 19 occur in the San Sebastian Shale of Porto Rico as designated by Doctor Chester A. Reeds * and Professor Howard A. Meyerhoff.** The San Sebastian thus appears equivalent to the base of the Antigua formation.

Twenty-one of the 42 species occur in the Lares Limestone. Of these, 7 occur in the Antigua only, 4 in the Antigua and Anguilla, or Antigua and Emperador and 7 in the Anguilla or Emperador only. The Lares Limestone on this basis appears transitional, but on comparing the occurrence of the Lares species with the San Sebastian, it is found that 17 of the 21 from the Lares Limestone were collected also from the San Sebastian. The Lares Limestone then appears closely related to the later formation. Only two of the Lares species were found in the Cibao above.

Six of the 42 species occur in the Cibao as limited by Meyerhoff.* Of these, 1 occurs in the Antigua only, 0 in the Antigua and Anguilla or Antigua and Emperador, and 2 in the Anguilla or Emperador only. The Cibao appears to be related to the formations of Anguilla age rather than to older beds, but an impression based on so few species cannot be as conclusive as one could wish.

From the collections of Reeds and Hubbard, 39 species were identified from the Ponce formation as determined by Doctor Reeds in the field. Of these 39 species, 21 have been identified from the San Sebastian Shale, 17 from the Lares Limestone, 4 from the Cibao Limestone, 2 from Los Puertos and 2 from the Quebradillas Formation. The distribution indicates that the collection was made from the beds on the south side of Puerto Rico without any particular field recognition as to the zonal divisions or lithologic phases more readily determined in the field on the north side of the island. The Ponce Formation, as here determined from the coral collection, includes beds equivalent to the San Sebastian, Lares, Cibao, Los Puertos and Quebradillas of the northern section. The lower part of the Ponce Formation, as designated in the field by Reeds, would include the Guanica, Juana Diaz and Collazo beds as given by Vaughan.* This would leave only the upper limestone deposits to be included in the limited Ponce. With detailed field work added to the faunal studies still other limitations should be possible.

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* Reeds, C. A., Field Tabulation List, unpublished.

** Meyerhoff, H. A., personal communication.

* Meyerhoff, H. A., personal communication.

* Vaughan, T. Wayland, Bull. Geol. Soc. of Amer., XXXV, 1924, opposite p. 720.

Of the 42 species common to the collections of Vaughan and to those of Reeds and Hubbard, 10 have been identified from the Antigua Formation only, 8 from the Antigua and Anguilla or Antigua and Emperador, 8 from the Anguilla or Emperador only and 5 from the Bowden of Jamaica. The Antigua would thus include the lower Ponce, which is here correlated with the Guanica—Juana Diaz—Collazo horizon.* With no further division undertaken on the basis of the present information, the remaining Ponce beds are equivalent to the Anguilla-Bowden deposits.

The following table shows a possible correlation of the formations of Porto Rico, based on the present coral studies, with the formations elsewhere from which considerable coral faunas have been obtained.**

TABLE II

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="2">Panama and Costa Rica</th><th>Lesser Antilles</th><th>Florida</th><th>Jamaica</th><th>Northern Porto Rico</th><th>Southern Porto Rico</th></tr>
<tr><td rowspan="2">Miocene</td><td>Middle</td><td colspan="2" rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">Bowden</td><td rowspan="2">Quebradillas</td><td rowspan="3">Ponce</td></tr>
<tr><td>Lower</td></tr>
<tr><td rowspan="3">Oligocene</td><td>Upper</td><td rowspan="2">Culebra</td><td>Emperador</td><td>Anguilla</td><td rowspan="2"></td><td rowspan="3"></td><td>Los Puertos</td></tr>
<tr><td rowspan="2">Middle</td><td rowspan="2"></td><td>Cibao</td></tr>
<tr><td>Antigua</td><td>Chattahoochee</td><td>Lares</td><td>Guanica</td></tr>
<tr><td colspan="5"></td><td>San Sebastian</td><td>Juana Diaz</td></tr>
</table>

TABULATION OF THE COLLECTING LOCALITIES

The localities from which the corals were collected are grouped into two lists. The first one gives the stations visited by Dr. Chester A. Reeds and Mr. P. B. Hill during the months of June and July, 1915.

* Vaughan, T. W., Bull. Geol. Soc. of Amer., XXXV, 1924, opposite p. 720.
** Vaughan, T. W., Bull. 103, U. S. Nat. Mus., 1919.

The number 440 is the accession number allotted to the collection in the American Museum of Natural History. The other number or numbers designate the field locality. The description of each station is preceded by the age of the formation from which the collection was made as determined by the field interpretation and the study of the fossil specimens.

The second list groups in consecutive order, the stations visited by Dr. Bela Hubbard during his study of the Lares district. Many of the specimens in his collection are excellently preserved. He was fortunate in securing representatives of a number of genera not commonly present in a collection of Porto Rican fossils.

Collecting Localities of the Reeds Collection

440-3 *Los Puertos—Arecibo Limestone.* Near south edge of Aguadilla, about 150 feet above the sea on an old road leading eastward up the hill.

440-11 *Los Puertos—Arecibo Limestone.* Collection from rock wall in railroad cut just south of railroad station, Aguadilla.

440-14 *Los Puertos—Arecibo Limestone.* Collection from south end of cut just south of railroad station, Aguadilla.

440-17 *Los Puertos—Arecibo Limestone.* Collection from the field ¼ mile east of the south edge of Aguadilla, about 300 feet above the sea.

440-18 *Recent.* Collection from the beach south of Aguadilla.

440-20 *San Sebastian.* Collection from shaly limestone south side of road near Km. post 33, on road from San Sebastian to Lares.

440-24, -25,-26,-27. *San Sebastian.* Collection from bank along road from San Sebastian to Lares at Km. post 28.4.

440-28 *San Sebastian.* Collection from the shales at Km. post 28.25 on road from San Sebastian to Lares.

440-33, -34,-35. *Lares.* Collection from the surface slope, 100 feet above the base of the formation, ¼ mile west of the river near the edge of the limestone escarpment overlooking Culebrinus River valley. Collazo River near San Sebastian.

440-36 *San Sebastian.* Collection below the third fall, 100 feet below the bridge over Collazo River near San Sebastian, on the down stream side.

440-38, -39,-40,-41, -42,-43. *San Sebastian.* Collection from the roadside near Collazo River on the road from San Sebastian to Lares.

440-44 *San Sebastian.* Collection from beneath overhanging cliff, 50-100 feet below the base of the Arecibo—Lares Limestone, near Km. 28, Hm. 8, on the road from San Sebastian to Lares.

440-45, -46,-47,-48, -49,-50,-51, -52. *San Sebastian.* Collection from the talus slope beneath bluff, 50 feet high along roadside near Km. post 28, Hm. post 8, on the road from San Sebastian to Lares.

440-53 *San Sebastian.* Collection from Mr. Rabell's property below the 100 foot falls near the road below the bridge over the Collazo River on the road from San Sebastian to Lares.

440-55 *San Sebastian.* Collection from the shale zone along the road from San Sebastian to Lares near Km. post 32, Hm. post 8.

440-56 *San Sebastian.* Collection from the marly beds on the south side of the road between Km. post 33, Hm. post 5-6, on the road from San Sebastian to Lares.

440-57, -58,-59. *San Sebastian.* Collection from the quarry on the north side of road from San Sebastian to Lares near Km. post 33, Hm. post 3. (This horizon is sometimes referred to the Lares formation, base of the Arecibo.)

440-62 *San Sebastian.* Collection from beds 20 feet below the top of the formation along roadside opposite Km. post 28, Hm. post 4, on road from San Sebastian to Lares near the bridge over the Collazo River.

440-63 *San Sebastian.* Collection from the bluish shale, 11-12 feet thick, exposed along the side of road No. 8, from San Sebastian to Lares near Km. post 29, Hm. post 3-4.

440-64 *San Sebastian.* Collection from the bed at the base of the Arecibo—Lares formation along the San Sebastian to Lares road near Km. post 29, Hm. post 3-4.

440-72, -73. *San Sebastian.* Collection from the coral zone just above bench mark 75.5 meters on bridge at the waterfall near

Km. post 28, Hm. post 8, on road No. 8 from San Sebastian to Lares.

440-92 *Lares.* Collection from beneath a limestone cliff about ½ mile northeast of Lares.

440-105 *San Sebastian.* Collection from near Km. post 29, east of San Sebastian.

440-107 *San Sebastian.* Collection from the outcrop of green shales in the bank of the river 100 yards below the last falls (50 feet in height) in the Collazo River.

440-110 *Cibao.* Collection from an outcrop ½ mile north of Rabell's ranch house along the road leading northeast of San Sebastian about 10 Km.

440-116 *San Sebastian.* Collection from just below the last falls on the Collazo River.

440-117 *Lares.* Collection from the weathered marl beds along the roadside near Km. post 2, Hm. post 3, in an excavation for the roadway of road No. 2, leading from Aguadilla to Rincon.

440-119 *Lares.* Collection from weathered marly limestone in embankment on the roadside near Km. post 9, Hm. post 9, on road No. 2, leading from Aguadilla to Rincon.

440-123 *Lares.* Collection from weathered limestone on north bank of road near bridge at Km. post 7, Hm. post 5, on the government highway leading from Aguadilla to Rincon.

440-126, -129,-130, -131,-133, -134,-135. *Quebradillas.* Collection from the cut at west end of railroad bridge over Guajataca River near Quebradillas.

440-136, -137. *Quebradillas.* Collection from along the railroad tracks between the wagon road crossing and the railroad bridge over the river near Quebradillas.

440-142 *Quebradillas.* Collection from the cut along the roadside near Km. post 40, on road from Quebradillas to Camuy.

440-170 *Juana Diaz.* Collection from the "fifth ledge" of fossiliferous shaly limestone in Jacaguas River bed, 1-2 Km. northwest of Juana Diaz.

440-242 *Juana Diaz?* Collection from the road embankment 25 feet above the river on the west bank of Coamo River below Coamo Reservoir.

440-286, -291,-292, -293,-294, -296,-297. *Ponce.* Collection from embankment of rock in situ on the north side of the road near Km. post 1, Hm. post 8-9, on the highway leading from Ponce to Penuelas.

440-298, -299,-300. *Ponce.* Collection from a cliff bank on the north side of the road near Km. post 2, Hm. post 8-9, on the highway from Ponce to Penuelas about 5 Km. west of Ponce.

440-307 *Ponce.* Collection from the south wall of road near a prospective bridge over a stream near Km. post 5, Hm. post 2, on the highway from Ponce to Penuelas.

440-320, -321,-322, -323. *Ponce.* Collection from a reef in a northwardly-facing bluff along the roadside near Km. post 25, Hm. post 2, on the road from Penuelas to Guayamilla.

440-325, -326,-327, -328,-329, -330,-331. *Ponce.* Collection from a coral and algal reef in a high bluff along roadside near Km. post 25, Hm. post 1-3, on the road from Ponce to Penuelas and Guayamilla.

440-339, -340,-341, -342,-344, -346. *Ponce.* Collection from a small bat cave in a great wall of coral and foraminiferal reef limestone on the east shore of Guánica Harbor.

440-354, -355,-359, -360,-361, -362,-364, -365,-366, -367. *Ponce.* Collection from the cliff just south of the lighthouse pier, Guánica Harbor.

440-368, -369,-370, -373,-375, -376,-378, -380. *Ponce.* Collection from the face of cliff, 300 feet south of the small bat cave, east shore Guánica Harbor.

440-381, -383,-384, *Ponce.* Collection from the foraminiferal beds designated above (440-339, etc.) and with 30-40 feet of limestone

-385,-386, -387,-389, -390. overlying the reef at 340-389, east shore, Guánica Harbor.

440-401, -402,-403, -405,-407, -408,-409, -410,-412, -413,-415, -418. *Cretaceous.* Collection from the island ¼ mile southeast of Parguera, Porto Rico. The Island forms the east shore of the Parguera Harbor.

440-441, -442,-443, -444. *Lares.* Collection from the basal portion of the limestone overlying the tuff near Km. post 64, Hm. post 9, on the road from Arecibo to Ponce.

440-445, -446,-449, -450. *Lares.* Collection from the bluff on the west side of the road near Km. post 66, Hm. post 6-7, leading from Arecibo to Ponce.

440-451, -452,-453, 454,-455, -456,458. *Lares.* Collection from near Km. post 66, Hm. post 7-8, on the road from Arecibo to Ponce.

440-460, -461. *Cibao.* Collection from the talus slope and wash near Km. post 69, Hm. post 2.5, on the road from Arecibo to Ponce.

440-462 *Cibao.* Collection from a high bluff on the west side of the road, near Km. post 69, Hm. post 3, leading from Arecibo to Ponce.

440-465, -466,-467, -468. *Cibao.* Collection from a high bluff along the roadside near Km. 69, Hm. posts 6-7, on the highway from Arecibo to Ponce.

440-486 *Los Puertos.* Collection from blocks along roadway taken from boulders in the talus slope near Km. post 2, on the road from Manatí to Ciales.

440-490 *Cibao.* Collection from limestone *in situ* in the east bluff along the roadside near Km. post 4, Hm. post 6, on the highway leading from Manatí to Ciales.

440-507 *Lares.* Collection from a bluff 60 feet high and 200 feet long on the east side of the roadway near Km. post 9, on the road from Manatí to Ciales.

440-542 *Quebradillas.* Collection from a railroad cut in a bluff on the west bank of River Loiza, ¼ mile northwest of Central Canovanas, near Loiza.

COLLECTING LOCALITIES OF THE HUBBARD COLLECTION

800, 801, 802, 803, 804, 805, 806, 807, 808 ..... Zone C, Km. 32.8, Lares Road.

811, 812, 814, 815 ..... Zone C, Lares Road.

816, 817 ..... Zone C, Collazo-Lares Road.

818, 819, 822 ..... Zone C, Lares Road.

824, 826, 827 ..... Zone D, Lares.

828, 829, 830, 833 ..... Zone C, Collazo-Lares Road.

834, 835, 836 ..... Zone C or D, West of San Sebastian.

839, 840 ..... Zone C, Lares Road.

841 ..... Zone D, Lares.

846
847
849
850
852
853 .....Zone C, Collazo-Lares Road.
854
855
856
857
859
860
863 .....Zone D, Lares.
864
865
866
867
868
869
870
874
877
878
879
880
881
882 .....Zone C, Collazo-Lares Road.
886
887
888
890
891
893
894
896
897
898
899
900
901
909

912, 913, 914, 916 — Zone D, Lares.

917, 918 — Zone C, East of Lares.

922, 924, 925, 933, 934, 935, 936, 937, 942, 943, 945, 948 — Lares District.

955, 956 — Zone C or D, East of Lares.

957, 958, 959, 960, 964, 968 — Zone C, Lares Road.

974, 975 — Lares District.

980 — Zone G, South of Camuy.

982 — Lares District.

984 — Zone C, Collazo near Lares Road.

986, 987, 989 — Zone C, Collazo-Lares Road.

990 ..... Zone H, Rincon Point.

991, 993, 995, 996, 998, 999, 1000, 1001, 1004, 1006, 1089 ..... Lares District.

H 1, H 2, H 3 ..... Lares District.

S 5, S 7 ..... Mona Island (Collected by N. L. Britton).

P.R. 82 a-d, P.R. 98 c-g ..... Zone C or D, Lares Reef.

* GLOSSARY

Calyx-ice ..... The cup-shaped upper end of a corallite.

Coenenchyma ..... Porous intercorallite tissue.

Colline ..... A calcareous ridge separating series of calicular centers as in *Manicina*.

Columella ..... A solid or porous rod of calcareous tissue that occupies the center of a corallite.

Corallite ..... An individual of a corallum.

Corallum ..... An entire skeleton of a compound coral.

Costae ..... The extension of the septa outwardly beyond the theca or wall of the corallite.

Endotheca ..... The inner wall of a corallite.

Exotheca ..... A cellular structure between adjacent costae and forming the coenenchyma of the intercorallite area.

Gonioporid arrangement of septa .... Six primaries extending directly to the columella, with a triplet group of a secondary and two tertiaries between each and often a directive plane.

Palus-i .....One of the slender, upright, calcareous growths that surround the central part of some corals.

Poritid arrangement of septa.....A solitary directive, four lateral pairs and a ventral triplet.

Septum-a .....One of the vertical, radial, calcareous, solid or porous plates projecting into the calyx.

Synapticula-ae .....One of the conical or cylindrical calcareous processes which extends between adjacent septa.

Trabecula-ae .....One of the numerous calcareous rods that serve as units to make up the network structure of the columella or septa in some corals.

Verrucae .....Small protuberances bearing calices.
Example: *Pocillopora.*

SYSTEMATIC DESCRIPTION OF GENERA AND SPECIES

CLASS ANTHOZOA

MADREPORARIA IMPERFORATA

* FAMILY SERIATOPORIDAE MILNE EDWARDS AND HAIME, 1849

Genus **Pocillopora** Lamarck, 1816

Pocilloporo Lamarck, Hist. Nat. Anim. sans Vert., II, 1816, p. 273; Lamarck, Hist. Nat. Anim. sans Vert., II, 1836, p. 441; Dana, Zoophytes, 1848, p. 523; Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXIX, 1849, p. 261; Milne Edwards and Haime, Hist. Nat. des Corall., III, 1860, p. 301; Verrill, Trans. Conn. Acad. Arts and Sci., I, 1870, p. 519; Zittel, Traite de Paleontologie, I, 1883, p. 247; Vaughan, Carnegie Inst. Washington, Dept. Marine Biology, Pub. 213, 1918, p. 75; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 342.

Genotype.—***Pocillopora acuta*** **Lamarck.**

Pocillopora acuta **Lamarck, Hist. Nat. Anim. sans Vert., II, 1816, p. 273.**

Description.—Corallum forms massive or branching colonies with numerous small verrucae upon the entire surface; the calices are small, deep, oval or circular and present upon the verrucae and the spaces between; the individual calices are separated by compact coenenchyma on the sides of the branches or lobes, but closely crowded on the ends; the surface is granulose or hispid; there are six to twelve septa, the six major ones are conspicuous; tabulae are few; the wall is well developed and porous; a columella is present.

Range.—Tertiary to Recent.

Pocillopora portoricensis Coryell, n. sp.

Plate XXVI, Figure 1

Description.—The corallum forms palmate lobes and masses; the verrucae are very numerous, often only 1 to 2 mm. apart, measuring only 1 to 2 mm. in diameter and averaging 2.5 mm. in height; a few are elongate with a greater width of 3 mm. or more; the calices are small, oval or circular, ⅔ mm. in diameter and separated by a narrow wall or a thickness of coenenchymous tissue equal to or more than the diameter of the calyx; one to four calicular pits occur on a single verruca while only one or two are present upon the flattened area between; six strong septa are present and are joined to the well developed columella; in some calices two opposite septa are more strongly developed than the others; the entire surface is papillate.

