STUDIES ON THE FAUNA OF CURAÇAO AND OTHER CARIBBEAN ISLANDS: No. 180.

THE DEEP-WATER SCLERACTINIA OF THE CARIBBEAN SEA AND ADJACENT WATERS

by

STEPHEN D. CAIRNS

(University of Miami, Rosenstiel School of Marine and Atmospheric Science, Miami)

Anthemiphylliidae

Caryophylliidae

Flabellidae

INTRODUCTION

Ahermatypic Scleractinia are very common throughout the tropical western Atlantic, both in number of species and individuals. Of the Scleractinia known from the western Atlantic, there are over twice as many species of ahermatypes (species that do not have symbiotic zooxanthellae) as hermatypes (the shallow-water "reef corals," all of which have zooxanthellae). This paper is a review of all known species of deep-water Scleractinia that occur in the Caribbean Sea and adjacent waters, all of which are ahermatypic. The term "deep-water" is used here to designate depths equal to or greater than 200 meters; the 88 species treated all have bathymetric ranges that exceed 200 meters at their deepest points. Another 27 ahermatypic species are confined to the shallow water (0–200 m) of the Caribbean, and two species are known from off tropical Brazil but not the Caribbean, resulting in 117 species of tropical western Atlantic ahermatypes.

The only person to have comprehensively studied the deep-water western Atlantic corals was POURTALÈS, whose last publication was in 1880. In the ensuing century, large collections have accumulated and Scleractinian classification has been greatly modified. This review is based primarily on the large collections at the University of Miami (RSMAS), USNM, and MCZ.

Historical Resume of the Tropical Western Atlantic Ahermatypic Scleractinia

The first ahermatypic coral to be described from the tropical western Atlantic was the shallow-water species *Astrangia solitaria* (Lesueur, 1817) from Guadeloupe. Later, in a series of six publications between 1848 and 1850, Milne Edwards & Haime described nine new shallow-water ahermatypes found in the West Indies; however, eight of these are cosmopolitan or amphi-Atlantic in distribution. Only *Oxysmilia rotundifolia*, endemic to the western Atlantic, was indicated as questionably having been collected in the western Atlantic: "habite les mers d'Amérique?" (Milne Edwards & Haime, 1848b: 247). Duchassaing (1850) reported on the first collection of deep-water corals from the Antilles and described one new species, *Caryophyllia berteriana*. Duchassaing & Michelotti (1860, 1864) reported 14 ahermatypic species from the Antilles, including three valid new species, as well as several poorly described, still undetermined species (original specimens lost). Later, Duchassaing (1870) reported six species of ahermatypes from the Antilles, including new species, but his descriptions are poor and his type-material is lost, making that paper of little value.

Pourtalès was partially responsible for, and participated in, the earliest systematic deep-water dredging beginning in May, 1867. His primary biological interest in the dredged material was the ahermatypic corals. Between 1867 and 1880 he published six papers, in which he described 59 new species and 10 new genera. Of these, 47 species and eight genera are still considered valid. Pourtalès created a firm foundation for the study of western Atlantic ahermatypic corals upon which all subsequent revisions must be based. His material is deposited primarily at the MCZ and partially at the USNM, BM, and YPM. Only three out of 59 types have been lost. Arango y Molina (1877) listed 15 ahermatypes from off the coasts of Cuba, all based on Pourtalès's earlier papers.

Verrill published ten short papers (1870 to 1908) listing or describing ahermatypic corals collected by the Fish Hawk, Blake, Albatross, and other vessels mainly in the temperate northwest Atlantic. Three new species were described but all are junior synonyms. In a short note, PACKARD (1873) reported a *Deltocyathus* (unknown species) from off Cape Cod at 263 meters. In 1877, the Swedish naturalist LINDSTRÖM reported 17 ahermatypic species from the Virgin Islands and St.-Barthélemy, including two valid new species. Although LINDSTRÖM made a number of errors in his paper, he did not deserve DUNCAN'S (1883) overzealous criticism (*e.g.*, see Discussion of *P. stimpsonii*).

MOSELEY published the preliminary study of the Challenger deep-water corals in 1876 but his final report did not appear until 1881. The Challenger made 14 successful dredge hauls in the western Atlantic, from which MOSELEY reported 15 deep-water species, five of these new. In the same year, RIDLEY (1881) described *Madracis brueggemanni* from off Brazil (20°42'S, 37°27'W) and the West Indies (60 m).

VAUGHAN (1901) reported on the corals collected by the Fish Hawk (1898 to 1899) around Puerto Rico. He treated nine ahermatypic corals including one new species, *Cyathoceras portoricensis*, a junior synonym of *Oxysmilia rotundifolia*. VAUGHAN (1906) later described two new species of *Astrangia* from off Brazil.

The next half-century produced only two short notes regarding western Atlantic ahermatypic corals. BOONE (1928) reported two species collected by the Pawnee I off British Honduras, and WELLS (1947a) described *Coenocyathus bartschi* (= *Rhizosmilia maculata* (Pourtalès, 1874)) from the West Indies. Interest was renewed in western Atlantic ahermatypic corals when SQUIRES (1959) reported on the deep-sea corals collected by the Lamont Geological Observatory R/V Vema. He reported 10 species, one of them new, from five western Atlantic stations off Bermuda, the Straits of Florida, and off Rio de Janeiro. Unfortunately, the identifications in this paper are unreliable.

In the last 15 years a number of papers have included lists or reports of single species from various western Atlantic localities: 15 ahermatypic corals were reported from off Barbados (LEWIS, 1965); 14 from off Jamaica (GOREAU & WELLS, 1967); four from off Cabo Frio, Brazil (TOMMASI, 1970); 14 from off Brazil (LABOREL, 1970); one from off Surinam (BEST, 1970); three from Onslow Bay, North Carolina (MACINTYRE, 1970); four, including two new species, from off Bermuda (WELLS, 1972); 16 from off the Caribbean coast of Panama (PORTER, 1972); and 15 from off Jamaica (WELLS & LANG, 1973). WELLS (1973) described another two shallow-water ahermatypic species from off Jamaica and wrote a short paper on *Guynia annulata* (1973a). KELLER (1975) reported 22 species of ahermatypic corals from 18 stations off the Cuban coasts and off the northern coast of the Yucatán Peninsula. Unfortunately, her identifications are not reliable and her specimens are poorly documented. ERHARDT (1976) reported *Stephanocyathus nobilis* (= *S. paliferus*) off Venezuela. Finally, in a series of five papers, CAIRNS (1977 to 1978) reviewed the western Atlantic species of several genera and listed the ahermatypic fauna of the Gulf of Mexico, resulting in the description of 10 new species.

ACKNOWLEDGMENTS

I am very grateful to Dr. FREDERICK M. BAYER (USNM), who originally motivated me to study Scleractinia, provided help and encouragement throughout the study, and made it possible for me to study the collections at the USNM. Dr. GILBERT L. VOSS (RSMAS) kindly made available to me the University of Miami collection, which forms the nucleus of this review. The collection of these specimens was supported by a grant from the National Geographic Society to the RSMAS, University of Miami, for investigation of the biology of the deep sea. I am especially indebted to Dr. H. ZIBROWIUS (SME) for allowing me to examine his large collection of northeastern Atlantic ahermatypes, and for his advice and suggestions, which have made this a better paper. It is a pleasure to acknowledge Dr. JOHN W. WELLS (Cornell), who has answered my countless questions on coral systematics and provided me with encouragement throughout the study.

I would like to thank the following people who have generously extended to me the use of their collections and facilities or loaned me specimens used in this study: Drs. H. W. LEVI and D. M. OPRESKO (MCZ), Dr. L. H. PEQUEGNAT (TAMU), Dr. J. LANG (University of Texas at Austin), Dr. P. F. S. CORNELIUS (BM), Mr. W. C. JAAP (FDNR), Drs. J. P. CHEVALIER and F. DEBRENNE (MNHNP), Dr. D. N. GOMBERG (University of Hawaii), Dr. R. M. O'CLAIR (NMC), Dr. E. KIRSTEUER (AMNH), Dr. W. D. HARTMAN (YPM), Dr. O. ELTER (MIZS), Mr. G. TESTA (MOM), Dr. R. OLERÖD (NRM), Dr. R. C. BRUSCA (AHF), Dr. L. R. TOMMASI (University of São Paulo), Dr. D. R. MOORE (RSMAS), Dr. P. WAGENAAR HUMMELINCK (Rijksuniversiteit, Utrecht), Dr. A. RICHIE (The Australian Museum, Sydney), Dr. J. HODGE (The Macleay Museum, University of Sydney), Ms. D. GRIMM (Dauphin Island Sea Lab, Alabama), Ms. E. WILKENS (Virginia Institute of Marine Science), and Mr. J. H. THOMPSON, Jr. (TAMU).

I am particularly grateful to my wife for her valuable editing, proofreading, and typing of the manuscript and to my father, EDWARD J. CAIRNS, for his careful editing of the manuscript. The scanning electron photomicrographs were taken by the staff of the Scanning Electron Microscope Lab at the USNM. The distribution base map was drawn by CHARLES G. MESSING.

The greater part of this paper was presented to the Faculty of the University of Miami as a dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy. I am grateful to my committee members: Drs. F. M. BAYER, G. L. VOSS, D. R. MOORE, J. W. WELLS, and D. L. TAYLOR, for their critical review. This is a scientific contribution from the Rosenstiel School of Marine and Atmospheric Science, University of Miami.

MATERIAL AND METHODS

This study is based on the examination of 15,430 specimens divided into 2591 lots that were collected from 1160 stations throughout the Caribbean and adjacent waters. The largest single collection is a result of the trawling of the research vessels associated with the RSMAS, University of Miami, which, except for a reference collection, was transferred to the USNM. The USNM housed the second largest collection of western Atlantic ahermatypes, derived primarily from the collections of U.S. government research vessels and secondarily by gifts from other institutions. With the addition of the RSMAS collection, it is by far the largest depository of western Atlantic ahermatypes in the world.

Other major collections examined include the historically important Pourtalès collection and Cuban Atlantis material at the MCZ, and a large collection of Gulf of Mexico specimens from TAMU. Other sources of specimens, in decreasing order of size, are from: the University of Texas at Austin, through J. LANG (Eastward, Nekton); SME, through H. ZIBROWIUS (Calypso, Akaroa, WH); NMC (Hudson, Pocock); BLM material of Texas, Alabama, Florida, and Virginia; FDNR, through W. JAAP (Hourglass); University of São Paulo, through L. TOMMASI (Wladimir Besnard); miscellaneous lots at the YPM and BM (Rosaura, Blake); and several HUMMELINCK stations. A very large collection of eastern Atlantic ahermatypes was also examined at the SME.

The classification used is that of WELLS (1956), with some modifications introduced by CHEVALIER (1961) and ZIBROWIUS (1974c). The terminology used in the species accounts is from WELLS (1956), CHEVALIER (1971: 15–22), and SQUIRES (1964). The term "principal septa" refers to the two S_1 aligned on the greater axis of the calice (CHEVALIER, 1961: 305).

Synonymies are complete unless otherwise indicated.

In the material examined sections, the numbers in parentheses indicate the number of specimens in that lot. Enumeration of specimens is not indicated for colonial species. Following the number, or station number for colonial species, is an indication of where the specimen is deposited. If no indication is given, it is at the USNM.

Holotypes are deposited at the USNM and MCZ. Most of the paratypes are at the USNM; others are at the MCZ and UMML.

In order to avoid possibly erroneous depth ranges resulting from bathymetrically wide-ranging trawls, a confirmed, or restricted, depth range is used. The stated bathymetric range extends from the deepest shallow to the shallowest deep component. Thus, if one specimen was collected from a station that was trawled from 18–500 m and a second from 450–600 m, the possible range is 18–600 m. The first station indicates that it does occur shallower than 501 m, the second that it does occur deeper than 449 m. The confirmed range is then 450–500 m.

Solitary corals are ideal subjects for stereophotography and many stereo pairs are provided in the plates. The stereo view allows a much more accurate interpretation of the spatial relationships among the septa, pali, and columella as well as the depth of the fossa. If a stereo viewer is not available, one can, with patience and practice, "fuse" the stereo pair by focusing beyond the plane of the paper. Some thin or glossy specimens have been coated with an opaque dye and recoated with a fine layer of NH_4Cl in order to improve their contrast for photography. These specimens are indicated in the plate captions.

The following abbreviations are used:

VESSELS

P – R/V Pillsbury.
G – R/V Gerda.
CI – R/V Columbus Iselin.
GS – R/V Gilliss.
GS (G) – R/V Gilliss (Geology).
O – M/V, R/V Oregon and R/V Oregon II.
SB – M/V, R/V Silver Bay.
BL – U.S. Coast Survey Steamer Blake.
Alb – U.S. Fish Commission Steamer Albatross.
FH – U.S. Fish Commission Steamer Fish Hawk.
Gos – R/V Gosnold.
E – R/V Eastward.
WH – Walther Herwig.
Atl – Atlantis and R/V Atlantis II.
WB – N/Oc Wladimir Besnard.
TAMU – Texas A & M University (R/V Aliminos).
SME – Station Marine d'Endoume (Calypso).
Chall – H. M. S. Challenger.

MUSEUMS

AHF – Allan Hancock Foundation, University of Southern California.
AMNH – American Museum of Natural History, New York.
BM – British Museum (Natural History), London.
FDNR – Florida Department of Natural Resources, St. Petersburg, Florida.
MCZ – Museum of Comparative Zoology, Harvard.
MIZS – Museo ed Istituto di Zoologia Sistematica, Torino.
MNHNP – Muséum National d'Histoire Naturelle, Paris.
MOM – Musée Océanographique, Monaco.
NMC – National Museum of Canada, Ottawa.
NRM – Naturhistoriska Riksmuseet, Stockholm.
RSMAS – Rosenstiel School of Marine and Atmospheric Science, University of Miami (Invertebrate Museum abbreviated UMML).
SME – Station Marine d'Endoume, Marseille.
UMML – University of Miami Marine Laboratory (now RSMAS), Miami, Florida.
USNM – United States National Museum, Washington, D.C.
YPM – Yale Peabody Museum, New Haven.
ZMA – Zoölogisch Museum, Amsterdam.

OTHER

BLM – Bureau of Land Management.
SEM – Scanning Electron Microscope.
cd – Calicular diameter.

STATION LIST

R/V PILLSBURY (P)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
105	30°58'	79°42'	388–403	27 July 1964
112	32 08	79 16	70–95	28 July 1964
120	31 48	76 38	2195–2377	29 July 1964
197	27 59	79 20	567–586	11 Aug. 1964
198	27 59	79 20	229–256	11 Aug. 1964
199	27 59	79 20	311–329	11 Aug. 1964
200	27 59	79 20	329–348	11 Aug. 1964
208	27 12	79 17	512	12 Aug. 1964
209	26 59	79 16	550	12 Aug. 1964
211	26 41	79 05	384–403	12 Aug. 1964
337	9 51	78 39	1846	9 July 1966
338	9 58	78 31	1822–1836	9 July 1966
340	9 14	77 46	304–362	9 July 1966
364	9 29	76 34	924–950	13 July 1966
374	9 52	76 11	373–434	14 July 1966
388	10 16	76 03	814–1050	15 July 1966
389	9 54	75 51	50–69	15 July 1966
391	10 03	76 27	1222–1748	16 July 1966
392	9 45	76 09	74–78	16 July 1966
394	9 29	76 26	416–634	16 July 1966
403	8 49	77 13	96–98	17 July 1966
405	8 49	77 21	90–92	17 July 1966

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
407	9°00'	77°25'	1158–1225	18 July 1966
413	9 01	76 53'	952–1267	18 July 1966
420	9 31	78 26	50	19 July 1966
439	8 51	81 03	18–22	20 July 1966
445	9 02	81 24	338–342	21 July 1966
446	8 58	81 26	109–295	21 July 1966
448	9 10	80 56	869–952	21 July 1966
478	11 34	62 11	598	2 Aug. 1966
479	11 20	62 03	121–128	2 Aug. 1966
581	21 05	86 23	146–265	22 May 1967
584	21 01	86 24	347–353	23 May 1967
585	21 02	86 29	567–570	23 May 1967
586	23 32	82 33	1682–1737	24 May 1967
587	21 17	86 13	448–457	14 March 1968
595	21 09	86 27	33–586	15 March 1968
596	21 04	86 22	46–420	15 March 1968
600	20 29	87 06	439–463	16 March 1968
605	18 50	87 31	695–773	17 March 1968
606	18 45	87 33	467–649	17 March 1968
607	18 30	87 37	715–787	17 March 1968
610	17 02	87 38	297–329	18 March 1968
629	15 58	86 09	40	21 March 1968

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
630	15° 59'	86°02'	35–37	21 March 1968
634	23 33	82 47	1638–1757	25 March 1968
636	23 54	81 27	1003–1336	25 March 1968
639	11 39	12 45	210–232	6 April 1968
650	6 07	52 19	84–91	8 July 1968
672	7 37	55 22	1221–1336	11 July 1968
673	7 56	54 39	1042–1070	11 July 1968
675	8 26	54 17	1235–1272	12 July 1968
682	7 34	56 25	1318–1345	14 July 1968
689	8 14	57 38	1373–1446	15 July 1968
705	10 45	62 00	77–86	18 July 1968
707	11 21	62 21	78	19 July 1968
709	11 09	62 46	46	19 July 1968
722	11 04	64 04	91	21 July 1968
736	10 57	65 52	69–155	22 July 1968
737	10 44	66 07	60–73	22 July 1968
741	11 48	66 07	1052–1067	23 July 1968
747	11 46	67 06	1098–1175	24 July 1968
748	11 25	67 10	1784–1867	25 July 1968
749	10 37	67 58	59	25 July 1968
753	11 19	68 22	384–607	26 July 1968
754	11 37	68 42	684–1574	26 July 1968
755	11 44	69 03	796–1006	26 July 1968
757	11 40	69 22	161–187	27 July 1968

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
773	12°17'	72°15'	60–64	29 July 1968
775	12 05	72 39	78–82	29 July 1968
776	12 13	72 50	408–576	29 July 1968
781	11 30	73 27	531–567	30 July 1968
797	10 22	75 47	150–170	1 Aug. 1968
830	18 40	65 58	1446–1510	4 Feb. 1969
838	10 32	60 23	93–115	30 June 1969
846	11 38	60 37	659–1126	2 July 1969
848	11 22	61 26	146	2 July 1969
849	11 15	61 46	137–143	2 July 1969
850	11 46	61 30	800–924	3 July 1969
854	12 02	61 36	66–84	3 July 1969
861	12 42	61 06	18–744	4 July 1969
874	13 11	61 05	156–201	6 July 1969
875	13 10	61 06	108–183	6 July 1969
876	13 14	61 05	231–258	6 July 1969
877	13 17	61 06	329–467	6 July 1969
881	13 21	61 03	576–842	6 July 1969
889	14 04	60 51	371–403	7 July 1969
890	14 06	60 51	198–430	7 July 1969
891	14 05	60 50	265–567	7 July 1969
892	14 17	60 45	1116–1354	7 July 1969
901	13 38	60 56	256–344	9 July 1969
904	13 45	61 06	201–589	9 July 1969

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
905	13°46'	61°05'	384-963	9 July 1969
907	14 27	60 58	115-214	9 July 1969
910	14 33	61 06	51-82	10 July 1969
913	14 54	61 05	46-48	10 July 1969
918	16 04	61 26	399-497	11 July 1969
919	16 05	61 19	683-733	12 July 1969
920	16 06	61 19	531-733	12 July 1969
923	16 05	61 24	476-686	14 July 1969
929	15 30	61 12	457-503	15 July 1969
931	15 31	61 12	146-494	15 July 1969
943	16 26	61 37	274	17 July 1969
944	16 33	61 37	360-421	17 July 1969
948	16 51	62 03	733	17 July 1969
954	16 55	62 43	686-1043	18 July 1969
969	17 26	61 41	69-339	20 July 1969
984	18 26	63 13	393-451	22 July 1969
988	18 29	63 25	686-724	23 July 1969
991	18 47	64 47	205-380	23 July 1969
1138	20 52	74 22	2745-2751	12 Jan. 1970
1140	20 50	73 34	274-289	13 Jan. 1970
1143	20 55	73 28	110-220	13 Jan. 1970
1171	23 35	79 24	512-525	27 June 1970
1177	19 26	73 35	1528-1611	30 June 1970
1178	19 14	73 14	1766-1903	30 June 1970

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1181	18°51'	74°30'	2489-2548	1 July 1970
1186	18 30	74 39	183	2 July 1970
1187	18 17	75 07	1034	2 July 1970
1197	17 34	76 09	1482-1504	3 July 1970
1224	17 31	77 49	878-906	6 July 1970
1225	17 43	77 58	457-558	6 July 1970
1232	17 56	78 00	210-265	7 July 1970
1238	18 16	78 31	1244-1830	8 July 1970
1255	17 18	78 32	622-823	14 July 1970
1256	17 27	78 10	521-658	14 July 1970
1261	17 13	77 50	595-824	15 July 1970
1262	17 21	77 35	805-1089	15 July 1970
1303	18 21	69 14	170-176	21 July 1970
1304	17 45	64 59	3477-3871	23 July 1970
1311	9 13	81 47	46	26 Jan. 1971
1354	14 21	81 55	192-263	31 Jan. 1971
1355	14 35	81 32	450-576	31 Jan. 1971
1356	14 54	81 23	296-375	31 Jan. 1971
1357	15 14	81 26	249-256	31 Jan. 1971
1384	19 45	67 00	7919-7954	6 July 1971
1386	18 21	69 06	148	9 July 1971
1387	18 21	69 09	165	9 July 1971
1393	18 22	69 18	150	10 July 1971
1395	18 21	69 13	167	10 July 1971

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1401	17°51'	65°04'	4226	12 July 1971
1410	20 11	68 53	180	17 July 1971
1411	20 18	69 13	27-183	18 July 1971
1429	21 19	73 46	2532	21 July 1971
1432	21 41	73 51	130	22 July 1971
1435	21 58	73 42	1650	22 July 1971
1444	22 32	75 24	2450	24 July 1971

R/V GERDA (G)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
19	25°46'	80°05'	92	31 May 1962
23	25 32	79 24	130-261	30 June 1962
56	25 31	79 20	458	28 Aug. 1962
93	25 03	79 45	733	19 April 1963
103	25 17	79 40	824	10 May 1963
109	25 03	79 45	824	24 May 1963
114	24 02	83 02	759-869	18 June 1963
118	23 54	82 58	961-1034	18 June 1963
130	23 59	81 10	1021	21 June 1963
131	24 11	80 57	733-787	21 June 1963
132	24 23	80 48	275-302	21 June 1963
134	24 29	80 58	191	21 June 1963
135	24 29	80 53	220	21 June 1963
143	24 28	80 12	805	22 June 1963
169	27 01	79 21	522-567	29 June 1963

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
179	27°41'	79°11'	549-567	1 July 1963
182	27 55	78 40	860-897	2 July 1963
187	27 14	77 47	715-796	3 July 1963
190	25 57	78 07	733-897	4 July 1963
251	27 25	78 41	293-311	5 Feb. 1964
254	27 34	78 49	488-516	6 Feb. 1964
256	27 37	78 56	467-494	6 Feb. 1964
261	27 20	79 22	494-512	7 Feb. 1964
270	25 30	79 21	311-329	30 March 1964
289	24 11	81 36	594-604	3 April 1964
293	25 05	79 21	840-842	4 April 1964
296	25 36	79 23	715	5 April 1964
298	25 55	79 27	650-677	5 April 1964
299	26 12	79 31	641	5 April 1964
300	26 16	79 30	640	5 April 1964

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
301	26°28'	79°26'	622-648	5 April 1964
304	25 26	79 33	796	23 May 1964
311	25 41	79 31	787-805	24 May 1964
372	23 51	81 02	1107-1162	16 Sept. 1964
375	23 54	81 27	1153-1190	17 Sept. 1964
386	27 09	79 18	604	19 Sept. 1964
403	27 49	78 50	824	20 Sept. 1964
405	27 48	79 00	522-549	21 Sept. 1964
448	23 54	82 21	620-647	1 Dec. 1964
480	24 30	80 57	192	26 Jan. 1965
493	26 32	78 55	183-549	3 Feb. 1965
503	26 31	78 51	366	4 Feb. 1965
509	26 07	79 11	311-329	2 March 1965
524	26 17	78 41	513-715	3 March 1965
526	26 28	78 40	278-329	3 March 1965
610	25 25	80 07	77-82	15 April 1965
636	24 06	79 13	46-128	30 June 1965
661	27 07	79 32	695-718	17 July 1965
663	27 30	79 22	569-576	17 July 1965
664	27 35	79 22	567	17 July 1965
666	27 48	79 15	522	17 July 1965
667	27 52	79 15	520-534	17 July 1965
672	27 53	79 03	796	18 July 1965
674	27 52	78 32	911	18 July 1965
676	26°25'	79°54'	190-200	19 July 1965
678	25 54	78 13	540-576	20 July 1965
681	25 52	77 54	198-223	20 July 1965
688	26 35	78 15	472-512	21 July 1965
691	26 35	78 24	333-375	21 July 1965
692	26 35	78 24	329-421	21 July 1965
694	26 28	78 40	622-695	21 July 1965
701	26 29	78 40	275-311	22 July 1965
702	26 29	78 40	73-220	22 July 1965
703	26 29	78 40	27-165	22 July 1965
706	26 27	78 43	489-522	22 July 1965
707	26 27	78 40	514-586	22 July 1965
708	26 27	78 46	650	22 July 1965
711	26 23	78 42	818-851	23 July 1965
715	26 04	79 24	512-549	2 Aug. 1965
719	26 16	79 14	404-412	3 Aug. 1965
720	26 22	79 11	476-500	3 Aug. 1965
721	26 23	79 04	487-494	3 Aug. 1965
723	26 10	78 41	512-751	3 Aug. 1965
725	26 01	79 10	143-210	3 Aug. 1965
817	23 50	79 30	508	22 June 1967
849	25 54	79 59	256	2 Aug. 1967
859	23 54	81 57	1143-1200	29 Aug. 1967
861	24 08	81 36	514-558	29 Aug. 1967
866	24°28'	81°29'	187	29 Aug. 1967
872	24 21	80 10	841-847	30 Aug. 1967
882	21 12	86 20	64-73	9 Sept. 1967
885	21 10	86 28	419-433	9 Sept. 1967
889	20 55	86 28	177-220	10 Sept. 1967
893	21 10	86 21	241-320	10 Sept. 1967
899	20 57	86 34	40-165	10 Sept. 1967
912	26 26	79 19	494-503	25 Sept. 1967
915	25 54	78 12	439	26 Sept. 1967
923	24 02	77 34	1554-1572	28 Sept. 1967
927	26 15	78 48	476	29 Sept. 1967
929	26 13	78 57	412-421	29 Sept. 1967
937	26 25	79 07	472-484	1 Oct. 1967
938	26 19	70 00	494-503	1 Oct. 1967
946	21 03	86 25	77-82	27 Jan. 1968
950	21 06	86 28	?	28 Jan. 1968
966	24 10	82 22	553-558	2 Feb. 1968
967	24 15	82 26	499-503	2 Feb. 1968
970	24 24	82 06	512	2 Feb. 1968
983	24 05	80 20	216	5 March 1968
984	24 05	80 20	155-230	5 March 1968
985	24 06	80 12	20-110	55 March 1968
986	24 05	80 19	75-132	5 March 1968
1011	23 43	79 32	291-311	14 June 1968
1012	23 35	79 33	508-530	14 June 1968
1015	23°34'	79°17'	516-525	15 June 1968
1016	23 34	79 12	529-543	15 June 1968
1017	23 58	79 17	554	15 June 1968
1029	24 17	81 11	293-302	25 Feb. 1969
1036	24 22	80 53	229-238	26 Feb. 1969
1102	24 15	81 34	247-284	29 April 1969
1111	23 52	80 42	1080-1089	30 April 1969
1125	26 45	79 05	494-531	13 June 1969
1270	21 05	86 31	318	20 Aug. 1970
1275	21 02	86 29	225-439	21 Aug. 1970
1312	26 38	79 02	505-527	31 March 1971
1322	26 36	79 04	613	9 Dec. 1971
1323	26 36	79 04	650	9 Dec. 1971
1327	25 59	78 33	421-426	11 Dec. 1971
1329	25 50	78 22	234-265	11 Dec. 1971

R/V COLUMBUS ISELIN (CI)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1	25°05'	77°22'	200	1 July 1972	92	24°43'	77°27'	805	11 March 1973
2	25 07	77 22	805	1 July 1972	93	24 42	77 26	603	11 March 1973
6	25 10	77 05	320	2 July 1972	140	26 24	79 36	738	28 Sept. 1973
7	25 08	77 28	329	2 July 1972	148	24 06	77 18	1379	3 Feb. 1974
12	23 32	76 55	1320	4 July 1972	158	23 30	76 56	1317	5 Feb. 1974
27	25 25	78 08	666	7 July 1972	210	24 05	81 22	858	20 Feb. 1974
37	25 08	77 12	512	9 July 1972	246	26 23	79 37	743-761	29 Oct, 1974
46	23 29	77 05	1234	24 Feb. 1973	401	24 39	76 26	1628	3-4 Sept. 1975
84	24 16	77 15	805	9 March 1973					

R/V GILLISS (GS)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
31	16°58'	79°28'	1088-1116	28 July 1972	44	12°58'	69°05'	1957-1993	8 Aug. 1972

R/V GILLISS (Geology) GS(G)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
71-6	24°41'	80°33'	155-188		13	27°24'	79°26'	622	
71-7	24 44	80 27	165-200		14	24 16	81 35	260	
5	24 22	80 50	247-265		15	24 19	81 42	211-222	

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
16	24°16'	81°50'	284-385		40	24°21'	80°39'	435-465	
19	24 19	81 57	220		42	24 25	80 43	385	
23	24 19	82 00	220		43	24 26	80 45	220-348	
25	24 21	81 40	190		44	24 26	80 45	145-266	
27	24 20	81 37	220		48	24 34	80 31	275	
39	24 17	80 48	460-623						

M/V, R/V OREGON and R/V OREGON II (O)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
450	23°10'	89°47'	229	28 Aug. 1951	1555	24°55'	84°17'	393	19 June 1956
489	27 44	85 09	465	29 Sept. 1951	1867	16 38	82 43	256	21 Aug. 1957
490	27 44	85 02	393	29 Sept. 1951	1884	16 53	81 22	412	23 Aug. 1957
534	27 32	93 02	732-823	11 April 1952	1887	16 55	81 10	549	23 Aug. 1957
1025	25 12	84 05	137	19 April 1954	1889	16 39	81 01	457	24 Aug. 1957
1251	29 16	87 49	366	26 Feb. 1955	1890	16 35	80 55	183	24 Aug. 1957
1302	28 53	87 58	1628	26 May 1955	1911	12 44	82 14	640	11 Sept. 1957
1320	24 51	84 09	338-348	7 July 1955	1916	13 18	82 12	640	12 Sept. 1957
1321	24 49	84 06	311-366	7 July 1955	1981	10 03	60 01	366	3 Nov. 1957
1348	24 29	81 50	274	18 July 1955	1982	10 00	59 59	457	3 Nov. 1957
1408	28 02	90 15	366	20 Sept. 1955	1984	9 45	59 45	366	3 Nov. 1957
1494	29 15	88 30	110	3 May 1956	1985	9 41	59 47	274	3 Nov. 1957

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1986	9°39'	59°47'	183	4 Nov. 1957	2820	28°23'	88°22'	1829	15 July 1960
1989	9 45	59 45		4 Nov. 1957	3203	29 14	88 20	88	2 Feb. 1961
1991	9 17	59 19	457	4 Nov. 1957	3252	29 07	88 05	732	27 April 1961
1993	9 03	59 00	137	4 Nov. 1957	3550	17 47	77 51	430	16 May 1962
2068	2 35	47 48	220	15 Nov. 1957	3553	17 18	78 18	439-457	17 May 1962
2080	2 04	47 00	229	17 Nov. 1957	3554	17 17	78 29	146-183	17 May 1962
2202	28 58	88 11	1143	26 June 1958	3559	16 37	80 15	146	18 May 1962
2286	7 26	54 49	192-220	8 Sept. 1958	3560	16 35	80 10	576	18 May 1962
2356	17 33	63 35	229-241	25 Sept. 1958	3562	16 38	79 53	914	18 May 1962
2575	27 06	89 13	2012-2195	29 July 1959	3568	14 14	81 59	183-220	21 May 1962
2603	18 30	65 59	421	25 Sept. 1959	3573	14 18	81 44	750-768	22 May 1962
2637	17 37	63 36	512	30 Sept. 1959	3584	9 13	81 30	366	25 May 1962
2655	18 26	67 11	229	6 Oct. 1959	3601	9 07	81 10	732	31 May 1962
2771	11 40	62 27	402	15 April 1960	3603	12 16	82 54	27-37	2 June 1962
2772	11 30	62 29	329	18 April 1960	3621	16 00	81 09	220-238	6 June 1962
2774	11 32	62 40	357-388	19 April 1960	3627	16 50	81 21	366	7 June 1962
2775	11 35	62 37	402-421	19 April 1960	3651	29 12	88 03	457-549	25 July 1962
2776	11 36	62 42	430	19 April 1960	3659	29 11	87 57	1326	27 July 1962
2777	11 36	62 46		19 April 1960	3663	28 56	88 08	1463-1600	28 July 1962
2780	11 36	62 52	393-421	20 April 1960	3664	28 49	88 03	1554-1829	28 July 1962
2813	28 48	87 57	1829	13 July 1960	3666	28 49	88 25	1051-1189	29 July 1962
2814	28 53	87 47	1737-1920	13 July 1960	3704	28 54	88 46	402	12 Aug. 1962

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
3953	26°35'	96°25'	137-165	27 Sept. 1962	4713	27°34'	92°10'	914	24 Feb. 1964
3955	26 43	96 43	64	27 Sept. 1962	4807	23 30	97 11	732	10 April 1964
4148	29 10	87 54	878	17 Dec. 1962	4832	14 16	80 27	220-238	12 May 1964
4203	5 29	52 02	59	23 Feb. 1963	4833	14 16	80 26	82-155	12 May 1964
4225	0 18	44 23	183	9 March 1963	4834	14 14	80 29	274-293	12 May 1964
4226	0 18	44 17	274	9 March 1963	4840	11 09	74 28	366	16 May 1964
4297	7 46	54 17	640	22 March 1963	4841	11 10	74 29	412	17 May 1964
4301	7 34	54 13	366	24 March 1963	4882	10 16	75 54	549	25 May 1964
4302	7 35	54 25	274	24 March 1963	4903	10 04	76 06	183-220	28 May 1964
4304	7 30	55 00	183	24 March 1963	4904	10 00	76 05	146-183	28 May 1964
4377	24 12	83 46	1097	7 Aug. 1963	4907	10 04	75 56	320	28 May 1964
4398	12 46	70 41	201	26 Sept. 1963	4911	11 50	73 05	320-348	31 May 1964
4405	11 53	69 28	393	27 Sept. 1963	4913	12 09	72 47	183	1 June 1964
4412	11 49	69 24	549	3 Oct. 1963	4928	14 05	81 21	183	8 June 1964
4413	11 53	69 25	640	3 Oct. 1963	4931	16 01	81 09	220	9 June 1964
4421	11 49	69 24	366	4 Oct. 1963	4932	16 06	81 11	165	9 June 1964
4423	11 53	69 28	348	5 Oct. 1963	4938	20 31	86 12	274-300	11 June 1964
4430	11 46	68 48	1097	6 Oct. 1963	4939	20 25	86 13	274	11 June 1964
4459	10 50	66 58	97	13 Oct. 1963	4940	20 30	86 14	311-329	12 June 1964
4461	10 50	66 55	97	13 Oct. 1963	4954	35 48	74 28	1829	18 July 1964
4569	23 18	86 33	914	7 Dec. 1963	5015	13 02	59 34	201-247	20 Sept. 1964
4570	23 11	86 28	914	7 Dec. 1963	5016	13 05	59 40	146-183	20 Sept. 1964
4605	27 45	94 11	329-366	18 Jan. 1964	5021	11 21	60 39	165-183	21 Sept. 1964

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
5028	11°30'	60°46'	366–439	22 Sept. 1964
5037	11 37	62 47	366–439	24 Sept. 1964
5419	20 50	73 29	311-329	25 May 1965
5430	20 44	70 44	512-585	28 May 1965
5432	20 48	70 46	384–430	28 May 1965
5629	10 52	67 58	284	28 Sept. 1965
5636	11 27	68 32	384	29 Sept. 1965
5639	11 44	68 43	1006	1 Oct. 1965
5645	12 26	69 59	177	2 Oct. 1965
5648	12 27	69 51	229	2 Oct. 1965
5682	12 32	71 39	124	9 Oct. 1965
5698	12 08	72 16	59	12 Oct. 1965
5733	8 50	77 25	128	18 Oct. 1965
5740	9 47	79 25	421	19 Oct. 1965
5755	29 24	79 50	732	19 Nov. 1965
5915	18 14	63 20	139	25 Feb. 1966
5925	15 38	61 15	448	4 March 1966
5929	15 39	61 10	649	5 March 1966
5930	15 38	61 07	809	5 March 1966
5933	15 25	61 12	110	5 March 1966
5934	15 31	61 12	357	5 March 1966
5954	13 42	60 53	97	10 March 1966
5955	13 41	50 53	165	10 March 1966

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
5956	13°40'	60°54'	229	10 March 1966
6435	12 38	82 20	152	6 Feb. 1967
6690	29 17	79 27	878	9 May 1967
6695	17 41	62 51	549-585	18 May 1967
6696	17 46	62 59	649-667	18 May 1967
6699	17 39	62 16	329-338	19 May 1967
6701	17 17	62 23	640-677	20 May 1967
6703	16 53	61 53	750-841	21 May 1967
6705	17 14	63 01	704-777	22 May 1967
6708	18 26	63 12	457-503	23 May 1967
6715	18 36	63 27	201-238	30 May 1967
6721	17 38	62 48	622-695	5 June 1967
6722	17 34	62 42	612-699	5 June 1967
10170	28°20'	85°40'	494	9 Sept. 1968
10173	28 07	85 56	732	10 Sept. 1968
10491	10 28	60 04	649	25 April 1969
10513	8 26	58 11	183	27 April 1969
10514	8 06	57 41	369	27 April 1969
10632	27 01	84 55	503	18 June 1969
10633	27 53	85 13	485	19 June 1969
10716	36 47	74 42	95	28 July 1969
10729	36 13	74 49	112	29 July 1969

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
10825	15°42'	61°08'	640	1 Dec. 1969
10827	15 40	61 09	622	1 Dec. 1969
10828	15 42	61 18	677	2 Dec. 1969
10831	17 38	63 48	651	3 Dec. 1969
10832	17 42	63 58	741	3 Dec. 1969
10833	17 42	63 43	786	3 Dec. 1969
10843	17 06	62 17	589	8 Dec. 1969
10845	17 33	62 46	667	9 Dec. 1969
10847	18 18	63 24	658	10 Dec. 1969
10875	28 42	87 18	1207	15 Jan. 1970
10876	28 55	87 23	1463	15 Jan. 1970
10877	28 34	87 26	1646	16 Jan. 1970
10878	28 54	87 29	1829	16 Jan. 1970
10897	28 45	88 13	1646	28 Jan. 1970
10901	29 11	87 09	896	5 Feb. 1970
11218	16 32	83 24	914	24 Oct. 1970
11225	12 35	82 16	549	27 Oct. 1970
11226	12 19	82 22	585	27 Oct. 1970
11227	9 12	81 11	575	28 Oct. 1970
11228	9 05	81 18	594	29 Oct. 1970
11240	9 58	76 29	1271	4 Nov. 1970
11244	10 00	76 10	549	6 Nov. 1970

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
11284	11 12	74 24	567	16 Nov. 1970
11290	12 18	72 41	375	21 Nov. 1970
11301	12 50	70 43	521	24 Nov. 1970
11302	12 52	70 24	603	24 Nov. 1970
11303	12 54	70 39	603	25 Nov. 1970
11307	12 55	70 16	622	26 Nov. 1970
11310	12 54	70 39	612	26 Nov. 1970
11703	30 28	79 51	494	19 Jan. 1972
11705	30 26	79 44	640	19 Jan. 1972
11716	30 52	79 39	576	21 Jan. 1972
11718	30 52	79 32	750	21 Jan. 1972
11722	31 46	79 15	402	22 Jan. 1972
11725	31 44	79 02	543	22 Jan. 1972
11726	31 42	78 53	512	22 Jan. 1972

M/V, R/V SILVER BAY (SB)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
50	28°58'	85°20'	70-81	15 July 1957
206	28 00	94 48	86-91	1 Oct. 1957
332	29 17	88 16	84	26 March 1958
446	28 25	78 24	1079	10 June 1958
450	28 52	79 46	640	11 June 1958
453	29 38	78 26	878	12 June 1958
1125	20 04	91 50	48	23 April 1959
1182	29 02	88 09	1097	3 June 1959
1694	33 36	76 44	190	29 Feb. 1960
1788	32 01	79 24	64-82	14 March 1960
1789	32 02	79 15	101-128	14 March 1960
2263	34 37	76 27	14	25 July 1960
2416	24 18	81 29	229	28 Oct. 1960
2418	24 15	81 24	265-293	28 Oct. 1960
2420	24 15	81 25	457	28 Oct. 1960
2424	24 15	81 27	274	29 Oct. 1960
2425	24 24	81 59	137	29 Oct. 1960
2427	24 20	82 04	220	29 Oct. 1960
2443	24 08	80 09	329-366	3 Nov. 1960
2445	24 08	80 08	252	3 Nov. 1960
2449	23 55	80 34	494	3 Nov. 1960
2460	23 35	79 35	183-238	6 Nov. 1960
2474	24 56	79 18	549	7 Nov. 1960
2475	24 48	79 17	549	8 Nov. 1960
2484	26 39	79 30	732	10 Nov. 1960
2488	25°41'	79°20'	82-210	10 Nov. 1960
2523	28 53	80 05	90	15 Nov. 1960
2547	33 11	77 26	49-104	7 Dec. 1960
2813	34 35	75 53	44	1 March 1961
2863	36 04	74 49	110	4 March 1961
3339	33 56	76 27	82-113	15 Aug. 1961
3407	27 52	80 07	37	22 Sept. 1961
3467	27 27	79 00	229-274	25 Oct. 1961
3471	27 23	78 26	388-412	25 Oct. 1961
3472	27 20	78 19	457-622	25 Oct. 1961
3474	27 08	77 52	274-302	25 Oct. 1961
3476	26 49	77 01	137-274	26 Oct. 1961
3483	25 10	77 16	183	27 Oct. 1961
3494	23 36	75 25	183-366	3 Nov. 1961
3495	23 00	75 00	91-457	3 Nov. 1961
3496	20 53	73 42	183	4 Nov. 1961
3513	23 26	79 24	549-594	8 Nov. 1961
3514	23 30	79 27	549	8 Nov. 1961
3515	24 03	79 31	576	8 Nov. 1961
3520	25 11	80 08	137	9 Nov. 1961
3704	28 30	80 02	68-75	25 Jan. 1962
5142	19 52	71 59	640	12 Oct. 1963
5144	19 56	72 00	732-860	13 Oct. 1963
5168	19 47	70 22	640-732	15 Oct. 1963

U.S. COAST SURVEY STEAMER BLAKE (BL)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
2	23°14'	82°25'	1472	1877-1878
5	24 15	82 13	278-419	1877-1878
15	23 14	82 25	1435	1877-1878
16	23 11	82 23	534	1877-1878
19	23 03	83 11	567	1877-1878
20	23 03	83 11	402	1877-1878
21	23 02	83 13	525	1877-1878
22	23 01	83 14	183	1877-1878
23	23 01	83 14	348	1877-1878
32	23 32	88 05	174	1877-1878
36	23 13	89 16	154	1877-1878
44	25 33	84 35	986	1877-1878
45	25 33	84 21	185	1877-1878
46	25 43	84 48	1624	1877-1878
50	26 31	85 53	218	1877-1878
51	23 11	82 21	444-823	1877-1878
56	23 09	82 22	320	1877-1878
57	23 09	82 21	324	1877-1878
58	23 10	82 12	443	1877-1878
59	Off Havana		289	1877-1878
62	Off Havana		146	1877-1878
68	Off Havana		444-838	1877-1878
69	Off Havana		183	1877-1878
76	Off Havana		282	1877-1878
100	Off Havana		457-732	Dec. 1878
101	Off Havana		320-457	Dec. 1878
108	21°44'	76°36'	1817	17 Dec. 1878
109	21 02	74 45	2842	18 Dec. 1878
111	19 06	74 49	2195	19 Dec. 1878
117	SW P.	Rico	1598	28 Dec. 1878
124	17 48	64 54	1061	3 Jan. 1879
128	17 43	64 54	329	4 Jan. 1879
129	17 43	64 54	574	4 Jan. 1879
130	17 43	64 55	825	4 Jan. 1879
132	17 38	64 54	214	5 Jan. 1879
133	17 39	64 56	81	5 Jan. 1879
134	17 37	64 48	454	5 Jan. 1879
135	17 44	64 56	823	6 Jan. 1879
139	17 47	64 49	399	7 Jan. 1879
141	18 19	64 26	1575	8 Jan. 1879
143	17 30	63 43	274	13 Jan. 1879
145	17 21	62 56	494	14 Jan. 1879
153	16 44	62 16	553	16 Jan. 1879
154	16 41	62 15	545	16 Jan. 1879
155	16 42	62 13	161	16 Jan. 1879
156	16 42	62 13	161	16 Jan. 1879

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
157	Off Montserrat		220	17 Jan. 1879
158	Off Montserrat		271	17 Jan. 1879
161	16°02'	61°49'	1066	19 Jan. 1879
162	16 03	61 50	1342	19 Jan. 1879
163	16 03	61 52	1406-1604	20 Jan. 1879
164	15 56	61 42	276	21 Jan. 1879
166	15 56	61 37	274	21 Jan. 1879
167	16 10	61 29	320	21 Jan. 1879
171	15 58	61 43	335	22 Jan. 1879
173	Off Guadeloupe		1342	23 Jan. 1879
175	15 32	61 32	1111	24 Jan. 1879
176	15 32	61 31	715'	24 Jan. 1879
177	15 32	61 30	216	24 Jan. 1879
185	15 25	61 27	609	27 Jan. 1879
189	15 18	61 24	154	29 Jan. 1879
195	14 43	61 13	916	5 Feb. 1879
203	14 29	64 05	176	10 Feb. 1879
206	14 26	60 55	311	10 Feb. 1879
208	14 25	60 55	390	11 Feb. 1879
210	14 29	61 06	349	12 Feb. 1879
211	14 29	61 06	653	12 Feb. 1879
213	Off Martinique		653	12 Feb. 1879
214	14 31	61 08	1632	12 Feb. 1879

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
218	13°49'	61°05'	300	15 Feb. 1879
220	13 50	61 04	212	16 Feb. 1879
224	13 07	61 13	209	18 Feb. 1879
226	13 09	61 16	775	19 Feb. 1879
227	13 10	61 18	1046	19 Feb. 1879
230	13 13	61 19	848	20 Feb. 1879
231	13 12	61 17	174	20 Feb. 1879
233	13 07	61 06	318	21 Feb. 1879
238	12 46	61 24	230	23 Feb. 1879
239	12 46	61 25	618	23 Feb. 1879
240	12 33	61 29	300	23 Feb. 1879
244	12 12	61 45	1449	24 Feb. 1879
246	12 06	61 46	282	25 Feb. 1879
247	12 05	61 47	311	25 Feb. 1879
253	11 25	62 04	176	27 Feb. 1879
254	11 27	62 11	300	27 Feb. 1879
256	12 07	61 47	677	28 Feb. 1879
258	12 03	61 46	291	28 Feb. 1879
259	12 03	61 46	291	28 Feb. 1879
260	12 03	61 47	532	28 Feb. 1879
261	Off Grenada		622	
262	12 02	61 47	168	1 March 1879
266	12 05	61 50	843	2 March 1879

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
269	13°08'	61°06'	227	3 March 1879
271	13 05	61 13	838	3 March 1879
272	13 04	59 37	139	5 March 1879
273	13 03	59 36	188	5 March 1879
274	13 01	59 36	382	5 March 1879
276	13 04	59 37	172	5 March 1879
277	13 04	59 38	194	5 March 1879
278	13 05	59 38	126	6 March 1879
280	12 58	59 37	404	6 March 1879
281	12 55	59 37	527	6 March 1879

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
288	13°11'	59°46'	730	8 March 1879
290	13 12	59 39	134	9 March 1879
292	13 14	59 39	102	9 March 1879
293	13 14	59 39	148	9 March 1879
294	13 14	59 40	249	9 March 1879
298	13 03	59 38	220	10 March 1879
300	13 07	59 39	150	10 March 1879
316	32 07	78 38	419	12 July 1880
318	31 49	77 52	616	12 July 1880

U.S. COAST SURVEY STEAMER BIBB

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
22	24°14'	81°00'	592	4 May 1868
31	24 25	81 27	183	6 May 1868
95	24 49	84 01	227	17 Jan. 1869
135	24 21	81 59	229	17 Feb. 1869
136	24 17	81 59	252	17 Feb. 1869
141	23 58	80 29	576	10 March 1869
187	24°47	80 33	145	8 May 1869

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
191	24°43'	80°29'	207	8 May 1869
194	24 40	80 23	269	8 May 1869
201	24 53	80 24	110	11 May 1869
203	24 52	80 20	214	11 May 1869
215	25 25	79 58	518	13 May 1869
216	25 27	79 57	525	13 May 1869

U.S. FISH COMMISSION STEAMER ALBATROSS (Alb)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
2117	15°25'	63°32'	1230	27 Jan. 1884
2135	19 56	75 47	457	27 Feb. 1884
2143	9 31	76 26	284	23 March 1884
2150	13 35	81 21	699	9 April 1884
2152	4 km NW of Havana		708	30 April 1884
2153	23 11	82 23	518	30 April 1884
2157	23 10	82 21	53	30 April 1884
2159	23 11	82 20	179	30 April 1884
2166	23 11	82 21	358	1 May 1884
2167	23 11	82 21	368	1 May 1884
2316	24 26	81 48	91	15 Jan. 1885
2318	24 26	81 46	82	15 Jan. 1885
2319	23 11	82 21	262	17 Jan. 1885
2320	23 11	82 19	238	17 Jan. 1885
2321	23 11	82 18	421	17 Jan. 1885
2322	23 11	82 18	210	17 Jan. 1885
2323	23 11	82 20	298	17 Jan. 1885
2324	23 10	82 20	60	17 Jan. 1885
2326	23 12	82 19	355	17 Jan. 1885
2327	23 12	82 18	333	17 Jan. 1885
2332	23 11	82 20	285	19 Jan. 1885

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
2334	23°11'	82°18'	123	19 Jan. 1885
2336	23 11	82 19	287	19 Jan. 1885
2338	23 11	82 20	346	19 Jan. 1885
2342	23 11	82 20	368	19 Jan. 1885
2343	23 12	82 19	510	19 Jan. 1885
2345	23 11	82 20	337	20 Jan. 1885
2346	23 11	82 20	366	20 Jan. 1885
2347	23 11	82 20	395	20 Jan. 1885
2351	22 41	84 17	772	21 Jan. 1885
2353	20 59	86 23	305	22 Jan. 1885
2354	21 00	86 24	238	22 Jan. 1885
2384	28 45	88 16	1719	3 March 1885
2385	28 51	88 18	1335	3 March 1885
2392	28 48	87 27	1324	13 March 1885
2393	28 43	87 15	960	13 March 1885
2394	28 39	87 02	768	13 March 1885
2399	28 44	86 18	358	14 March 1885
2407	28 48	84 37	44	15 March 1885
2415	30 44	79 26	805	1 April 1885
2416	31 26	79 07	505	1 April 1885
2529	41 04	66 14	1211	14 July 1885
2530	40 54	66 24	1748	14 July 1885

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
2596	35°09'	75°10'	90	17 Oct. 1885
2601	34 39	75 34	196	18 Oct. 1885
2625	32 35	77 30	452	21 Oct. 1885
2639	25 05	80 15	102	9 April 1886
2655	27 22	78 08	618	2 May 1886
2656	27 59	78 24	1046	3 May 1886
2657	28 08	78 28	988	3 May 1886
2658	28 21	78 33	940	3 May 1886
2659	28 32	78 42	931	3 May 1886
2660	28 40	78 46	921	3 May 1886
2661	29 17	79 37	801	4 May 1886
2662	29 25	79 43	793	4 May 1886
2663	29 39	79 49	770	4 May 1886
2664	29 41	79 55	683	4 May 1886
2665	29 47	80 06	481	4 May 1886
2666	30 48	79 49	494	5 May 1886

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
2667	30°53'	79°43'	499	5 May 1886
2668	30 59	79 39	538	5 May 1886
2669	31 09	79 34	644	5 May 1886
2671	31 20	79 22	512	5 May 1886
2672	31 31	79 05	507	5 May 1886
2676	32 30	77 01	745	6 May 1886
2678	32 40	76 41	1337	6 May 1886
2750	18 30	63 31	907	27 Nov. 1887
2751	16 54	63 12	1257	28 Nov. 1887
2753	13 34	61 03	514	4 Dec. 1887
2754	11 40	58 33	1609	5 Dec. 1887
2756	3 22S	37 49	763	14 Dec. 1887
2760	12 07S	37 17	1864	18 Dec. 1887
2761	15 39S	38 33	1496	26 Dec. 1887
2763	24 17S	42 49	1227	30 Dec. 1887
4397	33 10	121 42	4016	1 April 1904

U.S. FISH COMMISSION STEAMER FISH HAWK (FH)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
889	37°22'	74°29'	105	16 Nov. 1880
940	39 54	69 52	245	4 Aug. 1881
949	40 03	70 31	183	23 Aug. 1881
1040	40 00	70 06	170	21 Sept. 1881

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
7283	24°18'	81°54'	232	19 Feb. 1902
7286	24 18	81 48	243	19 Feb. 1902
7296	24 22	81 48	223	26 Feb. 1902

M/V COMBAT

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
45	29°46'	80°11'	329	17 Aug. 1956	436	24°13'	81°42'	549	21 July 1957
164	32 12	79 07	91	1 Nov. 1956	447	25 07	79 15	549	23 July 1957
165	32 16	79 05	73	1 Nov. 1956	449	24 05	79 46	640	24 July 1957
238	27 30	78 52	421	3 Feb. 1957	450	23 59	79 43	640	24 July 1957
308	31 04	79 42	366	23 April 1957	452	24 35	79 58	1033	25 July 1957
412	34 26	75 42	393	22 June 1957	457	25 16	80 07	119	26 July 1957

R/V GOSNOLD (Gos)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1533	28°21'	80°01'	78	24 May 1964	1638	28 41'	79°50'	406	5 June 1964
1564	25 09	80 12	105	28 May 1964	1639	28 52	79 52	435	5 June 1964
1580	24 10	81 22	631	1 June 1964	1641	28 52	79 24	777	5 June 1964
1584	24 33	80 57	204	1 June 1964	1642	28 59	79 31	752	5 June 1964
1590	24 35	80 28	284	2 June 1964	1643	29 01	79 40	822	5 June 1964
1591	24 46	80 24	199	2 June 1964	1644	29 10	79 44	802	5 June 1964
1595	24 55	80 04	500	2 June 1964	1645	29 21	79 44	712	5 June 1964
1606	25 57	79 48	465	3 June 1964	1650	30 01	79 31	779	6 June 1964
1607	26 08	79 54	284	3 June 1964	1653	30 23	79 27	835	6 June 1964
1615	26 56	79 37	669	3 June 1964	1656	30 40	79 44	579	6 June 1964
1632	28 07	79 44	479	4 June 1964	1657	30 40	80 00	244	6 June 1964

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1723	29°10'	79°55'	494	14 June 1964	1796	32 39	78 00	248	21 June 1964
1729	30 00	79 58	504	14 June 1964	1811	33°01'	77°16'	320	22 June 1964
1731	30 11	79 53	534	14 June 1964	1824	33 10	77 01	339	23 June 1964
1735	30 21	79 53	534	14 June 1964	1827	32 44	75 51	692	24 June 1964
1737	30 30	80 02	284	14 June 1964	1842	33 39	76 45	130	25 June 1964
1738	30 31	79 52	480	14 June 1964	1860	34 37	75 44	66	26 June 1964
1739	30 31	79 42	639	14 June 1964	1863	34 51	75 31	86	26 June 1964
1742	30 45	79 19	752	14 June 1964	2150	39 47	69 44	1675	18 Aug. 1964
1743	30 51	79 24	802	14 June 1964	2191	40 42	66 45	690	27 Aug. 1964
1748	31 11	79 29	524	16 June 1964	2468	29 25	79 39	780	
1749	31 21	79 29	484	16 June 1964	2609	39 22	72 04	1450	12 Aug. 1966
1750	31 18	79 46	144	16 June 1964	39	Off Pt. Morant, Jamaica		200–300	18 March 1967
1764	31 41	79 15	504	17 June 1964	112/26	17 50	76 05	540–600	13 Feb. 1968
1766	31 49	79 00	450	17 June 1964	112/27	17 55	76 05	400–480	13 Feb. 1968
1767	31 50	78 46	455	17 June 1964	112/76	17 38	78 00	800	23 Feb. 1968
1768	31 54	78 30	534	17 June 1964	112/78	17 21	78 19	700	23 Feb. 1968
1784	32 34	78 15	244	21 June 1964	112/79	17 37	78 29	1000–1100	23 Feb. 1968
1785	32 41	78 14	190	21 June 1964	112/86	17 29	77 48	1090–1100	25 Feb. 1968

YACHT CAROLINE, JOHNSON-SMITHSONIAN DEEP-SEA EXPEDITION

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1	18°34'	66°15'	658-1097	30 Jan. 1933
12	18 31	66 00	366-549	2 Feb. 1933
13	18 31	66 02	366-549	2 Feb. 1933
17	18 30	66 11	84-165	3 Feb. 1933
23	18 32	66 18	476-658	4 Feb. 1933
25	18 32	66 22	439-549	7 Feb. 1933
32	18 26	67 15	366-512	9 Feb. 1933
37	18 14	67 39	293-366	10 Feb. 1933
38	18 12	67 43	439-476	10 Feb. 1933
49	18°16'	67°31'	329	13 Feb. 1933
67	18 30	65 46	329-512	23 Feb. 1933
81	18 30	65 26	366-732	26 Feb. 1933
84	18 33	65 19	549-640	26 Feb. 1933
93	18 38	65 10	640-732	2 March 1933
94	18 38	65 05	549-860	2 March 1933
99	18 40	64 56	329-366	3 March 1933
102	18 51	64 43	165-914	4 March 1933

R/V EASTWARD (E)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
43	Off Southeast Jamaica		450-525	
9541	33°52'	76°29'	70-104	
14449	34 18	75 47	450	
26004	28 08	79 33	785-830	Nov. 1974
26017	26 39	79 33	770-785	Nov. 1974
26019	27 17	79 25	665-685	Nov. 1974
26023	27 32	79 22	685-705	Nov. 1974
26028	27°10'	79°25'	635-700	Nov. 1974
26031	27 00	79 24	645-690	Nov. 1974
26034	27 50	79 20	635-670	Nov. 1974
26037	26 29	79 06	560-640	Nov. 1974
26052	25 43	79 48	660-770	Nov. 1974
26052	25 43	79 48	660-770	Nov. 1974
26538	27 13	79 14	420	March 1975
26542	27 14	79 14	440	March 1975
26547	27°18'	79°17'	520	March 1975
26549	27 18	79 13	370	March 1975
30150	19 22	81 05	775-800	7 July 1976
30158	19 22	81 13	875-900	8 July 1976
30159	19 23	81 13	1575-1600	8 July 1976
30175	19 24	81 18	600-1125	10 July 1976
30176	19 24	81 17	600-1250	10 July 1976
30178	19 25	81 23	585-600	11 July 1976
30179	19 18	81 25	610-730	11 July 1976

WALTHER HERWIG (WH)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
44/68	33°42'S	51°00'	200	25 Feb. 1968
83/68	25 24S	44 54	500	1 March 1968
89/68	24 17S	43 50	300	2 March 1968
90/68	24 21S	43 54	500	2 March 1968
91/68	24°28'S	43°43'	800	2 March 1968
104/68	22 30S	40 07	800	9 March 1968
127/68	30 59S	49 51	130	14 March 1968

BLM - ALABAMA

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
22-VI-B	29°33'	87°24'	91	18 Oct. 1975
33-I-C	26 27	84 19	183	27 Feb. 1976
33-III-C	28°34'	85°16'	183	26 Feb. 1976
33-IV-B	28 58	85 24	91	26 Feb. 1976

MAFLA

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1974-18	29°35'	87°25'	?	1974	2212	27°57'	84°48'	189	1 July 1976
1974-33	30 10	86 12	?	1974	2645	29 35	87 20	107	?
					2746	27 04	84 14	121	28 June 1976
2106	26 26	84 15	168	28 June 1976	2957	25 30	84 14	155	20 Aug. 1977

ATLANTIS AND R/V ATLANTIS II (Atl)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
2950	26°14'	78°43'	521	3 Feb. 1938	2999	23°10'	81°29'	265-512	17 March 1938
2980B	22 44	78 48	402-412	10 March 1938	3313	22 03	85 06	1006	25 March 1939
2985	23 23	79 17	457	12 March 1938	3332	22 10	81 11	320-412	5 April 1939
2987A	23 22	79 56	521-549	13 March 1938	3336	22 12	81 12	366-439	6 April 1939
2987D	23 21	79 58	576	13 March 1938	3341	21 59	81 20	567-777	7 April 1939
2989	23 10	80 04	658	14 March 1938	3344	21 32	80 12	2633	8 April 1939
2990B	23 17	80 12	759	14 March 1938	3345	21 08	79 57	1262-1280	8 April 1939
2991	23 21	80 23	869	14 March 1938	3355	19 50	75 00	1957	15 April 1939
2991A	23 23	80 21	869	14 March 1938	3363	20 49	74 56	1518	19 April 1939
2992A	23 26	80 35	1015	15 March 1938	3366	20 46	74 59	1143	19 April 1939
2994	23 24	80 50	1033-1070	15 March 1938	3367	20 46	75 02	1170	19 April 1939
2995	23 24	81 01	677-1106	16 March 1938	3369	20 49	75 08	1097	20 April 1939

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
3370	20°47'	75°11'	823	20 April 1939	3459	23°21'	80°36'	914	4 May 1939
3371	20 46	75 13	540	20 April 1939	3469	23 12	81 22	777	9 May 1939
3374	20 45	75 19	549	20 April 1939	3470	23 24	80 59	1116	10 May 1939
3375	20 45	75 20	421	20 April 1939	3472	23 21	80 55	933	10 May 1939
3379	21 49	76 43	1664	25 April 1939	3474	23 18	80 46	896	10 May 1939
3392	22 35	78 16	412	27 April 1939	3478	23 09	81 28	439	11 May 1939
3396	22 34	78 15	329	28 April 1939	3482	23 09	81 28	348	11 May 1939
3397	22 35	78 16	329	28 April 1939	260	33 36	62 25	1383	18 Oct. 1960
3400	22 35	78 19	329	28 April 1939	266-4	31 56	77 26	768	26 June 1961
3416	22 50	78 55	366	30 April 1939	266-6	31 55	77 23	785	27 June 1961
3423	22 50	79 08	448	30 April 1939	266-7	31 53	77 23	750	28 June 1961
3451	23 20	79 59	741	3 May 1939	280-3	38 54	61 01	1171-1595	24 Sept. 1962
3454	23 24	80 36	1097	4 May 1939	280-14	38 34	62 09	1902-2560	14 June 1962
3457	23 23	80 36	1006	4 May 1939	280-16	38 31	63 13	1646	21 June 1962

N/Oc WLADIMIR BESNARD (WB)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1	24°16'S	43°55'	220	22 July 1969	322	25°06'S	43°44'	2040-2150	9 Feb. 1969
2	24 09S	43 59	160	22 July 1969	391	24 43S	43 44	1500	24 July 1969
318	25 15S	44 00	180	7 Feb. 1969	413	33 40S	51 46	78	31 Oct. 1968

TEXAS A&M UNIVERSITY, R/V ALAMINOS (TAMU)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
65A9-4	24°00'	83°11'	975	3 July 1965
65A9-7D	22 00	85 30	2076	5 July 1965
65A9-11	20 17	86 17	1134	8 July 1965
65A9-14	22 43	86 13	1033	10 July 1965
65A9-15	23 10	86 30	759-969	11 July 1965
65A9-15A	23 05	87 05	183-366	11 July 1965
65A9-20	25 00	84 00	128	14 July 1965
65A9-21	24 58	84 17	399	14 July 1965
65A14-9	20 58	92 28	77	7 Oct. 1965
66A5-4	28 20	87 03	1097-1189	3 April 1966
67A5-1A	28 13	89 27	997	9 July 1967
67A5-4G	28 18	87 21	2587	14 July 1967
67A5-5D	28 32	87 23	1463	15 July 1967
67A5-6B	28 48	87 03	732	16 July 1967
67A5-7E	29 13	87 00	836	17 July 1967

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
67A5-8B	28°55'	87°24'	1454	18 July 1967
67A5-9E	29 30	86 57	622	20 July 1967
67A5-10B	29 05	86 14	91	20 July 1967
67A5-11C	29 25	86 21	183	21 July 1967
67A5-13B	29 30	8652	366	22 July 1967
67A5-13E	29 39	86 54	366-384	22 July 1967
68A3-9A	21 44	92 34	914-1006	21 March 1968
68A7-1A	28 51	88 48	864-529	25 July 1968
68A7-2B	28 53	88 38	549-585	26 July 1968
68A7-7B	28 00	86 08	1097	1 Aug. 1968
68A7-9A	29 28	86 46	366	4 Aug. 1968
68A7-12B	29 14	87 00	878	6 Aug. 1968
68A7-13A	29 03	87 15	1061	7 Aug. 1968
68A7-13B	29 00	87 21	1408	7 Aug. 1968

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
68A7-13D	28°59'	87°23'	1463	7 Aug. 1968
68A7-15D	29 10	87 32	1097	9 Aug. 1968
68A7-15H	29 10	87 16	914	9 Aug. 1968
68A7-17B	29 10	87 02	878	11 Aug. 1968
68A13-12A	25 31	95 51	1061-1317	17 Nov. 1968
68A13-23	27 35	95 23	732	20 Nov. 1968
69A13-16	24 38	88 14	1646	7 Oct. 1969
70A10-35	11 29	73 33	476	17 July 1970

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
70A10-39	12°14'	72°31'	205	18 July 1970
70A10-41	12 53	69 38	1006-1116	17 July 1970
70A10-42	12 39	69 41	795	17 July 1970
71A8-29	23 55	97 00	937	4 Aug. 1971
71A8-47	21 35	96 55	914	8 Aug. 1971
71A8-71	19 49	92 21	229-342	14 Aug. 1971
72F1-48	29 34	86 30	183	29 June 1972

EXPLORER

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1a	16°35'	82°47'	183	11 March 1960
1b	16 39	82 50	274	11 March 1960

Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1c	16°40'	82°52'	366	11 March 1960
4	25 41	84 20	157-159	30 March 1960

STATION MARINE D'ENDOUME, CALYPSO (SME)

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1758	32°50'S	50°00'	1050	13 Jan. 1962	1776	24°54'S	44°26'	1000	25 Jan. 1962
1761	27 34S	47 01	1000	17 Jan. 1962	1777	24 49S	44 32	575-535	25 Jan. 1962
1763	27 38S	47 13	250	17 Jan. 1962	1778	24 53S	44 38	250	25 Jan. 1962
1764	27 33S	47 33	120	17 Jan. 1962	171	37 36S	54 46	740	29 Dec. 1961
1775	27 05S	46 54	252	19 Jan. 1962					

AKAROA

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
5	9°01'	34°51'	46	10 Sept. 1965	5c	9°01'	34°51'	370	10 Sept. 1965
5b	9 01	34 51	560	10 Sept. 1965	185	10 44	36 21	540	4 Dec. 1965

R/V CHAIN, CRUISE 35

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
15	Off St. Paul Rocks		291	13 April 1963	36	8°11'	57°40'	104	28 April 1963
					38	8 08	57 53	110	28 April 1963
16	Off St. Paul Rocks		110-146	13 April 1963	39	8 08	57 52	101	28 April 1963
35	Off Guyana			27 April 1963	43	8 53	59 04		29 April 1963

CSS HUDSON

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
3A	12°29'	61°13'	439-549	17 March 1968	4B	12°23'	61°20'	297-423	17 March 1968
3B	12 29	61 13	497-549	17 March 1968					

HUMMELINCK STATION

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
1442	Off Barbados		100	19 Feb. 1964	1443	Off Barbados		200	19 Feb. 1964

MISCELLANEOUS

Station Number	°N Latitude	°W Longitude	Depth (m)	Date	Station Number	°N Latitude	°W Longitude	Depth (m)	Date
Pocock-IV	Off Barbados		187-205	10 July 1965	IOSP-2	Off San Paulo, Brazil		110	19 June 1962
Rosaura-34	12°05'	61°49'	720-800	27 Nov. 1937	Nekton beta-563	24° 02'	77°11'	130	12 Jan. 1976
Anton Bruun-831	22 50	85 58	1000	16 Oct. 1966					
N/oc Almirante Saldanha-2803	25 18S	44 45	440	7 Jan. 1972	Nekton gamma-244	Discovery Bay, Jamaica		274	4 Sept. 1972
IOSP-1	24 20S	44 40	130m	19 June 1962	Nekton gamma-232	Discovery Bay, Jamaica		166	

SPECIES ACCOUNT

Order **SCLERACTINIA**

Suborder ASTROCOENIINA Vaughan & Wells, 1943

Family **POCILLOPORIDAE** Gray, 1840

Genus **Madracis** Milne Edwards & Haime, 1849

Diagnosis. – Colonial, extratentacular budding producing massive or ramose corallum. Coenosteum solid. Septa arranged in groups of six, eight, or ten, but rarely in more than two cycles. Columella styliform, prominent. No pali.
Type-species: *Madracis asperula* Milne Edwards & Haime, 1849, by monotypy.

1. **Madracis myriaster** (Milne Edwards & Haime, 1849)

Plate I, figures 1–2, 4–5

Axhelia myriaster MILNE EDWARDS & HAIME, 1849: 69; 1850: xxi; 1850a: 92, pl. 4, figs. 6, 6a; 1857: 126–127. – ROOS, 1971: 52, pls. 6–7.
Stylophora mirabilis DUCHASSAING & MICHELOTTI, 1860: 62, pl. 9, fig. 6.
Madracis myriaster: POURTALÈS, 1871: 27–28. – WELLS, 1973: 19. – LANG, 1974: 277–278. – BRIGHT, *et al.*, 1974: 33–34. – CAIRNS, 1977b: 5; 1978: 10.
Axohelia myriaster: POURTALÈS, 1874: 41, pl. 8, fig. 3.
Axohelia (*Stylophora*) *dumetosa*: POURTALÈS, 1874: 40, pl. 8, fig. 1.
Axohelia schrammii POURTALÈS, 1874: 41, pl. 8, fig. 2. – VERRILL, 1901: 110, pl. 18, figs. 3–4.
Not *Axohelia schrammi*: LINDSTRÖM, 1877: 14 (= *M. asperula*).
Axohelia dumetosa: POURTALÈS, 1878: 204. –? MOSELEY, 1881: 182 (specimen missing).
Axohelia mirabilis: POURTALÈS, 1880: 107–108.
Axhelia mirabilis: VAUGHAN, 1901: 295, pl. 1, figs. 3, 3a.
?*Madracis mirabilis*: KELLER, 1975: 181.

D e s c r i p t i o n. – Colonies are rarely dredged intact. Judging from the numerous broken branches and basal fragments, this species seems to produce a broad, bushy colony measuring 30–40 cm in height, with irregular branching. Planar colonies with anastomosing branches also occur. The basal main branch measures up to 25 mm in diameter and is firmly attached by an encrusting base, which bears calices. The diameters of terminal branches are 3–4 mm. The calices near the base are round, about 1.5 mm in diameter, and widely separated from one another by one-three calicular diameters. At the branch tips the calices are elongated in the axis of the branch, about 2.0 × 1.5 mm in diameter, and close-set (separated by only one-fourth to one-half their calicular diameter). The corallites are usually flush with the surface of the branch or sometimes raised on mounds; however, the exsert septa project well above the coenosteum. The coenosteum, especially on the encrusting base and thick basal branches, is prominently striate with anastomosing ridges. In some cases, the striae form very high, thin ridges, which bear a single row of pointed spines, but usually the ridges are much less conspicuous. On medium diameter branches (5–6 mm) and especially toward the branch tips the striae are often lacking, replaced by close-set, large, rounded granules.

Each corallite has 10 highly exsert primary septa, which extend about one-third of the distance to the center of the calice. Occasionally larger corallites up to 3 mm in calicular diameter occur with 16–20 septa. The inner edges of the septa are vertical, straight, and entire. Their faces are smooth or covered with slender, pointed granules, producing a "hirsute" appearance. Ten rudimentary secondary septa are also present, each of which is composed of a row of low spines. The inner edges of the primary septa are united by a large, low, solid columella, which fills in most of the fossa. A tall, compressed style, aligned with the two septa in the plane of the branch, projects from the center of the columella. Sometimes the style is absent.

D i s c u s s i o n. – Both *Axhelia* and *Madracis* were originally described in the same paper (MILNE EDWARDS & HAIME, 1849); *myriaster* was designated the type of *Axhelia* on page 69 and *asperula* was designated the type of *Madracis* on page 70. In both cases the authors provided a combined description of genus and species (see *International Code of Zoological Nomenclature,* Article 16 a vi). POURTALÈS (1871: 27), as first reviser, clearly designated *Madracis* as the senior synonym.

The history of the synonymy of *M. myriaster* is complicated. Shortly after MILNE EDWARDS & HAIME's (1849) description of *M. myriaster,* DUCHASSAING & MICHELOTTI (1860) described *Stylophora mirabilis* and later DUCHASSAING (1870) described *Stylophora dumetosa,* both from the Lesser Antilles. The former is a junior synonym of *M. myriaster* and I consider the latter a *species dubia,* since: (1) no illustration was provided, (2) the short description does not differentiate it from other western Atlantic *Madracis,* and (3) the holotype is lost. Four years later, POURTALÈS (1874) provisionally identified specimens as *A. myriaster* and *A. dumetosa* and described a new species, *A. schrammii.* All are *M. myriaster.* He carefully noted, however, that comparisons to type-material, which he did not perform, were essential for correct identification. By 1880 POURTALÈS admitted that what he identified as *A. myriaster* and *A. dumetosa* were identical, but he provisionally chose the name *A. mirabilis,* instead of *A. myriaster,* since he considered *A. myriaster* an East Indian species; otherwise he stated, "I cannot tell in what way they differ" (POURTALÈS, 1880: 107). (A type-locality for *A. myriaster* was not given in the original description. Only in 1850 did MILNE EDWARDS & HAIME (1850 a) mention the imprecise location of "mers des Indes.") POURTALÈS was correct in his synonymy of *A. myriaster* and *A. mirabilis*; however, *A. myriaster* is not known from the East Indies. Only recently was POURTALÈS proven correct when I examined the holotype of *M. mirabilis* at the MIZS and confirmed that it is the striate *M. myriaster.* Therefore, the common, shallow-water, nonstriate species, known today as *M. mirabilis sensu* Wells, 1973, requires a new name. Oddly enough. POURTALÈS never realized that his own *A. schrammii* was also *M. myriaster.* It was not until 1901 that two authors simultaneously published remarks concerning *A. schrammii*: VERRILL (1901) implied that *A. schrammii* and *A. myriaster* were the same, and VAUGHAN (1901) correctly synonymized *A. schrammi* with *M. mirabilis.* MOSELEY's (1881) specimen from Bermuda, identified as *A. dumetosa,* is lost.

M. myriaster could be confused with both *M. asperula* and *M. mirabilis sensu* Wells, 1973, two shallow-water western Atlantic species. Sometimes *M. asperula* also bears faint intercalicular striae but can be distinguished from *M. myriaster* by its thinner branch tips (2–3 mm in diameter) and even more elongate calices at the branch tip. *M. mirabilis sensu* Wells, a hermatypic coral, has thicker branches (up to 10 mm in diameter) and blunt branch tips (not attenuated as in *M. myriaster* and *M. asperula*).

Remarks. – Calcareous worm tubes secondarily covered by coenosteum often thread between the calices, indicating that the worm and coral were at one time symbiotic.