Type.—23013, Reeds Collection, American Museum of Natural History.

Locality.—440-362, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

Remarks.—This species is distinguished from *Pocillopora palmata* Palmer by the more numerous, smaller and more closely spaced verrucae.

* Genus **Stylophora** Schweigger, 1819

Stylophora Schweigger, Beobacht. auf Naturf., 1819, Pl. V; Schweigger, Hand. Naturg., 1820, p. 413; Blainville, Dict. Sci. Nat., LX, 1830, pp. 319, 351; Milne Edwards and Haime, Ann. Sci. Nat., ser. 3, Zool., XIII, 1850, p. 102; Milne Edwards and Haime, Hist. Nat. Corall., II, p. 133; Fromentel, Intr. Polyp. foss., 1861, p. 179; Duncan, Linn. Soc. London Jour., Zool., XVIII, 1884, p. 45.

Genotype.—*Madrepora pistillata* Esper.

Description.—Corallum forming cylindrical or palmate branches or incrustations; the calices are circular and separated by coenenchyma; costae are rudimentary; endotheca is present; septa are of two cycles, six extending to the prominent styliform columella.

Range.—Eocene to Recent.

* **Stylophora affinis** Duncan, 1863

Plate XXVI, Figures 2, 2a

Stylophora affinis Duncan, Geol. Soc. London Quart. Jour., 1863, XIX, p. 436, Pl. XVI, fig. 4; Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 25; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 336.

Reussia affinis Duchassaing and Michelotti, Sup. Mem. Corall. Antilles, 1866, p. 70; Duchassaing, Rev. Zooph. et Spong. Antilles, 1870, p. 26.

Description.—Corallum composed of nearly cylindrical branches; calices shallow, circular, 0.8 to 1.0 mm. in diameter, surrounded by a raised margin and from 0.8 to 1.0 mm. apart; six prominent septa reach to the large, dense and styliform columella; coenenchyma papillose, the granules often in rows.

Locality.—440-64,-300,-321,-339,-384,-454, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale Ponce Formation and Lares Limestone.

* Stylophora goethalsi Vaughan, 1919

Plate XXVI, Figures 3, 3a

Stylophora goethalsi Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 338, Pl. LXXV, figs. 2-3.

Description.—Corallum composed of compressed branches with marginal protuberances; calices shallow, 0.5 to 0.75 mm. in diameter and from 0.5 to 1.5 mm. apart; six well developed septa extend to the prominent columella, short secondary septa occur; coenenchymal surface granulose.

Cotype.—No. 324767, U. S. National Museum.

Locality.—440-460, Reeds Collection, American Museum of Natural History.

Occurrence.—Cibao of the Arecibo group.

* Stylophora granulata Duncan, 1864

Plate XXVI, Figure 4

Stylophora granulata Duncan, Geol. Soc. London Quart. Jour., XXI, 1864, p. 10, Pl. II, fig. 3; Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 25; Duncan, Geol. Soc. London Quart. Jour., XXIX, 1873, p. 551; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 340.

Description.—Corallum composed of nearly cylindrical branches; calices deep, 0.75 to 1.25 mm. in diameter, irregularly spaced and surrounded by a raised margin formed by the septa and costae; six principal septa reach to the columella, secondary septa are present; the coenenchyma is conspicuously granulose and in places costate.

Locality.—440-327, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

* Stylophora macdonaldi Vaughan, 1919

Plate XXVI, Figures 5, 5a

Stylophora macdonaldi Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 339, Pl. LXXV, figs. 5-7a.

Description.—Corallum consisting of slender branches, compressed wherever bifurcating; calices shallow, 1.0 mm. in diameter and from 0.5 to 1.5 mm. apart; six well developed septa extend to the prominent columella with their outer edges raised at the margin of the calyx; coenenchymous tissue granulated.

Cotypes.—No. 324769, 324770, U. S. National Museum.

Locality.—440-117,-126,-321,-331, Reeds Collection, American Museum of Natural History, and 901, Hubbard Collection, Columbia University, New York City.

Occurrence.—Lares Limestone, Quebradillas Formation and Ponce Formation.

* Stylophora panamensis Vaughan, 1919

Plate XXVI, Figure 6

Stylophora panamensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 335, Pl. LXXV, figs. 1, 1a.

Description.—Corallum consists of irregularly shaped plates; calices shallow, 0.5 to 0.75 mm. in diameter, from 0.5 to 1.0 mm. apart and margins slightly elevated; six primary septa join the compressed columella; coenenchyma inconspicuously granulose.

Type.—No. 324768, U. S. National Museum.

Locality.—440-20,-39, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale.

* Stylophora ponderosa Vaughan, 1900

Plate XXVI, Figure 7

Stylophora ponderosa Vaughan, U. S. Geol. Surv. Mono. 39, XXXIX, 1900, p. 132, Pl. XIII, fig. 16; Pl. XIV, figs. 1-1b; U. S. Nat. Mus. Bull. 103, 1919, p. 342.

Description.—Corallum large irregular masses; calices shallow, polygonal, 1 mm. in diameter; walls average 0.5 mm. in thickness, consisting of laminae of spinose coenenchyma; six well developed septa reach the styliform columella.

Type.—U. S. National Museum.

Locality.—440-340,-346,-442, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation and Lares Limestone.

* **Stylophora portobellensis** Vaughan, 1919

Plate XXVI. Figures 8, 8a

Stylophora portobellensis **Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 338, Pl. LXXVI, figs. 1-1a.**

Description.—Corallum composed of compressed branches with somewhat flabellate terminals; calices shallow, 0.5 to 1.0 mm. in diameter and from 0.25 to 0.5 mm. apart; six well developed septa extend to the prominent, styliform columella; coenenchyma dense and granulose.

Type.—No. 324762, U. S. National Museum.

Locality.—440-331, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

* FAMILY.—ASTROCOENIIDAE KOBY

* Genus **Astrocoenia** Milne Edwards and Haime, 1848

Astrocoenia **Milne Edwards and Haime, Compte Rendu., XXVII, 1848, p. 469; Gregory, Palaeo. Indica, ser. 9, II, 1900, Pt. 2, p. 59.**

Genotype.—*Astrea numisma* **Defrance.**

Description.—Corallum forms massive, lamellar, dendroidal or incrusting masses; corallites prismatic, contiguous and with thick walls; calices polygonal; eight principal septa extend to the styliform columella.

Range.—Triassic to Recent.

* **Astrocoenia decaturensis** Vaughan, 1919

Plate XXVI, Figure 9

Astrocoenia decaturensis **Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 348, Pl. LXXVIII, figs. 3-4a.**

Astrocoenia ornata **Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 425, Pl. XIV, fig. 7; Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 23.**

Description.—Corallum large, dendroidal or massive, with irregular surface; calices shallow, polygonal, 1.5 to 2.5 mm. in diameter; the walls

are thin, usually less than 1 mm. thick and surmounted by a raised line of granules; sixteen to twenty septa are present in each calice with eight or ten septa reaching the columella respectively; endothecal dissepiments are few and thin.

Type.—No. 324789, U. S. National Museum.

Locality.—440-45,-339,-341,-364,-442,-460, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale, Ponce Formation, Lares Limestone and Cibao Limestone.

* **Astrocoenia guantanamensis** Vaughan, 1919

Plate XXVII, Figure 1

Astrocoenia guantanamensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 347, Pl. LXXIX, figs. 1-2.

Description.—Corallum massive, tuberose; calices shallow, polygonal, from 1.0 to 1.75 mm. in diameter; the walls from 0.25 to 0.5 mm. thick, marked by septal costae or dentations; there are sixteen septa, eight of which reach the styliform columella; the secondary septa taper inward and are about one-half as long as the primaries.

Type.—No. 324794, U. S. National Museum.

Locality.—440-59, Reed Collection, American Museum of Natural History, and 802, 957, 958, 960, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

* **Astrocoenia meinzeri** Vaughan, 1919

Plate XXVII, Figure 2

Astrocoenia meinzeri Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 349, Pl. LXXIX, figs. 3, 3a.

Description.—Corallum composed of branches elliptical in cross-section; calices from 2.5 to 3.0 mm. in diameter and from 1.25 to 1.5 mm. deep; the walls are from 0.5 to 1.5 mm. thick, with the upper surface ridged or grooved longitudinally; there are sixteen septa, with eight reaching the styliform columella where the ends of the septa thicken and fuse around the columellar mass; dissepiments are present.

Type.—No. 324791, U. S. National Museum.

Locality.—440-346, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

* **Astrocoenia ornata** Milne Edwards and Haime, 1857

Plate XXVII, Figure 3

Astrocoenia ornata Milne Edwards and Haime, Hist. Nat. Corall., II, 1857, p. 357.

Description.—Corallum forms a rounded or hemispherical mass; calices polygonal, measuring from 2.0 to 2.5 mm. in diameter; walls thick and very granulose; the principal septa are thickest near the wall and join with the large columella at the center of the calyx.

Locality.—440-51, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale.

* **Astrocoenia portoricensis** Vaughan, 1919

Plate XXVII, Figures 4, 4a

Astrocoenia portoricensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 350, Pl. LXXVI, figs. 4, 4a; Pl. LXXVIII figs. 1, 1a.

Astrocoenia ornata Vaughan, Geol. Soc. London Quart. Jour., LVII, 1901, p. 497; (not) Milne Edwards and Haime, Hist. Nat. Corall., II, 1857, p. 257.

Description.—Corallum composed of palmate branches; calices shallow, polygonal, from 1.0 to 1.5 mm. in diameter; walls from 0.2 to 0.5 mm. thick; there are sixteen septa, eight of which reach the compressed styliform columella; endothecal dissepiments present; interseptal spaces about as wide as the thickness of a septum; septal costae present but inconspicuous.

Type.—No. 324785, U. S. National Museum.

Locality.—440-20,-38,-39,-40,-46,-59,-321,-325,-331,-354,-355,-383,-454, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale, Lares Limestone and Ponce Formation.

* FAMILY.—ORBICELLIDAE VAUGHAN

Genus **Antiguastrea** Vaughan, 1919

Antiguastrea Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 401.

Heterastraea Reis (not *Heterastraea* Tomes) preoccupied, Bayer. Geognost. Landesuntersuch. geognost. Jahrg, II, 1889, pp. 150-152.

Genotype.—*Antiguastrea cellulosa* (Duncan).

Astraea cellulosa Duncan, Geol. Soc. London Quart. Journ., XIX, 1863, pp. 417, 418, Pl. XIII, fig. 10.

Antiguastrea cellulosa Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 402, Pl. XCVIII, figs. 3-4a; Pl. XCIX, figs. 1-3a; Pl. C figs. 1-4a; Pl. CI, figs. 2-2a. (For a more complete synonymy see the description of the species.)

Description.—The corallum forms dome-shaped, tuberose or explanate massive heads of variable sizes, ranging from a few inches to five or more inches in diameter; corallites are shallow, rounded or subpolygonal and vary from 2.0 to 10.75 mm. in diameter; intercalicular tissue is porous; calicular walls are thick; the costae are subequal and as numerous as the larger septa, and usually not present over the entire exothecal tissue; the columella is lamellar and usually conspicuous; the septa are arranged in four cycles, rarely in five; dissepiments are present.

Range.—Oligocene.

Remarks.—This genus is distinguished from *Orbicella* by its lamellar columella and less well developed costae.

Antiguastrea cellulosa (Duncan), 1863

Plate XXVIII, Figure 1

Astraea cellulosa Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, pp. 417, 418, Pl. XIII, fig. 10.

Isastraea turbinata Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 423, Pl. XIV, figs. 1a-c; Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 89 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 25; Duchassaing, Rev. Zooph. et Spong. Antilles, 1870, p. 31.

Heliastraea cellulosa Duchassaing and Michelotti, Sup. Mém. Corall. Antilles 1866, p. 86 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 24; Duchassaing, Rev. Zooph. et Spong. Antilles, 1870, p. 30.

Orbicella cellulosa Vaughan, Geol. Soc. London Quart. Jour., LII, 1902, p. 497; Vaughan, Carnegie Inst. Washington Yearbook, No. 13, 1915, p. 360.

Antiguastrea cellulosa Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 402, Pl. XCVIII, figs. 3-4a; Pl. XCIX, figs. 1-3a; Pl. C, figs. 1-4a; Pl. CI, figs. 2-2a.

Description.—Corallum massive heads of variable shapes as tuberose, hemispherical and subplanate; the corallites are rounded or subpolygonal, usually antiguous, leaving small areas of interstitial tissue; the calicular depressions are shallow and vary in diameter from 2 to 9 mm., averaging about 4.5 mm.; septa are numerous, arranged in four cycles in the average-sized calices; the columella is small, usually distinct and composed of lamellate tissue; the walls of the calices are well developed

and thick; costae are as numerous as the septa and usually not well developed.

Asexual reproduction takes place by submarginal or intercalcinal gemmation.

Type.—Coll. Geol. Soc. London; "Conglomerate" of Antigua.

Locality. — 440-14,-34,-40,-41,-92,-242,-339,-454, Reeds Collection, American Museum of Natural History, and 826, 863, 900, 984, and P. R. 82 (a) and (b), Hubbard Collection, Columbia University, New York City.

Occurrence.—Los Puertos Limestone, Lares Limestone, San Sebastian Shale, Juana Diaz ? and Ponce Formation.

Antiguastrea cellulosa curvata (Duncan)

Plate XXVII, Figure 5

Astraea cellulosa curvata Duncan, Geol. Soc. London Quart. Journ., XIX, 1863, p. 418.

Antiguastrea cellulosa curvata Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 408, Pl. XCVIII, figs. 4, 4a.

Description.—Corallum irregular and massive; the corallites are circular or compressed into oval forms as seen in cross-section and average 4.5 mm. in diameter; costae delicate and unequal; calicular walls thick; septa in four cycles, the primary are large and conspicuously denticulate; the columella consists of porous structure; dissepiments occur within the calices; exothecal tissue is abundant in the interspaces.

Asexual reproduction is by intercalicular or marginal gemmation.

Type.—Coll. Geol. Soc. London; "chert-formation" of Antigua.

Locality.—440-39,-46, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale.

* Orbicella Dana, 1846

Orbicella Dana, U. S. Expl. Exped. Zooph., 1846, p. 205; Vaughan, Geol. Reichs Mus. Leiden Samml., ser. 2, II, 1901, p. 21; Verrill, Trans. Conn. Acad. Arts. and Sci., XI, 1902, p. 93; Vaughan, Carnegie Inst. Washington Pub. 213, 1918, p. 85.

Phyllocoenia Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 469.

Genotype.—*Madrepora annularis* Ellis and Solander.

(For a more complete synonymy see the description of the species.)

Description.—The following is the original description of the genus: "Cells nearly circular, more or less prominent, not sub-dividing by

growth, or rarely so; stars (calices) with distinct limits formed by the coalescence laterally of the lamellae, and therefore cells appear tubular and separated by interstices."

Range.—Jurassic to Recent.

* Orbicella annularis (Ellis and Solander), 1786

Plate XXVIII, Figure 2

Madrepora annularis Ellis and Solander, Nat. Hist. Zooph., 1786, p. 169, Pl. LIII, figs. 1, 2.

Madrepora faveolata Ellis and Solander, Nat. Hist. Zooph., 1786, p. 166, Pl. LIII, figs. 5, 6; Gmelin, Linn. Syst. Nat., ed. 13, 1790, p. 3769.

Madrepora acropora Gmelin, Linn. Syst. Nat., ed. 13, 1790, p. 3767; Esper, Pflanzenth., Fortsetz., I, 1797, p. 21, Pl. XXXVIII.

Astrea annularis Lamarck, Hist. Nat. Anim. sans Vert., II, 1816, p. 259; Lamouroux, Exp. Meth. Genres des Polyp., 1821, p. 58, pl. LIII, figs. 1, 2.

Explanaria annularis Ehrenberg, Corall. Roth. Meer., 1834, p. 84 (of reprint).

Astraea (Orbicella) annularis Dana, U. S. Expl. Exped. Zoophytes, p. 214, Pl. X, fig. 6.

Heliastraea annularis Milne Edwards and Haime, Hist. Nat. Corall., II, 1857, p. 473; Duchassaing and Michelotti, Mém. Corall. Antilles, 1861, p. 76 (of reprint); Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 84 (of reprint).

Heliastraea acropora Duchassaing and Michelotti, Mém. Corall. Antilles, 1861, p. 76 (of reprint); Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 84 (of reprint).

Heliastraea lamarcki Duchassaing and Michelotti, Mém. Corall. Antilles, 1861, p. 76 (of reprint); Sup. Mém. Corall. Antilles, 1866, p. 84 (of reprint).

Cyphastraea costata Duncan (part), Geol. Soc. London Quart. Journ., XIX, 1863, pp. 441, 443; Duchassaing and Michelotti, Sup, Mém. Corall. Antilles, 1866, p. 85 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 24; Gregory, Geol. Soc. London Quart. Jour., LI, 1895, p. 274.

Astraea barbadensis Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, pp. 421, 444, Pl. XV, figs. 6a, 6b.

Orbicella annularis Verrill, Mus. Comp. Zool. Bull., I, 1864, No. 3, p. 48; Verrill, Boston Soc. Nat. Hist. Proc., X, 1865, p. 323; Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 94, Pl. XV, fig. 1; Vaughan, Biol. Soc. Washington Proc., XV, 1902, p. 56; Duerden, Nat. Acad. Sci. Mem., VIII, 1903, p. 564, Pls. VIII-X, figs. 64-73; Vaughan, Washington Acad. Sci. Jour., V, 1915, p. 596; Vaughan, Carnegie Inst. Washington Year Book No. 14, 1916, p. 227.

Heliastraea barbadensis Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 85 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 24.

Echinopora franski Gregory, Geol. Soc. London Quart. Jour., LI, 1895, p. 274.

Orbicella acropora Vaughan, Geol. Reichs. Mus. Leiden Samml., ser. 2, II, 1901, p. 22; Vaughan, U. S. Fish Comm. Bull. for 1900, II, 1901, p. 301, Pls. VI, VIII.

Orbicella annularis stellulata Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 96, Pl. XV, fig. 2.

Orbicella hispidula Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 100, Pl. XV, figs. 3-3b.

Description.—Corallum composed of rounded, epithecated masses of variable size; calices deep, circular or nearly so, 1.5 to 2.5 mm. in diameter and from 0.5 to 2.0 mm. apart; the septa are in three complete cycles, the primaries and secondaries extend to the columella, the tertiaries have their inner ends free; the septa rise steeply from the deep center of the calyx, cross over the outer rim and form costae upon the surface of the intercorallite areas; endothecal and exothecal dissepiments occur; the columella consists of a tangle of the inner edges of the septa, its diameter varies from ⅓ to ½ of that of the calice.

Cotypes.—British Museum and No. 156455, U. S. National Museum.

Locality.—440-129,-294,-360,-361,-362,-366, Reeds Collection, American Museum of Natural History, and 801, 933, 934, 975, S 5, S 7, Hubbard Collection, Columbia University, New York City.

Occurrence.—Quebradillas Formation and Ponce Formation.

* Orbicella cavernosa (Linnaeus), 1766

Plate XXIX, Figure 1

Madrepora cavernosa Linné, Syst. ed. 12, 1767, p. 1276; Esper, Pflanzenth., Fortsetz, I, 1797, p. 18, Pl. XXXVII.

Madreport radiata Ellis and Solander, Nat. Hist. Zooph., 1786, p. 169, Pl. XLVII.

Favia cavernosa Oken, Lehrb. Naturg., 1815, p. 67.

Astrea radiata Lamarck, Hist. Anim. sans Vert., ed. 2, 1816, pp. 258, 259, 404; Lamouroux, Encycl. Meth., 1824, pp. 57, 131, Pl. XLVII (reprint of plate of Ellis and Solander).

Astrea (*Orbicella*) *radiata* and *A.* (*O.*) *argus* Dana, U. S. Expl. Exped. Zooph., 1846, pp. 206, 207, Pl. X, figs. 1a, 1b.

Astrea cavernosa Schweigger, Hand. Natur., 1820, p. 419; Edwards and Haime, British Fossil Corals, 1850, p. 39.

Heliastrea cavernosa Milne Edwards and Haime, Hist. Corall., II, 1857, p. 463.

Orbicella cavernosa Verrill, Bull. Mus. Comp. Zool., 1, 1864, p. 47; Verrill, Proc. Boston Soc. Nat. Hist., X, 1865, p. 323; Pourtales, Florida Reefs, 1871, p. 76; Quelch, Reef Corals, Chall. Exped., XVI, 1886, pp. 12, 106; Verrill, Trans. Conn. Acad. Arts and Sci., X, 1900, p. 553; Vaughan, Geol. Reichs. Mus. Leiden Samml., ser. 2, II, 1901, p. 27; Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 102; Vaughan, Wash. Acad.

Sci. Jour., V, 1915, p. 596; Carnegie Inst. Washington Yearbook No. 14, 1916, p. 227; U. S. Nat. Mus. Bull. No. 103, p. 380, Pl. LXXXVII, figs. 1-1c; Pl. LXXXVIII, figs. 1-3b.

Orbicella radiata Gregory, Quart. Jour. Geol. Soc., LI, 1895, p. 270; Vaughan, Bull. Mus. Comp. Zool., XXXIV, 1899, p. 156.

Description.—Corallum composed of irregularly arched, epithecated masses; calices nearly circular or elliptical, 8 to 11 mm. in diameter, 3 to 4 mm. deep and from contiguous to 6 mm. apart; individual corallites project from 6 to 7 mm. above the intercorallite tissue; the mature corallite has forty-eight septa, alternate ones extending to the columella; the outer ends of the septa form costae upon the margin of the corrallites and over the intercorallite surface; the columellar tangle is trabecular with a papillate surface and the larger ones measure 4 mm. in diameter.

Locality.—440-27,-326,-359, Reeds Collection, American Museum of Natural History, and 818, 933, 934, 935, 936, 990, S 5, S 7, P. R. 98 (c), Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Orbicella costata (Duncan), 1863

Plate XXIX, Figure 2

Astraea costata Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 422, Pl. XIII, fig. 9.

Heliastraea costata Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 24.

Orbicella costata Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 387, Pl. XCI, figs. 1-3a; Pl. XCII, figs. 1-3; Pl. XCIII, figs. 1, 1a.

Description.—Corallum composed of irregular masses and heads; calices deep upon raised corallite extensions, 7.5 to 8.25 mm. in diameter and separated by broad costated intercorallite areas; the costae are alternately large and small; walls are thin; the septa are arranged in six systems of irregular cycles; the columella is formed by the dissepiments of the longer septa and a central porous tangle of tissue; endotheca and exotheca are abundant.

Locality.—440-38,-47,-48,-105,-242,-364,-458, Reeds Collection, American Museum of Natural History, and 847, 909, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Juana Diaz Shale ?, Ponce Formation and Lares Limestone.

* Orbicella limbata (Duncan), 1863

Plate XXIX, Figure 3

Phyllocoenia limbata Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 433; Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 76 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 23; Duchassaing, Rev. Zooph, et. Spong. Antilles, 1870, p. 28.

Pleisiastraea ramea Duncan, Geol. Soc. London Quart. Jour., XX, 1864, p. 39, Pl. V, figs. 1a, 1b; Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 87 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 25; Duchassaing, Rev. Zooph. et Spong. Antilles, 1870. p. 30.

Phyllocoenia sculpta tegula Duncan, Soc. London Quart. Jour., XIX, 1863, p. 432.

Description.—Corallum composed of undulating epithecated plates; calices nearly circular, 2.0 to 3.25 mm. in diameter, from 1 to 3 mm. apart; corallites only slightly raised above the intercorallite area; septa in three cycles extend outward from the calices over the interspaces as costae; primaries and secondaries extend inward to the trabecular columella.

Locality.—440-362, Reeds Collection, American Museum of Natural History, and 991, Hubbard Collection, Columbia University, New York City.

Occurrence.—Ponce Formation.

Orbicella tampaensis Vaughan, 1919

Plate XXX, Figure 1

Orbicella tampaensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 390, Pl. XCV, figs. 1-3a.

Description.—The following is the original description:

"The corallum forms head-shaped masses up to the size of a man's fist.

"Calices deep, decidedly elevated, up to 4 or 4.5 mm.; diameter from 6 to 10 mm. Costae prominent, distant; there are none or only rudimentary costae corresponding to the last cycle of septa.

"Septa, distant, in four cycles, the fourth usually more or less incomplete. The primaries and some or all of the secondaries, occasionally a tertiary, reach the columella. Usually there are three or four different sizes. On the inner ends of the primaries are paliform teeth below which the margins fall steeply to the bottom of the fossa. Margins

of the primaries exert as much as 1.5 mm.; those of the secondaries almost as prominent; those of the tertiaries less prominent; those of the quaternaries inconspicuous. Septa thickened in the wall.

"Columella much looser than in the other related species."

Type.—No. 324900, U. S. National Museum.

Locality.—The type came from the "silex" bed of the Tampa formation, Tampa, Florida. The specimens from Porto Rico are from the following localities: 440-27,-38,-40,-48,-50,-51,-286,-456, Reeds Collection, American Museum of Natural History, and 829, 846, 890, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Ponce Formation and Lares Limestone.

*FAMILY.—FAVIIDAE GREGORY

Genus **Calamophyllia** Blainville, 1830

Calamophyllia Blainville, Dict. des Sci. Nat., LX, 1830, p. 312; Milne Edwards and Haime, Ann. des Sci. Nat., ser. 3, XI, 1849, p. 261; Milne Edwards and Haime, Pol. foss. des terr. palaeoz., 1851, p. 80; Milne Edwards and Haime, Hist. Nat. des corall., II, 1857, p. 342; Zittel, Traité de Paleon., I, 1883, p. 257 (French edition); Zittel, Text Book of Paleon., I, 1913, p. 99 (Eastman edition).

Lithodendron (pars) Michelin, Icon. Zooph., 1843, p. 94.

Rhabdophyllia Milne Edwards and Haime, Pol. foss. des terr. palaeoz., 1851, p. 83; Milne Edwards and Haime, Hist. Nat. des corall., II, 1857, p. 347.

Genotype.—*Calamite striee* Guettard = *Calamophyllia striata* (Guettard), Mém. sur les Sci. et les Arts, II, 1770, p. 406, pl. XXXIV.

Description.—The corallum forms a fasciculate colony of long cylindrical or slightly conical stems that are free above the point of fission. The surface of the branches are incompletely epithecated, leaving the costae conspicuously visible; regular or irregular collarettes ornament the stems. The calices are terminal and shallow; the columella is rudimentary or composed of a network of calcareous tissue; septa are numerous, granulose and finely denticulated, dissepiments are few to numerous; synapticulae sometimes present.

Range.—Triassic, Jurassic and Tertiary.

Remarks.—This genus is easily distinguished from *Cladocora* Hemprich and Ehrenberg by its habit of reproduction.

Calamophyllia dendroidea Coryell, new species

Plate XXX, Figures 2, 3

Description.—The corallum consists of a group of cylindriform branches forming masses that vary from a cluster of a few stems to heads of several

inches in diameter. The individual branches were formed by equal division of the parent polyp, growing upward as parallel unconnected stems with terminal polyps, either slightly contiguous or free. The calices are shallow. The individual stems vary from 10 mm. to 15 mm. in diameter except at or immediately before the point of fission, where the longer diameter of the dividing polyp often measures as much as 20 mm.

The outer surface is incompletely epithecated. Costal ridges are formed by the projecting ends of the septa of every cycle; the distance from the crest of one costa to the adjacent one measures 0.5 mm.; the thickness of the thecal wall is equal to the thickness of the primary septa at the junction with the theca.

From twenty-six to forty-two or more septa reach the central network structure that represents the columellar tangle of calcareous tissue, where several of the septa thicken or branch, forming a paliform structure. The lateral faces of the septa are finely granulose and in places spinelike projections rise and frequently form synapticulae. Dissepiments are rare.

Type.—No. 23003-4, American Museum of Natural History.

Locality.—440-327, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

Calamophyllia portoricensis Coryell, new species

Plate XXX, Figure 4; Plate XXXI, Figures 1-4

Description.—The corallum forms heads of free or slightly contiguous, cylindrical or strongly compressed branches that range in diameter from 6 to 15 mm. for the cylindrical stems and from 2 to 5 and 10 to 20 mm. for the shorter and longer diameters of the compressed stems. The compression of the stems in some cases is accentuated by crushing even when about them occur undistorted branches.

A rudimentary epitheca is present. The outer edge of the septa of every cycle except the last forms a costal ridge or row of costal spines, that vary from 1 mm. to 1.5 mm. apart. The thecal wall is thick, equal to two or three times the thickness of the primary septa at the junction with the theca.

The septa are numerous; fifty-four septa occur in a corallite measuring 13 mm. in diameter. The septa of the last cycle are short and extend radially inward from the theca only about the thickness of the wall. The major septa reach the columellar tangle, where they thicken, forming paliform structures. A few spines are present on the lateral faces of the septa. No synapticulae were observed. Dissepiments are rare.

Calamophyllia portoricensis is easily distinguished from *C. dendroidea* by the wider spacing and spinose character of the costae.

Type.—No. 23001, American Museum of Natural History.

Locality.—440,-11,-20,-56,-321,-328,-341,-346,-384,-442,-443,-451,-452,-454, Reeds Collection, American Museum of Natural History, and 827,

852, 893, 894, 917, 925, P. R. 82 (d), Hubbard Collection, Columbia University, New York City.

Occurrence.—Los Puertos Limestone, San Sebastian Shale, Ponce Formation and Lares Limestone.

Genus **Favites** Link, 1807

Favites Link, Beschreib. Nat. Samml. Rostock, 1807, Pt. 3, p. 162; Vaughan, Geolog. Reichs Mus. Leiden Samml., ser. 2, II, 1901, p. 21; Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 92; Vaughan, Carnegie Inst. Washington Dept. of Marine Biol. Pub. 213, 1918, p. 109.

Genotype.—*Madrepora abdita* Ellis and Solander = *Madrepora favosa* Esper.

Description.—Corallum massive; corallites polygonal, often irregular; the individual walls separated by narrow intercorallite area; the septa well developed usually, in three cycles; paliform lobes present; the columella well developed and usually trabecular.

Range.—Tertiary to Recent.

Favites expansa Coryell, new species

Plate XXXII, Figures 1, 1a

Description.—Corallum forms massive heads spreading from a small base; the type specimen measures 4.75 inches in its greatest diameter and 2.25 inches in height; the corallites are of irregular shape but predominantly of a rounded form, varying from 2.5 to 10.0 mm. in diameter; the septa are numerous, well developed in the broad bottom of the calyx pits; the larger septa reach to the columella; the larger calices are deep, the younger ones are shallow; the walls of the individuals are separated from one another by an intercalicular area that varies from 0.5 to 2.0 mm. in width.

Type and *Locality.*—No. 828, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

Favites irregularis Coryell, new species

Plate XXXII, Figure 2

Description.—Corallum forms massive, thick, flabelliform colonies; the type specimen measures 2¾ inches in maximum thickness; the calices are irregular polygonal forms and of variable sizes measuring from 2 to 17 mm. across; the walls rise steeply above the bottom of the calices in many individuals and are separated from one another by an intercorallite area vary-

ing from 0.5 to 1.0 mm. in width; the septa are numerous and well developed in the bottom of the calicular pits but only represented as costal ridges upon the surrounding walls; the longer septa reach the well developed columella.

Type and *Locality.*—No. 864, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

Genus **Goniastrea** Milne Edwards and Haime, 1848

Goniastrea Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 495; Zittel, Traité de Paleontologie, I, 1883, p. 259; Zittel, Text Book of Paleontology, I, 1913, p. 99; Vaughan, U. S. Nat. Mus. Bull. 103, p. 416.

Genotype.—*Astrea retiformis* Lamarck, Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 495.

Description.—Corallum forms massive heads with a domed or undulating upper surface; the calices are irregularly polygonal, separated by simple compact walls and reproduce by fission; the septa are well developed with pali occurring before the inner end of all except the last cycle; the columella is spongy.

Range.—Cretaceous to Recent.

Goniastrea crassa Coryell, new species

Plate XXXIII, Figure 1

Description.—The corallum forms heads 13 cm. or more in diameter; the calices are deep, irregularly polygonal, separated by thickened simple crested walls and vary from 4 to 10 mm. in their longer diameter and 3 to 5 mm. in the shorter diameters, measured from crest to crest of the walls; the septa are well developed, consisting of alternating long and short plates, the longer expanding at their inner ends to form paliform structures; the ends of only the last cycle of septa are free; from thirty-four to forty septa are present in the larger calices and from twenty-four to twenty-six in the average size, which are 5 mm. in their greater diameter; the columella is spongy, not well developed in the smaller individual corallites.

Type and *Locality.*—No. 986, Hubbard Collection, Columbia University, New York City.

Occurrence.—Arecibo group.

Remarks.—This species is distinguished from *Goniastrea canalis* Vaughan by the larger calices, fewer septa and thicker common wall. It differs from *Goniastrea variabilis* Duncan by the thicker common wall.

Goniastrea pectinata (Ehrenberg), 1834

Plate XXXIII, Figure 2

Astraea pectinata Ehrenberg, Korallenth. Roth. Meer., 1834, p. 96.
Astraea favistella Dana, U. S. Expl. Exped., Zooph., 1846, p. 241, Pl. XIII, figs. 2-2d.
Astraea sinuosa Dana, U. S. Expl. Exped., 1846, p. 243, Pl. XIII, figs. 5-5c.
Goniastraea pectinata Klunzinger, Korall. Roth. Meer., 1879, Pt. 3, p. 34, Pl. IV, fig. 6; Vaughan, Carnegie Inst. Washington, Dept. of Marine Biology, Pub. 213, 1918.
Goniastraea favus Klunzinger, Korall. Roth. Meer., 1879, Pt. 3, p. 35, Pl. IV, fig. 4, Pl. X, fig. 7.

Description.—Corallum forms massive heads; the corallites are polygonal, varying from 5 to 12 mm. in maximum diameter; the larger are oval in cross-section and present stages in reproduction by fission; the walls are thick, costated and with acute summits formed on the costa in the central part of the domed surface; the outer septal ends of adjacent calices meet upon the wall forming costa; often a large septum is opposed by a small one; the larger septa end in paliform lobes at the margin of the trabecular columella.

Locality.—440-367, Reeds Collection, American Museum of Natural History.

Occurrence.—Recent.

Genus.—**Hydnophora** Fischer de Waldheim, 1807

Hydnophora Fischer de Waldheim, Mus. Demidoff, III, 1807, p. 295, 1 pl.; Fischer de Waldheim, Recherches sur les Hydnophores, 1810, pp. 7-13, 1 pl.; Fischer de Waldheim, Oryctographie du gouvernement de Moscou, 1830-37, p. 155; Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., 1848, p. 493; Milne Edwards and Haime, Ann. des Sci. Nat., ser. 3, XI, 1849, p. 299; Milne Edwards and Haime, Hist. Nat. Corall., II, 1857, p. 418; Vaughan, Carnegie Inst. Washington, Dept. of Marine Biol. Pub. 213, 1918, p. 121.
Hydnophorella Delage and Hérouard, Traité de Zool. concrete, II, 1901, Pt. 2, p. 628.
Genotype.—*Hydnorphora demidovii* Fischer de Waldheim = *Madrepora excsa* Pallas, Elench. Zooph., 1766, p. 290.

Description.—Corallum forms massive expansions with flattened or undulating surfaces; the corallites are all confluent in branching or in osculating arrangement, separated by disconnected ridge-like or pyramidal collines; the corallite centers are more or less distinct; the valleys vary from 5 to 10 mm. in width with depths corresponding to the irregularity

in height of the collines, 2 to 6 mm.; the septa are well developed, wavy, thin and dentate; there is no columella; transverse tissue abundant.

Range.—Cretaceous to Recent.

Hydnophora hubbardi Coryell, new species

Plate XXXIII, Figure 3

Description.—Corallum forms massive expansions with an undulating surface; the valleys are short, irregular and confluent, varying from 5 to 10 mm. in width; the collines form pyramids and straight, curved and branching ridges that vary from 2 to 5 mm. in height. The septa are well developed, curved and dentate, averaging eight to nine in 5 mm.

Type and *Locality.*—No. 859, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

Genus.—**Lamellastraea** Duncan, 1868

Lamellastraea Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 19; Zittel, Traité de Paléontologie, I, 1883, p. 260.

Genotype.—*Lamellastraea smythi* Duncan.

Lamellastraea smythi Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 20, Pl. I, figs. 2a, 2b.

Description.—The following is the original description of the genus:—"The corallum is compound; the corallites are united by their walls, and are more or less polygonal in transverse outline; the columella is essential and lamellar; the septa are alternately large and small; and the reproduction is principally by fissiparity through the solid columella, and occasionally by marginal gemmation."