Material. – P-705 (USNM 45779); P-854 (USNM 45788); P-875 (UMML 8: 223); P-907 (USNM 45789); P-910 (USNM 45786); P-991 (USNM 45780, UMML 8: 330); P-1140 (USNM 45776); P-1186 (USNM 45787); P-1303 (USNM 45784); P-1387 (USNM 45778); P-1393 (USNM 45781); P-1395 (USNM 45782); P-1410 (USNM 45785); G-134 (USNM 45793); G-251 (USNM 45791); G-270 (USNM 45792); G-493 (USNM 45790); G-691 (USNM 45777, UMML 8: 329); CI-1 (USNM 45794); O-1494; O-2603; O-3554; O-3559; O-3603; O-3955; O-4297; O-4398; O-4832; O-4928; O-4932; O-4938; O-5016; O-5419; O-5432; O-5933; O-6715; SB-3467; SB-3494; SB-3495; SB-3496; BL-45 (MCZ); BL-62 (MCZ); BL-269 (MCZ); BL-293 (USNM); undetermined Hassler station off Barbados, 183 m (MCZ); Alb-2152 (USNM 16153); Alb-2157 (USNM 36509); Alb-2159 (USNM 16151); Alb-2166; Alb-2319 (USNM 16146); Alb-2321 (USNM 36507); Alb-2323 (USNM 10121); Alb-2324 (USNM 10866); Alb-2334; Alb-2336 (USNM 10210); Alb-2338 (USNM 10223); Alb-2353 (USNM 10279); Caroline-49; E-30175; E-30178; Chain-36; Hummelinck-1443; south shore of Bermuda, 160 m. – Holotype of *S. mirabilis*; syntype of *A. schrammii*; Lindström's (1877) *A. schrammi* (NRM); Vaughan's (1901) *A. mirabilis* (USNM 36534).

Types. – The type of *Axhelia myriaster* could not be found at the MNHNP in 1975; it is presumed lost. The holotype of *Stylophora mirabilis*, collected at St. Thomas, Virgin Islands, is deposited at the MIZS (Coel. 358). The figured branch of Pourtalès's *Axohelia schrammii* from Guadeloupe, Lesser Antilles, is deposited at the MCZ (2765). It has been broken into five pieces.
Type-Locality. – "Mers des Indes" (Milne Edwards & Haime, 1850a).

Distribution. – Common throughout the Caribbean and Gulf of Mexico, ranging from off Florida to off Surinam; however, present off northern coast of South America only off Leeward Group; Bermuda (Map 1). 37–708 m. 9–26°C, based on eight records.

Suborder FUNGIINA Verrill, 1865

Family **FUNGIIDAE** Dana, 1846

Genus **Fungiacyathus** Sars, 1872

Diagnosis. – Solitary, cupolate, free. Septotheca thin; costae thin and spinose. Septa irregularly dentate, laterally braced by thin ribbons extending from the septotheca and by thin septal striae. Columella feeble. Paliform lobes sometimes present. Type-species: *Fungiacyathus fragilis*, Sars, 1872, by monotypy.

2. **Fungiacyathus pusillus** (Pourtalès, 1868), new comb.

Plate II, figures 2–3, 5

Diaseris pusilla POURTALÈS, 1868: 139; 1871: 47, pl. 2, figs. 6–8; 1880: 97.

Description. – The corallum rests on a flat to slightly concave, round base, which measures 16.8 mm in diameter in the largest specimen examined. The entire corallum is very fragile and is often collected in fragments or with incipient fracture lines. Narrow, ridged costae alternate in size, with the C_5 smaller than the others. The costae have dentate margins and are most highly ridged toward the outer edge. All costae reach the center of the base except the C_5, which extend only three-fourths as far.

Septa are arranged in six systems and five complete cycles. S_1 are independent and each bears a high, rounded lobe on its outer edge. The lobe bears eight–ten distinct carinae on each side, which degenerate into rows of granules toward the base. Toward the center of the calice the S_1 bear three–five long, slender spines, which also bear lateral carinae. S_2 are smaller but also have outer lobes with six–eight vertical carinae. Their inner edges have four–seven large spines, also ridged. S_3 and S_4 are progressively smaller with smaller, ridged outer lobes. The S_3 join the S_2 about halfway to the center and the S_5 join the S_4 about one-third of the distance to the center. S_5 are always very small (each septum composed of only several spines), but are present even in a specimen measuring 6.5 mm in diameter. The edges of all septa are straight. Synapticulae bridging adjacent septa and every other septum (crossing over the rudimentary S_5) are frequent.

A rudimentary columella is formed by the intermingling of the innermost septal spines of the S_1 and S_2.

Discussion. – There are six Recent nominal species of *Fungiacyathus* with five cycles of septa: *F. fragilis* Sars, *F. stephanus* (Alcock), *F. paliferus* (Alcock), *F. sibogae* (Alcock), *F. hawaiiensis* (Vaughan), and *F. pusillus*. The latter is easily distinguished from *F. fragilis*, the only other Atlantic representative, by its smaller size and straight septal margins. However, *F. pusillus* is extremely similar to *F. stephanus* (Indian Ocean) in morphology, differing only in size (one-half as large) and its shallower bathymetric range.

Material. – P-587 (16) USNM 45833; P-600 (1) USNM 45834; P-861 (1) USNM 45835; G-1102 (1) USNM 45832. – Syntypes of *D. pusilla*.

Types. – Two lots of syntypes are present at the MCZ. One contains 10 fragments (5596) and the second contains one whole specimen (5619). It is impossible to determine at which Bibb station(s) they were collected.
Type-Locality. – Off Sand Key, Florida; 218–262 m.

Distribution. – Florida Keys; Arrowsmith Bank, Yucatan; off the Grenadines, Lesser Antilles (Map 2). 285–439 m.

3. **Fungiacyathus symmetricus** (Pourtalès, 1871)

Plate I, figures 7–8; Plate II, figure 1; Plate III, figure 1

Fungia symmetrica Pourtalès, 1871: 46, pl. 7, figs. 5–6; 1874: 43. – Moseley, 1876: 548, 562–563 (in part: Chall-24, 36, 56, 181). – Pourtalès, 1878: 208. – Agassiz, 1888: 153, fig. 476.
Not *Fungia symmetrica*: Duncan, 1873: 334, pl. 49, figs. 16–19 (= *F. marenzelleri*). – ?Studer, 1878: 651. – Thomson, 1878: 132, fig. 33.
Diaseris crispa Pourtalès, 1871: 47–48 (in part: see Types of *F. crispus*).
Bathyactis symmetrica: Pourtalès, 1880: 97, 112. – Moseley, 1881: 186–190 (in

part: Chall-24, 36, 56, 181), pl. 11, figs. 8, 8a, 9, 9a. – VAUGHAN, 1901: 311, pl. 1, figs. 7a–b. – LEWIS, 1965: 1063.

Not *Bathyactis symmetrica*: VERRILL, 1882: 313 (= *F. fragilis*); 1883: 65 (= *F. fragilis*). – ?JOURDAN, 1895: 28. – ?ALCOCK, 1898: 28; ?1902: 37. – MARENZELLER, 1904: 312–313, pl. 18, fig. 25; 1904a: 76 (= *F. marenzelleri*). – GRAVIER, 1915: 3, 1920: 97–98 (= *F. fragilis* and *F. marenzelleri*), pl. 10, figs. 165–166. – THOMPSON, 1931: 9 (= *F. fragilis*). – GARDINER & WAUGH, 1939: 230–231 (? *F. marenzelleri*). – ?YABE & EGUCHI, 1942: 137. – TIZARD, *et al.*, 1885: fig. 287.

Not *Fungiacyathus symmetrica*: DURHAM & BARNARD, 1952: 11. – ?KIKUCHI, 1968: 11.

?*Fungiacyathus symmetricus*: WELLS, 1958: 262, 267, pl. 2, figs. 1–2. – SQUIRES, 1961: 18. – UTINOMI, 1965: 248–249. – SQUIRES, 1969: 17, map 2.

Fungiacyathus symmetricus: LABOREL, 1970: 153, 155. – KELLER, 1975: 174–175.

Description. – The corallum rests on a flat or slightly concave, horizontal base. The average diameter of the round base is about 10 mm, although the largest specimen examined measures 14.1 mm. The height of the highest septal spines from the base is between 4–5 mm. Ridged costae corresponding to all septa are present on the base. C_1 are most highly ridged and, like the C_2, reach the center of the base. C_3 and C_4 are progressively less prominent and do not reach the center. The costae bear serrate teeth, which gradually decrease in size to small granules toward the center of the base. Granules are also present in the intercostal spaces. In well-preserved specimens, lines of fine perforations occur in the intercostal spaces (Pl. II 1).

The septa are arranged in six systems and four complete cycles. S_1, the only independent septa, are the largest, highest septa and meet in the center. On their upper margins, extending from the external edge to the columella, each septum bears 12–15 extremely high spines, which are compressed in the plane of the septum. Each spine bears a prominent vertical carina on either side, which gradually degenerates to a row of granules about halfway to the base. These granules are usually small and pointed but may be large (two-three times the width of a septum) and blunt. The slightly smaller S_2 also meet in the center but are joined by the S_3 near the columella. The S_4 are joined to the S_3 about halfway to the center. All septa bear high, delicately ridged spines as described for the S_1. Each septum is united to its adjacent septa by six-seven broad synapticulae, which are also in contact with the base. Toward the center of the calice, often a columella is formed as a small, circular platform pierced by the innermost spines of the S_1 and S_2. Sometimes there is no distinct columella but simply an intermingling of the long, innermost spines, which are round in cross-section near the center of the calice.

Discussion. – *F. symmetricus* has been reported in all three oceans and generally has been considered a cosmopolitan species with a great depth range (59–5872 m). This misconception originated with MOSELEY (1881), who reported this species, originally described by POURTALÈS from the western Atlantic, to be cosmopolitan at shallow and great depths. A re-examination of MOSELEY's Challenger records showed that specimens from only four stations (24, 36, 56, and 181) out of 19 are *F. symmetricus*; the other are large specimens belonging to other species. Three of these four stations are western Atlantic, whereas the fourth (Chall-181) is from off northeast New Guinea at 4462 m. This latter record greatly exceeds the typical depth and geographic range of this species and is probably a labelling error. Many authors after MOSELEY uncritically accepted his redescription and therefore frequently reported it. I have not verified all of the Indo-Pacific records of *F. symmetricus*, but I strongly question its existence outside the western Atlantic. *F. marenzelleri* Vaughan, on the other hand, does have a cosmopolitan distribution and may be the species so often referred to as *F. symmetricus*. Among the four new subspecies of *F. symmetricus* treated by KELLER (1976), there is little doubt that the nominal subspecies is the species described here. A worldwide revision of all *Fungiacyathus* is needed.

MATERIAL. – P-585 (6) USNM 45821; P-605 (1) USNM 45822; P-606 (1) USNM 45823; P-607 (4) USNM 45824; P-861 (27) USNM 45825; P-881 (108) USNM 45772, (1) UMML 8: 228; P-891 (1) USNM 45771; P-904 (9) USNM 45826; P-919 (3) USNM 45774; P-943 (18) USNM 45827; P-944 (1) USNM 45828; P-984 (1) USNM 45829; P-988 (2) USNM 45773; P-1261 (1) USNM 45830; 73 specimens from 30 Gerda stations in the Straits of Florida; SB-2443 (1); BL-2 (3) MCZ; BL-21 (2) MCZ; BL-57 (1) MCZ; BL-59 (1) MCZ; BL-68 (20) MCZ; BL-100 (3) MCZ; BL-128 (2) MCZ; BL-134 (3) MCZ; BL-164 (2) MCZ; BL-167 (2) MCZ; BL-210 (1) MCZ; Alb-2150 (1) USNM 7592; Alb-2342 (3) USNM 16095; Alb-2750 (22) USNM 36448;

Combat-447 (4); Caroline-25 (4); Caroline-32 (5); Caroline-38 (1); Caroline-93 (2); Atl-2999 (3) MCZ; Atl-3375 (1) MCZ; Atl-3379 (1) MCZ; Atl-3392 (2) MCZ; Atl-3396 (3) MCZ; WB-1 (1) USNM 45831; SME-1763 (1) SME; SME-1764 (1) SME; Akaroa-5 (1) SME. – Syntype of *F. symmetrica* (Bibb-157); Moseley's (1881) specimens (Chall-24, 36, 56, 181); Vaughan's (1901) specimens (USNM 22094, 22088); Marenzeller's (1904) specimens (USNM); Verrill's (1882, 1883) specimens (YPM).

Types. – The original description was based on two specimens (syntypes): one was collected off Carysfort Reef, Florida (Bibb-157) and is deposited at the MCZ (2767); the other specimen, from off Cojima, Cuba (Bibb-139), is presumed lost.
Type-Locality. – Straits of Florida; 640–823 m.

Distribution. – Antillean distribution and western Caribbean (not off northern coast of South America); Bermuda; off Brazil from Recife to 27°33'S (Map 2). 183–1664 m; MOSELEY's (1881) record of 59 m (Chall-36) is discounted as a labelling error. 6–12°C, based on three records.

4. **Fungiacyathus crispus** (Pourtalès, 1871)

Plate I, figures 3, 6; Plate II, figures 4, 7

Diaseris crispa POURTALÈS, 1871: 47–48, pl. 5, figs. 1–2; 1874: 44. – LINDSTRÖM, 1877: 23, pl. 3, fig. 39. – POURTALÈS, 1878: 209; 1880: 97. – AGASSIZ, 1888: 153, fig. 477.
Fungiacyathus crispus: ZIBROWIUS, 1976: 85–86, pl. 42, figs. A-L. – CAIRNS, 1977b: 5; 1978: 10.

Description. – The corallum is very irregular in shape, most often collected as wedge-shaped pieces that have fractured from a larger corallum. One of the few whole specimens known (Pl. II 4) has regenerated an entire calice from an original segment consisting of seven septa. Its calicular diameter is 5.4 mm but the extrapolated diameter of the parent sector is 9.0 mm. The base is flat and bears an irregular granulation. Costae are difficult to distinguish. If a fragment has more than five or six septa, usually incipient fracture lines are present, originating at the outer edge and usually occurring between every three-four septa. Specimens probably fracture along these lines when being collected.

Discrete systems and cycles of septa are not apparent because of the incomplete nature of most specimens or irregularities due to regeneration from a smaller fragment. Four cycles of septa (48) appear to be arranged in the same manner as in *F. symmetricus*. The larger septa bear 16–18 tall, slender, pointed spines, shaped and laterally carinate as in *F. symmetricus*. The septal granules, a continuation of the lateral carinae, are extremely high (two-three times the thickness of a septum) and are often clavate or bifurcate. The presence of a columella is impossible to determine since this area of the corallum is invariably missing.

Discussion. – This species is distinctive because of its high degree of schizoparity. It is very similar to *F. symmetricus* but differs with regard to its smaller size, greater number of spines per septum, and its tendency to fracture.

Material. – P-1401 (1) USNM 45836; O-1251 (5); O-1867 (4); O-4226 (9); Hassler, off Barbados, 183 m (26) MCZ; Caroline-93 (3); Hudson-4B (4) NMC; off Anna Maria Key, Florida, 366–487 m (1) USNM 45837. – Syntypes of *D. crispa*; Lindström's (1877) specimens from Anguilla (10) NRM.

Types. – Eight lots of syntypes are deposited at the MCZ. The three lots labelled "Boschma" 1, 2, and 3 are *F. symmetricus*. The other five lots are labelled: "Boschma" 4, MCZ 5593 (two fragments); "Boschma" 5, MCZ 5593 (one regenerated corallum); "Boschma" 4 and 5, MCZ 5593 (ten fragments); "Florida, 120–150 fms.", MCZ 5593 (one fragment); and "Florida, 120–180 fms.", MCZ 5618 (nine fragments). My illustrated fragment (Pl. I 3, 6) from lot MCZ 5618 is designated lectotype; the other 22 pieces are designated paralectotypes.
Type-Locality. – Pourtalès did not give a definite location for his type-material in his text or with the specimens; however, he did imply that they were taken from Alligator and Tennessee Reefs and off Sand Key, Florida; 220–329 m.

Distribution. – Western Atlantic: Antillean distribution; eastern Gulf of Mexico; off Honduras; off the Amazon, Brazil (Map 3). 183–640 m. – Eastern Atlantic: area bounded by Portugal, Madeira, and the Azores. 340–1010 m.

5. **Fungiacyathus marenzelleri** (Vaughan, 1906)

Plate II, figures 8–9; Plate III, figures 3, 8

Bathyactis symmetrica: Marenzeller, 1904a: 76. – Gravier, 1920: 97 (in part: Sta. 698, 738, 1150, 1331, 1334), pl. 10, figs. 165–166.

Bathyactis marenzelleri VAUGHAN, 1906a: 66, pl. 4, figs. 1, 1a–b.
Fungia symmetrica: DUNCAN, 1873: 334, pl. 49, figs. 16–19.
Fungiacyathus marenzelleri: ZIBROWIUS, 1976: 83–85, pl. 40, figs. A–M, pl. 41, figs. A–K.

Description. – The corallum rests on a flat to very slightly concave base, which is very thin and fragile, sometimes porous. Its edges are sometimes regularly scalloped in groups of one-three septa. The diameters of the round bases of the western Atlantic specimens never exceed 22 mm. A thin, ridged costa, more prominent toward the calicular edge, corresponds to each septum. C_{1-3} may extend to the center of the base; C_4 are usually smaller, often consisting of a row of several spines, reaching only one-half to three-fourths of the distance to the center. All costae are dentate and slightly sinuous.

Septa are arranged in six systems and four complete cycles. The S_1 are the largest and only independent septa. Each S_1 bears nine–ten laterally ridged spines. The two innermost spines are small, thin, and rod-like, and are part of the columella. The intermediate three–four spines are larger, higher, and also stand alone; however, the outer four–five spines are much larger and fused together, forming a serrate lobe, projecting considerably beyond the basal diameter. The carinae on the lobe are directed obliquely toward the columella, becoming horizontal at the outer edge of the septum near the base. They become rows of granules toward the base. S_2 and S_3 are similar in shape and ornamentation, but the S_4 are quite small, consisting of only three–four fused spines. The higher cycle septa are joined to one another in a manner typical for the genus. At the junction there is a thin calcareous deposit uniting the septa. Adjacent septa are united by thin synapticulae. The synapticulae begin as small bridges originating from the side of a septum and grow toward the base. The adjacent septa produce similar, narrow bridges in the same area, which fuse with one another, forming the connection.

A thin, round columella is present in the center and is usually pierced by the inner spines of the S_1 and S_2.

Discussion. – *F. marenzelleri* is distinguished from the other two Atlantic species of *Fungiacyathus* that have only four cycles of septa, *F. symmetricus* and *F. crispus*, by its larger size and greater depth range. ZIBROWIUS (1976) hypothesized that *F. marenzelleri*, not *F. symmetricus*, is the cosmopolitan species implied by MOSELEY (1881) and VAUGHAN & WELLS (1943).

Material. – P-1138 (34) USNM 45838; P-1429 (32) USNM 45839, (1) UMML 8: 230; P-1444 (1) USNM 45840; CI-401 (1) USNM 45841. – Holotype of *B. marenzelleri* (USNM), paratypes (MCZ); Marenzeller's (1904a) specimens; Moseley's (1881) specimens.

Types. – Holotype: Albatross-4721 (USNM). – Paratypes: Albatross-4670 (MCZ, three specimens).
Type-Locality. – 8°07.5'S, 104°10.5'W (off Peru); 3820 m.

Distribution. – Western Atlantic: Bahamas (first record in western Atlantic) (Map 3). 2450–2745 m. – Off Greenland (Labrador Sea). – Elsewhere: eastern Atlantic from off England to Morocco; off Cape Verde Islands; off Azores; off Angola; ?Indian Ocean; off Peru and California. 1805–5870 m.

Family **MICRABACIIDAE** Vaughan, 1905

Genus **Leptopenus** Moseley, 1881

Diagnosis. – Solitary, cupolate, free. No wall, costae alternating in position with septa. Costae and septa united by simple synapticulae producing a very porous, delicate corallum. Columella trabecular. Type-species: *Leptopenus discus* Moseley, 1881, by subsequent designation (WELLS, 1936).

6. **Leptopenus discus** Moseley, 1881

Plate III, figures 4–7

Leptopenus discus MOSELEY, 1881: 205–208, pl. 14, figs. 1–4, pl. 16, figs. 1–7. – WELLS, 1958: 262; 1964: 109. – SQUIRES, 1965: 878–879, fig. 1; 1967: 505.
Not *Leptopenus discus*: DENNANT, 1906: 162 (? *Letepsammia*).
Leptonemus discus: AGASSIZ, 1888: 154, fig. 479 (taken from MOSELEY, 1881, pl. 14, fig. 1).

Discussion. – A description of this species is not given for the following reasons: (1) I have examined no new material, (2) MOSELEY's original description and figures are excellent, and (3) AGASSIZ's specimen, which was never described, is in very poor condition and cannot add to MOSELEY's description.

Leptopenus discus is known from only six specimens: four syntypes from the Challenger, one central fragment collected by the Galathea (SQUIRES, 1965), and one fragmented, central piece collected by the Blake (AGASSIZ, 1888). It is odd that POURTALÈS did not report the Blake specimen in 1878 with his account of the Scleractinia of that cruise. AGASSIZ's delayed record is confusing because he reported an incorrect locality and depth, and used a slightly restored and rotated copy of MOSELEY's figured syntype to illustrate his own specimen. The Blake specimen (BL-109) that formed the basis of AGASSIZ's record was rediscovered at the USNM with the MCZ catalog number of 5631. The corallum, which is only a central piece measuring about 12 mm in diameter, is highly fragmented and held together by the dry tissue mentioned by AGASSIZ (1888) and SQUIRES (1967).

Material. – BL-109 (1) USNM 46916. – Syntype of *L. discus*, Challenger-147 (BM 1880.11.25.159).

Types. – The original description was based on four syntypes collected from Challenger stations 147, 157, and 323, all at the BM.
Type-Locality. – South Indian Ocean, southwest Atlantic; 2926–3566 m.

Distribution. – Western Atlantic: off northeastern Cuba; off Rio de la Plata, Argentina (Map 4). 2842–3475 m. – Elsewhere: southern Indian Ocean; Makassar Strait, Indonesia. 2000–3566 m.

Suborder FAVIINA Vaughan & Wells, 1943

Superfamily FAVIICAE Gregory, 1900

Family **OCULINIDAE** Gray, 1847

Genus **Madrepora** Linnaeus, 1758

Diagnosis. – Colonial, extratentacular budding forming dendroid colonies. Coenosteum dense, no costae, corallites filled internally by stereome. No pali; columella spongy or absent. Type-species: *Madrepora oculata* Linnaeus, 1758, by subsequent designation (VERRILL, 1901).

7. **Madrepora oculata** Linnaeus, 1758

Plate III, figure 2; Plate IV, figure 5; Plate V, figures 1–3

Synonymy complete for western Atlantic only:

Madrepora oculata LINNAEUS, 1758: 798. – PALLAS, 1776: 308. – ESPER, 1789: 108, pl. 12, figs. 1–3. – MARENZELLER, 1904a: 79. – DURHAM & BARNARD, 1952: 11. – SQUIRES, 1959: 5–8 (in part: not station A 180–112). – EGUCHI, 1968: C-29, pl. C-8, figs., 1–9. – BEST, 1970: 298, fig. 2. – BOURCIER & ZIBROWIUS, 1973: 826, figs. 6–7. – ZIBROWIUS, 1974a: 762, pl. 2, figs. 2–5; 1976: 104–108, pl. 20, figs. A–P. – CAIRNS, 1978: 10.

Amphelia oculata: MILNE EDWARDS & HAIME, 1850a: 85.

Amphihelia oculata: MILNE EDWARDS & HAIME, 1857: 119. – POURTALÈS, 1871: 24. – DUNCAN, 1873: 326, pl. 45, figs. 1–3. – POURTALÈS, 1880: 96, 107. – JOURDAN, 1895: 26. – ALCOCK, 1902: 35. – MARENZELLER, 1904: 308, pl. 14, figs. 1, 1 a–b. – GRAVIER, 1920: 89, pl. 10, figs. 158–164. – CHEVALIER, 1966: 938 (in part: not specimen off Cape Naze), pl. 5, figs. 8–9.

Amphihelia ramea: DUNCAN, 1873: 326, pl. 44, figs. 1–3, pl. 45, figs. 4–6, pl. 46, figs. 1–19. – ?LINDSTRÖM, 1877: 14. – JOURDAN, 1895: 26.

Lophohelia carolina: MOSELEY, 1876: 547.

Amphihelia sculpta: POURTALÈS, 1878: 204.

Lophohelia candida MOSELEY, 1881: 179–180, pl. 9, figs. 6–13.

Lophohelia prolifera: GRAVIER, 1920: 87 (in part).

Description. – *M. oculata* is extremely variable, forming large bushy or flabellate colonies by extratentacular budding. End branches are usually sympodial in growth form with calices occurring in opposite and alternating rows. New branches can occur at the level of any calice. A large colony is anchored by a massive base measuring up to several centimeters in diameter. A base often encrusts the spicules of a deep-water sponge (*Hyalonema*). End branches measure as little as 2.3 mm in diameter, whereas basal branches often exceed 2 cm. Branches are usually round but may be very compressed, with greater to lesser branch diameters differing by ratios of over 2:1; the calices occur on the broad sides. Calices on the distal branches are well individualized and exsert, whereas calices occurring on thick, basal branches are often recessed in the coenosteum or completely covered by it. Rarely the basal calices are raised on small mounds. The coenosteum is white and extremely finely granulated, producing a smooth texture. Sometimes finely incised, longitudinal striae are present, most conspicuously on the sides of the branches that do not bear the calices. Calices vary in diameter from 2.5 to 3.8 mm.

Septa are arranged in six systems and three cycles. S_1 are usually larger than the S_2 but can be equal in size, especially in older corallites on basal branches. S_1 are slightly exsert and sometimes extend as a short costal ridge outside the calice. S_3 are much smaller and can be well developed or rudimentary, composed of a line of dissociated simple or bifid spines. The inner edges of all septa are straight and usually finely dentate. The septal faces bear granules, which are usually low in profile but sometimes very prominent (two times the thickness of the septum), giving a very hirsute appearance to the septa. The granules are often arranged in well-defined rows or even short carinae oriented parallel to the trabeculae.

The calicular fossae on terminal branches are usually very deep and slightly curved, with only rudimentary columellas. On older, thicker branches, calicular fossae are short and straight, sometimes sealed off by endothecal dissepiments and columellas are usually better developed, consisting of several crispate, spongy trabeculae, which are often connected to the S_1. In general, the columella is quite variable and may not occur at all.

This species commonly occurs in another form (see DUNCAN, 1873: pl. 45, fig. 1) invariably associated with a commensal worm (*Eunice* sp.), around which the coral grows or encrusts. In this form the branching pattern is much closer, forming bushy colonies with frequently anastomosing branches. The color of the coenosteum is yellowish-gray, and the fossae are filled in with stereome, almost obscuring the septa altogether. Often only low, crispate spines remain in the calice as evidence of the septa.

Discussion. – ZIBROWIUS (1974a: 762–766) should be consulted for a lengthy discussion of the synonymy of this variable species. He discusses 15 nominal species that might be considered as junior synonyms. Of these, I have examined the types of three: *M. galapagensis* Vaughan, 1906; *M. kauaiensis* Vaughan, 1907, and *L. candida* Moseley, 1881, and have concluded that the first two are valid species and the latter is a junior synonym of *M. oculata*. *M. galapagensis* has larger, flared corallites and exsert S_1, more like *M. carolina* than *M. oculata*. *M. kauaiensis* has smaller corallites and very poorly developed S_3, if they occur at all.

Remarks. – *M. oculata* and *L. prolifera* are the primary deep-bank builders in the eastern Atlantic. Although widespread in the western Atlantic, *M. oculata* is not a primary constituent of the coral banks in the Straits of Florida (see *E. profunda*).

Material. – P-364 (USNM 45891); P-388 (USNM 45895); P-607 (USNM 45897); P-636 (USNM 45890); P-673 (USNM 45898); P-675 (USNM 45893); P-689 (USNM 45888, UMML 8: 307); P-741 (USNM 45889, UMML 8: 305); P-747 (USNM 45892); P-755 (UMML 8: 233); P-954 (USNM 45899); P-1187 (USNM 45894); P-1262; colonies from 19 Gerda stations in the Straits of Florida (USNM 45871–45886); CI-148 (USNM 45900); GS-31; GS (G)-13 (USNM 45901); GS (G)-39 (USNM 45902); GS (G)-40 (USNM 45904); O-534; O-4569; O-4570; O-4807; O-4913; O-5930; O-11218; O-11718; BL-2 (MCZ); BL-15 (MCZ); BL-171 (MCZ); BL-240 (MCZ, USNM); BL-256 (MCZ); BL–260 (MCZ); BL-318; Alb-2117 (USNM 7056); Alb-2415 (USNM 10746); Alb-2416 (USNM 10528); Alb-2663 (USNM 15950); Alb-2669 (USNM 14496); Alb-2672 (USNM 36523); Gos-1615; Gos-1748; Gos-1750; Gos-1766; E-26004; E-26017; E-26023; E-26028 (USNM 45903); E-26052 (USNM 45896); WH-90/68 (SME); WH-104/68 (SME); Akaroa 5c (SME); TAMU 70A10–41 (TAMU); TAMU 71A8–29 (TAMU); TAMU 65A9–4 (TAMU). – Syntypes of *L.candida*; Marenzeller's (1904) specimens (USNM); Squires's (1959) specimens (AMNH); Lindström's (1877) specimens (NRM).

Types. – The Linnaean types of *M. oculata* from Sicily and the Tyrrhenian Sea are lost. Six syntype branches of *L. candida* are deposited at the BM (1880.11.25.95). They were collected at Chall-23, off Sombrero Island, Lesser Antilles in 823 m.
Type-Locality. – Sicily and Tyrrhenian Sea, Mediterranean.

Distribution. – Western Atlantic: common throughout the tropical western Atlantic from Georgia to Rio de Janeiro, Brazil; Gulf of Mexico (Map 4). 144–1391 m. 4°–12°C, based on 12 records. – Elsewhere: eastern Atlantic, Indian, and Pacific Oceans. 80–1500 m.

8. **Madrepora carolina** (Pourtalès, 1871)

Plate IV, figures 1–4

Not *Madrepora exigua* DANA, 1848: 469, pl. 38, figs. 2 a–b (= *Acropora exigua*).– RATHBUN, 1888: 15.
Lophohelia exigua POURTALÈS, 1871: 24, 26, pl. 1, figs. 6–7; 1878: 204; 1880: 96.
Lophohelia carolina POURTALÈS, 1871: 24, 26.
Not *Lophohelia carolina*: MOSELEY, 1876: 547 (= *Madrepora oculata*).
Not *Lophohelia exigua*: LINDSTRÖM, 1877: 14 (= *Thalamophyllia riisei*).
Lophohelia prolifera: MOSELEY, 1881: 179 (in part: Chall-109).
Madrepora carolina: CAIRNS, 1977b: 5; 1978: 10.

Description. – The corallum is attached by a thick base (up to 28 mm in diameter) expanding at the substrate into a thin encrusting layer, which supports randomly placed, upright corallites. Corallites generally occur in a sympodial growth form, in opposite, alternating fashion. However, in the largest colony examined (36 cm tall), all of the corallites are directed toward one side, the other side being covered by an encrusting zooanthid. Branching can occur at each calice and is usually in one plane, producing a flabellate colony. However, three-dimensional branching does occur, producing bushy colonies. The corallites are flared at their distal ends, even those on basal branches, and measure 3.5–5.5 mm in diameter. The coenosteum is white and finely granulated. Thin, ridged costae correspond to the first two cycles of septa but are only prominent near the calice. Very fine coenosteal striae are sometimes present, particularly at the base of the colony.

Septa are arranged in six systems and three cycles. Each higher cycle of septa is progressively smaller and less exsert. Four of the six S_1 on opposite sides of each calice are slightly larger than the other two; their lower, inner edges almost meet in the center of the fossa. Sometimes the S_3 are quite rudimentary, expressed only as thin ridges or rows of spines. The inner edges of all septa are entire and slightly sinuous. Septal granules are small and inconspicuous, sometimes arranged in poorly-defined lines parallel to the trabeculae.

The fossa is deep and often curved on distal branches. There is never a columella.

Discussion. – POURTALÈS (1871) described two species of *Lophohelia*, *L. exigua* and *L. carolina*, on the same page. He based *L. exigua* on thin, bushy end branches and *L. carolina* on more massive basal branches with less exsert calices. It is now clear that both specimens belong to the same species. Since *L. exigua* is a secondary junior homonym of DANA's *Madrepora exigua*, *L. carolina* is chosen as the senior synonym.

M. carolina is easily differentiated from *M. oculata*, the only other *Madrepora* known from the Atlantic, by its larger, flared corallites, less prominent septal granulation, and dimorphic S_1.

Material. – G-134 (USNM 45905, UMML 8: 232); G-135 (USNM 45911); G-251 (USNM 45906); G-503 (USNM 45907); G-636 (USNM 45912); G-691 (USNM 45908, UMML 8: 304); G-692 (USNM 45909); CI-6 (USNM 45913); GS (G)–44 (USNM 45914); O-1025; O-1890; O-3955; O-4833; O-4932; O-4938; O-4939; SB-206; SB-332; SB-2449; SB-3339; SB-3467; BL-45 (MCZ); Bibb-216 (MCZ); Alb-2153 (USNM 7189); Alb-2157 (USNM 10833); Alb-2324 (USNM 10215); Alb-2327 (USNM 36355); Alb-2345 (USNM 36348); Alb-2346 (USNM 10254); Alb-2353 (USNM 10252); Alb-2354; Alb-2661 (USNM 16156); Caroline-37; E-26538; E-26542; E-26549; E-30150; E-30176; BLM-22-VI-B (Alabama BLM); 27°54′53″N, 93°26′50″W, 100 m (Texas BLM); TAMU 65A9–20 (TAMU); Chall-109 (BM); Explorer-4. – Holotype of *L. carolina*; syntypes of *L. exigua*; Lindström's (1877) specimens (NRM); Moseley's (1881) specimens (BM).

Types. – The holotype of *L. carolina* (two labels are present: 2764 and 2754) is deposited at the MCZ. Two lots of syntypes of *L. exigua* are deposited at the MCZ: one lot (2778) contains three branches, the other (two labels are present: 2789 and 2781) contains four branches. Both are labelled "Florida Straits, 36–79 fathoms." The worn fragments from off Pacific Reef, Florida (Bibb-216) are not at the MCZ and are presumed lost.

Type-Locality. – Unknown, but probably from off Havana, Cuba.

Distribution. – Greater Antilles; western Caribbean; Gulf of Mexico; off eastern coast of U.S. from North Carolina to Florida; St. Peter and Paul Rocks (Map 5). 53–801 m, most common between 200–300 m.

Family ANTHEMIPHYLLIIDAE Vaughan, 1907

Genus **Anthemiphyllia** Pourtalès, 1878

Diagnosis. – Solitary, patellate, free. Septotheca thick and smooth (porcelaneous) or costate. Septa strongly dentate. No pali; columella trabecular, papillose on surface. Type-species: *Anthemiphyllia patera* Pourtalès, 1878, by monotypy.

9. **Anthemiphyllia patera** Pourtalès, 1878

Plate V, figures 5–7

Anthemiphyllia patera POURTALÈS, 1878: 205, pl. 1, figs, 14–15; 1880: 97, 112, pl. 2, figs. 5–6. – VAUGHAN, 1907: 80. – GARDINER & WAUGH, 1938: 172. – ZIBROWIUS, 1976: 108.

Description. – The corallum is bowl-shaped and free; the rounded base usually has a scar of attachment at its apex or shows regeneration from a parent fragment. The largest specimen examined measures 13.1 mm in calicular diameter and 7.3 mm in height. The calice is round. The wall is thick, porcelaneous, and smooth. Finely granulated, equal costae can be distinguished only at the calicular edge.

Septa are arranged in six systems and four cycles. S_1 reach the columella and bear seven-nine prominent spines. The one-three spines closest to the columella are slender and tall, compressed in the plane of the septum. The next several spines are larger and strongly compressed perpendicular to the plane of the septum. The outermost spines are much smaller, grading into a costal dentition near the base. S_2 and S_3 are equal in size and slightly smaller than the S_1, but bear similar septal spination. S_4 are much smaller and bear seven-eight small spines. S_5 are sometimes present in the largest coralla. When this occurs, the S_4 that are flanked by the S_5 are enlarged to the same size as the S_2 and S_3, and the S_5 are the same size as typical S_4. S_{1-3} are equally exsert; S_4 are slightly less exsert. All septa bear low, rounded granules, often occurring in pairs.

Plate-like granules on the lower, inner edges of the S_{1-3} often unite with those of adjacent septa, forming a solid platform surrounding the columella. The columella is massive, round, and flat, composed of numerous crispate, spongy trabeculae. The fossa is relatively shallow.

Discussion. – There are three nominal species of *Anthemiphyllia: A. patera* Pourtalès; *A. dentata* (Alcock, 1902) (Celebes Sea, Japan); and *A. pacifica* Vaughan, 1907 (Hawaii). YABE & EGUCHI (1942) implied that the two Pacific species were synonymous. *A. patera* is easily distinguished from *A. pacifica* by its shape, porcelaneous base, and distinctive columella.

Material. – P-861 (6) USNM 45916; G-688 (4) USNM 45915; BL-100 (15) MCZ, (2) USNM; Gos-1656 (1); Hudson-4B (10) NMC.

Types. – The holotype, collected at BL-16, is not at the MCZ, USNM, or BM; it is presumed lost.
Type-Locality. – 23°11'N, 82°23'W (off Havana, Cuba); 534 m.

Distribution. – Off Fernandina, Florida; Northwest Providence Channel, Bahamas; off Havana, Cuba; Grenadines, Lesser Antilles (Map 6). 500–700 m.

Suborder CARYOPHYLLIINA Vaughan & Wells, 1943

Superfamily CARYOPHYLLIICAE Gray, 1847

Family **CARYOPHYLLIIDAE** Gray, 1847

Subfamily Caryophylliinae Gray, 1847

Genus **Caryophyllia** Lamarck, 1801

Diagnosis. – Solitary; ceratoid, turbinate, or subcylindrical; fixed or free. Septotheca usually strongly costate. Pali opposite S_3 in one crown (or before second group of septa when hexameral symmetry obscured). Columella fascicular, formed of twisted ribbons. Type-species: *Madrepora cyathus* Ellis & Solander, 1786, by subsequent designation (BRODERIP, 1828).

KEY TO THE ELEVEN WESTERN ATLANTIC SPECIES OF *Caryophyllia*

1 Corallum free. 2
1′ Corallum attached. 4

2 Calicular diameter of adult over 30 mm; usually more than 48 septa . . . . *C. ambrosia caribbeana* n. subsp.
2′ Calicular diameter of adult rarely exceeds 10 mm; 48 septa or less 3

3 Basal tip invariably broken off; pali irregular and poorly developed; 36 or less septa . . . *C. cornuformis* Pourtalès, 1868
3′ Basal tip often pointed; pali well developed; usually 48 septa . . . . *C. horologium* Cairns, 1977

4 Septa arranged hexamerally 5
4′ Septa not arranged hexamerally (pentamerally, heptamerally, octamerally, or decamerally) 10

5 Pali before antipenultimate cycle of septa (S_2) . . . . *C. paucipalata* Moseley, 1881
5′ Pali before penultimate cycle of septa (usually S_3). 6

6 Last cycle of septa (S_4) extends as far or farther toward the columella as penultimate cycle (S_3) . . . . *C. polygona* Pourtalès, 1878
6′ Last cycle of septa does not extend as far toward the columella as the penultimate cycle 7

7 Fine thecal striae occur perpendicular to the costae . . . . *C. corrugata*, n. sp.
7′ No thecal striae. 8

8 Corallum small (average cd = 6 mm, 6–8 mm tall); short, oblique carinae on faces of S_4 . . . . *C. parvula*, n. sp.
8′ Corallum large (over 10 mm in cd); no carinae on septal faces 9

9 Costae prominent, ridged; columellar elements usually fused to one another laterally; 55–91 m depth range. . . . . *C. horologium* Cairns, 1977

9′ Costae usually flat; columellar elements distinct; 100–1033 m depth range . . . . *C. berteriana* Duchassaing, 1850

10 Septa always arranged octamerally; septal granules fused into short, oblique ridges near the inner septal margin . . . . *C. barbadensis*, n. sp.

10′ Septa arranged heptamerally, octamerally, or decamerally; septa never ridged. 11

11 Septa arranged decamerally. 12

11′ Septa arranged heptamerally or octamerally . . . . *C. berteriana* Duchassaing, 1850

12 Theca costate (not porcelaneous); fossa moderately deep; pali very narrow; upper corallum brownish . . . *C. zopyros*, n. sp.

12′ Theca porcelaneous; fossa very shallow; pali narrow; corallum entirely white . . . . *C. antillarum* Pourtalès, 1874

10. **Caryophyllia berteriana** Duchassing, 1850

Plate VI, figures 4–8; Plate VII, figure 1

Caryophyllia berteriana Duchassaing, 1850: 15. – Milne Edwards & Haime, 1857: 19, pl. D1, fig. 1. – Duchassaing & Michelotti, 1860: 59; 1864: 64. – Duchassaing, 1870: 24. – Pourtalès, 1871: 8. – Duncan, 1873: 317. – Pourtalès, 1874: 33–34, pl. 1, figs. 1–2; 1880: 96, 99. – ?Vaughan, 1901: 292 (specimen lost). – Lewis, 1965: 1063. – Zibrowius, 1976: 117. – Cairns, 1977b: 5; 1978: 10.

Caryophyllia formosa Pourtalès, 1867: 113; 1871: 7–8, pl. 1, fig. 16. – Duncan, 1873: 317. – Pourtalès, 1878: 199.

Not *Caryophyllia berteriana*: Lindström, 1877: 8 (= *C. antillarum* and *Trochocyathus rawsonii*) – Moseley, 1881: 134. – Gardiner, 1904: 112–113 (see Discussion). – Wells, 1958: 261. – Squires, 1961: 17.

Description. – The corallum is ceratoid and laterally compressed, producing a round to elliptical calice. The pedicel is usually reinforced by concentric layers of stereome but may be be quite slender.

The corallum is firmly attached to the substrate by a thin, encrusting base. An average corallum measures 17.5 × 16.5 mm in calicular diameter and about 22 mm tall. The expression of costae is variable. Usually they are broad, flat, and subequal (C_4 broader than C_{1-3}), separated by narrow furrows, and prominent only near the calice. Sometimes, however, C_{1-3} form low ridges extending halfway to the base. Costal granules are small and arranged such that three–five low, rounded granules can be counted across the width of each costa near the calice.

Septa are arranged in four cycles and usually six systems, although seven and eight systems are common, resulting in 48, 56, or 64 septa. S_1 and S_2 are moderately exsert and equal in size, extending three-fourths of the distance to the columella. S_3 and S_4 are progressively smaller and less exsert. The inner margins of the S_1, S_2, and S_4 are slightly sinuous, whereas those of the S_3 are very sinuous with broad septal undulations. Septal granules are high and blunt, sometimes fusing into short, oblique carinae, which are arranged in widely spaced rows on slight undulations.

Depending on the number of systems present, there may be 12, 14, or 16 pali arranged in a ring before the S_3. They are tall, thin, rounded on their upper edges, and have sinuous inner margins. The palar granules are larger than those of the septa. The columella is composed of 2–17 small, tightly twisted, pointed ribbons, which are rarely fused together. They are arranged linearly or randomly in an elliptical field.

Discussion. – POURTALÈS (1867) described *C. formosa* to apply to those forms with only twelve pali, a light, thin corallum (before secondary stereome thickening), and less exsert septa than *C. berteriana*. With more material at hand, POURTALÈS (1880) synonymized *C. formosa*. MOSELEY's *C. berteriana* is very similar to this species but has much thicker septa at the calicular edge and a narrower corallum. Additionally, this specimen is from the eastern Atlantic from 2779 m, well outside the known bathymetric and geographic ranges for *C. berteriana*.

GARDINER's (1904) specimens from South Africa are distinctly different from *C. berteriana* in that they possess file-sculptured thecae and the S_4 are much longer than the S_3. They probably represent an undescribed species. This erroneous African record formed the basis of WELLS's (1958) and SQUIRES's (1961) distributional records.

Material. – P-208 (1) USNM 45997; P-209 (1) USNM 45998; P-848 (1) USNM 46000, (1) UMML 8: 237; P-849 (2) USNM 46001; P-904 (1) USNM 46002; P-944 (2) USNM 46003; P-1140 (8) USNM 45999; G-23 (1) USNM 45986; G-261 (1); G-304 (2) USNM 45987; G-311 (1) USNM 45988; G-509 (2) UMML 8: 354; G-661 (1) USNM 45989; G-663 (2) USNM 45990; G-667 (1); G-707 (6) USNM 45991; G-708 (2) USNM 45992; G-711 (1) USNM 45993; G-725 (1) UMML 8: 352; G-889 (2) USNM 45994; G-1312 (1) USNM 45996; G-1329 (3) USNM 45995; CI-7 (1) USNM 46004; O-1993 (1); O-2356 (4); O-2655 (1); O-4297 (1); O-4398 (36); O-5015 (12); O-5432 (2); O-5645 (1); O-5648 (42); O-5934 (1); O-10833 (1); SB-3467 (1); SB-3472 (2); BL-20 (1) MCZ; BL-32 (1) MCZ; BL-45 (1) MCZ; BL-132 (2) MCZ; BL-154 (4) MCZ; BL-156 (1) MCZ; BL-157 (4) MCZ; BL-158 (1) MCZ; BL-189 (1) MCZ; BL-231 (1) MCZ; BL-240 (2) MCZ; BL-253 (1) MCZ; BL-254 (2) MCZ; BL-273 (6) MCZ; BL-293 (2) MCZ; BL-290 (39) MCZ; BL-292 (2) MCZ; BL-296 (9) MCZ; Hassler, off Barbados, 183 m (21) MCZ; Alb-2152 (2); Alb-2153 (3) USNM 7190; Alb-2342 (1) USNM 10232; Combat-238 (1) USNM 46005; Combat-447 (1); Combat-450 (1) USNM 45660; Combat-452 (1); Gos-112/78 (1); E-26017 (1); E-26549 (1); E-30179 (2); BLM 33-I-C (1) Alabama BLM; Atl-2980 B (1) MCZ; Atl-3341 (1) MCZ; Atl-3482 (2) MCZ; TAMU 65A9-15A (15) TAMU; east edge of DeSoto Canyon, west of Cape San Blas, Florida, 183–549 m (2) AMNH; Hummelinck-1443 (27). – Syntypes of *C. formosa*; Lindström's (1877) *C. berteriana*; Moseley's (1881) *C. berteriana*; Gardiner's (1904) *C. berteriana*.

Types. – The types of *C. berteriana* are probably lost; none are labelled as such at the MIZS or the MNHNP. Two syntypes of *C. formosa* are deposited at the MCZ (2756), collected at Corwin-2 or 4 off Havana in 494 m. Another syntype is at the YPM (4762).
Type-Locality. – Guadeloupe (Lesser Antilles); 100 m.

Distribution. – Common throughout Caribbean and eastern Gulf of Mexico, ranging from off Florida to off Surinam; however, present off northern coast of South America only off Leeward Group (Map 7). 100–1033 m. 7–23°C, based on six records.

11. **Caryophyllia cornuformis** Pourtalès, 1868

Plate VII, figures 2–5

Caryophyllia cornuformis POURTALÈS, 1868: 133; 1871: 9, pl. 1, figs. 14–15. – DUNCAN, 1873: 317. – POURTALÈS, 1878: 198–199; 1880: 96, 99–100. – LEWIS,

1965: 1063. – ZIBROWIUS, 1976: 137–139, pl. 73, figs. A–L. – CAIRNS, 1978: 10.

Caryophyllia pourtalesi DUNCAN, 1873: 317, pl. 42, figs. 3–10. – ?LINDSTRÖM, 1877: 8 (in part: northwest Atlantic specimen only), pl. 1, fig. 4. – DUNCAN, 1878: 238, pl. 43, figs. 1–7, 11–14; 1883: 362. – LINDSTRÖM, 1884: 102.

Caryophyllia communis: JOURDAN, 1895: 12 (in part: Sta. 161).

Caryophyllia clavus: GRAVIER, 1920: 16 (in part).

Not *Caryophyllia cornuformis*: GARDINER & WAUGH, 1938: 179–180, text-fig. 2.

Description. – The corallum is small, free, and regularly curved, tapering only slightly toward the base. The base is always broken, revealing one or two cycles of septa. The largest corallum examined, containing 40 septa, measures 10.2 mm in calicular diameter and 25.0 mm tall, but an average-size specimen measures 5.5–6.5 mm in calicular diameter and contains 24–28 septa. The theca is usually porcelaneous and smooth, interrupted only by fine intercostal striae. The costae are broad, flat and extend to the base. C_3 are slightly broader than the other costae. Low, rounded granules are sometimes distinguishable on the costae, arranged such that four-five can be counted across the width of each costa near the calice. The calicular edge is regularly serrate, a low apex corresponding to every septum.

Septa are arranged in three cycles but in a variable number of systems, ranging from five to eleven. Typical septal arrangements are: 6/6/12, 7/7/14, and 8/8/16; the largest has 11/11/18. The total number of septa is roughly a function of calicular size, with new systems developing with growth. First an S_2 forms between two S_1, then two S_3 develop, flanking the S_2. Simultaneously, a palus forms before the S_2. Often the incipient palus seems to be an adjacent columellar rod that enlarges, changing from a twisted ribbon to a lamellar plate. S_1 are slightly exsert and extend almost to the columella. S_2 and S_3 are progressively less exsert and smaller. The inner edges of all septa descend vertically into a moderately deep fossa; those of the S_1 and S_3 are sinuous, whereas those of the S_2 are very sinuous, corresponding to septal undulations directed parallel to the trabeculae. Pointed septal granules are arranged in lines on the crests of the septal undulations. The granules become less prominent toward the septal edge, which may be smooth or porcelaneous.

Palar development is very irregular. When present, the pali stand before the S_2; however, they may be completely absent or correspond to any number of S_2. They are typical in shape for the genus, with sinuous inner edges. Sometimes, however, they are large, spirally twisted rods, like the columella, especially when the system is newly formed. The palar granules are about twice the size of the septal granules and are often arranged in short carinae oriented horizontally or slightly obliquely. The columella is composed of one-nine tightly twisted ribbons, which lie in an elliptical palar fossa.

Discussion. – LINDSTRÖM's specimen of *C. pourtalesi* is atypical in that its pali are very poorly developed for its size. The distributional gap between Georgia and Newfoundland, as well as the difference in bathymetry is similar to the disjunct distribution of *C. ambrosia caribbeana*. More specimens from the northeast Atlantic may show a subspecific difference.

Material. – P-600 (1) USNM 46042; P-606 (2) USNM 46043; P-877 (2) USNM 46045; P-889 (2) USNM 46044; P-891 (2) UMML 8: 357; G-132 (1) USNM 46028; G-134 (1) USNM 46040; G-289 (38) USNM 46029, (4) UMML 8: 234; G-299 (10) USNM 46030; G-300 (18) USNM 46031; G-301 (1) USNM 46032; G-663 (29) USNM 46033, (9) UMML 8: 358; G-664 (200) USNM 46034; G-676 (1) USNM 46035; G-715 (3) USNM 46041; G-861 (2) USNM 46036; G-1015 (1) USNM 46039; G-1322 (5) USNM 46037; G-1323 (5) USNM 46038; O-2068 (5); O-2776 (6); O-4226 (100); SB-2425 (1); SB-2445 (3); BL-19 (10) MCZ; BL-100 (2) MCZ; BL-274 (2) MCZ; Alb-2659 (1) USNM 16114; Alb-2750 (33) USNM 36420; Alb-2756 (11) USNM 36363; Gos-1590 (3); Gos-1748 (1); E-43 (1); E-26019 (1); Akaroa-5c (1) SME. – Syntypes of *C. cornuformis* and *C. pourtalesi*; Lindström's (1877) specimens (NRM).

Types. – Two lots of syntypes are deposited at the MCZ: one lot, labelled "Fl. Straits, 237–250 fms" (5493a), contains two poor specimens; the other lot, labelled "Florida, 250 fms" (2771), contains three specimens, one of which is in good condition. DUNCAN's *C. pourtalesi* is based on two syntypes deposited at the BM (1883.12.10.143, 1880.12.10.22).
Type-Locality. – Off Sand Key and the Samboes, Florida; 433, 454 m.

Distribution. – Western Atlantic: Antillean distribution and off eastern Yucatan Peninsula to Belize (not off northern coast of South America); off Brazilian coast to Recife (Map 8). 37–931 m. – Elsewhere: northwest Atlantic from 46°–63°N. 1065–1970 m; eastern Atlantic in area bounded by the Celtic Sea, the Azores, and Morocco. 1300–2200 m.

12. **Caryophyllia antillarum** Pourtalès, 1874

Plate V, figures 8–10

Caryophyllia antillarum POURTALÈS, 1874: 34 (in part: see Types), pl. 6, figs. 3–4; 1880: 96, 100 (in part: BL-157, 166, 273, 288, 300).
Caryophyllia berteriana: LINDSTRÖM, 1877: 8 (in part: the larger of the two specimens).
Not *Caryophyllia antillarum*: POURTALÈS, 1878: 199 (indeterminate).
Not *Caryophyllia* sp. cf. *antillarum*: GOREAU & WELLS, 1967: 449. – WELLS, 1973: 58 (= *Caryophyllia* C, Cairns, 1976).

Description. – The corallum is ceratoid, narrowing to a pedicel measuring about one-half the calicular diameter, which expands basally to form an encrusting attachment. The calice is round to slightly elliptical. The lectotype measures 9.0 × 8.6 mm in calicular diameter. The theca is smooth and porcelaneous, covered by very low, rounded granules. Costae are not usually distinguishable, but when present they are broad, flat, unequal (those corresponding to the tertiaries are twice as broad as all others), and separated by narrow, very shallow striae.

Septa are usually arranged decamerally in three cycles: 10/10/20. The 10 primaries are moderately exsert and extend about three-fourths of the distance to the columella. Secondaries and tertiaries are progressively less exsert and extend about halfway to the columella, the tertiaries being only slightly smaller than the secondaries. The inner edges of the primaries and tertiaries are only slightly sinuous, whereas those of the secondaries are extremely sinuous. The sinuosity reflects the septal undulations, running perpendicular to the trabeculae. The septal faces are smooth except for small pointed granules arranged in widely spaced rows on the crests of the septal undulations.

A very tall, narrow palus stands before each secondary septum, separated from it by a deep, narrow notch. Palar granulation is more prominent than that of the septa, consisting of numerous taller, blunt spines, which sometime form short horizontal carinae. The pali form an elliptical ring enclosing an elongate columella, which is composed of three–ten slender, twisted ribbons usually arranged in two parallel rows. The ribbons are basally interconnected as well as connected to the inner edges of the pali. The fossa is very shallow; the tops of both the pali and columellar elements usually rise above the calicular edge.

Discussion. – *C. antillarum* is easily distinguished from all other western Atlantic *Caryophyllia* but easily could be confused with *C. abyssorum* Duncan, 1873, known only from the eastern Atlantic between 1000–1500 m. *C. abyssorum*, also decameral, differs in that it has a curved, slightly larger, more massive corallum, with thicker septa and a deeper fossa.

Material. – P-876 (2) USNM 45919; G-694 (1) USNM 45917; G-706 (1) UMML 8: 235; G-707 (1) USNM 45918; CI-93 (1) USNM 45920; BL-76 (1) MCZ; BL-157 (1) MCZ; BL-166 (1) MCZ; BL-273 (9) MCZ; BL-288 (2) MCZ; BL-300 (2) MCZ; Atl-3332 (1) MCZ; Pocock-IV (1) NMC; ?SME-1776 (1) SME. – Syntypes of *C. antillarum;* Lindström's (1877) specimen.

Types. – Three lots containing six syntypes of *C. antillarum* are deposited at the MCZ. The single specimen in lot 2786, the only one that is figured and described in the original description, is designated lectotype. Only one of the four specimens in lot 5432 is the same species (designated paralectotype); the other three are *Caryophyllia barbadensis*, n. sp. (1) and perhaps *Caryophyllia zopyros*, n. sp. (2). The third lot (5477) contains one specimen of *Caryophyllia barbadensis*. All six specimens were collected at an undetermined Hassler station off Barbados.
Type-Locality. – Barbados; 183 m.

Distribution. – Antillean distribution (Map 9). 150–1000 m.

13. **Caryophyllia polygona** Pourtalès, 1878

Plate VII, figures 6–9

Caryophyllia polygona Pourtalès, 1878: 198–199; 1880: 96; Cairns, 1978: 10.
Caryophyllia antillarum: Pourtalès, 1880: 100 (in part: BL-108).

Description. – The corallum is usually ceratoid and is firmly attached by a long, slender pedicel one-fourth to one-third the calicular diameter, which expands into a thin, encrusting sheet basally. Some specimens are more stout, with a shorter and thicker pedicel and thickened upper theca. The calice is round to slightly elliptical in shape. The largest specimen examined measures 18.2 × 15.2 mm in calicular diameter and 32.1 mm tall, but normally individuals are much smaller. C_1 and C_2 are usually highly ridged, even cristiform, from the calice to the base. Sometimes, however, the ridges are prominent only near the calice, or for a short distance in the middle of the corallum, or, in rare cases, not ridged at all. C_3 and C_4 are usually not prominent. Specimens in good condition usually have smooth, porcelaneous thecae with no evidence of costal granulation. A small specimen of 24 septa measuring 5 mm in calicular diameter has a smooth, translucent, milky-white theca. Worn specimens, however, reveal a fine granulation of low, rounded tubercles. The calicular edge is serrate, forming a large apex corresponding to every septum of the first two cycles and a much smaller apex for every septum of the third and fourth cycles.

Septa are arranged in six systems and four cycles; the fourth cycle is usually complete at a calicular diameter of 10 mm. S_1 are slightly larger than S_2. Both are highly exsert and extend about two-thirds of the distance to the columella. S_4 are smaller and less exsert than the S_2 but more exsert than the S_3 and also usually extend farther toward the columella than the S_3. The inner edges of all septa are usually straight but may be slightly sinuous, especially the inner edges of the S_3. Moderately tall, pointed, blunt granules occur randomly on the septal faces.

A tall, large palus stands before each S_3 and is separated from the septum by a moderately deep and narrow notch. The palar granulation is more prominent and the palar margins much more sinuous than those of the septa. The pali form an elliptical crown inside which the columella rests. The columella is composed of 4–15 slender, twisted ribbons, often linearly arranged in one–three parallel rows. The fossa is moderately deep.

Discussion. – In five of the 19 valid species of Atlantic *Caryophyllia* the last cycle of septa (usually S_4) extends farther toward the columella than the septa of the penultimate cycle (usually S_3): *C. ambrosia* Alcock, 1898; *C. polygona* Pourtalès, 1878; *C. barbadensis*, n. sp.; *C. atlantica* Duncan, 1873; and *C. calveri* Duncan, 1873. The last two are known only from the eastern Atlantic. *C. polygona* can be distinguished from all of these species by its prominently ridged C_1 and C_2. Other characters, such as porcelaneous theca, hexameral symmetry, and lack of septal carinae additionally serve to differentiate it from these species.

Material. – P-586 (6) USNM 46049, (1) UMML 8: 238; P-634 (8) USNM 46050, (4) UMML 8: 356; P-1262 (1) UMML 8: 355; G-296 (1) USNM 46046; G-372 (1) USNM 46047; G-1111 (1) USNM 46048; O-11722 (1); BL-108 (1) MCZ; Gos-112/78 (1) Cornell; E-26017 (1); TAMU 69A13–16 (4) TAMU; Rosaura-34 (1) BM. – Syntypes of *C. polygona*.

Types. – The two syntypes, collected from BL-41, are deposited at the MCZ (5476).
Type-Locality. – 23°42′N, 83°13′W (western Straits of Florida); 1573 m.

Distribution. – Antillean distribution; off Campeche Bank, Mexico (Map 6). 700–1817 m. 5–8°C, based on four records.

14. **Caryophyllia paucipalata** Moseley, 1881

Plate VIII, figures 1–6

Caryophyllia paucipalata Moseley, 1881: 138, pl. 1, figs. 3, 3a.

Description. – The corallum is trochoid, narrowing to a base of attachment measuring about half the calicular diameter. The calice of the lectotype is round, measuring 10.5 mm in diameter; the corallum is 17.5 mm tall. The theca is very thick and bears broad, equal, flat costae barely distinguishable in the upper two-thirds of the corallum. On the basal third, faint intercostal striae are present. Low, rounded costal granules are visible only in the upper corallum; consequently the theca is rather smooth.

The septa of the lectotype are arranged pentamerally (5/5/10/20); however, the septal arrangement in three subsequently collected specimens is hexameral, and the latter is believed to be the normal condition. S_1 are slightly exsert and extend almost halfway to the columella. S_1 are only slightly larger than the S_2 and S_3, which are about the same size. The S_4 are about half the size of the S_3. The inner edges of all septa are slightly sinuous, the paliferous septa (S_2) to the greatest degree. The septa bear moderately tall, pointed granules.

Typical *Caryophyllia*-like pali stand before the S_2; however, only five pillar-like pali are present in the lectotype. The columella, which lies slightly below the pali, consists of one-five twisted laths. The fossa is moderately deep.

Discussion. – *C. paucipalata* is unique among the Atlantic *Caryophyllia* in that its pali stand before the antipenultimate group (second group) of septa instead of the penultimate group (usually the third) as in all others.

C. paucipalata should not be confused with *C. paucipaliata* Yabe & Eguchi, 1942, a Pliocene fossil from Japan.

Material. – BL-266 (1) MCZ; Rosaura-34 (2) BM 1938.3.1.83–91. – Types.

Types. – The two syntypes from Chall-24 are deposited at the BM (1880.11.25.34). The more complete specimen, which formed the basis of the original description and both figures, is herein designated as lectotype. The other specimen (paralectotype) is very worn but hexameral in septal arrangement.
Type-Locality. – Off Culebra, Virgin Islands; 714 m.

Distribution. – Known only from the Windward Group, Lesser Antilles (Map 9). 714–843 m.

15. **Caryophyllia ambrosia caribbeana,** new subspecies

Plate V, figure 4; Plate VI, figures 1–3, 9

Caryophyllia communis var. *costata*: Pourtalès, 1880: 100, pl. 1, figs. 12–13.
Caryophyllia ambrosia: Boone, 1928: 7–8, pls. 2–3. – Keller, 1975: 180, pl. 2, figs. 5–8.
?*Caryophyllia clavus*: Lewis, 1965: 1063.
Caryophyllia sp. cf. *C. ambrosia*: Cairns, 1978: 10.

Description. – The trochoid to turbinate corallum tapers to a very narrow, pointed, unattached base. The lower part of the corallum is usually curved about 90° (20°–180°) in the direction of the smaller calicular axis. The largest specimen measures 44.3 × 36.8 mm in calicular diameter and 69 mm tall. The expression of costae and costal granulation is quite variable. Usually the C_1 are prominent and ridged, highest near the calicular edge, and extend almost to the base. Broader, flat costae, equal in size and separated from one another by narrow, shallow striae, correspond to the other septa. Sometimes none of the costae are ridged, but all are broad and flat or slightly convex; at other times, in addition to the primaries, the secondary costae are also slightly ridged. The costal granulation is usually very coarse, consisting of small, pointed spines, producing a very rough texture.

Septa of three different sizes are distinguishable: primaries, secondaries (bearing the pali), and tertiaries. Adult coralla usually possess 14, 16, or 18 primaries (56, 64, or 72 septa), rarely 12; all are highly exsert. This causes the calicular edge to be serrate, because the theca rises to an apex at each primary. The tertiaries flanking each primary are also quite exsert. The primaries extend three-fourths of the distance to the columella, the secondaries about half the distance. The secondaries are only slightly exsert and usually do not extend as far toward the columella as the tertiaries. The inner edges of the primaries and tertiaries are straight to slightly sinuous; those of the secondaries are the most sinuous, especially adjacent to the pali. The septa are thin and smooth except for low, blunt granules arranged in widely spaced rows on the crests of septal undulations, which run perpendicular to the trabeculae.

Each secondary septum bears a large palus, sometimes larger than the septum it borders, which extends to the columella. The pali are separated from the secondaries by deep, narrow notches and have very sinuous margins. Their granulation is much more prominent than that of the septa, usually composed of long (three-four times the palar thickness), blunt spines, which are often fused into short carinae.

The columella is elongate, enclosed by the elliptical palar crown. It is composed of numerous twisted, fascicular ribbons, which are usually fused to one another and to the pali. The ribbons often occur in one straight row but may also be arranged in two parallel rows or randomly in an elliptical field. The interiors of older coralla are solidly filled in with stereome.

Discussion. – Some authors (*e.g.*, POURTALÈS and MOSELEY) have attributed the common western Atlantic *Caryophyllia* to *Ceratocyathus communis* Seguenza, 1864, an Italian fossil species.

There is no doubt that *C. ambrosia* is similar, if not identical, to *Ceratocyathus communis*, as well as to *C. affinis*, *C. ponderosus*, *C. scillae*, *C. suborbiculata*, *C. ecostatus*, and *C. costatus*, all attributable to SEGUENZA. However, because none of SEGUENZA's types are preserved, his figures are inadequate, and the geological age of his fossils is not certain, some authors (*e.g.*, ZIBROWIUS) have chosen not to accept his names for Recent species. Therefore, the first available name for the Recent species is *Caryophyllia ambrosia* Alcock, 1898.

The Caribbean and Gulf of Mexico specimens differ slightly but consistently from typical *Caryophyllia ambrosia* Alcock, 1898. The two most conspicuous differences, both of which are qualitative and somewhat subjective, concern the shape of the corallum and the nature of the costae. First, the corallum of *C. a. caribbeana* is more open, not as slender as in *C. a. ambrosia*. Second, the costae of *C. a. caribbeana* are more prominent, often ridged, and highly granulated, producing a rough texture. Furthermore, they are usually unequal, the C_1 and C_2 being larger. The costae of *C. a. ambrosia* are flat and equal, with a very fine, rounded granulation, producing a smooth texture. These morphological differences are augmented by both a geographic and bathymetric isolation of the two forms. *C. a. caribbeana* is widely distributed in the Gulf and Caribbean, off Brazil, and as far north as 26°28'N off east Florida, at depths of 183–1646 m. The typical subspecies is known from the Indian Ocean, eastern Atlantic, and in the western Atlantic off the northeast coast of North America no farther south than 38°34'N, from 1600–3000 m. It has been reported from off the northeast coast of the United States by MOSELEY (1881) and VERRILL (1885a, 1908a) as *C. communis*.

The first new name applied to the Caribbean subspecies was *C. communis* var. *costatus* Pourtalès, 1880; however, this combination is a junior homonym of SEGUENZA's (1864) *Ceratocyathus* (= *Caryophyllia*) *costatus*. The name *caribbeana* is proposed for the new subspecies. *C. seguenzae* Duncan, 1873 (eastern Atlantic) may also prove to be another subspecies of *C. ambrosia*.

Material. – P-340 (8) USNM 45974; P-364 (5) UMML 8: 351; P–394 (15) USNM 45973; P-445 (1) USNM 45975; P-448 (1) USNM 45976; P-478 (9) USNM 45980, (4)

UMML 8: 350; P-605 (1) USNM 45977; P-607 (11) USNM 45978; P-636 (2) USNM 45979; P-682 (7) USNM 45923, (2) UMML 8: 349; P-741 (12) USNM 45981, (1) UMML 8: 236; P-747 (2) USNM 45957; P-753 (100) USNM 45922; P-754 (6) USNM 45958; P-846 (2) USNM 45959; P-850 (3) USNM 45982; P-861 (4) USNM 45960; P-881 (13) USNM 45961; P-889 (4) USNM 45962; P-891 (2) USNM 45963; P-918 (6) USNM 45964; P-944 (1) USNM 45965; P-984 (2) USNM 45966; P-1171 (2) USNM 45971; P-1187 (3) USNM 45967; P-1255 (1) USNM 45968; P-1256 (1) USNM 45969; P-1262 (2) USNM 45970; P-1355 (1) 45983; 49 specimens from 19 Gerda stations in the Straits of Florida; GS-31 (55) USNM 45924; CI-12 (1) USNM 45985; CI-93 (1) USNM 45984; O-1884 (1); O-1911 (20); O-1981 (15) USNM 45658; O-1982 (3) USNM 45661; O-1985 (34) USNM 53370; O-1989 (30) USNM 45659; O-2202 (2); O-2637 (1); O-2772 (2); O-2774 (1); O-2775 (1); O-3252 (4); O-3550 (1); O-3553 (2); O-3554 (1); O-3562 (1); O-3573 (2); O-4226 (11) USNM 45925; O-4302 (9); O-4304 (7); O-4421 (1); O-4423 (9); O-4713 (3); O-4840 (1); O-4907 (10); O-4911 (1); O-4913 (2); O-5629 (1); O-5636 (7); O-5639 (1); O-5740 (3); O-5925 (1); O-5929 (4); O-6695 (2); O-6696 (1); O-6701 (1); O-6703 (2); O-6721 (6); O-6722 (5); O-10173 (2); O-10491 (3); O-10513 (1); O-10825 (3); O-10827 (2); O-10831 (1); O-10833 (1); O-10843 (1); O-10875 (5); O-10876 (1); O-10877 (1); O-10901 (2); SB-2474 (1); SB-2475 (13); SB-3514 (1); SB-3515 (6); SB-5142 (4); SB-5144 (1); SB-5168 (1); BL-2 (2) MCZ; BL-134 (2) MCZ; BL-143 (1) MCZ; BL-214 (1) MCZ; BL-227 (1) MCZ; BL-254 (1) MCZ; BL-258 (2) MCZ; BL-274 (1) MCZ; Alb-2117 (8) USNM 7057; Alb-2385 (2) USNM 10375; Alb-2392 (5) USNM 16106; Alb-2393 (1) USNM 10417; Combat-450 (23); Combat-449 (3); Caroline-23 (1); 47 specimens from 18 Atlantis stations from off the coasts of Cuba (MCZ); TAMU 65A9–4 (12) TAMU; TAMU 65A9–14 (22) TAMU; TAMU 65A9–15 (1) TAMU; TAMU 66A5–4 (2) TAMU; TAMU 67A5–1A (1) TAMU; TAMU 67A5–7E (2) TAMU; TAMU 67A5–8B (2) TAMU; TAMU 67A5–13E (1) TAMU; TAMU 68A3–9A (2) TAMU; TAMU 68A7–7B (1) TAMU; TAMU 68A7–9A (5) TAMU; TAMU 68A7–12B (2) TAMU; TAMU 68A7–13B (1) TAMU; TAMU 68A7–13A (3) TAMU; TAMU 68A7–15D (2) TAMU; TAMU 68A7–15H (2) TAMU; TAMU 68A13–12A (1) TAMU; TAMU 68A13–23 (1) TAMU; TAMU 70A10–35 (1) TAMU; TAMU 70A10–41 (9) TAMU; TAMU 71A8–29 (2) TAMU; SME-1758 (2) SME; SME 1761 (4) SME; SME 1777 (1) SME; Chain-35 (1); Anton Bruun-831 (6) MCZ. – Type of *C. a. caribbeana*.

Types. – Syntypes of typical *C. ambrosia* are deposited at the Indian Museum, Calcutta, the ZMA (Coel. 1179), and the MNHNP. The holotype of *C. a. caribbeana*, collected at P-388, is at the USNM (45972).
Type-Locality. – 10°16′N, 76°03′W (off Isla de Rosario, Colombia); 814–1050 m (of new subspecies).

Distribution. – Widespread throughout Caribbean and Gulf of Mexico, ranging from off Florida to off Uruguay (Map 10). Between 26°30′N and 38°30′N off eastern coast of U.S. the species is poorly documented. Typical *C. ambrosia* occurs north of 38°30′N, in the eastern Atlantic, and Indian Ocean. *C. a. caribbeana*: 183–1646 m. 5–16°C, based on 12 records. – *C. a. ambrosia*: 1600–2670 m.

16. **Caryophyllia barbadensis**, new species

Plate VIII, figures 7–9; Plate IX, figure 1

Caryophyllia antillarum POURTALÈS, 1874: 34 (in part: see Types); 1880: 100 (in part: BL-294).

Description. – The corallum is slender, slightly curved, and subcylindrical, tapering only slightly toward the base of attachment. The calice is round to slightly elliptical. The holotype measures 6.0 × 5.5 mm in calicular diameter and 12.9 mm tall. The costae, which extend to the base, are equal, broad, slightly convex, and separated by shallow, narrow striae.

Septa are octamerally arranged: 8/8/16. The eight primaries are exsert and extend almost to the columella. Secondaries and tertiaries are equal in size, less exsert, and extend about halfway to the columella. The inner edges of all septa are sinuous, those of the secondaries being the most wavy. Septal granules are prominent, equal to the septal thickness in height, and usually fuse into short, horizontal carinae at the inner edges of all the septa.

Eight tall pali, separated from the secondary septa by deep and narrow notches, form a ring encircling the columella. The pali have very sinuous margins and bear short, horizontal carinae like the septa. The columella is composed of two-four twisted ribbons linearly arranged in the elongate fossa.

Discussion. – *C. barbadensis* is distinguished from all other Atlantic *Caryophyllia* by its octameral symmetry and very sinuous pali. Other distinctive characters are its shape, tertiary septa equal in size to the secondaries, and the horizontal carinae on the septal faces.

Material. – Types.

Types. – Of the six syntypes designated for *C. antillarum*, two are *C. barbadensis*: the single specimen from lot 5477 (designated here as paratype) and one of four specimens from lot 5432 (designated here as holotype). Both specimens were collected at the same Hassler station off Barbados and are deposited at the MCZ. Four more specimens (paratypes) from BL-294 are also at the MCZ.
Type-Locality. – Barbados; 183 m

Distribution. – Known only from Barbados, Lesser Antilles (Map 11). 183–249 m.

17. **Caryophyllia corrugata**, new species

Plate IX, figures 2–5

Description. – The corallum is small, ceratoid to trochoid, and attached by a pedicel of about one-third the calicular diameter. The calice is strongly flared and elliptical; the calicular diameter of the holotype measures 9.0 × 7.8 mm. C_1 and C_2 are prominently ridged and extend about halfway to the base; C_3 are ridged only near the calice. Fine thecal lamellae, which often bifurcate and rejoin one another, run perpendicular to the costae and form a very striking pattern. Those that encompass the narrow pedicel are continuous. These lamellae are similar to those found on two Pacific species, *C. rugosa* Moseley, 1881 and *C. lamellifera* Moseley, 1881.

Septa are arranged in six systems and four complete cycles. S_1 are slightly larger than the S_2; both are highly exsert and extend almost to the columella. S_3 and S_4 are progressively smaller and less exsert. The inner edges of the S_1, S_2, and S_4 are straight or only slightly sinuous, whereas the inner edges of the S_3 are very wavy, particularly near the adjacent pali. Moderately tall, blunt, pointed granules are arranged in widely spaced, well-defined, curved rows perpendicular to the trabeculae.

Tall, slender pali, separated from the septa of the third cycle by deep, narrow notches, extend to the columella. They have rounded upper edges and moderately sinuous inner and outer margins. The columella consists of several narrow, twisted ribbons linearly arranged in the elongate fossa.

Discussion. – *C. corrugata* is easily distinguished from all other Atlantic *Caryophyllia* by its distinctive thecal sculpture. Although similar to MOSELEY's two species in this regard (see Description), it is clearly different from them in size and shape.

Etymology. – The specific name *corrugata* (Latin, = wrinkled, ridged) refers to the distinctive thecal ornamentation.
Material. – Types.

Types. – Holotype: BL-69 (MCZ). – Paratypes: P-991 (1) USNM 46859; SB-3494 (2) USNM 46860.
Type-Locality. – Off Havana, Cuba; 183 m.

Distribution. – Antillean distribution from the Virgin Islands to Cuba (Map 11). 183–380 m.

18. **Caryophyllia parvula,** new species

Plate IX, figures 6–8; Plate X, figures 5–6

Description. – The corallum is small, subcylindrical to ceratoid, and firmly attached by a broad, smooth base, which is usually thickened by deposits of stereome. The upper half of the corallum is brownish in color, whereas the basal deposits are creamy white. The holotype measures 6.1 × 5.0 mm in calicular diameter and 5.8 mm tall but is not considered to have reached its adult size. The C_1 and C_2 of the holotype are highly ridged; C_3 are ridged only near the calice. No costal granulation is apparent. In contrast, a paratype (BL–139) has a smooth theca with no evidence of costae and very low, inconspicuous thecal granules.

The septa of the holotype are arranged in six systems and four cycles but S_4 are missing in two half-systems and are developed only incipiently in four other half-systems. It is not unusual for specimens of smaller calicular diameters to have 8–11 half-systems in various stages of development. S_1 are highly exsert and slightly larger than the S_2, which, in turn, are much larger than the S_3; S_4 are equal in size to or slightly smaller than the S_3. The inner edges of all septa are sinuous, especially those of the S_3. The septal faces of the S_1, S_2, and S_3 are covered with randomly arranged, low, pointed granules. Septal granulation on the S_4 and sometimes the S_3 consists of low carinae, directed obliquely toward the columella, giving these septa a frilled appearance.

The fossa is moderately deep. A tall, narrow palus is separated from each septum of the third cycle by a deep, narrow notch. The inner and outer palar margins are slightly sinuous and their faces often bear short, horizontal carinae similar to those found on the S_4. The columella is formed of four-six narrow, irregularly shaped rods, which terminate below the level of the pali.

Discussion. – This species can be distinguished from the other western Atlantic species of *Caryophyllia* by its small size, wide base of attachment, and the distinctive carinae of the S_4.

Etymology. – The specific name *parvula* (Latin, = little) refers to the small size of the corallum in relation to the other western Atlantic *Caryophyllia*.

Material. – O-4459 (1); O-4938 (1, on base of *M. carolina*); BL, off Havana, 158 fms (= 289 m) (1) MCZ; BL-177 (1) MCZ; Steamer Norseman, 21°48'S, 40°03'W, 128 m (5); IOSP-1 (1) SME; Gos-39 (1); Atl-3332 (1) MCZ; Hummelinck-1443 (1). – Types.

Types. – Holotype: P-1140 (USNM 46865). – Paratypes: BL-139 (1) MCZ; G-984 (1) USNM 46868; SB-3494 (2) USNM 46866; SB-3496 (1) USNM 46867; Alb-2319 (1) USNM 36359; Alb-2320 (2) USNM 10094.
Type-Locality. – 20°50'N, 73°34'W (off northeast Cuba); 274-289 m.

Distribution. – Antillean distribution; Arrowsmith Bank, Yucatan; off Venezuela; off southeastern Brazil (Map 12). 97–399 m.

19. **Caryophyllia zopyros**, new species

Plate X, figures 1–4

Caryophyllia antillarum: POURTALÈS, 1880: 110 (in part: BL-239, BL-273, BL-294).

Description. – The shape of the corallum is very similar to that of *C. antillarum*: trochoid to ceratoid and firmly attached by a pedicel of about one-half the calicular diameter, which expands to form a thin encrusting base of attachment. The calice is usually round or slightly elliptical. A typical adult specimen measures 10 mm in calicular diameter and 15–17 mm tall. Broad, equal, flat to slightly convex costae are distinguishable only near the calice. They are separated at the calicular edge by shallow striae, which become indistinguishable toward the base. Low, rounded costal granules are present over the entire surface of each costa such that, on the average, three–four occur across each costa near the calicular edge. Often the upper half of the corallum is light brown, the lower half white. The theca is thick.

Septa are usually arranged decamerally in three systems; only one specimen examined has eleven primaries (44 septa). Primaries are exsert and extend about halfway to the columella. Secondaries and tertiaries are progressively less exsert and extend a progressively shorter distance toward the columella. The inner edges of the primary and tertiary septa are moderately sinuous; those of the secondary septa are most wavy. The septal faces are covered by widely spaced, low, pointed granules in a random arrangement.

A high, narrow palus stands before each secondary, separated from it by a deep, narrow notch. Both the inner and outer palar margins are sinuous and their faces bear tall, blunt granules larger than those on the septal faces. The circumscribed columella stands lower in the fossa and is composed of several slender, twisted, interconnected ribbons, which are also in contact with the inner edges of the pali.

Discussion. – *Caryophyllia zopyros* resembles *C. antillarum* in many respects, but can be distinguished by a number of characters: its theca bears equal costae instead of being porcelaneous, its fossa is deeper, its pali are narrower, and its primaries are less exsert and less distinctive.

Etymology. – The specific name *zopyros* (Greek, = pyrotechnic) alludes to the resemblance of the calicular view of the corallum to an exploding fireworks display.

Material. – BL-157 (1) MCZ; Atl-3478 (2) MCZ; Pocock-IV (1) NMC. – Types.

Types. – Holotype: BL-273 (MCZ 5577). – Paratypes: BL-273 (10) MCZ 5577, (1) USNM 46870; BL-239 (2) MCZ; BL-294 (2) MCZ; P-890 (1) USNM 46869; Discovery Bay, Jamaica, 73 m (1) USNM 46056.
Type-Locality. – 13°03′05″N, 59°36′18″W (off Barbados); 188 m.

Distribution. – Antillean distribution (Map 13). 73–618 m.

Genus **Concentrotheca**, new genus

Diagnosis. – Solitary, subcylindrical, attached by polycyclic base. Costae inconspicuous; wall thick and smooth. Pali in one crown before S_3 or second group of septa. Columella papillose. Type-species: *Thecocyathus laevigatus* Pourtalès, 1871, here designated.

Discussion. – The new genus *Concentrotheca* is erected for the single species *T. laevigatus*, which clearly does not belong to *Thecocyathus* Milne Edwards & Haime, 1848 as originally placed by POURTALÈS. It differs from this European Jurassic genus in having pali only before one cycle, a polycyclic base, and no epitheca. The monotypic genus is most closely related to *Caryophyllia* in the Caryophylliinae but differs in having a polycyclic base and a papillose columella.

Etymology. – The generic name refers to the concentric thecal rings of polycyclic development. *Gender*: feminine.

20. **Concentrotheca laevigata** (Pourtalès, 1871), new comb.

Plate XVI, figures 7–12

Thecocyathus laevigatus POURTALÈS, 1871: 14, pl. 5, figs. 3–4; 1878: 202 (in part: BL-5); 1880: 96. – GARDINER & WAUGH, 1938: 171. – ZIBROWIUS, 1974c: 25; 1976: 109–110, pl. 62, figs. A–N. – CAIRNS, 1977b: 5; 1978: 11.

Description. – The corallum is subcylindrical and firmly attached by a polycyclic base containing up to five concentric thecal rings. The calice is variable in shape: sometimes round, elliptical, or irregular. The largest specimen examined measures 8.4 mm in calicular diameter and 14.2 mm tall. The theca, particularly near the calicular edge, is thickened with stereome, which produces a heavy corallum. The theca is usually smooth and porcelaneous with no costal granulation. Equal, slightly convex costae, separated by narrow striae, are sometimes barely visible through the exterior, glossy deposits.

Septa are arranged in a regular hexameral pattern (six systems and three cycles) at calicular diameters of less than 5 mm. Above this calicular diameter there are 7–12 primary septa (half-systems), an equal number of secondaries, and usually twice as many tertiaries. However, it is common for one or more half-systems to be incomplete (lacking both tertiaries) or overdeveloped (with quaternary septa), with both conditions occurring in the same calice. The primaries are the largest septa, slightly exsert, and have vertical inner edges extending to the columella. The secondaries and tertiaries are progressively smaller and barely exsert. All septal edges are vertical and straight except for the lower inner edges of the secondaries, which are slightly sinuous adjacent to their pali. Randomly arranged, low, rounded granules cover the septal faces.

A tall, narrow, pointed palus often occurs before each secondary. The presence of pali, however, is quite variable. In a corallum containing 10 secondaries, there may be 0–10 pali. The pali are usually larger than the columellar elements and project higher in the fossa. However, sometimes the pali and columellar pillars are similar, in which case the pali can be distinguished by their position directly before the secondaries. The pali are granulated like the septa. The papillose columella is composed of 1–13 slender, granulated pillars.

Material. – P-587 (1) USNM 46240; G-849 (1) USNM 46238, (1) UMML 8: 385; G-885 (1) USNM 46239; GS (G)-71-7 (1) USNM 46242; BL-5 (57) MCZ; Bibb-194 (1) MCZ; Alb-2601 (1); Alb-2672 (1); Combat-? off Jacksonville, Florida, 321 m (5); Gos-1584 (1); Gos-1737 (2); Gos-1766 (1); west of Anna Maria Key, Florida, 366–487 m (1). – Syntypes.

Types. – One hundred fourteen syntypes, divided into nine lots, bearing the numbers 2772 and 5609, are at the MCZ. Only three of the lots can be assigned a locality: Bibb-155 (50), 141 (1), and 169 (17). The other 46 specimens are labelled as "Florida Reefs, 100–315 m."
Type-Locality. – Straits of Florida; 183–576 m.

Distribution. – Western Atlantic: northern temperate distribution from off North Carolina to Florida Keys; Arrowsmith Bank, Yucatan (Map 13). 183–800 m, 10–12°C based on four records. – Eastern Atlantic: Azores. 600–772 m.

Genus **Cyathoceras** Moseley, 1881

Diagnosis. – Solitary, ceratoid to turbinate, fixed. Septotheca usually costate. No pali. Columella fascicular, composed of several twisted ribbons. Type-species: *Cyathoceras cornu* Moseley, 1881, by subsequent designation (FAUSTINO, 1927).

21. **Cyathoceras** sp. cf. **C. cornu**

Plate XII, figures 2, 4

Synonymy for *C. cornu*:
Cyathoceras cornu MOSELEY, 1881: 156–157, pl. 4, figs. 7, 7a. – VAUGHAN, 1907: 78. – WELLS, 1936: 106; 1958: 261. – SQUIRES, 1961: 17.
?*Cyathoceras woodsi* WELLS, 1964: 110–112, pl. 1, figs. 4–7.

Description. – The lectotype of *C. cornu* is ceratoid and straight, measuring 22.7 mm from the calice to the broken pedicel. The calice is irregularly round, with a diameter of about 11.2 mm. The theca is very smooth and porcelaneous; small costal ridges are distinguishable only near the calice and near the fracture. There are no costal granules or intercostal striae.

The septa are arranged hexamerally in four complete cycles plus six pairs of S_5, for a total of 60 septa. S_1 and S_2 are equal in size, slightly exsert, and have wavy inner edges bordering the columella. S_3 are smaller, with straight inner edges. S_4 and S_5 are progressively smaller, the S_5 being quite rudimentary, and have straight, laciniate inner edges. The moderately deep fossa contains a fascicular columella composed of three very broad, twisted, and fused ribbons. The paralectotype from Chall-163 (Twofold Bay, New South Wales) is different in several respects and may be a different species. It is not considered in this comparison.

The three specimens from the Gerda and Pillsbury stations are very similar to *C. cornu*, but because of their small size and immaturity, they are not identified as such. These specimens are ceratoid to trochoid and firmly attached by a pedicel measuring about one-half the calicular diameter. The largest specimen measures 7.9 × 7.1 mm in calicular diameter and 12.3 mm tall. Costae are equal, flat or slightly ridged, and separated by very shallow, thin striae.

Septa are decamerally arranged; however, the broken base of one specimen reveals 12 septa. Ten large septa (primaries) are slightly exsert and have very sinuous, entire inner edges. The 10 secondaries are three-fourths that size and have slightly less sinuous margins. The 20 tertiaries are much smaller and have straight, slightly serrate inner edges. All septa bear small, blunt granules arranged in close-set lines oriented parallel to the trabeculae.

The fascicular columella is composed of seven-eight broad, twisted, and fused ribbons.

Discussion. – Because *C. cornu* is known from only three adult specimens (lectotype – Pl. XII 1,3, paralectotype (?), and Calypso-171), its range of variation is very poorly known and identification of small specimens is therefore uncertain. The three specimens in question are very similar to *C. cornu*, differing primarily in their symmetry and the nature of their costae. Both of these differences may be due to the variation in their size. *Cyathoceras woodsi* Wells, 1964 from off Queensland, Australia is a similar decameral species differing from *C.* sp. cf. *C. cornu* primarily in its smaller size. *C. woodsi* may prove to be a synonym of *C. cornu*.

Material. – P-596 (1); G-889 (1); G-893 (1); Calypso-171 (1) SME. – Types of *C. cornu*; types of *C. woodsi*.

Types. – The lectotype (1880.11.25.59), collected at Chall-320, and the paralectotype (1880.11.25.60), collected at Chall-163, are both at the BM. The holotype and paratypes of *C. woodsi* are deposited at the USNM.
Type-Locality. – 37°17′S, 53°52′W (off Rio de la Plata, Uruguay); 1097 m.

Distribution. – Off Rio de la Plata, Uruguay and Twofold Bay, New South Wales, Australia. The three compared specimens are known only from off Arrowsmith Bank, Yucatan Channel (Map 14). The bathymetric range of the types is 220–1097 m. The range of the compared specimens is 220–241 m.

22. **Cyathoceras squiresi**, new species

Plate XI, figures 5–9

Aulocyathus sp. Squires, 1959: 23–24, figs. 11–12.

Description. – The attached corallum is ceratoid to trochoid, ranging in shape from straight to slightly curved, bent, or scolecoid; the calice is usually round. The largest specimen examined (holotype) measures 10.7 mm in calicular diameter and 14.5 mm in height. The corallum tapers only slightly to a thick pedicel and monocyclic base, which is strengthened by deposits of stereome. The wall is likewise thickened, producing a heavy corallum. Very faint, shallow straie separate broad, flat, equal costae, which extend to the base. The costae are finely granulated with an average of three-four low, rounded granules occurring across the width of each costa near the calicular edge. In specimens in good condition, the costae and granulation are sometimes obscured by very smooth, glossy stereome.

The septa are rarely arranged in a hexameral pattern; instead, there are usually 10 primary septa (sometimes 9 or 11), all equal in size with very wavy inner edges. The secondary and tertiary septa are progressively smaller, with less wavy inner edges, and do not reach the columella as do the primaries. None of the septa, which often number 40, are exsert. The septal faces bear prominent granules arranged in rows oriented obliquely to the septal edges (perpendicular to the trabeculae). The granules often fuse to form carinae, particularly on the upper, inner edges of the primaries and secondaries.

The fossa is moderately deep and contains a compact columella composed of two–nine twisted, fascicular ribbons. The ribbons are interconnected basally and also fuse with the inner edges of the primary septa.

Discussion. – *C. squiresi* is easily distinguished from the other Recent species of *Cyathoceras* by its nonexsert septa and lack of hexameral symmetry. It is clearly identical to *Aulocyathus* sp. reported by SQUIRES (1959), who mistakenly cited the number of septa in his specimen as 28 instead of 38.

Remark. – *C. squiresi* is often found attached to *Enallopsammia profunda* and consequently is often found on deep-water coral banks, including the bank reported in the Straits of Florida (see *E. profunda*).
Etymology. – This species is named in honor of DONALD F. SQUIRES, author of numerous papers on the ahermatypic corals of New Zealand and Antarctic.

Material. – G-661 (2); SB-2484 (2); Gos-1643 (1). – Types: Squires's (1959) *Aulocyathus* sp. (AMNH 3347).

Types. – Holotype: CI-246 (USNM 46874). – Paratypes: CI-246 (4) USNM 46875; CI-140 (5) USNM 46876; G-44 (10) USNM 46877, (1) UMML 8: 282; E-26004 (2) USNM 46878; E-26017 (9) UMML 8: 296.
Type-Locality. – 26°22′N, 79°37′W (northern Straits of Florida); 743–761 m.

Distribution. – Northern temperate distribution from off Georgia to southern Florida (Map 14). 686–822 m.

Genus **Labyrinthocyathus**, new genus

Diagnosis. – Solitary, ceratoid to trochoid, fixed. Costae usually absent. No endotheca. No pali. Columella composed of interconnecting network of lamellar plates. Type-species: *Labyrinthocyathus langi*, n. sp., here designated.

Discussion. – *Labyrinthocyathus* is established for species similar to *Cyathoceras* and *Ceratotrochus*, but which have distinctive columellas composed of a network of plates instead of papillose, fascicular columellas of twisted ribbons. The genus *Crispatotrochus* is also similar to *Labyrinthocyathus*. The holotype of the type-species *C. inornatus* T. Woods, 1878 (deposited at the Macleay Museum, Sydney) has a fascicular columella of twisted ribbons (Pl. XII 5) similar to that of *Cyathoceras*. The following species are placed within this genus: *L. langi* n. sp. (type of genus) (Recent, western Atlantic), *Ceratotrochus limatulus* Squires, 1964 (Recent, New Zealand), *Cyathoceras cornu sensu* Gardiner, 1904 (Recent, Madagascar) (Pl. XI 10–11), *Cyathoceras kondoi* Wells, 1977 (Eocene, Tonga), and probably *Parasmilia mentaldoensis* Chevalier, 1961 (Miocene, Italy). The latter species was placed in *Parasmilia* instead of the superficially similar *Cyathoceras* because of the presence of an endotheca and of fine septal granules (not carinae) in *Parasmilia*. However, an endotheca was not reported for the holotype of *P. mentaldoensis*. These five species, the first four of which have been examined by the author, conform to the generic description, the diagnostic feature being the columella.

Etymology. – The generic name refers to the labyrinthine arrangement of the columellar elements. *Gender*: masculine.

23. **Labyrinthocyathus langi**, new species

Plate XIII, figures 1–4

Description. – The corallum is ceratoid to trochoid and usually bent or slightly curved. The holotype has a round calice measuring 12.0 mm in diameter narrowing to a slender pedicel 3.7 mm in diameter. It is attached by a slightly expanded base. The corallum wall is thick, particularly near the calicular edge. The theca is smooth, bearing no granulation; costae are only slightly expressed or absent. When present they are broad, flat, and separated by very faint, narrow striae.

Septa are arranged in six systems and four cycles. The holotype has two S_5 but also lacks two S_4, resulting in 48 septa. S_1 and S_2 are equal in size, slightly exsert, and extend to the columella. S_3 and S_4 are progressively smaller; however, the S_3 also reach the columella. The inner edges of the first two cycles are sinuous, whereas those of the last two cycles are less so. Widely spaced rows of low, blunt granules oriented perpendicular to the trabeculae occur on the septal faces. Sometimes short carinae occur near the septal edges.

The fossa is moderately deep with a compact columella, which is round to elliptical in outline. The columella is a maze of short, interconnected lamellae, which are not conspicuously granulated. Usually a short section of a columellar lamella borders the inner edge of every S_3. This often occurs by the bifurcation of a more centrally located lamella near the inner edge of an S_1 or S_2; the forked portions of the lamella are then directed toward each of the two S_3 that flank the S_1 or S_2.

Discussion. – *L. langi* is most easily distinguished from *L. facetus*, n. sp. by its lack of granules or carinae on the columellar elements. It is also similar to *Parasmilia mentaldoensis* Chevalier, 1961, except that the latter is decameral.

Etymology. – This species is named in honor of JUDITH LANG, who provided me with the Eastward ahermatypes, which included the holotype of this species.

Material. – Gos-1645 (1); Caroline-94 (2); E-26023 (1) USNM 46809; E-30176 (1); E-30178 (2). – Types.

Types. – Holotype: E-26017 (USNM 46871). – Paratypes: G-694 (1) UMML 8: 297; E-14038 (2) USNM 46872; Atl-3341 (2) MCZ; Alb-2354 (5) USNM 46873.
Type-Locality. – 26°38.5′N, 79°32.5′W (northern Straits of Florida); 770–785 m.

Distribution. – Antillean distribution from Virgin Islands to Cuba; Arrowsmith Bank, Yucatan; off east coast of Florida (Map 15). 695–810 m.

24. **Labyrinthocyathus facetus**, new species

Plate XII, figures 6–9

Description. – The corallum is conical, ceratoid in the smaller paratype and subcylindrical in the larger holotype. The calice is slightly elliptical, with the longer axis defining the orientation of the slightly elongate columella. The holotype measures 10.2 × 10.0 mm in calicular diameter and 21.1 mm tall. It is solidly attached to the substrate by a thick pedicel 4.4 mm in diameter. The pedicel and theca are both extensively thickened by layers of stereome. There are no costae, even at the calicular edge. The theca is covered by small, low, rounded granules and is yellowish-brown toward the calice, white toward the base.

Septa are arranged in six systems and four cycles. The holotype lacks two pairs of S_4 (44 septa), whereas the paratype has only 11 half-systems and lacks one pair of S_4 (42 septa). S_1 and S_2 are equal in size, very thick near the theca, and moderately exsert in the paratype, but almost nonexsert in the holotype. These larger septa have vertical, entire inner edges, which are sinuous, especially near the columella. The S_3 are slightly smaller, much thinner, and also have sinuous inner edges. The S_4 are the smallest septa, yet are well developed, with a much finer sinuosity to their inner edges. All septal faces are smooth, covered by only a few randomly arranged, low, blunt granules.

The columella is very distinctive. It is composed of four-six highly granulated, irregularly shaped pillars, interconnected in the holotype but independent in the paratype. These pillars are not flattened, twisted ribbons as in *Caryophyllia* or *Cyathoceras*, but highly modified lamellae, which bear coarse granules and short carinae.

Discussion. – *L. facetus* is distinguished from the only other Recent Atlantic species of *Labyrinthocyathus*, *L. langi*, by its more compact and granulated columella and by the yellowish color of of its upper theca.

Etymology. – The specific name *facetus* (Latin, =elegant, well made) is given to this handsome coral.

Material. – Types.

Types. – Holotype: GS(G)-16 (USNM 46879). – Paratype: O-11722 (1) USNM 46880.
Type-Locality. – 24°15.7'N, 81°50.3'W (Pourtalès Terrace, western Straits of Florida); 284–385 m.

Distribution. – Straits of Florida; off Savannah, Georgia (Map 15). 385–402 m.

Genus **Oxysmilia** Duchassaing, 1870

Diagnosis. – Solitary, ceratoid to trochoid, fixed. Corallum base increases in diameter by repeatedly covering raised costae with exothecal dissepiments, so as to produce partitioned concentric rings. Septotheca costate. No pali. Columella papillose or elongate, fused mass, not composed of twisted ribbons. Type-species: *Lophosmilia rotundifolia* Milne Edwards & Haime, 1849, by monotypy.

25. **Oxysmilia rotundifolia** (Milne Edwards & Haime, 1849)

Plate X, figures 7–9; Plate XI, figures 1–4

Lophosmilia rotundifolia Milne Edwards & Haime, 1849: 247, pl. 5, figs. 3, 3a; 1857: 180. – Pourtalès, 1874: 40, pl. 7, figs, 2–3; 1880: 96, 108.
Desmophyllum incertum Duchassaing & Michelotti, 1860: 60–61, pl. 9, fig. 4 (not 5). – Duchassaing, 1870: 25.
Oxysmilia rotundifolia: Duchassaing, 1870: 27. – Vaughan & Wells, 1943: 204. – Durham, 1949: 153. – Cairns, 1978: 11.
?*Lophosmilia urena* Duchassaing, 1870: 26.
Parasmilia ? punctata Lindström, 1877: 21, figs. 37–38.

?*Cyathoceras portoricensis* VAUGHAN, 1901: 293, pl. 2, figs. 1 a–c. – Lewis, 1965: 1062.
Cyathoceras incertum: ROSSI, 1958: 9–10, fig. 1.

Description. – The shape of the corallum is variable, ranging from ceratoid to trochoid to long and cylindrical. Most coralla have a thick pedicel, measuring one-third to two-thirds the calicular diameter, which expands into an encrusting base equal to or larger than the calice in diameter. The base is not polycyclic as defined by DURHAM (1949); instead, up to six concentric thecal rings can be present, as described in the generic diagnosis. The calice is elliptical; the largest specimen measures 35.0 × 27.0 mm in calicular diameter and 48 mm tall. Sometimes this species is found clumped in small quasicolonies probably produced by independent settlement of larvae.

Law, rounded costae of equal width, separated by wide, shallow grooves, correspond to every septum but are prominent only near the calicular edge and toward the base. Costal granulation is indistinguishable.

Septa are arranged in six systems and five complete cycles; larger coralla have some S_6. S_1 are highly exsert, with vertical inner edges that reach the columella. The remaining cycles of septa are progressively smaller and less exsert. The inner edges of all septa are straight and entire, except for those of the S_5, which are irregularly serrate. The lower, inner edges of the S_1 and S_2 are usually in contact with the columella; however, the S_3 are usually joined to the columella through small, slender paliform lobes (paliform trabeculae?), which are identical to the columellar elements in shape. Low, rounded, close-set septal granules are aligned parallel to the trabeculae near the septal edge, but are randomly arranged on the rest of the septal face.

The fossa is deep and bears an elongate, variable columella. Sometimes it is a massive, fused structure, which may be trilobed because of the partitioning of the inner edges of the lateral S_1. Usually it is a spongy mass of thin trabeculae, which are united basally. It also can be carinate, composed of thick granulated pillars, or quite inconspicuous.

Discussion. – DUCHASSAING (1870) established *Oxysmilia* for the single species *L. rotundifolia* Milne Edwards & Haime, 1849, because he considered it to be a colonial form distinctive from the solitary *Lophosmilia*. POURTALÈS (1874, 1880) soon realized that it was not a colonial species and therefore returned it to *Lophosmilia*. VAUGHAN & WELLS (1943) have maintained the monotypic genus *Oxysmilia* in order to distinguish it from the distinctive genera *Cyathoceras* and *Lophosmilia*, which have differently shaped columellas.

There is no doubt that *D. incertum* is a junior synonym of *O. rotundifolia*. *P. punctata* Lindström, 1877, is also considered to be a young, worn specimen of this species. *C. portoricensis* is probably a small, elongate *O. rotundifolia*, but it is too small (cd = 5.5 × 7.0 mm) to accurately identify.

Material. – P-707 (1) USNM 46059; P-709 (1) USNM 46060; P-875 (2) UMML 8: 384; P-876 (4) USNM 46061; P-1303 (2) USNM 46062; P-1384 (2) USNM 46063; P-1386 (2) USNM 46064; P-1387 (2) USNM 46065; P-1393 (4) USNM 46066; G-725 (7) USNM 46057, (1) UMML 8: 240; G-984 (1) USNM 46058; O-1890 (4); O-4297 (21); O-4459 (1); O-4832 (4); O-4833 (1); O-4904 (1); O-5016 (5); O-5648 (1); O-5954 (1); O-5955 (2); O-6435 (2); SB-3476 (1); SB-3496 (2); BL-132 (1) MCZ; BL-133 (1) MCZ; BL-155 (28) MCZ; BL-156 (1) MCZ; BL-272 (6) MCZ; BL-292 (1) MCZ; Alb-2322 (3); E-9541 (1) USNM 46067; E-26547 (1); 27°54′53″N, 93°26′50″W, 100 m (2) BLM-Texas; Chain-35 (1); Chain-36 (1); Chain-43 (11); Hummelinck-1443 (7). – Holotypes of *L. rotundifolia*, *D. incertum*, *P. punctata*, and *C. portoricensis*.

Types. – A specimen that is probably the holotype of *L. rotundifolia* is deposited at the MNHNP; however, its label is unclear. The holotype of *D. incertum* is housed at the MIZS (Coel. 318). The holotype of *Parasmilia punctata* Lindström, 1877, is deposited at the NRM (type 114). The holotype of *C. portoricensis* is at the USNM (19633). The type of *L. urena* Duchassaing, 1870, is not at the MNHNP or the MIZS and is presumed lost.
Type-Locality. – "America"; no depth specified.

Distribution. – Common throughout Caribbean and Bahamas, ranging from off North Carolina to Surinam; one record from western Gulf of Mexico (Map 16). 46–640 m.

Genus **Trochocyathus** Milne Edwards & Haime, 1848

Diagnosis. – Solitary, turbinate to ceratoid, fixed or free. Septotheca costate, partially covered by a pellicular epitheca. Discrete pali arranged opposite all but last cycle of septa in two crowns. Columella essential, papillose, or spongy. Type-species: *Turbinolia mitrata* Goldfuss, 1827, by subsequent designation (MILNE EDWARDS & HAIME, 1850).

Discussion. – ALLOITEAU (1958) incorrectly changed the type of the genus to *T. plicata* Michelotti, 1838, apparently based on recommendation 69 B 11 or 12 of the International Code of Zoological Nomenclature; however, MILNE EDWARDS & HAIME (1850: xiv) clearly chose *T. mitrata* at a much earlier date.

The generic limits of *Trochocyathus*, *Paracyathus* Milne Edwards & Haime, 1848, *Tethocyathus* Kühn, 1933, and *Thecocyathus* Milne Edwards & Haime, 1848 have been interpreted differently by past authors primarily because of their choice of diagnostic characters and the interpretation of these characters. Consequently the numerous species assigned to these genera by SEMPER (1872), ALCOCK (1902), MARENZELLER (1907), VAUGHAN (1907), GARDINER & WAUGH (1938), YABE & EGUCHI (1942), and others should be reanalyzed in light of recent emendations of the generic diagnosis by WELLS (1956) and CHEVALIER (1961).

CHEVALIER (1961) defines *Paracyathus* as possessing paliform lobes, not true pali as found in *Trochocyathus*. ZIBROWIUS (1976) implies that *Paracyathus* is a rhizangiid. Without making a thin-section to check the trabecular structure of a paliform lobe vs. a true palus, one can usually distinguish *Paracyathus* by its multilobate paliform lobes, which are often indistinguishable from the columella.

Tethocyathus has been differentiated from *Trochocyathus* because of its extensive epitheca (VAUGHAN & WELLS, 1943). However, ALLOITEAU (1958) correctly pointed out that the type-species of *Trochocyathus*, *Turbinolia mitrata* Goldfuss, 1827 (= *T. plicata*), has a pellicular epitheca as do most other *Trochocyathus*. CHEVALIER

(1961) again uses the presence of true pali vs. paliform lobes to distinguish the two. According to him, *Tethocyathus* has paliform lobes and *Trochocyathus* has true pali. Without a longitudinal thin-section through a paliform process, *Tethocyathus* can usually be diagnosed by its thick, prominent epitheca (not pellicular). Also, if *Thecocyathus microphyllus* Reuss, 1871 (type-species of *Tethocyathus*) is found to be polycyclic, this may be an additional generic difference. However, even if the base is polycyclic, this is not universally accepted as a generic level character and the degree of expression of the epitheca is an unreliable character, especially since different specimens of the same species may or may not have an epitheca.

With this discussion in mind, the following three species are provisionally assigned to *Trochocyathus*: *T. rawsonii*, *T. fossulus*, n. sp., and *T. fasciatus*, n. sp.

26. **Trochocyathus rawsonii** Pourtalès, 1874

Plate XIII, figures 5–7; Plate XIV, figures 1–6

Trochocyathus rawsonii POURTALÈS, 1874: 35, pl. 6, figs. 7–10; 1878: 199 (in part: not BL-68); 1880: 96, 101 (in part: not BL-280). – ZIBROWIUS, 1974a: 767; 1976: 153. – CAIRNS, 1977b: 5; 1978: 11.
Montlivaultia poculum POURTALÈS, 1878: 205–206, pl. 1, figs. 21–22; 1880: 96.
Paracyathus laxus POURTALÈS, 1880: 96, 104–105, pl. 1, figs. 9–11.
Not *Trochocyathus rawsonii*: GARDINER, 1904: 100–103, 124, pl. 1, figs. 2 a–b, pl. 2, figs. A–K. – WELLS, 1956: F342; 1958: 261. – SQUIRES, 1961: 17.

Description. – The shape of the corallum is quite variable. It is commonly turbinate with a blunt monocyclic base, but also can be bowl-shaped or trochoid. The turbinate and bowl-shaped forms can occur either free or attached; the trochoid form is always attached. The free form usually bears a small scar of former attachment or a small object that has become incorporated into its base. The calice is often round but also may be elliptical or irregular. The largest calice examined measures 25.9 × 22.5 mm in diameter; the largest specimen measures 33.0 mm tall. Costae are usually masked by thin, wrinkled bands of epitheca, which extend to within 1–2 mm of the calice. The costae are usually distinguishable only near the calicular edge, where they bear low, blunt granules and are separated by deep furrows.

Septa are arranged in six systems and five cycles, but the last cycle is never complete. At a calicular diameter of only 14 mm the septa are regularly arranged in four complete cycles, with pali before the first three cycles. With an increase in size, the higher septal cycles become difficult to distinguish because of the random and incomplete development of the fourth and fifth cycles. S_1 are the largest and the only independent septa. The higher cycle septa are progressively smaller and sometimes are interconnected with one another within each system through their pali. The lower, inner edges of the P_4 often unite with the P_3, which, in turn, sometimes are fused to the P_2 near the columella. All septa are slightly exsert and have straight to slightly sinuous, entire edges except for those of the last cycle, which are coarsely dentate. The septal and palar faces bear low, rounded granules, randomly arranged except near the edges of the septa, where several granules are often arranged in lines parallel to the trabeculae.

Tall pali as thick as the septa are present before all but the last cycle of septa. P_1 are the smallest and extend to the columella. Two of the six P_1, those opposite the principal septa, are slightly smaller than the other four. P_2 are twice as large and also extend to the columella. P_3 are equal in size to the P_2 but are slightly recessed from the columella. When S_5 are present in a half-system, P_4 also occur, which are then the smallest pali and the farthest away from the columella. The space between the inner edges of the P_3 (and P_4) and the columella is often occupied by progressively smaller secondary and tertiary paliform lobes.

The papillose columella is elliptical in outline and slightly lower in the fossa than the pali. It is composed of numerous, irregularly shaped, interconnected pillars and fused to the inner edges of the adjacent pali.

Discussion. – POURTALÈS (1874) originally described *T. rawsonii* from small specimens of 10–17 mm calicular diameter with few S_5 and no epitheca, characters typical for a small specimen. Later (1878), he described *M. poculum* from a larger, worn specimen of

22 mm calicular diameter with 10 S_5, poorly developed pali, and a very small columella. This specimen was an extreme variation of *T. rawsonii* in which the corallum underwent rejuvenescence, making it taller. Furthermore, the secondary paliform lobes of the higher cycle septa became long and slender, occupying the space normally taken up by the columella. Transitions from this form with long, slender paliform lobes and small columella to more typical *T. rawsonii* are known. Finally, in 1880, POURTALÈS described *P. laxus*, the typical adult *T. rawsonii*.

GARDINER's (1904) reference to *T. rawsonii* from South Africa was unfounded and led to WELLS's (1956, 1958) and SQUIRES's (1961) incorrect listings. GARDINER's specimen had a more elongate corallum, better delineated costae, and no S_5.

Material. – P-479 (1) USNM 46085; P-848 (9) USNM 46086; P-849 (1) USNM 46087; P-876 (6) USNM 46088; P-890 (9) USNM 46089; P-929 (1) USNM 46090; P-1303 (3) USNM 46091; P-1357 (3) USNM 46093; P-1395 (2) USNM 46092; G-480 (1) USNM 46081; G-694 (1) USNM 46082; G-1036 (6) USNM 46083; G-1312 (2) USNM 46084; GS (G)-5 (1) USNM 46098; GS (G)-15 (1) UMML 8: 382; GS (G)-23 (1) USNM 46099; GS (G)-48 (2) USNM 46100; O-2080 (6); O-4226 (34) USNM 46097, (3) UMML 8: 242; O-4398 (40); O-4931 (1); O-5645 (1); O-5648 (9); O-10513 (1); SB-1788 (1); SB-2424 (10); BL-2 (1) MCZ; BL-32 (14) MCZ; BL-50 (3) MCZ; BL-273 (1) MCZ; BL-300 (5) MCZ; Caroline-38 (1); Caroline-102 (1); MAFLA-2106 (1) FDNR; MAFLA-2746 (1) FDNR; TAMU 65A9–15A (7) TAMU; Explorer-4 (1); off Egmont Key, Florida, 366 m (1). – Syntypes of *T. rawsonii*, *P. laxus*; holotype of *M. poculum*; Gardiner's (1904) *T. rawsonii*.

Types. – Ten syntypes of *T. rawsonii*, divided into four lots, are deposited at the MCZ. One lot (5627) contains four specimens collected by STIMPSON off the west coast of Florida (183 m); the other three lots (2762, 5479C, 5627) contain three, one, and two syntypes respectively, all collected from a Hassler station off Barbados. Fourteen syntypes of *P. laxus* collected from four stations are also at the MCZ: BL-149 (1), BL-214 (1), BL-253 (8), and BL-254 (4). They all bear the MCZ number 5482. The holotype of *M. poculum* (2759), collected by STIMPSON, presumably off the west coast of Florida, is also at the MCZ.
Type-Locality. – West coast of Florida and Barbados; 183 m

Distribution. – Common throughout Caribbean, ranging from off Georgia to off the Amazon, Brazil; Campeche Bank, Mexico; Florida west coast (Map 17). 82–622 m. 8–23°C, based on four records.

27. **Trochocyathus fossulus,** new species

Plate XV, figures 4–6, 11

Description. – The attached corallum is ceratoid, tapering to a massive, monocyclic base with a diameter of one-half to three-fourths the calicular diameter and secondarily thickened by stereome. The holotype is 10.2 × 9.7 mm in calicular diameter and 16.8 mm tall. The theca, which is largely obscured by encrusting organisms in both specimens, is smooth, with low, equal costae visible only at the calicular edge.

There are three different kinds of septa: primaries, secondaries, and tertiaries, arranged octamerally, resulting in 32 septa. The primaries are the largest and most exsert. The tertiaries, although slightly less exsert than the secondaries, extend slightly farther toward the columella than do the secondaries. The difference in exsertness of all three kinds of septa is slight. All septa have slightly sinuous inner edges. Their lateral faces are covered by large, blunt granules, which are randomly arranged except at the upper septal edge, where short carinae occur parallel to the trabeculae.

Tall pali are present before the primaries and secondaries. Those before the secondaries are two–three times larger and twice as wide as those before the primaries. The pali are single-lobed and distinct from the columella both in size and shape. The palar granulation is coarser and higher than that of the septa, sometimes forming horizontal carinae. The inner edges of all pali terminate at the columella, forming an elliptical ring, which encloses a field of numerous (7–14) irregular, tall columellar pillars, terminating just below the level of the pali. In the holotype, the pillars are narrow and evenly spaced; in the paratype, the pillars are massive and crowded. The upper edges of both pali and columella project above the calicular margin and are only slightly below the level of the exsert septa, resulting in a very shallow fossa.

Discussion. – There are several minor differences between the holotype and the paratype. The latter has a thicker base, more massive columellar elements, and more rounded septal granules.

These differences are probably a result of its greater deposits of stereome.

This species is easily distinguished from the other Recent species of *Trochocyathus* by its octameral symmetry and exsert calicular elements (shallow fossa). In corallum, septal, and columellar shape, it is similar to *T. virgatus* Alcock, 1902 and *T. rhombocolumna* Alcock, 1902.

Etymology. – The specific name *fossulus* (Latin, =small ditch) refers to the very shallow fossa of this species.

Material. – Types.

Types. – Holotype: P-991 (USNM 46881). – Paratype: CI-6 (1) USNM 46882.
Type-Locality. – 18°47′N, 64°47′W (Virgin Islands); 205–380 m.

Distribution. – Known only from the Bahamas and the Virgin Islands (Map 17). 205–380 m.

28. **Trochocyathus fasciatus,** new species

Plate XIV, figure 10; Plate XV, figures 1–3

Description. – The corallum is ceratoid, attached by a narrow pedicel measuring one-third to one-fourth the calicular diameter. The holotype, which is broken off near the base, measures 7.3 × 6.2 mm in calicular diameter and 16.1 mm from calice to break, where the pedicel diameter is 2.2 mm. A smaller corallum (paratype) of 4.5 mm in greater calicular diameter and 11.8 mm tall, is attached to the holotype but is not an extra- or intratentacular bud. The third paratype is 8.4 × 6.0 mm in calicular diameter and is also broken near the base. Costae are well-defined only near the calice, where the C_{1-3} are slightly ridged for several millimeters. In addition, the C_{1-2} and sometimes the C_3 are characteristically pigmented a light brown for about one-fourth of the distance to the base. The C_4 and the lower three-fourths of the theca are covered by low, rounded granules. There are no intercostal grooves.

Septa are arranged in six systems and four cycles. In the holotype one half-system is incomplete (missing a pair of S_4), for a total of 46 septa; the small attached specimen lacks five pairs of S_4 for 38 septa; and the large paratype is irregular in that it has only 11 half-systems and lacks four pairs of S_4, for only 36 septa. S_1 and S_2 are equal in size, exsert, and light brown on their upper, outer edges as a continuation of the costal stripes. Each of these septa has a straight, vertical inner edge separated from a small palus by a deep, narrow notch. The twelve P_{1-2} form a crown around the columella. S_3 are half as large as the S_{1-2}, less exsert, and bear large pali, which are four–five times larger than the P_{1-2}. The 12 P_3 project higher in thefossa than the P_{1-2} and also extend to the columella, forming a second distinct crown of pali. S_4 are smaller and less exsert than the S_3 and have slightly serrate inner edges. The septa and pali are covered by low rounded or low pointed granules, which are slightly larger on the pali. The septal granules are arranged in short lines parallel to the trabeculae.

The fossa is moderately deep and encloses a well-defined columella composed of a field of 10–15 discrete, irregularly shaped rods, which terminate at a level below the P_{1-2}.

Discussion. – *Trochocyathus fasciatus* is easily distinguished from all other Atlantic *Trochocyathus* by its variegated costae. Unfortunately, it is known from only three specimens from one locality, which does not allow an adequate description of its variability.

Etymology. – The specific name *fasciatus* (Latin, =striped) refers to the darkly pigmented striped costae.

Material. – Types.

Types. – Holotype: Alb-2354 (USNM 16116). – Paratypes: Alb-2354 (2, 1 attached to holotype) USNM 46913.
Type-Locality. – 20°59′30″N, 86°23′45″W (off Arrowsmith Bank, Yucatan Channel); 238 m.

Distribution. – Known only from type-locality (Map 18).

Genus **Tethocyathus** Kühn, 1933

Diagnosis. – Solitary, turbinate to ceratoid, fixed or free. Septotheca covered by thick, often wrinkled, epitheca. Discrete paliform lobes arranged opposite all but last cycle of septa in two crowns. Columella essential, papillose at surface. Type-species: *Thecocyathus microphyllus* Reuss, 1871, by original designation.

29. **Tethocyathus cylindraceus** (Pourtalès, 1868)

Plate XIII, figures 8–11

Thecocyathus cylindraceus Pourtalès, 1868: 134; 1871: 13–14 (in part: not Bibb-173), pl. 2, figs. 14–15; 1874: 37; 1880: 96, 101 (in part: not BL-296). – Agassiz, 1888: 149, fig. 464.
Tethocyathus cylindraceus: Wells, 1956: F423, figs. 1a, b.

Description. – The corallum is subcylindrical, tapering only slightly toward the expanded, polycyclic base. The calice is round; the largest corallum examined measures 14.6 mm in diameter and 15 mm tall. The wall is thick and usually covered by a smooth, thick epitheca terminating in a low rim at the calice and sometimes producing a circular groove between the outer, upper septal margins and the epithecal rim. Otherwise, the theca bears granulated, flat, indistinct costae that extend to the base.

Septa are usually arranged in six systems and four cycles; however, there are two S_5 in the largest corallum examined. S_1 are slightly larger than the S_2, which, in turn, are slightly larger than the S_3, all of which are considerably larger than the S_4. If the corallum is epithecate, the septa usually are not exsert; if costate, all septa are slightly exsert. The inner edges of all septa are broadly sinuous and those of the S_4 are sometimes dentate. Septal granulation is prominent, consisting of numerous tall, pointed granules often arranged in lines and short carinae oriented parallel to the trabeculae.

Stout paliform lobes occur before all but the last cycle. P_1 are small, low in the fossa, and closest to the columella. P_2 are two–three times larger and slightly taller; their inner edges reach almost the same distance toward the columella as the P_1. P_3 are variable in size but usually are about the same size as the P_1 and are slightly recessed from the columella. Two crowns of paliform lobes are thus formed, the inner crown of 12 P_1 and P_2 and an outer crown of 12 P_3. In a fully developed specimen, the one P_2 and two P_3 of each system are grouped in a chevron; however, it is not unusual for some of the P_2 to be missing.

The papillose columella, which is slightly lower in the fossa than the pali, is composed of 5–30 irregular pillars arranged in a circular field. They are interconnected among themselves and also attached to the inner edges of the adjacent pali.

Discussion. – This species is provisionally placed in *Tethocyathus* because of its thick epithecal covering and its great similarity to the type-species *T. microphyllus* (pers. comm., J. W. WELLS). If the paliform lobes are found to be true pali, it may be necessary to transfer it to *Trochocyathus*.

Material. – G-694 (2) USNM 46069, (1) UMML 8: 241; G-708 (1) USNM 46070; G-1029 (1) USNM 46071; GS(G)-42 (1) USNM 46072; BL-296 (1) MCZ; Hassler, Barbados, 183 m (1) MCZ; Gos-112/27 (1); off Sand Key, Florida, 220 m (2); off Western Dry Rocks, Florida, 263 m (2). – Syntypes of *T. cylindraceus*.

Types. – Thirteen syntypes, divided into three lots numbered 2763 and 5611, are deposited at the MCZ. Neither labels with the syntypes nor information in the original description specify the stations at which they were collected.
Type-Locality. – Off the Florida Reef; 183–366 m.

Distribution. – Straits of Florida; Jamaica; Barbados (Map 18). 155–649 m.

30. **Tethocyathus recurvatus** (Pourtalès, 1878)

Plate XIV, figures 7–9

Thecocyathus recurvatus POURTALÈS, 1878: 202; 1880: 96.
Trochocyathus rawsonii: POURTALÈS, 1878: 199 (in part: BL-68).

Description. – The corallum is ceratoid and regularly curved between 30°–90°, tapering to a narrow, blunt, monocyclic base. The corallum is usually free but is sometimes attached to a small object. The calice is circular to slightly elliptical; the largest specimen examined is 7.5 × 7.3 mm in calicular diameter and about 10.0 mm tall. The septotheca is moderately thick and covered by a smooth epitheca, which often forms a thin, circular rim at the calicular edge. The epitheca obscures the costae and costal granulation; however, intercostal striae, which delimit equal costae, can often be seen through the epitheca.

Septa are arranged in six systems and four cycles, but the fourth cycle is never complete. The largest specimen examined has only twelve S_4 (36 septa) equally distributed in all six systems, which is probably the adult condition. S_1 are exsert, with rounded upper and vertical inner edges. The higher cycle septa are progressively smaller and less exsert, but in every system the S_3 flanked by S_4 is enlarged to almost the same size as an S_2, whereas the other unflanked S_3 is only slightly larger than the S_4. All inner septal edges are sinuous, but those of the S_4 are less sinuous than those of the S_{1-3}. Low, pointed, randomly arranged granules cover the septal faces.

Two indistinct and incomplete crowns of paliform lobes stand before all but the last cycle of septa. P_1, the smallest and closest to the columella, are tall and narrow. P_2 and P_3 are twice as large, project higher in the fossa, and are slightly recessed from the columella. The outer calicular margins of some of the paliform lobes, especially the P_2 and P_3, are molded around the inner edge of the septa. The paliform lobes are separated from their corresponding septa by deep, narrow notches. They are granulated and bear short, horizontal carinae.

The papillose columella lies slightly deeper in the fossa than the pali. It is composed of 5–15 granulated pillars, which are interconnected basally and also attached to the adjacent pali. The columellar pillars are distinct from the paliform lobes.

Discussion. – This species is provisionally placed in *Tethocyathus* because of its prominent and complete epithecal exterior. However, like *T. cylindraceus,* if the paliform lobes are found to be true pali, *T. recurvatus* may have to be transferred to *Trochocyathus*.

Material. – P-600 (1) USNM 46103; G-254 (1) USNM 46101; G-688 (8) USNM 46102, (1) UMML 8: 244; G-912 (1) USNM 46105; BL-51 (1) MCZ; BL-68 (1) MCZ; E-43 (2) USNM 46104. – Syntypes of *T. recurvatus*.

Types. – Two syntypes (5610), taken at a Blake station off Havana during the dredging season of 1877–78, are deposited at the MCZ. The exact station cannot be determined.
Type-Locality. – Off Havana, Cuba; 320 m.

Distribution. – Straits of Florida; off Cozumel, Mexico; off Jamaica (Map 19). 320–488 m.

31. **Tethocyathus variabilis**, new species

Plate XV, figures 7–10

Thecocyathus cylindraceus POURTALÈS, 1868: 134 (in part); 1871: 13 (in part: Bibb-173); 1880: 101 (in part: BL-296).
Thecocyathus laevigatus: POURTALÈS, 1878: 202 (in part: BL-19).
Thecocyathus rawsonii: POURTALÈS, 1880: 101 (in part: BL-280).
Asterosmilia prolifera: SQUIRES, 1959: 12.
"*Thecocyathus*" sp. A ZIBROWIUS, 1976: 110–111, pl. 55, figs. A–N, pl. 56, figs. A–M.

Description. – The corallum is ceratoid, tapering to a wide pedicel, which measures up to 60% of the calicular diameter. The monocyclic base of attachment is only slightly expanded. The calice is round; larger specimens measure 10 mm in calicular diameter and are up to 22 mm tall. The theca is thick. Equal, slightly convex costae bear uniform, low, rounded granules, numbering, on the average, about three across the width of each costa near the calicular edge. Sometimes bands of epitheca or a solid epitheca obscure both the costae and costal granulation.

Septa are arranged in six systems and four cycles, but the last cycle is rarely complete. S_1 are exsert and reach closer to the columella than any of the other septa. S_2 are only slightly larger than the S_3, which, in turn, are considerably larger than the S_4. Each cycle is progressively less exsert. The inner edges of S_1 and S_4 are straight but the lower, inner edges of the S_2 and S_3 have numerous undulations in the proximity of the columella. The septa bear small, pointed granules arranged in lines oriented parallel to the trabeculae.

All specimens have a round, deep-set, papillose columella composed of numerous tall, slender rods, which are round or elongate in cross section. In some specimens paliform teeth (lobes?) are regularly arranged before the S_1, S_2, and S_3. In rare cases, three indistinct crowns of paliform teeth, often identical in size and shape to the other columellar elements, are present. The paliform teeth before the S_3 are nearest the calicular edge, whereas those before the S_1 are nearest the axis. Palar elements, however, are usually completely absent, but, when they occur, they may be randomly arranged, occur in a triple crown, or occur only before the S_2.

Discussion. – This species is provisionally placed in the genus *Tethocyathus* because most of the large coralla examined are epithecate and few have paliform teeth (lobes?). However, because some specimens are definitely costate and others have prominent paliform teeth before the second and third cycles, both of which are considered to be generic or subgeneric level characters, a re-evaluation of these seemingly variable generic level characters is necessary.

Etymology. – The specific name *variabilis* (Latin, =changeable) refers to the variable phenotypic expression of this species.

Material. – P-587 (9); P-861 (5) UMML 8: 295; P-929 (5) UMML 8: 283; G-663 (2); G-664 (2); G-885 (1); BL-19 (1) MCZ; BL-173 (1) MCZ; BL-280 (1) MCZ; BL-296 (1) MCZ; Hudson-3A (11) NMC; Hudson-4B (3) NMC. – Squires's (1959) *A. prolifera* (AMNH – 4 specimens). – Types.

Types. – Holotype: P-861 (USNM 46980). – Paratypes: P-861 (20) USNM 46981; P-929 (16) USNM 46982; Caroline-38 (2) USNM 46983.
Type-Locality. – 12°42′N, 61°05.5′W (east of the Grenadine Islands); 18–744 m.

Distribution. – Western Atlantic: Antillean distribution; Arrowsmith Bank, Yucatan Channel (Map 19). 250–576 m. – Eastern Atlantic: off Spanish Sahara; Azores. 269–860 m.

Genus **Paracyathus** Milne Edwards & Haime, 1848

Diagnosis. – Solitary; turbinate; fixed or free. Septotheca costate. Paliform lobes often bi- or trilobed, opposite all but last cycle. Columella papillose, often indistinguishable from the inner paliform lobes. Type-species: *Paracyathus procumbens* Milne Edwards & Haime, 1848, by subsequent designation (MILNE EDWARDS & HAIME, 1850).

32. **Paracyathus pulchellus** (Philippi, 1842)

Plate XVI, figures 1–6

Synonymy complete for western Atlantic only:

Cyathina pulchella PHILIPPI, 1842: 42.

Paracyathus pulchellus: MILNE EDWARDS & HAIME, 1857: 55. – LEWIS, 1965: 1062.– BEST, 1970: 306–308, fig. 8. – ZIBROWIUS, 1976: 96–100, pl. 29, figs. A–K, pl. 30, figs. A–L. – CAIRNS, 1977b: 5, 11–13, pl. 2, figs. 2–3; 1978: 11.

Paracyathus defilippi DUCHASSAING & MICHELOTTI, 1860: 60, pl. 9, figs. 2–3; 1864: 65. – DUCHASSAING, 1870: 25. – POURTALÈS, 1874: 38; 1878: 200; 1880: 96, 105. – MOSELEY, 1881: 144 (in part: specimen from off Azores). – VAUGHAN, 1901; 292. – GARDINER & WAUGH, 1938: 182. – DURHAM, 1949: 156. – SQUIRES, 1959: 12–15. – LEWIS, 1960: 12; 1965: 1062. – GOREAU & WELLS, 1967: 449. – WEISBORD, 1968: 71. – PORTER, 1972: 113. – WELLS & LANG, 1973: 58. – KELLER, 1975: 178. – DEFENBAUGH, 1976: 27, 39, fig. 58.

Paracyathus confertus POURTALÈS, 1868: 134; 1871: 11, pl. 6, figs. 11–13. – STUDER, 1878: 628. – AGASSIZ, 1888: 149–150, fig. 466. – SQUIRES, 1958: 258.

Description. – The shape of the corallum is variable. Young specimens are often short and cylindrical but also may be conical. Larger specimens are usually trochoid to turbinate, tapering to a pedicel measuring one-fourth to one-half the calicular diameter and re-expanding into an encrusting polycyclic base. The calice is usually elliptical but can be perfectly round or strongly compressed. The largest corallum examined measures 15.5 × 13.3 mm in calicular diameter, 24.0 mm tall, and contains 76 septa. The expression of costae is also variable. The costae are usually only conspicuous near the calicular edge as low, slightly convex ridges separated by narrow, shallow intercostal furrows. In other cases, the costae are highly ridged, extend to the base, and are separated by broad, deep furrows. Costal granules, when present, are low and rounded. The proximal two-thirds of the corallum is often covered by encrusting organisms (*e.g.*, bryozoans, algae, foraminifera), giving it a white appearance. Occasionally, bands of epitheca are deposited in this area, also giving the exterior a milky-white color. Otherwise, the distal part of the corallum and septa are usually brown or reddish-brown.

Septa are arranged in six systems and five cycles. Above a calicular diameter of about 8 mm, S_5 begin to appear, but a full fifth cycle (96 total septa) is never attained. A pair of S_5 usually occurs in all twelve half-systems before a second pair is added to any half-system. S_1 and S_2 are equal in size and moderately exsert. The higher cycle septa are progressively smaller and less exsert. The inner edges of all septa are straight to slightly sinuous. The septal and palar faces bear prominent, pointed or rounded granules, which sometimes fuse at the axial margin to form horizontal or oblique carinae, giving the septa a thick appearance.

The paliform lobes are the most variable character of this species and occur before all but the last cycle. They are tall and usually more prominently granulated than the septa. Each is separated from its respective septum by a deep, narrow notch. P_1 and P_2 are equal in size, lowest in the fossa, and closest to the columella. P_3 are usually twice as large, terminate higher in the fossa, and are often wedge-shaped: their outer (calicular) edges are considerably broader than their inner (axial) edges. P_4 are about the same size as the P_3, recessed from the columella, and terminate even higher in the fossa than the P_3. In the space between the inner edge of a P_4 and the columella there are often two–four additional paliform lobes (multi-lobate condition) of progressively smaller size nearer the columella.

The fossa is extremely variable in depth. It is usually deep but can range from very deep to level with the upper edges of the septa, the latter condition being rare. The papillose columella is large and usually elliptical in outline, composed of up to 60 close-set, uniform, slender rods. The rods all terminate at the same level, sometimes forming a convex bulge in larger specimens. The columellar elements are interconnected basally and fused to the inner edges of the paliform lobes, from which they can be indistinguishable.

Material. – P-199 (1) USNM 46127; P-389 (5) USNM 46147; P-392 (14) USNM 46148; P-403 (1) USNM 46149; P-405 (1) USNM 46150; P-420 (1) USNM 46151; P-581 (1) USNM 46154; P-596 (2) USNM 46155; P-629 (1) USNM 46153; P-650 (18) USNM 46156; P-1140 (6) USNM 46158; 77 specimens from 23 additional Pillsbury stations throughout the Antilles; G-681 (1) USNM 46121; G-692 (1) USNM 46122; G-882 (1) USNM 46124; G-946 (1) USNM 46125; G-950 (1) USNM 46126; G-1329 (3) USNM 46123; 119 specimens from 18 additional Gerda stations in the Straits of Florida; CI-6 (1) USNM 46163; CI-7 (1) USNM 46164; O-1348 (2); O-2286 (1); O-4225 (1); SB-2263 (1); SB-2523 (2); SB-3407 (1); SB-3494 (13); BL-2 (1); BL-22 (1); BL-23 (1); BL-32 (1); BL-45 (19); BL-50 (1); BL-62 (1); BL-132 (2); BL-155 (1); BL-157 (1); BL-164 (1); BL-203 (1); BL-246 (1); BL-247 (1); BL-271 (5); BL-272 (1); BL-278 (1); BL-290 (1); BL-292 (3); BL-293 (1), all specimens from Blake stations at MCZ; Hassler, off Barbados, 183 m (15) MCZ; Alb-2167 (1) USNM 16128; Alb-2316 (10) USNM 10077; Alb-2318 (3) USNM 14003; Gos-1533 (3); Gos-1591 (1); Gos-1785 (1); Gos-1860 (1); Caroline-17 (1); TAMU 65A9–15A (11) TAMU; TAMU 65A9–20 (3) TAMU; TAMU 65A14–9 (1) TAMU; TAMU 67A5–11C (22) TAMU; TAMU 70A10–39 (1) TAMU; TAMU 72F1–48 (5) TAMU; 27°54′53″N, 93°26′50″W, 100 m (10) BLM-Texas. – Holotype of *P. defilippi*; syntypes of *P. confertus*; Moseley's (1881) *P. defilippi*.

Types. – The types of *C. pulchella* are at the Berlin Museum. The holotype of *P. defilippi*, a small specimen of 44 septa and only 4.0 × 4.4 mm in calicular diameter, is at the MIZS (Coel. 229). Eight syntypes of *P. confertus*, divided into three lots, are at the MCZ (all numbered 5481). One lot is from Bibb-39; the locality of the other two is unknown. Another syntype is at the YPM (4769).
Type-Locality. – Off Naples and Trapani, Mediterranean.

Distribution. – Western Atlantic: common throughout Caribbean and Gulf of Mexico, ranging from North Carolina to off the Amazon, Brazil (Map 20). 17–838 m. Most common, however, between 50–250 m. 18–24°C, based on six records. – Eastern Atlantic: Mediterranean; area bounded by Portugal, the Azores, and the Gulf of Guinea.

Genus **Deltocyathus** Milne Edwards & Haime, 1848

Diagnosis. – Solitary, discoid to patellate, free (sometimes with a scar of previous attachment at center of base). Costae present. Pali opposite all but last cycle; inner edges of P_3 join P_2 near columella, forming deltas. Columella papillose. Type-species: *Turbinolia italica* Michelotti, 1838, by monotypy.

KEY TO THE SIX WESTERN ATLANTIC SPECIES OF *Deltocyathus*

1′ Center of base bears distinct, circular scar; intercostal furrows near calicular edge extremely deep . . . . *D. moseleyi*, n. sp.
1′ Center of base not scarred; intercostal furrows moderately deep or shallow 2

2 Shape of base conical (apical angle: 80°–110°–120°); no elongate costal spines; only species known from deeper than 1200 m . . . . *D.* sp. cf. *D. italicus* (Michelotti)
2′ Shape of base flat, convex, or slightly conical (apical angle: 140°–180°); may or may not have costal spines; found shallower than 1200 m 3

3 Calicular rim usually thickened; S_4 rudimentary, attached to S_3 near columella by several slender processes; often more than 48 septa . . . . *D. eccentricus*, n. sp.
3′ Calicular rim not thickened; S_4 not rudimentary; usually 48 septa 4

4 C_1 always broader than other costae and usually projecting outward as large spines; S_2 and C_2 usually black . . . . *D. calcar* Pourtalès, 1874
4′ Equicostate, no projecting costal spines; corallum white. . . 5

5 S_4 more exsert and extending farther toward columella than S_3; inner edge of each S_4 unites with its adjacent P_3 well above the notch that separates the S_3 from its corresponding P_3. . . . . *D. pourtalesi*, n. sp.
5′ S_4 less exsert and smaller than S_3; inner edge of each S_4 unites with its adjacent P_3 below the notch that separates the S_3 from its corresponding P_3 . . . . . . *D. agassizii* Pourtalès, 1867

33. **Deltocyathus agassizii** Pourtalès, 1867

Plate XVII, figures 4–6

Deltocyathus agassizii POURTALÈS, 1867: 113–114; 1871: 15 (in part: four specimens from "Florida and Cuba, 60–327 fms"). – ZIBROWIUS, 1976: 161–162.
Not *Deltocyathus agassizii*: POURTALÈS, 1874: 35; 1878: 200. – MOSELEY, 1876: 546, 551. – LINDSTRÖM, 1877: 10. – BOONE, 1928: 8.
Deltocyathus italicus variety *agassizii*: POURTALÈS, 1880: 102 (in part).

Description. – [The following description is based on the best-preserved of the four syntypes.] The base of the corallum is flat and bears no scar of attachment. The calice is round, measuring 10.8 mm in diameter. At the calicular edge the costae are equal in width, rounded, and separated by moderately deep furrows. Toward the center of the base the C_4 become much narrower and all of the intercostal furrows become much shallower. All but the C_4 reach the center of the base. The costae bear large, worn granules on their outer surface and finer, pointed granules laterally.

Septa are arranged in six systems and four complete cycles. The S_4 are smaller than the S_3 and are joined to the S_3 by several broad trabeculae at or slightly below the notch separating the S_3 from their corresponding pali. The P_3 join the P_2 closer to the columella. The inner edges of all septa are slightly sinuous. Both septa and pali bear prominent, pointed granules. The columella is composed of 15–17 slender rods loosely fused together basally.

Discussion. – *D. agassizii* has been collected very rarely, known from only eight worn specimens. Subsequent records of this species made by POURTALÈS (1874, 1878), MOSELEY (1876), LINDSTRÖM (1877), BOONE (1928), and probably PACKARD (1873), VERRILL (1874, 1883), and LEWIS (1965) pertain to one or more of the five other species of *Deltocyathus* known from the western Atlantic.

D. agassizii most closely resembles *Deltocyathus pourtalesi*, particularly in shape, costae, costal granulation, and absence of a basal scar. It can be distinguished by its lower connection of the S_4 to the S_3 and larger S_3 than S_4.

Material. – Two specimens labelled "Florida and Cuba, 60–327 fms," collected by Bibb (MCZ); Alb-2750 (1); E-26023 (1) USNM 46243. – Syntypes.

Types. – There are four complete specimens and one fragment (syntypes) deposited at the MCZ, all in worn condition. They were collected at Bibb-4 in 1867.
Type-Locality. – 1.6 miles (2.6 km) off Chorrera, Cuba; 494 m.

Distribution. – Known only from the Straits of Florida and off Anguilla, Lesser Antilles (Map 21). 494–907 m.

34. **Deltocyathus calcar** Pourtalès, 1874

Plate XVII, figures 7–10; Plate XVIII, figure 7

Deltocyathus agassizii: POURTALÈS, 1871: 15–16 (in part: Bibb-201), pl. 2, figs. 4–5, pl. 5, figs. 9–10; 1878: 200 (in part). – LINDSTRÖM, 1877: 10–11 (in part: specimen from Anguilla), pl. 1, fig. 13, pl. 2, figs. 14, 18, 19.
Deltocyathus agassizii variety *calcar* POURTALÈS, 1874: 35–36, pl. 6, fig. 11.
Deltocyathus italicus: POURTALÈS, 1880: 101–103 (in part: variety *beta* and *delta*), pl. 1, figs. 4–5. – MOSELEY, 1881: 145–147 (in part: off Bermuda, 200 fms), text-fig., page 145 (lower pair). – TIZARD, *et al.*, 1885: fig. 277. – VAUGHAN, 1901: 293. – TOMMASI, 1970: 56, figs. 5e, 7b. – LABOREL, 1970: 153; 1971: 175.
Deltocyathus calcar: ZIBROWIUS, 1976: 157. – CAIRNS, 1977: 86–87, 2 figs.; 1977b: 5; 1978: 11.

Description. – The shape of the corallum base varies, ranging from conical to slightly rounded to almost flat. There is no scar of attachment at the apex. The calice is round; the largest specimen examined measures 14.8 mm in diameter, exclusive of costal spines. The corallum is usually pigmented in a distinct pattern. The most common scheme is for all or part of the S_2 and C_2 to be dark brown. Other patterns, in order of frequency, are: completely white; completely light brown; only the spines pigmented dark brown; and S_2 and P_1 dark brown.

The C_1 are thick and rounded, substantially larger than the other costae. Each C_1 usually bears a large accessory spine, which can project a distance equal to the radius of the calice from the calicular edge, giving the corallum a stellate appearance; sometimes, however, these spines are much reduced, expressed only as incipient nubs, or absent altogether. The costae of the higher cycles are thinner but also reach the apex, except for the C_4, which extend about

0.9 of that distance. All costae are separated by shallow striae and bear large, rounded, blunt granules, which give the appearance of a beaded margin to the higher cycle costae. The large costal spines are finely granulated. C_{2-4} are usually rounded but may be flattened or ridged also.

Septa are arranged in six systems and four cycles in typical *Deltocyathus* fashion. S_1 and S_2 are about equal in size and exsertness; they are larger than the S_3, which, in turn, are slightly larger than the S_4. The S_4 are joined to the S_3 by four-six thin processes just below the notch that separates the S_3 from its P_3. P_{1-3} are separated from their corresponding septa by deep, narrow notches. Septal granules are usually broad and arranged in lines parallel to the trabeculae. Palar granulation is higher than that of the septa, composed of broad, often bifid granules one–three times the palar thickness in height.

The fossa is shallow with a prominent columella, which is round to elliptical in outline, and composed of numerous compressed rods united at their bases and to the inner edges of the S_{1-3}.

Discussion. – POURTALÈS (1874, 1880) was essentially correct in assuming that there was a species of *Deltocyathus* with a continuous gradation from prominent costal spines to the spineless condition. He was wrong, however, in assuming that this species was *D. agassizii* or *D. italicus* and overlooked the four other distinct species of *Deltocyathus* in his own collection. Evaluation of characters not studied by POURTALÈS, such as the junction of the S_3 to the S_4, width of the costae, presence or absence of a basal scar, and relative size of S_3 and S_4 distinguishes these species.

The distinctive costal spines and pigment pattern are known only in this species. However, when both spines and pigment are lacking, it still can be differentiated from the other western Atlantic *Deltocyathus* by its prominent C_1 and the nature of the junction of the S_3 to the S_4.

Material. – P-198 (2) USNM 46274; P-340 (7) USNM 46269; P-446 (1) USNM 46273; P-737 (1) USNM 46271; P-797 (3) USNM 46262; P-874 (7) USNM 46261; P-876 (3) USNM 46263; P-890 (4) USNM 46259; P-904 (1) USNM 46264; P-931 (1) USNM 46260; P-943 (187) USNM 46268; P-969 (2) USNM 46277; P-1140 (1) USNM

46266; P-1232 (1) USNM 46258; P-1303 (2) USNM 46272; P-1354 (475) USNM 46267, (46) UMML 8: 377; P-1357 (34) USNM 46280; 213 specimens from 14 Gerda stations in the Straits of Florida (USNM); O-1251 (6); O-1867 (7); O-3203 (5); O-3621 (2); O-4226 (300) USNM 46283; O-4301 (1) USNM 46282; O-4832 (5); O-4833 (1); O-4928 (3); O-5733 (1); O-5915 (2); O-5955 (10); SB-50 (2); SB-2443 (1); SB-2445 (1); SB-3494 (19); specimens from 37 Blake stations throughout Antilles (MCZ); Bibb-201 (1) MCZ; Alb-2135 (1) USNM 16092; Alb-2323 (1) USNM 10122; Alb-2338 (1) USNM 10222; Alb-2342 (1) USNM 16093; Alb-2345 (1) USNM 10250; Alb-2347 (1) USNM 10257; Alb-2399 (1) USNM 10442; Combat-447 (3); Gos-1590 (2); Gos-1657 (1); Gos-1811 (1); Gos-1824 (3); Gos-1842 (2); Caroline-12 (4); Caroline-13 (1); Caroline-25 (14); Caroline-81 (7); Caroline-99 (1); Caroline-102 (2); E-30150 (1); E-30178 (2); MAFLA-2106 (3) FDNR; MAFLA-2746 (1) FDNR; WB-1 (9) USNM 46276; WB-2 (2) USNM 46275; WB-318 (10) USNM 46281; TAMU 65A9–15A (4) TAMU; TAMU 67A5–13B (59) TAMU; TAMU 68A7–9A (3) TAMU; Explorer-1a (30); Explorer-1b (2); Chain-36 (1); Chain-38 (3); Chain-39 (1); Chain-43 (1); SME-1778 (8) SME; Akaroa-185 (1) SME; Hummelinck-1443 (7); 225 km southwest of Egmont Key, Florida (50) AMNH. – Syntypes; Lindström's (1877) specimens (NRM); Moseley's (1881) specimens (BM); Vaughan's (1901) specimens (USNM).

Types. – One hundred forty-one specimens, divided into three lots of 122, 18, and 1 specimens, are deposited at the MCZ. They were collected at an undetermined Hassler station off Barbados. No types were designated by POURTALÈS since he considered this species to be a variety of *D. agassizii*. Therefore, one specimen is chosen as holotype and the remaining specimens are designated as paratypes.
Type-Locality. – Off Barbados; 183 m.

Distribution. – Widespread in Caribbean and eastern Gulf of Mexico, ranging from off North Carolina to off Rio de Janeiro, Brazil; off Bermuda (Map 22). 81–675 m. 8°–19°C, based on six records.

35. **Deltocyathus** sp. cf. **D. italicus** (Michelotti, 1838)

Plate XVII, figures 1–3

?*Turbinolia italica* MICHELOTTI, 1838: 51, pl. 1, fig. 8.
Deltocyathus agassizii: POURTALÈS, 1871: 15 (in part: Bibb-95, Bibb-141, Bibb-191); 1878: 200 (in part: BL-46). – MOSELEY, 1876: 546, 551 (in part). – BOONE, 1928: 8.
Deltocyathus italicus: POURTALÈS, 1880: 101 (in part: variety *agassizii*), pl. 1, figs. 2–3. – MOSELEY, 1881: 145–147 (in part: Chall. stations 24, 56, 78, 120). – MARENZELLER, 1904: 281 (in part: Valdivia-56). – GRAVIER, 1920: 34–36 (in part). – KELLER, 1975: 177, pl. 2, figs. 1–4b. – CAIRNS, 1977b: 5; 1978: 11.
Deltocyathus sp. A ZIBROWIUS, 1976: 156–157, pl. 49, figs. A–L.

Description. – The patellate corallum is small and unattached, with an apical angle between 80°–120°. The apex of the base is bluntly pointed, with no scar or other sign of previous attachment. The largest specimen examined has a round calice measuring 16.5 mm in diameter, although 10–11 mm is more typical. C_1 and C_2 are equal in size, narrow, and highly ridged, especially toward the calicular edge. C_3 are less prominent and usually rudimentary. C_{1-3} reach the apex but the C_4 do not. Costal granulation is variable. C_1 and C_2 usually bear coarse granules on their outer edges, producing a serrated or sometimes a beaded margin. Smaller granules are present on the lateral surfaces of the costae. C_3 and C_4 are similarly granulated but not as prominently. The corallum is usually white but is sometimes uniformly pink.

Septa are arranged in six systems and four complete cycles, only rarely with septa of the fifth cycle. S_1, which are the largest and only independent septa, are only slightly larger than the S_2, which, in turn, are substantially larger than the S_3 and S_4. The S_4 are slightly larger than the S_3. Each S_1 bears a tall, narrow palus separated from its septum by a deep, narrow notch. The two P_1 attached to the principal septa are smaller than the other four. Larger and taller pali usually occur on the inner edges of the S_2; however, they are sometimes reduced in size or absent entirely. P_3 are equal in size to the P_2 and fused to the P_2 by their lower, inner margins, if P_2 are present, forming the characteristic deltas. S_4 do not bear pali; their inner edges are solidly fused to the P_3 at or near the notch separating the S_3 from the P_3. All septa are highly exsert. The septal granulation is prominent but sparse, composed of tall, slender spines (up to two times the septal thickness) or broader, blunter granules. The septal and slightly larger palar granules sometimes form short, vertically oriented carinae.

The fossa is very shallow or nonexistent. The elongate columella, aligned with the principal septa, is composed of numerous slightly twisted, narrow rods, which are solidly fused together.

Discussion. – This species is either closely related or identical to the European fossil species *D. italicus*. The only difference is that the costal granulation of the latter seems to be coarser. *D.* sp. cf. *D. italicus* is easily distinguished from the other Atlantic species by its strongly conical base and, to a lesser degree by its ridged costae, sometimes pink corallum, and greater depth range.

Material. – P-478 (4) USNM 46201; P-585 (1) USNM 46213; P-607 (5) USNM 46211; P-634 (2) USNM 46217; P-747 (1) USNM 46214; P-754 (1) UMML 8: 373; P-776 (4); P-861 (5) USNM 46207; P-881 (1) USNM 46202; P-891 (1) USNM 46200; P-904 (1) USNM 46210; P-905 (1) USNM 46212; P-919 (2) USNM 46208; P-920 (1) USNM 46204; P-988 (10) USNM 46199; P-1171 (1) UMML 8: 372; P-1177 (2) USNM 46198; P-1181 (2) USNM 46215; P-1238 (3) USNM 46203; P-1255 (2) USNM 46206; P-1256 (1) USNM 46209; P-1261 (1) USNM 46205; P-1435 (15) USNM 46218; G-190 (2) USNM 46185; G-923 (1) USNM 46197; 111 specimens from 18 additional Gerda stations in the Straits of Florida; 322 specimens from 18 Columbus Iselin stations in the Tongue of the Ocean and Exuma Sound, Bahamas; GS-31 (15) USNM 46234; GS-44 (1) USNM 46235; O-2202 (50); O-2775 (1); SB-1182 (6); SB-3515 (1); BL-46 (MCZ); BL-117 (MCZ); BL-129 (1) MCZ; BL-132 (MCZ); BL-161 (MCZ); BL-162 (MCZ); BL-163 (MCZ); BL-173 (MCZ); BL-224 (MCZ); BL-238 (MCZ); BL-244 (MCZ); BL-261 (4) MCZ; Bibb-95 (MCZ); Bibb-141 (MCZ); Bibb-191 (MCZ); Alb-2384 (4) USNM 10372; Alb-2393 (1); Alb-2394 (3) USNM 14004; Alb-2750 (7) USNM 36460A; Alb-2751 (100) USNM 36431; Alb-2754 (17) USNM 36476; Alb-2760 (1) USNM 36454; Alb-2761 (3) USNM 36472; Alb-2763 (2) USNM 36432; Gos-1580 (3); Gos-1595 (2); Caroline-1 (2); Caroline-23 (1); Caroline-84 (3); Caroline-93 (6); WB-322 (6) USNM 46237; WB-391 (1) USNM 46236; Atl-2987A (20) MCZ; Atl-3345 (MCZ); Atl-3355 (MCZ); Atl-3363 (MCZ); Atl-3423 (MCZ); TAMU 65A9–4 (4) TAMU; TAMU 65A9–7D (12) TAMU; TAMU 65A9–11 (10) TAMU; TAMU 65A9–14 (1) TAMU; TAMU 66A5–4 (2) TAMU; TAMU 67A5–4G (1) TAMU; TAMU 67A5–6B (2) TAMU; TAMU 67A5–7E (3) TAMU; TAMU 67A5–8B (1) TAMU; TAMU 67A5–9E (7) TAMU; TAMU 68A7–1A (23) TAMU; TAMU 68A7–2B (16) TAMU; TAMU 68A7–13A (5) TAMU; TAMU 68A7–13D (2) TAMU; TAMU 68A7–15D (3) TAMU; TAMU 68A7–15H (2) TAMU; TAMU 68A7–17B (3) TAMU; TAMU 71A8–47 (6) TAMU; SME-1777 (1) SME. – Moseley's (1881) specimens.