Range.—Tertiary.

Lamellastraea crassa Coryell, new species

Plate XXXIII, Figure 4

Description.—Corallum massive, forming heads; the corallites are irregularly polygonal and united by their walls; the calices are of various sizes, the larger with their longer diameters equal to 9 mm. and their shorter 2.5 mm.; the smaller calices have diameters equal to from 2 to 3 mm.; the septa are of alternating long and short plates, the longer ones reach the columella or two may unite near the columella; the shorter septa are rudimentary; twelve to eighteen longer septa are present in the average size calices; paliform structures occur more or less well developed; the calicular walls are thick and strong; the columella is lamellar and well developed, especially in the elongated calices.

Type and *Locality.*—No. 875, Hubbard Collection, Columbia University, New York City.

Occurrence.—Recent.

Genus.—**Latomeandra** d'Orbigny, 1849

Latomeandra d'Orbigny, Milne Edwards and Haime, Ann. des. Sci. Nat., ser. 3, XI, 1849, p. 270; d'Orbigny, Notes sur des pol. foss., 1849, pp. 8, 9; Milne Edwards and Haime, Pol. foss. des terr. palaeoz., 1851, p. 85.

Axophyllia, Microphyllia and *Comophyllia* d'Orbigny, Notes sur des pol. foss., 1849, pp. 8, 9.

Oulophyllia d'Orbigny, Prodr. de paleont., I, 1850, p. 387 (not Milne Edwards and Haime).

Latimaeandra, Milne Edwards and Haime, Hist. Nat. des Corall., II, 1857, p. 543; Zittel, Traité Paléontologie, 1883, p. 261; Zittel, Text Book of Paleontology, I, 1913, p. 98.

Genotype.—**Latomeandra plicata** (Goldfuss)

Lithodendron plicatum Goldfuss, Petref. Germ., 1826, p. 45, Pl. XIII, fig. 5.

Description.—Corallum forms massive or subdendroidal colonies; the corallites are distributed in short valleys; the collines are formed by the union of the walls of the adjacent series; the calicinal centers are quite distinct; the walls of the colony are finely striated and granulose; the epitheca is practically absent; the columella is rudimentary; the septa are numerous, thin, denticulate and granulose.

Range.—Triassic to Tertiary.

Latomeandra lata Coryell, new species

Plate XXXIII, Figure 5

Description.—Corallum massive with flattened or undulating surface; the corallites are arranged in short, shallow, irregularly broad and narrow valleys within which the calcinal centers are usually distinct; the width of the valleys vary from 40 mm. about the centers to 10 mm. between them; the septa are well developed, dentate, often curved and averaging seven to eight in 5 mm.; the collines are thin, irregularly curved and sharply crested; the columella is poorly developed.

Type and *Locality.*—No. 912, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

Genus.—**Leptoria** Milne Edwards and Haime, 1848

Leptoria.—Milne Edwards and Haime, Compte Rendu, XXVII, 1848, p. 493; Zittel, Traité de Paléontologie, I, 1883, p. 259; Zittel, Text Book of Paleontology (Eastman ed.), 1913, p. 99; Vaughan, Carnegie Inst. Washington, Dept. of Marine Biology, IX, Pub. 213, 1918, p. 117; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 421.

Genotype.—*Madrepora phrygia* Ellis and Solander.

Madrepora phrygia Ellis and Solander, Nat. Hist. Zooph., 1786, p. 162, Pl. XLVIII, fig. 2.

Meandrina phrygia Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 493.

Description.—Columella forms massive heads with domed, flattened or undulating surfaces; the calices are confluent and arranged in long sinuous valleys separated by simple collines; the septa are numerous and nearly parallel; the columella is lamellar.

Range.—Jurassic to Tertiary.

Leptoria areolata hispida (Verrill), 1901

Plate XXXIV, Figure 1

Macandra areolata hispida Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 83, Pl. XII, figs. 2, 3.

Description.—Corallum forms massive heads of large and small size, many averaging 3 to 5 inches in diameter. The valleys are wide, varying from 10 to 20 mm. across; the collines are simple in some places and double in others; they vary from 3 to 6 mm. in thickness. The septa are well developed, hispid and coarsely serrate, the longer extend to the lamellose columella.

Type.—From the Florida Reefs; Recent.

Locality.—H 1, H 3, Hubbard Collection, Columbia University, New York City.

Occurrence.—Pleistocene and Recent.

Remarks.—This species is placed in *Leptoria* because of the structure of the columella.

Leptoria phrygia (Ellis and Solander)

Plate XXXIV, Figure 2

Madrepora phrygia Ellis and Solander, Nat. Hist. Zooph., 1786, p. 162, Pl. XLVIII, fig. 2.

Leptoria phrygia Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 493; Vaughan, Carnegie Inst. Washington, Pub. 213, 1918, p. 117.

Description.—Corallum forms massive dome-shaped or explanate colonies with the upper surface flat or undulating; the calices are in long sinuous furrows, averaging 5 mm. wide, separated by colline walls 1 mm. thick; the septa are numerous; eight to nine in 5 mm., the longer reaching to or very near the lamelliform columella; the inner ends of the major septa are swollen, giving rise to paliform structures; the shorter septa are inconspicuous.

Type.—No. 324968a, U. S. National Museum.

Locality.—849, 913, 974, 982, 993, Hubbard Collection, Columbia University, New York City.

Occurrence.—Recent.

Genus.—**Maeandra** Oken, 1815

Maeandra Oken, Lehrb. Naturg., Th. 3, Abth. 1, 1815, pp. 68, 70; Ehrenberg, Corall. Roth. Meer., 1834, pp. 99, 101; Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 66; Vaughan, Carnegie Inst. Washington, Pub. 213, 1918, p. 119; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 417.

Genotype.—*Madrepora labyrinthiformis* Linnaeus.

Madrepora labyrinthiformis Linnaeus, Syst. Nat., ed. 10, 1758, p. 794.

Description.—Corallum is massive with domed, flattened or undulating surfaces, forming hemispherical colonies that are often 5 or 6 feet in diameter; the calices are confluent and arranged in relatively long sinuous rows surrounded by simple collines; the septa are both long and short and slope downward from the crest of the collines into the actinal groove; the inner ends of the longer septa are thickened, forming structures, that appear like pali along the margin of the porous columella in the bottom of the groove; the upper margin of the septa are coarsely dentate or serrate.

Range.—Tertiary to Recent.

Maeandra antiguensis Vaughan, 1919

Plate XXXIV, Figure 3

Maeandra antiguensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 417; Pl. CIII, figs. 3-4a.

Description.—Corallum forms masses with undulating or domed surfaces; the furrows are relatively long and sinuous with an average width of 4.25 mm.; the calcinal centers are indistinct; the collines are simple with solid-appearing, narrow summits formed by the lamelliform wall that separates the valleys; the septa are dentate, crowded, thirty-two to thirty-six in 1 mm., alternately long and short and slope steeply toward

the columellar groove; the longer septa reach the columella where they thicken, forming paliform structures; the columella is porous; dissepiments are present.

Cotype.—No. 325003, U. S. National Museum.

Locality.—914, 916, 922, 964, Hubbard Collection, Columbia University, New York City.

Occurrence.—Middle Oligocene.

Maeandra labyrinthiformis (Linnaeus), 1758

Plate XXXIV, Figure 4

Madrepora labyrinthiformis Linné, Syst. Nat., ed. 10, 1758, p. 794; Esper, Pflanzenth., Fortsetz., I, 1789, p. 74, Pl. III.

Madrepora meandrites var. *y* Pallas, Elench, Zooph., 1766, pp. 292, 293.

Meandrina cerebriformis Lamarck, Hist. Nat. Anim. sans Vert., 1816, p. 246; Dana, Zooph. U. S. Expl. Exped., 1846, p. 263, Pl. XIV, fig. 2.

Diploria cerebriformis Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 493; Milne Edwards and Haime, Hist. Nat. Corall., II, 1857, p. 402; Pourtalés, Ill. Cat. Mus. Comp. Zool., No. 4, Mém. 2, 1871, p. 75; Verrill, Trans. Conn. Acad. Arts and Sci., X, 1900, p. 552.

? Maeandrina labyrinthiformis Pourtalés, Florida Reefs, Corals, 1880, Pl. IX, figs. 10-12.

Diploria labyrinthiformis Vaughan, Samml. Geol. Reichs and Mus., II, 1901, p. 45.

Diploria geographica Whitfield, Bull. Amer. Mus. Nat. Hist., N. Y., XIV, 1901, p. 223, Pls. XXIII, XXIV.

Maeandra labyrinthiformis Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 70, Pl. X, figs. 1-3.

Description.—Corallum forms massive heads often attaining a diameter of five or six feet; the corallites lie in long sinuous valleys separated by broad ridges; the collines consist of the calicular walls widely spaced with considerable intermural tissue and vary from 3 to 5 mm. in thickness; an intermural furrow, usually wide, lies upon the central portion of the dividing collines; where extracalicinal budding occurs, the collines broaden and the dividing walls between the older valleys and the new buds are simple; the double wall feature appears later; the columella is porous; the septa are numerous, strong, parallel, averaging eight to nine major ones in 5 mm. along the ridge, which unite with the columella or thicken to form the paliform structures.

Locality.—948, Hubbard Collection, Columbia University, New York City.

Occurrence and *Range.*—Pleistocene and Recent.

* Genus.—**Manicina** Ehrenberg, 1834

Manicina Ehrenberg, Corallenth. Roth. Meer., 1834, p. 101 (of reprint); Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 84.

Colpophyllia Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 492; Milne Edwards and Haime, Hist. Nat. des Corall., II, 1857, p. 384.

Genotype.—*Madrepora gyrosa* Ellis and Solander.

Description.—Corallum massive, wide-spreading, pedunculate mass; calices arranged in series that form deep, sinuous valleys with steep sides; the crest of the collines are marked by a groove which separates the walls of the individual series; costae present and visible upon the base of the corallum; columella present or absent; dissepiments present.

Range.—Tertiary to Recent.

* **Manicina willoughbiensis** Vaughan, 1919

Plate XXXV, Figure 1

Manicina willoughbiensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 422, Pl. CIV, figs. 2, 2a; Pl. CV.

Description.—Corallum forms a pedunculate expansion with flattened or curved surface; calcinal valleys deep, steep-sided, sinuous and often long, measuring 5 to 16 mm. in width and from 8 to 10 mm. in depth; calcinal centers distinct and from 9 to 21 mm. apart; collinal summits marked by a narrow furrow, 1.0 to 1.5 mm. wide; 19 to 22 septa in 1 cm.; columella present or absent; dissepiments well developed; the lower surface of the corallum is radially costated, the costae averaging 1 mm. apart.

Type.—No. 325006a, U. S. National Museum.

Locality.—440-72,-73, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale.

Genus.—**Metastraea** Milne Edwards and Haime, 1857

Metastraea Milne Edwards and Haime, Hist. Nat. des Corall., II, 1857, p. 525.

Genotype.—*Prionastrea ? aegyptiaca* Milne Edwards and Haime, Ann. des Sci. Nat., ser. 3, XII, 1849,. p. 137 (Recent).

Metastraea aegyptorum Milne Edwards and Haime, Hist. Nat. des Corall., II, 1857, p. 525, Pl. *D9*, fig. 1. (The species of the genotype was renamed by Milne Edwards and Haime in error. Art. 32, Inter. Rules. of Zool. Nomen.)

Description.—The corallum forms a massive hemispherical or plate-like expansion spreading from a basal center; the diameter of the ex-

pansion varies from a few to 15 inches or more; the base is free of epitheca and conspicuously costate; the corallites are large, of irregular polygonal shape and moderately deep; a rather simple wall separates the adjacent individuals; dissepiments are few; a cellulose columella is present.

Range.—Tertiary to Recent.

Metastraea planulata Coryell, new species

Plate XXXV, Figure 2; Plate XXXVI, Figure 1

Description.—The corallum forms plate-like expansions, the diameter of which varies from a few to more than 15 inches: the corallites are large and vary in shape from regularly polygonal to elongate or compressed polygonal forms; the shorter diameters range from 5 to 10 mm. and the greater from 9 to 30 mm.; the depth of the calices vary from 3 to 5 mm.; each corallite depression consists of a single septal center with a spongy columella and separated from the adjacent depressions by a rather simple, definite, thin wall; from thirty to fifty large septa reach to the center and between each a small one occurs, appearing often as an inconspicuous denticulate ridge on the corallite wall; dissepiments are few.

Holotype.—23011, American Museum of Natural History.

Locality.—440-339,-378, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

* FAMILY.—AGARICIDAE VERRILL

* Genus **Agaricia** Lamarck, 1801

Agaricia Lamarck, Syst. Anim. sans Vert., 1801, p. 375; Lamarck, Hist. Nat. des Anim. sans Vert., 1815; Lamarck, Hist. des Anim. sans Vert., II, 1836, p. 380; Quelch, Voy. Chall. Zool., XVI, 1886, p. 116; Vaughan, Samml. des Geol. Reichs in Leiden, II, Heft 1, 1901, p. 63; Verrill, Trans. Conn. Acad. Arts and Sci., Vol. XI, 1901, p. 140.

Undaria Oken, Lehrb. Naturg., 1815, p. 68.

Agaricia (*Mycedium*) Dana, U. S. Expl. Exped. Zooph., 1846, pp. 333, 335.

Agaricia and *Mycedium* Milne Edwards and Haime, Hist. Nat. des Corall., III, 1860, pp. 72, 80; Duchassaing and Michelotti, Mém. Corall. Antilles, 1860, pp. 80, 81.

Genotype.—*Merulina undata* Ellis and Solander.

Description.—Corallum unifacial or bifacial, cup-shaped, turbinate, foliate or encrusting growth; calices stellate, arranged in concentric lines or grooves separated by collines or arranged irregularly; the septa are in two or four cycles usually fine and evenly serrulate.

Range.—Tertiary and Recent.

Agaricia agaricites crassa Verrill, 1901

Plate XXXVI, Figure 2

Agaricia crassa Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 145, Pl. XXX, fig. 6; Pl. XXXIV, fig. 2; Vaughan, Washington Acad. Sci. Jour., V, 1915, p. 596; Vaughan, Carnegie Inst. Washington Yearbook, 1916, No. 14, p. 228.

Agaricia agaricites crassa Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 427.

Description.—Corallum forms massive, spheroidal, hemispherical or explanate colonies, attaining a maximum diameter of six inches; the upper surface is regularly convex or undulating and covered with irregularly reticulated arrangement of collines; epitheca incomplete; the calices are deep, either separated or grouped in series of two or more by prominent crested collines, the diameter of the calices varies from 2 to 3 mm.; the septa are dentate, prominent, alternately large and small, and confluent with those of the adjacent individual pits; dissepiments are present; the columella appears solid.

Locality.—This species occurs in the reefs of the Bahamas. The specimen studied and figured here is from the island of Porto Rico, locality 945, Hubbard Collection, Columbia University, New York City.

Occurrence.—Recent.

* **Agaricia irregularis** Coryell and Ohlsen, new species

Plate XXXVII, Figure 1

Description.—Corallum consists of thin laminae growing in irregular funnel-shaped masses, attached at the apex of the cone; calices small, deep, conical, irregularly distributed on the inner surface only of the funnel; each calice is sunken below the general surface of the coenenchyma; the corallite pits consist of narrow, deep cones projecting below the intercorallite area with their apices converging toward the base of the corallum; the coenenchyma is covered with fine, longitudinal and serrated costae that coincide with the septa wherever a corallite lies in their path.

Type.—No. 23009, American Museum of Natural History.

Locality.—440-465,-166,-467,-468, Reeds Collection, American Museum of Natural History.

Occurrence.—Cibao Limestone.

* **Agaricia sinuata** Coryell and Ohlsen, new species

Plate XXXVII, Figure 2

Description.—Corallum consists of a thin lamina forming irregular funnel-shaped masses; calices are deep, conical cavities forming the lower tubular

end of a very distinctly elongated, upwardly directed depression in the coenenchymous tissue; they are irregularly distributed over the inner surface only of the funnel; the corallites project below the coenenchyma as slender, cone-like shapes with their apices directed toward the base of the corallum; the intercorallite area is covered with fine, longitudinal and evenly serrated costae that join the septa as in *A. irregularis*.

Type.—No. 23008, American Museum of Natural History.

Locality.—440-462, Reeds Collection, American Museum of Natural History.

Occurrence.—Cibao Limestone.

* Genus.—**Pironastrae**a d'Achiardi, 1875

Pironastraea d'Achiardi, Corall. eocen. del. Friuli, 1875, p. 76, Pl. XV, figs. 2a-3d; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 432.

Genotype.—*Pironastraea discoides* d'Achiardi.

Description.—Corallum massive or consisting of undulating plates with finely costated basal epitheca, which is complete or incomplete; calices with centers either distinct or indistinct, separated by rounded collines; no interserial walls; septa thin, numerous, traceable across the intercorallite ridges and trabeculate near the false or papillose columella; synapticulae small and abundant.

Range.—Tertiary to Recent.

* **Pironastraea anguillensis** Vaughan, 1919

Plate XXXVII, Figure 3

Pironastraea anguillensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 433, Pl. CXI, figs. 1-1b; Pl. CXII, figs. 1, 1a.

Description.—Corallum massive, subhemispherical or plate-like; calcinal valleys deep with narrow bottoms; the collines steep with narrowly rounded crests; the septa in a single calyx, that is surrounded by an interseptal ridge, are numerous, averaging from thirty-eight to forty-five; eighteen septal costae occur in a distance of 5 mm. measured near the center of the collines; the columella position is marked by a pit; synapticulae are abundant.

Type.—No. 325174, U. S. National Museum.

Locality.—440-45, Reeds Collection, American Museum of Natural History and 824, 841, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

* **Pironastraea antiguensis** Vaughan, 1919

Plate XXXVIII, Figure 1

Pironastraea antiguensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 434, Pl. CXII, fig. 2, 2a; Pl. CXIII, fig. 1, 1a.

Description.—Corallum massive; calcinal series measure from 5.5 to 7.5 mm. from crest to crest of the collines; valleys shallow with broad bottoms and gently sloping sides; calcinal centers indicated by converging septa lie about 4.5 mm. apart; calcinal pits absent; septa numerous, forty-eight in an individual calyx measuring 6 mm. across; septal costae numerous, twenty-two in 5 mm. along the crest of the colline; synapticulae abundant; pseudocolumella present, marked by papillae.

Type.—No. 325177, U. S. National Museum.

Locality.—440-342,-451, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation and Lares Limestone.

Genus.—**Siderastrea** Blainville, 1830

Siderastrea Blainville, Dict. Sci. Nat., LX, 1830, p. 335; Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 495; Quelch, Challenger Exped., 1886, Reef Corals, p. 133; Verrill, Dana's Corals and Coral Islands, ed. 3, 1890, p. 424; Vaughan, U. S. Geol. Surv. Mono. 39, 1900, p. 154; Vaughan, U. S. Nat. Mus. Bull. 59, 1907, p. 136; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 435.

Astrea Lamarck, Syst. Anim. sans Vert., 1801, p. 371; Fromentel, Introd. à l'Étude des Polyp. foss., 1861, p. 235.

Astraea Oken, Lehrb. der Naturg., Th. 3, Abth. 1, 1815, p. 75; Milne Edwards and Haime, Hist. Nat. Corall., II, 1857, p. 505; Gregory, Geol. Soc. London Quart. Jour., LI, 1895, p. 277.

Astrea = *Astraea*, preoccupied by Bolten for a Mollusca, Mus. Boltenianum, 1798, p. 79.

Genotype.—*Madrepora radians* Pallas = *Astrea galaxes* Lamarck (genotype by elimination, Art. 30, I e and III k) = *Madrepora galaxea* Ellis and Solander.

Madrepora radians Pallas, Elench. Zooph., 1766, p. 322.

Madrepora astroites Linné, Syst. Nat., ed. 12, 1767, p. 1276 (not Pallas, 1766).

Madrepora galaxea Ellis and Solander, Nat. Hist. Zooph., 1786, p. 168.

Astrea radians astroites Oken, Lehrb. Naturg., Th. 3, Abth. 1, 1815, p. 65.

Astrea (*Siderastrea*) *galaxea* Blainville, Dict. Sci. Nat., LX, 1830, p. 335.

Description.—The following is the original description as given by Blainville:—

"Loges superficielles ou peu profondes, non marginées, à lamelles nombreuses, très-fines, peu saillantes, partant d'un centre excavé, et se portant jusqu' à celles d'une autre étoile avec lesquelles souvent elles se continuent."

The corallum forms massive hemispherical or dome-shaped colonies, often growing into heads several inches in diameter; the calices are polygonal, compressed and irregular in some species, varying in diameter from 2.0 to 8.25 mm., and usually shallow; the septa are numerous, arranged in three or four cycles, pronouncedly dentate, trabeculate and the shorter ones distinctly perforate; a true or false columella is present; synapticulae may be few or abundant.

Range.—Tertiary to Recent.

Siderastrea conferta (Duncan), 1863

Plate XXXVIII, Figure 2

Isastraea conferta Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 422, Pl. XIV, fig. 2; Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 25.

Siderastrea conferta Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 451, Pl. CXVII, fig. 3; Pl. CXX, fig. 1-4; Pl. CXXI, figs. 1-2a.

Description.—Corallum massive, irregularly dome-shaped with somewhat explanate base; measuring as much as 4.5 inches or more in diameter; the calices are polygonal, shallow and vary from 2.5 to 7.5 mm. in diameter; the septa are numerous, seventy to eighty in the larger calices, conspicuously dentate on the upper margin, the outer ends often raised higher than the narrow walls of the calicular pit; synapticulae are abundant; the columella is not well developed.

Type.—Coll. Geol. Soc. of London; "Chert formation" of Antigua.

Locality and *Occurrence.*—The specimen is from the Reed Collection and occurs in the San Sebastian Shale.

FAMILY.—OULASTREIDAE VAUGHAN, 1919

Genus.—**Cyathomorpha** Reuss, 1868

Cyathomorpha Reuss, Denkschr. K. Akad. der Wiss. Math-Naturwiss, cl., XXVIII, 1868, p. 142, Pl. II, figs. 6 a-c; Zittel, Traité de Paléontologie, 1883, p. 260; Duncan, Linn. Soc. London Journ., Zool., XVIII, 1884, p. 105; Reis, Bayer, geognost. Landesuntersuch. Geognost. Jahresh., II, 1889, p. 147, Pl. III, figs. 17-19; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 454.

Genotype.—*Cyathomorpha rochettina* (Michelin).

Astrea rochettina Michelin, Icongraph. Zoophytol., 1840-1847, p. 58, Pl. XII, fig. 2.

Agathiphyllia conglobata Reuss, Die Foraminif., Anthoz. u. Bryoz. von Oberburg, Denkschr. K. Akad. Wiss. Math.-Naturwiss. cl. Wein., XXIII, 1864, p. 15, Pl. II, figs. 10-11.

Cyathomorpha conglobata Reuss, Denkschr. K. Akad. der Wiss. Math.-Naturwiss. cl., XXVIII, 1868, p. 142, Pl. II, figs. 6 a-c.

Cyathomorpha rochettina Reis, Bayer, geognost. Landesuntersuch. Geognost. Jahresh., II, 1889, p. 147, Pl. III, figs. 17-19.

Description.—The corallum consisting of superimposed layers, forms turf-like, turbinate, massive, explanate or dome-shaped masses, some of which are more than 10 cm. in diameter; epitheca is absent or only represented by shreds; the calyx pits are subcircular, either contiguous or separated and commonly raised above the interstitial tissue; their diameter varies from 3.5 to 20.0 mm.; septa are numerous and in several cycles, the earlier ones are solid or only with few perforations, the later cycles and rudimentary septa are distinctly perforate, composed of fused trabeculae; the calicular rims and outer surface of the protuberant calicular cavities are costate; synapticulae and dissepiments are present and usually common; the columella is trabecular or composed of the twisted or fused end of the longer septa; pali well developed and often raised to form a crown showing above the septa.

Range.—Oligocene.

Remarks.—This genus is distinguished from *Orbicella* by its synapticulate and perforate structures.

Cyathomorpha antiguensis (Duncan), 1863

Plate XXXVIII, Figures 3-5

Astrara antiguensis Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 419, Pl. XIII, fig. 8.

? Astroria affinis Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 425; Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 83 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 24; Duchassaing, Rev. Zooph. Antilles, 1870, p. 30.

Astroria antiguensis Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 425; Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 83 (of reprint); Duchassaing, Rev. Zooph. Antilles, 1870, p. 30.

Heliastraea antiguensis Duchassaing and Michelotti, Sup. Mém. Corall. Antilles, 1866, p. 86 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 24; Duchassaing, Rev. Zooph. Antilles, 1870, p. 30.

Cyathomorpha antiguensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 163, Pl. CXXIX, fig. 2; Pl. CXXX, figs. 1-3; Pl. CXXXI, figs. 1-4; Pl. CXXXII, figs. 1-2b; Pl. CXXXIII, fig. 1.

Description.—The corallum forms turbinate, hemispherical or discoidal massive heads varying from 9 to 16 inches in diameter with only rudimentary epitheca on the basal surface; the individual corallites multiply by budding, apparently intercalcinal; the calices are rounded or subpolygonal, separated by porous tissue formed of costae and many synapticulae; the costae pass over the calcinal margin and unite with the septa; the calyx pits vary from 3 to 12 mm. in diameter and are usually shallow, but a few specimens have deep calices, some as much as 5 mm.; the walls are synapticulate; the septa are numerous, granulose, sometimes carinate and usually in four cycles, uniting with the costae over the calcinal margin; the longer septa extend to the well developed columellar tangle, the shorter ones sometimes are joined to the sides of the longer ones; the individual plates of the primary and secondary cycles appear imperforate; paliform lobes form a double circular feature, the inner circle is more distinct and associated with the primary and secondary septa, the outer circle is associated with the tertiary septa; synapticulae and dissepiments are common.

Type.—Coll. Geol. Soc. London; "Marl-formation" of Antigua.

Locality.—440-58,-119, Reeds Collection, American Museum of Natural History, and 805-8, 814, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale and Lares Limestone.

Cyathomorpha tenuis (Duncan), 1863

Plate XXXIX, Figure 1

Astraea tenuis Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, p. 421, Pl. XIII, fig. 11.

Heliastraea tenuis Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 24.

Orbicella tenuis Vaughan (part), Geolog. Reichs Mus. Leiden Samml., ser. 2, II, p. 33.

Cyathomorpha tenuis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 467, Pl. CXXXII, figs. 3, 3a; Pl. CXXXIII, figs. 2-3b.

Description.—The corallum is a pulvinate mass, two to five inches in diameter, composed of rounded tubes separated from the adjacent corallites either by a narrow wall or by porous tissue that measures as much as 2 mm. in thickness; the calices are distinctly outlined, slightly raised and vary from 3 to 6 mm. in diameter; the costae, present on the calicular margins, extend down the outside of the calicular pits and meet those of adjacent calices; inwardly the costae unite with the numerous septa that vary in number from twenty-four to forty, arranged in four

cycles; the principal septa bear paliform structures more distinct than the other primary and secondary septa; synapticulae form the wall of the tubular corallites and are numerous among the costae, where they form the coarsely porous interstitial tissue; the central network is not definitely arranged in a columella.

Type.—Coll. Geol. Soc. London; "Marl-formation," Antigua.

Locality.—440-39,-40,-46,-49,-51,-59,-242,-325,-385, Reeds Collection, American Museum of Natural History, and 804, 811, 815, 850, 853, 854, 855, 886, 888, P. R. 98 (f) and (g), Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Juana Diaz Shale ? and Ponce Formation.

Genus.—**Diploastrea** Matthai, 1914

Diploastrea Matthai, Linn. Soc. London, Trans., Zool., ser. 2, XVII, 1914, p. 72; Vaughan, Dept. Marine Biology, IX, Pub. 213, 1918, p. 142; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 469.

Genotype.—*Diploastrea heliopora* (Lamarck).

Astrea heliopora Lamarck, Hist. Nat. Anim. sans Vert., 1816, p. 265; ed. 2, 1836, p. 415.

Astraea glaucopsis Dana, U. S. Expl. Exped., Zooph., 1846, p. 208, Pl. X, figs. 2a, 2b.

Astraea patula Dana, U. S. Expl. Exped., Zooph., 1846, p. 209, Pl. X, figs. 14-14e.

Orbicella minikoiensis Gardiner, Fauna and Geog. Maldive and Laccadive Arch., II, 1904, p. 774, Pl. LXIII, fig. 35; Vaughan, Proc. U. S. Nat. Mus., XXXII, 1907, p. 252.

Diploastrea heliopora Matthai, Linn. Soc. London Trans., Zool., ser. 2, XVII, 1914, p. 72, Pl. XX, figs. 7, 8; Pl. XXXIV, fig. 9.

Matthai states: "This genus has been created for *Orbicella minikoiensis* Gardiner," 1904. He places this species in synonomy with *Astrea heliopora* Lamarck, 1816, which has been described by Lamarck as follows: "*A. planulata;* stellis orbiculatis, majusculis, multiradiatis, margine separatis lamellis extus superneque incrassatis; centro papilloso."

Description.—Corallum consists of incrusting or massive forms; epitheca incomplete; calices large, shallow and commonly raised above the intercalicular area from which they are separated by a wall; costae are present and in many places those of adjacent corallites are confluent upon the intercorallite areas and in other places alternate; the septa are coarsely dentate, coarsely perforate and thick near the calyx wall; synapticulae and dissepiments are present; paliform columns are absent but the innermost denticles of the major septa often rise above the surface and simulate pali; the columella is trabeculate.

Range.—Tertiary to Recent.

Remarks.—*Diploastrea* is distinguished from *Cyathomorpha* in its coarse perforation and dentation and in the absence of pali.

Agathiphyllia is similar to *Diploastrea* in having no pali according to Reuss. It is necessary to study the type specimen before the relation of these two genera can be determined and until that is done the genus of *Diploastrea* will be recognized.

Brachyphyllia cannot be recognized without further study of the type, *B. dormitzeri*.

Diploastrea crassolamellata (Duncan), 1863

Plate XXXIX, Figure 2

Astraea crassolamellata Duncan, Geol. Soc. London Quart. Jour., XIX, 1863, pp. 412-417, Pl. XIII, figs. 1-7.

Heliastraea crassolamellata Duchassaing and Michelotti, Sup. Corall. Antilles, 1866, p. 86 (of reprint); Duncan, Geol. Soc. London Quart. Jour., XXIV, 1868, p. 24; Duchassaing, Rev. Zooph. Antilles, 1870, p. 30.

Orbicella crassolamellata Vaughan, Geol. Soc. London Quart. Jour., LVII, 1901, p. 497.

Brachyphyllia sp. Vaughan, Geol. Soc. London Quart. Jour., LVII, 1901, p. 497.

Diploastrea crassolamellata Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 470, Pl. CXXXV, figs. 1-5b; Pl. CXXXVI, figs. 1-1b; Pl. CXXXVII, figs. 1-5.

Description.—Corallum massive, expending upward and outward from a small base, the upper surface flat or dome-shaped, deeply grooved between the calices; the lower surface is incompletely epithecated; the calices are large, shallow, raised above the intercalicular tissue and vary from 6.25 to 27.5 mm. in diameter; the septa are in several cycles (four to nine) and very porous; synapticulae and trabeculae are abundant within and without the calyx; the columella is well developed, large and trabeculate, often measuring 5 mm. in diameter; the calicular walls are porous; costae are present and observed wherever the epitheca is absent.

Type.—Coll. Geol. Soc. London; "Marl formation," Antigua.

Locality.—440-57,-58,-340,-378,-444, Reeds Collection, American Museum of Natural History, and 807, 813 Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Ponce Formation and Lares Limestone.

MADREPORARIA PERFORATA

FAMILY.—ACROPORIDAE VERRILL

Genus **Acropora** Oken, 1815

Acroporidae Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 163; (not Acroporidae Canu, 1913, which was made to include several genera of Cheilostome Bryozoa).

Genus—*Acropora* Oken, 1815.

Acropora Oken, Lehrb. Naturg., Th. 3, Abth. 1, 1815, p. 66; Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 164; 1902, p. 208; Vaughan, Carnegie Inst. Washington, Dept. of Marine Biol. Pub. 213, p. 159; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 479; Zittel, Text Book of Paleon., I, 1913, p. 107.

Madrepora Lamarck (not Linné, ed. X, 1758, p. 792), Hist. Anim. sans Vert., II, 1816, p. 277; ed. 2, 1836, p. 445; Dana, Zooph., 1846, p. 435; Milne Edwards and Haime, Hist. Corall., III, 1860, p. 132; Rathbun, Catalog, U. S. Nat. Mus., X, 1887, pp. 10-19; Klunzinger, Korall. Roth. Meer., II, 1879, p. 2; Brook, Catalog. Mad. Brit. Mus., I, 1893, p. 22.

Isopora.—Studer (as subgenus), Monatsber. Akad. Wiss. Berlin, 1878, p. 535; Vaughan, Fossil Corals Curaco, 1901, p. 68; Vaughan, Bull. U. S. Fish Comm. for 1900, II, 1901, p. 312.

Heteropora Ehrenberg, Korall. Roth. Meer., Abhandl. K. Acad. Wiss. Berlin for 1832, 1834, p. 323; (not Blainville, whose genus was referred to a Bryozoan).

Acropora Reuss, Die fossilen Anthozoen und Bryozoan der Schichtenguippe von Crosaro, Denkschrift. der K. Akad. der Wissenschaft. Wein, XXIX, 1869, p. 277, was used for a Bryozoan species. In U. S. Nat. Mus. Bull. 106, 1920, pp. 318-320, Canu and Bassler added two new species of Cheilostome Bryozoa to the genus of Reuss. In Zittel, Traité de Paléontologie, 1883, *Acropora* (a Bryozoan genus) was included under *Vincularia* as a synonym. Further study is necessary to determine what should be done with the Bryozoan species now assigned to the genus *Acropora*, a name that can be properly used only for a coral species.

Genotype.—*Millepora muricata* Linnaeus.

Millepora muricata Linnaeus, Syst. ed. 10, 1758, p. 792.

Madrepora muricata Pallas, Elench. Zooph., 1766, p. 327; Linnaeus, Syst. ed. 12, 1767, p. 1279.

Madrepora cervicornis Lamarck, Hist. Anim. sans Vert., 1816, pp. 278, 281.

Acropora muricata Oken, Lehrb. Naturg., Th. 3, Abth. 1, 1815, p. 66.

Description.—Corallum forms branching, flabellate or palmate colonies; the calices are small, circular pits at the end of tubular projections raised above the surface of the porous coenenchyma; they protrude most conspicuously upon the upper surfaces of the palmate forms or nearer the ends of the branches in the branching colonies; the septa are often rudimentary and in two cycles; the two major or directive

septa in some calices form a conspicuous partition; the columella is rudimentary or absent; the costal ridges are numerous or replaced by papillose tissue.

Range.—Tertiary to Recent.

Acropora crassa Coryell, new species

Plate XXXIX, Figure 3

Description.—Corallum forms bilaminate, palmate fronds or masses with the lamina on the lower side of the broad fronds much thinner and carrying a less number of corallites than the upper lamina; fronds vary in thickness from ½ to 3½ inches; the corallites are small, 0.5 to 0.8 mm. in diameter, circular in cross-section and separated from one another by a distance equal to or less than their diameter; the coenenchyma is coarsely porous; the calcinal walls are thick and often in contact in adjacent individuals; the directive septum is well developed and in many calices it unites with the opposite one.

Type.—No. 23006, American Museum of Natural History.

Locality.—440-346,-368,-369, Reeds Collection, American Museum of Natural History, and 918, 968, 987, 989, 1089, Hubbard Collection, Columbia University, New York City.

Occurrence.—Ponce Formation.

Remarks.—This species is distinguished from *Acropora palmata* by the thick, calcinal walls, closer average spacing of the corallites and the thicker and less undulating palmate corallum.

Acropora palmata (Lamarck), 1816

Plate XL, Figure 1

Madrepora palmata Lamarck, Hist. Nat. Anim. sans Vert., II, 1816, p. 279; Gregory, Ann. Mag. Nat. Hist., ser. 7, VI, 1900, p. 29.

Madrepora muricata palmata Brook, Brit. Mus. Cat. Madrep. corals, gen. *Madrepora*, 1893, p. 25.

Isopora muricata palmata Vaughan, U. S. Fish Comm. Bull. for 1900, II, 1901, p. 313, Pls. XXVI, XXVII.

Acropora muricata palmata Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1901, p. 166.

Acropora palmata Vaughan, Washington Acad. Sci. Jour., V, 1915, pp. 597, 598; Vaughan, Nat. Acad. Sci. Proc., II, 1916, pp. 95, 100; Vaughan, Carnegie Inst. Washington Yearbook No. 14, 1916, pp. 227-230; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 483.