Types. – According to CHEVALIER (1961) the types of *D. italicus* (Michelotti) are lost.
Type-Locality. – Tortona, Italy (Miocene).

Distribution. – Western Atlantic: widespread in the Caribbean and Gulf of Mexico, ranging from off Florida to off Rio de Janeiro, Brazil; Bermuda (Map 23). 403–2634 m. 3°–7°C, based on 10 records. – Eastern Atlantic: area bounded by Gulf of Gascony, the Azores, and Morocco; Gulf of Guinea. 1500–2300 m.

36. **Deltocyathus eccentricus**, new species

Plate XVIII, figures 8–11

Deltocyathus agassizii: POURTALÈS, 1871: 15 (in part: Bibb-141); 1874: 35–36 (in part: off Barbados); 1878: 200 (in part: BL-2, 19, 20, 58). – MOSELEY, 1876: 546 (in part).
Deltocyathus italicus: POURTALÈS, 1880: 101 (in part). – MOSELEY, 1881: 145 (in part: Chall-24, 56). – JOURDAN, 1895: 16 (in part). – GRAVIER, 1920: 34 (in part).
Deltocyathus andamanicus: GRAVIER, 1920: 37, pl. 4, figs. 55–59, pl. 15, fig. 209.
Deltocyathus hexagonus: ZIBROWIUS, 1976: 158–160, pl. 50, figs. A–M, pl. 51, figs. A–N. – CAIRNS, 1978: 11.

Description. – The base of the corallum is flat to slightly conical, with a diameter: height ratio between 2.4–3.2. The wall is very thin except toward the calicular edge, where it forms a thickened outer lip. The calice is irregularly round. The largest specimen examined measures 15.8 mm in calicular diameter. Costae and costal granulation are quite variable. C_1 and C_2 are equal in size and extend to the apex; C_3 are slightly smaller and do not quite reach the apex; and C_4 are the smallest, reaching 0.8–0.9 of the distance to the apex. C_1 and C_2 are usually low and rounded but can be quite high and ridged. Low, rounded granules are usually present on the costae but may become fused toward the calicular edge, forming a series of transverse ridges. There is no scar of attachment at the apex. The coralla are usually white but are sometimes a dark brown or light red.

Septa are arranged in six systems and four complete cycles; however, additional half-systems, composed of four septa (one extra S_2 and S_3 and two extra S_4) are common. S_1 are the largest septa, independent, and connected to the columella through tall, narrow pali. S_2 are slightly smaller and also join the columella via their pali. S_3 unite with the S_2 near the columella by a fusion of the inner edges of their respective pali. S_4 are well developed at the calicular edge but are very small below the upper rim, consisting of only a low ridge or series of spines. They join with the S_3 by four–five narrow processes deep within the fossa near the columella. P_{1-3} are separated from their corresponding septa by deep, wide notches. The two P_1 before the principal septa are smaller than the other pali.

The inner edges of S_{1-3} are slightly to very sinuous. Pointed septal and palar granules can reach as high as twice the septal thickness but are usually shorter and arranged in distinct, widely spaced lines oriented parallel to the septal trabeculae.

The fossa is very shallow but the columella is never higher than the theca. The elongate columella, aligned with the principal septa, is composed of 5–20 small, narrow rods, embedded in a fused basal mass. The columella sometimes expands as a thin, circular membrane fusing with the inner edges of S_{1-3}.

Discussion. – *D. eccentricus* is one of four species that both POURTALÈS and MOSELEY lumped first as *D. agassizii* and later as *D. italicus*. It is easily distinguished from the other species of *Deltocyathus* by its irregularly round calicular outline, thickened outer lip, reduced S_4, and rudimentary junction of the S_4 to the S_3.

Etymology. – The specific name *eccentricus* (Latin, =deviation from circular shape) refers to the irregular outline of the calice.

Material. – P-340 (45) USNM 46421; P-394 (4) USNM 46423; P-478 (5) USNM 46419; P-585 (4) USNM 46429; P-605 (3) USNM 46426; P-606 (10) USNM 46418; P-607 (31) USNM 46416; P-753 (3) USNM 46431; P-861 (34) USNM 46425; P-881 (2) UMML 8: 247; P-889 (12) USNM 46415; P-891 (13) USNM 46430, (3) UMML 8: 375; P-904 (8) USNM 46420; P-905 (20) USNM 46427; P-944 (1) USNM 46424; P-984 (4); P-1225 (34) UMML 8: 376; P-1256 (7) USNM 46417; P-1261 (1) USNM 46422; P-1356 (1) USNM 46434; 98 specimens from 26 Gerda stations from the Straits of Florida; CI-27 (4) USNM 46435; CI-84 (5) USNM 46436; O-1986 (1); O-3252 (2); O-3560 (3); O-4226 (1) USNM 46438; SB-3515 (39); BL-2; BL-19; BL-20; BL-58; BL-100; BL-101; BL-130; BL-154; BL-157; BL-176; BL-208; BL-211; BL-230; BL-233; BL-244 – all BL specimens at MCZ; Bibb 141 (MCZ); Hassler, off Barbados, 183 m (MCZ); Alb-2750 (20) USNM 36461; Combat-45 (1); Combat-447 (1); Gos-1632 (4); Gos-1638 (2); Gos-1639 (2); Gos-1723 (1); Gos-1827 (1); Caroline-23 (1); Caroline-25 (8); Caroline-67 (20); Caroline-93 (1); Caroline-94 (1); E-43 (1); Atl-2950; Atl-2990B; Atl-2999; Atl-3370; Atl-3371; Atl-3375; Atl-3459 – all Atl specimens at MCZ; TAMU 71A8–71 (3) TAMU; Explorer 1c (17). – Moseley's (1881) specimens. – Types.

Types. – Holotype: P-881 (USNM 46986). – Paratypes: P-881 (71) USNM 46428.
Type-Locality. – 13°21′N, 61°03′W (off St. Vincent); 576–842 m.

Distribution. – Western Atlantic: throughout the Caribbean and Gulf of Mexico, ranging from South Carolina to off the Amazon, Brazil; Bermuda (Map 24). 183–907 m. – Eastern Atlantic: area bounded by Portugal, the Azores, and Cape Verde Islands. 300–1000 m.

37. **Deltocyathus moseleyi**, new species

Plate XVIII, figures 1–3

Deltocyathus agassizii: POURTALÈS, 1871: 15 (in part). – MOSELEY, 1876: 546 (in part: Chall-56). – LINDSTRÖM, 1877: 10 (in part: eastern Atlantic specimens), pl. 2, figs. 15–17. – POURTALÈS, 1878: 200 (in part: BL-2).
Deltocyathus italicus: MOSELEY, 1881: 145 (in part: Chall-56). – JOURDAN, 1895; 16 (in part). – GRAVIER, 1920: 34 (in part), pl. 3, figs. 45–56.
Deltocyathus sp. B ZIBROWIUS, 1976: 160–162, pl. 52, figs. A–K, pl. 53, figs. A–L.

Description. – The base of the corallum is variable in shape, ranging from flat to almost hemispherical in large specimens. There is usually a slightly indented scar of attachment at the center of the base, but sometimes there is a projecting umbo, or even a short conical pedicel. C_{1-3} are only slightly wider than the C_4. All costae are rounded and extend to the basal scar. At the calicular edge, the costae are separated by very deep furrows, which become progressively shallower toward the scar. The costae bear very fine, pointed granules; those on the lateral surfaces toward the calicular edge are so tall that they often touch those of adjacent costae. The calice is round. The largest specimen measures 16.0 mm in calicular diameter, but 10–11 mm is more typical. The corallum is usually light brown, except for the basal scar and the area surrounding it, which are white. Reddish-brown and pure white coralla are also known.

Septa are arranged in six systems and four cycles in typical *Deltocyathus* fashion. The S_4 are smaller than the S_3 and joined to them very deep in the fossa close to the columella by two–three narrow processes. The inner edges of all septa are straight. The pali that correspond to the S_{1-3} are separated from their corresponding septa by narrow and moderately deep notches. The two P_1 before the principal S_1 are half as large as the other four P_1. P_3 are the most exsert, whereas P_1 are the least exsert pali. Septal and palar granulation consists of high, slender spines; those on the pali are usually taller (up to three times the thickness of a palus). The septal granules are arranged in radiating lines paralleling the trabeculae.

The columella is usually elliptical, aligned with the principal S_1. It is composed of 10–15 thickened pillars, sometimes slightly clavate, which are fused to one another and to the inner edges of the S_1 and S_2.

Discussion. – This species is unique among the Atlantic species of *Deltocyathus*, being the only one with a basal scar. It is further differentiated by its fine costal granulation and deep intercostal furrows.

Material. – P-610 (2); P-874 (1) UMML 8: 281; P-876 (1) UMML 8: 294; P-931 (1); G-723 (1); GS (G)–40 (1); BL-2 (1) MCZ; Gos-1606 (1); Gos-1641 (1); E-26023 (1) UMML 8: 293. – Lindström's (1877) specimens; Moseley's (1881) specimens. – Types.

Types. – Holotype: P-876 (USNM 46984). – Paratype: P-876 (1) USNM 46985.
Type-Locality. – 13°14'N, 61°05'W (off St. Vincent); 231–258 m.

Distribution. – Western Atlantic: Straits of Florida; off Belize; Windward Group, Lesser Antilles; Bermuda (Map 21). 201–777 m. – Eastern Atlantic: area bounded by Celtic Sea, Azores, and Madeira. 200–1200 m.

38. **Deltocyathus pourtalesi**, new species

Plate XVIII, figures 4–6

Deltocyathus agassizii: Pourtalès, 1878: 200 (in part: BL-20, 50, 51, 57, 58).
Deltocyathus italicus variety *delta* Pourtalès, 1880: 103 (in part: BL-101), pl. 1, figs. 6–8.

Description. – The base of the corallum is flat with no scar of attachment, but sometimes a small umbo occurs at the center. The calice is round; the largest specimen measures 14.9 mm in calicular diameter and 6.5 mm tall. C_1 and C_2 are equal in width and only slightly larger than C_3 and C_4, giving the base an equicostate appearance. All but the C_4 reach the center of the base. The costae have serrated outer edges resulting from large, blunt granules; they also bear smaller, pointed granules laterally. The costae are separated by furrows, which are most deeply incised toward the calicular edge. The upper, outer edges of the septa are usually highly dentate. The corallum is always white.

Septa are arranged in six systems and four complete cycles. S_1 are independent, each septum joining the columella through a tall, wide palus. S_2 are equal in size to the S_1 whereas the S_3 are the smallest septa, joined to the S_2 near the columella by a fusion of their pali. The S_4 are larger and more exsert than the S_3; they fuse solidly with the P_3 above the level of the notch that separates the S_3 from their corresponding pali. All septa are highly exsert because of the very low level of the theca. P_{1-3} are separated from their corresponding septa by deep, narrow notches; usually those notches corresponding to the S_3 are deepest. The two P_1 before the principal S_1 are half as large as the other P_1. The inner edges of all septa are straight to slightly sinuous. The septal and palar granules are widely spaced, randomly arranged, pointed, and about equal to the septal thickness in height.

The columella is elliptical to round and composed of 4–20 irregularly shaped rods fused basally and connected to the inner edges of the S_{1-3}. The level of the columella is higher than the upper thecal edge.

Discussion. – *D. pourtalesi* is distinguished from the other Atlantic species of *Deltocyathus* by its flat base, very low theca, equal costae, and S_4 that are slightly larger than the S_3.

Etymology. – This species is named in honor of L. F. POURTALÈS, who greatly contributed to the knowledge of deep-water corals.

Material. – P-211 (1) USNM 46289, (1) UMML 8: 377; G-56 (1) USNM 46290; G-664 (6) USNM 46291; G-720 (1) USNM 46292; G-721 (1) USNM 46293; BL-20 (25) MCZ; BL-50 (2) MCZ; BL-51 (3) MCZ; BL-57 (11) MCZ; BL-58 (2) MCZ; BL-101 (10) MCZ; Alb-2342 (1) USNM 10235; Gos-1811 (2); Atl-3396 (59) MCZ; Atl-3397 (2) MCZ; Atl-3400 (1) MCZ; Atl-3416 (1) MCZ. – Types.

Types. – Holotype: P-209 (USNM 46883). – Paratypes: P-209 (1) USNM 46884; G-179 (8) USNM 46885, (1) UMML 8: 280; BL, 2 miles (3.2 km) east of Havana, Cuba (5) USNM 19197.
Type-Locality. – 26°59′N, 79°16′W (northern Straits of Florida); 330–450 m.

Distribution. – Off Cuba; Straits of Florida; off South Carolina (Map 25). 311–567 m.

Genus **Stephanocyathus** Seguenza, 1864

Diagnosis. – Solitary, patellate, free. Costae usually present. Paliform lobes usually present on all septa. Columella trabecular, papillose, or fused on surface. Type-species: *Stephanocyathus elegans* Seguenza, 1864, by subsequent designation (WELLS, 1936).

39. **Stephanocyathus (Stephanocyathus) diadema** (Moseley, 1876)

Plate XIX, figures 1–6

Ceratotrochus diadema MOSELEY, 1876: 553–554. – THOMSON, 1878: 113, fig. 30.
? *Ceratotrochus discoides* MOSELEY, 1876: 554.
Flabellum angulare: POURTALÈS, 1878: 203.
Stephanotrochus diadema: POURTALÈS, 1880: 96, 104, pl. 2, fig. 1. – MOSELEY, 1881: 152–153, pl. 3, figs. 1 a–c. – SCLATER, 1886: 130. – AGASSIZ, 1888: 149–150. – TIZARD, *et al.*, 1885; fig. 281.
?*Stephanotrochus discoides*: MOSELEY, 1881: 153–154, pl. 3, figs. 2 a–c.
Not *Stephanotrochus diadema*: JOURDAN, 1895: 18. – ROULE, 1896: 319. – STEPHENS, 1909: 24. – GRAVIER, 1920: 43–51. – THOMPSON, 1931: 9.
Stephanocyathus diadema: GARDINER & WAUGH, 1938: 191. – [BAYER, 1973]: illustrated on Haitian postage stamp, 1.5 gourdes. – ZIBROWIUS, 1976: 165. – CAIRNS, 1977: 87, upper right figure; 1977c: 730–731, figs. 1–2; 1978: 11.
Not *Stephanocyathus diadema*: ZIBROWIUS, SOUTHWARD & DAY, 1975: 100, pl. 3, fig. F (corrected in addendum, p. 100 = *S. moseleyanus*). – SORAUF & PODOFF, 1977: pl. 1, figs. 5–6 (= *S. paliferus*).
Stephanocyathus diadema nobilis: KELLER, 1975: 180, pl. 2, figs. 9 a–b.

Description. – The adult corallum is bowl- or saucer-shaped, free, and rests on a very small, projecting umbo, which is its original point of attachment. Smaller coralla (cd less than than 30 mm) have flat, very thin walls, with a deeply serrated calicular edge. The largest corallum examined measures 64.0 mm in calicular diameter and 33.5 mm in height, making it one of the largest solitary ahermatypic corals in the western Atlantic. About half of the coralla examined are white; the other half are uniformly pink.

C_1 and C_2 are prominent, ridged, and have up to 21 projecting teeth. An average-size specimen (cd = 48 mm) has only 12–14 teeth on each C_1 and C_2, the first tooth occurring about 12 mm from the center of the base. C_3 are sometimes ridged near the calicular edge but rarely have costal teeth. C_4 and C_5 are barely distinguishable. There is no costal granulation.

Septa are arranged in six systems and five cycles. The calicular edge is jagged because the theca forms a point corresponding to every septum, the most projecting points corresponding to the S_1 and S_2. The S_1 are highly exsert and are the only independent septa. The upper margin of each S_1 usually forms a large, exsert lobe, which is reduced in size just below the calicular edge by a wide notch or broad indentation. Toward the columella, the septum enlarges again as a wide paliform lobe. The S_2 are equally as exsert as the S_1 and almost as large; the other cycles are progressively less exsert and smaller. The inner margins of all septa follow the general shape described for the S_1. In each system the inner edges of the two P_3 are united with the P_2 by a spongy extension of the columella. Likewise, the P_4 are connected to the P_3 and the P_5 to the P_4, at distances progressively farther from the columella. The edges of the S_1 are entire; however, those of the higher cycle septa are irregularly dentate. The septa and paliform lobes bear small, blunt granules arranged in lines oriented parallel to the septal trabeculae.

The columella is elliptical in outline, its longer axis aligned with the principal S_1. It is composed of a solidly fused, granular mass, which is usually flat, sometimes concave. Calcareous deposits of the same texture extend outward from the columella into all six systems, serving to unite the inner edges of the higher cycle septa.

Discussion. – Aspects of the synonymy are discussed in CAIRNS (1977c).

Material. – P-337 (9) USNM 46321; P-338 (8) USNM 46325; P-364 (2) USNM 46318; P-374 (1) USNM 46326; P-391 (2) USNM 46319; P-407 (7) USNM 46322; P-413 (5) USNM 46320; P-636 (2) USNM 46307; P-672 (3) USNM 46323; P-682 (2) USNM 46324; P-741 (3) USNM 46308; P-748 (6) USNM 46309; P-754 (1) USNM 46310; P-830 (1) UMML 8: 312; P-850 (2) USNM 46311; P-1177 (2) USNM 46312; P-1178 (2) USNM 46313, (2) UMML 8: 249; P-1197 (2) USNM 46314; P-1224 (9) USNM 46315; P-1262 (10) USNM 46316; P-1304 (2) USNM 46317; P-1435 (64)

USNM 46329; 31 specimens from 10 Gerda stations in the western Straits of Florida; 267 specimens from 35 Columbus Iselin stations in Exuma Sound, Bahamas; GS-31 (71) USNM 46306, (13) UMML 8: 313; O-1302 (2); O-2202 (1); O-2575 (3); O-2813 (3); O-2814 (5) USNM 53397; O-2820 (13) USNM 53371; O-3562 (5); O-3659 (2); O-3663 (1); O-3664 (11); O-3666 (1); O-4430 (4) USNM 53372; O-4570 (5); O-5639 (2); O-10875 (5); O-10876 (4); O-10877 (7); O-10878 (6); O-10897 (2); O-11240 (3); BL-46 (1) MCZ; BL-111 (2) MCZ; BL-173 (1) MCZ; Alb-2117 (24) USNM 7059; Alb-2384 (6) USNM 10369; Alb-2385 (1); Alb-2392 (5) USNM 10408; Alb-2678 (52) USNM 14555; Alb-2751 (6) USNM 36456; Alb-2754 (1) USNM 36480; Alb-2760 (2) USNM 36422; E-30176 (1); Atl-2992A (3) MCZ; WB-322 (8) USNM 46305; TAMU 65A9–11 (2) TAMU; TAMU 67A5–5D (1) TAMU; TAMU 68A7–13B (2) TAMU; TAMU 70A10–41 (10) TAMU; TAMU 70A10–42 (19) TAMU; Anton Bruun-831 (4) MCZ. – Syntypes of *C. diadema*; holotype of *C. discoides*.

Types. – The lectotype (Chall-120) and paralectotype (Chall-78) of *C. diadema* are both deposited at the BM (1880.11.25.55). The paralectotype of *S. diadema* is small, broken, and outside the geographic range for the species. It is probably *S. moseleyanus* or another species of *Stephanocyathus*. The holotype of *C. discoides* (Chall-120) is also at the BM (1880.11.25.56).
Type-Locality. – 8°37′S, 34°28′W (off Recife, Brazil); 1234 m.

Distribution. – Widespread in Caribbean and eastern Gulf of Mexico, ranging from off South Carolina to off Rio de Janeiro, Brazil (Map 26). 795–2133 m. 3°–8°C, based on 12 records.

40. Stephanocyathus (Stephanocyathus) paliferus Cairns, 1977

Plate XIX, figures 7–9, 11

Stephanocyathus elegans: Pourtalès, 1880: 103 (not *C. elegans* Seguenza, 1864).
Stephanocyathus nobilis: Erhardt, 1976: 59–61, pl. 1, figs. 1–2.
Stephanocyathus diadema: Sorauf & Podoff, 1977: pl. 1, figs. 5–6.
Stephanocyathus (*S.*) *paliferus* Cairns, 1977c: 731–735, figs. 4–7; 1978: 11.

Description. – The corallum is bowl-shaped, free, and usually has a small scar of attachment at the center of the base, which often incorporates a small piece of substrate into the corallum. The largest specimen examined (the holotype) is 42.0 mm in calicular diameter and 21.0 mm in height. The theca, even of small specimens, is moderately thick and always white.

The costae corresponding to the first two cycles of septa bear up to 12 low, blunt spines, which, in larger specimens, occur only on the lower face of the corallum, being absent from the calicular edge. Costae corresponding to the higher cycle septa are prominent only near the calicular edge, where they are rounded and slightly convex, separated by broad, shallow, grooves; toward the apex they are indistinguishable or represented by faint lines. The calicular edge is entire.

Septa are arranged in six systems and five cycles, but the last cycle is rarely complete. The holotype has 90 septa; however, two other coralla of lesser calicular diameters have 98 septa. The S_1 are the largest septa, most exsert, and independent of the others. The S_2 are only slightly less exsert; the higher cycle septa are progressively smaller. The rudimentary S_5 are very small, thin, and are usually independent. The inner edges of all septa, except the S_5, are straight and entire. The septa and paliform lobes bear numerous low granules, which are often arranged in poorly-defined lines parallel to the trabeculae.

Each septum but those of the last cycle bears a large paliform lobe, which is separated from its septum by a deep, broad notch. The notch is deeper and narrower in the higher cycle septa. P_1 and P_2 extend to the columella; however, P_2 are usually slightly larger. The two P_1 before the principal S_1 are smaller than the other P_1. P_3, about the same size as the P_2, are slightly recessed from the columella. P_4, equal in size to the P_1, are recessed even farther from the columella. Within each system, the P_4 unite with the P_3 and the P_3 with the P_2 by a solid fusion of their lower, inner edges.

The columella is elongated along an axis defined by the principal S_1. It is composed of numerous distinct pillars, which usually remain individualized but sometimes fuse into a more solid structure. The columellar elements are basally fused among themselves and to the adjacent P_1 and P_2. The columella is sometimes absent.

Discussion. – *S. paliferus* is easily distinguished from the other Atlantic *Stephanocyathus* by its distinct paliform lobes and well individualized columellar elements. ERHARDT's (1976) record of *S. nobilis* is undoubtedly a small *S. paliferus*.

Material. – P-340 (2) USNM 46448, (2) UMML 8: 316; P-394 (1) USNM 46447; P-445 (2) USNM 46454; P-607 (1) USNM 46449; P-753 (45) USNM 46443, (7)

UMML 8: 277; P-861 (1) USNM 46444; P-889 (1) USNM 46445; P-984 (1) USNM 46446; P-1171 (3) USNM 46450; P-1255 (2) USNM 46451; G-524 (1) USNM 46439; G-967 (1) USNM 46440; G-1012 (10) USNM 46441, (1) UMML 8: 317; G-1015 (1) USNM 46442; O-450 (3) USNM 53364; O-1555 (1) USNM 53369; O-1889 (1) USNM 53403; O-1981 (75); O-1982 (2) USNM 53373; O-1984 (4) USNM 53401; O-1985 (29); O-1989 (115) USNM 53405; O-2774 (1); O-3584 (4); O-3627 (1); O-4203 (1) USNM 46452; O-4226 (3) USNM 46453; O-4421 (5); O-4423 (4); O-4840 (1); O-4907 (9); O-5028 (1); O-5037 (3); O-5636 (7); O-5740 (7); O-5925 (3); O-5930 (15); O-6708 (1); O-6721 (1); O-11290 (1); SB-2475 (7); SB-2488 (1); SB-3513 (4); SB-3514 (4); SB-3515 (19); BL-274 (1) MCZ; BL-280 (1) MCZ; BL-281 (1) MCZ; Alb-2143 (3) USNM 7145; Combat-45 (4); Combat-449 (1) USNM 53366; E-43 (1) Cornell; Atl-2985 (3) MCZ; Atl-3344 (3) MCZ; Atl-3439 (2) MCZ. – Types of *S. paliferus*.

Types. – The holotype and 19 paratypes of *S. paliferus* are deposited at the USNM (47755–47759).
Type-Locality. – 23°58′N, 79°17′W (Santaren Channel, Bahamas); 555 m.

Distribution. – Common throughout Caribbean and Bahamas, ranging from off Florida to off the Amazon, Brazil; Campeche Bank, Mexico; off Florida west coast (Map 27). 229–715 m. 11°–19°C, based on eight records.

41. Stephanocyathus (Stephanocyathus) laevifundus Cairns, 1977

Plate XIX, figure 10; Plate XX, figures 1–4

Stephanocyathus variabilis: Pourtalès, 1880: 104, pl. 2, fig. 2 (not *Ceratocyathus variabilis* Seguenza, 1864).
Stephanocyathus (*S.*) *laevifundus* Cairns, 1977c: 735–736, figs. 8–12.

Description. – The corallum is discoidal, with a flat or slightly concave base. The center of the base is usually blunt, rarely projecting, and never incorporates any of the substrate. The largest corallum examined measures 46.0 mm in calicular diameter and 17.0 mm in height. The corallum is always white. The base is smooth, sometimes glossy, with only faint lines representing costae radiating from the center. Rarely the C_1 and C_2 are slightly ridged near the upturned edge of the base. Very low, rounded granules are barely distinguishable on the base and do not alter the smooth texture. The calicular margin is not serrate.

Septa are arranged in six systems and five cycles; a complete fifth cycle is often present in specimens measuring only 25 mm in calicular diameter. S_1 and S_2 are equal in size and highly exsert. The higher cycle septa are progressively smaller and much less exsert. The S_1 and S_5 are independent; each S_1 reaches the columella by a large paliform lobe, whereas the S_5 are rudimentary, reaching the columella as very low ridges. The remaining septa are joined to one another within each system by the inner edges of their paliform lobes: the P_4 to the P_3 and the P_3 to the P_2. The inner edges of all septa, except the S_5, are straight and entire. Septal and palar granulation is similar to that of the two previously discussed species, consisting of small, low, rounded granules arranged in close-set radiating lines parallel to the underlying trabeculae, which are most conspicuous near the septal margin.

All but the last cycle of septa bear paliform lobes, each of which is separated from its corresponding septum by a shallow, broad indentation. P_1 are the largest lobes, closest to the columella, and sometimes thickened on their axial margins. Two of the six P_1, those aligned with the principal septa, are smaller than the four lateral P_1. The paliform lobes of the remaining three cycles are progressively smaller, farther away from the columella, and usually more acute.

The columella is elongated in the axis defined by the principal S_1 and is variable in structure. It is often a low, solidly fused mass but it also can be composed of small, individualized pillars united at their bases.

Discussion. – The most distinctive feature of *S. laevifundus* is its smooth, flat base. Comparisons to other species are made by CAIRNS (1977c).

Material. – P-881 (13) USNM 46382, (3) UMML 8: 380; P-1187 (3) USNM 46383; 98 specimens from 17 Gerda stations in the Straits of Florida, USNM 46365–46381; CI-210 (3) USNM 46384; SB-446 (4); BL-214 (1) MCZ; BL-218 (2) MCZ; Alb-2656 (1) USNM 16069; Alb-2657 (2) USNM 14621; Alb-2658 (4) USNM 14553; Atl-2991A (3) MCZ; Anton Bruun-831 (3) MCZ. – Types of *S. laevifundus*.

Types. – The holotype and 47 paratypes are deposited at the USNM (45751–45753). One paratype is at the UMML (8: 278).
Type-Locality. – 25°05′N, 79°21′W (northern Straits of Florida); 840 m.

Distribution. – Antillean distribution; off Panama (Map 28). 300–1158 m. 5°–7°C, based on three records.

Subgenus **Odontocyathus** Moseley, 1881

Diagnosis. – Like the nominal subgenus but with basal part of one or two cycles of costae (C_1 and C_2) bearing stout spines or tubercles. Type-species: *Platytrochus coronatus* Pourtalès, 1867, by monotypy.

42. Stephanocyathus (Odontocyathus) coronatus (Pourtalès, 1867)

Plate XX, figures 5–6, 8–9

Platytrochus coronatus POURTALÈS, 1867: 114.
Trochocyathus ? coronatus: POURTALÈS, 1871: 14–15, pl. 6, fig. 16. – MOSELEY, 1876; 550–551. – POURTALÈS, 1880: 96, 106.
Odontocyathus coronatus: MOSELEY. 1881: 148–151, pl. 2, figs. 4a–b, 5a–b, text-fig. – TIZARD, *et al.*, 1885: fig. 280.
Stephanocyathus (Odontocyathus) coronatus: GARDINER & WAUGH, 1938: 191. – ZIBROWIUS, 1976: 91. – CAIRNS, 1977c: 736–738, figs. 13–16; 1978: 11.
Stephanocyathus (Odontocyathus) sp. KELLER, 1975: 179.

Description. – The corallum has a nearly horizontal base, which bears a small, raised scar of attachment at its center. At the basal diameter between 12–18 mm the wall rises almost vertically, forming an angle of 60°–80° with the plane of the base. The largest corallum examined measures 34.5 mm in calicular diameter, 25.0 mm in basal diameter, and 35.0 mm in height. On the base, the C_1 and C_2 each bear three–four spines, which are progressively larger toward the edge. At the edge of the base each of the 12 costae bears a massive tubercle, sometimes very irregular in shape, measuring up to 9 mm in length. These 12 tubercles project outward, usually forming an expanded base of support. Costae and costal granulation are usually inconspicuous; however, on one well-preserved specimen, low, smooth costae separated by very shallow grooves are present. Low, round granules are closely arranged such that six–seven occur across the width of a costa.

Septa are arranged in six systems and five cycles, but the last cycle is never complete; a corallum rarely has over 72 septa. S_1 and S_2 are the largest septa, equal in size, and highly exsert. The higher cycle septa are progressively smaller and much less exsert. The inner edges of all septa are straight and entire. The septal faces are covered by numerous, very small, low granules arranged in lines parallel to the trabeculae.

Each septum, except the S_5, has a distinct paliform lobe, which is separated from the septum by a deep, broad notch. P_1 and P_2 are closest to the columella, equal in size, and are the smallest, lowest lobes. They are extremely variable in shape: often tall and rounded, standing well above the columella and encircling it, but sometimes elongate and pointed, overhanging the columella. In the extreme case, they are quite long, slender, and pointed, indistinguishable from the columellar elements. Finally, especially in small coralla, the upper edges of the P_1 and P_2 can be horizontal, merging directly with the columella, all at the same level. P_3 are two-three times larger, reach higher in the fossa, and are recessed from the columella. When two S_5 flank an S_4, the S_4 bears a paliform lobe of equal size and height to the P_3, but slightly more recessed from the columella. The P_4 do not reach the columella; instead, their inner edges are loosely joined to the inner edges of the P_3. When an S_4 is not flanked by two S_5, it remains small, rudimentary lower in the fossa, and bears only a slight, sometimes dentate paliform lobe. The P_1 and P_2 form an inner, lower crown of lobes, whereas the P_3 and P_4 form an outer, higher crown.

The columella is small, elongate to round in outline, and quite variable. It may be composed of several poorly individualized, stout rods, which are strongly fused basally or occur as a low, level, spongy mass or as long, slender, contorted rods.

Discussion. – The only other Atlantic *Odontocyathus* is *S.* (*O.*) *nobilis* (Moseley, 1873), known from the eastern Atlantic and questionably from the Indian Ocean (Zibrowius, 1976). At the USNM there is a single specimen (Pl. XX 7, 10) that appears to be *S.* (*O.*) *nobilis* from off Fortaleza, Brazil: 3°22'S, 37°49'W, 763 m (Alb-2756); this would be its first and only record for the western Atlantic. *S.* (*O.*) *coronatus* is distinguished by its more prominent costal tubercles and large paliform lobes.

Material. – P-607 (2) USNM 46476; P-741 (1) USNM 46468; P-754 (1) USNM 46469; P-830 (3) USNM 46470; P-846 (1) USNM 46471; P-892 (2) USNM 46472, (2) UMML 8: 251, 318; P-954 (1) USNM 46473; P-1187 (10) USNM 46474; P-1262 (4) USNM 46475; G-93 (1) USNM 46459, (1) UMML 8: 319; G-131 (2) USNM 46460; G-143 (1) USNM 46461; G-182 (5) USNM 46455, (1) UMML 8: 320; G-187 (1) USNM 46456; G-375 (1) USNM 46462; G-403 (3) USNM 46457; G-448 (1) USNM 46463; G-872 (1) USNM 46464; G-674 (1) USNM 46458; G-1016 (1) USNM 46467; G-1111 (1) USNM 46465; GS-31 (4) USNM 46466; O-3562 (1); O-3573 (1); O-4148 (1); O-4570 (9); O-5639 (7); O-5930 (11); SB-446 (1); BL-141 (1) MCZ; BL-175 (2) MCZ; BL-185 (1) MCZ; Alb-2117 (6) USNM 7062; Alb-2656 (1) USNM 14623; Alb-2750 (5) USNM 36411; Combat-452 (4) USNM 53365; Gos-112/79 (1) Cornell; Gos-112/86 (2) Cornell; E-30176 (3); Atl-2990B (3) MCZ; Atl-2991 (16) MCZ; Atl-2992A (3) MCZ; Atl-2994 (2) MCZ; Atl-2995 (3) MCZ; Atl-3313 (10) MCZ; Atl-3363 (1) MCZ; Atl-3366 (11) MCZ; Atl-3367 (2) MCZ; Atl-3369 (4) MCZ; Atl-3454 (1) MCZ; Atl-3457 (3) MCZ; Atl-3470 (1) MCZ; TAMU 65A9–14 (3) TAMU; TAMU 68A7–13A (1) TAMU; TAMU 70A10–41 (6) TAMU; Anton Bruun-831 (5) MCZ. – Holotype of *P. coronatus*; Moseley's (1881) specimens (BM).

Types. – The small and extremely worn holotype is deposited at the MCZ (2769).
Type-Locality. – 30°41'N, 77°03'W (Blake Plateau, off northern Florida); 841 m.

Distribution. – Throughout the Caribbean and eastern Gulf of Mexico; Bahamas (Map 29). 543–1250 m. 3°–8°C, based on 10 records.

Subfamily TURBINOLIINAE Milne Edwards & Haime, 1848

Genus **Trematotrochus** T.-Woods, 1879

Diagnosis. – Solitary, ceratoid to cuneiform, perforate, free. Costae prominent with hispid granulation. Three–four cycles of septa, the highest cycle septa often rudimentary but corresponding to well-developed costae. Paliform lobes variable but usually present before S_2. Columella styliform, or fused by union of inner edges of septa and paliform lobes, or slightly compressed. No endotheca or epitheca. Type-species: *Conocyathus fenestratus* T.-Woods, 1878, by monotypy.

Discussion. – When WELLS (1937) established the subgenus *Batotrochus* for *Turbinolia corbicula*, he noted its resemblance to *Trematotrochus* but differentiated *Batotrochus* by its larger columella and lack of paliform lobes. Some of the Atlantis specimens, however, have paliform lobes before the S_2 and the difference in the size of the columella of *T. corbicula* and *T. fenestratus* is not thought to be a generic level character. DENNANT (1899) emended the generic definition to include a wider range of columellar shapes. I have compared *T. corbicula* with 11 topotypic specimens (Pl. XXI 2, 5) and the two syntypes of *T. fenestratus* (Australian Museum, Sydney, Paleontology, F: 1698), all collected from the Balcombian of Muddy Creek, near Hamilton, Victoria, and found the two species to be almost identical. The main difference concerns the costae: the costae of *T. fenestratus* are equal, whereas those of *T. corbicula* alternate in width, the C_3 being twice as broad as the C_1 and C_2. Based on this comparison and the variation found in the Atlantis specimens, *Turbinolia (B.) corbicula* is transferred to *Trematotrochus*, making *Batotrochus* a junior synonym of *Trematotrochus*.

43. **Trematotrochus corbicula** (Pourtalès, 1878), new comb.

Plate XXI, figures 1, 3–4, 6; Plate XL, figure 10

Turbinolia corbicula POURTALÈS, 1878: 203, pl. 1, figs, 12–13; 1880: 96. – GARDINER & WAUGH, 1938: 171.
Turbinolia (Batotrochus) corbicula: WELLS, 1937: 239, pl. 1, figs. 3–4. – KELLER, 1975: 176. – CAIRNS, 1978: 11.

Description. – The corallum is free, ceratoid, and very small, rarely exceeding 4 mm in length and 2.4 mm in calicular diameter. The theca is fenestrate (perforate), consisting of 24 hispid costae, which alternate in width, the C_3 being twice as broad as the C_1 and C_2. In each deep intercostal groove, there is a single row of large pores penetrating the theca. Thin, horizontal bars (synapticulae?) between the pores bridge the intercostal space. The C_1 reach the base, whereas the C_2 terminate at about 90% of the distance to the base. Each pair of C_3 unites with a C_2 near the base and extends toward the base for a short distance as one costa. The costae bear long, narrow, blunt granules on both their outer and lateral edges. The calice is round.

S_1 and S_2 are equal in size, slightly exsert, and extend to the columella. S_3 are rarely developed, but if so, only as small ridges in the upper corallum. The septal faces bear few large, blunt granules.

Some specimens have six small, granulated paliform lobes associated with the inner edges of the S_2. The lobes are closely adjacent to the columella and are separated from the S_2 by deep, wide notches. The fossa is very shallow. The papillose columella is composed of one-five tightly fused elements and is joined by the inner edges of the S_1 and S_2.

Material. – Atl-2987D (10) USNM 46477, (36) MCZ; Atl-2999 (1) MCZ. – Syntypes.

Types. – One syntype from BL-19 (5603) and two from BL-20 (5602) are deposited at the MCZ. An additional syntype from BL-20 is at the BM (1970.1.26.53).
Type-Locality. – Off Bahia Honda, Cuba; 402–567 m.

Distribution. – Known only from off northwestern Cuba (Map 30). 400–576 m.

Genus **Peponocyathus** Gravier, 1915

Diagnosis. – Solitary, free, imperforate. Shape variable, including bowl-shaped, cylindrical, hemispherical, and globose. Presence of pali variable: usually present before S_2 but may be present before all but last cycle. Columella papillose. Type-species: *Peponocyathus variabilis* Gravier, 1915 (= *P. folliculus* (Pourtalès, 1868)), by original designation.

44. **Peponocyathus folliculus** (Pourtalès, 1868)

Plate XXII, figures 1–4

Stephanophyllia folliculus POURTALÈS, 1868: 139.
Paracyathus ? folliculus: POURTALÈS, 1871: 11–12.
Leptocyathus ? stimpsonii: LINDSTRÖM, 1877: 9 (in part: 23 out of 26 specimens), specimens), pl. 1, figs. 7–8.

Leptocyathus stimpsonii: POURTALÈS, 1878: 201 (in part: BL-5); 1880: 104 (in part BL-100).
Peponocyathus variabilis GRAVIER, 1915: 5, figs. 1–2; 1920: 39, pl. 4, figs. 60–73, pl. 13, fig. 202, pl. 14, figs. 203–204.
Trochocyathus (*Peponocyathus*) *variabilis*: VAUGHAN & WELLS, 1943: 205, pl. 41, figs. 9, 9a–b.
Peponocyathus folliculus: ZIBROWIUS, 1976: 178–180, pl. 46, figs. A–L, pl. 47, figs. A–K.

Description. – The corallum is free (only rarely fixed) and is variable in shape. It can be a long or short cylinder, a truncated cone, hemispherical, globose, or even onion-shaped. GRAVIER (1920) illustrated many of its forms under the name of *variabilis*. The calicular diameter is usually exceeded either basally or midway on the corallum. The largest specimen examined measures 7.0 mm in height and 4.5 mm in calicular diameter, but coralla are more typically 3–5 mm high, with a smaller calicular diameter.

In cylindrical specimens there are usually 24 costae, but in more rounded coralla C_4 are often present. The costae are separated by deep, narrow grooves, each costa bearing prominent granules (arranged two–three across a costa), as well as randomly arranged lateral granules that project into the intercostal groove. The costae follow much the same arrangement as in *P. stimpsonii*, differing only in that C_4 are present only in larger coralla and originate laterally, usually halfway between the base and the calice or near the calice.

Septa are arranged in six systems and three cycles; only the largest coralla have distinct S_4. S_1 are the largest and most exsert septa and extend to the columella. S_2 and S_3 are smaller and less exsert than the S_1, but equal in size to each other. Sometimes the inner edges of the S_3 fuse with the S_2. Even though distinct C_4 are sometimes present, S_4 usually are not, or if so, they are developed only in the upper calice as an extension of the costae. The septa and pali are covered with high, blunt granules, which exceed the thickness of a septum in height.

Before each S_2 there is a highly granular palar rod very similar in shape to the columellar elements. The columella is composed of several tuberculated rods, which rest in a very shallow fossa.

Discussion. – *P. folliculus* is similar to *P. stimpsonii* in morphology and geographic and depth ranges. However, it can be differentiated by its highly variable shape (often cylindrical), presence of C_4 without corresponding S_4, lateral origin of C_4 instead of at the base, and the absence of S_4 except in very large individuals. *P. folliculus* is also very similar to *P. orientalis* Yabe & Eguchi, 1932, known from the Pleistocene of Ryukyu. *P. folliculus* differs in being smaller and having less septa.

Material. – BL-2 (2) MCZ; BL-5 (23) MCZ, (3) USNM; BL-100 (6) MCZ; Gos-1590 (6); Hudson-4B (1) NMC. – Holotype of *S. folliculus*; Lindström's (1877) specimens (NRM).

Types. – The holotype of *S. folliculus* is deposited at the MCZ (Bibb-51). Fourteen syntypes of *P. variabilis* are deposited at the MOM (Prince of Monaco station 2214).
Type-Locality. – 24°12′40″N, 81°19′25″W (western Straits of Florida); 433 m.

Distribution. – Western Atlantic: Antillean distribution (Map 30). 284–457 m. – Eastern Atlantic: Azores; the high grounds between Madeira and Portugal. 300–732 m.

45. **Peponocyathus stimpsonii** (Pourtalès, 1871)

Plate XX, figure 11; Plate XXII, figures 5–7

Leptocyathus stimpsonii Pourtalès, 1871: 12, pl. 3, figs. 1–3. – Lindström, 1877: 9 (in part: 3 of 26 specimens), pl. 1, figs. 5–6. – Pourtalès, 1878: 201 (in part: not BL-5); 1880: 104 (in part: not BL-100). – Duncan, 1883: 363.
Deltocyathus italicus: Jourdan, 1895: 16 (in part).
Deltocyathus lens: Gravier, 1920: 36, pl. 3, figs. 47–54, pl. 13, figs. 200–201.
Deltocyathus stimpsoni: Gardiner & Waugh, 1938: 172.
Peponocyathus stimpsonii: Lewis, 1965: 1063. – Zibrowius, 1976: 180–182, pl. 48, figs. A–L. – Cairns, 1977b: 5; 1978: 11.
Notocyathus sp. Lewis, 1965: 1062.
Notocyathus (*Paradeltocyathus*) *orientalis*: Keller, 1975: 178.

Description. – The corallum is hemispherical, rarely exceeds 7 mm in calicular diameter, and is always wider than tall. It is free and sometimes has an irregular, asymmetrical base caused by asexual budding from a parent fragment. Equal costae corresponding to all septa are bordered by very deep, narrow intercostal grooves. Only the C_1 are independent, reaching the base of the corallum. Each C_3 extends three-fourths of the distance to the center of the base, where it is joined by its two adjacent C_4; this combined costa continues for only a short distance before it joins a C_2 very close to the center of the base. Each costa bears a distinct row of outwardly projecting granules as well as randomly arranged lateral granules, which extend into the intercostal groove.

There is no distinct boundary separating the costae from the septa. The upper costae are so produced and close-set and the septa are so exsert that the upper thecal edge is entirely hidden from view. The septa are arranged in six systems and four cycles. S_1 are the largest, most exsert septa and extend to the columella. The higher cycle septa are progressively smaller and less exsert. The inner edges of the S_4 are usually attached to the P_3 by their lateral septal granules. The septa bear prominent, blunt granules, which are as high as the thickness of a septum. Sometimes the granules fuse into short, vertically oriented carinae at the upper septal edges.

The presence and symmetry of pali are quite variable; usually, however, there are distinct pali at the inner edges of the S_2, appearing as highly tuberculated rods. Less often, there are wider and thinner pali before the S_3. Sometimes, however, pali are missing altogether or they merge indistinguishably with the columella. The columella is composed of six–eight slightly smaller tuberculated rods, which are very similar to the pali in shape. Usually six of the columellar rods are regularly arranged directly before the S_1, resembling pali of the first cycle.

Discussion. – There is confusion about the generic placement of this species and its relative *P. folliculus* (see CAIRNS, 1976) because of overnaming and varying interpretations of the turbinolid genera. A comprehensive generic revision of this subfamily is greatly needed.

P. stimpsonii is extremely similar to the Indo – West Pacific *Notocyathus* (*Paradeltocyathus*) *orientalis* (Duncan, 1876). Further comparisons may show them to be synonymous (Pl. XL 8–9).

DUNCAN (1883) unjustly criticized LINDSTRÖM (1877) in his discussion of *Leptocyathus stimpsonii*. LINDSTRÖM was faulted for not finding pali in front of the S_2 and S_3, as DUNCAN clearly observed in his specimens. Inasmuch as the variation in distinctness and number of pali in this species is great, I believe that both authors observed correctly.

Material. – G-966 (1) USNM 46478; O-4226 (64); Alb-2665 (4) YPM 8489; Gos-1657 (1); Gos-1735 (1); Gos-1768 (1); BL-20 (2) MCZ; BL-50 (4) MCZ; BL-51 (2) MCZ; BL-253 (1) MCZ; Hassler, off Barbados, 183 m (1) MCZ; MAFLA-2106 (1) FDNR; MAFLA-2957 (1) FDNR; TAMU 65A9–15A (3) TAMU; Hummelinck-1443 (5). – Syntypes of *L. stimpsonii*; Lindström's (1877) specimens (NRM); Lewis's (1965) specimen (USNM 46479).

Types. – Four syntypes (5572) from off Conch Reef, Florida (Bibb-201) are deposited at the MCZ. One syntype from Bibb-201 is at the YPM (4766). The syntype from off Tennessee Reef, Florida (Bibb-181) is missing.
Type-Locality. – Off Florida Keys; 110–293 m.

Distribution. – Western Atlantic: Antillean distribution; Campeche Bank, Mexico; off Florida west coast; off Amazon, Brazil (Map 31). 110–553 m. – Eastern Atlantic: Madeira; Azores. 200–600 m.

Subfamily DESMOPHYLLINAE Vaughan & Wells, 1943

Genus **Desmophyllum** Ehrenberg, 1834

Diagnosis. – Solitary, trochoid, fixed. No pali. Columella absent or very small. Sparse endothecal dissepiments. Type-species: *Desmophyllum dianthus* Ehrenberg, 1834 by subsequent designation (Milne Edwards & Haime, 1850).

46. **Desmophyllum cristagalli** Milne Edwards & Haime, 1848

Plate XXI, figures 7–8; Plate XXII, figure 8

Synonymy incomplete:

Desmophyllum cristagalli MILNE EDWARDS & HAIME, 1848: 253, pl. 7, figs. 10–10a. – DUNCAN, 1873: 321–322, pl. 41, figs. 10–16. – POURTALÈS, 1878: 203 (in part: BL-2); 1880: 96, 106 (in part: BL-288). – VERRILL, 1885: 150. – AGASSIZ, 1888: 151. – JOURDAN, 1895: 22. – ROULE, 1896: 318–319. – MARENZELLER, 1904: 267–268, pl. 15, fig. 2; 1904a: 81. – GOURRET, 1906: 119, pl. 11, fig. 8. – VAUGHAN, 1907: 67–68, pl. 7, figs. 3a–b. – VERRILL, 1908a: 494. – GRAVIER, 1920: 72–76, pl. 8, figs. 130–135. – NOBRE, 1931: 65–66. – HOFFMEISTER, 1933: 8–9, pl. 2, figs. 1–4. – DURHAM, 1949: 158, pl. 10, figs. 2, 4, 7–8. – DURHAM & BARNARD, 1952: 86–87, pl. 11, fig. 48. – SQUIRES, 1958: 91; 1959: 18–20 (in part: Sta. V7–12). – WELLS, 1958: 262. – RALPH & SQUIRES, 1962: 9–10, pl. 3, figs. 1–10. – SQUIRES & KEYES, 1967: 25, pl. 3, figs. 12–14. – BEST, 1969: 310, fig. 11. – SQUIRES, 1969: 16–17, map 1. – LABOREL, 1970: 156. – LIVINGSTON & THOMPSON, 1971: 788. – ZIBROWIUS, 1974a: 758, pl. 3, figs. 1–10. – ZIBROWIUS, SOUTHWARD & DAY, 1975: 98, pl. 4, figs. A–B. – KELLER, 1975: 176. – ZIBROWIUS, 1976: 183–187, pl. 23, figs. A–O, pl. 24, figs. A–M. – SORAUF & JELL, 1977: 2–18, pls. 1–8.

Desmophyllum costatum MILNE EDWARDS & HAIME, 1848: 254.

Desmophyllum cumingii MILNE EDWARDS & HAIME, 1848: 254, pl. 7, fig. 11.

Desmophyllum serpuliforme GRAVIER, 1915: 12, figs. 4–5; 1920: 78, pl. 7, figs. 121–129, pl. 16, fig. 215.

Description. – *D. cristagalli* varies greatly in its corallum shape and diameter of attachment. The corallum is usually greatly flared, with a firm pedicel one-eighth to one-fourth the diameter of the calice, but also can assume a cylindrical shape with a base almost as large as the calice. Some coralla attain a very large size, up to 50 × 80 mm in calicular diameter; elongate, narrower coralla measure up to 20 cm in length. These sizes are exceptional; an average-size specimen containing a full five cycles of septa measures about 45 × 35 mm in calicular diameter and 60–70 mm tall. The shape of the calice is usually round in young specimens, becoming elliptical with greater size. Narrow, ridged costae often correspond to the first three cycles but may be entirely absent. The theca is thick, especially in larger coralla, and covered by low, fine, rounded granules.

Septa are closely arranged in six systems and five cycles. Coralla with calicular diameters ranging from 20–50 mm usually have a complete fifth cycle (96 septa). Coralla larger than 45 mm in calicular diameter often have supplementary S_6. The largest corallum examined (Alb-2781, off Chile) with a calicular diameter of 77.0 × 55.0 mm has 180 septa. S_1 and S_2 are equal in size, exsert, and descend vertically into a very deep fossa. S_3 are smaller and less exsert but are considerably larger than the S_4. The S_4 are equally or less exsert than the S_5 but descend deeper into the fossa. The inner edges of all septa are entire and straight. The septal faces are covered by numerous, very fine granules, which are so low that the face appears smooth. Occasionally there are large, irregular deposits of stereome on the septal faces.

The fossa is very deep; in those forms that are elongate, sparse endothecal dissepiments are present. A small columella composed of one to several small rods is sometimes present in young specimens. Columellas are rare in larger specimens; none occurred in any of the western Atlantic specimens examined.

Discussion. – Both ALCOCK (1902) and VAUGHAN (1907) suggested that the small specimen described as *Desmophyllum reflexum* Duchassaing & Michelotti, 1860, is synonymous with *D. cristagalli*. The holotype of *D. reflexum* is not present at the MIZS or the MNHNP, and the original description and figures are inadequate to identify the specimen. The brief description of the costal and septal granulation, however, does not agree with that of *D. cristagalli*. I consider *D. reflexum* to be a *species dubia*.

SQUIRES (1959) treated *D. solidum* Pourtalès, 1871, as a junior synonym of *D. cristagalli*. Examination of the holotype shows it to be synonymous with *Thalamophyllia riisei* (Duchassaing & Michelotti) instead.

Material. – G-114 (1) USNM 46480; G-130 (2) USNM 46481; G-311 (1) USNM 46482; G-859 (1) USNM 46483; CI-140 (1) UMML 8: 252; CI-246 (1) USNM 46484; BL-2 (2) MCZ; BL-288 (2) MCZ; Gos-1656 (2); Gos-2150 (2); Gos-2609 (2); E-26017 (1); E-26052 (1); WH-104/68 (1) SME; Atl-260 (1) AMNH; Atl-280–14 (10); Atl-2995 (2) MCZ; Atl-3451 (5) MCZ; TAMU 65A9–4 (1) TAMU; SME-1776 (4) SME. – Holotype of *D. cristagalli*; holotype of *D. serpuliforme*; Marenzeller's (1904a) specimen (USNM 22074); Squires's (1959) specimen (AMNH).

Types. – The holotype of *D. cristagalli* is deposited at the MNHNP. The syntypes of *D. costatum* are probably lost; they cannot be found at the MNHNP or BM. The types of GRAVIER's *D. serpuliforme* are deposited at the MOM (Prince of Monaco station 1344) (ZIBROWIUS, 1976).
Type-Locality. – Gulf of Gascony; unknown depth.

Distribution. – Western Atlantic: off Nova Scotia; off New Jersey; Muir Seamount; near Kelvin Seamount; Straits of Florida; off Cuba; off Martinique, Lesser Antilles; off southeastern Brazil (Map 32). 155–1939 m. – Elsewhere: widespread in Atlantic, Pacific, Indian, and Antarctic Oceans. 80–2460 m.

47. **Desmophyllum striatum,** new species

Plate XXII, figure 9; Plate XXIII, figures 2–3

Desmophyllum cailetti: LINDSTRÖM, 1877: 12.
Desmophyllum cristagalli: POURTALÈS, 1878: 203 (in part: BL station off Havana, 158 fm = 289 m); 1880: 106 (in part: BL-135).

Description. – The corallum is trochoid with a slightly flared calice. The calice narrows to a thick pedicel with a diameter measuring 40–50% that of the calice. The base may spread out as a thin, translucent layer up to three times the calicular diameter. The largest specimen, the holotype, measures 9.7 × 8.7 mm in calicular diameter and 8.7 mm tall. Low, ridged C_1 and C_2 extend halfway to the base and bear large, blunt granules. Only if S_4 are present in a system are C_3 expressed. There are also very fine (0.2 mm in width), thecal striae oriented perpendicular to the costae. The striae occasionally bifurcate and anastamose; 40–42 parallel striae occur in the holotype. These striae are also found on the base. This thecal ornamentation is identical to that found in three species in the genus *Caryophyllia* (*C. lamellifera*, *C. rugosa*, and *C. corrugata*, n. sp.).

Septa are arranged in six systems and four cycles; the last cycle is never complete. The holotype has 38 septa. S_1 are highly exsert, thick, and meet in the lower fossa. S_2 are almost as large but less exsert and less thick, and also meet at the bottom of the fossa. Often only two of the four S_4 within a system are developed, in which case the S_3 flanked by two S_4 are enlarged to almost the size of an S_2. Both septa, the S_2 and the accelerated S_3, extend closely parallel toward the center of the fossa. The remaining S_3 (unflanked by S_4) and all S_4 are slightly exsert, small, and do not reach the center of the fossa. Small paliform lobes, not separated from the septa by notches, are present on the lower, inner edges of the S_2 and accelerated S_3. If all four S_4 are developed in a system, the higher cycle septa are progressively and regularly smaller. Very close-set, fine, pointed granules cover the septal faces.

The fossa is narrow and deep, usually without a trace of a columella. However, sometimes the lower, inner edges of the S_1 and S_2 fuse to produce a rudimentary columella.

Discussion. – This species is easily distinguished from *D. crista-galli*, the only other *Desmophyllum* known from the Atlantic, by its much smaller size, fewer septa, and very distinctive thecal striae, which occur even on an individual 1.5 mm in calicular diameter.

D. striatum could also easily be confused with individual corallites of *T. riisei*, particularly because these two species are often collected together. It can usually be differentiated by its thecal striae, thicker pedicel, and less exsert septa.

Etymology. – The specific name *striatum* (Latin, =groove, channel) refers to the distinctive, horizontal thecal striae.

Material. – Nekton-244 (4) USNM, (1) UMML 8: 284; Nekton (*beta*)-563 (1). – Lindström's (1877) specimen (NRM); Types.

Types. – Holotype: CI-6 (USNM 46886). – Paratypes: P-1411 (1) USNM 46887; SB-3494 (1) USNM 46888; BL-69 (1) MCZ; BL station off Havana, 158 fm (= 289 m) (1) MCZ; Bay of Cochinos, Cuba (1) USNM 46889.
Type-Locality. – 25°10′N, 77°05′W (Virgin Islands); 320 m.

Distribution. – Greater Antilles; Bahamas (Map 32). 130–823 m.

Genus **Thalamophyllia** Duchassaing, 1870

Diagnosis. – Colonial, forming reptoid colonies by extratentacular budding from stolons. Corallites ceratoid. No pali or columella. Type-species: *Desmophyllum riisei* Duchassaing, 1860, by monotypy.

48. Thalamophyllia riisei
(Duchassaing & Michelotti, 1860)

Plate XXIII, figures 1, 4–6, 9–10

Desmophyllum rusei DUCHASSAING & MICHELOTTI, 1860: 61, pl. 9, fig. 5.
Desmophyllum riisei: DUCHASSAING & MICHELOTTI, 1864: 66. – POURTALÈS, 1880: 96, 106, pl. 1, fig. 14. – AGASSIZ, 1888: 150, fig. 469. – GOREAU & WELLS, 1967: 449. – PORTER, 1972: 113. – WELLS & LANG, 1973: 58. – LANG, 1974: 278, fig. 7. – LAND, LANG & BARNES, 1977: 170.
Thalamophyllia riisei: DUCHASSAING, 1870: 28. – ZIBROWIUS, 1976: 187.
Desmophyllum simplex VERRILL, 1870: 371, fig. 2. – GRAVIER, 1920: 81.
Desmophyllum solidum POURTALÈS, 1871: 17, pl. 5, figs. 5, 6; 1880: 96. – AGASSIZ, 1888: 150, fig. 470.

Lophohelia exigua: LINDSTRÖM, 1877: 14.
Cyathoceras riisei: VAUGHAN, 1907: 68.
?*Desmophyllum fasciculatum*: ALLAN & WELLS, 1962: 390, pl. 3, figs. 5–6.

Description. – The reptoid colony forms loose aggregations of corallites separated from one another by 5–10 mm but all interconnected basally by very thin, narrow stolons. Often the delicate stolons are obscured or abraded away. An individual ceratoid corallite has a thin pedicel, which expands into a flared calice. The largest specimen examined measures 13.0 × 11.0 mm in calicular diameter and 19.2 mm tall. Highly ridged, narrow C_1 extend to the base; C_2 extend only halfway to the base. The highest cycle costae (C_3 or C_4) are usually broader than the others and are covered by low, inconspicuous granules.

Septa are arranged in six systems and four cycles; the fourth is never complete. The largest specimen examined contains 42 septa. Corallites measuring 4–10 mm in calicular diameter usually have 24 septa; S_4 occur only in larger specimens. S_1 are extremely exsert, with rounded upper edges and vertical, straight inner edges, which almost meet in the bottom of the fossa. S_2 are also quite exsert but much less than the S_1. If S_4 are not present in a system, the S_3 are often very thick, with correspondingly broad costae. If S_4 are present, they become the thick septa with broad costae, whereas the S_3 remain thin. When the highest cycle septa are thick, it is the result of a secondary thickening of stereome and corresponds to the "*solidum*" form. If the highest cycle septa are thin, the specimen is the typical form. Both forms are found within millimeters of each other and have no taxonomic validity. Very low, rounded, uniformly spaced granules cover the septal faces. The fossa is usually elongate and deep. There is no columella.

Discussion. – ZIBROWIUS (1976) resurrected *Thalamophyllia* Duchassaing, 1870, to accomodate two species, *D. riisei* and *D. gasti* Döderlein, 1913. It differs from *Desmophyllum* only in its tendency to reproduce asexually by budding from a basal expansion. *T. riisei* is easily distinguished from *T. gasti* by its prominent costae and flared calice.

VAUGHAN (1907) placed *D. riisei* in the genus *Cyathoceras* because he observed a columella in the holotype. I agree with JOUBIN (1928) in assuming that a labelling error occurred regarding the holotype, since it distinctly does not have a columella (WELLS, pers. comm.).

Material. – P-405 (USNM 46491); P-596 (USNM 46492); P-991 (UMML 8: 256); G-103 (USNM 46486); G-984 (USNM 46487); G-985 (USNM 46488); G-986 (USNM 46489); CI-158 (USNM 46493); O-4297; SB-3494; BL-22 (MCZ); BL-155 (MCZ); BL-156 (MCZ); BL-157 (MCZ); BL-177 (MCZ); BL-203 (MCZ); Alb-2135 (USNM 16076); Alb-2157 (USNM 16090); Alb-2166 (USNM 7384); Alb-2323; Alb-2327 (USNM 16073); Alb-2332 (USNM 16071); Alb-2334 (USNM 10193); Alb-2336 (USNM 10210A); Gos-39 (Cornell); E-30159; E-30178; Chain-43; Nekton (*gamma*)-244; Cardiff Hall, Jamaica, 39–43 m (USNM 46495); off Golding Cay, Bahamas, 914 m (USNM 46496); off Acklin's Island, Bahamas, 33 m (USNM 46494). – Holotype of *D. solidum*; holotype of *D. simplex*; Lindström's (1877) specimens (NRM).

Types. – The holotype of *D. riisei* was reported to be at the MIZS in 1962 but could not be found there in the summer of 1975. The type-colony of *D. simplex* Verrill, is at the YPM (3862). The holotype of *D. solidum* Pourtalès, collected at Bibb-141, is deposited at the MCZ (2760).
Type-Locality. – St. Thomas, Virgin Islands.

Distribution. – Antillean distribution, ranging from Bahamas to off Surinam; off Panama (Map 33). 18–1317 m.

49. **Thalamophyllia gombergi**, new species

Plate XXIII, figures 7–8, 11

Description. – Small, phaceloid colonies are formed by closely adjacent budding from a common basal layer of coenosteum. The colonies are secondarily increased by settlement of planulae on old or dead corallites. The corallites are cylindrical, tapering only slightly toward the base; the diameter of the thickened pedicel ranges from one-half to three-fourths that of the calicular diameter. The calice is round to slightly elliptical, measuring 7.0 × 6.8 mm in the largest corallite of the holotype colony; its height is 10.8 mm. Broad, flat, equal costae correspond to all septa. They are set apart by very faint striae, which become indistinguishable halfway to the base. Four–five very fine, rounded costal granules occur across the width of each costa near the calice. The theca is very thick.

Mature corallites have 24 septa arranged in six systems and three cycles. A small, cylindrical corallite measuring 1.4 mm in diameter and 2.1 mm in height possesses only the first cycle of septa. All septa are slightly exsert. S_1 are larger than the S_2 and both have entire, vertical inner edges. S_3 are much smaller and have irregular, slightly sinuous inner edges. Low, blunt, randomly arranged granules cover the septal faces. The fossa is extremely deep and narrow, bordered by the inner edges of the S_1 and S_2. There is no columella.

Discussion. – This species is placed in the genus *Thalamophyllia* because of its tendency to bud from a common basal expansion. It is easily distinguished from the other two species in the genus, *T. riisei* and *T. gasti*, by its broad, granulated costae, thick wall, and cylindrical corallites.

Etymology. – This species is named in honor of DAVID GOMBERG, who provided me with the Gilliss (Geology) ahermatypes, which included the holotype of this species.

Material. – Types.

Types. – Holotype: a small colony of five corallites from GS (G)-25 (USNM 46890). – Paratypes: GS (G)-25 (7) USNM 46891, (1) UMML 8: 285; GS (G)-27 (13) USNM 46892, (4) UMML 8: 292; GS (G)-71-6 (2) USNM 46893; GS (G)-71-7 (1) USNM 46894.
Type-Locality. – 24°21.3′N, 81°40.2′W (Pourtalès Terrace); 190 m.

Distribution. – Known only from the Pourtalès Terrace, Florida (Map 33). 155–220 m.

Genus **Lophelia** Milne Edwards & Haime, 1849

Diagnosis. – Colonial, forming large dendroid colonies by intratentacular budding. Coenosteum dense. Costae and columella poorly developed. Pali absent. Sparse tabular endothecal dissepiments. Type-species: *Madrepora prolifera* Pallas, 1766, by subsequent designation (MILNE EDWARDS & HAIME, 1850).

50. **Lophelia prolifera** (Pallas, 1766)

Plate XXIV, figures 1–5

Synonymy incomplete:
?*Madrepora pertusa* LINNAEUS, 1758: 797.
Madrepora prolifera PALLAS, 1766: 307. – LINNAEUS, 1767: 1281. – ELLIS & SOLANDER, 1786: 153, pl. 2, figs. 2–5. – ESPER, 1791: 104, 289, pl. 11.
Lophelia prolifera: MILNE EDWARDS & HAIME, 1850a: 81. – CECCHINI, 1917: 149. – TEICHERT, 1958: 1066. – SQUIRES, 1959: 22–23 (in part: V3–23; Station V7-12 is *Solenosmilia variabilis*). – MOORE & BULLIS, 1960: 125–128, fig. 2. – ROSSI, 1960: 9–10. – STETSON, SQUIRES & PRATT, 1962: 22, fig. 13. – SQUIRES, 1963: 23, fig. – CHEVALIER, 1966: 974–975. – SQUIRES, 1969: 16. – BEST, 1969: 312–313, fig. 13. – LABOREL, 1970: 156. – CAIRNS, 1977b: 5; 1978: 11.
Lophohelia prolifera: MILNE EDWARDS & HAIME, 1857: 117. – POURTALÈS, 1871: 24–25, pl. 1, figs. 3–5. – DUNCAN, 1873: 328–332, pl. 42, figs. 7–8. – MOSELEY, 1881: 178–179, pl. 8, figs. 7–8 (not Chall-109). – VERRILL, 1883: 63–64. – AGASSIZ, 1888: 151, fig. 472. – JOURDAN, 1895: 25. – MARENZELLER, 1904: 307, pl. 15, figs. 3, 3a. – GOURRET, 1906: 121, pl. 11, fig. 10, pl. 12, fig. 10A. – GRAVIER, 1920: 87–89 (in part: not pl. 10, fig. 157). – NOBRE, 1931: 67–68, pl. 19–20.
Lophohelia affinis POURTALÈS, 1868: 135.
Lophohelia tubulosa STUDER, 1878: 631, pl. 1, figs. 8a–e.
Bathelia candida: JOURDAN, 1895: 27.
Lophelia pertusa: DONS, 1944: 38. – CARLGREN, 1945: 151, fig. 74. – ZIBROWIUS, 1974a: 761, pl. 2, figs. 6–9; 1976: 192–197, pl. 21, figs. A–L.
Dendrosmilia nomlandi DURHAM & BARNARD, 1952: 85, pl. 10, fig. 47.
Desmophyllum cristagalli: SQUIRES, 1959: 18–22 (in part: figs. 8–10).

Description. – The corallum increases by intratentacular budding, producing massive, dendroid, bushy colonies with branches which often anastomose. Terminal branches are slender and bear opposite, alternately arranged corallites. Toward the base, which can reach several centimeters in diameter, budding is less regular and often random. The calicular size and branching pattern are quite variable. DUNCAN's (1873) form *gracilis* is a slender phenotype with widely spaced corallites separated by four–five times their own calicular diameters. MOSELEY's (1881) form *brachycephala* has a closer branching pattern with stout, vertically compressed corallites having very thick walls. It can also occur as thick (12 mm in diameter), massive branches, bearing flared corallites reaching 20 mm in calicular diameter. Virtually all intergrades are expressed; none have subspecific value.

The shape of the calice is also variable, ranging from round to elliptical to highly irregular. The coenosteum is covered by very fine, rounded, uniform granules and sometimes shallow striae. Short, ridged costae sometimes correspond to the primary septa.

Septa are not arranged in regular systems or cycles; instead there are usually seven–nine primary septa (up to 11), which are slightly exsert and extend to the bottom of the fossa. Secondary septa, almost as wide but less exsert, also extend into the fossa. The tertiaries are smaller, less exsert, and rudimentary lower in the fossa; they are often missing from many systems and rarely flank every secondary septum. The granulation on the septal faces is variable. Usually the granules are small, inconspicuous, and widely spaced, producing a smooth texture, but sometimes they are prominent, arranged in close-set lines or even short carinae oriented parallel to the trabeculae.

The fossa is very deep and sometimes curved as the corallite is curved. Often a thin, endothecal dissepiment considerably shortens the fossa. A columella is rare but when present it is very small, composed of one–three short rods.

Discussion. – In view of the great variation found in *L. prolifera* and its wide geographic and depth ranges, it is probable that both *Dendrosmilia nomlandi* Durham & Barnard, 1952 and *Lophelia californica* Durham, 1947, both described from the eastern Pacific, are junior synonyms. The type-specimen of *D. nomlandi* is only a small fragment of a branch with broken corallites. Extratentacular budding cannot be proven from this specimen. Also, the presence of a columella does not exclude it from being a *Lophelia*. No characters were given by Durham for differentiating *L. californica* from *L. prolifera.*

Material. – P-105 (USNM 46020, UMML 8: 310); P-112 (USNM 46019); P-197 (USNM 46018); P-639 (USNM 46017, UMML 8: 309); P-776 (USNM 46016); colonies from 12 Gerda stations in the Straits of Florida (USNM 46006–46015); CI-140 (USNM 46021, UMML 8: 253); CI-246 (USNM 46023); O-2776; O-2780; O-3651; O-6690; O-11301; O-11703; O-11716; O-11725; O-11726; BL-117 (MCZ); BL-153 (MCZ); BL-260 (MCZ); BL-318 (MCZ); Alb-2415 (USNM 10504); Alb-2416 (USNM 17047); Alb-2625 (USNM 19164); Alb-2661 (USNM 14568); Alb-2663 (USNM 16159); Alb-2667 (USNM 14498); Alb-2669 (USNM 14462); Alb-2671 (USNM

16154); Combat-308; Combat-412; Combat-436; Gos-1606; Gos-1615; Gos-1642; Gos-1643; Gos-1644; Gos-1645; Gos-1731; Gos-1738; Gos-1739; Gos-1742; Gos-1743; Gos-1764; Gos-1796; Gos-2191; Gos-2468; E-14449 (USNM 54498); E-26004 (USNM 46022); E-26017; E-26019; E-26028 (USNM 46026); E-26031 (USNM 46027); E-26034; E-26037; WH-83/68 (SME); WH-89/68 (SME); WH-90/68 (SME); WH-91/68 (SME); SME-1776 (SME); SME-1777 (SME); TAMU 68A7-12B (TAMU); Almirante Saldanha-2803 (USNM 46238). – Syntypes of *L. affinis*; holotype of *D. nomlandi*; Squires's (1959) specimens (AMNH); Moseley's (1881) specimens (BM).

Types. – The types of PALLAS's *prolifera*, based on material from Norway, are unknown. Likewise, no type-material of *M. pertusa* is known to exist. Syntypes of *Lophohelia affinis* Pourtalès are present at the MCZ (5612), represented by 31 fragments including the illustrated specimen (POURTALÈS, 1871: figs. 3–5). A branch is also deposited at the YPM (4774). POURTALÈS's material was collected at Bibb-5, off Coffin's Patches, Florida. Finally, the type-material of *L. tubulosa* Studer, from Gazelle-8, is deposited at the Berlin Museum (ZIBROWIUS, 1976).
Type-Locality. – Off Norway.

Distribution. – Western Atlantic: from Nova Scotia to off Florida; Straits of Florida; eastern Gulf; Lesser Antilles; off southeastern Brazil (Map 34). 95–1000 m, most common between 500–800 m. 3°–12°C, based on 11 records. – Elsewhere: eastern Atlantic; Indian Ocean; eastern Pacific. 60–2170 m.

Subfamily PARASMILIINAE Vaughan & Wells, 1943

Genus **Anomocora** Studer, 1878

Diagnosis. – Solitary, subcylindrical, free. Tendency to bud new coralla from edge zone with subsequent loss of organic connection. Wall thin. Columella trabecular, no pali. Tabular endothecal dissepiments common and widely spaced. Type-species: *Coelosmilia fecunda* Pourtalès, 1871, by monotypy.

51. **Anomocora fecunda** (Pourtalès, 1871)

Plate XXIV, figures 6–8

Coelosmilia fecunda POURTALÈS, 1871: 21–22 (in part: pl. 1, fig. 12, pl. 6, figs. 14–15; not pl. 3, figs. 4–5).
Parasmilia fecunda: LINDSTRÖM, 1877: 21. – POURTALÈS, 1878: 206 (in part: BL-45).

Anomocora fecunda: STUDER, 1878: 641–642, pl. 1, figs. 9f–g, pl. 2, figs. 9a–e. – SQUIRES, 1959: 15–19. – CAIRNS, 1977b: 5; 1978: 11.
Blastosmilia fecunda: DUNCAN, 1878: 245.
Not *Parasmilia fecunda*: POURTALÈS, 1880: 109 (=*C. arbuscula*). – MARENZELLER, 1904: 311–312, pl. 15, fig. 5. – GRAVIER, 1920: 91–94, pl. 11, figs. 169–173 (=*C. arbuscula*). – GARDINER & WAUGH, 1939: 229.
Ceratotrochus ? GRAVIER, 1920: 57, pl. 6, figs. 104–105.
Not *Anomocora fecunda*: EGUCHI, 1968: C-42, pl. C-10, figs. 1–5, pl. C–20, figs. 10–11, pl. C-23, fig. 3.
Coenosmilia fecunda: ZIBROWIUS, 1976: 198–200 (in part: pl. 14, figs. A–K).

Description. – The corallum is cylindrical, straight to gently curved, and slightly tapered toward the base, which is invariably broken. Large coralla exceed 10 cm in length and 10 mm in calicular diameter. Numerous buds and scars of former buds are scattered irregularly on the theca. The buds detach from the parent at a small size; while still attached to the parent they rarely exceed 20 mm in length and never produce additional buds. Low costae, separated by shallow grooves, are distinguishable from the calice to the base. Both the theca and septa are very thin (about 0.3 mm) and tabular dissepiments are widely spaced (about one every 4 mm), giving the corallum a very low density. The calice is round to elliptical.

Septa are irregularly arranged; however, the fully developed condition is six systems and four cycles, in which case the S_1 are slightly exsert, larger than the S_2, and have entire, straight, vertical inner edges reaching the columella. S_2 are less exsert and often bear large, thin lobes or elongate, slender ribbons on their lower, inner edges. S_3 are smaller, not exsert, and usually bear two–five long, slender, contorted ribbons oriented perpendicular to the septal edge or inclined upward from it. These twisted ribbons intermingle with the lobes of the S_2, sometimes forming a dense columella. If present, each S_4 consists of a row of low spines. The septal faces are often smooth, with curved growth lines parallel to the septal margin, or are inconspicuously granulated in rows perpendicular to the trabeculae.

The fossa can be very deep or quite shallow, depending on how recently a dissepiment has formed. Dissepiments in the process of forming are common. They originate from the septal and thecal edges as numerous slender, adjacent plates, which merge with those of adjacent septa in the center of the interseptal space. Often a line remains where the junction occurred.

Discussion. – Both POURTALÈS (1880) and ZIBROWIUS (1976) have synonymized *C. arbuscula* and *A. fecunda*. POURTALÈS (1880: 109) stated that they were simply extreme forms of the same species and that there were "... numberless intermediate ones, often parts of the same stock." After careful examination of all of POURTALÈS's material, the USNM collection, and additional eastern Atlantic material, I cannot find any such intermediates. *A. fecunda* is consistently and distinctively different from *C. arbuscula* in many characters, such as: (1) a longer, cylindrical corallum, (2) a random budding pattern with buds that break off before a third generation occurs, (3) more widely spaced dissepiments, (4) conspicuous lobes and ribbons on the inner edges of S_2 and S_3, and (5) absence of a solid, fused columella.

Material. – P-198 (17) USNM 46498; P-199 (2) USNM 46499, (1) UMML 8: 337; P-584 (3) USNM 46510; P-707 (2) USNM 46504; P-709 (25) USNM 46505, (1) UMML 8: 254; P-736 (20) USNM 46506; P-737 (7) USNM 46507; P-773 (2) USNM 46508; P-775 (19) USNM 46509, (11) UMML 8: 336; P-838 (1) USNM 46503; P-874 (1) USNM 46502; P-991 (1) USNM 46501; G-1270 (1); O-4832 (1); O-4939 (1); O-5648 (10); BL-45 (1) MCZ; Alb-2327 (1); Alb-2343 (3) USNM 10244; Gos-39 (1) Cornell; Caroline-102 (1); TAMU 65A9–15 (6) TAMU; TAMU 65A9–20 (9) TAMU; TAMU 65A9–21 (5) TAMU; Chain-16 (10); Explorer-4 (9). – Syntypes of *C. fecunda*; Lindström's (1877) specimens (NRM).