Description.—Corallum forms undulating and palmate branching colonies; the corallites are circular and protrude above the finely porous coenenchyma, extending out farthest on the margins of the branches; the

calcinal pits vary from 0.5 to 0.8 mm. in diameter; costal ridges are numerous; six septa are well developed, a single directive or two opposites are more prominent than the rest; the coenenchyma of well preserved or recent specimens is very spinous; calcinal walls are thin.

Locality.—937, H 2, Hubbard Collection, Columbia University, New York City.

Occurrence and *Range.*—Pleistocene and Recent.

Acropora panamensis Vaughan, 1919

Plate XL, Figure 2

Acropora panamensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 480, Pl. CXLI, figs. 1-2.

Description.—Corallum composed of thick branches varying from 12 to 20 mm. in diameter and becoming compressed below a point of bifurcation, where the greatest diameter often measures 30 mm.; the corallites are protuberant, projecting upward and outward; the average individual extends from 1.5 to 2.0 mm. above the coenenchyma; the diameters of the calices vary from 1.5 to 3.5 mm.; they are scattered over the branches irregularly, in some places more closely spaced than in others, but commonly separated from one another by a distance equal to the diameter of the calice; costal ridges are numerous; synapticulae are present; the septa occur in two cycles; the directives are well developed but do not form dimidiate calices; coenenchyma is porous and near a corallite protuberance it is covered with the extended costal ridges.

Type.—No. 325042a, U. S. National Museum; Emperador Limestone.

Locality.—440-51-,-62,-64,-330,-340,-454, Reeds Collection, American Museum of Natural History, and 880, 896, 897, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Ponce Formation and Lares Limestone.

Genus.—**Astreopora** Blainville, 1830

Astreopora Blainville, Dict. Sci. Nat., LX, 1830, p. 348; Milne Edwards and Haime, Compte Rendu de l'Acad. des Sci., XXVII, 1848, p. 258; Milne Edwards and Haime, Archi. du Mus. d'Hist, Nat., V, 1851, p. 141; Milne Edwards and Haime, Hist. Nat. des Corall., III, 1860, p. 167; Bernard, Brit. Mus. Cat. Madreporaria, II, 1896, p. 77; Vaughan, Carnegie Inst. Washington Pub. 213, 1918, p. 145; Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 483.

Genotype.—*Astreopora myriophthalma* (Lamarck).

Astrea myriophthalma Lamarck, Hist. Nat. Anim. sans Vert., 1816, p. 260.

Description.—Corallum consists of massive or branching colonies with porous coenenchymous tissue filling the spaces between each individual; the surface of the intercalicular area is smooth, canaliculate or bearing small spine-like structures; the calices are irregularly rounded, slightly protuberant; the septa are irregularly developed, consisting of a different number of cycles in different individuals of the same colony; a columella is present but often poorly developed.

Range.—Tertiary to Recent.

Astreopora antiguensis Vaughan, 1919

Plate XL, Figue 3

Astreopora antiguensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 484, Pl. CXXXIX, figs. 3, 3a; Pl. CXL, fig. 1.

Description.—Corallum consists of subterete or palmate branches; the calices are protuberant, irregular in outline, 2 to 4 mm. in diameter and varying from 1.5 to 2.5 mm. apart; the individual corallites are costate; the coenenchymous tissue appears somewhat smooth and porous except where the costae are present; the septa appear arranged in two or three incomplete cycles; the columella may or may not be present.

Type.—Museum of Comparative Zoology, Harvard University.

Locality.—440-321, Reeds Collection, American Museum of Natural History.

Occurrence.—Ponce Formation.

*FAMILY.—PORITIDAE DANA

* Genus.—**Goniopora** Blainville, 1830

Goniopora Blainville, Dict. Sci. Nat., LX, 1830, p 359; Quoy and Gaimard, Voyage de l'Astrolabe, Zool., IV, 1833, p. 218.

Genotype.—*Goniopora pedunculata* Quoy and Gaimard.

Description.—Corallum forms compressed or cylindrical branches, lamelliform foliations or subhemispherical masses; calices polygonal, 1.5 to 4.0 mm. in diameter; wall costated, spiny or granular; the septa, usually 24 in number, are arranged in the gonioporid plan, six primaries extending directly to the columella with a triplet group of a secondary and two tertiaries between each, and sometimes a directive plane formed by two opposite primaries can be distinguished; the columella is composed of a network tangle of calcareous tissue; synapticulae and pali are present.

Range.—Tertiary and Recent.

* Goniopora canalis Vaughan, 1919

Plate XL, Figure 4

Goniopora canalis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 494, Pl. CXLVI, figs. 1-3.

Description.—Corallum forms compressed branches; the calices are polygonal, varying in diameter from 2 to 4 mm. and on unweathered surfaces have a depth of 1.0 to 1.25 mm.; the walls are costate, reticulate, ridge-like, enclosing a single calice or a longitudinal series of two to four and varying in thickness from 0.75 to 1.25 mm.; the septa are gonioporoid, tapering inward with two cycles reaching the inconspicuous columella tangle; no pali observed.

Tye.—No. 325052, U. S. National Museum.

Locality. — 440-39,-451, Reeds Collection, American Museum of Natural History, and 870, 878, 891, 996, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale and Lares Limestone.

* Goniopora cascadensis Vaughan, 1919

Plate XL, Figure 5

Goniopora cascadensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 497, Pl. CXLVI, figs. 6-9.

Description.—Corallum forms small subcylindrical branches; the calices are polygonal and vary in diameter from 1.5 to 2.5 mm.; the walls are thin, costate and reticulate or apparently absent in some places; the septa are in three cycles, two of which reach the well developed, often styloform columellar tangle; the pali are slightly developed as a cycle of thickenings around the columella.

Type.—No. 325072, U. S. National Museum.

Locality.—440-38,-339,-373, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Goniopora clevei Vaughan, 1919

Plate XL, Figure 6

Goniopora clevei Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 496, Pl. CXLV, figs. 1-6a.

Description.—Corallum forms irregularly shaped branches; the calices are subcircular and shallow; the walls consist of a reticulate

structure that fills the intercalcinal spaces, the thickness of which varies from a thin synapticular zone to a reticulated mass measuring 1 mm. across; the septa are poritid in arrangement and number, except that the major ones are peripherally bifurcated; the columella is well developed and centrally dense; the pali aggregation consists of six structural elements.

Type.—University of Upsala.

Locality.—440-24,-25,-27,-38,-39,-40,-46,-48,-49,-50,-51,-58, Reeds Collection, American Museum of Natural History, and 866, 867, 868, 869, 874, 877, 879, 882, P. R. 95 (b), Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

* Goniopora decaturensis Vaughan, 1919

Plate XL, Figure 7

Goniopora decaturensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 490, Pl. CXLIII, figs. 1, 1a.

Description.—Corallum consists of superimposed, undulating, foliated lamellae; calices are shallow, polygonal and vary from 2.5 to 3.0 mm. in diameter; the walls are thin or absent; septa are gonioporid in arrangement and number, of variable thickness, the longer reaching the conspicuous columellar tangle; trabeculae and synapticulae are present in many interseptal loculi.

Type.—No. 325031, U. S. National Museum.

Locality.—440-40,-339,-341,-366,-389, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Goniopora decaturensis silicensis Vaughan, 1919

Plate XL, Figure 8

Goniopora decaturensis var. *silicensis* Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 491, Pl. CXLIII, figs. 2, 2a.

Description.—It is only necessary here to give the characters that make it convenient to support the erection of this variety. These are as follows: calices vary in diameter from 2.5 to 4.0 mm. and the septa are thin.

Type.—No. 325026, U. S. National Museum.

Locality.—440-33,-320,-323,-346, Reeds Collection, American Museum of Natural History.

Occurrence.—Lares Limestone and Ponce Formation.

* Goniopora hilli Vaughan, 1919

Plate XLI, Figure 1

Goniopora hilli Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 488, Pl. CXLII, figs. 1, 1a.

Description.—Corallum is large, consisting of superimposed, irregularly flattened plates; the calices are polygonal, varying from 3 to 4 mm. in diameter and from 1.0 to 1.5 mm. in depth on unweathered surfaces; the intercalcinal walls are from 0.75 to 1.25 mm. in thickness; the narrow walls are crossed by septa extensions (costae), the thicker walls consist of a reticulate structure; the septa are gonioporid in number and arrangement and usually of three cycles, the first and second extending to the columellar tangle which forms the bottom of the calices; pali are inconspicuous.

Type.—No. 325058, U. S. National Museum.

Locality. — 440-42,-107,-339,-340,-341,-344,-390, Reeds Collection, American Museum of Natural History, and 1004, P. R. 98 (a), Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Goniopora imperatoris Vaughan, 1919

Plate XLI, Figure 2

Goniopora imperatoris Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 493, Pl. CXLII, figs. 3, 3a.

Description.—Corallum forms compressed, lobate columnar masses; the calices are polygonal, varying from 1.5 to 2.5 mm. in diameter and are as much as 0.75 mm. deep where the surface is unweathered; the walls are costate and consist of reticulate tissue measuring from 0.75 to 1.25 mm. in thickness; the septa are gonioporid, thin and with two cycles reaching the very conspicuous columellar tangle; pali are well developed.

Type.—No. 325049, U. S. National Museum.

Locality.—440-46,-48,-344, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Goniopora jacobiana Vaughan, 1919

Plate XLI, Figure 3

Goniopora jacobiana Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 492, Pl. CXLIV, figs. 1-3a.

Description.—Corallum forms a hemispherical or columniform mass of superimposed lamellae; the calices are polygonal and vary from 2.5 to 3.5 mm. in diameter; the walls are thin, costated or having a reticulate structure where the thickness reaches 1 mm.; septa are gonioporid and thin; the columella is inconspicuous and apparently absent in some calices; no pali observed.

Type.—No. 325077, U. S. National Museum.

Locality.—440-342, Reeds Collection, American Museum of Natural History and 942, 943, Hubbard Collection, Columbia University, New York City.

Occurrence.—Ponce Formation.

* Goniopora panamensis Vaughan, 1919

Plate XLI, Figure 4

Goniopora panamensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 489, Pl. CXLII, figs. 2-2b.

Description.—Corallum is large, consisting of superimposed, flattened or domed plates; the calices are polygonal, varying from 2.5 to 3.5 mm. in diameter and often reaching a depth of 2.0 mm.; in many places the calices occur in series surrounded by a definite, common, ridge-like wall; the individual walls are thick, reticulated, and at the junction angles, acervuline; the septa are gonioporid in arrangement and number, two cycles of which reach the small columellar tangle; pali are inconspicuous.

Type.—No. 325053, U. S. National Museum.

Locality.—440-39,-47,-50,-366, Reeds Collection, American Museum of Natural History, and 860, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Goniopora portoricensis Vaughan, 1919

Plate XLI, Figure 5

Goniopora portoricensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 495, Pl. CXLVI, figs. 4, 5.

Description.—Corallum forms cylindrical or compressed branches; the calices are polygonal, shallow and vary in diameter from 1.5 to 2.0 mm.;

the walls are thin and appear as if formed by the fusion of the ends of the septa; the septa are thin and in three cycles; the columella is inconspicuous; the pali are not always sufficiently developed to be distinguished from the septal structures.

Type.—No. 325061, U. S. National Museum.

Locality.—440-38,-57,-62,-454, Reeds Collection, American Museum of Natural History.

Occurrence.—San Sebastian Shale and Lares Limestone.

* **Goniopora regularis** (Duncan), 1863

Plate XLII, Figures 1, 1a

Alveopora daedalaea var. *regularis* Duncan, Geo. Soc. London Quart. Jour., XIX, 1863, p. 426, Pl. XIV, figs. 4a, 4c.

Alveopora daedalaea Duncan, Geol. Soc. London Quart. Jour., XXIV, 1867, p. 25.

Alveopora regularis Vaughan, Geol. Reich. Mus. Leiden Samml., ser. 2, II, p. 71.

Goniopora regularis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 491.

Description.—Corallum is of an undulate, turbinate or lobulate columniform shape; calices are polygonal, varying from 1.5 to 2.5 mm. in diameter; the walls are distinct in places, consisting of reticulate structure; the septa are thin, granular and gonioporid in arrangement and number; the plate-like pali are conspicuous.

Locality.—440-320, Reeds Collection, American Museum of Natural History, and 865, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale and Ponce Formation.

* Genus.—**Porites** Link, 1807

Porites Link, Beschreib. Natur. Samml. Rostock, 1807, p. 162; Vaughan, Samml. Geol. Reichs. Mus. Leiden, ser. 2, II, 1901, p. 73; Vaughan, U. S. Comm. of Fish and Fisheries Bull. for 1900, II, 1901, p. 314, Pl. XXVIII; Vaughan, Proc. Biol. Soc. Wash., XV, 1902, p. 56; Bernard, Porites of the Indo-Pacific Region, 1905, p. 303, (35 plates); Bernard, Porites of the Atlantic and West Indies, 1906, p. 144, (17 plates); Vaughan, Carnegie Inst. Washington Pub. 213, 1918, p. 138.

Genotype.—*Madrepora porites* Pallas.

Description.—Corallum forms foliaceous or ramose tuffs, incrustations, hemispherical or lobed masses with a basal epitheca; corallites with trabeculate walls; calices small, polygonal; septa trabeculate,

spinose, twelve in number; columella a network tangle at the center of the corallite and often surmounted by a styliform trabecula; pali five or six, often indistinct, forming a circle about the columellar tangle; synapticules and dissepiments occur; tabulæ are porous.

Range.—Cretaceous to Recent.

* Porites anguillensis Vaughan, 1919

Plate XLII, Figure 2

Porites anguillensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 504, Pl. CXLIX, figs. 1-1b; Pl. CL, fig. 5.

Description.—Corallum composed of thin, undulating, superimposed laminae; calices shallow, subcircular, 1.7 to 2.3 mm. in diameter; walls of dense, costate and perforate coenenchymous tissue, 0.8 to 1.0 mm. in thickness; the twelve septa thick, in poritid arrangement; the six pali are before the inner ends of the septal groups; synapticulae are well developed, forming three rows in the wall and a ring about the pali; trabeculae in columellar tangle are coarse; an axial tubercle is present.

Type.—University of Upsala.

Locality. — 440-40,-45,-46,-50,-119,-344,-446,-458. Reeds Collection, American Museum of Natural History, and P. R. 98 (b), Hubbard Collection, Columbia University, New York City .

Occurrence.—San Sebastian Shale, Lares Limestone and Ponce Formation.

* Porites astreoides Lamarck, 1816

Plate XLII, Figures 3, 3a

Porites astreoides Lamarck, Hist. Nat. Anim. sans Vert., II, 1816, p. 269; Rathbun, U. S. Nat. Mus. Proc., X, 1887, p. 354; Vaughan, U. S. Fish Comm. Bull. for 1900, II, 1901, p. 317, Pl. XXXII; Pl. XXXIII; Pl. XXXIV, figs. 1, 2; Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1902, p. 160, Pl. XXXI, fig. 4; Vaughan, Carnegie Inst. Washington Yearbook No. 10, 1912, pp. 148-156, Pl. IV, figs. 3a, 3d, 3e; Pl. V, fig. 5b; Pl. VI, figs. 1c, 2e; Vaughan, Washington Acad. Sci. Jour., V, 1915, p. 597; Vaughan, Nat. Acad. Sci. Proc., II, 1916, p. 98; Vaughan, Carnegie Inst. Washington Yearbook No. 12, 1916, pp. 226-228, 231; Duerden, Nat. Acad. Sci. Mem., VIII, 1903, p. 550, Pls. III-V.

Porites verrilli Verrill, Trans. Conn. Acad. Arts and Sci., XI, 1902, p. 161, Pl. XXXI, fig. 5.

Description.—Corallum massive, subhemispherical, with a regularly curved or knobby surface; calices polygonal, deep, 1 to 2 mm. in diame-

ter; there are twelve principal porous septa with dentate upper margins and arranged in regular poritid form; walls are thin; the columella is composed of a network tangle; the pali are poorly developed.

Locality.—440-18,-367,-462, Reeds Collection, American Museum of Natural History.

Occurrence.—Recent, Ponce Formation ? and Cibao Limestone ?.

* **Porites baracoaensis** Vaughan, 1919

Plate XLII, Figure 4

Porites baracoaensis **Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 499, Pl. CXLVII, figs. 1, 1a.**

Description.—Corallum composed of slender branches; calices shallow, polygonal, 1.25 to 2.25 mm. in diameter; walls thin, costate and with squamae present within most of the calices; septa of poritid arrangement; there are usually six pali, one before the inner end of each group of septa and united at the base of the calyx to the columellar tangle.

Type.—No. 325069, U. S. National Museum.

Locality.—440-362, Reeds Collection, American Museum of Natural History, and 955, Hubbard Collection, Columbia University, New York City.

Occurrence.—Ponce Formation.

* **Porites douvillei** Vaughan, 1919

Plate XLII, Figures 5-7

Porites douvillei **Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 501, Pl. CXLIX, figs. 2, 2a; Pl. CLI, figs. 1, 1a.**

Description.—Corallum composed of compressed branches; calices shallow, polygonal, 1.25 to 2.0 mm. in diameter; walls thin, denticulate along the upper margin and usually straight; septa in poritid arrangement; pali well developed; synapticulae occur in a palar ring and in a ring midway between the center of the calyx and the wall, coinciding with a ring of septal granules; the columellar tangle has radial extensions to the pali and central tubercle.

Cotype.—No. 325106, U. S. National Museum.

Locality.—440-24,-25,-26,-27,-33,-35,-38,-39,-40,-44,-45,-46,-47,-49,-50,-52,-57,-64,-119,-123,-242,-362,-376,-451,-462, Reeds Collection, American

Museum of Natural History, and 995, 998, 999, 1000, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Lares Limestone, Cibao Limestone, Juana Diaz Shale ? and Ponce Formation.

Porites (Synaraea) macdonaldi Vaughan, 1919

Plate XLIII, Figure 1

Porites Synaraea macdonaldi Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 506, Pl. CLII, fig. 1-5a.

Description.—Corallum rises from an explanate base into lobes and irregular protuberances; the calices average 1.5 mm. in diameter and are arranged separately or in series varying from two to eleven calices surrounded by a costate or coarsely reticulate colline, within which the calcinal centers are definite and the individual walls indistinct; papillae occur in many places on the reticulate tissue between the calicular depression, especially at the junction angles of adjacent calices; the arrangement of the septa cannot always be determined; a ventral directive with lateral triplets can sometimes be observed; a ring of septal granules and another composed of synapticulae occur near the wall; pali and palar synapticulae can be differentiated in some calices; the columellar tangle is present.

Cotype.—No. 325046a, U. S. National Museum; Upper Oligocene.

Locality.—833, 881, 1001, 1006, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale.