Types. – Six syntypes are deposited at the MCZ in three lots: one contains the figured specimen of plate 6, figures 14–15 (MCZ 2752); the second lot contains four fragments, including the figured specimen of plate 1, figure 12; and the third lot (MCZ 5621) contains the figured specimen of plate 3, figures 4–5 (all POURTALÈS, 1871). The last specimen is neither *A. fecunda* nor *C. arbuscula* and may be an undescribed species. It differs from *A. fecunda* in that it is strongly attached, bears no buds, and has more distinct costal and septal granules and a solid columella. Since the description is obviously based on the specimen numbered MCZ 2752, it is designated lectotype and the five remaining fragments as paralectotypes.
Type-Locality. – Southern Straits of Florida; 124–576 m.

Distribution. – Western Atlantic: throughout Caribbean, southeastern Gulf of Mexico; St. Peter and Paul Rocks (Map 35). 73–567 m. – Eastern Atlantic: Azores; Madeira; Canary Islands. 130–540 m.

Genus **Coenosmilia** Pourtalès, 1874

Diagnosis. – Colonial; small bushy colonies produced by extratentacular budding from edge zone below calice. Columella trabecular; no pali. Tabular endothecal dissepiments abundant. Type-species: *Coenosmilia arbuscula* Pourtalès, 1874, by monotypy.

52. **Coenosmilia arbuscula** Pourtalès, 1874

Plate XXIV, figures 9–11

Coenosmilia arbuscula Pourtalès, 1874: 39–40, pl. 7, fig. 1; 1878: 206. – Lewis, 1960: 12; 1965: 1062. – Cairns, 1977b: 5; 1978: 11.
Parasmilia fecunda: Pourtalès, 1878: 206 (in part: BL-32); 1880: 109. – Gravier, 1915: 3; 1920: 91–94, pl. 11, figs. 169–173.
Coenosmilia fecunda: Zibrowius, 1976: 198–200 (in part: pl. 15, figs. A–F).

Description. – Small, bushy colonies form by extratentacular budding. The corallites are typically 10–15 mm long with an elliptical to round calice measuring 7–10 mm in diameter. Larger, massive founder corallites also occur, measuring up to 50 mm in length, with calicular diameters of up to 14.5 mm. However, single corallites are rare. Budding occurs from the edge zone usually within 5 mm of the top of the corallite and is very regular; two corallites often bud on opposite sides of the parent calice but three corallites, separated from one another by 120°, or four at 90°, are not rare. The parent corallite often dies after budding, giving the colony the appearance of an independent settlement of planulae on older, dead coralla. The buds never lose their attachment to the parent. The largest colony examined has a series of four successive buds.

The corallites are ceratoid and elongate, firmly attached by a thick pedicel. Costae correspond to all septa but are usually distinct only near the calice. C_1 and C_2 are slightly ridged and narrower than the C_3 and C_4. All costae bear fine, pointed granules. The wall is 0.5–0.6 mm thick.

Septa are arranged in six systems and four cycles, but corallites with 40 regularly arranged septa are common. S_1 are slightly larger than or equal in size to the S_2; both are exsert and extend to the columella. S_3 and S_4 are progressively smaller. S_4 are absent in small corallites and rudimentary in larger ones, represented only by a row of laciniate spines in the latter. The inner edges of the S_1 and S_2 are entire and usually straight, sometimes becoming sinuous on their lower, inner margins near the columella. The inner edges of the S_3 are dentate but not as irregular as those of the S_4. Septal granules are arranged in lines parallel to the trabeculae. The granules are low and rounded on the upper septal margins and higher and pointed deeper in the fossa.

The fossa is moderately deep. Long corallites contain tabular dissepiments (about one every 2 mm), which obscure much of the columella and shorten the fossa. The columella is a massive, elongate, convex structure, composed of numerous spongy, crispate trabeculae usually solidly fused together.

Discussion. – This species is very abundant in the Pourtalès collection at the MCZ. Perhaps because of a hasty examination or the lack of proper cleaning, POURTALÈS included three other species in his identified material: *Caryophyllia antillarum*, *Paracyathus pulchellus*, and *Thalamophyllia riisei*.

Anomocora fecunda, *C. arbuscula*, and *Asterosmilia prolifera* are often collected together at the same station and the latter two are sometimes attached to *A. fecunda*. Because of the variation in growth form of all three species and their external similarities, they easily could be confused.

Material. – P-757; P-874 (UMML 8: 340); P-969 (USNM 46559); P-991; P-1143 (USNM 46557); P-1354 (USNM 46558); G-251 (USNM 46553); G-688 (USNM 46554, UMML 8: 338); G-691 (UMML 8: 255); G-694 (USNM 46555); G-1327 (USNM 46556, UMML 8: 339); O-3568; O-4398; O-4832; O-4932; O-5015; O-5430; O-5648; O-10513; BL-32 (MCZ); BL-45 (MCZ); BL-62 (MCZ); colonies from 19 additional Blake stations throughout the Windward Group of Lesser Antilles (MCZ); Alb-2135 (USNM 7101); colonies from 13 additional Albatross stations from off Havana, Cuba (USNM); Alb-2354 (USNM 16084); Caroline-49; Caroline-102; E-30178; Explorer-4; Hummelinck-1443. – Syntypes of *C. arbuscula*.

Types. – Three lots of syntypes, including one small colony (2761) and nine other corallites (5622), are deposited at the MCZ. All were collected from a Hassler station off Barbados.

Type-Locality. – Off Barbados; 183 m

Distribution. – Western Atlantic: throughout Caribbean; southeastern Gulf of Mexico; off Guyana (Map 36). 109–622 m. – Eastern Atlantic: Azores; Madeira; Canary Islands, 130–540 m.

Genus **Dasmosmilia** Pourtalès, 1880

Diagnosis. – Solitary, turbinate or trochoid, free. Parricidal budding common. Theca very thin. Paliform lobes, usually several on each septum, before all but last cycle. Trabecular columella formed by mingling of inner paliform lobes. Type-species: *Parasmilia lymani* Pourtalès, 1871, by subsequent designation (WELLS, 1933).

53. **Dasmosmilia lymani** (Pourtalès, 1871)

Plate XXV, figures 1–3, 8–9

Parasmilia lymani POURTALÈS, 1871: 20, pl. 6, figs. 8–10. – VERRILL, 1882: 316; 1882a: 406–407.

Dasmosmilia lymani: POURTALÈS, 1880: 96, 108. – VERRILL, 1883: 64; 1885a: 535, fig. 17; 1908: 449. – CHEVALIER, 1966: 949. – TOMMASI, 1970: 56, fig. 2. – LABOREL, 1970: 155; 1971: 175. – DEFENBAUGH, 1976: 27, 39, fig. 56. – ZIBROWIUS, 1976: 142–143, pl. 26, figs. A–L, pl. 27, figs. A–L. – CAIRNS, 1977b: 5, 13–14, pl. 1, figs. 7–8; 1978: 11.

Description. – The corallum is cylindrical or ceratoid, often slightly curved, and usually has a broken base or is attached to a fragment of an older corallum. Individuals attached to the substrate are extremely rare. The shape of the calice is quite variable; it can be triangular, rectangular, round, or elliptical. Strongly compressed calices attain 28 mm in greater diameter with a corallum height of 50 mm; however, populations exist with calicular diameters never exceeding 14 mm and heights that never exceed 30 mm. Costae are also variable. They are usually ridged, equal, and separated by broad, flat furrows. However, sometimes they are unequal (more prominent costae alternate with less prominent ones), rounded, or flat, and separated by narrow, shallow intercostal spaces. Low, rounded granules cover the costae; near the calicular edge they are arranged such that, on the average, two–four occur across the width of a costa. The theca and septa are very fragile (0.3–0.5 mm thick) and often light brown.

Septa are arranged in six systems and six cycles, the last cycle never complete. S_{1-3} are equal in size, slightly exsert, and each septum may bear a thin, small paliform lobe on its inner edge. If no paliform lobe is present, the septum merges with the columella. S_4 are smaller, less exsert, and usually have sinuous inner edges. They bear much larger paliform lobes, which are sometimes divided into two–five lobes, all of which merge with the columella. S_5 and S_6 are progressively smaller, do not reach the columella, and do not have paliform lobes. There are usually 12–24 larger septa (S_{1-2} or S_{1-3}), with or without lobes; 12–24 paliferous septa (S_3 or S_4); and 24–48 S_4 or S_5, resulting in 12–24 quartets of septa composed of three different sizes. Pairs of S_6 occur in some quartets, resulting in coralla of 106+ septa. The septal granules are large and arranged both in lines parallel to the trabeculae as well as in curved rows perpendicular to the trabeculae.

The trabecular columella is composed of numerous crispate, twisted processes originating from the lower inner, edges of S_{1-4} deep in the fossa. The fossa is deep, extending to the last formed tabular dissepiment, one of which occurs every 3–6 mm; in a corallum with a calicular diameter of 15 mm, the fossa is 22 mm deep.

Remarks. – Evidence of three methods of propagation have been observed for *D. lymani*: (1) sexual reproduction, (2) asexual reproduction by longitudinal fission, and (3) asexual reproduction from fragments of a crushed or broken corallum. Coralla formed by the first method result from planulae settling on a hard substrate and would therefore be firmly attached. These individuals are rare. The second method results from an enlargement of the calice and a subsequent constriction into two separate calices and coralla, which produces only one additional specimen at a time. Coralla formed by this method can be found in various stages of division but are uncommon. Asexual budding from wedge-shaped fragments of a parent corallum is the most common condition observed. VERRILL (1882) reported over 30 buds from one broken piece.

Material. – P-112 (68) USNM 46567, (2) UMML 8: 258; P-722 (15) USNM 46566, (5) UMML 8: 387; G-19 (2) USNM 46561; G-132 (1) USNM 46562; G-610 (1) USNM 46563; G-866 (2) USNM 46564; G-1036 (4) USNM 46565, (1) UMML 8: 386; GS (G)-5 (1) USNM 46568; O-10729 (10); SB-1694 (10); SB-1789 (3); SB-2416 (1); SB-2547 (4); SB-2813 (1); SB-2863 (30); SB-3520 (1); 77 specimens from 10 Albatross stations off northeastern coast of North America; FH-899 (4) USNM 5055; FH-940 (9) USNM 19188; FH-949 (1) USNM 36474; FH-1040 (1) USNM 19178; Combat-164 (7); Combat-165 (1); 26 specimens from 10 Gosnold stations off northeastern coast of North America; BLM-33 III C (1) Alabama BLM; BLM-33 IV B (4) Alabama BLM; MAFLA-2212 (1); TAMU 67A5–10B (4) TAMU; TAMU 67A5–13B (2) TAMU; TAMU 68A7–9A (1) TAMU; TAMU 72 F1–48 (1) TAMU; IOSP-2 (1) SME; SME-1775 (1) SME. – Syntypes of *P. lymani*; Verrill's specimens (YPM).

Types. – Forty-nine syntypes, divided into six lots, bearing the numbers 2770, 5625, or 5469, are deposited at the MCZ. Of the six stations at which syntypes were collected, only three (Bibb-187, 194, and 203) are known for certain. Two additional specimens, perhaps also syntypes, are at the BM (1891.2.4.27 and 1970.1.26.33).
Type-Locality. – Off Florida Keys; 128–269 m.

Distribution. – Western Atlantic: from off Massachusetts to Florida Keys; eastern Gulf of Mexico; off Isla de Margarita, Venezuela; off southeastern Brazil (Map 37). 48–366 m. 7°–21°C, based on 15 records. – Eastern Atlantic: area bounded by Portugal, the Azores, and Spanish Sahara. 85–316 m.

54. **Dasmosmilia variegata** (Pourtalès, 1871)

Plate XXV, figures 4–7, 10; Plate XXVI, figure 1

Parasmilia variegata Pourtalès, 1871: 21, pl. 1, fig. 13.
Bathycyathus elegans Studer, 1878: 628–629, pl. 1, figs. 1a–d.
Dasmosmilia variegata: Pourtalès, 1880: 96, 109, pl. 2, figs. 11–12. – Gardiner & Waugh, 1938: 172–173. – Zibrowius, 1976: 143–144, pl. 28, figs. A–K. – Cairns, 1977b: 5; 1978: 11.
Paracyathus confertus: Jourdan, 1895: 15.

Description. – The corallum is ceratoid to trochoid, usually strongly compressed, and almost always attached by a thick pedicel to a fragment of the parent corallum from which it budded. An independently attached specimen has never been reported. Small calices are round but become elliptical or irregular in shape with an increase in size. The largest specimen examined measures 20.2 × 17.0 mm in calicular diameter and 21.0 mm tall. Prominent, convex costae are bordered by narrow, sharply incised intercostal striae. All costae but the C_5 extend to the base. Small, pointed granules cover the costae; near the calicular edge they are arranged five-seven across the width of a costa. C_1 and C_2 are usually dark brown or black but occasionally the entire corallum is white. The corallum wall is very thin (0.2–0.4 mm).

Septa are arranged in six systems and five cycles, the last cycle rarely complete. S_1 and S_2 are equal in size, highly exsert, swollen looking, and usually dark brown or black. Sometimes the septa adjacent to the S_1 and S_2 are also black. In half-systems lacking S_5, the S_4 are larger than the S_3, highly exsert, and, together with their adjacent S_1 and S_2, form exsert projections. When S_5 are present, both the S_3 and S_5 are larger than the S_4; in this case the S_5, together with their adjacent S_1, S_2, and S_3, form the exsert projections. Rounded septal granules are arranged both in lines parallel to the trabeculae and in rows perpendicular to the trabeculae.

Large, black, coarsely granulated paliform lobes are present on the lower, inner edges of the S_1 and S_2. These lobes also bear strong horizontal carinae. As seen in a longitudinal cross-section of the corallum, these septa also have up to 10 additional long, slender, twisted paliform lobes directed upward into the center of the fossa; the ends of the uppermost lobes form the columella. Twisted or stout paliform lobes are also present on the inner edges of the S_3 and S_4. They are smaller than the P_1 and P_2 but terminate much higher in the fossa. Widely spaced tabular dissepiments are present in larger coralla.

Material. – GS (G)-48 (1) USNM 46570; O-4226 (1+) USNM 46572; BL-254 (10) MCZ; off Egmont Key, Florida, 366 m (1) UMML 8: 257; off Anna Maria Key, Florida, 366–484 m (1) USNM 46571. – Syntypes of *P. variegata*.

Types. – Four syntypes, divided into two lots, both labelled "Florida Straits, 60–77 fms", are deposited at the MCZ. One lot of two specimens is numbered 2780; the other lot of two (5624) includes the figured type. Although not stated in the text or included with the specimens, the syntypes were collected from Bibb-201, 202, and 151. The type of *B. elegans* Studer is deposited at the Berlin Museum (Zibrowius, 1976).
Type-Locality. – Off Florida Keys; 110–141 m.

Distribution. – Western Atlantic: Florida Keys; off Tampa, Florida; off Península de Paria, Venezuela; off Amazon, Brazil

(Map 38). 110–366 m. – Eastern Atlantic: Cape Verde Islands; Azores. 185–600 m.

Genus **Solenosmilia** Duncan, 1873

Diagnosis. – Colonial, dendroid, or subphaceloid colonies formed by intratentacular budding. Stereome granular, costae sometimes correspond to first cycle. Tabular endothecal dissepiments. Columella small. Type-species: *Solenosmilia variabilis* Duncan, 1873, by monotypy.

55. **Solenosmilia variabilis** Duncan, 1873

Plate XXVI, figures 2–4

Solenosmilia variabilis DUNCAN, 1873: 328, pl. 42, figs. 11–18; 1877: 361. – POURTALÈS, 1878: 206, pl. 1, figs. 1–3; 1880: 96, 108. – MOSELEY, 1881: 181, pl. 9, figs. 1–5. – MARENZELLER, 1904: 310–311, pl. 15, figs. 4, 4a. – GRAVIER, 1915: 3; 1920: 94–96, pl. 9, figs. 153–156. – HOFFMEISTER, 1933: 14, pl. 4, fig. 7. – GARDINER & WAUGH, 1939: 229–230. – WELLS, 1958: 262; 1964: 109. – SQUIRES, 1969: 16, map 2. – LABOREL, 1970: 153, 156; 1971: 175. – LIVINGSTON & THOMPSON, 1971: 788. – ZIBROWIUS, 1974a: 768–769; 1976: 210–211, pl. 22, figs. A–N. – CAIRNS, 1978: 11.
Solenosmilia jeffreyi ALCOCK, 1898: 27–28, pl. 3, figs. 3, 3a–b.
Lophelia prolifera: GRAVIER, 1920: 87–89 (in part: pl. 10, fig. 157). – SQUIRES, 1959 22–23 (in part: V7–12).
Madrepora oculata: SQUIRES, 1959: 5–8 (in part: A 180–112).
Solenosmilia sp. KELLER, 1975: 177.

Description. – Colonies are bushy, achieved by intratentacular budding and its resultant dichotomous branching. Budding begins with an elongation of the calice and an increase in the number of septa. Next, the septa on opposite sides of the calice bridge over the fossa, dividing the calice in two but maintaining a connection between the polyps. Eventually the two corallites elongate and are completely partitioned by coenosteum. Normally, calices rarely exceed 5 mm in calicular diameter. The end branches may be quite slender (3–5 mm in diameter) or thick and massive (7–8 mm) and often anastomose. Basally the branches are very thick (up to 20 mm in diameter) and the colony is attached by an encrusting base also bearing corallites. The coenosteum is variable: it can be completely smooth and white; granular, glossy, and light gray; or granular with 8–10 ridged costae around the circumference of the branch.

Septa are usually arranged in six systems and three complete cycles. S_1 are highly exsert and have straight inner edges, which meet in the bottom of the fossa. S_2 are about one-third the size of the S_1 and are much less exsert but considerably larger than the S_3, which are developed only in the upper fossa. Sometimes, just before intratentacular division, a complete fourth cycle of septa is attained and some S_5 may be present (*e.g.*, 60 septa); however, the development of the S_4 and S_5 is very irregular. The inner edges of the S_{1-3} are straight and entire, whereas those of the S_4 and S_5 are dentate or laciniate. Septal granulation is low and very fine, producing a smooth texture.

Tabular endothecal dissepiments are present. When the fossa is deep, a rudimentary columella is often present, composed of spongy, crispate trabeculae.

Discussion. – *S. variabilis* is another branching species found on deep-water banks, probably contributing significantly to the bank's framework. In the eastern Atlantic it is found with the branching *L. prolifera* and *M. oculata*; in the western Atlantic it is found with *L. prolifera* and *E. profunda*. Earlier authors often failed to recognize *S. variabilis* from deep-water banks, usually mistaking it for *L. prolifera*, which it closely resembles. *S. variabilis* was found at the deep-water bank reported in this paper (see *E. profunda*).

Although not examined by the author, KELLER's (1975) *Solenosmilia* sp. is undoubtedly *S. variabilis*. *Solenosmilia* is considered to be monotypic.

Remark. – Colonial deformities produced by tube-dwelling polychaetes (*Eunice*?) were noted in western Atlantic specimens, a condition that has also been reported by ZIBROWIUS (1976) in specimens from the northeast Atlantic and Indian Oceans.

Material. – P-881 (USNM 46573); P-891 (USNM) 46574, UMML 8: 260); P-892 (USNM 46575); P-1262 (USNM 46576); G-118 (USNM 46577); G-1029 (USNM

46578); CI-140 (USNM 46579); O-1991; O-4301; O-4377; O-4405; O-10514; BL-20 (MCZ); BL-100 (MCZ); BL-154 (MCZ); BL-171 (MCZ); BL-218 (MCZ); BL-298 (MCZ); Alb-2416 (USNM 36345); Alb-2672; Gos-112/78 (Cornell); WH-104/68 (SME); TAMU 65A9–4 (TAMU); SME-1776 (SME); Akaroa-5c (SME). – Syntypes of *S. variabilis*; Squires's (1959) specimens (AMNH).

Types. – The original description of *S. variabilis* mentions specimens from two Porcupine stations: number 17 and number 32, both from the second expedition, all deposited at the BM. Syntypes of *S. jeffreyi* are deposited at the Indian Museum, Calcutta; MNHNP; and the ZMA (ZIBROWIUS, 1976).
Type-Locality. – Off southwestern Spain; 1190–2003 m.

Distribution. – Western Atlantic: Muir Seamount; Antillean distribution, ranging from off Georgia to off Surinam; Recife to São Paulo, Brazil (Map 38). 220–1383 m. – Elsewhere: eastern Atlantic; Indian Ocean; off southeastern Australia. 280–2165 m.

Genus **Asterosmilia** Duncan, 1867

Diagnosis. – Solitary, trochoid to ceratoid, free. Paliform lobes usually opposite third cycle. Columella papillose, lamellar, or crispate at surface, trabecular below. Type-species: *Trochocyathus abnormalis* Duncan, 1865, by subsequent designation (VAUGHAN, 1919).

56. **Asterosmilia prolifera** (Pourtalès, 1871)

Plate XXVI, figures 5–6, 8

Ceratocyathus prolifer POURTALÈS, 1871: 19–20, pl. 3, figs. 8–10.
Asterosmilia prolifera: POURTALÈS, 1880: 96, 109–110, pl. 2, figs. 9–10. – VAUGHAN, 1919: 354. – ZIBROWIUS, 1976: 206–208, pl. 18, figs. A–N. – CAIRNS, 1977b: 5; 1978: 11.
? *Ceratotrochus johnsoni* DUNCAN, 1882: 217, pl. 8, figs. 5–8.
Not *Asterosmilia prolifera*: SQUIRES, 1959: 12 (= *Tethocyathus variabilis*, n. sp.).

Description. – This is an exeedingly variable species which, for the sake of convenience, is divided here into two distinctive forms primarily based on the shape of the pali and secondarily on the corallum shape, costae, and color. The most common form (Pl.

XXVI 5) is trochoid to ceratoid, slightly curved, and has a rather large, elliptical calice typically measuring 12.5 × 11.0 mm in diameter. The costae are prominent only near the calice. A pointed, slender paliform lobe stands before each S_3 and is separated from the septum by a deep, narrow notch. The columella is usually massive, elliptical, and composed of numerous slender rods, which either are fused together loosely or stand alone.

The previous form grades imperceptibly into another common form (Pl. XXVI 6) characterized by wider paliform lobes often two–three times wider than the S_3. The corallum is usually more elongate (ceratoid), shaped like a tall, curved cone, and has a smaller calice, typically less than 10 mm in diameter. It has conspicuous, equal costae, which are prominent to the base; the costae are slightly convex, and bear fine, rounded granules. Sometimes the paliform lobes are so large that there is no room for a columella, but usually a single, thin, lamellar plate is present. In addition to these two forms, occasional variant specimens also occur that have no pali (Pl. XXVI 8) or only rudimentary ones.

Both forms are free; their bases are usually narrow, sometimes pointed and usually showing signs of repair from a previous fracture. They often reproduce asexually by parricidal budding, with one or two coralla originating from the calice of a parent. Most specimens are slightly curved and measure 20 mm in length on the average, although the longest is 50.0 mm.

Septa are typically arranged in six systems and four–five cycles. S_1 and S_2 are equal, exsert, and extend to the columella. Higher cycle septa are progressively smaller; often S_4 are represented only by spines or have a dentate inner margin. S_5 are rare. The figured type of *A. prolifera*, similar to the second described form, is atypical in that it has 32 S_5. In this specimen there are 21 primary septa enclosing 21 groups of three higher cycle septa (four S_5 are missing). The ornamentation on the septal faces is also variable; granules may be completely absent or range from small and pointed to prominent, measuring two–three times the thickness of the septum. When present they are arranged predominantly in rows running perpendicular to the trabeculae.

Pali and columella have already been discussed. The fossa is of variable depth ranging from very shallow to deep. Tabular endothecal dissepiments are present, particularly in the elongate coralla; however, most of the short coralla are solidly filled internally with stereome.

Material. – P-198 (1500) USNM 46777, (18) UMML 8: 259; P-199 (100) USNM 46778; P-200 (20); P-848 (1); P-913 (2) USNM 46802; 159 specimens from 19 additional Pillsbury stations from the northern coast of South America from Trinidad to Panama (USNM 46780–46797); O-4459 (3); O-4461 (7); O-5698 (1); SB-2445 (34); BL-253 (2) MCZ; BL-262 (1) MCZ; BL-272 (8) MCZ; BL-276 (1) MCZ; Combat-457 (4); Gos-1564 (3); TAMU 65A14–9 (11) TAMU. – Syntypes of *C. prolifer*; Squires's (1959) specimens (AMNH).

Types. – Twelve syntypes in two lots bearing numbers 2776 and 2789 are deposited at the MCZ. They are all from Bibb-143. A topotypic specimen, perhaps a syntype, is at the BM and bears the number MCZ 2776. Another syntype is at the YPM (4767). The syntypes of *C. johnsoni*, from Madeira (55 m), are missing from the BM. Type-Locality. – Off French Reef, Florida; 82 m.

Distribution. – Western Atlantic: Straits of Florida; northeastern Gulf of Mexico; Bay of Campeche, Mexico; very common along coast of South America from Colombia to French Guiana; Windward Group, Lesser Antilles (Map 39). 32–311 m. – Eastern Atlantic: Madeira; Canary Islands; off Spanish Sahara. 110–125 m.

57. **Asterosmilia marchadi** (Chevalier, 1966)

Plate XXVI, figures 7, 9–10

?*Trochosmilia elongata* Studer, 1879: 176; 1879a: 675.
Dasmosmilia marchadi Chevalier, 1966: 944–949, pl. 5, figs. 3–4, text-figs. 11–13.
Asterosmilia marchadi: Zibrowius, 1976: 208–209, pl. 19, figs. A–K. – Cairns, 1977 87, lower left figure.

Description. – The corallum is ceratoid, usually slightly curved, and tapers to a pointed, free base. Coralla bud asexually from the edge zone just below the calicular edge and remain attached to the parent until they are about 10 mm long, at which time they detach. Among the four western Atlantic specimens examined, the longest is 30 mm; the most typical specimen measures 11.1 × 9.7 mm in calicular diameter and 19.8 mm tall, and has two buds near the calice (P. XXVI 7, 10). The corallum and septa are usually light brown or reddish-brown. The costae, separated by shallow, broad grooves, consist of thin, elevated ridges covered by small granules. They are unequal: those of the highest cycle (C_4 or C_5) are narrower and less prominent.

Septa are arranged in six systems and four cycles with some S_5. S_1 are exsert and have straight, entire inner edges reaching to the columella. The remaining cycles of septa are progressively smaller and less exsert; S_5, if present, are rudimentary. The lower, inner edges of the S_3 usually bear broad, crispate paliform lobes, which tend to fuse together in pairs before the S_2 and extend to the columella. The inner edges of S_{4-5} are irregular. The septal granules are arranged in lines parallel to the trabeculae and form low carinae near the upper septal edges. The low-lying columella is seated in a relatively deep fossa. It is composed of several irregular, crispate lamellae, which are indistinguishable from the paliform lobes. Thin, closely spaced, slightly inclined tabular dissepiments are present in the lower half of the coralla.

Discussion. – *A. marchadi* is similar to the extremely variable *A. prolifera* but usually can be distinguished by the irregular junctions of the S_3 before the S_2 near the columella. Other characters that help to distinguish *A. marchadi* but are not diagnostic are: (1) a brownish color of the corallum, (2) a low, crispate columella, (3) S_1 larger than S_2, and (4) budding from the edge zone, not intratentacularly.

Trochosmilia elongata Studer, 1879, based on two specimens collected by the Gazelle off the mouth of the Congo River (180 m), may be the senior synonym of this species (ZIBROWIUS, 1976). Unfortunately, the types of *T. elongata* are not present at the Berlin or Berne museums, where the other Gazelle corals are deposited (ZIBROWIUS, pers. comm.).

Remarks. – According to descriptions of eastern Atlantic specimens (ZIBROWIUS, 1976; CHEVALIER, 1966), this species attains lengths of 50 mm and calicular diameters of 18 mm. Also, the eastern Atlantic specimens do not show a dichotomy in size of the S_1 and S_2.

ZIBROWIUS (1976: 71) was the first to report the symbiotic relationship between

Troglocarcinus balssi Monod, 1956 and *A. marchadi*. The crab chemically excavates a perfectly fitted cavity in the corallum wall and seems to obtain nourishment (mucous?) from the coral. Among the four western Atlantic specimens examined, one (Pl. XXVI 9) revealed this characteristic niche, identical to the eastern Atlantic ones.

Material. – P-198 (1); P-734 (1); P-749 (1); P-781 (1). – Holotype of *D. marchadi*.

Types. – The holotype of *A. marchadi*, collected by the Gerard Tréca (18.2.1954), is deposited at the MNHNP. Eight paratypes are at the IFAN, Dakar.
Type-Locality. – South of the peninsula of Cape Verde; 97–98 m.

Distribution. – Western Atlantic: off eastern Florida; off northern coast of South America (Map 40). 32–229 m. – Eastern Atlantic: from Spanish Sahara to Gabon. 32–85 m.

Genus **Rhizosmilia** Cairns, 1978

Diagnosis. – Small, phaceloid, clumped colonies formed by extratentacular budding. Corallite bases increase in diameter by adding exothecal dissepiments over raised costae, producing partitioned, concentric rings. Paliform lobes present before penultimate cycle. Columella prominent, varying from spongy to fascicular (a line of pillars) to lamellar. Endothecal dissepiments. Type-species: *Rhizosmilia gerdae* Cairns, 1978, by original designation.

58. **Rhizosmilia gerdae** Cairns, 1978

Plate XXVII, figures 5–8

Rhizosmilia gerdae CAIRNS, 1978a: 219–222, pl. 1, figs. 1–7.

Description. – The colony forms phaceloid clumps by extratentacular budding from a common basal coenosteum. Corallites are cylindrical or slightly tapered at the base. The base of a corallite increases in diameter by adding exothecal dissepiments over raised costae as described by Cairns (1978a). A typical corallite measures 12 × 10 mm in calicular diameter and 21 mm tall, although adult corallites vary from 7–17 mm in greater calicular diameter and may be up to 45 mm tall. Costae are usually well-defined only in the upper half of the corallum, where they are equal, low, rounded ridges separated by equally shallow grooves. Very small granules cover the costae.

Septa are arranged in six systems and four–five cycles. A corallite of 8–11 mm calicular diameter usually has a complete fourth cycle (48 septa), whereas, above 11 mm, pairs of S_5 are common, but a complete fifth cycle is rare. S_1 are usually slightly larger than S_2, exsert, and have straight, vertical inner edges, which do not reach the columella. The remaining cycles are progressively smaller and less exsert; S_5 are rudimentary with dentate inner edges. The low, rounded septal granules are arranged in lines parallel to the trabeculae.

A large paliform lobe occurs before each septum of the penultimate cycle, separated from it by a deep, narrow notch; together they form a palar crown set deep in the fossa.

The columella is prominent and quite variable. It may be an elliptical, spongy mass; or linear, individualized pillars; or a single lamella. Widely spaced (about one every 5 mm) endothecal dissepiments are present.

Discussion. – *R. gerdae* is similar to *Rhizosmilia maculata* (Pourtalès, 1874), particularly in its growth form and aspects of its paliform lobes, dissepiments, costal roots, and columella. It may be distinguished by the smaller size of its corallites (none known to exceed 15 mm in greater calicular diameter), complete absence of S_6, absence of brown speckled pigmentation, and shallower fossa.

Material. – G-526; Alb-2326 (USNM 10146). – Types.

Types. – The holotype and paratypes are deposited at the USNM.
Type-Locality. – 26°01′N, 79°10′W (off Bimini, Straits of Florida); 143–210 m.

Distribution. – Straits of Florida (Map 40). 123–355 m.

Genus **Phacelocyathus**, new genus

Diagnosis. – Quasicolonial, new corallites arising from encrusting coenosteum. Basal diameter increases by adding exothecal dissepiments over raised costae. Pali before all but last cycle. Columella papillose or lamellar. Sparse tabular endothecal dissepiments. Type-species: *Paracyathus flos* Pourtalès, 1878, here designated.

Discussion. – A new genus is named for the single species *Paracyathus flos* Pourtalès, 1878, which previously had been uncomfortably forced into *Paracyathus*, *Caryophyllia*, and *Trochocyathus*. Additional characters of this heretofore poorly known species are now evident, as observed in many previously unexamined specimens. These characters include: endothecal dissepiments, method of basal reinforcement, and colonial structure. It is most similar to *Rhizosmilia* Cairns, 1978, particularly in its growth form and basal reinforcement, but differs primarily by having pali before all but the last cycle, not just the penultimate cycle as in *Rhizosmilia.*

Etymology. – The generic name refers to the phaceloid growth form. Gender: masculine.

59. **Phacelocyathus flos** (Pourtalès, 1878), new comb.

Plate XXVII, figures 1–4

Paracyathus flos Pourtalès, 1878: 201; 1880: 96, pl. 2, figs. 7–8.
Caryophyllia flos: Goreau & Wells, 1967: 449. – Porter, 1972: 113. – Wells & Lang, 1973: 58. – Land, Lang & Barnes, 1977: 170.
"Trochocyathus" flos: Cairns, 1978: 11.

Description. – Small corallites are ceratoid with narrow pedicels and greatly flared calices. The base and pedicel increase in diameter by repeatedly covering thin, raised costae with exothecal dissepiments, so as to produce partitioned concentric rings. The corallites arise from a thin basal coenosteum forming small phaceloid colonies. Lang (pers. comm.) reported a colony approximately 30 cm in diameter. Corallites are usually separated from one another by a distance equal to their own calicular diameter. The calice is elliptical; the largest corallum examined measures 13.7 × 11.5 mm in calicular diameter and 17.0 mm tall. The upper quarter of the corallum, including all septa, is usually a dark brown or reddish-brown; however, some specimens and colonies are entirely white. The pali and columella are always white; the lower three-quarters of the corallum is also white or a lighter shade of brown. Costae are well distinguished only near the calicular edge, where they are broad and flat to slightly ridged, separated by narrow, shallow striae. Costal granules are large, low, and rounded.

Septa are arranged in six systems and four cycles; only in the larger coralla are S_5 present. S_1 and S_2 are equal in size, highly exsert, and usually quite thick, appearing inflated. S_3 are smaller, less exsert, but also usually thick. S_4 are considerably less exsert, but extend toward the columella equally as far as, or farther than, the S_3. The inner edge of each septum is straight and entire; the upper edge forms a well-defined, round profile. The hemispherical septal granules are very large and randomly arranged on the lower half of the septum. Toward the upper septal edge, granules are often fused into vertical carinae.

Pali occur before all but the last cycle. P_1 and P_2 are tall and narrow. P_3 are considerably larger (about three times as thick and four times as wide), extend farther toward the columella, and reach higher in the fossa than the P_{1-2}. Their calicular edges are usually broader than their axial edges and consequently are closely adjacent to the inner edges of the S_4 as well as the S_3. Sometimes, even before the development of S_5, lobes will begin to form before the S_4 in the following manner: each P_3, which is triangular in cross-section in its most developed state, is notched on top by two grooves that unite to form a V, the apex of which is directed toward the columella. Eventually, these grooves deepen, elongate, and finally separate the lateral components into two P_4. The P_3 is thereby reduced to a very small size (previously the triangular area bordered by the two original grooves). The two P_4 are each about half as large as the original P_3 and recessed from the columella.

The columella is elongate, very deep-set, and surrounded by an elliptical ring of pali. In small coralla it is composed of four-eight tall rods arranged in one or two parallel rows. With greater size, four or five of the largest rods fuse to produce a carinate, lamellar columella, which is flanked by a row of rods on either side. Tabular endothecal dissepiments are present.

Material. – P-405 (USNM 46076); P-1432 (USNM 46075); G-701; G-702; G-983 (USNM 46073); G-984 (SNM 46074); O-1890; O-1993; O-4832; SB-2460; SB-3494; Alb-2321 (USNM 16078); Alb-2326; Alb-2407 (USNM 10466); E-30158; E-30176; E-30178; Hudson-3B (NMC); Nekton (*beta*)-563 (USNM 46080); Nekton (*gamma*)-232 (USNM 46078); Akaroa-5b (SME); 26°33′N, 78°34′W, 76 m (USNM 46077); Hummelinck- 1442. – Syntypes.

Types. – One lot of syntypes (5483) is deposited at the MCZ. It contains one complete specimen broken into three parts and fragments of another. They were collected at BL-69.
Type-Locality. – Off Havana, Cuba; 183 m.

Distribution. – Antillean distribution; western Caribbean; eastern Gulf of Mexico; off Recife, Brazil (Map 41). 22–560 m.

Superfamily FLABELLICAE Bourne, 1905

Family **FLABELLIDAE** Bourne, 1905

Genus **Flabellum** Lesson, 1831

Diagnosis. – Solitary, cuneiform to compressed-turbinate, free. Wall epithecal. Base not thickened by stereome; no roots. Calicular edge jagged or entire. Pali absent. Columella rudimentary or absent. Type-species: *Flabellum pavoninum* Lesson, 1831, by subsequent designation (Milne Edwards & Haime, 1850).

60. **Flabellum moseleyi** Pourtalès, 1880

Plate XXVIII, figures 1–3

Flabellum moseleyi Pourtalès, 1880: 96, 105–106, pl. 2, figs. 13–14. – Agassiz, 1888: 150, figs. 468, 468a. – Zibrowius, 1974c: 21; 1976: 217. – Cairns, 1977b: 5; 1978: 11.

Description. – The corallum is originally attached by a small pedicel 2–3 mm in diameter, but at a very early stage it detaches and rests on its convex side. The adult corallum is regularly curved about 90° from its original orientation. The corallum expands into a flared elliptical calice, measuring 72.0 × 63.0 mm in the largest specimen examined. The calicular margin is scalloped, with its points corresponding to the exsert S_1 and S_2. C_1 and C_2 are very low and smooth, and extend to the pedicel. Faint intercostal striae delimit costae that correspond to the higher cycles. When the specimen measures 14–20 mm in calicular diameter, the principal S_1 and their corresponding costae become strongly produced, forming carinate costae on each end. At this stage, the corallum is compressed, with a greater to lesser calicular diameter ratio of 1.5 : 1. With an increase in size the calice becomes more elliptical and the principal costae less prominent, but there is always an indication of this growth stage in larger coralla. Very fine costal granulation is present and growth lines in irregular chevrons are particularly noticeable at the calicular edge. The color of the corallum, particularly the septa, is reddish-brown.

Septa are arranged in six systems and five complete cycles. S_1 and S_2 are equal in size, highly exsert, and meet in the bottom of the fossa. The higher cycle septa are not exsert and are progressively smaller, except for those S_5 adjacent to S_1 and S_2, which are almost as exsert as the septa they flank but are narrower than the S_4. All septal margins are entire and straight; the lower margins of S_{1-3} thicken and fuse in the bottom of the fossa, forming a rudimentary columella. The septal granules are large and arranged in lines on low crests oriented parallel to the trabeculae.

Discussion. – This species was synonymized with *F. alabastrum* Moseley, 1873 by SQUIRES (1959); however, *F. moseleyi* is quite distinct from *F. alabastrum* in many characters, including shape of corallum, septal granulation, costae, and geographic distribution.

Material. – P-374 (1) USNM 46585; P-478 (23) USNM 46582, (1) UMML 8: 261; P-585 (6) USNM 46581; P-776 (1) USNM 46587; P-861 (24) USNM 46583, (4) UMML 8: 327; P-881 (1) USNM 46584; P-1225 (1) USNM 46588; G-861 (2) USNM 46586; G-970 (1) USNM 46580; O-489 (8) USNM 53384; O-490 (12) USNM 45645; O-1887 (1); O-1982 (2); O-2771 (4); O-2774 (7); O-2775 (4); O-2776 (1); O-2777 (2); O-3252

(1); O-3560 (3); O-3601 (1); O-4412 (4); O-4413 (2); O-4841 (2); O-4882 (3); O-5028 (3); O-5925 (1); O-5929 (2); O-6703 (4); O-6705 (10); O-10170 (1); O-10491 (1); O-10632 (1); O-10633 (10); O-10825 (1); O-10827 (3); O-10828 (1); O-10831 (1); O-10845 (3); O-10847 (1); O-11227 (1); O-11228 (1); O-11244 (1); O-11284 (1); O-11302 (13); O-11303 (2); O-11307 (1); O-11310 (16); SB-3515 (5); Gos-112/76 (1) Cornell; 53 specimens from 11 Atlantis stations off the northern coast of Cuba (MCZ); TAMU 70A10–35 (1) TAMU; Hudson-3A (1) NMC. – Syntypes.

Types. – Five syntypes are deposited at the MCZ, collected from five Blake stations: BL-188, BL-274, BL-279, BL-281, and BL-288. The single specimen from BL-188 bears the number MCZ 5460.
Type-Locality. – Lesser Antilles; 216–871 m.

Distribution. – Widespread in Caribbean and eastern Gulf of Mexico, ranging from off northern Florida to off Trinidad (Map 42). 216–1097 m. 6°–18°C, based on eight records.

61. **Flabellum fragile** Cairns, 1977

Plate XXIX, figures 1–3, 7

Flabellum fragile CAIRNS, 1977b: 14–15, pl. 2, figs. 1, 4–6, 9; 1978: 11.

Description. – The corallum is trochoid to turbinate, tending to become cylindrical with continued growth. The basal angle is about 50°. The pedicel is very narrow (often only one-tenth the calicular diameter), not reinforced by stereome, and often slightly bent. Adult coralla often are not firmly attached, in which case the base usually contains a small, hard object. The calice is elliptical; the holotype is 18.2 × 16.6 mm in calicular diameter and 19.4 mm tall. The largest known specimen measures 20.0 × 17.4 mm in calicular diameter and 17.2 mm tall. The epithecal wall is very thin, bearing chevron-shaped growth lines forming points at the upper, outer edge of every S_{1-3}. The epitheca is usually encrusted by foraminifera, polychaetes, and/or bryozoans. The calicular margin is smooth, continuous, and not jagged.

Septa are regularly arranged in six systems and four complete cycles. S_1 and S_2 are equal in size, slightly exsert, and extend to the rudimentary columella. Their inner edges are vertical and sinuous. S_3 are half as large as S_1 and S_2, not exsert, and do not reach the columella. They also have less sinuous inner edges. S_4 are small (rudimentary lower in the fossa) and have straight inner edges. Septal granulation is prominent on all septa, expressed as tall (one–two times the septal thickness in height), pointed granules arranged in poorly-defined, widely spaced lines oriented parallel to the trabeculae.

The fossa is moderately deep, containing a rudimentary, elongate columella composed of a loosely fused mass of randomly arranged trabeculae. The columella extends to the lower, inner edges of the S_1 and S_2.

Material. – BL-36 (1) MCZ 5496; MAFLA-2212 (3); TAMU 65A9–20 (11) TAMU; Explorer-4 (5); southwest of Panama City, Florida, 183 m (1) MCZ. – Types.

Types. – The holotype and three paratypes are at the USNM (45764–45767). One paratype is deposited at the FDNR (FSBC I 15286).
Type-Locality. – 27°37′N, 84°21′W (off Egmont Key, Florida); 91 m.

Distribution. – Eastern Gulf of Mexico; Florida Keys; Campeche Bank; ? off São Paulo, Brazil (Map 43). 80–366 m.

62. **Flabellum pavoninum atlanticum,** new subspecies

Plate XXVIII, figures 4–7

Flabellum sp. CAIRNS, 1977: 86, upper left fig.

Description. – The corallum is compressed and flabellate; the two faces are slightly convex. Initially the corallum is attached by a narrow, cylindrical pedicel about 3 mm in diameter but later detaches. The angle of the lateral edges varies from 75°–128°, exclusive of crests (principal costae). The inclination of the lateral faces varies from 42°–52° (see SQUIRES, 1964 for terminology). The calice is elliptical, entire, and very open. The dimensions of the holotype are 48.5 × 39.8 mm in calicular diameter and 44.7 mm tall. The theca and septa are very thin and fragile. Inconspicuous costal striae correspond to all but the last cycle of septa; otherwise, epithecal growth–mark the theca. Some coralla are marked by reddish-brown stripes aligned with the primary septa. The principal costae form distinctive crests, which begin to appear at a greater calicular diameter of about 10 mm. They may remain small or continue to grow (projecting up to 6 mm from the theca) as the corallum increases in size. When forming, the principal septa stand free, *i.e.* without an attachment to the theca.

In a large corallum there are 112 septa arranged in 28 groups of four. The 28 primaries are equal, not exsert, and descend vertically to the bottom of the fossa, where their inner edges fuse, forming an elongate, rudimentary columella. The secondaries are half as high and slope obliquely into the fossa. The tertiaries are smaller and often extend only a short distance into the fossa; often they are poorly developed or absent from the four penultimate (lateral) groupings. The septal granules are prominent, one–two times the septal thickness in height, and arranged in short lines parallel to the trabeculae.

Discussion. – There are over 100 nominal species of *Flabellum*, most described from the Indo-Pacific region. Only seven valid Recent species are known from the tropical-temperate Atlantic: *F. macandrewi* Gray, 1849; *F. alabastrum* Moseley, 1873; *F. angulare* Moseley, 1876; *F. moseleyi* Pourtalès, 1880; *F. chunii* Marenzeller, 1904; *F. fragile* Cairns, 1977; and *F. pavoninum atlanticum*, n. subsp. All are found in the western Atlantic except *F. chunii*. Most species of *Flabellum* are poorly known and many have complicated synonymies. In a preliminary revision of the genus *Flabellum*, ZIBROWIUS (1974c) suggested that the genus could be divided into three groups. *F. pavoninum atlanticum* belongs to his "first group", *Flabellum s. str.*

F. p. atlanticum is designated as a subspecies of *F. pavoninum* because of its remarkable resemblance to *F. p. paripavoninum* Alcock, 1894 *sensu* Vaughan, 1907. ALCOCK's types were not examined by the author, but VAUGHAN's (1907) Hawaiian specimens were compared and found to be extremely similar. There are already at least six nominal subspecies of *F. pavoninum*: typical Lesson, 1831; *distinctum* Milne Edwards & Haime, 1848; *latum* Studer, 1878; *paripavoninum* Alcock, 1898; *lamellosum* Alcock, 1902; and *magnificum* Marenzeller, 1904, all from the Indo-Pacific. They are distinguished primarily by their shape (angle of lateral edges, angle of lateral faces, height: width) and presence or absence of crests on the lateral costal edges. The new subspecies is identical to *F. p. paripavoninum sensu* Vaughan, 1907 in shape, differing only in its larger lateral crests, more prominent septal granulation, and lesser number of septa for corresponding calicular diameter. (The Indo-Pacific subspecies has almost twice as many septa for the corresponding calicular diameter.) In the Atlantic, *F. p. atlanticum* is most similar to *F. chunii* Marenzeller, 1904, both having similar lateral crests. However, *F. chunii* is easily distinguished by the larger angle of its lateral edges (up to 180°), lesser inclination of lateral faces, and greater number of septa.

Material. – P-197 (1); G-256 (1); G-664 (6); G-667 (1); G-674 (1); G-678 (1); G-719 (1); G-720 (6); G-721 (2); G-915 (1); G-937 (1); SB-2443 (1); SB-3472 (1); Alb-2655 (10) USNM 14620; Combat-447 (18) USNM 53425; 88 specimens from 17 Atlantis stations from Old Bahama and Nicholas Channels off the northern coast of Cuba (MCZ). – Types.

Types. – Holotype: G-179 (USNM 46895). – Paratypes: G-179 (41) USNM 46896, (6) UMML 8: 286; G-254 (1) USNM 46898; G-405 (1) USNM 46897; G-666 (1) USNM 46899; G-927 (1) USNM 46900; G-938 (3) UMML 8: 299; SB-3514 (3) USNM 46901.
Type-Locality. – 27°41'N, 79°11'W (northern Straits of Florida); 549–567 m.

Distribution. – Off northern Cuba; Straits of Florida; Bahamas (Map 43). 357–618 m.

Genus **Placotrochides** Alcock, 1902

Diagnosis. – Solitary, compressed-cylindrical. Attached by base strengthened by stereome or truncated as the result of transverse division. Usually three cycles of septa. No pali. Columella rudimentary. Type-species: *Placotrochides scaphula* Alcock, 1902, by subsequent designation (WELLS, 1936).

63. **Placotrochides frusta,** new species

Plate XXIX, figures 4–6, 8–9

Placotrochides sp. A ZIBROWIUS, 1976: 228–229, pl. 66, figs. E–M.

Description. – All specimens examined are unattached, having previously detached from their original bases by a transverse division. They are variable in shape, but are usually higher than broad, and round to slightly compressed in cross-section. The largest specimen examined measures 5.0 × 4.2 mm in calicular diameter and 8.7 mm from calice to break. The basal, transverse fracture is usually completely closed over by deposits of stereome, which fill in between the septa and columella. The epitheca is very thin and fragile; only very shallow, longitudinal striae can be seen on the theca, which correspond to the septal insertions. Thin, scalloped growth lines, perpendicular to the costae, circle the theca. The calicular edge is entire, not scalloped.

Some calices bear 12 primary septa (S_1 and S_2) and 12 much smaller septa (S_3); however, 8–13 primary septa may occur, depending on the size and shape of the corallum. No corallum examined has more than 26 septa. The S_1 and S_2 are equal in size, not exsert, and have entire, vertical, sinuous inner edges, which join with the columella. The S_3 are much smaller and extend only a short distance into the fossa. They usually appear as small ridges with serrate inner edges. A few widely spaced, pointed granules occur on the septal faces.

The fossa varies in depth: it can be either very deep or quite shallow. A large, elongate columella forms by the intermingling and/or fusion of the lower, inner edges of the S_1 and S_2.

Discussion. – ZIBROWIUS (1974c) resurrected the genus *Placotrochides* to include those flabellids with transverse division and a massive, stereome-reinforced base. According to ZIBROWIUS (1974c: 23; 1976: 227), there are three other valid species in this genus, all from the western Pacific: both *P. alabastrum* (Alcock, 1902) and *P. scaphula* Alcock, 1902 are larger with more septa, whereas *P.*

kikutii Yabe & Eguchi, 1941 is much smaller and has a differently shaped columella.

ZIBROWIUS (1976) described and figured the fixed form of *P. frusta*.

Etymology. – The specific name *frusta* (Latin, = a bit, a part) refers to the shape of the corallum. A frustrum, in geometry, is the part of a conical solid next to the base left by cutting off the top portion by a plane parallel to the base.

Material. – Alb-2756 (12) USNM 36347; Hudson-4B (9) NMC. – Types.

Types. – Holotype: Alb-2750 (USNM 36451). – Paratypes: Alb-2750 (5) USNM 36453.
Type-Locality. – 18°30'N, 63°31'W (northwest of Anguilla); 907 m.

Distribution. – Western Atlantic: Windward Group, Lesser Antilles; off Fortaleza, Brazil (Map 43). 497–907 m. – Eastern Atlantic: off Morocco. 1300 m.

Genus **Javania** Duncan, 1876

Diagnosis. – Solitary, turbinate, fixed. Wall epithecal. Base reinforced by layers of stereome. No pali. Calicular edge jagged. Columella rudimentary. Type-species: *Javania insignis* Duncan, 1876, by monotypy.

64. **Javania cailleti** (Duchassaing & Michelotti, 1864)

Plate XXVIII, figures 8–12; Plate XXX, figures 1, 4

Desmophyllum cailleti DUCHASSAING & MICHELOTTI, 1864: 66, pl. 8, fig. 11 (not fig. 2). – DUCHASSAING, 1870: 25. – POURTALÈS, 1871: 16, pl. 1, figs. 17–18; 1874: 38; 1878: 203; 1880: 96, 106. – MOSELEY, 1881: 162.
?*Galaxea eburnea* POURTALÈS, 1871: 29, pl. 3, figs. 6–7.
Not *Desmophyllum cailetti*: LINDSTRÖM, 1877: 12 (=*Desmophyllum striatum*, n. sp.).
Desmophyllum eburneum MOSELEY, 1881: 162, pl. 6, figs. 1, 1a–b. – JOURDAN, 1895: 22–23.
Desmophyllum nobile VERRILL, 1885: 150–151.
Desmophyllum vitreum ALCOCK, 1898: 20, pl. 2, figs. 2, 2a–b. – GRAVIER, 1920: 76–77, pl. 8, figs. 136–137.
Flabellum sp. MARENZELLER, 1904a: 81.

Desmophyllum galapagense VAUGHAN, 1906a: 63, pl. 1, figs. 1-1b.
Not *Desmophyllum eburneum*: GRAVIER, 1920: 77–78, pl. 7, fig. 120 (= *Caryophyllia atlantica*).
?*Desmophyllum delicatum* YABE & EGUCHI, 1942: 115, 144, pl. 9, figs. 2a–b.
Flabellum alabastrum: SQUIRES, 1959: 27.
Javania eburnea: ZIBROWIUS, 1974c: 12–13, pl. 3, figs. 13–17; 1976: 225–227, pl. 65, figs. A–L.
Javania cf. *eburnea*: ZIBROWIUS, 1974c: 13–16, pl. 4, figs. 22–29, pl. 5, figs. 31–34.
Javania vitrea: ZIBROWIUS, 1974c: 16–17, pl. 5, figs. 18–21.
Desmophyllum gailleti: KELLER, 1975: 177.
Javania cailleti: CAIRNS, 1977b: 5; 1978: 11.

Description. – The corallum is ceratoid, expanding into a large, elliptical calice. The pedicel diameter, which measures one–fourth to one-half the calicular diameter, is reinforced by concentric layers of stereome. The pedicel re-expands basally into a large, thin, encrusting sheet, by which the corallum is attached. The largest specimen examined measures 45.0 × 65.0 mm in calicular diameter, but 18 × 14 mm is more typical. The theca and septa are initially very thin and fragile until they are secondarily thickened with stereome. The theca is very smooth and often porcelaneous, with scalloped growth lines, the peaks of which correspond to the S_{1-3}. Costae rarely occur, but when expressed they are faint to well developed ridges in the upper one-third of the corallum, corresponding to S_{1-3}.

Septa are usually arranged in six systems and four cycles but often four of the S_3 are enlarged, giving the appearance of eight regular systems with four cycles (64 septa). S_1 and S_2 are equal in size and highly exsert. S_3 are less exsert and much smaller; S_4 are not exsert and become rudimentary in the lower fossa. The inner edges of all septa are entire and usually straight, but sometimes those of the S_3 and S_4 are slightly sinuous; more rarely those of the S_1 and S_2 are also sinuous. Septal granules vary from low and rounded to narrow and pointed, and are arranged in lines parallel to the trabeculae, either on the crests of small septal undulations or over a flat septal face.

The fossa is elongate, deep, narrow, and bordered by the inner edges of the S_1 and S_2. A solid, rudimentary columella forms deep within the fossa by the fusion of the lower, inner edges of the S_1 and S_2.

D i s c u s s i o n. – Even though the holotype of *D. cailleti* is lost, the two figures and brief Latin description could refer to no other nominal West Indian species. The 64 – septa holotype is simply the common variation in which four of the S_3 are accelerated to form 16 half-systems.

The holotype of *G. eburnea* Pourtalès, 1871, is also lost, but the two figures and brief description strongly suggest that it is a young specimen of *J. cailleti.*

VAUGHAN'S (1906a) *D. galapagense* is also a junior synonym. In the original description he remarked that it was very close to *D. eburneum* Moseley, differing only in the entire absence of costae and lack of septal exsertness outside the thecal margin. Both of these differences are well within the range of variation of *J. cailleti.* MARENZELLER'S (1904a) *Flabellum* sp., a small, broken, worn specimen (USNM 22084) is probably a junior synonym. Likewise, ZIBROWIUS (1976: 227) implied that *Desmophyllum delicatum* Yabe & Eguchi, 1941, is also a junior synonym.

M a t e r i a l. – P-587 (18) USNM 46770, (3) UMML 8: 321; P-610 (1) 46771; P-705 (1) USNM 46763; P-838 (1) USNM 46764; P-890 (1) USNM 46765; P-918 (3) USNM 46766; P-923 (1) UMML 8: 261; P-944 (2) USNM 46767; P-969 (2) USNM 46768; P-984 (1) USNM 46769; P-1187 (3); 40 specimens from 15 Gerda stations in the Straits of Florida; CI-2 (1) USNM 46772; CI-6 (2) USNM 46773; CI-46 (1) USNM 46774; CI-92 (1) USNM 46775; GS-31 (1) USNM 46776; O-1320 (1); O-1916 (1); O-2637 (1); O-4297 (25); O-4459 (1); O-4461 (1); O-4832 (4); O-4903 (1); O-5015 (8); O-5021 (1); O-5648 (2); O-5682 (1); O-5733 (1); O-5955 (1); O-5956 (3); O-6715 (2); O-10716 (1); O-10828 (1); O-10832 (3); SB-3471 (1); SB-3474 (10); BL-19 (2) MCZ; BL-36 (1) MCZ; BL-45 (1) MCZ; BL-101 (1) MCZ; 123 specimens from 15 additional Blake stations from the Windward Islands, Lesser Antilles; Bibb-141 (1) MCZ; Alb-2322 (1) USNM 16079; Alb-2327 (1) USNM 10151; Alb-2415 (2) USNM 10516; Alb-2662 (1) USNM 16091; Alb-2663 (2) USNM 14614; Alb-2666 (1) USNM 16074; Alb-2669 (1) USNM 16075; Alb-2750 (2) USNM 36351; Alb-2753 (1) USNM 36414; E-26017; E-26023; E-30176; WH-44/68 (5) SME; BLM-22 VI B (1) Alabama BLM; TAMU 65A9–20 (1) TAMU; Chain-36 (1); Chain-43 (3); Hummelinck-1443 (1). – Syntypes of *D. eburneum*; holotypes of *D. nobile* and *D. galapagense*; Lindström's (1877) specimens (NRM); Moseley's (1881) specimens (BM); Marenzeller's (1904a) *Flabellum* sp. (USNM 22084).

T y p e s. – The holotype of *D. cailleti* is lost; it is not present at the MIZS or the MNHNP. The type of *G. eburnea* is one of the few POURTALÈS types that is missing (presumed lost) from the MCZ. MOSELEY'S *D. eburneum* is based on five syntypes collected from Chall-306. They are deposited at the BM (1880.11.25.65). The holotype of *D. nobile* Verrill, 1885, is at the USNM (type number 7964). Most of the type-

material of *D. vitreum* Alcock, 1898, is at the Indian Museum, Calcutta, but five syntypes are deposited at the MNHNP and two are at the ZMA (Coel. 1198). The type of *D. galapagense* Vaughan, 1906 is at the USNM. The type of *D. delicatum* was not traced.
Type-Locality. – Lesser Antilles (no specific location or depth was given).

Distribution. – Western Atlantic: off Nova Scotia: widespread in Caribbean and eastern Gulf of Mexico, ranging from off Georgia to off Surinam; off Uruguay (Map 44). 86–1682 m. 6°–16°C, based on 13 records. – Elsewhere: eastern Atlantic; Indian and Pacific Oceans. 400–2165 m.

65. **Javania pseudoalabastra** Zibrowius, 1974

Plate XXX, figures 9–10

Flabellum alabastrum: Jourdan, 1895: 23–24 (in part: Hirondelle-203).
Javania pseudoalabastra Zibrowius, 1974c: 10–11, pl. 2, figs. 7–12; 1976: 224-225, pl. 66, figs. A–D. – Cairns, 1977: 85, 2 figs.

Description. – [The original description was based on three broken, worn specimens. The following description is based on one perfect specimen from the Tongue of the Ocean, Bahamas]. The corallum is attached by a thick pedicel, elliptical in cross-section, measuring 11.3 × 9.1 mm in diameter. The pedicel is white, smooth, and thickened by concentric layers of stereome. At the height of 15 mm the pedicel changes color to reddish-brown and expands into a greatly flared calice, somewhat constricted at its center. The upper theca and septa are very thin and brittle. Prominent, ridged costae correspond to the first three cycles. C_1 and C_2 are larger than the other costae and extend to the top of the smooth pedicel. Scalloped growth lines peak at the costae. The calicular diameter is 43.8 × 21.4 mm; the height is 34.2 mm.

Septa are arranged in six systems and four cycles, with five supplementary septa of the fifth cycle (53 septa). S_1 and S_2 are equal in size, very exsert, and extend so far into the calice that several overlap. Exsert S_3 and nonexsert S_4 are progressively smaller. The septa of the fifth cycle are not arranged in pairs; instead they occur in five different half-systems and are as fully developed as the S_4.

All septa are thin, very delicate, the same reddish-brown as the upper theca, and have straight, entire edges. The septal faces are smooth with few scattered granules. Growth lines are parallel to the septal edge. The fossa is deep but obscured by the great inward development of the S_1 and S_2.

Material. – P-1262 (1) USNM 46612; CI-46 (1) USNM 46611. – Types.

Types. – Holotype: deposited at the MOM; collected at Hirondelle-203.
Type-Locality. – 39°27′05″N, 30°55′05″W (Azores); 1557 m.

Distribution. – Western Atlantic; Bahamas; off Jamaica (Map 44). 1089–1234 m. – Eastern Atlantic: Azores. 784–1557 m.

Genus **Polymyces**, new genus

Diagnosis. – Solitary, ceratoid to trochoid, fixed. Wall epithecal, reinforced basally by six regularly placed pairs of structures resembling rootlets, which never detach from the corallum. "Rootlets" communicate with polyp by 12 small pores located adjacent to every S_2. No pali; rudimentary columella formed by fusion of inner edges of lower cycle septa. Type-species: *Rhizotrochus fragilis* Pourtalès, 1871, here designated.

Discussion. – The genus *Monomyces* Ehrenberg, 1834 was originally created to include the species *M. anthophyllum* (= *Caryophyllia pygmaea* Risso, 1826), which has one lateral root in addition to its main attachment. The genera *Coelocyathus* M. Sars, 1857, and *Biflabellum* Döderlein, 1913, also are junior objective synonyms of *Monomyces*. The type-species of *Rhizotrochus* Milne Edwards & Haime, 1848, *R. typus* Milne Edwards & Haime, 1857, differs from *Monomyces* in that it has numerous randomly arranged lateral roots. The number of roots, one or several, was not considered of generic significance by either Wells (1956) or Zibrowius (1974c). The form typified by *P. fragilis*, however, is quite different in that the "rootlets" are regularly arranged, always 12 in number, and never detached from the corallum. For these reasons this genus is erected to contain *R. fragilis* Pourtalès, 1868 and *Flabellum* (?) *montereyense* Durham, 1947.

Etymology. – The generic name refers to the 12 pairs of root-like structures on the base of the corallum. *Gender*: masculine.

66. **Polymyces fragilis** (Pourtalès, 1868), new comb.

Plate XXX, figures 2–3, 5–8

Rhizotrochus fragilis POURTALÈS, 1868: 134–135; 1871: 17–18, pl. 4, figs. 1–4; 1878: 203; 1880: 96. – AGASSIZ, 1888: 151, fig. 471. – ZIBROWIUS, 1974c: 22. – CAIRNS, 1977b: 5; 1978: 11.
Rhizotrochus tulipa POURTALÈS, 1874: 39, pl. 6, figs. 10–19; 1878: 203; 1880: 96, 106. – ZIBROWIUS, 1974c: 22.
Not *Rhizotrochus fragilis*: MOSELEY, 1881: 175.
Not *Monomyces fragilis*: WELLS, 1958: 261. – SQUIRES, 1961: 17.
Monomyces tulipa: LEWIS, 1965: 1062.

Description. – The corallum is ceratoid to trochoid, slightly compressed, and attached by a narrow pedicel to a slightly expanded base. The pedicel is reinforced by six pairs of symmetrically arranged "rootlets," which extend 5–10 mm up the side of the corallum from the base. Each pair of rootlets has a common atrium basally, which bifurcates distally into two tapering extensions, each of which is in open communication with the interior of the corallum via a small pore. The pores penetrate the inner theca on either side of each S_2. These pores cannot be seen in an intact specimen because of their depth within the fossa. A decalcified specimen reveals mesenterial extensions, corresponding to these rootlets, which communicate through the pores. The calice is elliptical; an average-size specimen of 25 mm height measures 18.0 × 16.0 mm in calicular diameter. The theca is very thin, variable in color (see Discussion), and glossy in unworn specimens. No costae or striae occur, but inconspicuous, scalloped growth lines are present.

Septa are arranged in six systems and four complete cycles. S_1 and S_2 are equal in size, slightly exsert, and extend to the bottom of the fossa, where their inner edges fuse into an elongate, rudimentary columella. S_3 are half as large, not exsert, and do not extend to the columella. S_4 are much smaller and not exsert. All septa are very thin and fragile, with entire and slightly sinuous inner edges. The septal granules are tall, pointed, and arranged on septal crests in widely spaced lines parallel to the trabeculae. The fossa is deep and elongate. The interior of the theca is sometimes greatly thickened with stereome.

Discussion. – CAIRNS (1976) maintained *R. tulipa* as a distinct species based on its distinctive color pattern, smaller size, and more exsert septa, but suggested that it may be synonymized with *R. fragilis*. Based on an examination of 66 additional intermediate specimens from 18 lots throughout the Caribbean, I now consider these differences to be insignificant and therefore synonymize *R. tulipa*. All intergrades in pigmentation between typical *tulipa* (with reddish-brown costal stripes) to typical *fragilis* (completely white) occur. Some specimens are uniformly reddish-brown with or without subdued stripes and one specimen (G-510) is white for the proximal 80% of the corallum but reddish-brown near the calice and upper septal margins. Other characters, such as size, shape, septal granulation, thickness or exsertness of septa, or structure of the rootlets do not differentiate the forms. Therefore all western Atlantic species of *Polymyces* are considered to be *P. fragilis*.

MOSELEY's (1881) erroneous record from the Cape of Good Hope led both WELLS (1958) and SQUIRES (1961) to incorrectly list this species in their faunal accounts. MOSELEY's specimen does not have basal rootlets.

Material. – P-600 (2); P-876 (1); P-891 (1); G-190 (1) USNM 46741; 83 specimens from 25 additional Gerda stations in the Straits of Florida and Northwest Providence Channel (USNM 46723–46740); CI-6 (1); CI-37 (1); GS(G)-5 (2) USNM 46743; O-1320 (4); O-1321 (8) USNM 53404; O-1348 (2); O-3704 (3); O-4226 (1); O-4398 (10); O-4832 (5); O-4833 (1); O-4834 (5); O-4938 (1); O-4939 (27); O-5648 (4); O-5733 (1); O-11716 (1); O-11725 (1); SB-2418 (8); SB-2427 (8); SB-3339 (1); SB-3494 (18); SB-3704 (1); BL-32 (2) MCZ; BL-56 (1) MCZ; BL-272 (1) MCZ; BL-273 (7) MCZ; BL-277 (1) MCZ; BL-296 (3) MCZ; BL-317 (1) MCZ; Bibb-31 (1) MCZ; Bibb-136 (1) MCZ; Alb-2323 (1); Alb-2596 (5); Alb-2639 (1) USNM 16134; FH-7286 (6); FH-7296 (2) USNM 22020; Gos-1533 (2); Gos-1590 (3); Gos-1643 (2); Gos-1767 (1); Gos-1863 (1); WH-127/68 (1) SME; Hummelinck-1443 (3). – Syntypes of *R. fragilis* and *R. tulipa*; Moseley's (1881) specimens (BM).

Types. – Seven lots of syntypes of *R. fragilis*, containing 100+, 60, 37, 11, 6, 3, and 2 specimens are deposited at the MCZ (MCZ 5451 and 5628). POURTALÈS did not

designate specific localities in his original description nor are they present with the syntypes. Seventy-one syntypes of *R. tulipa*, all collected from a Hassler station off Barbados (183 m), are deposited at the MCZ in four lots.
Type-Locality. – Off the Florida Reef; 172–592 m.

Distribution. – Throughout the Caribbean and eastern Gulf of Mexico, ranging from off North Carolina to off the Amazon, Brazil (rare off northern coast of South America); off southeastern Brazil (Map 45). 75–796 m. 10°–18°C, based on eight records.

Genus **Gardineria** Vaughan, 1907

Diagnosis. – Solitary, turbinate to cylindrical, fixed. Wall epithecal but thickened internally by stereome. Septa not always arranged hexamerally. Paliform lobes opposite larger septa. Columella well developed, papillose. Type-species: *Gardineria hawaiiensis* Vaughan, 1907, by original designation.

67. **Gardineria paradoxa** (Pourtalès, 1868)

Plate XXXI, figures 4–6, 10

Haplophyllia paradoxa POURTALÈS, 1868: 140–141; 1871: 52, pl. 2, figs. 11–13. – DUNCAN, 1872: 34. – POURTALÈS, 1880: 97. – AGASSIZ, 1888: 154–155, figs. 480–481. – HICKSON, 1910: 5.
Duncania barbadensis POURTALÈS, 1874: 45, pl. 9, figs. 5–7. – LINDSTRÖM, 1877: 13. – POURTALÈS, 1880: 97, 112. – DUNCAN, 1883: 366. – AGASSIZ, 1888: 155.
Gardineria barbadensis: LEWIS, 1965: 1063. – WELLS, 1973: 50. – ZIBROWIUS, 1974c: 24.
Not *Gardineria* cf. *barbadensis*: GOREAU & WELLS, 1967: 449 (= *G. minor*).
Gardineria paradoxa: WELLS, 1973: 51.

Description. – The corallum is initially trochoid, becoming cylindrical with greater size. It is solidly attached to the substrate, either basally or laterally. The calice is round, with a diameter of up to 16 mm. The wall is epithecal, internally thickened by stereome. A long, cylindrical corallum is usually solidly filled in with stereome. The thin epitheca often rises above the level of the septa, producing a circular groove separating it from the outer, upper edges of the septa. The epitheca is sometimes highly corrugated; a corallum measuring 41 mm in height has about 22 concentric ridges, or lips, corresponding to successive stages of rejuvenescence.

The septa are not arranged in distinct cycles or systems; instead, there are 19–22 (usually 20) widely spaced primary septa of equal size. In larger coralla, additional rudimentary septa are developed between the primary septa. The large septa are not exsert and each septum has one–three high, narrow paliform lobes on its inner edge. The uppermost lobe is separated from the septum by a broad, shallow notch. In some coralla, the paliform lobes alternate in size and position: one septum has larger and higher lobes, whereas adjacent septa have lobes that are narrower and closer to the columella. Both the lobes and the septa bear large, blunt, randomly arranged granules.

The paliform lobes are similar in size and shape to the columellar rods, from which they are often indistinguishable. The papillose columella is composed of 2–35 slender pillars, forming a round field in the center of the calice. The fossa is shallow and often solidly filled by dense deposits of stereome.

Material. – P-948 (1); O-6699 (1); BL-247 (1) MCZ; BL-273 (12) MCZ; Bibb-187 (1) MCZ; Gos 112/78 (1) USNM 46617; E-43 (1); Hudson-3B (1) NMC; Hummelinck-1443 (3). – Syntypes of *D. barbadensis*; Lindström's (1877) specimen (NRM); Lewis's (1965) specimens (Cornell).

Types. – The corallum of the holotype of *H. paradoxa*, collected at Bibb-22, is lost, but the soft parts are preserved in the alcoholic type-collection at the MCZ. There are 14 syntypes of *D. barbadensis* divided into three lots (2757, 2791, no number), also deposited at the MCZ. All were collected at a Hassler station off Barbados (183 m).
Type-Locality. – 24°14′20″N, 80°59′40″W (Straits of Florida); 692 m.

Distribution. – Antillean distribution; Arrowsmith Bank, Yucatan (Map 46). 91–700 m.

68. **Gardineria minor** Wells, 1973

Plate XXXI, figures 7–9

Colangia simplex POURTALÈS, 1878: 206–207 (in part: Blake station off Havana, 146 m).
Gardineria sp. cf. *barbadensis*: GOREAU & WELLS, 1967: 449.
Gardineria minor WELLS, 1973: 49–53, figs. 36a–g. – WELLS & LANG, 1973: 58. – ZIBROWIUS, 1974c: 24. – SCATTERDAY, 1974: 86. – LAND, LANG & BARNES, 1977: 170.

Description. – The shape of the corallum is variable, ranging from short and cylindrical, with a base equal in diameter to the calice, to a long, irregularly tapered cylinder, attached by a narrow base. Young coralla are often attached by their sides. Dimensions of the largest corallum examined are 8.3 × 7.9 mm in calicular diameter. The calice is round. The thin epitheca usually displays irregular, concentric banding and extends above the level of the upper septal margins.

Septa are arranged in six distinct systems and four cycles. Small coralla measuring 0.5–1.0 mm in calicular diameter have only one cycle of septa. The second cycle of septa is usually complete at a calicular diameter of 1–2 mm; the third cycle at 2–7 mm; and the fourth cycle between 5–8 mm. S_1 are exsert and by far the largest septa. They are also the only ones having an entire margin. S_2 are much smaller, not exsert, and have very irregular inner edges consisting of two–three wide, blunt paliform teeth projecting perpendicular to the septal edge. S_3 are smaller and bear four–five paliform teeth on their inner margins. S_4 are rudimentary, composed of five–eight linearly arranged, low spines. The septal granules are large, blunt, and sparsely distributed.

A small, narrow paliform lobe sometimes is present on the inner edge of each S_1. A more distinct, larger, and wider lobe usually is present on the inner edge of each S_2, separated from the septum by a narrow notch. The columella is composed of 1–20 slender, irregularly shaped rods, which fuse proximally into a solid mass. The rods are sometimes indistinguishable from the paliform lobes.

Discussion. – *G. minor* is distinguished from *G. barbadensis* by its hexameral symmetry, smaller size, and different habitat, found only in a cave environment or in heavily shaded sites. It is distinguished from *G. simplex* by its smaller size and greater number of septa at the same calicular diameter.

Material. – P-439 (3) USNM 46622; P-630 (1) USNM 46623; P-1311 (2) USNM 46624; P-1387 (3) USNM 46625; G-889 (1) USNM 46626; G-899 (1) USNM 46627; G-983 (1) USNM 46619; G-984 (2) USNM 46620; G-986 (2) USNM 46621; SB-3494 (4); BL station, off Havana, 146 m (2) MCZ; BL-156 (1) MCZ; Alb-2324 (2) USNM 10135; off Santa Marta, Colombia, 17–50 m (1) Cornell; off Cayman Island, 37 m (1); Daaibooi baai, Curaçao, 24 m (1) USNM 46629; off Andros, Bahamas, deep reef, 25 April 1970 (2) USNM 46632; 26°33'N, 78°34'W, 42.7 m (1) FDNR; Theodore Tissier (1), 15°15'N, 60°57'W, 90 m. – Types of *G. minor* and *C. simplex*.

Types. – The holotype and paratypes of *G. minor* are deposited at the USNM (53503-53506).

Three syntypes of *Colangia* (= *Gardineria*) *simplex* Pourtalès, 1878 are deposited at the MCZ; two collected at a Blake station off Havana, 80 fm (146 m); and one from BL-22 (5566). The two specimens from the Havana station are *Gardineria minor* but because the original description primarily concerned the BL-22 specimen (Pl. XXXI 1–3), which is different (both figures are of this specimen), it is designated lectotype for *G. simplex*, thus preserving WELLS's (1973) name *G. minor* for the other two specimens.

Type-Locality. – Yallahs, Jamaica; 15 m.

Distribution. – Widespread in the Caribbean and Bahamas (Map 47). 2–241 m, most common between 10–100 m.

Family **GUYNIIDAE** Hickson, 1910

Genus **Guynia** Duncan, 1872

Diagnosis. – Solitary, ceratoid to scolecoid, free or fixed laterally; sometimes producing chains of individuals by extratentacular budding. Wall epithecal; a row of mural "pores" (spots) present in every interseptal space. Pali absent. Columella composed of one twisted ribbon. Type-species: *Guynia annulata* Duncan, 1872, by monotypy.

69. **Guynia annulata** Duncan, 1872

Plate XXXII, figures 1–3

Guynia annulata DUNCAN, 1872: 32, pl. 1, figs. 1–8; 1873: 335–336, pl. 47, figs. 9–16. - POURTALÈS, 1874: 44, pl. 9, figs. 3–4; 1878: 209; 1880: 97, 112. - GARDINER & WAUGH, 1938: 172. – ROSSI, 1961: 34. – ZIBROWIUS, 1969: 327–328. – WELLS, 1972: 6, figs. 11–14. – WELLS & LANG, 1973: 58. – WELLS, 1973a: 59–63, figs. 1–3. – BOURCIER & ZIBROWIUS, 1973: 827. – ZIBROWIUS, 1976: 230–232, pl. 57, figs. A–Q. – ZIBROWIUS & SALDANHA, 1976: 101–102. – ZIBROWIUS & GRIESHABER, 1976: 381. – CAIRNS, 1977b: 5; 1978: 11.
Guynia n. sp. GOREAU & WELLS, 1967: 449.

Description. – The extremely small corallum is cylindrical and scolecoid in shape, rarely exceeding 10 mm in length and 1 mm in calicular diameter. It is usually attached by its side, sometimes growing free distally. WELLS (1973a) reported that sometimes a new corallum buds extratentacularly from just below the calicular edge; successive budding forms a chain of individuals. Specimens from the northern Gulf of Mexico attach sand grains both basally and randomly along their coralla.

The epitheca is thin and particularly fragile at the calicular end. The theca is variable; it may be smooth for the entire length or interrupted by a series of annuli (*e.g.*, 21 over a distance of 3.6 mm) or even may bear six-eight ridged costae corresponding to the S_1. In addition, there are small white spots on the theca arranged in six or eight pairs of longitudinal rows. The rows are in the interseptal spaces directly adjacent to the smaller septa. The spots are also arranged in rings around the corallum; when annuli are present, one ring of 12 or 16 spots occurs between each growth segment. I hesitate to call these spots mural pores, which are typical for the family, because no surface relief was seen with a scanning electron microscope. Rows of shallow, round depressions were seen, however, on the interior of the theca corresponding to the externally visible white spots (Pl. XXXII 2), but complete perforations of the theca probably do not occur.

There are 12 or 16 septa arranged in two groups, hexamerally or octamerally respectively. The six or eight primaries are thick, with very sinuous inner edges, and extend almost to the columella. The six or eight secondaries are much smaller and thinner but also have sinuous inner edges. The septa are not exsert; the epitheca rises well above the level of the larger septa, and the smaller septa are so deep in the calice that they are sometimes hidden from view. The septal faces are smooth; there are no septal granules. The columella is a single massive, twisted or flanged ribbon, sometimes visibly attached to one or more of the larger septa deep in the fossa.

Discussion. – *G. inflata* (Hickson, 1910), from the Persian Gulf, is the only other Recent species belonging to this genus. It is differentiated by its possession of endotheca, a slightly bulbous proximal end, and by always being free, not laterally attached as *G. annulata* often is.

Material. – P-629 (4); P-630 (5) USNM 46637; P-1303 (1) USNM 46635; P-1354 (1) USNM 46636, (1) UMML 8: 265; G-725 (1) USNM 46634; SB-1125 (11); BL-22 (1) MCZ; BL-143 (1) MCZ; BL-154 (1) MCZ; BL–213 (1) MCZ; Hassler, Barbados, 183 m (9) MCZ; MAFLA 1974–18 (2) RSMAS; MAFLA 1974–33 (12) RSMAS; MAFLA-2645 (2) FDNR; 27°55′N, 93°27′W, 100 m (4) BLM, Texas; Hummelinck-1443 (1). – Syntypes of *G. annulata*.

Types. – Eighteen syntypes, collected at a Porcupine station made in 1870, are deposited at the BM (1883.12.10.110–120).
Type-Locality. – Adventure Bank, Mediterranean; 168 m.

Distribution. – Western Atlantic: Antillean distribution; Gulf of Mexico; western Caribbean; off Bermuda (Map 48). 37–653 m. – Eastern Atlantic: Mediterranean; Madeira; Azores. 28–200 m.

Genus **Schizocyathus** Pourtalès, 1874

Diagnosis. – Solitary, ceratoid, fixed. Longitudinal parricidal budding common. Wall epithecal; a row of mural spots flanks each S_2. Paliform lobes on S_3. Columella absent. Type-species: *Schizocyathus fissilis* Pourtalès, 1874, by monotypy.

70. **Schizocyathus fissilis** Pourtalès, 1874

Plate XXXII, figures 4–7

Schizocyathus fissilis POURTALÈS, 1874: 36–37, pl. 6, figs. 12–13. – LINDSTRÖM, 1877: 15–19, pl. 2, fig. 26, pl. 3, figs. 27–34, text-figs. 1–7 – POURTALÈS, 1878: 203; 1880: 96, 104. – DUNCAN, 1883: 366–367. – MARENZELLER, 1904: 300. – GRAVIER, 1915: 2, 17–22, figs. 6–11; 1920: 81–86, pl. 9, figs. 144–152, pl. 14, fig. 208, pl. 15, figs. 213–214, pl. 16, figs. 216–221. – GARDINER & WAUGH, 1938: 171. – LEWIS, 1965: 1063. – ZIBROWIUS, 1976: 234–236, pl. 59, figs. A–O. – CAIRNS, 1977b: 5; 1978: 11.

Description. – The corallum is ceratoid to subcylindrical, straight, and invariably attached to a fragment (usually one-sixth or one-third) of a parent corallum. The longest corallum known measures 25.0 mm, but more typically they are 7–8 mm in length, with a calicular diameter rarely exceeding 3.5 mm. The epitheca varies: it is usually thin, smooth, and glossy but sometimes bears rough, hispid spines (*e.g.*, LINDSTRÖM'S variety from Salt Island), or is marked with rugose thecal annuli. Six, thin, opaque, white lines, corresponding to the S_2 occur on the theca extending from the base to the calice. Toward the calice, these lines bifurcate, closely paralleling the S_2 to the calice. These are the future lines of fracture in asexual reproduction; the theca between the double lines and the enclosed S_2 break away from the corallum, which leads to the eventual division of the corallum into sixths or thirds. In each of the three–six sectors defined by these lines are two rows of white spots. They correspond to the interseptal spaces adjacent to every S_1. Successive spots are located about 0.5 mm apart. Neither lines nor spots are seen in surface relief with the SEM, which implies that they are not surface features. The calice is round and the epitheca extends slightly higher than the upper septal edges.

Septa are arranged in six systems and three complete cycles. S_1 are the thickest and widest septa, slightly exsert, and extend halfway to the center of the calice. They have sinuous inner edges and sometimes bear small paliform lobes. S_2 are extremely small and rudimentary, expressed only as small, ragged ridges in the upper corallum. S_3 are half as thick as the S_1, slightly exsert, and extend only one-fourth of the distance to the center of the calice. Lower in the fossa the S_3 bear paliform lobes that reach almost to the center of the calice, where the pair in each system unite in a V before the S_1. Deep in the fossa these inner extensions of the S_3 form a platform, which is dissected by six narrow channels corresponding to the S_2. The lateral faces of the S_1 and S_3 bear large blunt granules arranged in lines or short carinae parallel to the trabeculae. One atypical specimen has a poorly-defined palar platform and a rudimentary columella. Ordinarily there is no columella.

Discussion. – There has been continuing disagreement as to whether the rudimentary septa are the S_1 and the large, thick septa the S_2 (POURTALÈS, 1871; VAUGHAN & WELLS, 1943) or the converse (MARENZELLER, 1904; GRAVIER, 1920; ZIBROWIUS, 1976). Among the 180 specimens examined, only one (from Oregon-2772) was independently attached, i.e., not the result of asexual fragmentation. Its base clearly showed the original six septa, which, when traced to the calice, corresponded to the larger septa. For this reason I agree with ZIBROWIUS, *et al.* in calling the six larger septa the S_1 and the six smaller septa the S_2.

Material. – P-585 (1) USNM 46640; G-929 (1) USNM 46638; G-1011 (1) USNM 46639; O-1251 (2); O-1867 (8); O-2772 (31); O-3203 (1); SB-3483 (1); BL-51 (1) MCZ; BL-206 (slides) MCZ; BL-220 (2) MCZ; BL-259 (1) MCZ; BL-272 (1) MCZ; BL-290 (1) MCZ; BL-292 (1) MCZ; Gos-1632 (1); Caroline-13 (2); Caroline-84 (1); Caroline-93 (3); MAFLA-2106 (1) FDNR; MAFLA-2645 (2); MAFLA-2746 (1); Atl-2987D (22) MCZ; Atl-2989 (1) MCZ; Explorer-1a (10); Explorer-1b (1); Explorer-1c (25); Hummelinck-1443 (14). – Syntypes of *S. fissilis*; Lewis's (1965) specimen (Cornell).

Types. – Forty-one syntypes, divided into three lots, are deposited at the MCZ (5470, 2791). All were collected at a Hassler station off Barbados.
Type-Locality. – Off Barbados; 183 m.

Distribution. – Western Atlantic: Antillean distribution; eastern Gulf of Mexico; off Honduras (Map 49). 88–640 m. – Eastern Atlantic: the area bounded by Portugal, the Azores, and Morocco. 410–1300 m.

Genus **Stenocyathus** Pourtalès, 1871

Diagnosis. – Solitary, ceratoid to cylindrical, free or attached. Wall epithecal; rows of thecal spots flank each S_3. Pali, when present, opposite S_2. Columella formed of one–two twisted, crispate ribbons. Type-species: *Coenocyathus vermiformis* Pourtalès, 1868, by monotypy.

71. **Stenocyathus vermiformis** (Pourtalès, 1868)

Plate XXXII, figures 8–10; Plate XXXIII, figures 1–2

Coenocyathus vermiformis POURTALÈS, 1868: 133–134.
Stenocyathus vermiformis: POURTALÈS, 1871: 10, pl. 1, figs. 1–2, pl. 3, figs. 11–13. – LINDSTRÖM, 1877: 19–21, pl. 3, figs. 35–36. – POURTALÈS, 1878: 202; 1880: 96, 101 (in part: not BL-210), pl. 1, figs. 15–16. – DUNCAN, 1883: 368. – AGASSIZ, 1888: 148, fig. 483. – MARENZELLER, 1904: 298–300, pl. 18, fig. 16. – GRAVIER, 1915: 2; 1920: 30–32, pl. 3, figs. 35–37, pl. 13, 193–197. – GARDINER & WAUGH, 1938: 172. – WELLS, 1947: 167, pl. 10, figs. 1–5; 1958: 262. – ROSSI, 1958: 6, 11–12. – SQUIRES, 1959: 23. – ROSSI, 1961: 39–40. – ZIBROWIUS, 1969: 328. – LABOREL, 1970: 153. – ZIBROWIUS, 1971: 244; 1974a: 769–770; 1976: 232–234, pl. 58, figs. A–Q. – CAIRNS, 1977b: 5; 1978: 11.
Not *Caryophyllia vermiformis* DUNCAN, 1873: 316, pl. 40, figs. 13–16 (= *Caryophyllia abyssorum*).
Caryophyllia simplex DUNCAN, 1878: 237, pl. 43, figs. 32–34.
Caryophyllia carpenteri DUNCAN, 1878: 237, pl. 43, figs. 28–31.
Stenocyathus washingtoni CECCHINI, 1914: 151–152; 1917: 143–145, pl. 13, figs. 4–5.
Stenocyathus decamera RALPH & SQUIRES, 1962: 11–12, pl. 4, figs. 2–6. – SQUIRES & KEYES, 1967: 28, pl. 6, figs. 3–5.

Description. – The corallum is cylindrical, elongate, and vermiform, reaching lengths of over 50 mm but rarely exceeding 3 mm in calicular diameter. It is usually free, lying horizontally on the substrate; it is rarely basally attached. The epitheca is usually smooth and glossy, particularly delicate at the calicular end, but may also be rough as a result of the presence of numerous annuli corresponding to periodic stages of growth. Opaque, white spots are arranged in 24 longitudinal rows, which occur in all interseptal spaces but most closely adjacent to either side of the S_3. The centers of the spots are longitudinally spaced 0.35–0.45 mm apart. The spots are not visible as a surface structure with the SEM. The calice is round and one often occurs on each end of a recumbent specimen.

Septa are arranged in six systems and three cycles, but often the third cycle is not fully developed. The six S_1 are not exsert, extend only halfway to the columella, and have sinuous inner edges. S_2 are half as large and have even more sinuous inner edges. S_3 are almost as large as the S_2 but have reduced upper margins and virtually straight inner edges. Large, pointed septal granules are arranged either randomly or in short carinae oriented perpendicular to the trabeculae.

Six P_2 are often present, forming a distinct palar ring in the fossa. They are tall and narrow, with sinuous inner edges and granules that are larger than those on the septa. S_3 and P_2 are often missing from a system, producing an asymmetrical palar ring. The columella is composed of one, rarely two or three, twisted ribbons. Sometimes the columella is absent.

Discussion. – RALPH & SQUIRES's (1962) original description of *S. decamera*, the only other Recent species described in this genus, was poor and did not include a comparison to the type-species. Examination of 14 New Zealand specimens identified by SQUIRES as *S. decamera* (USNM) reveals that they differ only by having slightly larger calicular diameters than *S. vermiformis* (up to 6 mm) and are more often solidly attached to the substrate. All 14 specimens have a hexameral septal arrangement. I do not consider these differences of specific value. *S. alabamiensis* Wells, 1947 (Paleocene, Alabama) and *S. hoffmeisteri* Wells, 1976 (Eocene, Tonga) are the only other species described in the genus.

Material. – P-596 (1) USNM 46650; P-861 (3) USNM 46649; G-663 (4) USNM 46641; G-664 (5) USNM 46642; G-703 (1) USNM 46643; G-1102 (14) USNM 46644, (1) UMML 8: 266; GS(G)-14 (3) USNM 46645; GS(G)-13 (1) USNM 46646; GS(G)-43 (1) USNM 46647; O-4226 (44); BL-5 (2) MCZ; BL-51 (2) MCZ; BL-100 (2) MCZ; Alb-2672 (1); Gos-1607 (1); Gos-1650 (2); Gos-1653 (4) USNM 46648; Gos-1766 (1); Gos-1767 (1); E-26023 (1); E-26031 (1); Akaroa-5c (30) SME; Chain-15 (3); off Anna Maria Key, Florida, 366–487 m (1) USNM 46651; 21°48'S, 40°03'W, 128 m (4) USNM 10923. – Syntypes of *Coenocyathus vermiformis*; holotypes of *C. simplex*, *C. carpenteri*, and *Caryophyllia vermiformis*; Squires's (1959) specimen (AMNH 3441).

Types. – At the MCZ there are 38 coralla or fragments of *C. vermiformis* Pourtalès, distributed in four lots, bearing the numbers 2790, 5587, and 5605 (one lot is unnumbered). Although not clearly stated in the text or with the specimens, these syntypes were probably collected from Bibb-10, 11, and 21. The holotypes of *C. simplex* and *C. carpenteri* are both deposited at the BM (1883.12.10.24 and 1883.12.10.23). It is unknown if types of *S. washingtoni* exist. The holotype of *S. decamera* is deposited at the New Zealand Geological Survey, Wellington.
Type-Locality. – Off Florida Keys; 274–329 m.

Distribution. – Western Atlantic: off Georgia and Florida; off Havana, Cuba; Arrowsmith Bank, Yucatan; Windward Group, Lesser Antilles; off Brazil (Map 50). 128–835 m. – Elsewhere: Mediterranean; area bounded by Celtic Sea, Azores, and Madeira; Indian Ocean; off New Zealand. 110–1229 m.

Genus **Pourtalocyathus**, new genus

Diagnosis. – Solitary, ceratoid, free. Wall epithecal, often bearing hispid spines. One row of mural spots present in every interseptal space. Paliform lobes sometimes present before S_2. Columella papillose. Type-species: *Ceratotrochus hispidus* Pourtalès, 1878, here designated.

Discussion. – It is necessary to establish a new genus for *Ceratotrochus hispidus* because it possesses thecal spots identical to those found in the Guyniidae, but it does not belong to any of the described guyniid genera. Pourtalès either overlooked this character (it is not mentioned in his description but is found on the holotype) or did not realize its significance. Often the mural spots are not visible; only one-third of the specimens examined showed them clearly.

This genus is clearly different from all other genera in the Guyniidae. It differs from *Guynia* by its septal arrangement, numerous columellar elements, and larger size; from *Stenocyathus* by its differently shaped paliform lobes, columella, and corallum; and from *Schizocyathus* by the presence of a columella and its septal arrangement.

Etymology. – This genus is named in honor of L. F. Pourtalès. Gender: masculine.

72. **Pourtalocyathus hispidus** (Pourtalès, 1878), new comb.

Plate XXXIII, figures 3–8

Ceratotrochus hispidus POURTALÈS, 1878: 202, pl. 1, figs. 19–20. – ZIBROWIUS, 1974c: 25. – KELLER, 1975: 179.
Conotrochus typus: POURTALÈS, 1878: 202 (in part: BL-16).
Ceratotrochus typus: POURTALÈS, 1880: 96, 105.
Stenocyathus vermiformis: POURTALÈS, 1880: 101 (in part: BL-210).

Description. – The corallum is ceratoid and usually straight, if attached, or curved up to 90°, if free. It is originally attached by a thin, encrusting base but rarely remains attached in an upright position. The longest corallum examined measures 19.0 mm; the calicular diameter rarely exceeds 5.5 mm. The theca is quite variable in appearance. Often there are flat, broad costae corresponding to all septa and separated from each other by narrow, intercostal furrows. Sometimes the costae bear prominent, projecting granules arranged uniserially, which unite to form short ridges. Other specimens have smaller costal granules arranged three–four across the width of a costa. Still other coralla have no costae or spines; instead they have rough, imbricated, epithecal bands. Some coralla have a perfectly smooth epitheca with no ornamentation. Rows of white mural spots corresponding to each interseptal space are obvious on one-third of the specimens examined. These spots are visible in specimens with prominent costal spines as well as in the completely smooth specimens. The spots are not visible as a surface structure with the SEM. The calice is round and the epitheca usually continues for a short distance above the upper septal margins.

Septa are arranged in six systems and three complete cycles. S_1 have exsert, rounded upper edges, are sometimes quite thick, and extend to the columella. S_2 are half as large, less exsert, and also meet the columella. Small papillose P_2, similar in shape to the columellar elements, sometimes occur. S_3 are small, have slightly dentate inner edges, and do not reach the columella. The septal granules are large and arranged in lines parallel to the trabeculae. The lower, inner edges of the S_1 and S_2 are thickened where they join the columella. The columella is composed of 5–25 close-set, thin, tapered rods, which are usually swirled in a clockwise direction. The rods may remain individualized or fuse into a solid mass. There are no dissepiments or internal stereome.

Material. – P-889 (1) USNM 46662; P-984 (3) USNM 46663; P-1225 (2) USNM 46664; 18 specimens from 10 Gerda stations from the Straits of Florida (USNM 46652–46661); SB-3494 (5); BL-16 (1) MCZ; BL-100 (3) MCZ; BL-145 (3) MCZ; BL-195 (1) MCZ; BL-210 (1) MCZ; Gos-1729 (1); Caroline-1 (1); Caroline-25 (3); Caroline-67 (42); Atl-2999 (2) MCZ; Atl-3313 (1) MCZ; Atl-3332 (28) MCZ; Atl-3336 (7) MCZ. – Holotype of *C. hispidus*.

Types. – The holotype, collected at BL-19, is deposited at the MCZ (5583).
Type-Locality. – 23°02′N, 83°10′W (western Straits of Florida); 567 m.

Distribution. – Antillean distribution; off northeastern Florida (Map 51). 349–1200 m.

Suborder DENDROPHYLLIINA Vaughan & Wells, 1943

Family **DENDROPHYLLIIDAE** Gray, 1847

Genus **Balanophyllia** Wood, 1844

Diagnosis. – Solitary, turbinate to trochoid, fixed or free. Costae well developed. Synapticulotheca porous, especially near calicular edge. Septa follow Pourtalès Plan. Pali present or absent. Columella spongy. Type-species: *Balanophyllia calyculus* Wood, 1844, by monotypy.

73. **Balanophyllia cyathoides** (Pourtalès, 1871)

Plate XXXIII, figures 9–10; Plate XXXIV, figures 1–2

Dendrophyllia cyathoides POURTALÈS, 1871: 45–46, pl. 1, figs. 8–9; 1878: 208; 1880 97.
Balanophyllia palifera: POURTALÈS, 1880: 110 (in part: BL-300).
Balanophyllia cyathoides: CAIRNS, 1977a: 136–138, pl. 1, figs. 5–8.

Description. – The corallum is ceratoid and straight, narrowing to a thick pedicel of about one-half the calicular diameter and re-expanding into a solid base of attachment. The holotype measures 27.1 mm tall and 9.6 mm in lesser calicular diameter. Costae are narrow, equal, rounded, and separated by deep, narrow furrows. Sometimes the C_1 and C_2 are raised slightly above the others. Every costa bears a row of tall, blunt granules.

Septa are arranged in six systems and four cycles, rarely with additional S_5. S_1 are highly exsert and extend to the columella. S_2 are much less exsert, extending almost to the columella. S_3 and S_4 follow the Pourtalès Plan; two S_4 join before each S_3 and extend to the columella. At the junction there is often a small, indistinct paliform lobe, compressed and aligned with the adjacent S_3. The inner edges of all septa are straight and entire. The septal faces bear numerous, large, pointed granules arranged in lines parallel to the trabeculae.

The fossa is fairly shallow. The columella is elongate and narrow, and often carinate. It varies from spongy to solidly fused. Sometimes it is swirled as in *Balanophyllia dineta*, with oblique, lateral ridges.

Discussion. – This species is described and discussed by CAIRNS (1977a).

Material. – P-919 (2); G-251 (1) USNM 46665; G-691 (9) USNM 46668; G-692 (1) 46666; G-701 (1) USNM 46667; BL-69 (4) MCZ; BL-300 (2) MCZ; Alb-2157 (4) USNM 16102; Alb-2322 (11) USNM 16101; Alb-2327 (7) USNM 16104; Alb-2354 (3) USNM 16103. – Holotype.

Types. – The holotype (MCZ-2774) has been cut in half (vertically) along its lesser calicular diameter; only one-half is present at the MCZ. It was probably collected from Corwin-2 or 4 in 1867.
Type-Locality. – Off Havana, Cuba; 494 m.

Distribution. – Antillean distribution; Arrowsmith Bank, Yucatan (Map 52). 53–494 m.

74. **Balanophyllia palifera** Pourtalès, 1878

Plate XXXIV, figures 3–7

Balanophyllia floridana: POURTALÈS, 1874: 43, pl. 6, fig. 20.
Balanophyllia palifera POURTALÈS, 1878: 207 (in part: BL-68); 1880: 97, 110 (in part: BL-273). – CAIRNS, 1977a: 140–141, pl. 1, fig. 4, pl. 2, figs. 4, 5, 7; 1978: 11.

Description. – The corallum is subcylindrical to ceratoid, usually straight but sometimes slightly curved, and firmly attached to the substrate. The lectotype measures 6.6 × 6.0 mm in calicular diameter and is 16.0 mm tall. There are usually thin epithecal bands covering all or part of the synapticulotheca, most common towards the base, where they may completely obscure the costae. The costae are equal, narrow, compact, slightly ridged, and separated by narrow, deeply incised furrows. The costal granules are large and pointed.

Septa are arranged in six systems and four complete cycles; however, one large specimen (cd = 10.5 mm) has 14 complete half-systems or 56 septa. S_1 are the largest septa, with slightly exsert, thick, porous upper margins. S_2 are slightly smaller, less exsert, and do not extend as far toward the columella as the S_1. S_3 are very small and always flanked by two much larger S_4, which unite before each S_3. At the junction there is a large palus, almost as large as the S_4, which extends to the columella. The inner edges of S_{1-3} are straight and entire, whereas those of the S_4 are sometimes laciniate, especially deeper in the fossa. Numerous randomly arranged, pointed granules, sometimes measuring higher than the septal thickness, cover the septal faces. The palar granules are even larger but more blunt. The calicular edges of two of the pali of the paralectotype are bifurcated; the split ends are directed toward the flanking S_4.

The fossa may be deep or shallow and is sometimes bridged by endothecal dissepiments. The columella is composed of numerous, slender, twisted ribbons, which sometimes fuse together in an elongate mass aligned with the principal septa.

Discussion. – *B. palifera* is easily distinguished from other western Atlantic *Balanophyllia* by its distinct pali and long, slender corallum.

Material. – P-584 (2) USNM 46674; P-595 (1); P-596 (3); G-1275 (1) USNM 46673; BL-273 (1) MCZ; undetermined Hassler station off Barbados, 183 m (1) MCZ; Alb-2152 (10) USNM 16098; Alb-2157 (1) USNM 16105; Alb-2338 (1) USNM 10223A; Alb-2346 (2) USNM 16100. – Syntypes of *B. palifera*.

Types. – Two syntypes collected at BL-68 are deposited at the MCZ (5438). One of these (Pl. XXXIV 4–6) is designated lectotype, the other (Pl. XXXIV 3) paralectotype. The other syntype, from BL-12 (MCZ-5571), is *B. floridana*.
Type-Locality. – Off Havana; 444–838 m.

Distribution. – Off Havana, Cuba; Arrowsmith Bank, Yucatan; off Barbados (Map 53). 53–444 m.

75. **Balanophyllia wellsi** Cairns, 1977

Plate XXXIV, figures 8–9; Plate XXXV, figures 1–3

Balanophyllia wellsi Cairns, 1977a: 142–144, pl. 3, figs. 6–7, pl. 4, figs. 1–4.

Description. – The corallum has a slightly flared calice, which tapers to a thick pedicel measuring about one-half the calicular diameter. The pedicel enlarges basally to form a large, firm attachment. The calice and pedicel are elliptical in cross-section; the holotype measures 20.0 × 15.2 mm in calicular diameter, 9.3 × 8.5 mm at the narrowest pedicel diameter, and 30.0 mm tall. Costae are equal, compact, slightly ridged or rounded, and separated by very deep, narrow striae. The costae bear coarse, blunt granules on their outer surfaces and finer, more pointed granules laterally.

Septa are arranged in six systems and five cycles; however, the last cycle is never complete. The largest specimen examined (the holotype) contains 62 septa. S_1 and S_2 are equal in size, only slightly exsert, and extend to the columella. The remaining septa are arranged according to the Pourtalès Plan: septa of the last cycle (usually S_4) join in front of the S_3 where, (1) they may fuse and extend to the columella as one septum, (2) one of the septa may remain prominent whereas the other joins it but appears subsidiary, or (3) both septa may remain separate and extend almost to the columella closely parallel to each other (as in the holotype). A wide paliform lobe, not separated by a notch from its septum, sometimes occurs on the combined septa, or at their junction, or on each individual septum. The inner edges of all septa are straight and entire. The granulation on the upper, outer septal faces of the S_1 and S_2 fuses with that of adjacent septa, filling in the interseptal space with a porous network. The granules on the lower, outer septal faces are large and pointed, whereas on the inner edges the granules are low and rounded.

The fossa is deep and elongate. The columella of the holotype consists of four linearly arranged, twisted rods, which are aligned in the plane of the greater axis. The columellas of the paratypes are composed of more numerous rods fused into a narrow, elongate mass.

Discussion. – *B. wellsi* can be distinguished from all other species of *Balanophyllia* in the western Atlantic by its massive pedicel, flared calice, and distinctive septal arrangement.

Material. – SB-3472 (1); Gos-112/27 (1) Cornell. – Types.

Types. – The holotype and two paratypes are deposited at the USNM, four paratypes at the MCZ, and one paratype at the UMML.
Type-Locality. – 26°38′N, 79°02′W (northern Straits of Florida); 505–527 m.

Distribution. – Antillean distribution (Map 53). 412–505 m.

76. **Balanophyllia hadros**, new species

Plate XXXV, figures 4–6

Description. – The corallum is turbinate and slightly compressed, producing an elliptical calice. The largest specimen measures 30.9 × 24.8 mm in calicular diameter and 31.0 mm tall. The corallum rapidly tapers to a thick pedicel measuring one-third of the calicular diameter and re-expands slightly at the substrate to form a firm attachment. The costae are broad, equal, and separated by very narrow, deep striae. They are porous only near the calicular edge; lower on the corallum very low, rounded granules occur such that two–

three can be counted across the width of each costa. Often higher cycle costae merge with lower cycle costae toward the base.

Septa are arranged in six systems and five incomplete cycles. There is a direct relationship between calicular diameter and number of septa: the largest specimen examined has 15 pairs of S_5 for a total of 78 septa, and the smallest specimen of 19.3 mm greater calicular diameter has nine pairs of S_5, or 66 septa. S_1 and S_2 are equal in size and have straight, vertical, entire inner edges, which reach the columella. S_3 are slightly smaller and do not reach the columella. The higher cycle septa are arranged in a Pourtalès Plan. It is not unusual for an incomplete half-system to have one of its S_4 flanked by two S_5 and the other S_4 standing alone. If unflanked, the S_4 is almost as large as an S_3 and bears a prominent paliform lobe, which extends to the columella. If flanked by S_5, the S_4 is small and two S_5 meet before each S_4 in a large palus, which extends to the columella. None of the septa are exsert. Both septa and pali are covered by randomly arranged, low, pointed granules.

The fossa is moderately deep and contains an elongate columella composed of a compact, discrete, clockwise-swirling mass of ribbons.

Discussion. – Among the ten Recent species of western Atlantic *Balanophyllia*, this species most closely resembles *B. wellsi*, particularly in size and shape. It is differentiated from *B. wellsi* by its distinctive columella, larger and more distinct pali, and nonexsert septa.

Etymology. – The specific name *hadros* (Greek, =stout, strong) refers to the robust nature of the corallum.

Material. – Types.

Types. – Holotype: 0–4834 (USNM 46906). – Paratypes: O–4834 (15) USNM 46907; O-4832 (2) USNM 46908.
Type-Locality. – 14°14.2′N, 80°28.5′W (off Serrana Bank, Nicaragua); 274–293 m.

Distribution. – Known only from off Serrana Bank, Nicaragua (Map 52). 238–274 m.

77. **Balanophyllia bayeri**, new species

Plate XXXV, figures 7–9

Description. – The corallum is ceratoid, straight to slightly bent, and firmly attached by a thick pedicel. The holotype measures 11.4 × 10.3 mm in calicular diameter, 29.9 mm tall, and has a pedicel diameter of 4.8 mm. The pedicel diameter is usually about one-half that of the calicular diameter, and the height of the corallum is typically two–three times the calicular diameter. The theca is porous near the calice, becoming solid and granular toward the base. Costae are equal, broad, flat, and separated by thin, sometimes obscure striae, which diminish toward the base. Pairs of higher cycle costae (the C_4) join halfway to the base (where septal substitution occurs) and continue as one costa toward the base. There is no evidence of epithecal deposits and the costae are always free of attached organisms, implying that the edge zone must cover the corallum almost to the base.

Septa are arranged in six systems and usually four complete cycles, sometimes with several pairs of S_5. S_1 and S_2 are equal in size, very slightly exsert, and have straight, entire, vertical inner edges, which join the columella low in the fossa. The S_3 are small and flanked by pairs of larger S_4, each of which bears a small palus; in some cases the two P_4 fuse into a single, large lobe positioned before the S_3. The lobes extend to and sometimes into the columella. S_5, if present, are arranged in a Pourtalès Plan. There are randomly arranged, prominent, pointed granules on both the septal and palar faces.

The columella is a discrete, elongated structure aligned in the greater calicular axis. Like the columella of *B. dineta* and of *B. hadros*, it is composed of a clockwise-swirling mass of ribbons.

Discussion. – *B. bayeri* is most similar to *B. dineta* and *B. hadros* based on their very similar columellas and arrangement of septa and pali. It is distinguished from *B. hadros* by its smaller size and narrower (ceratoid) corallum. However, it is extremely similar to some specimens of *B. dineta* and could easily be confused with it. Distinctive characters of *B. bayeri* are: (1) a consistently larger pedicel diameter, (2) a longer, straighter corallum, (3) fewer S_5, (4) a more laterally compressed columella, and (5) absence of an epitheca.

Etymology. – This species is named in honor of FREDERICK M. BAYER, noted invertebrate zoologist and octocoral systematist.

Material. – Types.

Types. – Holotype: O-4940 (USNM 46909). – Paratypes: O-4940 (17) USNM 46910; O-4939 (5) USNM 46911; P-596 (16) USNM 46912.
Type-Locality. – 20°30′N, 86°14′W (off Isla Cozumel, Mexico); 311–329 m.

Distribution. – Known only from off Isla Cozumel, Mexico (Map 54). 274–311 m.

Genus **Dendrophyllia** Blainville, 1830

Diagnosis. – Colonial, dendroid or bushy colonies formed by extratentacular budding. Costae well-defined. Septa arranged according to Pourtalès Plan. Columella spongy. Tabular endothecal dissepiments may be present. Type-species: *Madrepora ramea* Linnaeus, 1758, by subsequent designation (MILNE EDWARDS & HAIME, 1850).

78. **Dendrophyllia cornucopia** Pourtalès, 1871

Plate XXXVI, figures 1–4

Dendrophyllia cornucopia POURTALÈS, 1871: 45, pl. 5, figs. 7–8; 1880: 97, 111. – MARENZELLER, 1907a: 14. – ZIBROWIUS, SOUTHWARD & DAY, 1975: 97, pl. 5, fig. F. – ZIBROWIUS, 1976: 245–246, pl. 93, figs. A–L. – CAIRNS, 1978: 11.
Not *Balanophyllia cornucopia*: HORST, 1922: 59, pl. 8, fig. 13.

Description. – The corallum is cylindrical and elongate (up to 15 cm), tapering gradually to a narrow base, which is invariably broken at the tip. The recumbent corallum may be straight, curved, or greatly contorted. Numerous buds project at right angles to the parent corallum. The buds are rarely large and break off at a young stage, which accounts for the numerous scars on the theca. The calice is elliptical; POURTALÈS's figured syntype measures 17.4 × 15.0 mm in calicular diameter. The corallum wall is thick and porous. Costae are flat, equal, porous, and set apart by narrow, poorly-defined striae. The costal granules are small and sharp. Epithecal bands are often present over most of the corallum.

Septa are arranged in six systems and five cycles, the fifth always incomplete. The figured syntype has 64 septa, including 16 S_5. S_1 and S_2 are equal in size, not exsert, and extend to the columella. Higher cycle septa follow the Pourtalès Plan, sometimes joining before the S_3 and extending to the columella. S_4 margins are irregular to laciniate. The septal granules vary from inconspicuous to large and pointed, twice the septal thickness in height.

The fossa is moderately deep, enclosing a massive, convex columella, oval to elliptical in outline. The fused columellar elements often form a clockwise-swirling vortex with obliquely ridged sides. Tabular endothecal dissepiments are abundant, occurring every 1.5–4.0 mm.

Discussion. – *D. cornucopia* does not fall within the definition of *Dendrophyllia sensu* Vaughan & Wells, 1943, nor does it resemble the type-species, *D. ramea*. Instead of a dendroid colony, it produces solitary coralla with randomly arranged buds, which usually detach long before a third generation bud can form from the second. The genus *Dendrophyllia* is in need of a revision in which a subgeneric category might usefully be employed to distinguish the diverse growth forms now included in the genus.

D. cornucopia is most similar to an undescribed species designated as *Dendrophyllia* A by CAIRNS (1976). The growth forms are identical, but *Dendrophyllia* A has much thinner thecae and septa and more widely spaced dissepiments, producing a much lighter corallum. Furthermore, *Dendrophyllia* A is known from shallower water (46–60 m).

Material. – P-861 (65) USNM 46684, (10) UMML 8: 269; P-1171 (2) USNM 46683; G-386 (1) USNM 46678; G-663 (3) USNM 46679; G-664 (1) USNM 46680; G-1012 (3) USNM 46682; G-1029 (30) USNM 46681, (1) UMML 8: 368; GS(G)-19 (1) USNM 46685; GS(G)-23 (4) USNM 46686; SB-2427 (8); BL-100 (1) MCZ; BL-

253 (1) MCZ; BL-254 (1) MCZ; BL-281 (2) MCZ; BL-290 (2) MCZ; FH-7283 (6) USNM 22024; FH-7286 (19) USNM 22023; TAMU 65A9–20 (2) TAMU. – Syntypes of *D. cornucopia.*

Types. – Three lots of syntypes are deposited at the MCZ: (1) two worn fragments (5442, 2752) from Bibb-135 and Bibb-173, (2) the illustrated specimen (1871: pl. 5, figs. 7–8) (2752) from Bibb-173, and (3) six pieces with soft parts in alcohol from Bibb-173. There is also a specimen from Bibb-173 at the BM.
Type-Locality. – Off Key West, Florida; 220–229 m.

Distribution. – Western Atlantic: Straits of Florida; off northern Cuba; Windward Group, Lesser Antilles (Map 54). 132–604 m. – Eastern Atlantic: Celtic Sea; Gulf of Gascony. 330–960 m.

79. **Dendrophyllia gaditana** (Duncan, 1873)

Plate XXXVI, figures 5–10

Balanophyllia gaditana Duncan, 1873: 333.
Balanophyllia fistula: Horst, 1922: 59 (in part: Siboga-310).
Balanophyllia praecipua Gardiner & Waugh, 1939: 240, pl. 1, fig. 2.
Dendrophyllia praecipua: Wells, 1964: 116, pl. 2, figs. 6–7. – Zibrowius, 1973: 52; 1974a: 758.
Dendrophyllia gaditana: Zibrowius, 1976: 246–248, pl. 94, figs A–N.

Description. – This species forms small, sparsely branched, delicate colonies. The largest known branch measures less than 75 mm in length. Few colonies, if any, have been collected that show a basal attachment. Branching occurs both intra- and extratentacularly; the latter predominates and is responsible for the colonial form. In extratentacular division, the bud originates from the edge zone not far from the calice. The bud usually grows perpendicular to the parent branch but sometimes curves upward, paralleling it. In intratentacular division the calice elongates and adds septa; often the branch increases in length several centimeters before the bud becomes separate. Frequently, however, the bud aborts and the elongated calice resumes its original shape. The branch, however, always retains the flattened shape caused by the aborted bud.

The calice is round to slightly elliptical; an average calice measures 5.5 × 4.2 mm in diameter, whereas a flattened calice in the process of intratentacular division may measure 8.8 × 3.5 mm. The branches are about the same diameter as the terminal calices. Usually the C_1 and C_2 are distinctly ridged and bear a single row of low, rounded granules. The higher cycle costae are low, equal, and also bear a single row of granules. The costae are covered by a thin, glistening epitheca, which usually extends to within 1–2 mm of the calice.

A mature corallite typically contains 48 septa arranged in six systems and four cycles; however, a calice in the process of intratentacular division may contain up to 17 or more half-systems, including S_5, for a total of 70–80 septa. Septa are arranged in a Pourtalès Plan. The S_1 are slightly larger and more exsert than the S_2; both have vertical, slightly serrate, lower inner edges as a result of perpendicularly projecting paliform teeth. Each S_3 is small and flanked by a pair of larger S_4, which join in front of the S_3 as a large paliform lobe. The septal and palar granulation is prominent and pointed, sometimes higher than the septal thickness. The large, spongy columella is bordered by the paliform teeth of the S_{1-2} and the P_4.

Discussion. – *D. gaditana* is easily distinguished from the other three western Atlantic *Dendrophyllia* by its much smaller branch diameter and peculiar intratentacular budding.

Material. – P-596 (1); O-4954 (1); Alb-2354 (11); Alb-2416 (1); Chain-15 (24 fragments); Chain-16 (3 fragments).

Types. – The very worn holotype of *D. gaditana* was collected at Porcupine station 29 in 1870, and is deposited at the BM (1883.12.10-97). Also deposited at the BM (1939.7.13.28) are the three types of *D. praecipua* collected at John Murray station 111 (5°04′18″S, 39°14′12″E, 73–165 m).
Type-Locality. – Iberian-Morocco Gulf (36°20′N, 6°47′W); 417 m.

Distribution. – Western Atlantic: off North Carolina and Georgia; Arrowsmith Bank, Yucatan; St. Peter and Paul Rocks (first records for the western Atlantic) (Map 55). 146–505 m. – Elsewhere: Iberian-Morocco Gulf; Madeira; Great Meteor Bank; Gulf of Guinea. 73–417 m. Off Queensland, Australia; off Indonesia; off Pemba, Tanzania.

80. **Dendrophyllia alternata** Pourtalès, 1880

Plate XXXVII, figures 1, 4, 8

Dendrophyllia alternata POURTALÈS, 1880: 97, 111, pl. 2, figs. 3–4. – ZIBROWIUS, 1974: 572; 1976: 248–249, pl. 95, figs. A–J. – CAIRNS, 1978: 11.

Description. – The colony is dendroid with uniplanar, dichotomous branching. The size of a mature colony is probably about 1 m. The diameter of the widest syntype branch is 13.0 mm, whereas the terminal branches measure 4–5 mm in diameter. Calices occur laterally in the plane of branching in an alternating fashion. Intercalicular distances range between 9–14 mm. Calices project 2–3 mm above the branch and are directed perpendicular to a large, basal branch but obliquely on a small, terminal branch. Coenosteal costae are prominent and rounded, separated by deep, narrow furrows. Costal granulation is fine, consisting of distinct, pointed spines particularly well developed on terminal branches. Calices are round and measure 4.5–5.5 mm in diameter.

Septa are arranged in six systems and four cycles; however, S_3 and S_4 are incompletely and irregularly developed, making the systems difficult to distinguish. There are usually 32, 34, or 36 septa in a poorly-defined Pourtalès Plan. S_1 and S_2 are equal, not exsert, and extend to the columella. Each pair of S_4 joins before a smaller S_3 and extends to the columella as one septum. There is usually a prominent paliform lobe (P_3) at the junction of the two S_4. The inner edges of S_4 are laciniate, particularly deep within the fossa. Sharp granules, equal to the septal thickness in height, are scattered over the septal faces.

The elongate columella is aligned in the direction of the branch and is composed of several granulated, individualized rods or a fused mass of rods.

Material. – P-901 (USNM 46690); G-169 (USNM 46688); G-386 (USNM 46689); G-661 (UMML 8: 369); G-663 (UMML 8: 270); G-664 (UMML 8: 370); O-1408; O-1991; O-4605; Gos-112/26 (Cornell); E-26017; E-30175; Atl-2980 B. (MCZ). – Syntypes.

Types – Eight branches (syntypes) are deposited at the MCZ: one from BL-209, one from BL-164, and six from BL-218. All bear the number 5440. Another branch from BL-209 is at the BM (1939.7.20.422).
Type-Locality. – Lesser Antilles; 274–346 m.

Distribution. – Western Atlantic: Antillean distribution; northern Gulf of Mexico (Map 55). 276–900 m. – Eastern Atlantic: northwest of Spain; Azores. 450–688 m.

Genus **Enallopsammia** Michelotti, 1871

Diagnosis. – Colonial, dendroid (often uniplanar) colonies formed by extratentacular budding. Coenosteum compact, synapticulothecate, porous only near calices. Septa arranged normally. Columella small. Type-species: *Coenopsammia scillae* Seguenza, 1864, by monotypy.

81. **Enallopsammia profunda** (Pourtalès, 1867)

Plate XXXVII, figures 5, 7

Diplohelia profunda POURTALÈS, 1867: 114; 1868: 135; 1871: 25, pl. 6, figs. 6–7.
Dendrophyllia profunda: POURTALÈS, 1878: 208, pl. 1, figs. 6–8. – SQUIRES, 1959: 28–30, figs. 13–14. – STETSON, SQUIRES & PRATT, 1962: 21, figs. 8–10, 12–13. – SQUIRES, 1963: 22, fig.
Stereopsammia profunda: POURTALÈS, 1880: 97, 111.
Not *Dendrophyllia profunda*: ALCOCK, 1902: 43 (= *E. marenzelleri*).
Not *Coenopsammia profunda*: MARENZELLER, 1904: 313 (= *E. marenzelleri*).
Enallopsammia profunda: ZIBROWIUS, 1973: 43–44, pl. 3, figs. 21–23. – CAIRNS, 1977b: 5; 1978:11.

Description. – The corallum is dendroid, forming massive colonies over 1 m high and equally broad. Subterminal branches are about 1 cm in diameter and bear prominent corallites shaped like truncated cones and projecting up to 1 cm perpendicularly from the main branch. Toward the branch tips the corallites are oriented obliquely. The calices are round to slightly elliptical (measuring 3–4 mm in diameter), and arranged alternately on opposite sides of a branch, sometimes producing a spiral along the branch. Their centers are between 9–14 mm apart. The coenosteum is very compact, almost solid, even on fresh specimens; it is noticeably porous only around the calicular edges.

Septa are arranged in six systems and three cycles, the last cycle rarely complete. S_1 are not exsert, narrow, and reach the columella deep in the fossa; S_2 and S_3 are progressively smaller. In a small calice, each pair of S_3 joins in front of an S_2; with greater size the Pourtalès Plan is lost and all septa are arranged in normal fashion. Scattered septal granules are tall and blunt, two–three times the septal thickness in height.

The fossa is very deep in young corallites on thin branches but shorter in older corallites on thickened branches as a result of infilling of stereome. The columella is usually small, consisting of a spongy mass of trabeculae.

Discussion. – The five Recent species of *Enallopsammia* have been reviewed by ZIBROWIUS (1973), who provides a generic discussion and detailed synonymies.

Remarks. – Ahermatypic deep-water banks have known since 1865 (SARS) from the eastern Atlantic. They were reported for the first time in the western Atlantic by MOORE & BULLIS (1960) from off the Mississippi Delta and later by STETSON, *et al.* (1962) and SQUIRES (1963) from the Blake Plateau. *E. profunda* and *L. prolifera* are the primary constituents of the deep-water coral banks in the western Atlantic, whereas *L. prolifera* and *M. oculata* are the framework species of the eastern Atlantic banks (STETSON, *et al.*, 1962). In the western Atlantic, *E. profunda* therefore seems to fill the role of *M. oculata*. Great quantities of *E. profunda* and *L. prolifera* were dredged from CI-140 and CI-246 (26°22′–24′N, 79°35′–37′W, 738–761 m), which strongly indicates another such bank in the Straits of Florida. *Solenosmilia variabilis*, a similar branching form, also was reported from these stations. Associated solitary species often found attached to these branching forms are: *Bathypsammia fallosocialis*, *Tethocyathus variabilis*, *Cyathoceras squiresi*, and *Desmophyllum cristagalli*.

Material. – P-105 (USNM 46596); P-120 (USNM 46595); colonies from 17 Gerda stations from the Straits of Florida (USNM 46598–46610); CI-140 (USNM 46591, UMML 8: 361); CI-246 (USNM 46590); GS(G)-13 (USNM 46592); O-6690; O-11705; O-11716; O-11718; O-11725; SB-453; SB-2484; BL-44 (MCZ); Bibb-22 (MCZ); Alb-2415 (USNM 10497); Alb-2416 (USNM 10529); Alb-2529 (USNM 11974, YPM 8381); Alb-2530 (USNM 11975); Alb-2661 (USNM 15914); Alb-2662 (USNM 36526); Alb-2663 (USNM 16162); Alb-2668 (USNM 36925); Alb-2671 (USNM 36927); Alb-2678 (USNM 19089); colonies from 22 Gosnold stations from the eastern slopes of Florida and Georgia; E-26004 (USNM 46593); E-26019; E-26028; E-26037; E-26052; TAMU 65A9–4 (TAMU). – Syntypes of *D. profunda*; Squires's (1959) specimens (AMNH 3343).

Types. – At the MCZ there are two lots of syntypes of *E. profunda*: one contains two worn fragments (MCZ 2782) and the second contains nine fragments (no number). Both were collected from Bibb-3. Another syntype from this Bibb station is at the YPM (4773). The syntype from 28°24′N, 79°15′W was not found.
Type-Locality. – Straits of Florida; 640 m.

Distribution. – Northern temperate distribution from off Massachusetts through the Straits of Florida; one record off St. Lucia, Lesser Antilles (Map 56). 403–1748 m, records below 1000 m rare. 3°–12°C, based on 15 records.

82. **Enallopsammia rostrata** (Pourtalès, 1878)

Plate XXXVII, figures 2-3, 6

Amphihelia rostrata Pourtalès, 1878: 204, pl. 1, figs. 4–5. – Agassiz, 1888: 152, fig. 473. – Gourret, 1906: 122, pl. 12, figs. 11, 11A–B.
Stereopsammia rostrata: Pourtalès, 1880: 97, 110–111.
Not *Anisopsammia rostrata*: Marenzeller, 1904: 314 (= *E. amphelioides*).
Anisopsammia rostrata: Gravier, 1915: 3; 1920: 102–104, pl. 12, figs. 181–185.
Enallopsammia rostrata: Squires, 1959: 40. – Zibrowius, 1973: 44–45, pl. 2, figs. 14–15; 1976: 253–254, pl. 87, figs. A–K, pl. 88, figs. A–C.
Not *Enallopsammia rostrata*: Laborel, 1970: 156 (= *E. amphelioides*).

Description. – The corallum is massive, forming dendroid, flabellate colonies with a base up to 3 cm in diameter. The colony is densely branched, especially near the smaller end branches where extratentacular budding occurs at the level of every, or every other, calice. Calices occur on only one side of the colony and are elliptical to teardrop-shaped, measuring 3–5 mm in diameter. The average distance between calicular centers is 6–8 mm. The calices project upward and are bordered beneath by a prominent, costoseptal rostrum. The rostrum is usually aligned with the branch axis but is occasionally perpendicular to it. It is sometimes so produced as to almost enclose the calice. The coenosteum on the calicular side of the branches is usually porous, whereas, on rhe reverse side, it is solid and striate. A faint to well marked spiny costa corresponds to each septum; some costae are continuous with the striae on the reverse side of the branch.

Septa are arranged in six systems and three complete cycles. Five of the six S_1 are small, not exsert, and extend to the columella. The enlarged S_1 is very exsert and, along with the three–four adjacent septa on either side, form the rostrum, which gives the calice its elongated or teardrop shape. The S_2 and S_3 are progressively smaller. The S_2 extend to the columella whereas the S_3 are sometimes loosely connected by trabeculae to the S_2 halfway to the columella. The septal granules are spiny, like those of the costae, and randomly arranged. The lower, inner edges of the S_1 and S_2 bear small lobes intimately connected with the rudimentary, trabecular columella.

Discussion. – A third species of *Enallopsammia*, *E. amphelioides* (Alcock, 1902), (Pl. XL 4–5) also occurs in the tropical western Atlantic. Previously known only from the Indo-Pacific, it was recently collected from the Azores and off Brazil (24°49′S, 44°31′W, 535 m). The Brazilian record was reported incorrectly as *E. rostrata* by LABOREL (1969). A large colony of this species was found in a display case at the BM labelled "Barbadoes" [sic]; no additional data could be ascertained. It is not unlikely that this species also exists in the Caribbean. It is distinguished from the two other western Atlantic species in this genus by the combination of having calices on only one side of the branch and a very weakly developed calicular rostrum, if present at all.

Material. – P-881 (USNM 46695); P-1187 (USNM 46694); P-1262 (USNM 46693, UMML 8: 272); G-190 (USNM 46692); O-11225; O-11226; O-11722; BL-124 (MCZ); BL-218 (MCZ, USNM); BL-266 (MCZ, USNM); BL-271 (MCZ); Gos-112/78 (Cornell); E-30176; Atl-2980 B (MCZ); Atl-3469 (MCZ); Atl-3472 (MCZ); Atl-3474 (MCZ); Atl-280-3; Atl-280-16. – Syntypes of *A. rostrata*; Squires's (1959) specimen (AMNH 3444).

Types. – Two lots of syntypes are deposited at the MCZ: one contains two branches including the illustrated type and the other lot contains one large branch and 28 fragments. Both lots are from BL-2.
Type-Locality. – 23°14′N, 82°25′W (western Straits of Florida); 1472 m.

Distribution. – Western Atlantic: Kelvin and San Pablo Seamounts; off Georgia; Antillean distribution; off Nicaragua; off São Paulo, Brazil (Map 57). 300–1646 m. SQUIRES's (1959) record of 3383 m is questioned. 5°–13°C, based on three records. – Eastern Atlantic: the area bounded by the Celtic Sea, Azores, and the Gulf of Guinea. 732–2165 m.

Genus **Thecopsammia** Pourtalès, 1868

Diagnosis. – Solitary, turbinate to trochoid, fixed. Costae absent, epitheca sometimes covers basal synapticulotheca. Septa follow Pourtalès Plan. No pali. Columella small, spongy. Type-species: *Thecopsammia socialis* Pourtalès, 1868, by subsequent designation (MARENZELLER, 1907).

83. **Thecopsammia socialis** Pourtalès, 1868

Plate XXXVIII, figures 7–9

Thecopsammia socialis POURTALÈS, 1868: 138; 1871: 44, pl. 2, figs. 9–10; 1880: 97. – VERRILL, 1883: 63. – AGASSIZ, 1888: 152, fig. 475. – MARENZELLER, 1907: 8; 1907a: 16. – SQUIRES, 1959: 38, figs. 21, 24. – ZIBROWIUS, 1976: 269.
Not *Balanophyllia* (*Thecopsammia*) *socialis*: DUNCAN, 1870: 295 (= *L. britannica*).
Not *Balanophyllia socialis*: DUNCAN, 1873: 333–334, pl. 43, figs. 14–19 (=*Leptopsammia britannica*).

Description. – The corallum is trochoid to turbinate, straight, and attached by an expanded base. The pedicel measures one-fourth to one-half the calicular diameter. The calice is round to elliptical; the largest specimen examined measures 20.4 × 17.9 mm in calicular diameter and 20.0 mm tall. A smooth epitheca, which overlays a thick, non-costate synapticulotheca, is usually present around the base but sometimes extends almost to the calice.

Septa are arranged in six systems and five cycles, the last cycle never complete even in the largest specimen. Coralla measuring 6–11 mm in calicular diameter have four complete cycles. Above 11 mm, S_5 begin to appear by septal substitution. Pourtalès's illustrated syntype, measuring 15.5 mm in calicular diameter, has 64 septa. S_1 are larger than the S_2, slightly exsert, and extend to the columella. Each pair of S_4 joins in front of an S_3 and extends to the columella (Pourtalès Plan). The first 24 S_5 are equally distributed in all twelve half-systems before any one half-system is completed with four S_5. The upper edges of all septa are rounded and their inner edges descend almost vertically into a deep fossa. Smaller specimens have more open (turbinate) calices with sloping septal edges. The septa bear low, close-set, blunt granules arranged in poorly-defined lines parallel to the trabeculae.

The columella is small and spongy, composed of individualized elements or a solid fusion of several elements into a compact mass.

Discussion. – *T. socialis* is most similar to, and often found with, *Bathypsammia fallosocialis* and *B. tintinnabulum*, but can easily be distinguished by its arrangement of septa according to the Pourtalès Plan. SQUIRES (1959) gives a detailed comparison.

Material. – G-298 (1) USNM 46696; G-672 (2) USNM 46697, (1) UMML 8: 367; G-849 (10) USNM 46698, (1) UMML 8: 273; G-1029 (6) USNM 46699; GS(G)-13 (2) USNM 46701; GS(G)-40 (7) USNM 46700; O-5755 (2); O-11716 (1); SB-450 (14); SB-453 (4); BL-316 (1) MCZ; Bibb-203 (1) MCZ; Alb-2662 (1) USNM 14611; Alb-2663 (9) USNM 16111; Alb-2669 (4); 29 specimens from 11 Gosnold stations from the eastern slopes of Florida and Georgia; E-26017 (2) USNM 46702; E-26019 (1) USNM 46703; E-26028 (1) USNM 46704; Atl-266-4 (2); Atl-266-6 (1); Atl-266-7 (8). – Syntypes of *T. socialis*.

Types. – Thirty-nine syntypes in four lots are deposited at the MCZ: (1) 20 specimens (5601), including the figured type, (2) 14 specimens (5601), (3) three specimens (2773) labelled "Florida, 100–300 fms.", and (4) two specimens (2773). Another syntype is at the YPM (4764). Five more specimens at the BM labelled "100–300 fms." are probably also syntypes. POURTALÈS did not specify localities in his original description or with the type-material, therefore all that is certain is that the syntypes were collected by the Bibb in 1868 off the Florida Keys.
Type-Locality. – Florida Keys; 183–549 m (by implication).

Distribution. – Northern temperate distribution from off

Georgia to the Florida Keys (Map 57). 214–878 m. 6°–11°C, based on four records.

Genus **Bathypsammia** Marenzeller, 1907

Diagnosis. – Like *Thecopsammia* but septa arranged normally and columella usually larger. Type-species: *Thecopsammia tintinnabulum* Pourtalès, 1868, by original designation.

84. **Bathypsammia tintinnabulum** (Pourtalès, 1868)

Plate XXXVIII, figures 1–3; Plate XXXIX, figure 1

Thecopsammia tintinnabulum POURTALÈS, 1868: 138; 1871: 43, pl. 1, figs. 10–11; 1878: 207; 1880: 97. – AGASSIZ, 1888: 152.
Bathypsammia tintinnabulum: MARENZELLER, 1907; 8; 1907a: 16. – SQUIRES, 1959 32–37, figs. 15–16, 20, 22–24. – CAIRNS, 1977b: 5; 1978: 11.

Description. – The corallum is bell-shaped, straight or slightly curved, and attached by a narrow, nipple-shaped pedicel usually measuring less than one-fourth the calicular diameter. The calice is elliptical; the largest specimen examined measures 17.5 × 15.6 mm in calicular diameter and 25.0 mm tall. An epitheca is usually present and can cover up to 95% of the thick synapticulotheca. No costae are present.

Septa are arranged in six systems and four cycles; the fourth cycle is complete only in the largest coralla. SQUIRES (1959) reported a specimen with 52 septa, including septa of the fifth cycle, but S_5 are uncommon. S_1 are slightly larger than S_2, not exsert, and extend into the columella, sometimes constricting it into three lobes. S_2 extend to the columella, S_3 only three-fourths of the distance. S_4 are rudimentary in large coralla and absent or barely distinguishable in average-size specimens. The number of S_4 is closely related to corallum size: they develop first in the end half-systems and later in the lateral ones. The inner edges of all septa are entire, straight, and unattached to other septa. Those of the S_1 and S_2 descend vertically into a moderately deep fossa, forming almost a right angle at their upper, inner edges. Septal granules are large and blunt, arranged in widely spaced, curved rows oriented perpendicular to the trabeculae.

The spongy columella is large, elongate, and, as noted by POURTALÈS (1871), sometimes constricted by the inner edges of the S_1.

Material. – 691 specimens from 36 Gerda stations in the Straits of Florida (USNM 46511–46546); CI-246 (1) USNM 46547; GS(G)-15 (3) USNM 46549; O-6690 (8); O-11718 (1); SB-450 (3); SB-2420 (1); SB-2427 (4); BL-5 (4) MCZ, USNM; BL-44 (3) MCZ; Bibb-135 (100) MCZ; Bibb-215 (8) MCZ; Alb-2660 (2) USNM 14622; Alb-2664 (3) USNM 14499; Alb-2676 (47) USNM 14569; Combat-452 (1); 59 specimens from 10 Gosnold stations from the eastern coast of Florida; E-26004 (1); E-26017 (1); E-26052 (1); 360 km southwest of Egmont Key, Florida, 366 m (7) AMNH. – Squires's (1959) specimens (AMNH 3437); Syntypes.

Types. – At the MCZ there are seven lots of syntypes containing 129, 50, 40, 21, 10, 7, and 3 specimens (MCZ 5604 and 2768). The illustrated specimen (1871: pl. 1, figs. 10–11) is in the lot of three and is chosen as lectotype. Eleven additional syntypes are at the BM, four of which are numbered 69.10.25.15, 91.9.28.16, and 1939.7.20.426–427. Another syntype is at the YPM (4763). POURTALÈS did not specify where the syntypes were collected, but they undoubtedly resulted from the 1868 cruise of the Bibb. Only two of the seven lots had definite station data: Bibb-18 and Bibb-66.

Type-Locality. – Off Florida reefs; 183–549 m.

Distribution. – Northern temperate distribution from off South Carolina through Florida Keys; off southwestern Florida (Map 58). 210–1079 m. 6°–10°C, based on seven records.

85. **Bathypsammia fallosocialis** Squires, 1959

Plate XXXVIII, figures 4–6

Bathypsammia fallosocialis SQUIRES, 1959: 37–39, figs. 17–19, 21, 24.

Description. – The corallum is trochoid, usually straight, and attached by a thick pedicel measuring 25–55% of the calicular diameter. It is often found attached to branches of *Enallopsammia profunda*. The calice is elliptical; the largest corallum examined measures 19.7 × 17.5 mm in calicular diameter and 33.0 mm tall. An epitheca is almost always present, usually covering half of the corallum but varying from 10–90%. Costae are not present; instead there is a uniform, highly porous synapticulotheca, which is very thick in large specimens, especially at the calicular edge.

Septa are arranged in six systems and usually four cycles, but SQUIRES (1959) reported a specimen with eight S_5. S_1 are slightly larger than the S_2; both are exsert and extend to the columella. S_3 are half as large as the S_1 and very narrow deeper in the fossa. S_4 are rudimentary and often have laciniate lower inner edges. Septal granulation consists of crowded, prominent, blunt spines, which are most highly developed near the inner edges of the S_1 and S_2 adjacent to the columella. The granules are arranged in rows oriented perpendicular to the trabeculae.

The fossa is moderately deep. The columella is very small and sometimes absent. When present it is elongate or elliptical, composed of a fused mass of twisted, spongy trabeculae.

Discussion. – *B. fallosocialis* closely resembles *B. tintinnabulum* but can be differentiated by the following: (1) its basal attachment is larger and not nipple-shaped, (2) its columella is smaller, (3) its theca is often much thicker, and (4) its septa are more crowded. No one character will always distinguish the two species since the range of variation overlaps in all parameters, but, taken together, these four characters will serve to differentiate the two.

Material. – P-105 (3) USNM 46705; P-901 (2) USNM 46717; 53 specimens from 8 Gerda stations in the northern Straits of Florida (USNM 46706–46713); CI-140 (2) USNM 46714; CI-246 (5) USNM 46715, (1) UMML 8: 275; O-11725 (2); SB-450 (6); BL-21 (2) MCZ; Alb-2416 (9) USNM 10544; Alb-2663 (7); Alb-2668 (6) USNM 14495; Gos-1749 (1); Gos-1766 (5); Gos-1767 (2); Gos-1784 (1); E-26004 (7) USNM 46716; Atl-266-4 (3) USNM 53411; Atl-266-6 (4) USNM 53412. – Paratypes.

Types. – Holotype: AMNH 3344. – Paratypes: sixty specimens (AMNH 3438). All specimens were collected at Vema-3-23.
Type-Locality. - 27°10′N, 79°34.9′W (northern Straits of Florida); 686 m.

Distribution. – Primarily a northern temperate distribution from off Georgia to off Havana, Cuba; one record off St. Lucia, Lesser Antilles (Map 59). 244–805 m. 6°–12°C, based on five records.

Genus **Rhizopsammia** Verrill, 1869

Diagnosis. – Reptoid colonies formed by extratentacular, stoloniferous budding, the corallites sometimes losing their interconnection. Corallites trochoid to cylindrical. Costae present. Pali present. Columella prominent, spongy. Type-species: *Rhizopsammia pulchra* Verrill, 1869, by monotypy.

86. **"Rhizopsammia" manuelensis** Chevalier, 1966

Plate XXXIX, figures 2–6

Rhizopsammia manuelensis Chevalier, 1966: 1382, pl. 6, figs. 1–3, pl. 7, fig. 5. – Zibrowius, 1976: 251–252, pl. 89, figs. A–M. – Cairns, 1977b: 5; 1978: 11.
Dendrophyllia n. sp. Allen & Wells, 1962: 390, pl. 4, figs. 2–4.

Description. – The colony forms phaceloid clumps composed of corallites of varying lengths and diameters, originating from an encrusting base. Small colonies are sometimes reptoid, as in the holotypic colony. Larger, phaceloid colonies from the western Atlantic commonly encrust the base of *Madrepora carolina*. Cylindrical to ceratoid corallites project up to 40 mm above the base, but rarely exceed 10 mm in height. An epitheca (holotheca) covers all of the basal encrustation and the lower coralla. The calices are elliptical, averaging 9.5 × 8.5 mm in diameter; however, the largest calice examined measures 18 mm in diameter. Costae are well-defined, equal, and bear one row of coarse, pointed granules.

Septa are arranged in six systems and five cycles; the last cycle is very irregularly developed. In a calice of 9.6 mm in diameter there are 56 septa. S_1 and S_2 are equal in size, slightly exsert, and extend to the columella. S_4 meet before the S_3 and extend to the columella. At their junction there is usually a distinct, high paliform lobe, separated from the S_3 by a notch. The inner edges of the S_1 and S_2 are entire; those of the S_3 are dentate or irregular. S_{4-5} are very porous, with laciniate paliform teeth. Septal granulation is variable, ranging from low and rounded to tall and pointed granules, and may be arranged randomly or in lines parallel to the trabeculae.

The fossa is deep. The columella of larger calices is massive, rounded, and elliptical, composed of individualized ribbons arranged in a clockwise-swirling mass.

Discussion. – CHEVALIER (1966) placed this species in *Rhizopsammia* Verrill, because the small, holotypic colony shows reptoid budding. However, larger colonies show a distinctly phaceloid growth form with corallites growing from a basal coenosteum as in *Cladopsammia* Lacaze-Duthiers, 1897. The type-species of *Rhizopsammia* produces corallites of uniformly low height and stolons, with subsequent loss of connection of individual corallites. The corallites of *R. manuelensis*, however, never form stolons, never lose their interconnection, and may be 40 mm tall. Although similar in growth form, *R. manuelensis* also does not appear to belong to *Cladopsammia* because of its prominent paliform lobes, which are not present in *C. rolandi* (type-species of *Cladopsammia*). In a general revision of the dendrophylliids, *R. manuelensis* could form the basis of a new generic or subgeneric category of *Cladopsammia* or *Rhizopsammia*.

Material. – P-595 (USNM 46720, UMML 8: 276); G-134; G-135 (USNM 46719); GS(G)-44 (USNM 46718); O-3953; SB-332; Alb-2354 (USNM 16103A); E-26538; WH-44/68 (SME); off Cat Cay, Bahamas, 366 m. – Types of *R. manuelensis* at MNHNP.

Types. – Holotype: a small colony of three corallites collected by the Gerard-Treca (23-3-1954) is deposited at the MNHNP, Institute of Paleontology. – Paratypes: one other colony at the MNHNP and others at IFAN, Dakar.
Type-Locality. – Off Cape Manuel, Dakar; 135 m.

Distribution. – Western Atlantic: Straits of Florida; northern Gulf of Mexico; Arrowsmith Bank, Yucatan; off Uruguay (Map 59). 78–366 m. – Eastern Atlantic; off Senegal; Cape Verde Islands; Gulf of Guinea. 55–135 m.

Genus **Trochopsammia** Pourtalès, 1878

Diagnosis. – Solitary, turbinate, fixed. Costae thick and porous. Septa arranged normally, showing no trace of the Pourtalès Plan.

Columella rudimentary or absent. Type-species: *Trochopsammia infundibulum* Pourtalès, 1878, by monotypy.

87. **Trochopsammia infundibulum** Pourtalès, 1878

Plate XL, figures 1–3

Trochopsammia infundibulum POURTALÈS, 1878: 208, pl. 1, figs. 16–17; 1880: 97, 110. – VAUGHAN & WELLS, 1943: 239, pl. 50, figs. 7–7a. – CAIRNS, 1978: 11.

Description. – The corallum is trochoid, tapering to a thick pedicel, and attached by an expanded base. The calice is round. An average-size specimen measures 10 mm in calicular diameter and about 13 mm tall. A solid, smooth epitheca covers the basal 10–20% of the corallum; otherwise broad, equal, finely granulated costae extend from the calice to the epitheca. The costae are separated by narrow, deeply incised grooves. Small, blunt costal granules are arranged over the entire surface of each costa such that, on the average, five–seven occur across a costa near the calicular edge.

The thickened costae merge into thick septa, which are arranged in six systems and three cycles. Several S_4 are present in only one of the specimens examined. The lower edges of the S_1 and S_3 extend to the center of the fossa; the S_2 do not quite reach the center. All septa are slightly exsert; the upper edges of the S_1 and S_2 are slightly ridged whereas the S_3 are rounded. The inner edges of the S_1 and S_2 are entire; those of the S_3 are irregularly dentate. Blunt granules cover most of each septal face except near the lower inner edge, where the granules are higher and usually fused into short carinae oriented perpendicular to the trabeculae.

The fossa is deep and narrow. There is usually no columella or, if present, only a very small one composed of several short trabeculae attached to the lower inner edges of the septa.

Material. – G-114 (2) USNM 46722; BL-226 (1) MCZ; BL-260 (2) MCZ; Alb-2351 (3) USNM 10276; Rosaura-34 (1) BM; 72 km south of Dry Tortugas, Florida, 1065 m (2). – Syntypes.

Types. – Two syntypes from BL-25 are deposited at the MCZ (5607). Two additional syntypes from BL-2 are at the BM (1939.7.20.430–431).
Type-Locality. – Off northwestern Cuba; 1161–1472 m.

Distribution. – Off northwestern Cuba; Windward Group, Lesser Antilles (Map 60). 532–1372 m.

INCERTAE SEDIS

88. "Cylicia" inflata Pourtalès, 1878

Plate XL, figures 6–7

Cylicia inflata POURTALÈS, 1878: 207, pl. 1, figs. 10–11; 1880: 96.

Description. – The corallites form loose clusters or small phaceloid colonies by reptoid budding. The corallites are roughly cylindrical in shape but usually slightly tapered at the calice and swollen toward the base. The largest corallite measures 3.8 mm tall, 1.4 mm in calicular diameter, and 2.4 mm in basal diameter. The theca is smooth and finely granulated, with only a slight trace of costae.

Septa are arranged in six systems and three complete cycles. The S_1 are slightly exsert and much larger than the S_2, which in turn, are larger than the S_3. Before the S_2, small pali occur. Their inner edges are often bifurcated, seeming to mold themselves around the inner edge of the S_2. A small, papillose columella of one–three elements lies deep in the fossa.

Discussion. – No material of this species has been discovered subsequent to its original description. It clearly does not belong to *Culicia* Dana, 1846. Because of the presence of pali before the second group of septa, it has affinities with *Caryophyllia*. *"C." inflata* could also be a young stage of a larger adult, but more material is needed to resolve its taxonomic position.

Material. – Types.

Types. – Two lots of syntypes are deposited at the MCZ. One lot (5573) from a Blake station off Havana at 242 fm (443 m), contains several attached specimens in very poor condition. The lot from BL-69 (5577) contains 21 small specimens, 13 of which are the species described and/or illustrated by POURTALÈS. The eight other specimens are young dendrophylliids. One of the 13 (Pl. XL 7) is designated lectotype; the remaining 12 are designated paralectotypes.
Type-Locality. – Off Havana, Cuba; 183 m.

Distribution. – Known only from off Havana, Cuba (Map 60). 183–443 m.

ZOOGEOGRAPHY

The rich, deep-water Scleractinian fauna of the Caribbean Sea has a strong influence on the tropical and temperate areas to the north and south. Consequently, the following zoogeographic analysis deals not only with the Caribbean but with the deep-water Scleractinian fauna of both the tropical and warm temperate regions of the western Atlantic.

Although corals have been examined from over 1150 deep-water stations, a thorough sampling of the Caribbean and adjacent waters is far from complete. There are still large, poorly sampled areas, notably off the southern coasts of Cuba and Hispaniola, off Costa Rica, the western Gulf of Mexico, and off Brazil between 5°N–20°S. Other areas have been intensively collected and are well known: the Straits of Florida, the northeastern Gulf of Mexico, the Lesser Antilles, and off the northwestern coast of Cuba. Some species are still known from only one or two records, others from over 150. Because of these limitations, the following analysis is considered preliminary.

Patterns of Distribution

Among the 88 deep-water species considered in this review, four patterns of distribution (Table 1, column 21) occur in the Caribbean and adjacent waters.

Firstly, an entirely insular distribution, extending from Grenada to western Cuba, including the Bahamas and sometimes the Florida Keys, is shared by 15 species. This pattern is similar to EKMAN's (1953: 53) and BAYER's (1961: 343) Antillean region and BRIGGS's (1974: 63) West Indian province, based on shelf organisms. This distribution will subsequently be referred to as Antillean.

Secondly, another 20 species are found throughout the Antillean distribution but also with at least one record in the western Caribbean. The western Caribbean component may be a unique record or occur along the entire coast, but the avoidance of the northern coast of South America is absolute. This pattern does not have a shallow-water analog.

Thirdly, seven species are endemic to the temperate region off the eastern coast of the United States, with a southern boundary often extending to the Florida Keys, the northern Bahamas, or sometimes as far south as Cuba. Five of these species have a primarily warm temperate distribution (*Concentrotheca laevigata*, *Cyathoceras squiresi*, *Thecopsammia socialis*, *Bathypsammia tintinnabulum*, and *B. fallosocialis*), whereas the other two (*Enallopsammia profunda* and *Dasmosmilia lymani*) are found well into the cold temperate region.

Finally, three species (*Deltocyathus pourtalesi*, *Rhizosmilia gerdae*, and *Flabellum pavoninum atlanticum*) are endemic to the insular side of the Straits of Florida and Old Bahama Channel.

Of the remaining species, 26 do not fall into a pattern of distribution within the Caribbean, either because of a paucity of records or because of an atypical distribution.

Another 17 species are widely distributed throughout the Caribbean off virtually every sector of the coast. These species are also usually common in the Gulf of Mexico, Bahamas, off the eastern coast of the United States, and off tropical Brazil. Of these 17 species, nine are endemic to the western Atlantic, six are amphi-Atlantic, and two are cosmopolitan.

FAUNISTIC RELATIONSHIPS IN THE WESTERN ATLANTIC

TABLE 1 indicates the generalized distribution of the 88 species treated in this review. Seventy-six of the 88 species occur in the

Caribbean. Reference to TABLE 1 indicates that the area of highest species diversity is off Cuba (61 species), followed by the Windward Group of the Lesser Antilles (60 species). However, other areas of the Caribbean, such as Hispaniola, Puerto Rico, and off the northern coast of South America have low species diversities, on the order of 20–25.

Areas adjacent to the Caribbean have many fewer species. For instance, there are only 40 species of deep-water corals known from the Gulf of Mexico: 19 in the western Gulf and 36 in the eastern Gulf (15 occur throughout the Gulf). Of these 40, four are cosmopolitan species, four are primarily temperate region species (Distributional pattern 4 of TABLE 1), one (*Flabellum fragile*) is endemic to the Gulf except for records in the upper Florida Keys, and the remaining 31 species are tropical or eurythermal tropical (Caribbean) species (BRIGGS, 1974: 366). None of the four temperate species shows a disjunct distribution around Florida. The deep-water ahermatypes of the Gulf of Mexico, therefore, are a depauperate extension of the Caribbean fauna with a minor temperate component.

The deep-water coral faunas of the Bahamas and the eastern coast of Florida have 54 and 55 species respectively, reflecting, in part, their proximity to the Caribbean fauna, especially Cuba.