* **Porites panamensis** Vaughan, 1919

Plate XLIII, Figure 2, Plate XLIV, Figure 1

Porites panamensis Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 503, Pl. CXLVIII, figs. 1-3a.

Description.—Corallum composed of broad, compressed, branch-like expansion with somewhat irregular surfaces; calices shallow, confluent in series of not more than three and measuring from 1.5 to 2.0 mm. in diameter; walls coarse, forming a zig-zag or straight ridge about the confluent series; twelve septa in typical poritid arrangement; the septal granules are irregular and do not form a mural ring; the pali, from six to eight in number, are irregularly placed; synapticulae few and better developed around the columellar tangle.

Type.—No. 325063, U. S. National Museum.

Locality. — 440-25,-26,-43,-52,-340,-341,-342,-361,-365,-366,-386,-452, Reeds Collection, American Museum of Natural History, and 887, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Ponce Formation and Lares Limestone.

Porites porites (Pallas), 1766

Plate XLIV, Figure 2

Madrepora porites Pallas, Elench. Zooph., 1766, p. 324; Linnaeus, Syst. Nat. ed. 12, 1767, p. 1279; Ellis and Solander, Nat. Hist. Zooph., 1786, p. 172, Pl. XLVII, figs. 1, 2; Esper, Pflanzenth, I, 1789, p. 135, Pl. XXI, Gmelin, Syst. Nat. ed. 13, 1790, p. 3774; Lamarck, Syst. Anim. Sans vert., 1801, p. 371; Schweigger, Handb. Naturg., 1820, p. 413.

Porites polymorphus Link, Beschreib. Natur. Samml., Rostock, 1807, p. 162.

Porites clavaria Lamarck, Hist. Nat. Anim. sans vert., II, 1816, p. 270; Lesueur, Mem. Mus. Hist. Nat., VI, 1820, p. 289, Pl. XVII, fig. 17; Lamouroux, Exp. Meth., 1821, p. 61, Pl. XLVII, figs. 1, 2; Deslongchamps. Encycl. Meth. Zooph., 1824, p. 652; Blainville, Dict. Sci. Nat., XLIII, 1826, p. 50; LX, p. 361; Ehrenberg, Abh. k. Akad. Wiss., 1834, p. 341; Dana, Zooph. Explor. Exped. Wilkes, VIII, 1848, p. 554; Duchassaing, Anim. Rad. Ant., 1850, p. 17; Milne Edwards and Haime, Ann. Sci. Nat. Zool., ser. 3, XVI, 1851, p. 26; Milne Edwards and Haime, Hist. Nat. Corall., III, 1860, p. 174; Duchassaing and Michelotti, Mem. Roy. Accad. Sci., Tor., ser. 2, XIX, 1861, p. 358; Verrill, Bull. Mus. Comp. Zool., I, 1864, p. 42; Duchassaing and Michelotti, Suppl. Mém. Cor. Ant. Mem. Roy. Accad. Sci. Tor., ser. 2, XXIII, 1866, p. 189; Duchassaing, Rev. Zooph. Ant., 1870, p. 32; Pourtalès, Ill. Cat. Mus. Comp. Zool. No. 4, 1871, p. 84; Lindstrom, Handl. k. Svensk. Vet.-Okad., XIV, 1877, No. 6, p. 24; Pourtalès, Mem. Mus. Comp. Zool., VII, 1880, Pt. 1, Pl. XII, figs. 4-6; Quelch, Zool. Challenger Exped., Pt. 46, 1886. p. 179; Rathbun, Proc. U. S. Nat. Mus., X, 1887, p. 356, Pl. XVI; Pl. XVII, fig. 2; Pl. XVIII; Pl. XIX, fig. 1; Rehberg, Nat. Ver. Hamburg, XII, 1892, Pt. 1, p. 47; Vaughan, *P.* forma *clavaria*, U. S. Fish Comm. Bull. for 1900, II, 1901, p. 316, Pl. XXIX; Pl. XXXI, fig. 2; Vaughan, Carnegie Inst. Washington Yearbook No. 10, 1912, pp. 148, 152, 156, Pl. IV, fig. 4c; Pl. VI, figs. 3, 4; Vaughan, Washington Acad. Sci. Jour., V, 1915, p. 597; Vaughan, Nat. Acad. Sci. Proc., II, 1916, pp. 95, 98; Vaughan, Carnegie Inst. Washington Yearbook No. 14, 1916, p. 228; Gregory, Quart. Jour. Geol. Soc. London, LI, 1895, p. 182.

Porites flexuosa Dana, Zooph. Explor. Exped. Wilkes, 1848, p. 554, Pl. LIII, fig. 6; Milne Edwards and Haime, Ann. Sci. Nat. Zool., ser. 3, XVI, 1851, p. 31; Milne Edwards and Haime, Hist. Nat. Corall., III, 1860, p. 176; Duchassaing and Michelotti, Mem. Roy. Accad. Sci. Tor., ser. 2, XIX, 1860, p. 358, Suppl. Mém. Corall., Ant. Mém. Roy. Accad. Sci.

Tor., ser. 2, XXIII, 1866, p. 191; Duchassaing, Rev. Zooph. Ant., 1870, p. 32.

Porites flabelliformis Lesueur, Mem. Mus. Hist. Nat., VI, 1820, p. 289; Deslongchamps, Encycl. Meth. Zooph., 1824, p. 652; Milne Edwards and Haime, Ann. Sci. Nat. Zool., ser. 3, XVI, 1851, p. 31; Milne Edwards and Haime, Hist. Nat. Corall., III, 1860, p. 178; Duchassaing and Michelotti, Suppl. Mém. Roy. Accad. Sci. Tor., ser. 2, XXIII, 1866, p. 190; Duchassaing, Rev. Zooph. Ant., 1870, p. 32.

Porites solanderi Duchassaing and Michelotti, Mem. Roy. Accad. Sci. Tor., ser. 2, XIX, 1861, p. 358, Suppl. Mém. Roy. Accad. Sci. Tor., ser. 2, XXIII, 1866, p. 189; Duchassaing, Rev. Zooph. Ant., 1870, p. 32; Quelch, Zool. Challenger Exped., Pt. XLVI, 1886, p. 13.

Porites plumieri Duchassaing and Michelotti, Suppl. Mém. Roy. Accad. Sci. Tor., ser. 2, XXIII, 1866, p. 190, Pl. X, fig. 14; Duchassaing, Rev. Zooph. Ant., 1870, p. 32; Quelch, Zool. Challenger Exped., Pt. XLVI, 1886, p. 13.

Porites macrocephala Duchassaing and Michelotti, Suppl. Mém. Roy. Accad. Sci. Tor., ser. 2, XXIII, 1866, p. 189, Pl. X, fig. 15; Duchassaing, Rev. Zooph. Ant., 1870, p. 32.

Porites recta Lesueur, Mem. Mus. Hist. Nat., VI, 1820, p. 288, Pl. XVII, fig. 16; Deslongchamps, Encycl. Meth. Zooph., 1824, p. 651; Dana, Zooph. Explor. Exped. Wilkes, 1848, p. 556.

Porites valida Duchassaing and Michelotti, Suppl. Mém. Roy. Accad. Sci. Tor., ser. 2, XXIII, 1866, p. 94 (of reprint).

Porites nodifera Klunzinger, Die Korallenthiere des Rothen Meeres, Pt. 2, p. 41.

Porites porites Vaughan, Biol. Soc. Washington Proc., XV, 1902, p. 56; var. Vaughan, Carnegie Inst. Washington Yearbook No. 7, 1909, p. 135.

Description.—The corallum forms ramose tufts with basal epitheca; the calices are shallow pits or even flush with the surface, varying from 1.5 to 2.0 mm. in diameter; the twelve septa are trabeculate, and often show a bilateral symmetry; they are grouped as follow, a single directive, four lateral pairs and a ventral triplet; a palus is present before each septal group, forming a ring of six (sometimes five) about the columellar tangle; the upper end of the columella may end in a single tubercle or appear papillose; the wall is porous and varies considerably from a thin division among the younger polyps on the end of the branches to as much as 0.5 mm. on the older portion of the corallum; synapticulae and dissepiments are present.

Locality.—This species occurs in the Bermudas, Bahamas, Florida, Vera Cruz and other Caribbean regions, also in the Indian Ocean reefs. The specimen in the Hubbard Collection of Columbia University is from Porto Rico, locality 935.

Occurrence and *Range.*—Miocene to Recent. The specimen that forms the basis of this description is Recent.

* Porites toulai Vaughan, 1919

Porites toulai Vaughan, U. S. Nat. Mus. Bull. 103, 1919, p. 501, Pl. CL, figs. 1-4.

Description.—Corallum composed of slender, subcylindrical or slightly compressed branches; calices shallow, 1.5 to 2.5 mm. in diameter, either surrounded by an individual wall or a wall enclosing several calices in longitudinal series with indistinct divisions separating each calyx; the septal arrangement is irregularly poritid; synapticular tissue forms a palar ring and also a circle near the wall; an irregularly developed ring of five or six pali surrounds and is connected to the columellar tangle by radial extensions; in some cases a central tubercle is present on top of the columella.

Type.—No. 32105a, U. S. National Museum.

Locality. — 440-24,-25,-27,-33,-38,-39,-44,-45,-46,-48,-49,-50,-51,-52,-56,-58,-62,-63,-64,-92,-123,-299,-325,-330,-331,-339,-362, -383, -442, -451,-452,-454, Reeds Collection, American Museum of Natural History, and 924, Hubbard Collection, Columbia University, New York City.

Occurrence.—San Sebastian Shale, Lares Limestone and Ponce Formation.

Other fossil corals from Porto Rico, not included in this paper but described by T. W. Vaughan in U. S. Nat. Mus. Bull. 103, are as follows:

Astreopora portoricensis Vaughan, p. 485. *Diploastrea crassolamellata magnifica* (Duncan), p. 470.

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ERRATA

The page references that appear in the captions to the plates require the following corrections:

Plate	XXVI	Substitute	pp.	186 - 189	for	pp.	32 - 37
"	XXVII	"	"	190 - 193	"	"	38 - 42
"	XXVIII	"	"	192&194	"	"	41&43
"	XXIX	"	"	195 - 197	"	"	45 - 47
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Plate XXVI

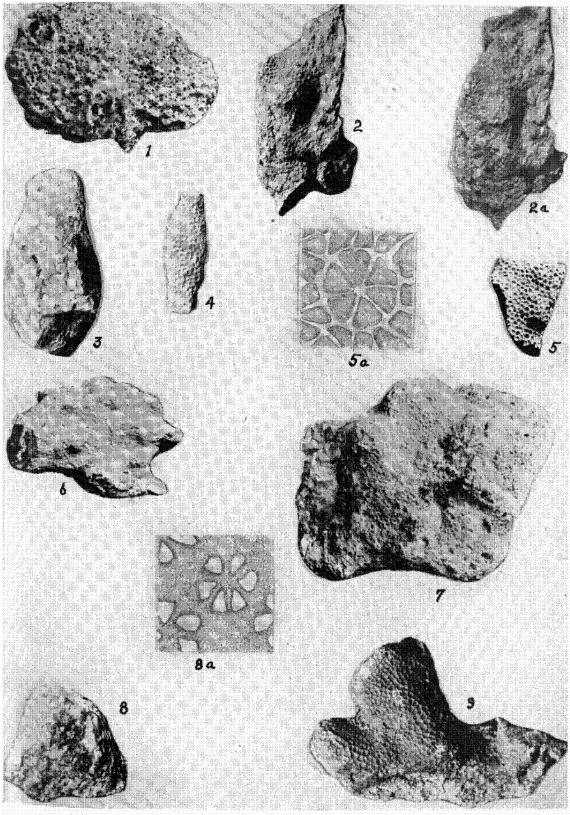


Plate XXVII

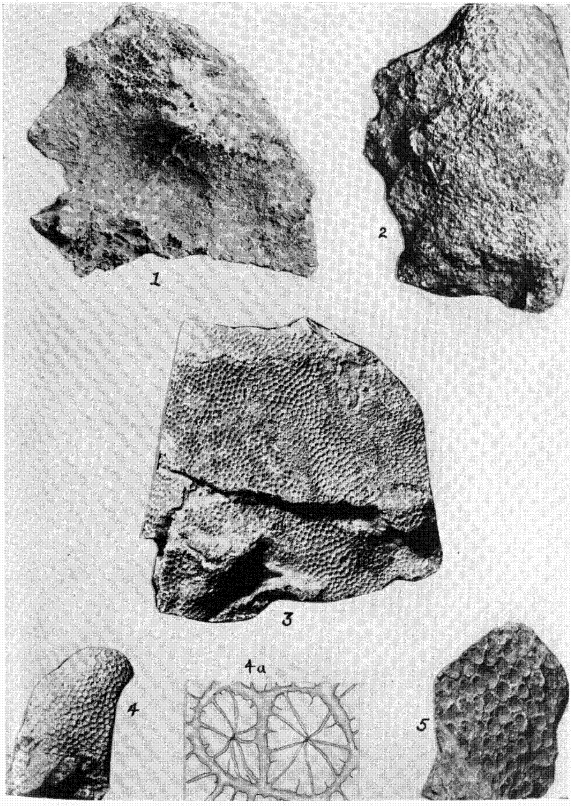


Plate XXVIII

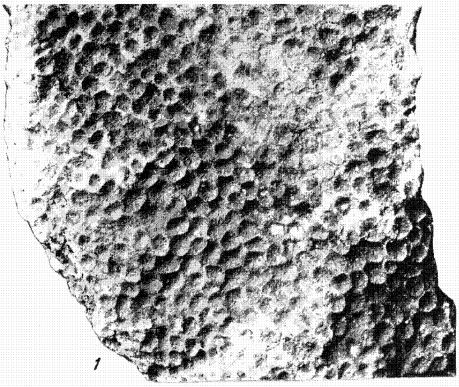
PAGE

Antiguastrea cellulosa (Duncan), ... 41

Fig. 1. A portion of a subplanate massive specimen, about x 4/5

Orbicella annularis (Ellis and Solander), ... 43

Fig. 2. A fragment of a massive corallum, about x ⅔



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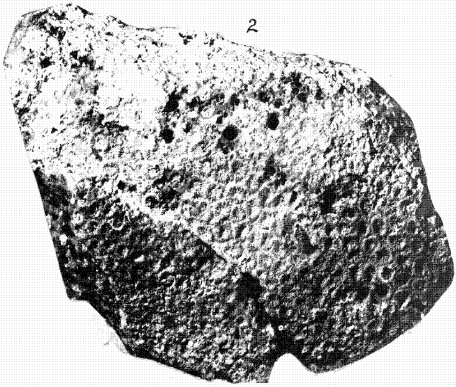

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Plate XXIX

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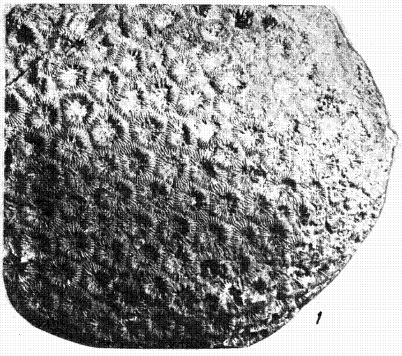
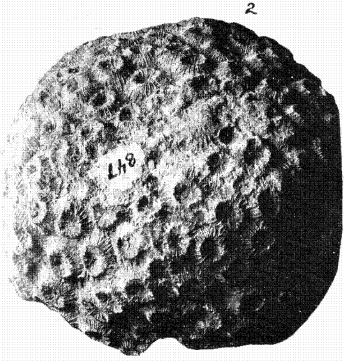




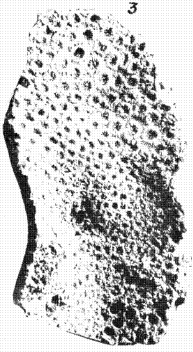


Plate XXX

PAGE

Orbicella tampaensis Vaughan, ... 48

Fig. 1. A head-shaped corallum, about x 4/5

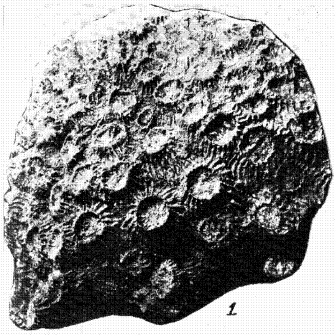
Calamophyllia dendroidea Coryell, new species, ... 50

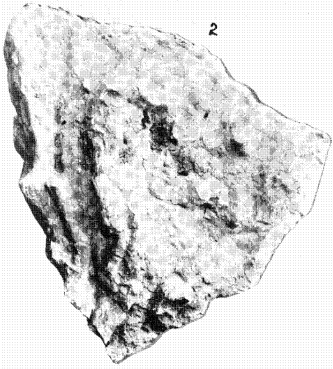
Fig. 2. A view of the type specimen, about x 3/5

Fig. 3. A few branches showing the habit of reproduction and the fine costae, about x 3/4

Calamophyllia portoricensis Coryell, new species, ... 51

Fig. 4. A view of the type specimen, about x 2/3





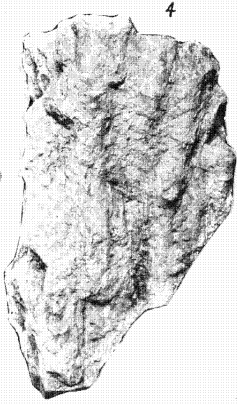


Plate XXXI

PAGE

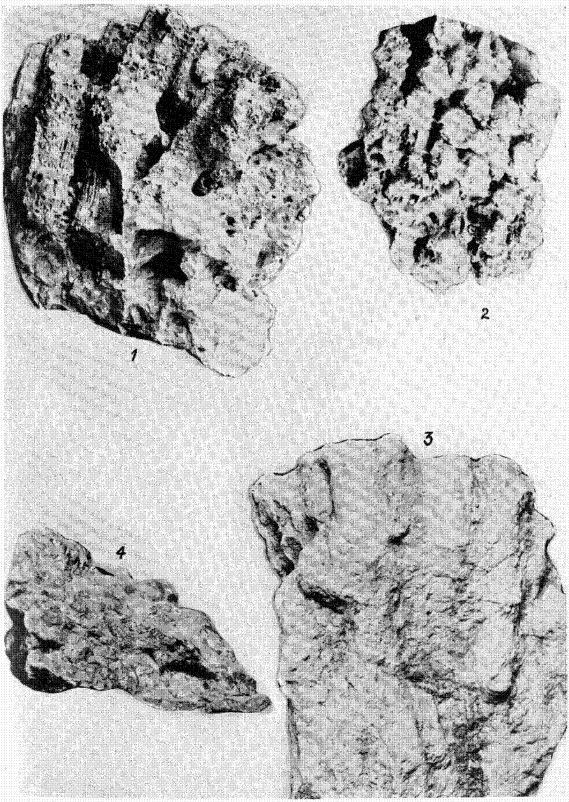
Calamophyllia portoricensis Coryell, new species, ... 51