To the north of Florida the influence of the Caribbean fauna decreases. There are 28 species of deep-water Scleractinia in the warm temperate northwest Atlantic. Half of these species are eurythermal tropical species, extending into the warm temperate region but not north of Cape Hatteras. Seven species are primarily endemic to the temperate region with southern ranges extending to Florida or Cuba (TABLE 1, column 21, pattern 4). The remaining seven species are cosmopolitan or widely distributed. North of Cape Hatteras, twelve deep-water species have been reported: six species characteristic of cold temperate waters that do not occur in the Caribbean (TABLE 2), two species common to the temperate region (*Enallopsammia profunda* and *Dasmosmilia lymani*), and four cosmopolitan or widely distributed species. No Caribbean tropical species extends into this cold temperate region. Therefore the fauna off the eastern coast of the United States can be divided into a

Table 1

Geographic Distribution of the Deep-Water Scleractinia of the Caribbean and Adjacent Waters

Species List	Bermuda	East coast of U.S.[1]	Eastern Florida & Keys	Bahamas	Western Gulf[2]	Eastern Gulf[3]	Cuba, Caymans	Hispaniola	Puerto Rico	Jamaica	Windward Group[7]	Leeward Group[7]	N. coast of S. America	Southwest Caribbean[4]	Northwest Caribbean[5]	Trinidad & Tobago, northeast Venezuela	Guianas, Surinam	Brazil	St. Peter & Paul Rocks	Eastern Atlantic	Distributional Pattern[6]	Bathymetric Range in western Atlantic (meters)	Temperature Range in western Atlantic (°C)
1 *M. myriaster*	×	.	×	×	×	×	×	×	×	×	×	×	.	×	×	.	×	.	.	.	3	37–708	9–26
2 *F. pusillus*	.	.	×	.	.	.	.	.	.	.	×	.	.	.	×	.	.	.	.	.	3	285–439	–
3 *F. symmetricus*	×	.	×	×	.	.	×	.	×	×	×	.	.	×	×	.	.	×	.	.	3	183–1664	6–12
4 *F. crispus*	.	.	×	.	.	×	.	.	.	.	×	.	.	.	×	.	.	×	.	×	3	183–640	–
5 *F. marenzelleri*	.	.	.	×	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	×	0	2450–2745	–
6 *L. discus*	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	×	0	2842–3475	–
7 *M. oculata*	.	×	×	×	×	×	×	×	×	×	×	×	×	.	×	×	×	×	.	×	1	144–1391	4–12
8 *M. carolina*	.	×	×	×	×	×	×	×	.	×	.	.	.	×	×	.	.	.	×	.	3	53–801	–
9 *A. patera*	.	.	×	×	.	.	×	.	.	.	×	.	.	.	.	.	.	.	.	.	2	500–700	–
10 *C. berteriana*	.	.	×	×	.	×	×	×	×	×	×	×	.	×	×	×	×	.	.	.	3	100–1033	7–23
11 *C. cornuformis*	.	×	×	×	.	×	×	.	.	×	×	.	.	.	×	.	.	×	.	×	3	37–931	–
12 *C. antillarum*	.	.	.	×	.	.	×	.	.	.	×	.	.	.	.	.	.	?	.	.	2	150–1000	–
13 *C. polygona*	.	.	×	.	×	.	×	.	.	×	×	.	.	.	.	.	.	.	.	.	2	700–1817	5–8
14 *C. paucipalata*	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	0	714–843	–
15 *C. a. caribbeana*	×	?	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	.	.	1	183–1646	5–16
16 *C. barbadensis*	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	0	183–249	–
17 *C. corrugata*	.	.	.	×	.	.	×	.	.	.	×	.	.	.	.	.	.	.	.	.	2	183–380	–
18 *C. parvula*	.	.	.	×	.	.	×	×	.	×	×	.	×	.	×	.	.	×	.	.	0	97–399	–
19 *C. zopyros*	.	.	.	.	.	.	×	.	.	×	×	.	.	.	.	.	.	.	.	.	2	73–618	–
20 *C. laevigata*	.	×	×	.	.	×	.	.	.	.	.	.	.	.	×	.	.	.	.	×	4	183–800	10–12
21 *C.* sp. cf. *C. cornu*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	0	220–241	–
22 *C. squiresi*	.	×	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	686–822	–
23 *L. langae*	.	×	×	.	.	.	×	.	.	.	×	.	.	.	×	.	.	.	.	.	3	695–810	–
24 *L. facetus*	.	×	×	.	.	.	.	.	.	.	.	?	.	.	.	.	.	.	.	.	0	385–402	–
25 *O. rotundifolia*	.	×	×	×	×	.	×	×	×	.	×	×	×	×	.	×	×	.	.	.	1	46–640	–
26 *T. rawsonii*	.	×	×	×	×	×	×	×	×	.	×	×	×	×	.	×	×	×	.	.	1	82–622	8–23

Species List	Bermuda	East coast of U.S.[1]	Eastern Florida & Keys	Bahamas	Western Gulf[2]	Eastern Gulf[3]	Cuba, Caymans	Hispaniola	Puerto Rico	Jamaica	Windward Group[7]	Leeward Group[7]	N. coast of S. America	Southwest Caribbean[4]	Northwest Caribbean[5]	Trinidad & Tobago, northeast Venezuela	Guianas, Surinam	Brazil	St. Peter & Paul Rocks	Eastern Atlantic	Distributional Pattern[6]	Bathymetric Range in western Atlantic (meters)	Temperature Range in western Atlantic (°C)
27 *T. fossulus*	.	.	.	×	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	0	205–380	–
28 *T. fasciatus*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	0	238	–
29 *T. cylindraceus*	.	.	×	×	.	.	.	.	.	×	×	.	.	.	.	.	.	.	.	.	2	155–649	–
30 *T. recurvatus*	.	.	.	×	.	.	×	.	.	×	.	.	.	.	×	.	.	.	.	.	0	320–488	–
31 *T. variabilis*	.	.	×	×	.	.	×	.	×	.	×	.	.	.	×	.	.	.	.	×	3	250–576	–
32 *P. pulchellus*	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	.	×	×	.	×	1	17–838	8–24
33 *D. agassizii*	.	.	×	.	.	.	×	.	.	.	×	.	.	.	.	.	.	.	.	.	2	494–907	–
34 *D. calcar*	×	×	×	×	.	×	×	×	×	×	×	.	×	×	×	×	×	×	.	.	1	81–675	8–19
35 *D.* sp. cf. *D. italicus*	×	?	×	×	×	×	×	×	×	×	×	×	×	.	×	×	.	×	.	×	1	403–2634	3–7
36 *D. eccentricus*	×	×	×	×	×	×	×	.	×	×	×	.	×	×	×	×	.	×	.	×	1	183–907	–
37 *D. moseleyi*	×	.	×	×	.	.	×	.	.	.	×	.	.	.	×	.	.	.	.	×	3	201–777	–
38 *D. pourtalesi*	.	×	×	×	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	5	311–567	–
39 *S. diadema*	.	×	×	×	.	×	×	×	×	×	×	×	×	×	×	×	×	×	.	.	1	795–2133	3–8
40 *S. paliferus*	.	.	×	×	×	×	×	.	.	×	×	×	×	×	×	×	×	×	.	.	1	229–715	11–19
41 *S. laevifundus*	.	.	×	×	.	.	×	×	.	.	×	.	.	×	.	.	.	.	.	.	3	300–1158	5–7
42 *S.* (*O.*) *coronatus*	.	.	×	×	.	×	×	×	×	×	×	×	×	×	×	×	.	.	.	.	1	543–1250	3–8
43 *T. corbicula*	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	0	400–576	–
44 *P. folliculus*	.	?	×	.	.	.	×	.	.	.	×	.	.	.	.	.	.	.	.	×	2	284–457	–
45 *P. stimpsonii*	.	×	×	.	.	×	×	.	.	.	×	.	.	.	.	.	.	×	.	×	2	110–553	–
46 *D. cristagalli*	.	×	×	×	.	.	×	.	.	.	×	.	.	.	.	.	.	×	.	×	0	155–1939	–
47 *D. striatum*	.	.	.	×	.	.	×	×	.	×	×	.	.	.	.	.	.	.	.	.	2	130–823	–
48 *T. riisei*	.	.	.	×	.	.	×	.	.	×	×	.	.	×	×	×	×	.	.	.	3	18–1317	–
49 *T. gombergi*	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0	155–220	–
50 *L. prolifera*	.	×	×	×	.	×	.	.	×	×	×	.	×	.	.	.	.	×	.	×	0	95–1000	3–12
51 *A. fecunda*	.	.	×	.	×	×	×	×	.	×	×	×	×	×	×	×	.	.	×	×	1	73–567	–
52 *C. arbuscula*	.	.	×	×	×	×	×	.	×	.	×	×	×	×	×	.	×	.	.	×	1	109–622	–

Species List	Bermuda	East coast of U.S.[1]	Eastern Florida & Keys	Bahamas	Western Gulf[2]	Eastern Gulf[3]	Cuba, Caymans	Hispaniola	Puerto Rico	Jamaica	Windward Group[7]	Leeward Group[7]	N. coast of S. America	Southwest Caribbean[4]	Northwest Caribbean[5]	Trinidad & Tobago, northeast Venezuela	Guianas, Surinam	Brazil	St. Peter & Paul Rocks	Eastern Atlantic	Distributional Pattern[6]	Bathymetric Range in western Atlantic (meters)	Temperature Range in western Atlantic (°C)
53 *D. lymani*	.	×	×	.	.	×	.	.	.	.	.	×	.	.	.	.	.	×	.	×	4	48–366	7–21
54 *D. variegata*	.	.	×	.	.	×	.	.	.	.	.	.	×	.	.	.	.	×	.	×	0	110–366	–
55 *S. variabilis*	.	×	×	.	.	×	×	.	.	×	×	×	.	.	.	×	×	×	.	×	0	220–1383	–
56 *A. prolifera*	.	.	×	×	×	×	.	.	.	.	×	×	×	.	.	×	×	.	.	×	0	32–311	–
57 *A. marchadi*	.	.	×	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.	×	0	32–229	–
58 *R. gerdae*	.	.	.	×	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	5	123–355	–
59 *P. flos*	.	.	.	×	.	×	×	×	.	×	×	.	.	×	.	×	.	×	.	.	3	22–560	–
60 *F. moseleyi*	.	.	×	.	.	×	×	.	.	×	×	×	×	×	×	×	.	.	.	.	1	216–1097	6–18
61 *F. fragile*	.	.	×	.	×	×	.	.	.	.	.	.	.	.	.	.	.	?	.	.	0	80–366	–
62 *F. p. atlanticum*	.	.	.	×	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	5	357–618	–
63 *P. frusta*	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.	×	.	×	0	497–907	–
64 *J. cailleti*	.	×	×	×	.	×	×	×	.	×	×	×	×	×	×	×	×	.	.	×	1	86–1682	6–16
65 *J. pseudoalabastra*	.	.	.	×	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	×	0	1089–1234	–
66 *P. fragilis*	.	×	×	×	.	×	×	.	.	.	×	×	.	×	×	.	.	×	.	.	1	75–796	10–18
67 *G. paradoxa*	.	.	×	.	.	.	.	.	.	×	×	.	.	.	×	.	.	.	.	.	3	91–700	–
68 *G. minor*	.	.	.	×	.	.	×	×	.	×	×	×	×	×	×	.	.	.	.	.	1	2–241	–
69 *G. annulata*	×	.	.	×	×	×	×	×	.	×	×	.	.	×	×	.	.	.	.	×	3	37–653	–
70 *S. fissilis*	.	.	×	×	.	×	×	.	×	.	×	.	.	.	×	.	.	.	.	×	3	88–640	–
71 *S. vermiformis*	.	×	×	×	.	×	×	.	.	.	×	.	.	.	.	.	.	×	×	×	3	128–835	–
72 *P. hispidus*	.	.	.	×	.	.	×	.	×	×	×	.	.	.	.	.	.	.	.	.	2	349–1200	–
73 *B. cyathoides*	.	.	.	×	.	.	×	.	.	.	×	.	.	.	×	.	.	.	.	.	3	53–494	–
74 *B. palifera*	.	.	.	.	.	.	×	.	.	.	×	.	.	.	×	.	.	.	.	.	3	53–444	–
75 *B. wellsi*	.	.	.	×	.	.	×	.	.	×	.	.	.	.	.	×	.	.	.	.	2	412–505	–
76 *B. hadros*	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	.	0	238–274	–
77 *B. bayeri*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	.	.	0	274–311	–
78 *D. cornucopia*	.	.	×	×	.	×	×	.	.	.	×	.	.	.	.	.	.	.	.	×	2	132–604	–

Species List	Bermuda	East coast of U.S.[1]	Eastern Florida & Keys	Bahamas	Western Gulf[2]	Eastern Gulf[3]	Cuba, Caymans	Hispaniola	Puerto Rico	Jamaica	Windward Group[7]	Leeward Group[7]	N. coast of S. America	Southwest Caribbean[4]	Northwest Caribbean[5]	Trinidad & Tobago, northeast Venezuela	Guianas, Surinam	Brazil	St. Peter & Paul Rocks	Eastern Atlantic	Distributional Pattern[6]	Bathymetric Range in western Atlantic (meters)	Temperature Range in western Atlantic (°C)
79 *D. gaditana*	.	×	.	.	.	.	.	.	.	.	.	.	.	.	×	.	.	.	×	×	0	146–505	–
80 *D. alternata*	.	.	.	×	×	.	×	.	.	×	×	.	.	.	.	×	.	.	.	×	2	276–900	–
81 *E. profunda*	.	×	×	×	.	×	×	.	.	.	×	.	.	.	.	.	.	.	.	.	4	403–1748	3–12
82 *E. rostrata*	.	×	.	×	.	.	×	×	.	×	×	.	.	×	.	.	.	×	.	×	3	300–1646	5–13
83 *T. socialis*	.	×	×	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	214–878	6–11
84 *B. tintinnabulum*	.	×	×	×	×	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	210–1079	6–10
85 *B. fallosocialis*	.	×	×	.	.	.	×	.	.	×	.	.	.	.	.	.	.	.	.	.	4	244–805	6–12
86 *"R". manuelensis*	.	.	×	×	×	×	.	.	.	.	.	.	.	.	×	.	.	×	.	×	0	78–366	–
87 *T. infundibulum*	.	.	.	.	.	×	×	.	.	.	×	.	.	.	.	.	.	.	.	.	2	532–1372	–
88 *"C". inflata*	.	.	.	.	.	.	×	.	.	.	.	.	.	.	.	.	.	.	.	.	0	183–443	–
Totals	*9*	*28*	*55*	*54*	*19*	*36*	*61*	*21*	*18*	*36*	*60*	*20*	*21*	*25*	*39*	*20*	*15*	*25*	*4*	*33*			

[1]) North of Florida.
[2]) Boundary between eastern and western Gulf of Mexico considered as the line from the Mississippi Delta to the northeast tip of the Yucatán Peninsula.
[3]) Southeastern border of eastern Gulf of Mexico considered as the line of longitude 83°30′ W between Cuba and the Florida Keys.
[4]) Southwestern Caribbean includes coasts of Panama, Costa Rica, Nicaragua, and all offshore islands.
[5]) Northwestern Caribbean includes coasts from Honduras to the shortest line connecting the Yucatán Peninsula to Cuba and all offshore islands.
[6]) Distributional patterns: 0. No distributional pattern; 1. Widespread throughout Caribbean; 2. Antillean distribution; 3. Antillean distribution plus western Caribbean; 4. Northern temperate distribution; 5. Insular side of Straits of Florida and Old Bahama Channel.
[7]) The geographic subdivisions of the Antilles proposed by WAGENAAR HUMMELINCK (1953, 1977) are used throughout this paper.

warm temperate component of 28 species, which is strongly influenced by the Caribbean tropical fauna, and a cold temperate component of 12 species north of Cape Hatteras, strongly influenced by temperate species common to the North Atlantic. There is an overlap of six species between the warm and cold temperate regions.

The nine species of deep-water ahermatypes known from Bermuda are all species that also occur in the Caribbean. No cosmopolitan, temperate, or endemic species have been reported, although two species of endemic shallow-water ahermatypes have been described. Five of the nine species have amphi-Atlantic distributions.

Thirty-four species of deep-water Scleractinia (including *Enallopsammia amphelioides* and *Stephanocyathus* (*Odontocyathus*) sp. cf. *S.* (*O.*) *nobilis*) are known from the Guianas to Cabo Frio, Brazil. Thirty-two are common in the Caribbean including six cosmopolitan species. *Stephanocyathus* sp. cf. *S.* (*O.*) *nobilis* is known from off Brazil and the eastern Atlantic and *Enallopsammia amphelioides* is known from off Brazil, the Azores, and the Indo-Pacific; neither has been reported from the Caribbean. No deep-water species are endemic to this region (southwestern and west equatorial tropical Atlantic), and 94% of the known species also occur in the Caribbean, implying that this region is simply a depauperate extension of the Caribbean fauna.

The Scleractinian fauna of the poorly known southwestern temperate Atlantic has been reviewed by SQUIRES (1961). Of the 17 ahermatypic species known from this region, six are cosmopolitan and the remaining 11 (TABLE 3) are characteristic of the South Atlantic temperate region, with no overlap with the Caribbean.

For reference, a list of the shallow-water tropical western Atlantic ahermatypes is provided (TABLE 4). Combining the tropical and temperate areas, both shallow and deep water (TABLES 1–4), results in 134 species of ahermatypic Scleractinia known from the western Atlantic.

In summary, of the 90 species of deep-water Scleractinia known from the tropical western Atlantic (including *Enallopsammia amphelioides* and *Stephanocyathus* (*O.*) *nobilis*), the center of species diversity is the Caribbean (76 species), specifically the Antilles. Away from the Caribbean, both north and south, there is a sharp decrease in the number of species. The Brazilian coast, Bermuda, Gulf of Mexico, and the warm temperate coast of the United States are considered to be depauperate extensions of the Caribbean fauna. Only the warm temperate coast of the United States from Florida to Cape Hatteras is characterized by an endemic slope fauna (5 of 28 species). Otherwise endemism does not mark these areas as zoogeographic subregions.

Worldwide Faunistic Relationships

The tropical western Atlantic Scleractinia found below 200 meters form a highly endemic (54 species = 60%), independent unit (Table 5). Of the remaining 36 species, 35 are found on both sides of the Atlantic: 11 (12%) are cosmopolitan/circumtropical and 24 (27%) are exclusively amphi-Atlantic. The cosmopolitan species are: *Fungiacyathus marenzelleri, Leptopenus discus, Madrepora oculata, Desmophyllum cristagalli, Lophelia prolifera,* and *Javania cailleti.* The following species are circumtropical or widespread, except for the eastern Pacific: *Solenosmilia variabilis, Stenocyathus vermiformis, Dendrophyllia gaditana, Enallopsammia amphelioides,* and ?*Stephanocyathus* (*Odontocyathus*) *nobilis.* Analyzed at the generic level, this fauna shows a strong cosmopolitan/circumtropical (Tethyan) influence (53%), and a lesser amphi-Atlantic (14%) and endemic (12%) component. *Polymyces* and *Oxysmilia* have an amphi-American distribution. Seven genera do not fall into any of the categories of Table 5 (see footnote c).

The shallow-water ahermatypic fauna is less well known, but when analyzed in the same manner (Table 5), a higher degree of species endemism (74%) and a lower amphi-Atlantic component (19%) are apparant. There are at least an additional 10 undescribed shallow-water species, most of which are endemic to the tropical western Atlantic, which would further increase the endemic percentage. Only one species is circumtropical, *Tubastraea coccinea,* and one, *Cladocora debilis,* is amphi-Atlantic and eastern Pacific. The generic analysis reveals a pattern similar to that of the deep-water corals: a highly cosmopolitan/circumtropical (59%) and low endemic

Table 2

Temperate (30°–55°N), Northwestern Atlantic Ahermatypes not found in the Tropical Western Atlantic

Flabellum alabastrum Moseley, 1873
Flabellum angulare Moseley, 1876
Flabellum macandrewi Gray, 1849
Fungiacyathus fragilis Sars, 1872
Vaughanella margaritata Jourdan, 1895
Caryophyllia ambrosia ambrosia Alcock, 1898

6 Species

Table 3

Temperate (25°–57°S), Southwestern Atlantic Ahermatypes not found in the Tropical Western Atlantic

Flabellum curvatum Moseley, 1881
Flabellum thouarsii Milne Edwards & Haime, 1848
Flabellum patagonichum Moseley, 1881
Caryophyllia profunda Moseley, 1881
Caryophyllia antarctica Marenzeller, 1904
Caryophyllia A Squires, 1969
Bathelia candida Moseley, 1881
Sphenotrochus gardineri Squires, 1961
Balanophyllia malouinensis Squires, 1961
Desmophyllum capense Gardiner, 1904
Oculina patagonica (Squires, 1963)

11 Species

TABLE 4

SHALLOW-WATER (EXCLUSIVELY 0–200 M) AHERMATYPES OF THE TROPICAL WESTERN ATLANTIC

Madracis sp. cf. *M. asperula* Milne Edwards & Haime, 1849
Madracis pharensis pharensis (Heller, 1868)
Madracis brueggemanni (Ridley, 1881)
Madracis formosa Wells, 1973
Agaricia cailleti (Duchassaing & Michelotti, 1864)
Cladocora debilis Milne Edwards & Haime, 1849
Astrangia danae Milne Edwards & Haime, 1849
Astrangia rathbuni Vaughan, 1906
Astrangia solitaria (Lesueur, 1817)
Phyllangia americana Milne Edwards & Haime, 1849
Colangia immersa Pourtalès, 1871
Oculina tenella Pourtalès, 1871
Caryophyllia horologium Cairns, 1977
Rhizosmilia maculata (Pourtalès, 1874)
"*Coenocyathus*" *goreaui* Wells, 1972
Pourtalosmilia conferta Cairns, 1978
Trochocyathus halianthus Lindström, 1877
Polycyathus senegalensis Chevalier, 1966
Sphenotrochus auritus Pourtalès, 1874
Gardineria simplex (Pourtalès, 1868)
Balanophyllia floridana Pourtalès, 1868
Balanophyllia goesi (Lindström, 1877)
Balanophyllia caribbeana Cairns, 1977
Balanophyllia grandis Cairns, 1977
Balanophyllia dineta Cairns, 1977
"*Rhizopsammia*" *bermudensis* Wells, 1972
Tubastraea coccinea Lesson, 1831

27 Species

(18%) and amphi-Atlantic (6%) components. *Astrangia* is Atlanto-east Pacific.

For the sake of comparison, the western Atlantic hermatypic corals were similarly analyzed (TABLE 5). This analysis reveals a very high specific (87%) and generic (58%) endemism and a small amphi-Atlantic component (13% of the species).

In summary, all three western Atlantic Scleractinian faunas (ahermatypic, 200+ m; ahermatypic, 0–200 m; hermatypic, 0–90 m), are highly endemic with small cosmopolitan and amphi-Atlantic components. However, there is a definite trend toward increase in endemism and decrease in cosmopolitan and amphi-Atlantic components of both species and genera when the faunas are ordered from greater to lesser depths, testifying to the greater effectiveness of the Atlantic Ocean as a barrier to dispersal of shallow-water species.

BATHYMETRY OF THE TROPICAL WESTERN ATLANTIC CARIBBEAN AHERMATYPES

In the Caribbean and adjacent waters the greatest number of ahermatypic species are found at depths of approximately 300 m; 59 species have bathymetric ranges that include 300 m. Thirty-five species have ranges extending to both 50 and 100 m, and 51 species occur at 200 m. (Twenty-two and 10 species occurring at 50 and 100 m, respectively, belong to the shallow-water ahermatypic fauna.) Deeper than 300 m, species diversity gradually decreases: 53 occur at 500 m, 22 at 1000 m, and 10 at 1500 m. Twelve species have ranges extending deeper than 1500 m. Two species, *Fungiacyathus marenzelleri* and *Leptopenus discus*, occur only at lower slope and upper abyssal depths. In summary, the greatest species diversity of ahermatypes is found on the upper slope, particularly between 200–500 m.

Table 5

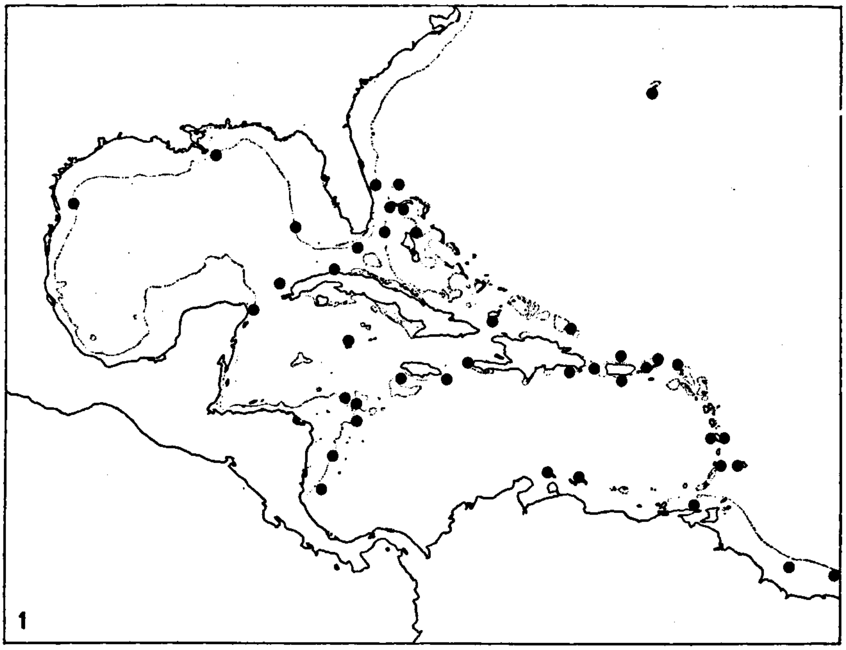
Faunal Affinities of the Tropical Western Atlantic Scleractinia

	Tropical western Atlantic Ahermatypes (200+ m)		Tropical western Atlantic Ahermatypes (0–200 m)		Western Atlantic Hermatypes	
	Species (90)	Genera (42)	Species (27)	Genera (17)	Species (61)	Genera (26)
Endemic western Atlantic	54(60%)	5(12%)	20(74%)	3(18%)	53(87%)	15(58%)
Amphi-Atlantic	24(27%)	6(14%)	5(18.5%)	1(6%)	8(13%)	2(8%)
Amphi-American	0	2(5%)[2]	0	0	0	2(8%)
Cosmopolitan in tropical and temperate oceans	6(7%)	12(29%)	1(4%)	8(47%)	0	3(12%)
Circumtropical except for eastern Pacific	5(5%)	10(24%)	0	2(12%)	0	2(8%)
Atlanto-east Pacific	0	0	1(4%)	1(6%)	0	1(4%)
Totals	*89*[1]	*35*[3]	*27*	*15*[4]	*61*	*25*[5]

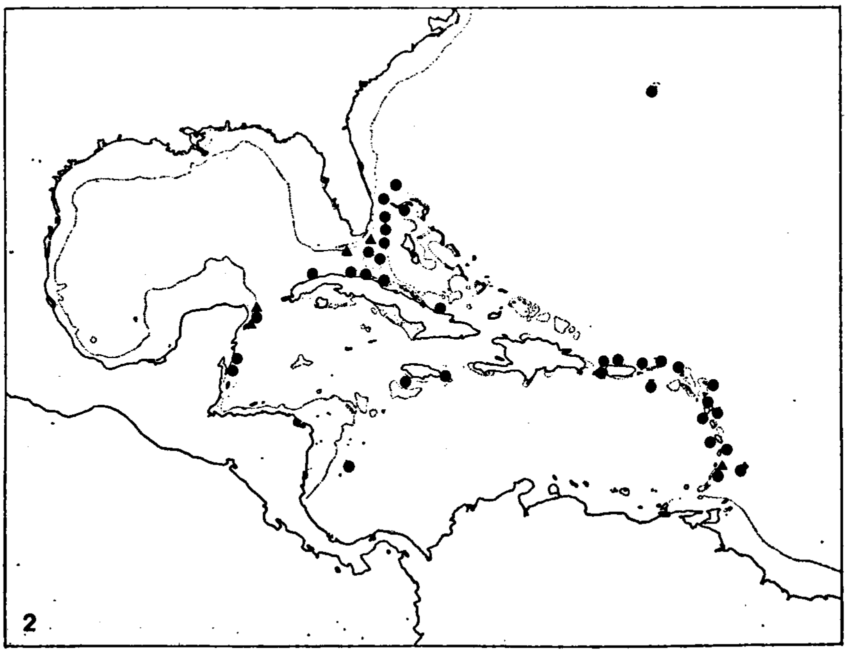
[1]) *Cyathoceras* sp. cf. *C. cornu*, known from western Atlantic and western Pacific, not included.
[2]) *Flabellum* ? *montereyense* Durham, 1947 considered as *Polymyces*; *Ceratotrochus franciscana* Durham & Barnard, 1952 as *Oxysmilia*; *Thecopsammia pourtalesi* Durham & Barnard, 1952 as *Endopsammia*; and *Kionotrochus* ? *avis* Durham & Barnard, 1952 as *Cyathoceras*.
[3]) *Anthemiphyllia*, *Trematotrochus*, and *Gardineria* known from western Atlantic and western Pacific; *Placotrochides* and *Labyrinthocyathus* from both sides of the Atlantic and western Pacific; *Cyathoceras* from both sides of the Pacific and western Atlantic; *Tethocyathus* not considered.
[4]) *Oculina* and *Gardineria* known from western Atlantic and western Pacific.
[5]) *Oculina* known from western Atlantic and western Pacific.

Distributional Maps

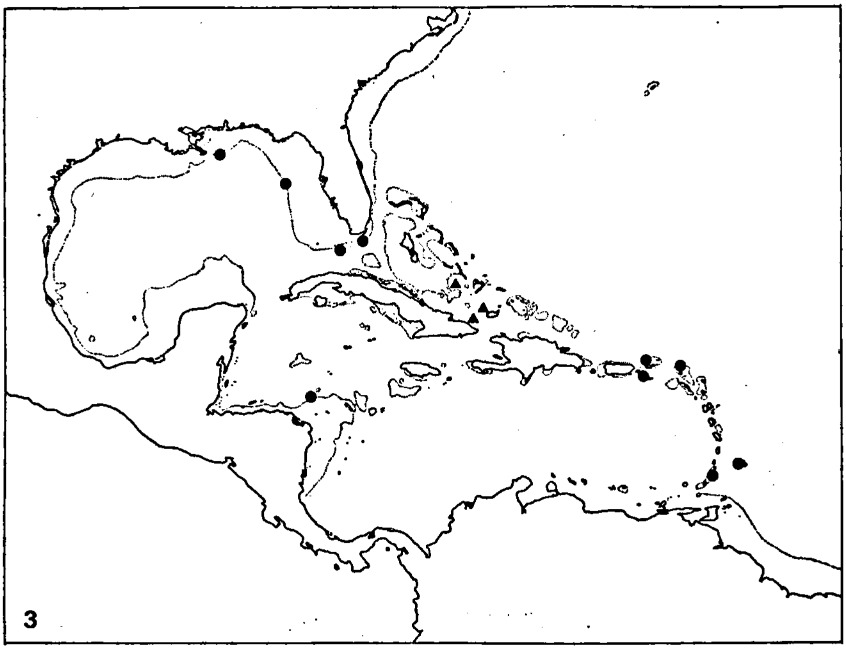
All records, both from the literature and new, are plotted on 60 distributional maps; however, sometimes only a part of the distribution of a species is shown. Records north of Cape Hatteras and south of Surinam, or in other parts of the world oceans, are recorded in the material examined or distribution sections of the individual species accounts. Because of the geographic proximity of many of the stations, one dot may symbolize more than one station.



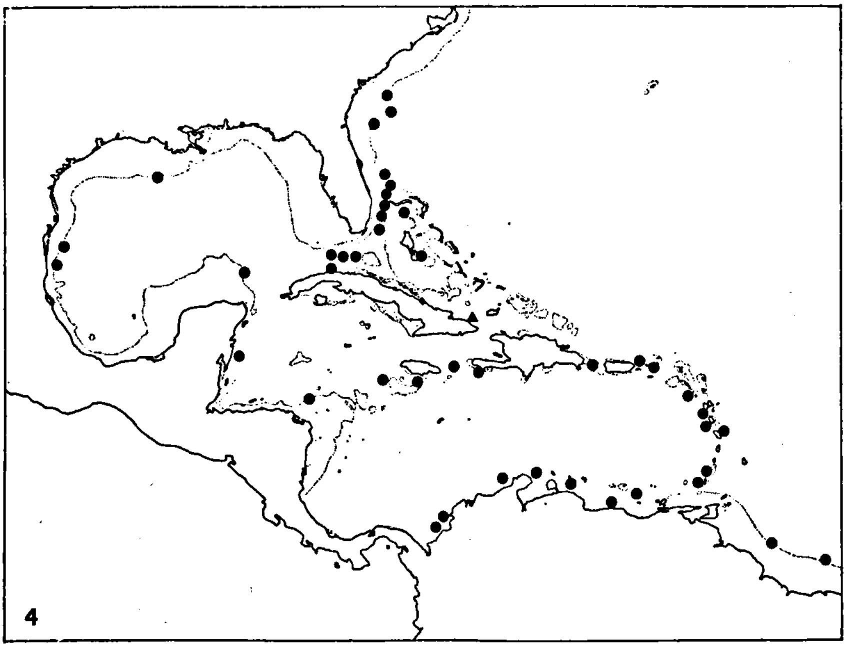
Map 1: Distribution of *Madracis myriaster*.



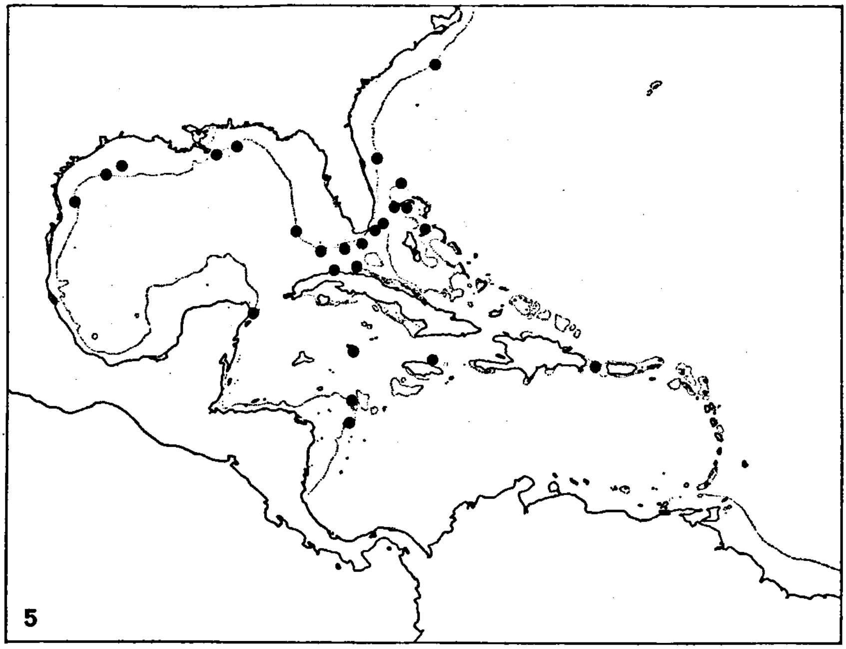
Map 2: Distribution of *Fungiacyathus pusillus* (triangles) and *F. symmetricus* (circles).



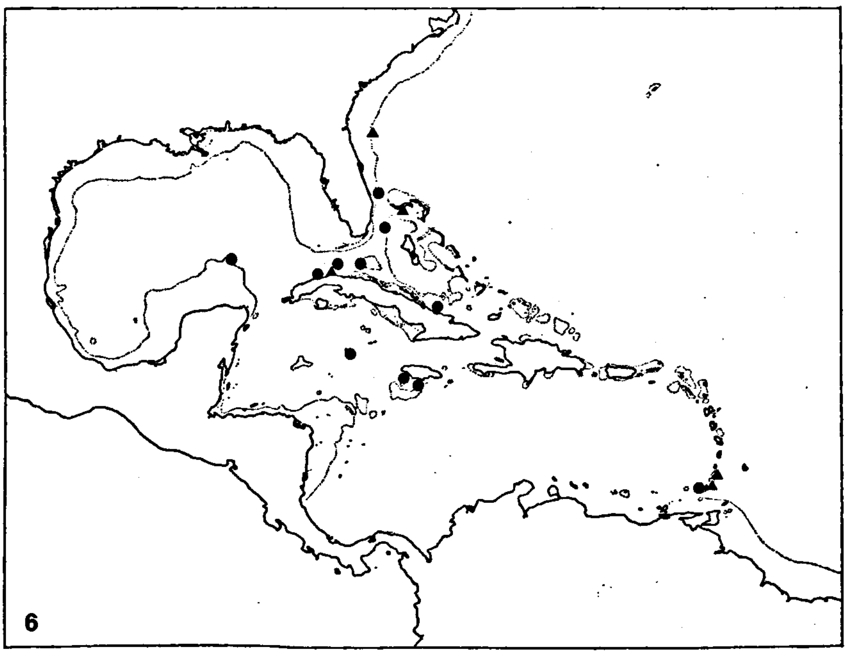
Map 3: Distribution of *Fungiacyathus crispus* (circles) and *F. marenzelleri* (triangles).



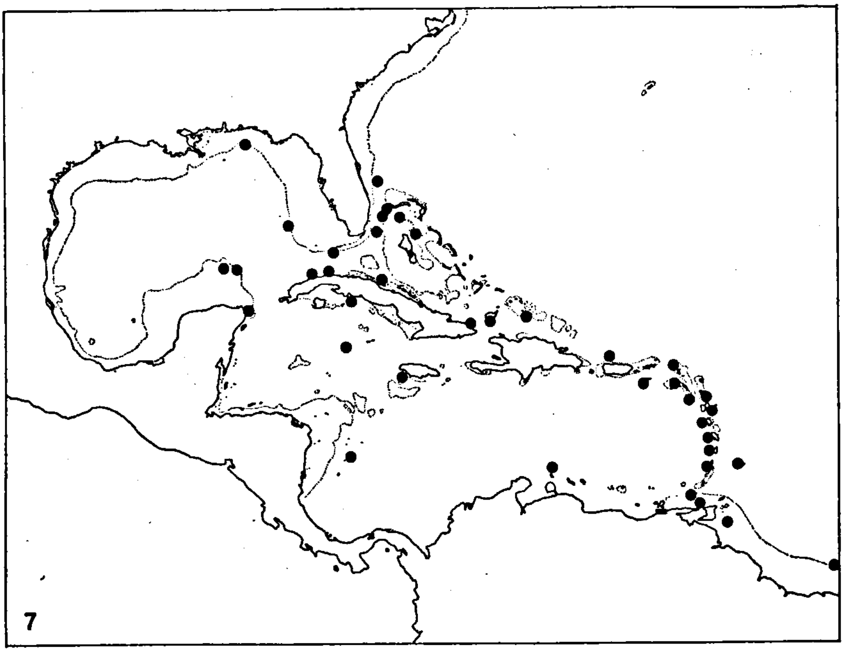
Map 4: Distribution of *Leptopenus discus* (triangle) and *Madrepora oculata* (circles).



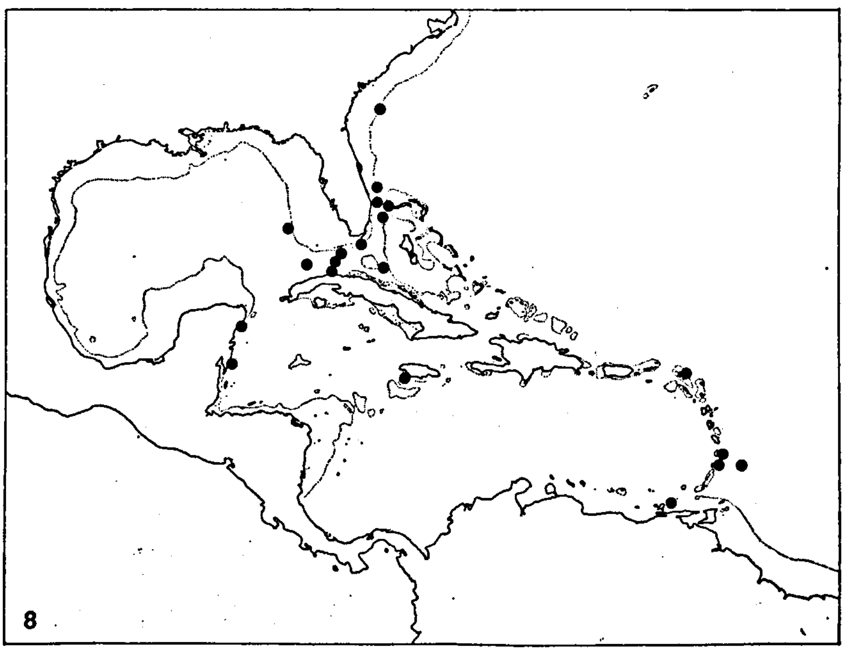
Map 5: Distribution of *Madrepora carolina*.



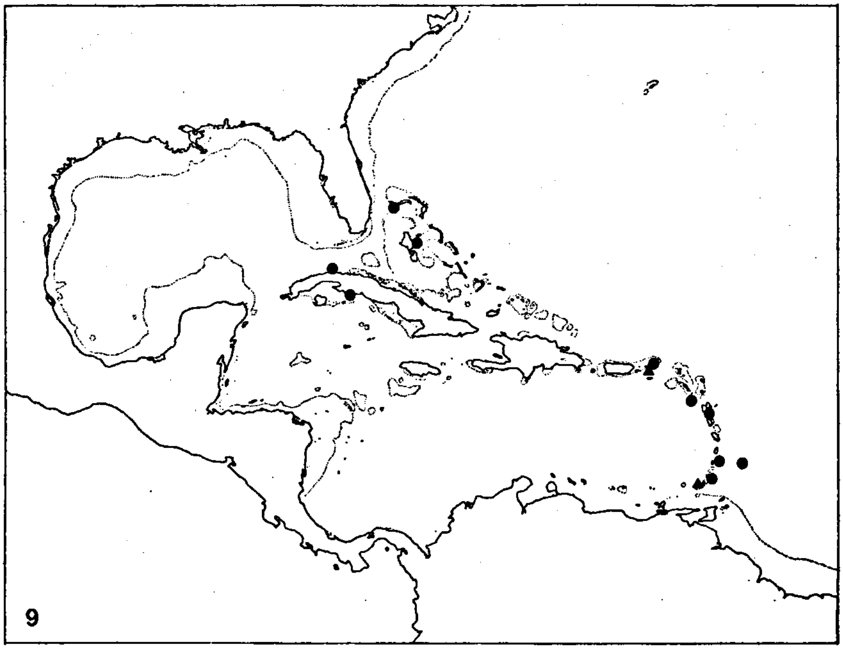
Map 6: Distribution of *Anthemiphyllia patera* (triangles) and *Caryophyllia polygona* (circles).



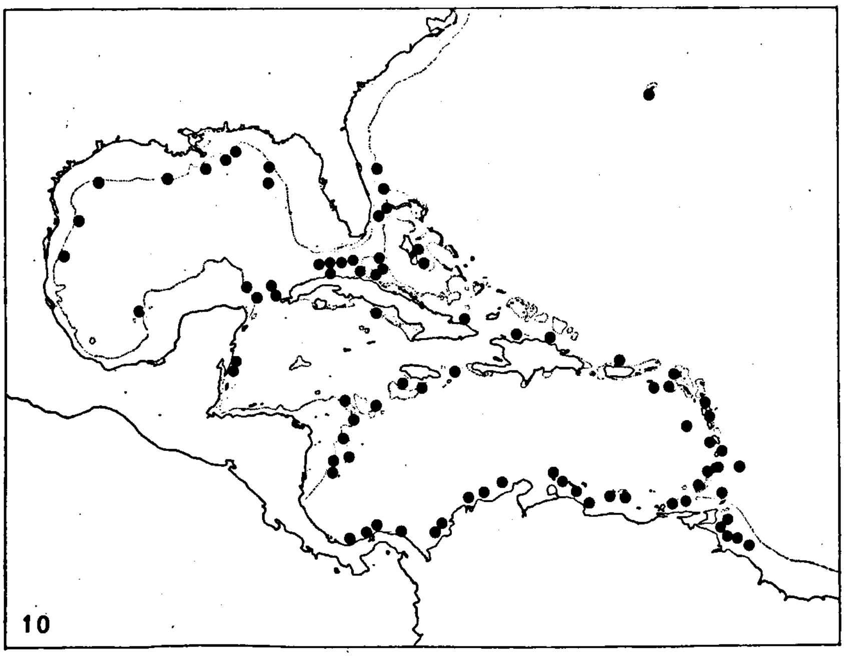
Map 7: Distribution of *Caryophyllia berteriana.*



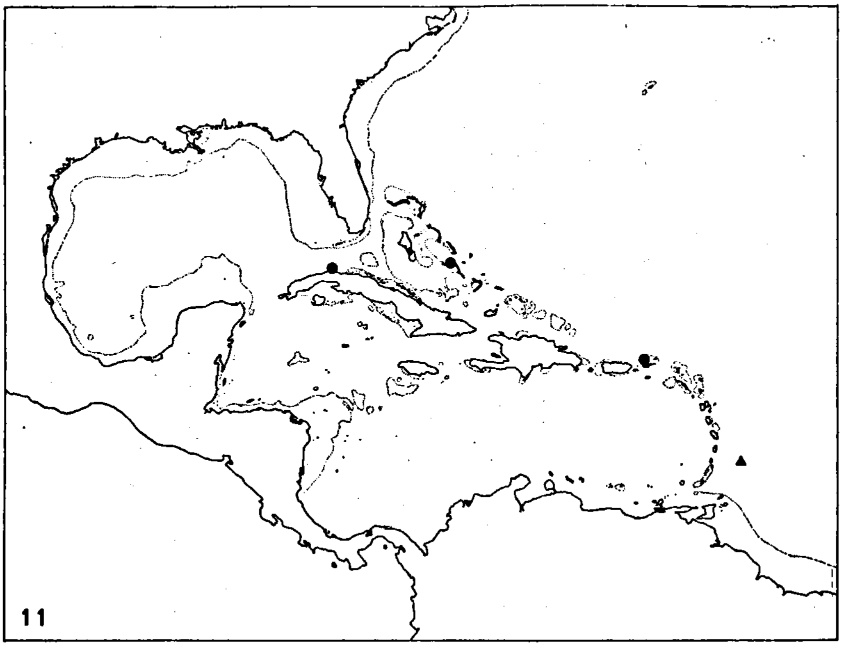
Map 8: Distribution of *Caryophyllia cornuformis.*



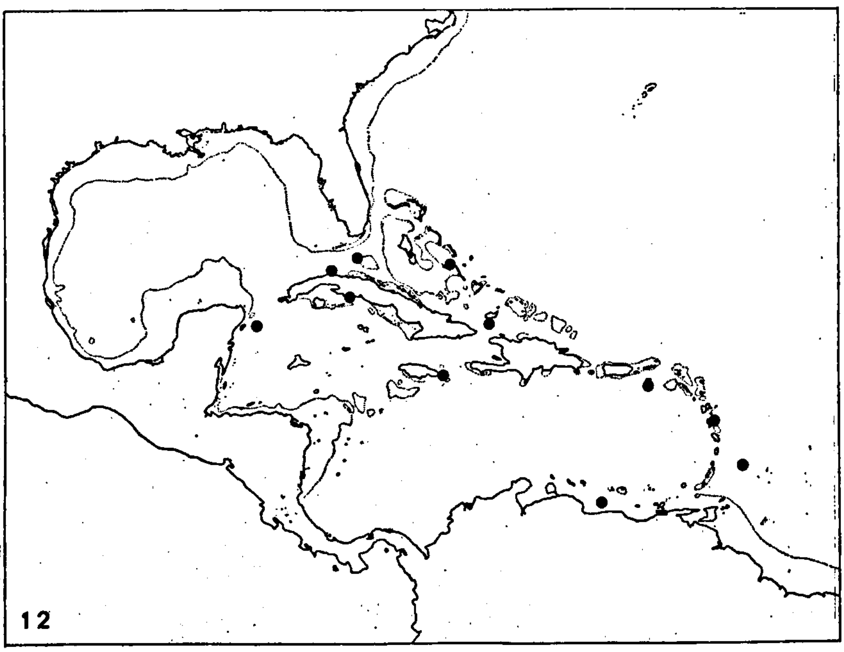
Map 9: Distribution of *Caryophyllia antillarum* (circles) and *C. paucipalata* (triangles).



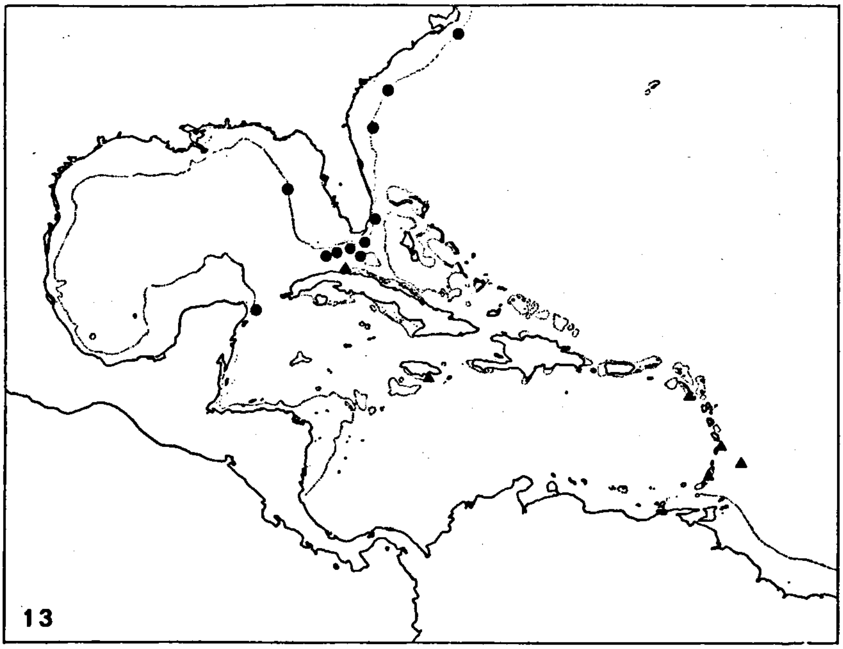
Map 10: Distribution of *Caryophyllia ambrosia caribbeana*.



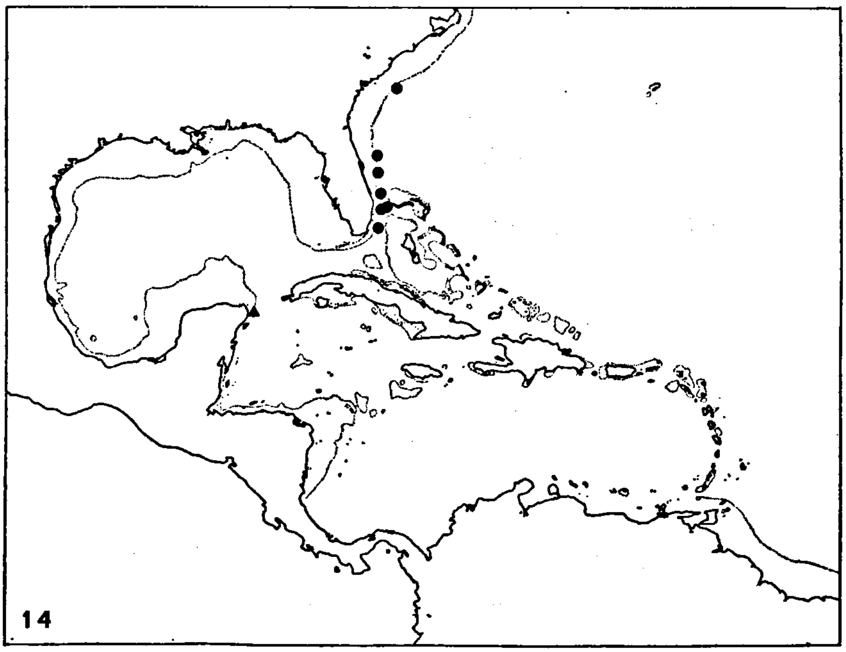
Map 11: Distribution of *Caryophyllia barbadensis* (triangle) and *C. corrugata* (circles).



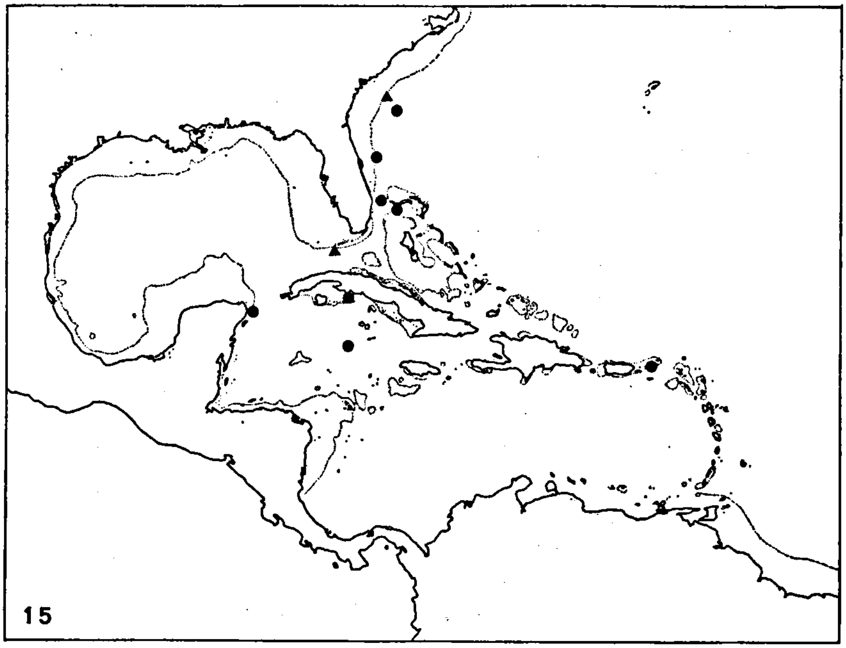
Map 12: Distribution of *Caryophyllia parvula*.



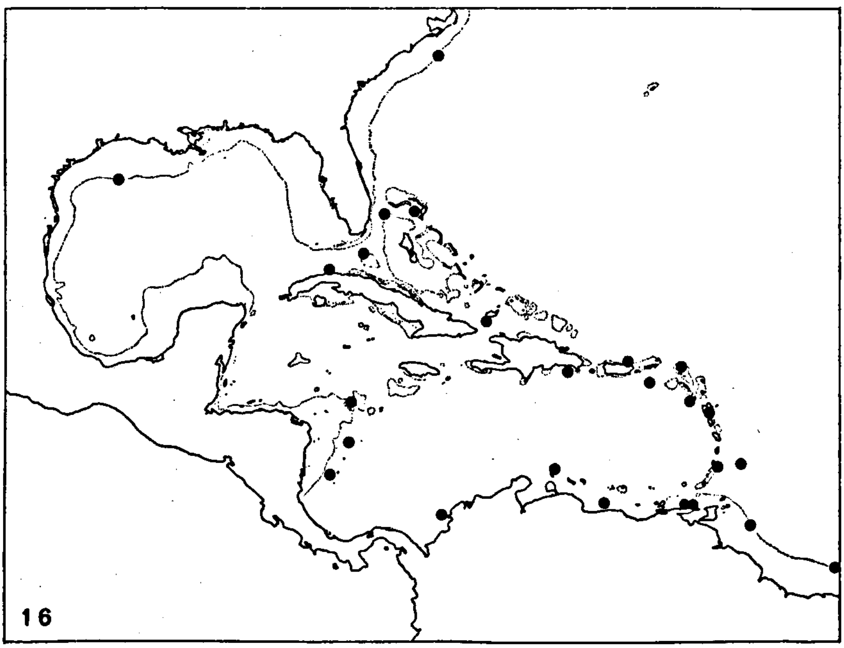
Map 13: Distribution of *Caryophyllia zopyros* (triangles) and *Concentrotheca laevigata* (circles).



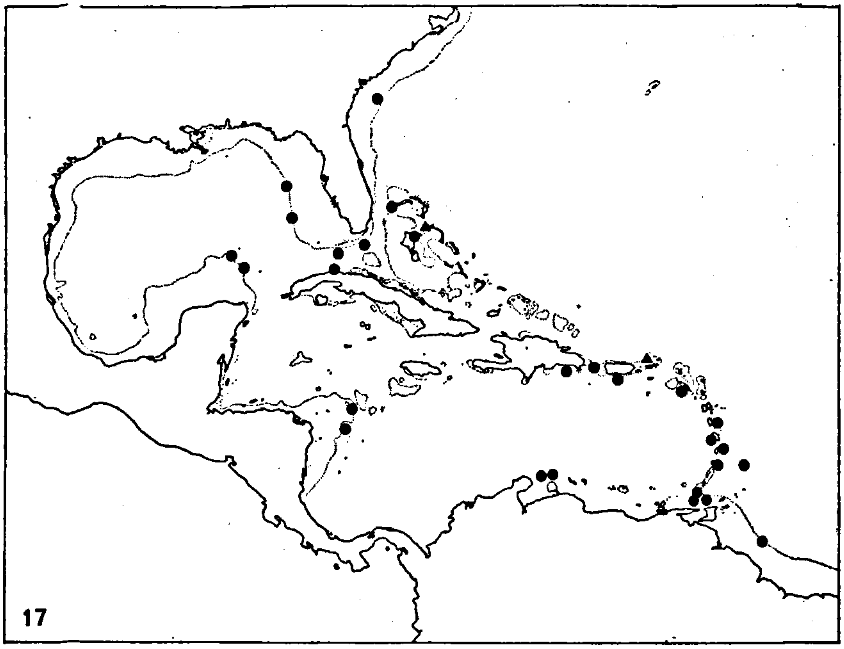
Map 14: Distribution of *Cyathoceras* sp. cf. *C. cornu* (triangle) and *Cyathoceras squiresi* (circles).



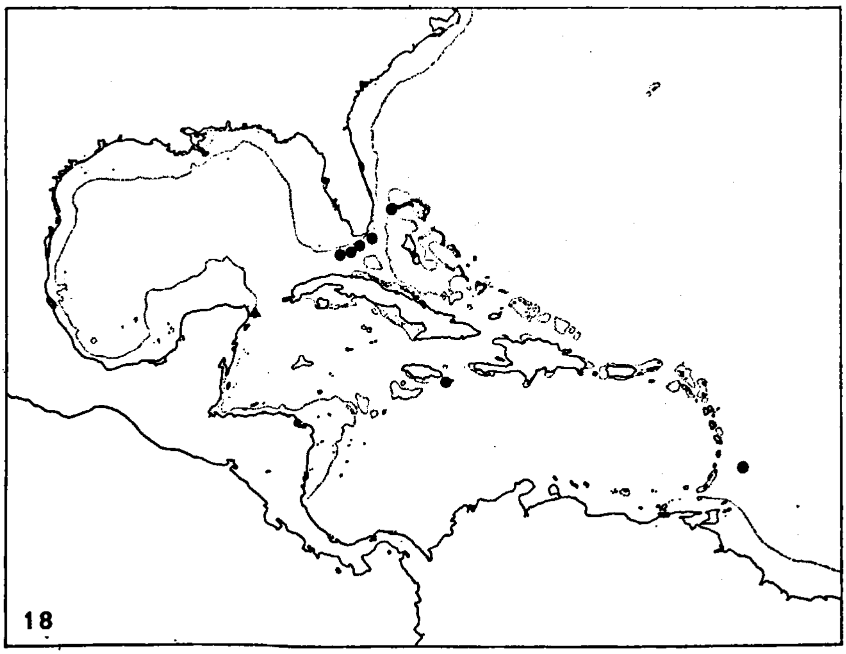
Map 15: Distribution of *Labyrinthocyathus langi* (circles) and *L. facetus* (triangles).



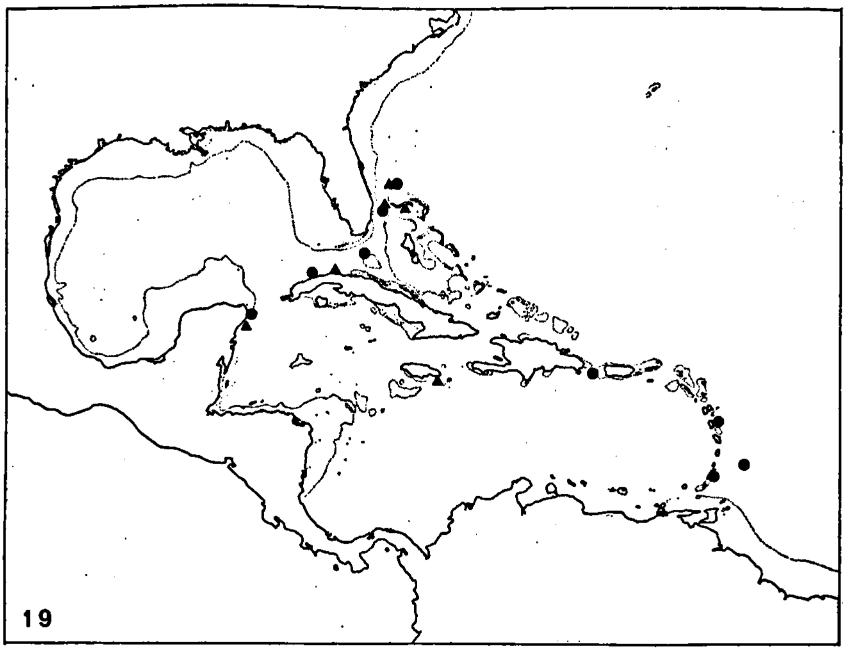
Map 16: Distribution of *Oxysmilia rotundifolia*.



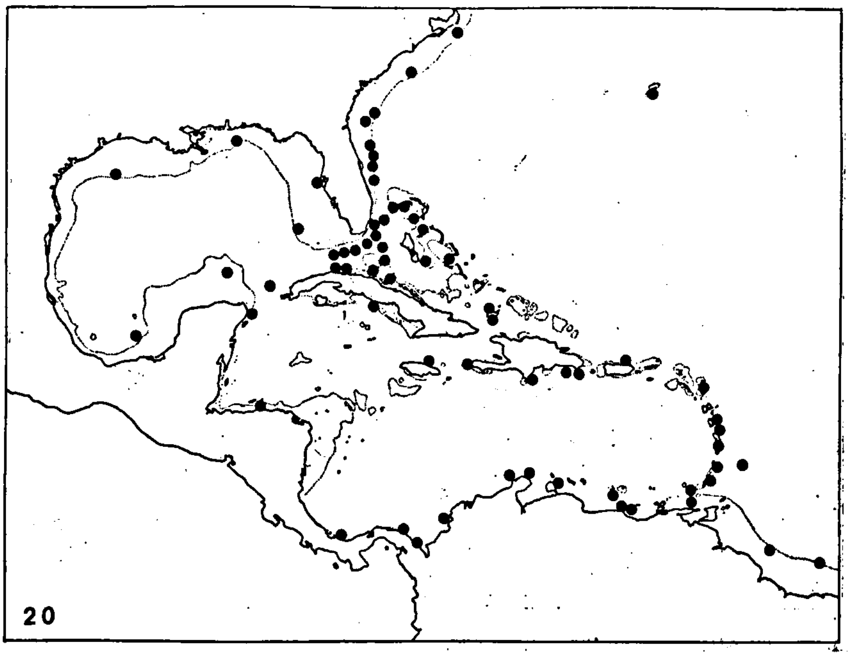
Map 17: Distribution of *Trochocyathus rawsonii* (circles) and *T. fossulus* (triangles).



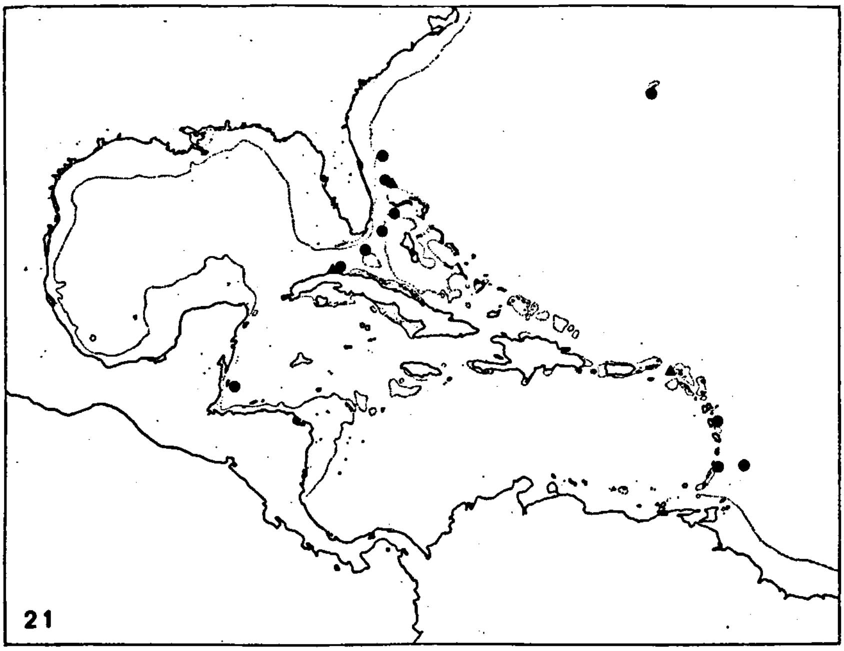
Map 18: Distribution of *Trochocyathus fasciatus* (triangle) and *Tethocyathus cylindraceus* (circles).



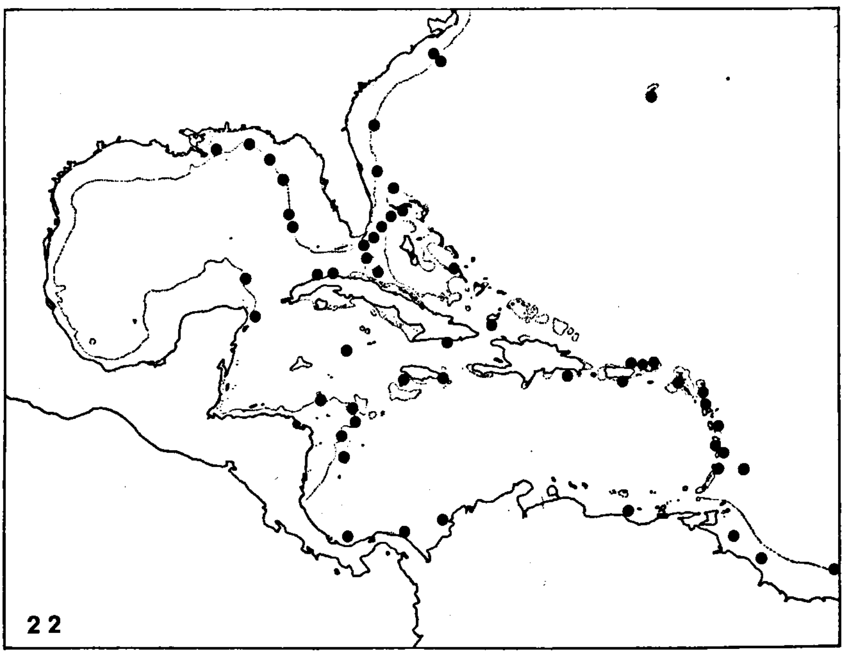
Map 19: Distribution of *Tethocyathus recurvatus* (triangles) and *T. variabilis* (circles).



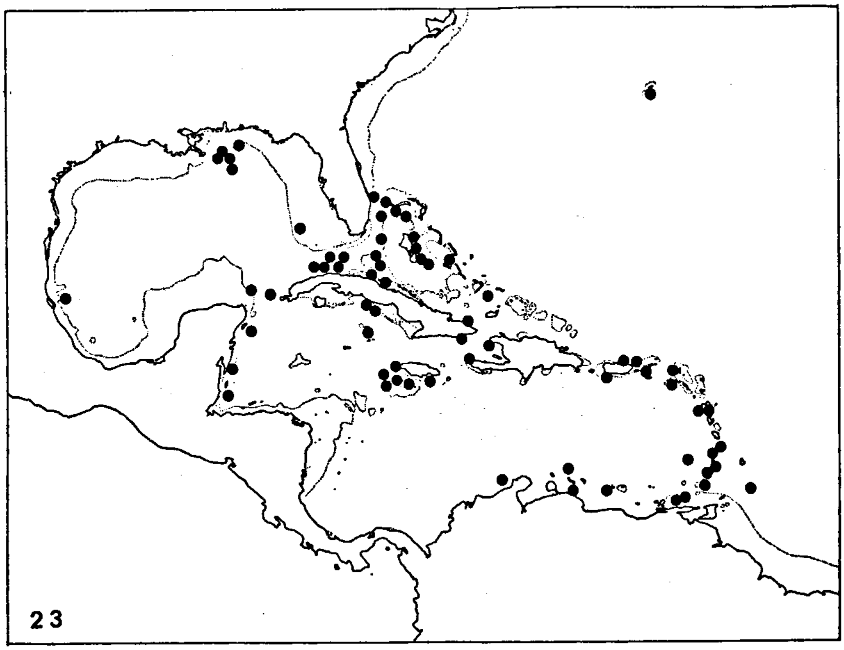
Map 20: Distribution of *Paracyathus pulchellus*.



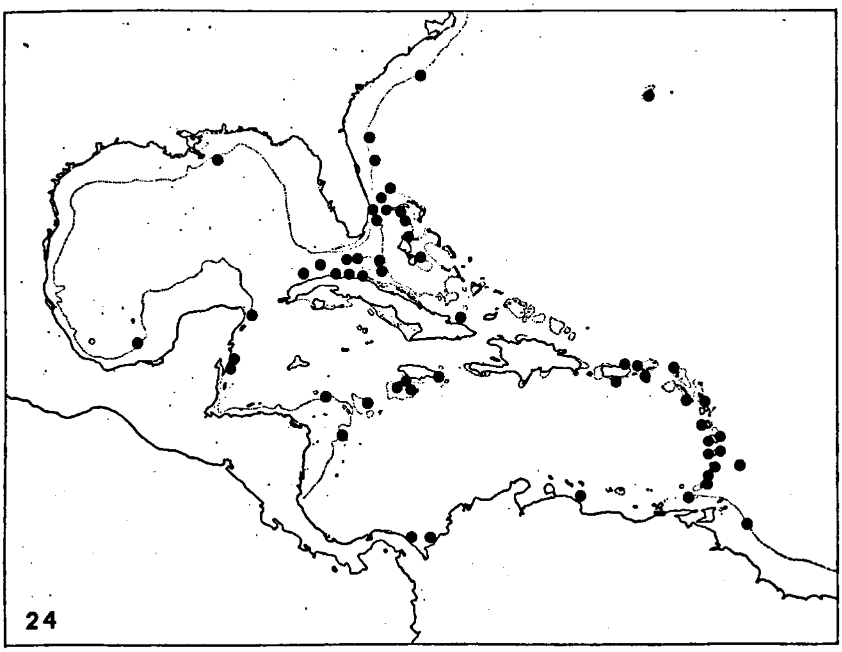
Map 21: Distribution of *Deltocyathus agassizii* (triangles) and *D. moseleyi* (circles).



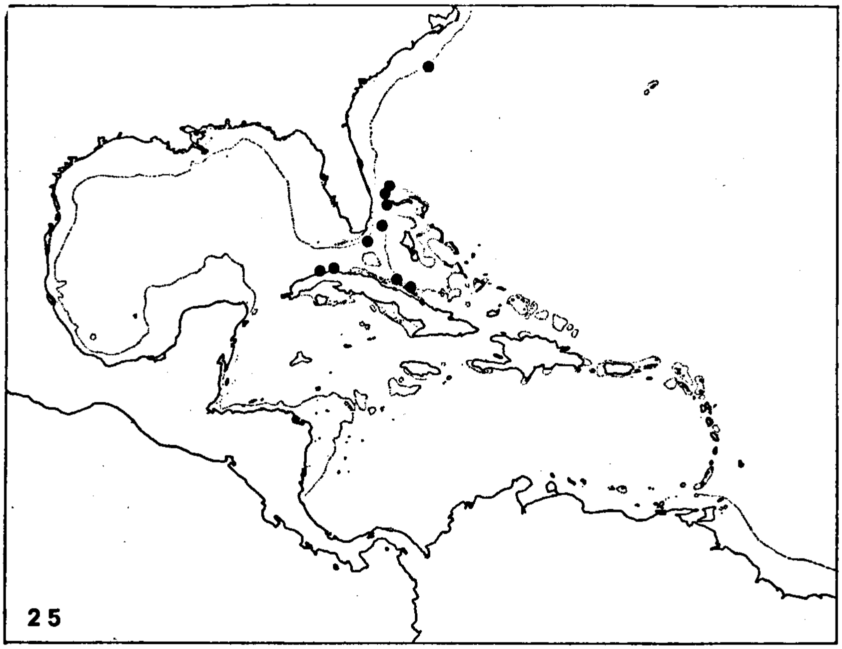
Map 22: Distribution of *Deltocyathus calcar*.



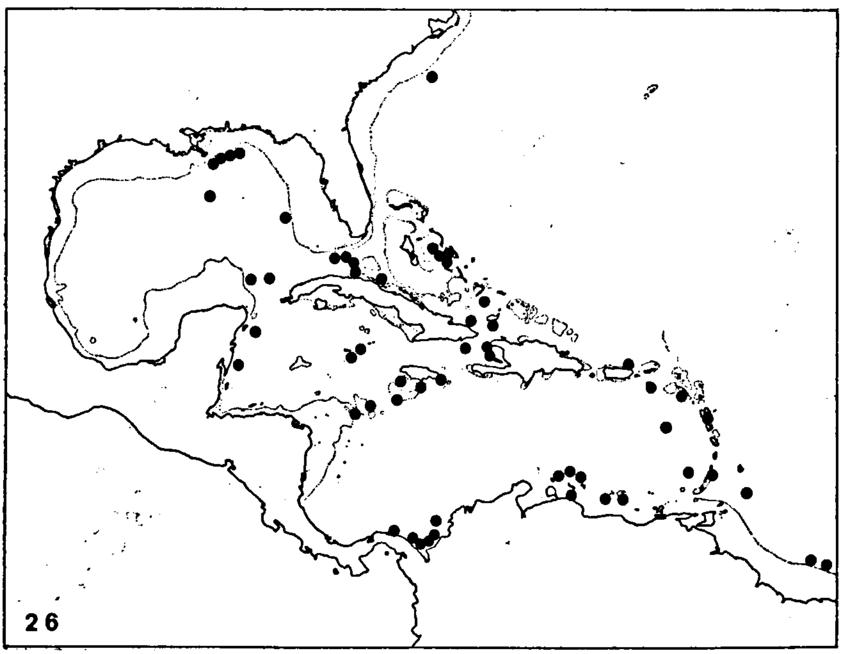
Map 23: Distribution of *Deltocyalhus* sp. cf. *D. italicus*.



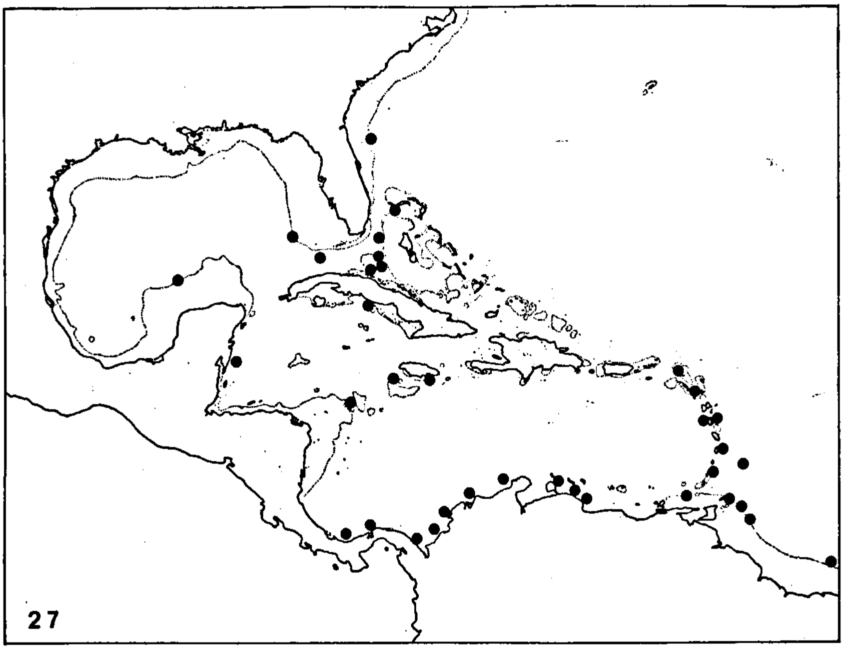
Map 24: Distribution of *Deltocyathus eccentricus*.



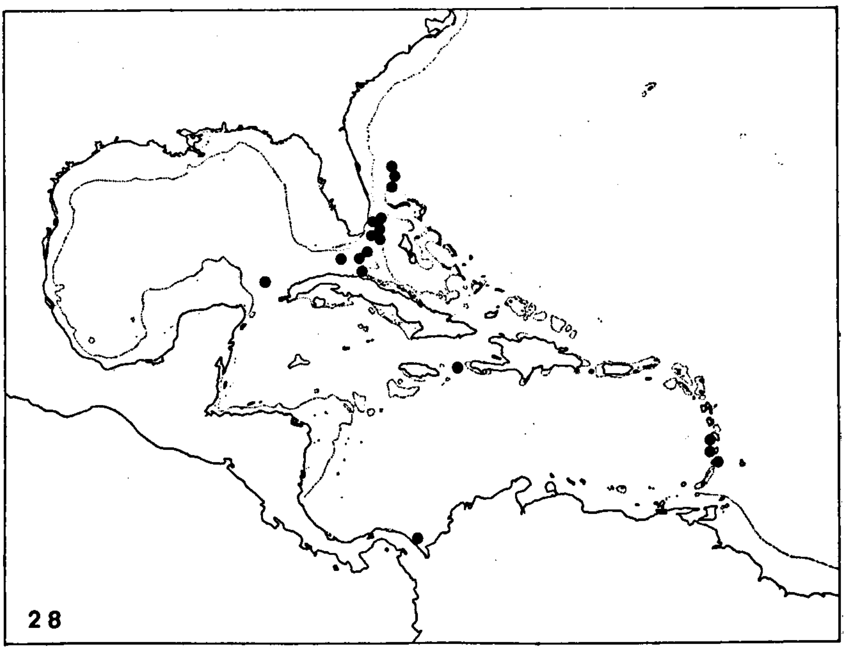
Map 25: Distribution of *Deltocyathus pourtalesi*.