Fig. 1. Another specimen somewhat weathered, showing the coarse costa and the manner of branching, about x 4/5

Fig. 2. End view of the specimen in fig. 1, about x 4/5

Fig. 3. Lateral view of the type specimen, about 5/6

Fig. 4. End view of the type specimen, showing rounded and compressed stems, about x 5/6



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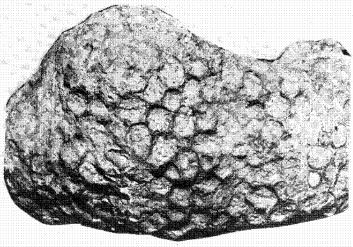

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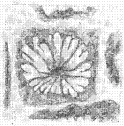

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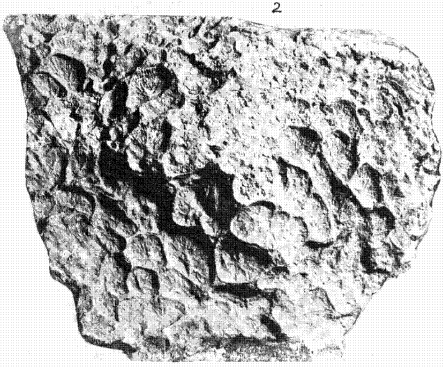

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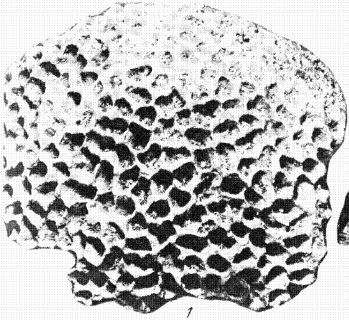

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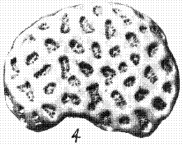

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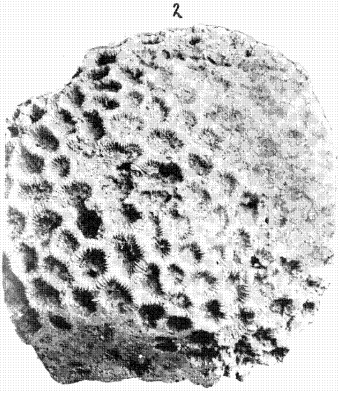

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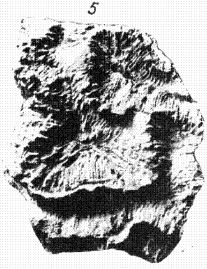

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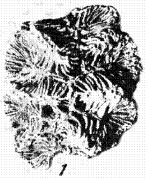
Plate XXXIV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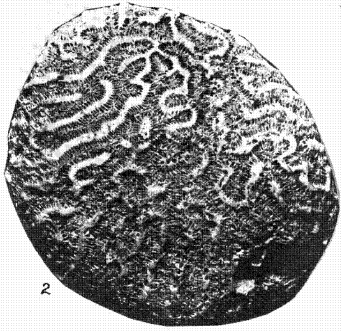
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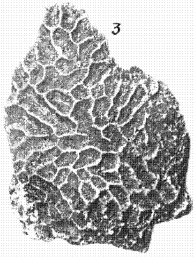
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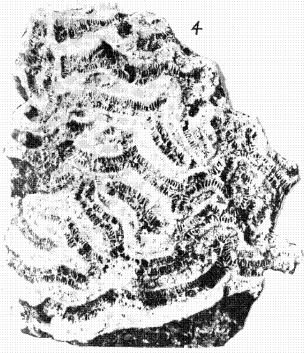
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Plate XXXV

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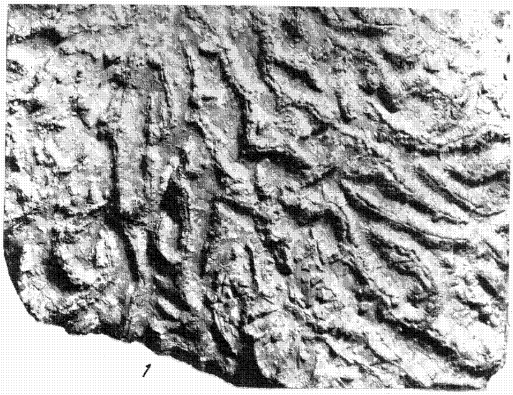
Manicina willoughbiensis Vaughan, ... 64

Fig. 1. A portion of the surface of a large specimen, x 4/5

Metastraea planulata Coryell, new species, ... 66

Fig. 2. A view of about one-third of the surface of the type specimen which is circular-like in expansion, x 2/5



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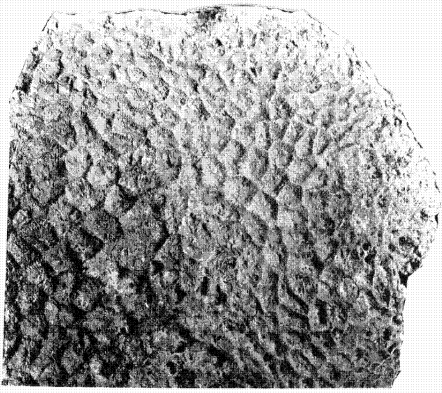

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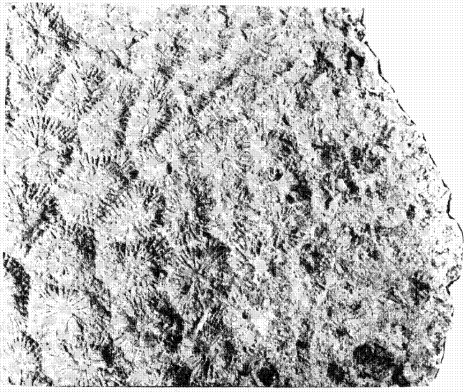
Metastraea planulata Coryell, new species, ... 66

Fig. 1. A portion of the surface of the type specimen, x 4/5

Agaricia agaricites crassa Verrill, ... 67

Fig. 2. Surface of an undulating corallum, x 4/5



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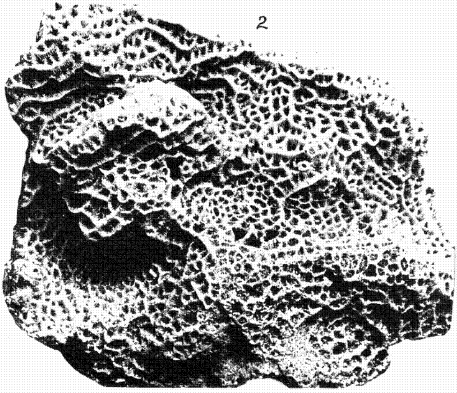

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Agaricia irregularis Coryell and Ohlsen, new species, ... 68

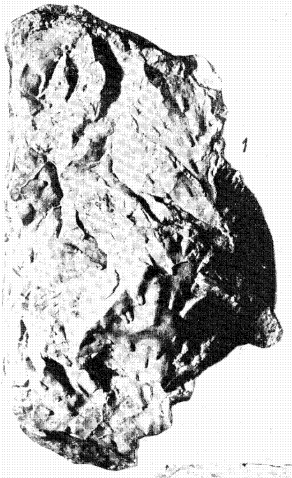
Fig. 1. A view of the type, which appears commonly as moulds, about x 5/6

Agaricia sinuata Coryell and Ohlsen, new species, ... 69

Fig. 2. A view of the type specimen, commonly appearing as moulds, about x 4/5

Pironastraea anguillensis Vaughan, ... 70

Fig. 3. A view of a portion of the corallum, about x 4/5



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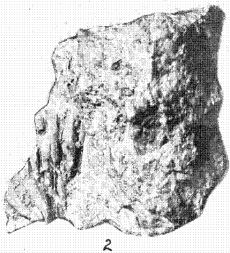

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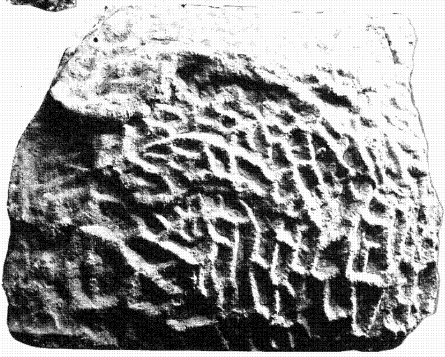

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Pironastraea antiguensis Vaughan, ... 70

Fig. 1. A surface view, a complete specimen, about x 3/5

Siderastrea conferta (Duncan), ... 72

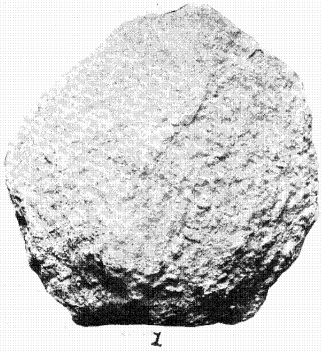
Fig. 2. A surface view of a small corallum, about x 5/6

Cyathomorpha antiguensis (Duncan), ... 74

Fig. 3. A surface view of a typical specimen, about x 5/6

Fig. 4. A specimen with large corallites, about x 4/5

Fig. 5. A fragment with one end polished, about x 9/10



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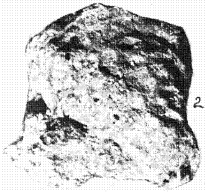

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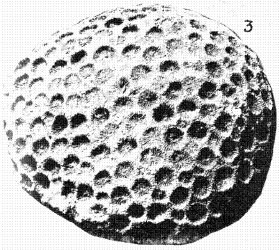

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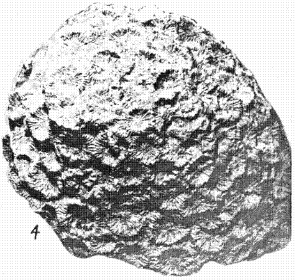

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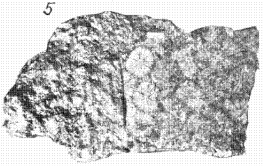

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Cyathomorpha tenuis (Duncan), ... 75

Fig. 1. A view of a small corallum, about x 4/5

Diploastrea crassolamellata (Duncan), ... 78

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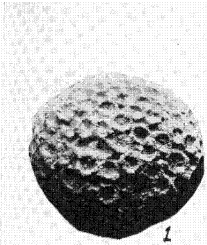
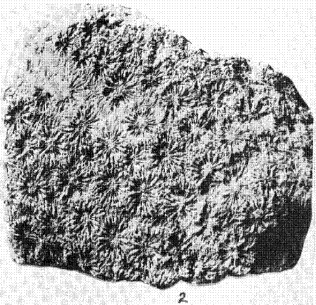
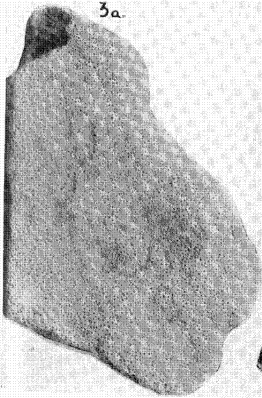
Acropora crassa Coryell, new species, ... 81

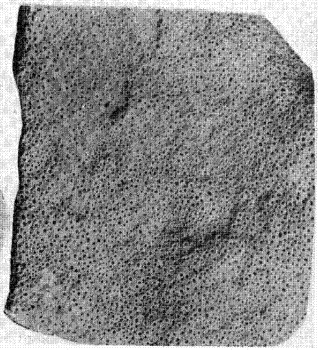
Fig. 3. Lateral view of a slightly weathered specimen, x 1

Fig. 3a. View of the entire specimen, about x ½









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Acropora palmata (Lamarck), ... 81

Fig. 1. Lateral view of a fragment of a branch, about x ¾

Acropora panamensis Vaughan, ... 82

Fig. 2. A fragment of a branch showing the prominent corallites, about x ⅔

Astreopora antiguensis Vaughan, ... 84

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Goniopora canalis Vaughan, ... 85

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Goniopora cascadensis Vaughan, ... 86

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Goniopora clevei Vaughan, ... 86

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Goniopora decaturensis Vaughan, ... 87

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Goniopora decaturensis silicensis Vaughan, ... 88

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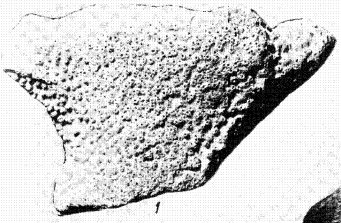
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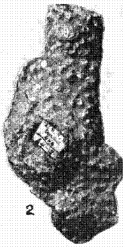
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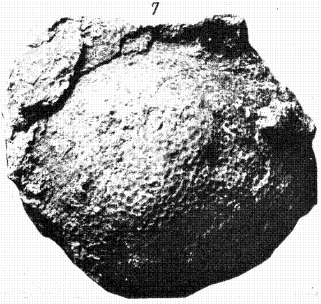
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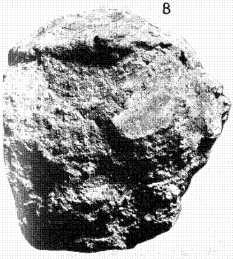
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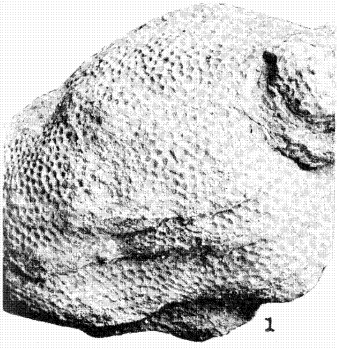

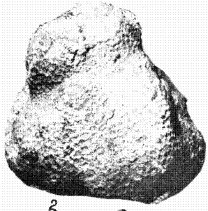

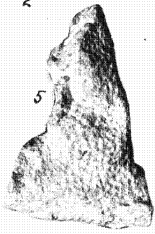

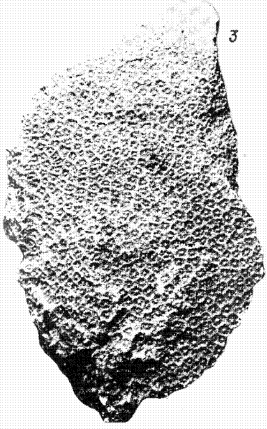

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Goniopora regularis (Duncan), ... 91

Fig. 1. Surface of a dome-shaped mass, about x 5/8

Fig. 1a. Diagram showing typical Gonioporid arrangement of septa.

Porites anguillensis Vaughan 93

Fig. 2. The surface of a lamellose mass, about x 4/5

Porites astreoides Lamarck, ... 93

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Fig. 3a. Diagram showing typical Poritid arrangement of septa.

Porites baracoaensis Vaughan, ... 94

Fig. 4. A fragment of a branching corallum, about x 4/5

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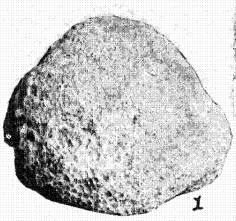
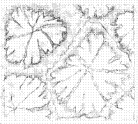
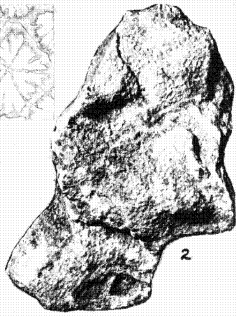
Fig. 5. A fragment of a nodose branch, about x 3/4

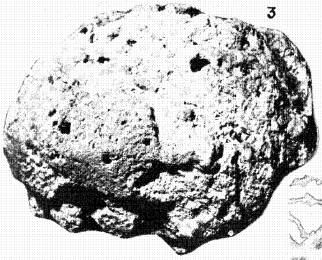
Fig. 6. A weathered fragment, about x 3/4

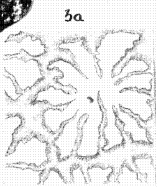
Fig. 7. A typical branch, about x 5/6

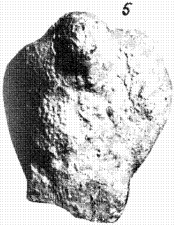












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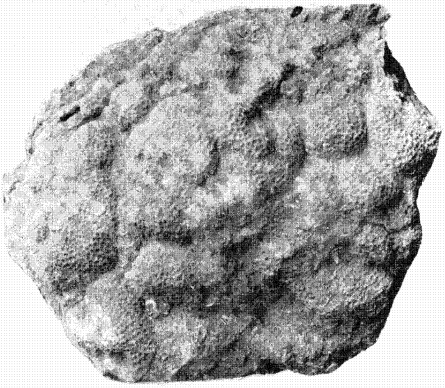
Porites (*Synaraea*) *macdonaldi* Vaughan, ... 95

Fig. 1. A view of lobed surface of a domed corallum, x ⅔

Porites panamensis Vaughan, ... 96

Fig. 2. A complete corallum, x 2/5



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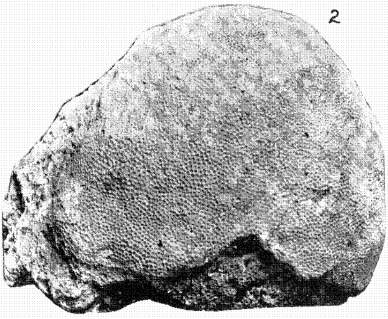

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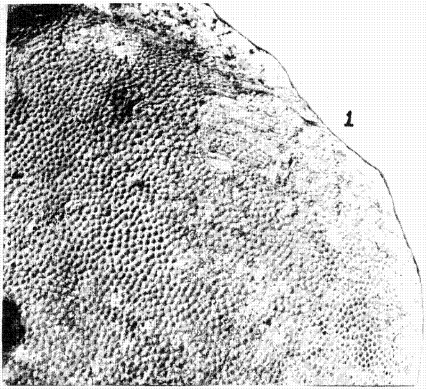
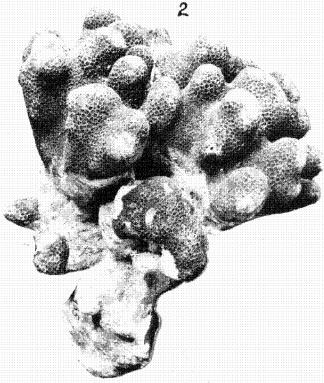
Porites panamensis Vaughan, ... 96

Fig. 1. A portion of the surface of a hemispherical mass, x 5/6

Porites porites (Pallas), ... 97

Fig. 2. A branching colony, x 3/8





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