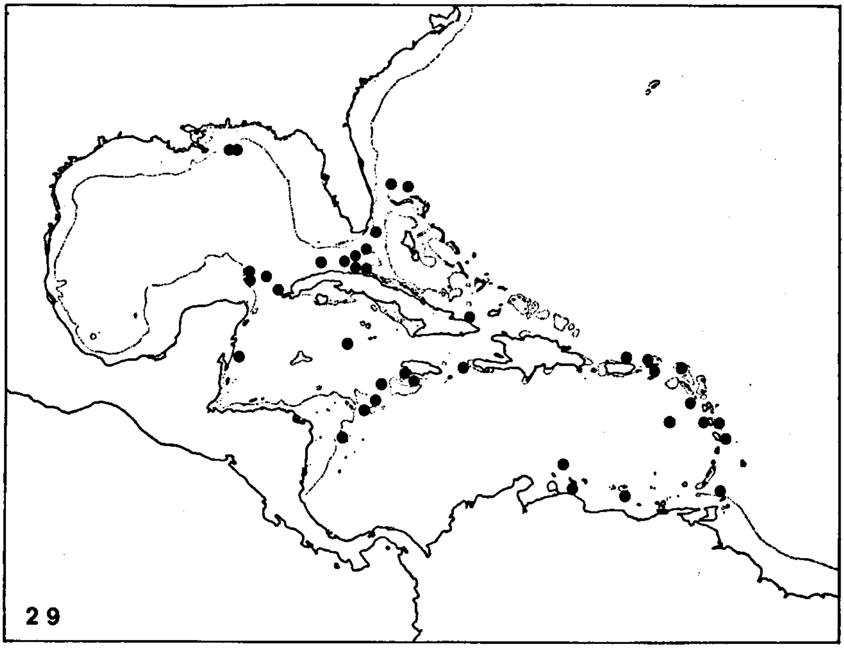
Map 26: Distribution of *Stephanocyathus* (*S.*) *diadema*.



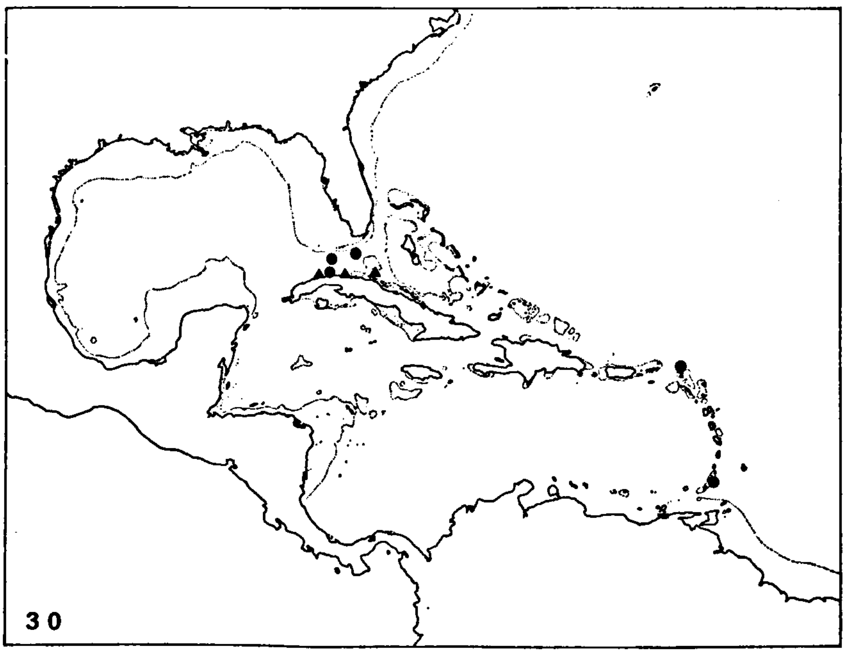
Map 27: Distribution of *Stephanocyathus* (*S.*) *paliferus*.



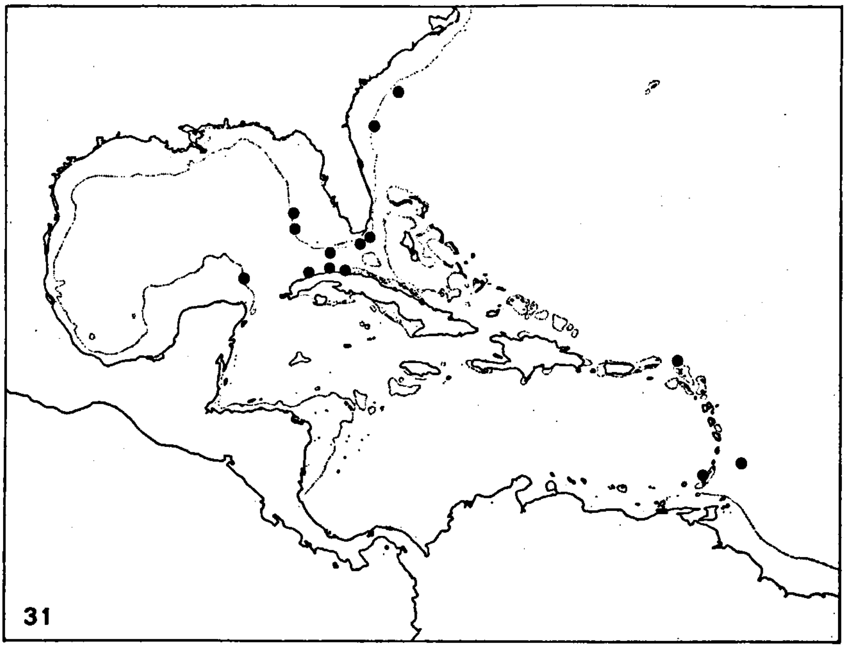
Map 28: Distribution of *Stephanocyathus* (*S*). *laevifundus*.



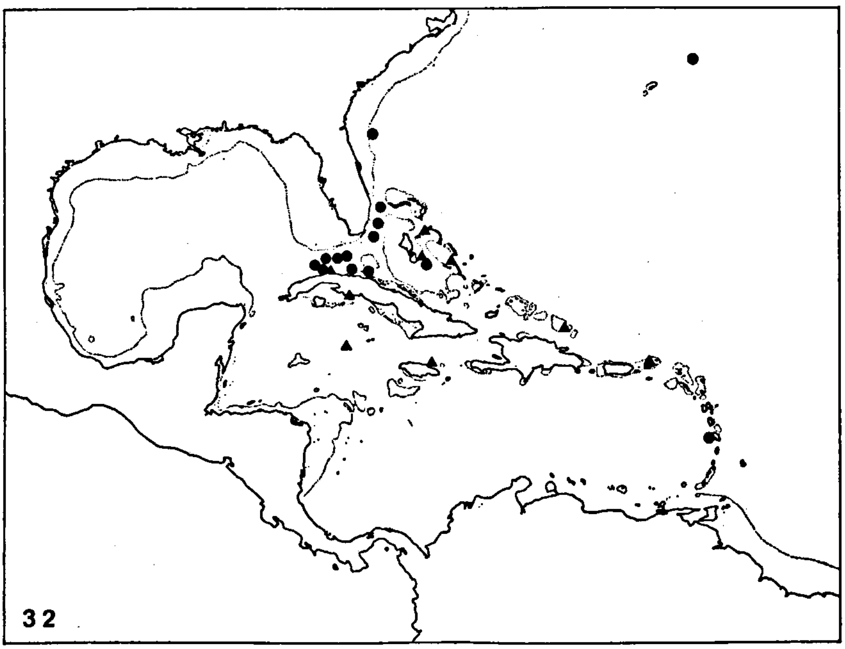
Map 29: Distribution of *Stephanocyathus* (*O.*) *coronatus*.



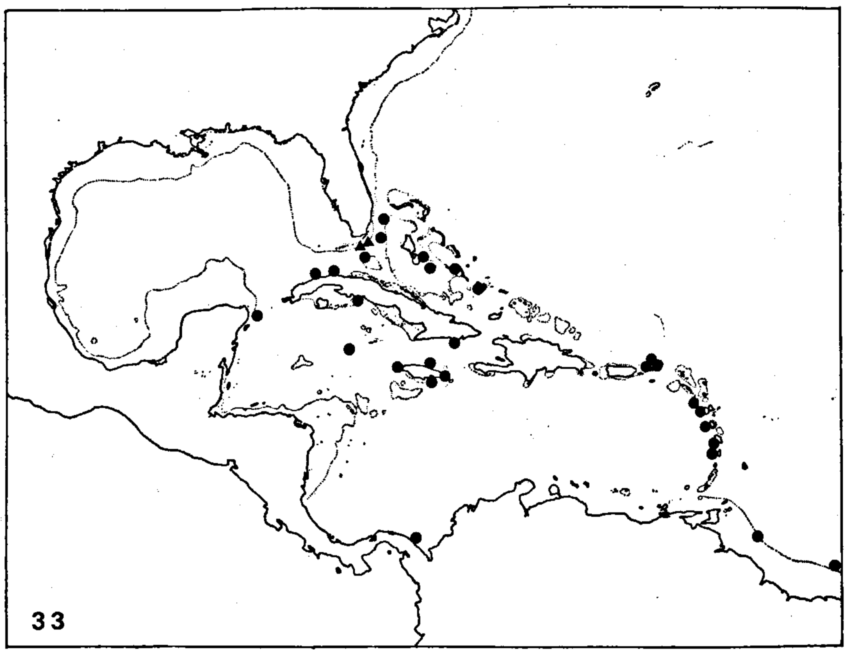
Map 30: Distribution of *Trematotrochus corbicula* (triangles) and *Peponocyathus folliculus* (circles).



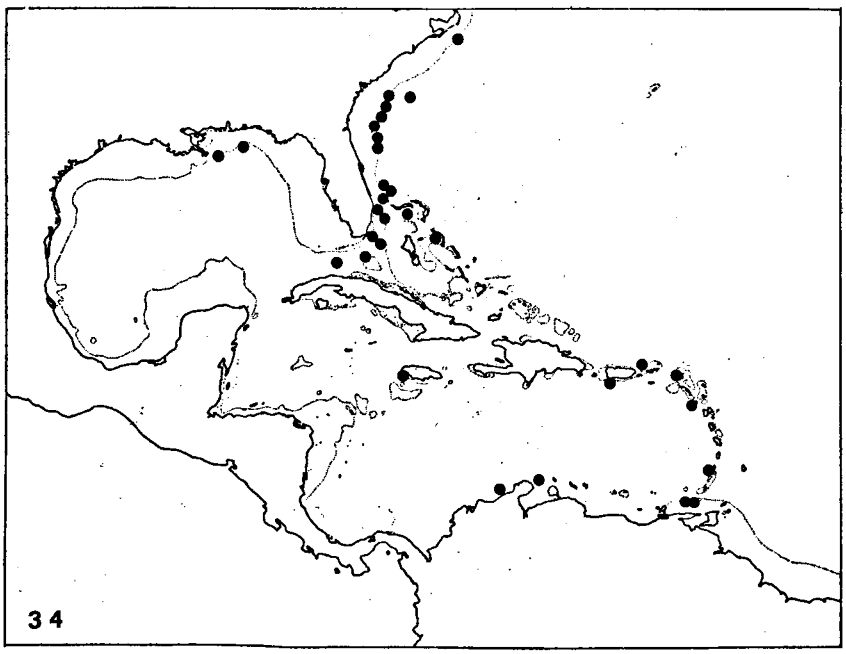
Map 31: Distribution of *Peponocyathus stimpsonii*.



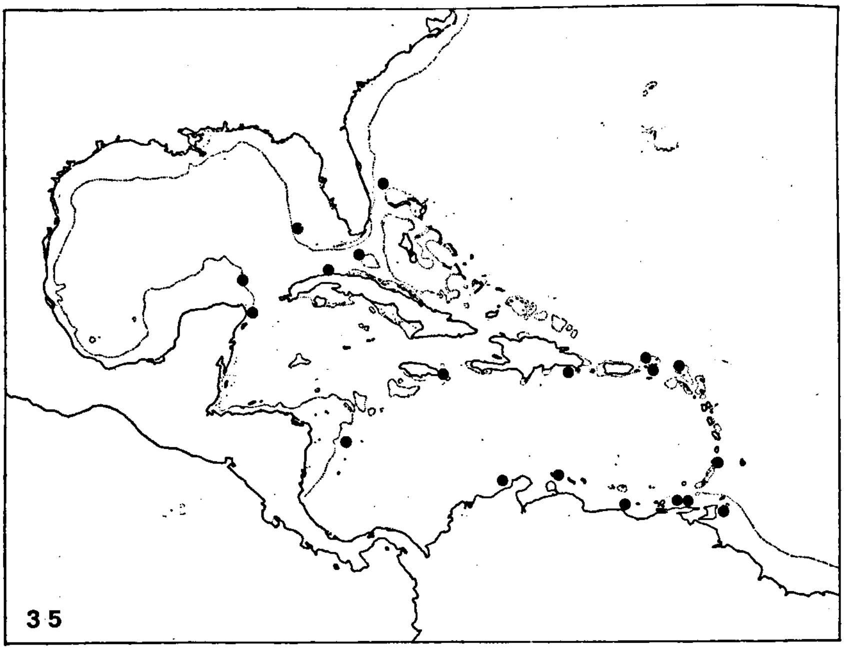
Map 32: Distribution of *Desmophyllum cristagalli* (circles) and *D. striatum* (triangles).



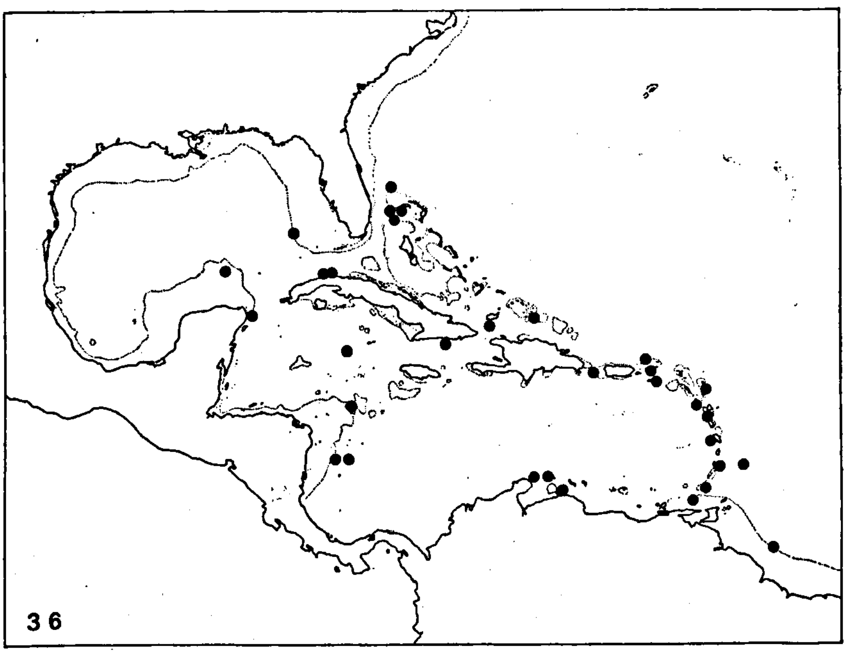
Map 33: Distribution of *Thalamophyllia riisei* (circles) and *T. gombergi* (triangles).



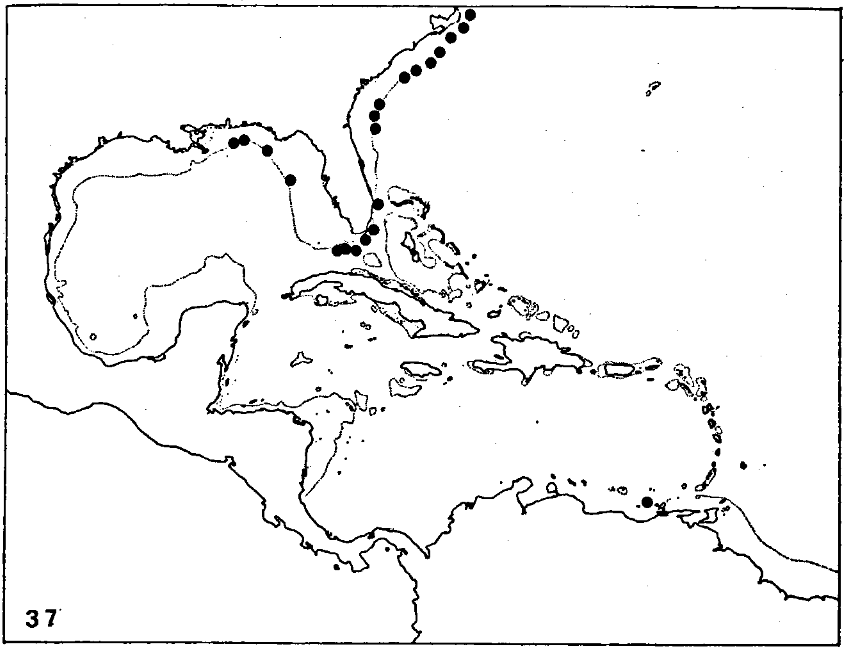
Map 34: Distribution of *Lophelia prolifera*.



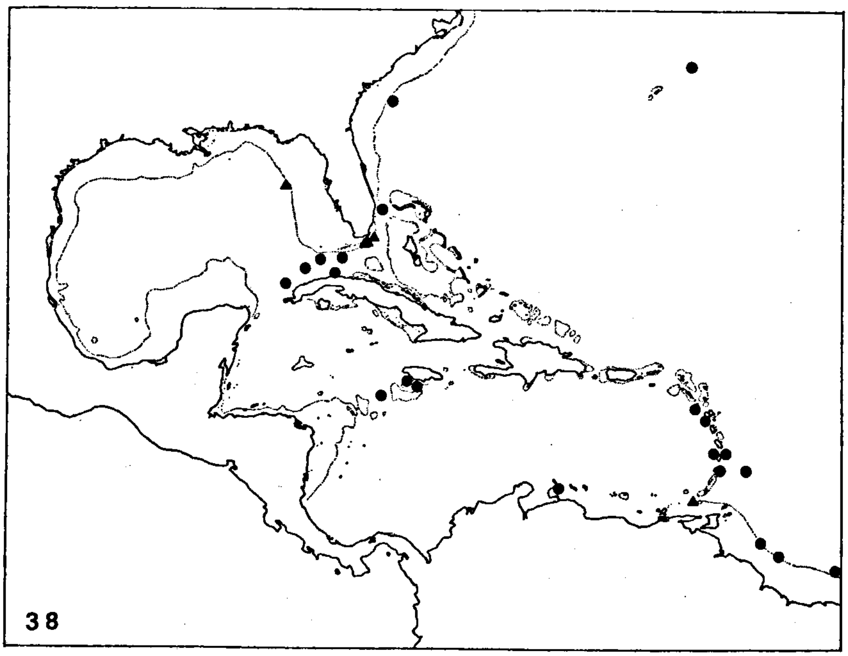
Map 35: Distribution of *Anomocora fecunda.*



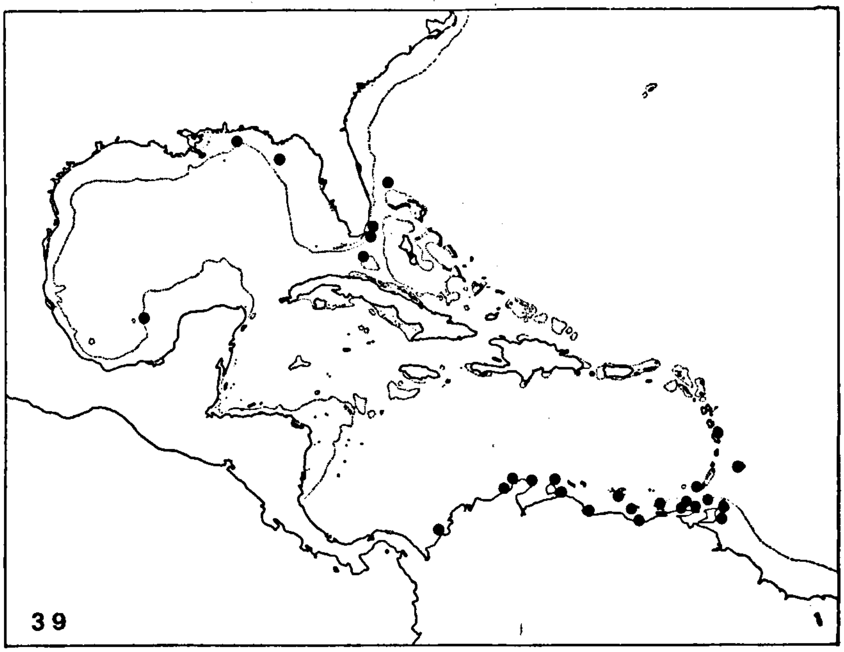
Map 36: Distribution of *Coenosmilia arbuscula.*



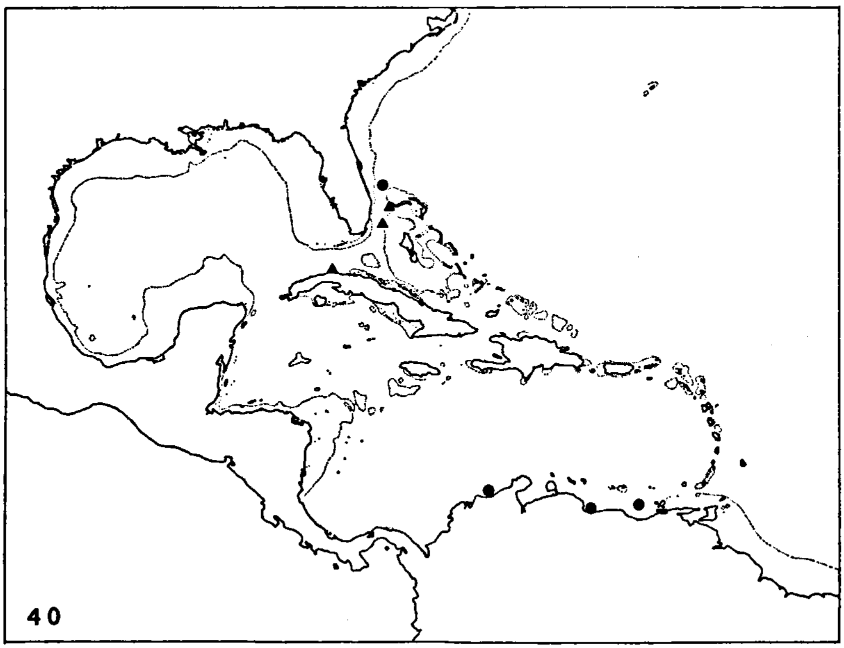
Map 37: Distribution of *Dasmosmilia lymani*.



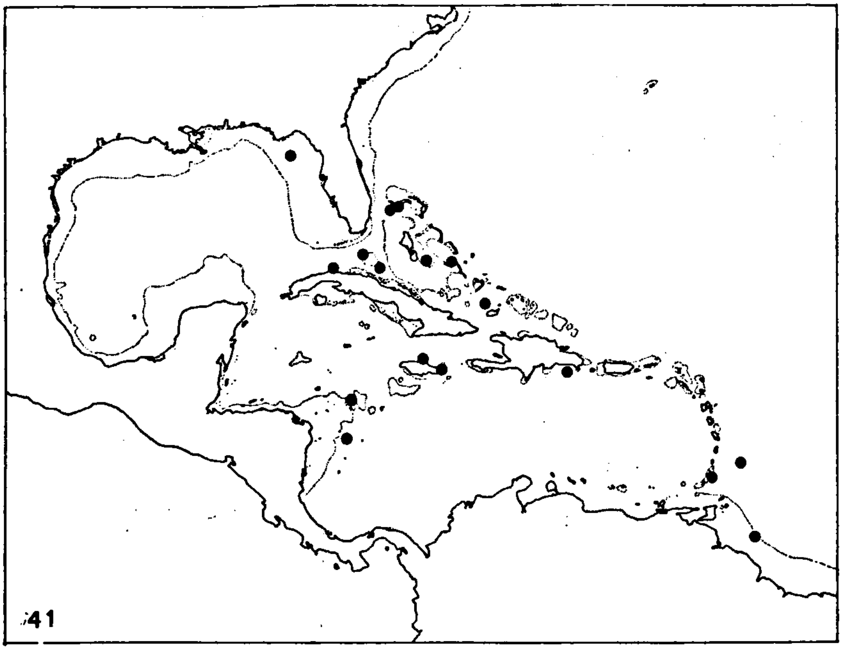
Map 38: Distribution of *Dasmosmilia variegata* (triangles) and *Solenosmilia variabilis* (circles).



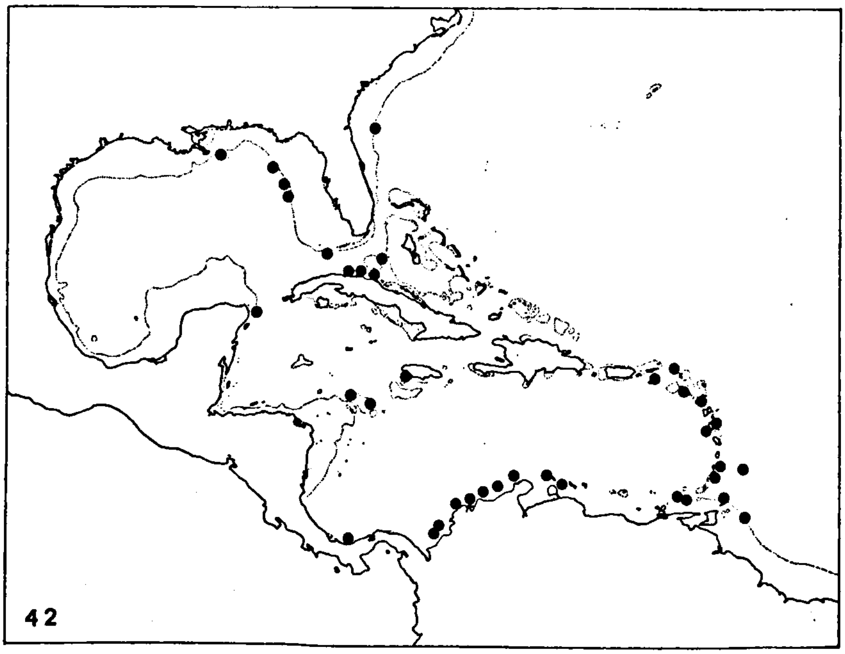
Map 39: Distribution of *Asterosmilia prolifera*.



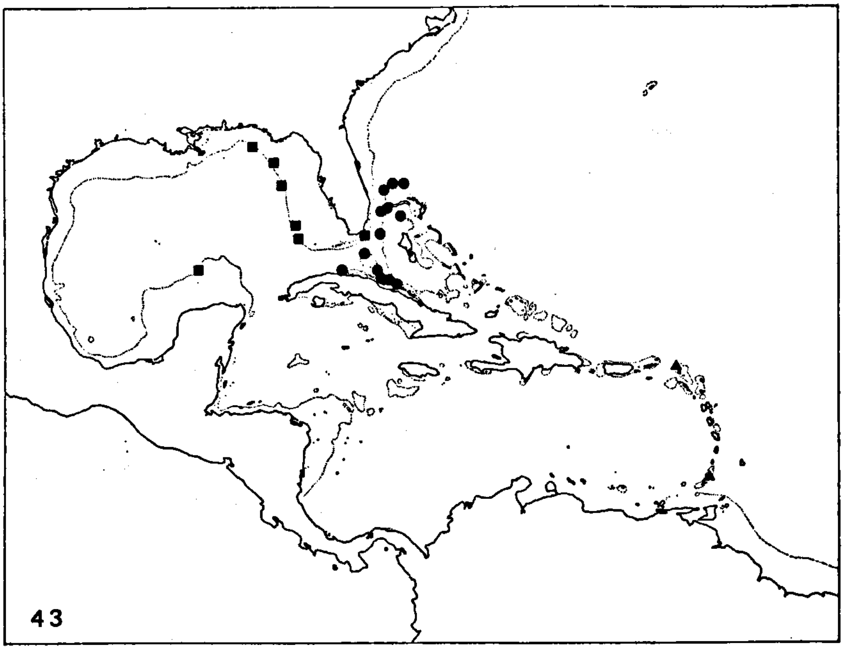
Map 40: Distribution of *Asterosmilia marchadi* (circles) and *Rhizosmilia gerdae* (triangles).



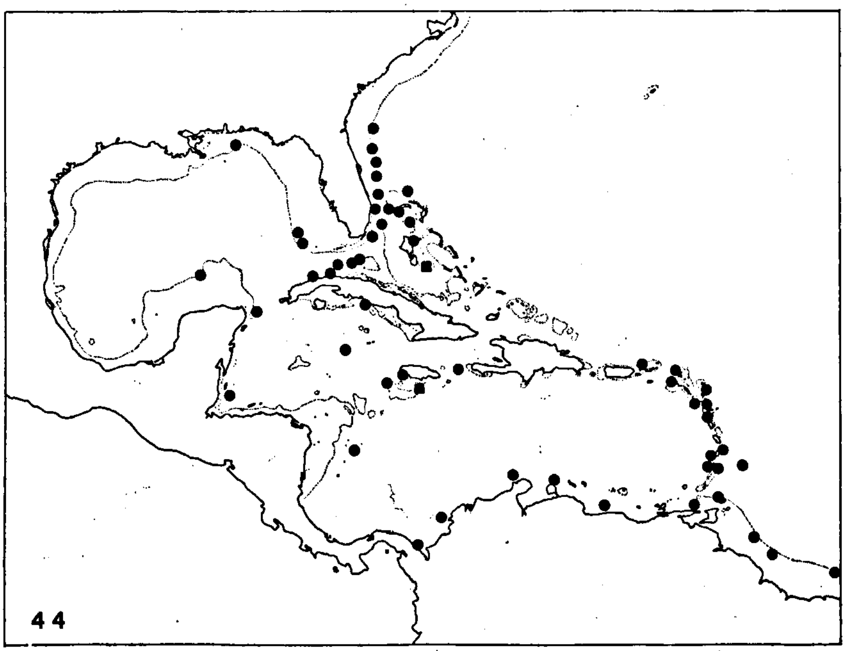
Map 41: Distribution of *Phacelocyathus flos*.



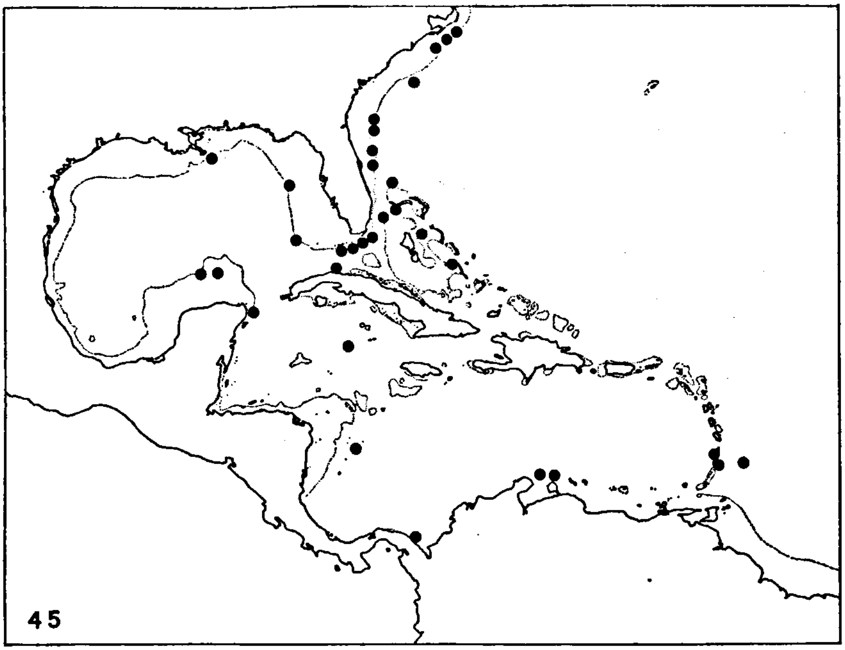
Map 42: Distribution of *Flabellum moseleyi*.



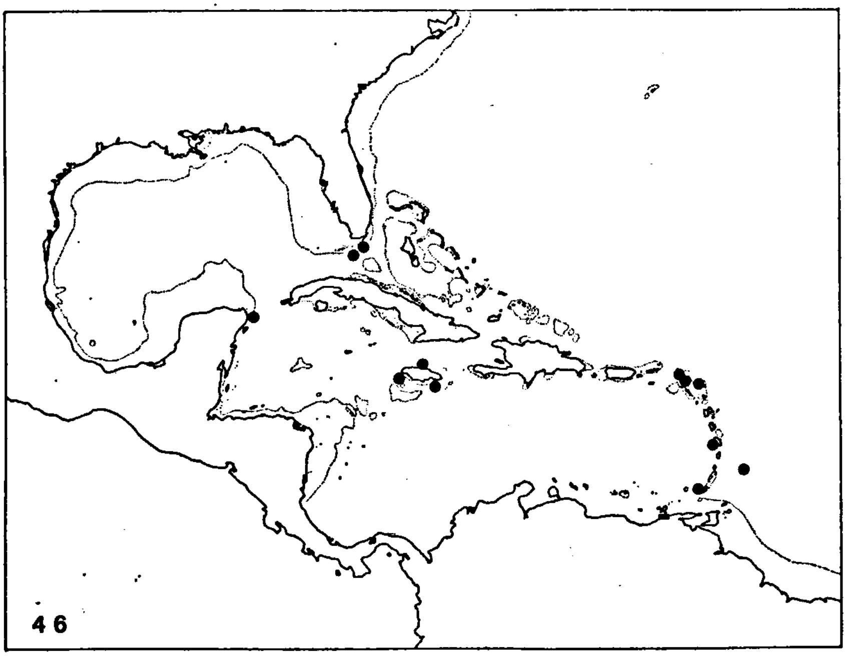
Map 43: Distribution of *Flabellum fragile* (squares), *F. pavoninum atlanticum* (circles), and *Placotrochides frusta* (triangles).



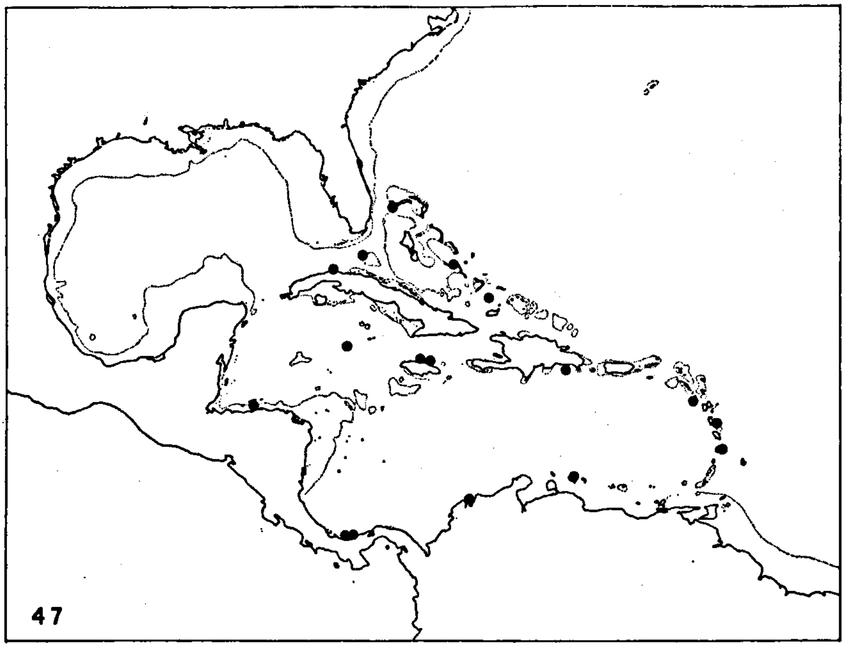
Map 44: Distribution of *Javania cailleti* (circles) and *J. pseudoalabastra* (squares).



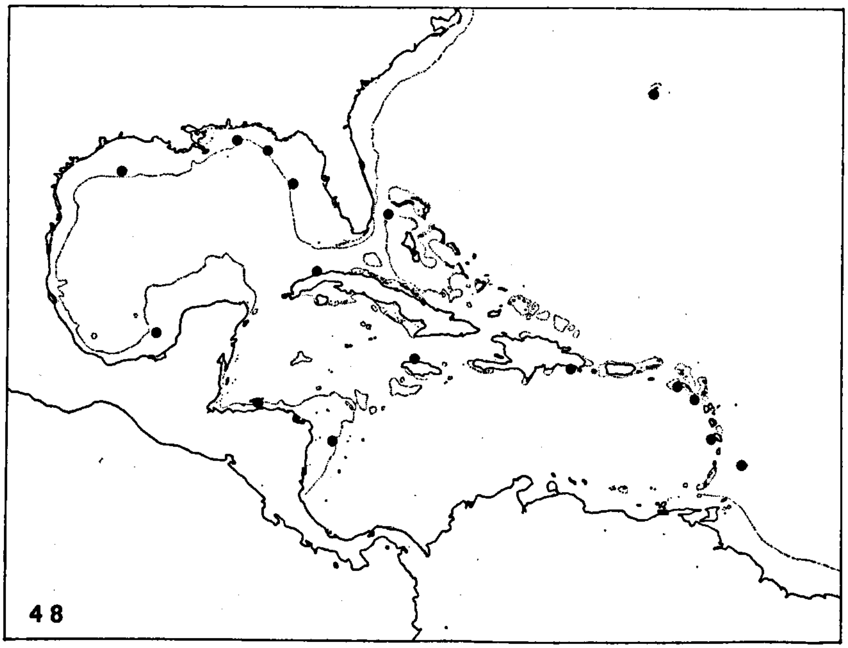
Map 45: Distribution of *Polymyces fragilis*.



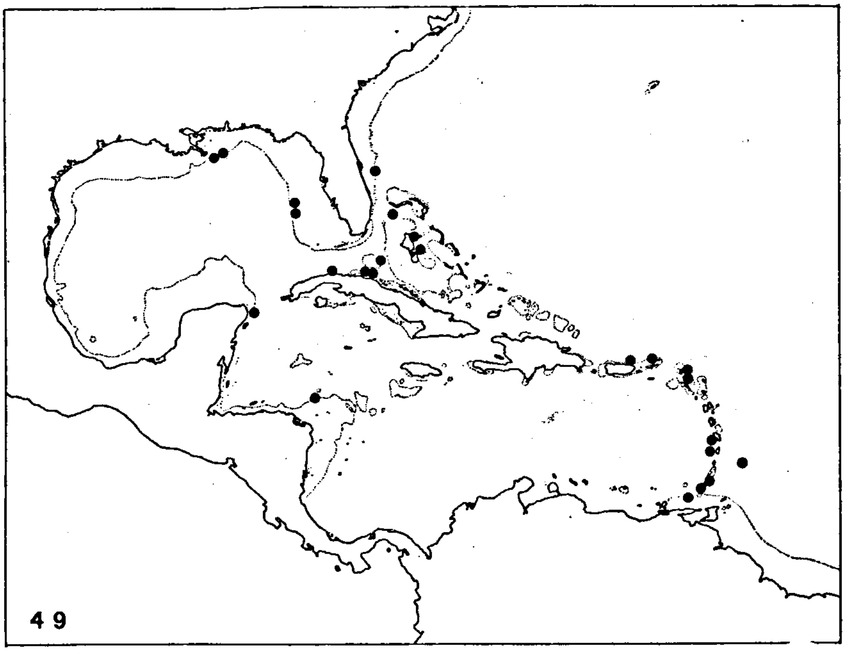
Map 46: Distribution of *Gardineria paradoxa*.



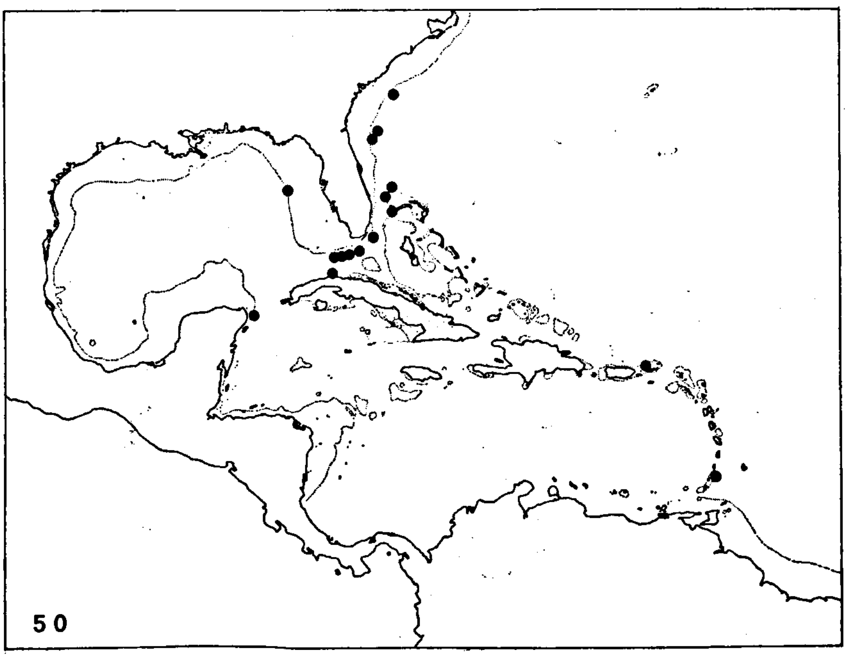
Map 47: Distribution of *Gardineria minor*.



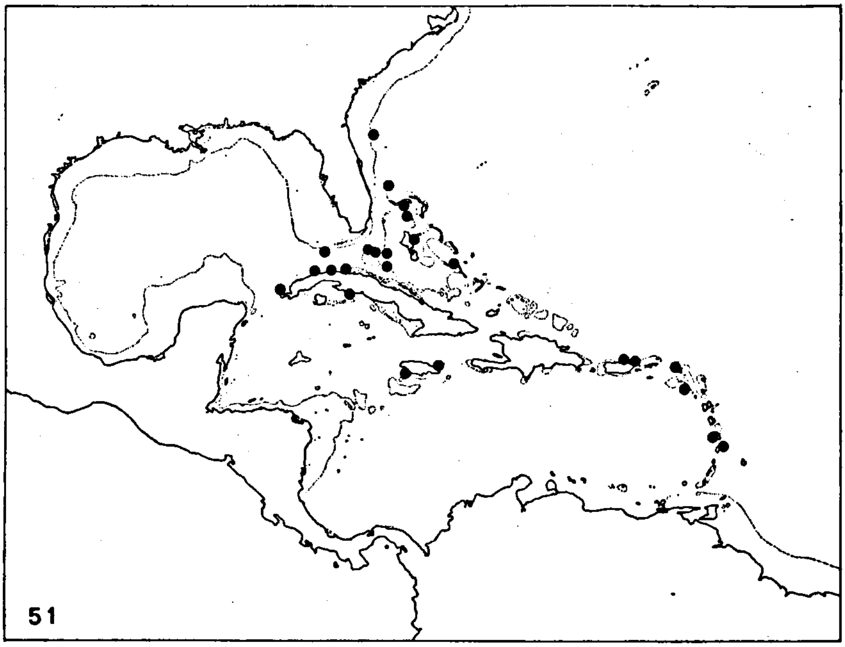
Map 48: Distribution of *Guynia annulata*.



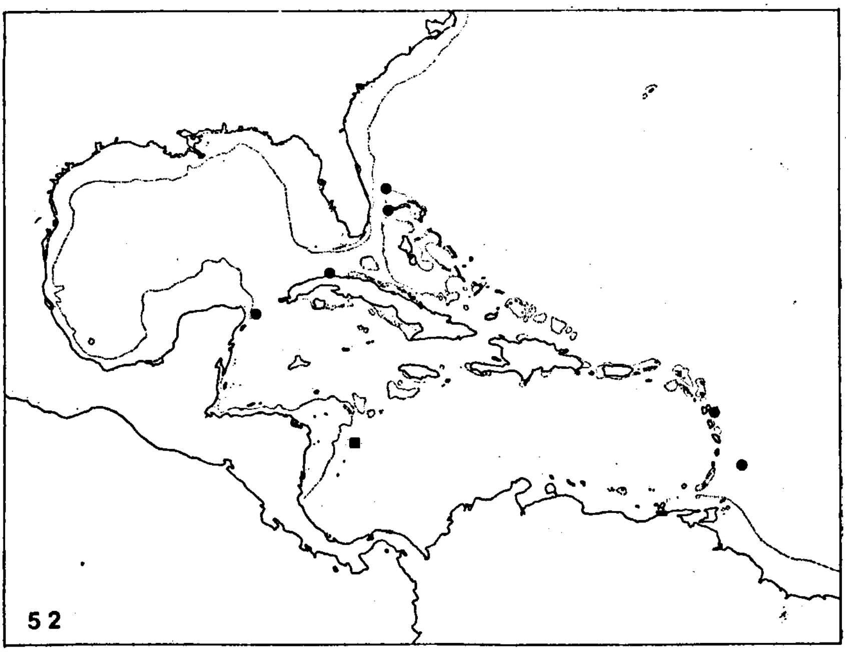
Map 49: Distribution of *Schizocyathus fissilis*.



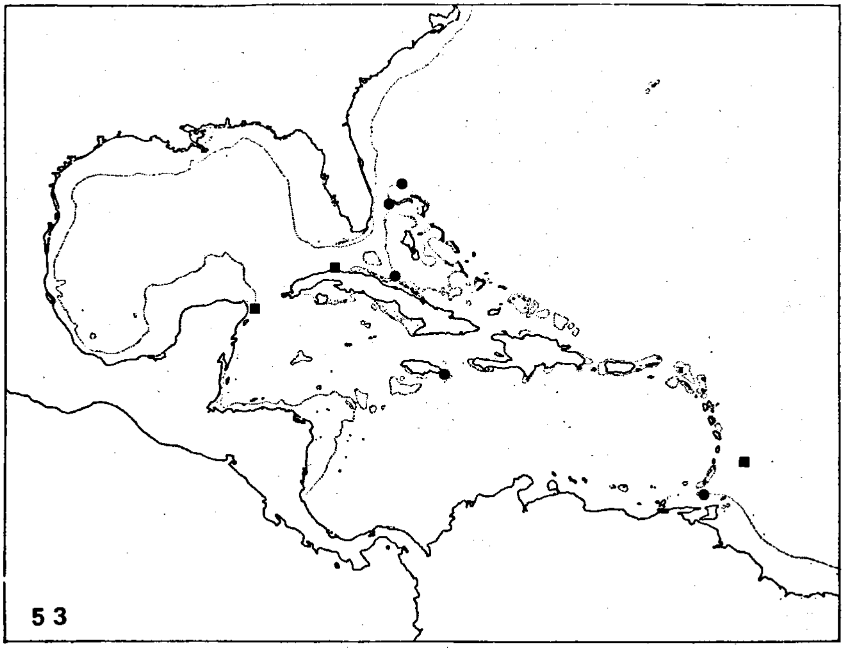
Map 50: Distribution of *Stenocyathus vermiformis*.



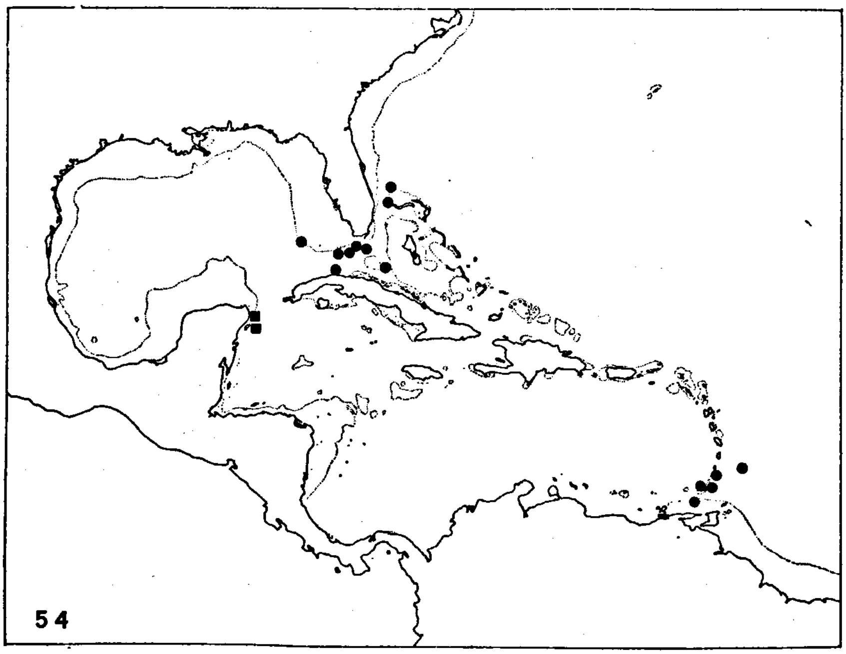
Map 51: Distribution of *Pourtalocyathus hispidus*.



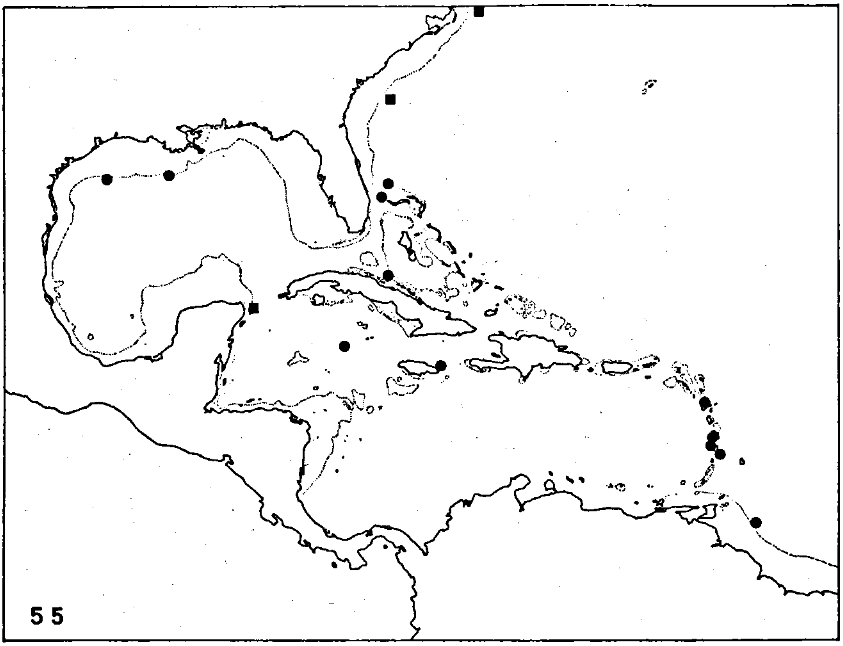
Map 52: Distribution of *Balanophyllia cyathoides* (circles) and *B. hadros* (square).



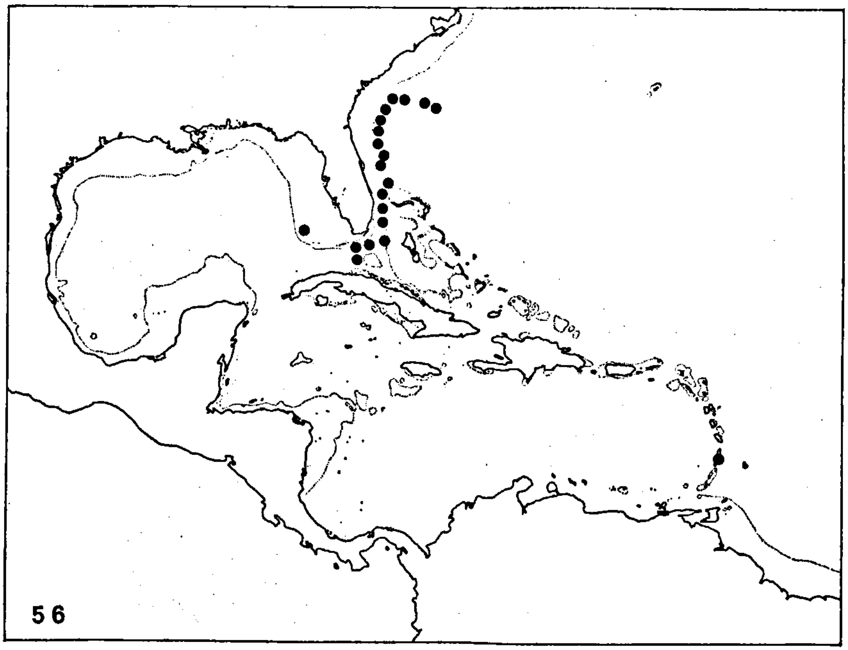
Map 53: Distribution of *Balanophyllia palifera* (squares) and *B. wellsi* (circles).



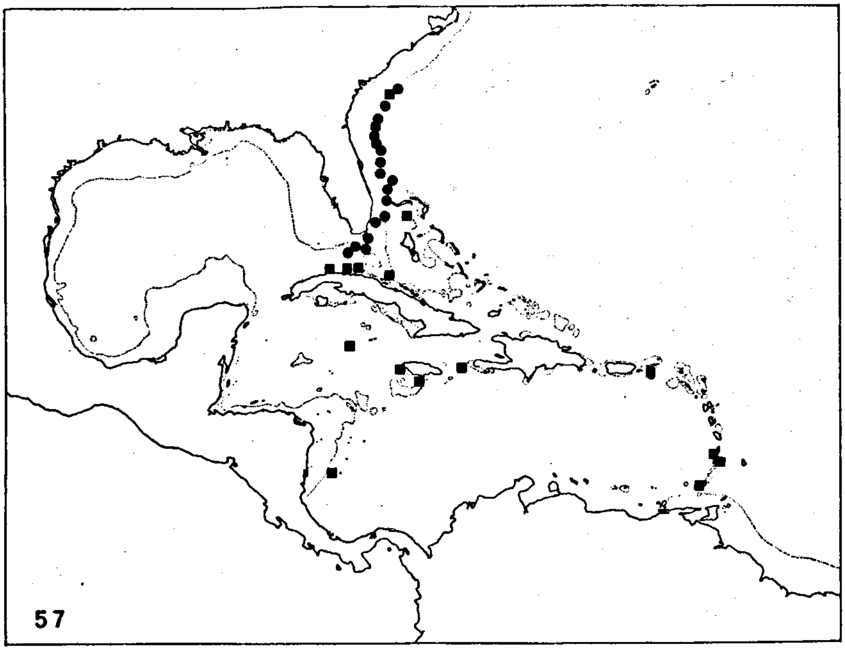
Map 54: Distribution of *Balanophyllia bayeri* (squares) and *Dendrophyllia cornucopia* (circles).



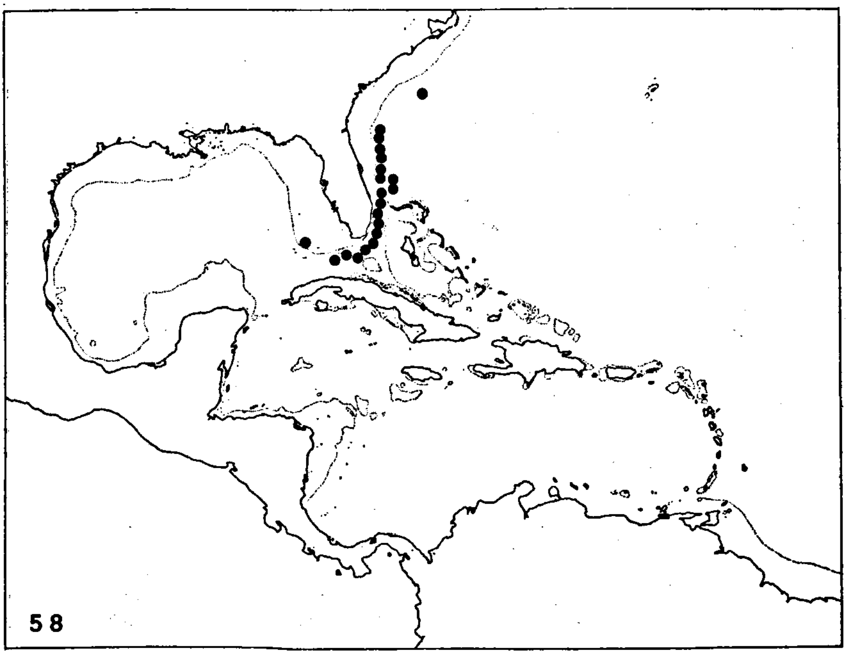
Map 55: Distribution of *Dendrophyllia gaditana* (squares) and *D. alternata* (circles).



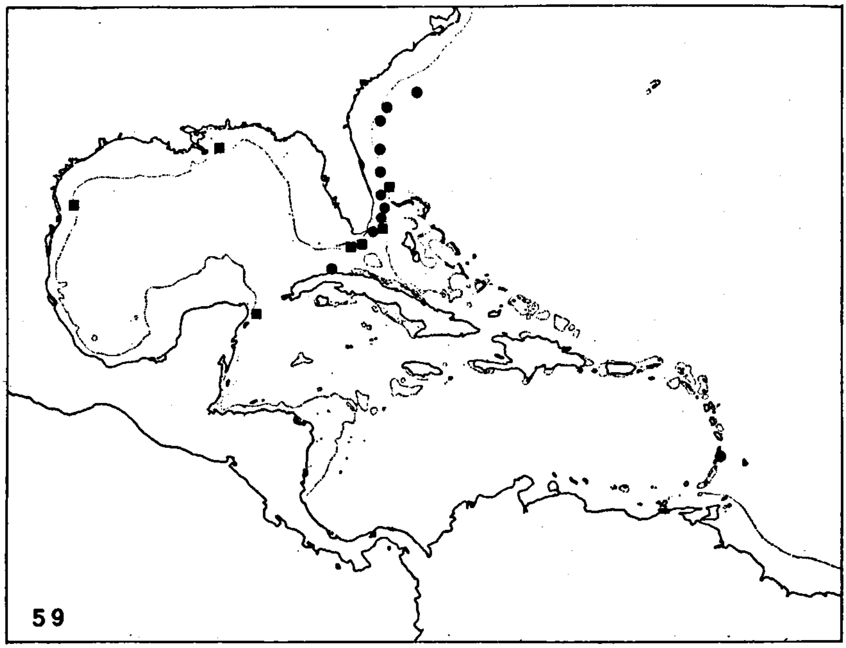
Map 56: Distribution of *Enallopsammia profunda.*



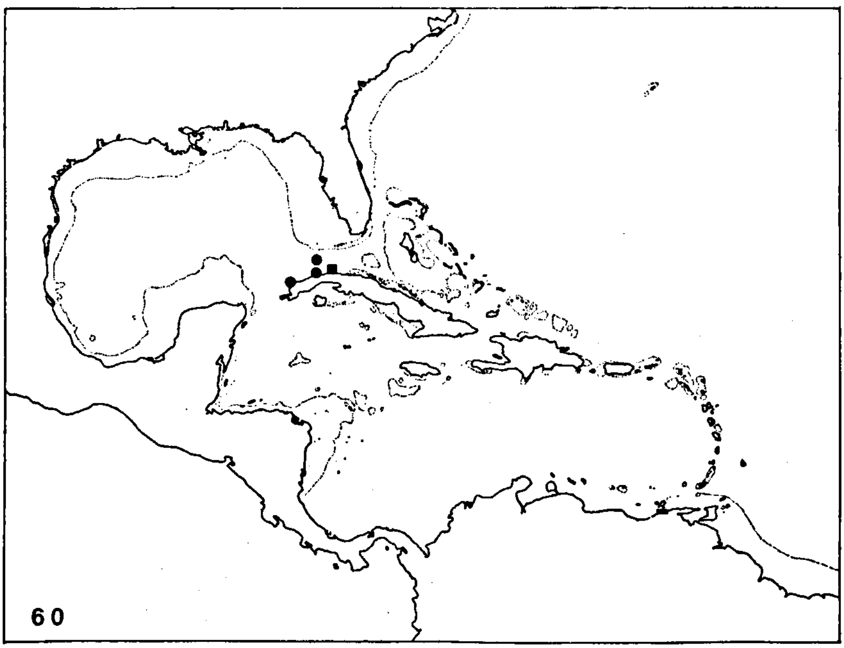
Map 57: Distribution of *Enallopsammia rostrata* (squares) and *Thecopsammia socialis* (circles).



Map 58: Distribution of *Bathypsammia tintinnabulum*.



Map 59: Distribution of *Bathypsammia fallosocialis* (circles) and *Rhizopsammia manuelensis* (squares).



Map 60: Distribution of *Trochopsammia infundibulum* (circles) and *"Cylicia" inflata* (square).

REFERENCES

AGASSIZ, A. 1888. Three cruises of the ... Steamer Blake. *Bull. Mus. comp. Zool.* *15*: 148–156, text-figs. 462–481.

ALCOCK, A. 1898. *An account of the deep-sea Madreporaria collected by the royal Indian marine survey ship Investigator.* Calcutta: Trustees Indian Museum, 29 pp., 3 pls.

— 1902. Report on the deep-sea Madreporaria of the Siboga-expedition. *Monogr. Siboga Exped.* *16a*: 52 pp., 5 pls.

ALLEN, J. R. L. & WELLS, J. W. 1962. Holocene coral banks and subsidence in the Niger Delta. *J. Geol.* *70* (4): 381–397, pls. 1–4.

ALLOITEAU, J. 1958. Monographie des Madréporaires fossiles de Madagascar. *Ann. Géol. Madagascar* *25*: viii + 218 pp., 38 pls., 37 text-figs.

ARANGO Y MOLINA, R. 1877. Radiados de la Isla de Cuba. Pólipos Calcáreos. *An. R. Acad. Cienc. Médicas, Físicas y Naturales de la Habana* *14*: 272–284.

BAYER, F. M. 1961. The shallow-water Octocorallia of the West Indian region. *Stud. Fauna Curaçao* *12* (55): 373 pp., 28 pls., 101 text-figs.

— [1973]. Marine Invertebrate postage stamps. République d'Haiti, set of eight colored illustrations.

BEST, M. B. 1969. Étude systématique et écologique des Madréporaires de la région de Banyuls-sur-Mer (Pyrénees-Orientales). *Vie et Milieu* (*A*) *20* (2A): 293–326, 18 figs.

— 1970. A new species of Polycyathus Duncan, 1876 from New Caledonia and a new record of Polycyathus senegalensis Chevalier, 1966 (Madreporaria). *Beaufortia* *17* (227): 79–84, 4 figs.

BOONE, L. 1928. Coelenterata from the tropical east American seas. Scientific results of the first oeceanographic expedition of the Pawnee 1925. *Bull. Bingham oceanogr. Coll.* *1* (5): 1–8, pls. 1–3.

BOURCIER, M. & ZIBROWIUS, H. 1973. Les "bouges rouges" déversées dans le Canyon de la Cassidaigne. Observations en soucoups plongeante SP 350 (juin 1975) et résultats de dragages. *Téthys* *4* (4): 811–841, 3 pls.

BOURNE, G. C. 1905. Report on the solitary corals collected by Professor Herdman, at Ceylon, in 1902. Pp. 187–242, 4 pls., 5 text-figs. *in* W. A. HERDMAN, ed. *Report to the government of Ceylon on the pearl oyster fisheries in the Gulf of Manaar.* London, Ray Society *4* (Suppl. *29*).

BRIGGS, J. C. 1974. *Marine Zoogeography*. McGraw-Hill Book Co., New York, 475 pp.

BRIGHT, T. J. & TUNNELL, J. W. & PEQUEGNAT, L. H. & BURKE, T. E. & CASHMAN, C. W. & CROPPER, D. A. & RAY, J. P. & TRESSLAR, R. C. & TEERLING, J. & WILLS, J. B. 1974. Biotic zonation of the West Flower Garden Bank. Pp. 3–54, 48 figs. *in* BRIGHT & PEQUEGNAT eds. *Biota of the West Flower Garden Bank*. Gulf Publ. Co., Houston.

BRODERIP, W. J. 1828. Description of Caryophyllia smithii n. sp. *Zool. Jour.* *3*: 485–486, pl. 13, figs. 1–6.

CAIRNS, S. D. 1976. *A revision of the deep-water ahermatypic corals (Scleractinia) of the tropical western Atlantic*. Ph.D. dissertation. Univ. Miami, 244 pp., 35 pls. (Unpublished).

— 1977. Deep-water corals. *Sea Front.* *23* (2): 84–89, 9 figs.

— 1977a. A revision of the Recent species of Balanophyllia (Anthozoa: Scleractinia) in the western Atlantic, with descriptions of four new species. *Proc. Biol. Soc. Wash.* *90* (1): 132–148, 4 pls.

— 1977b. Story corals. I. Caryophylliina and Dendrophylliina (Anthozoa: Scleractinia). *Mem. Hourglass Cruises* *3* (4): 1–27, 2 pls.

— 1977c. A revision of the Recent species of Stephanocyathus (Anthozoa: Scleractinia) in the western Atlantic, with descriptions of two new species. *Bull. mar. Sci.* *27* (4): 729–739, 2 pls.

— 1978. A checklist of ahermatypic Scleractinia of the Gulf of Mexico, with the description of a new species. *Gulf Res. Rep.* *6* (1): 9–15, 1 pl.

— 1978a. New genus and species of ahermatypic coral (Scleractinia) from the western Atlantic. *Proc. Biol. Soc. Wash.* *91* (1): 216–221, 1 pl., 1 text-fig.

CARLGREN, O. 1945. Polypdyr (Coelenterata) 3. Koraldyr. *Danmarks Fauna. København* *51*: 1–168.

CECCHINI, C. 1914. Su due nuovi Turbinolidae del Mediterraneo. *Mon. zool. Ital.* *25*: 151–152.

— 1917. Gli Alcionari e i Madreporari racolti nel Mediterraneo dalla R. N. Washington (1881–1883). *Arch. zool. Ital.* *9* (2): 123–157, pl. 13, text-figs. 1–2.

CHEVALIER, J. P. 1961. Recherches sur les Madréporaires et les formations récifales du Miocène de la Méditerranée occidentale. *Mem. Soc. geol. Fr.* (*N.S.*) *40* (93): 562 pp., 26 pls.

— 1966. Contributions à l'étude des Madréporaires des côtes occidentales de l'Afrique tropicale, pts. 1 and 2. *Bull. I.F.A.N.* (*A*) *28* (3A): 912–975, pls. 1–5; *28* (4A): 1356–1405, pls. 6–8.

— 1971. Les Scléractiniaires de la Mélanésie Française, 1re pt. *Expédit. Fr. sur les récifs coralliens de la Nouvelle-Calédonie* *5*: 307 pp., 38 pls., 182 text-figs.

DANA, J. D. 1846–1849. Zoophytes. *United States Exploring Expedition* (*1838–1842*), *7*: vi + 740 pp., 45 text-figs., 61 pls.

DEFENBAUGH, R. E. 1976. *A study of the benthic macroinvertebrates of the continental shelf of the northern Gulf of Mexico*. Ph.D. dissertation. Texas A & M Univ., 476 pp., including 50 pls. (Unpublished).

DENNANT, J. 1899. Descriptions of new species of corals from the Australian Tertiaries. Part 1. *Trans. roy. Soc. South Australia* *23* (1): 112–122, pls. 2–3.

— 1906. Madreporaria from the Australian and New Zealand coasts. *Trans. roy. Soc. South Australia* *30*: 151–165, pls. 5–6.

DONS, C. 1944. Norges korallrev. *Kongl. norske Vidensk. Selsk. forh.* *16*: 37–82.

DUCHASSAING, P. 1850. *Animaux radiaires des Antilles*. Paris, 33 pp., 2 pls.

— 1870. *Revue des Zoophytes et des Spongiaires des Antilles*. Paris, 52 pp., 2 pls.

DUCHASSAING, P. & MICHELOTTI, J. 1860. Mémoire sur les coralliaires des Antilles. *Mem. Acad. Sci. Torino* (*2*) *19*: 279–365 [reprint numbered 1–89], 10 pls.

— 1864. Supplément au mémoire sur les coralliaires des Antilles. *Mem. Acad. Sci. Torino* (*2*) *23*: 97–206 [reprint numbered 1–112], 11 pls.

DUNCAN, P. M. 1870. On the Madreporaria dredged up in the expedition of the H.M.S. Porcupine. *Proc. roy. Soc. London 18*: 289–301.

— 1872. On the structure and affinities of Guynia annulata Duncan, with remarks on the persistence of Paleozoic types of Madreporaria. *Phil. Trans. roy. Soc. London 162*: 29–40, 1 pl.

— 1873. A description of the Madreporaria dredged up during the expedition of the H.M.S. Porcupine in 1869 and 1870. Part 1. *Trans. zool. Soc. London 8* (5): 303–344, pls. 39–49.

— 1876. Notice of some deep-sea and littoral corals from the Atlantic Ocean, Caribbean, Indian, New Zealand, Persian Gulf, and Japan &c Seas. *Proc. zool. Soc. London 1876*: 428–442, pls. 38–41.

— 1877. On the rapidity of growth and variability of some Madreporaria on an Atlantic cable, with remarks on the rate of accumulation of foraminiferal deposits. *Ann. Mag. nat. Hist.* (*4*) *20*: 361–365 (Also: *Proc. roy. Soc. London 26*: 133–137).

— 1878. A description of the Madreporaria dredged up during the expedition of the H.M.S. Porcupine in 1869 and 1870. Part 2. *Trans. zool. Soc. London 10* (1): 235–249, pls. 43–45.

— 1882. On some Recent corals from Madeira. *Proc. zool. Soc. London 1882*: 213–221, pl. 8.

— 1883. Remarks on an essay by Prof. G. Lindström, entitled "Contributions to the Actinology of the Atlantic Ocean", and a reply to some of his criticisms. *Ann. Mag. nat. Hist.* (*5*) *12*: 361–369.

DURHAM, J. W. 1947. Corals from the Gulf of California and the North Pacific coast of America. *Mem. Geol. Soc. Amer. 20*: 68 pp., 14 pls.

— 1949. Ontogenetic stages of some simple corals. *Univ. Calif. Publ.* (*Geol. Sci.*) *28* (6): 137–172, pls. 4–5.

DURHAM, J. W. & BARNARD, J. L. 1952. Stony corals of the eastern Pacific collected by the Velero III and Velero IV. *Allan Hancock Pacific Exped. 16* (1): 110 pp., 16 pls.

EGUCHI, M. 1968. *The Hydrocorals and Scleractinian corals of Sagami Bay collected by His Majesty the Emperor of Japan*. Mazuren Co., Tokyo, xv + 221 pp., 70 pls.

EKMAN, S. 1953. *Zoogeography of the sea*. Sidgwick & Jackson, London, xiv + 417 pp., 121 figs.

ELLIS, J. & SOLANDER, D. 1786. *The natural history of many curious and uncommon Zoophytes, collected ... by the late John Ellis, systematically arranged and described by the late Daniel Solander*. London, xii + 208 pp., 63 pls.

ERHARDT, H. 1976. La existencia del coral Stephanocyathus nobilis (Moseley, 1881) en la costa de la península Guajira. Una demostración primaria para la costa atlántica de Colombia. *Mitt. Inst. Colombo-Alemán Invest. Cient. 8*: 59–62, 1 pl.

ESPER, E. J. C. 1788–1830. *Die Pflanzenthiere*. Nürnberg. 3 vol. text, 2 vol. pls.

FAUSTINO, L. A. 1927. Recent Madreporaria of the Philippine Islands. *Monogr. Philipp. Bur. Sci. 22*: 310 pp., 100 pls.

GARDINER, J. S. 1904. The turbinolid corals of South Africa, with notes on their anatomy and variation. *Mar. Invest. South Africa 3* (4): 93–129, pls. 1–3.

— 1913. The corals of the Scottish National Antarctic Expedition. *Trans. roy. Soc. Edinburgh 49* (3): 687–689.

GARDINER, J. S. & WAUGH, P. 1938. The flabellid and turbinolid corals. *John Murray Exped. Sci. Rep. 5* (7): 167–202, pls. 1–7, 6 text-figs.

— 1939. Madreporaria excluding the Flabellidae and Turbinolidae. *John Murray Exped. Sci. Rep. 6* (5): 225–242, pls. 1–2, 3 text-figs.

GOREAU, T. F. & WELLS, J. W. 1967. The shallow-water Scleractinia of Jamaica: revised list of species and their vertical distribution range. *Bull. mar. Sci. 17* (2): 442–453, 3 figs.

GOURRET, P. 1906. Lophohelia prolifera, Amphihelia rostrata, Amphihelia oculata. Pp. 121–122 *in* A. F. MARION, *Études des Coelentérés Atlantique recueillis par la commission de dragages de l'aviso le Travailleur durant des campagnes 1880 et 1881. Expéd. Sci. Travailleur et Talisman.* Paris.

GRAVIER, C. 1915. Note préliminaire sur les Madréporaires recueillis au cours des croisières de la Princesse Alice et de l'Hirondelle II, de 1893 à 1913 inclusivement. *Bull. Inst. océanogr. 304*: 22 pp., 11 figs.

— 1920. Madréporaires provenant des campagnes des yachts Princesse Alice et Hirondelle II (1893–1913). *Rés. Camp. sci. Prince de Monaco 55*: 123 pp., 16 pls.

HICKSON, S. J. 1910. On a new octoradiate coral, Pyrophyllia inflata (new genus and species). *Mem. Proc. Manchester Lit. Phil. Soc. 54* (*3*) 12: 1–7, 4 figs.

HOFFMEISTER, J. E. 1933. Report on the deep-sea corals obtained by the F.I.S. Endeavour on the coasts of New South Wales, Victoria, South Australia, and Tasmania. *Biol. Res. F.I.S. Endeavour 1909–14, 6* (1): 1–16, 4 pls.

HORST, C. J. VAN DER 1922. The Madreporaria of the Siboga Expedition. Part 3. Eupsammidae. *Monogr. Siboga Exped. 16c*: 99–127, pls. 7–8.

International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology. International Trust for Zoological Nomenclature, London 1964: xix + 176 pp.

JOUBIN, L. 1928. Note sur un coralliaire du genre Desmophyllum. *Bull. Mus. Hist. nat. Paris 34*: 212–218, 6 figs.

JOURDAN, E. 1895. Zoanthaires provenant des campagnes du yacht l'Hirondelle. *Rés. Camp. sci. Prince de Monaco 8*: 36 pp., 2 pls.

KELLER, N. B. 1975. Ahermatypic Madreporarian corals of the Caribbean Sea and the Gulf of Mexico. *Trudy Inst. Okeanol. 100*: 174–187, 2 pls.

— 1976. The deep-sea Madreporarian corals of the genus Fungiacyathus from the Kurile-Kamchatka, Aleutian trenches and other regions of world ocean. *Trudy Inst. Okeanol. 99*: 31–44, 3 pls.

KENT, W. S. 1870. Observations on the Madreporaria or "Stony Corals" taken in the late expedition on the yacht Norma off the coasts of Spain and Portugal. *Ann. Mag. nat. Hist.* (*4*) *6*: 459–461.

KIKUCHI, T. 1968. Fauna and flora of the sea around the Amakusa Marine Biological Laboratory. Part 7. Zoantharia, Coelenterata. *Contrib. Amakusa mar. Biol. Lab. 207*: 1–16, 5 pls.

LABOREL, J. 1970. Les peuplements de madréporaires des côtes tropicales du Brésil. *Ann. Univ. Abidjan* (*E*) *2* (3): 261 pp., 71 figs.

— 1971. Madréporaires et Hydrocoralliaires récifaux des côtes brésiliennes. *Rés. Sci.*

Camp. Calypso 9, 36 (25): 171–229, 8 pls., 6 text-figs. (Also: *Ann. Inst. océanogr.*, Paris *47*).

LAMARCK, J. B. P. A. DE 1816. *Histoire naturelle des animaux sans vertèbres ... II. Histoire des Polypes.* Paris, 568 pp.

LAND, S. L. & LANG, J. C. & BARNES, D. J. 1977. On the stable carbon and oxygen isotopic composition of some shallow water ahermatypic scleractinian coral skeletons. *Geochim. Cosmochim. Acta 41*: 169–172.

LANG, J. C. 1974. Biological zonation at the base of a reef. *Am. Sci. 62* (3): 272–281, 9 figs.

LESUEUR, C. A. 1817. Observations on several species of the genus Actinia; illustrated by figures. *J. Acad. Nat. Sci. Philadelphia 1*: 149–154, 169–189, pl. 8.

LEWIS, J. B. 1960. Sleractinia of Barbados. *J. Barbados Mus. Nat. Hist. Soc. 28* (1): 11–12.

— 1965. A preliminary description of some marine benthic communities from Barbados, West Indies. *Can. J. Zool. 43*: 1049–1074, 5 figs.

LINDSTRÖM, G. 1877. Contributions to the Actinology of the Atlantic Ocean. *Kungl. svenska Vetensk. Acad. Handl. 14* (6): 1–26, 3 pls., 9 text-figs.

— 1884. A reply to the remarks of Prof. Duncan on a paper entitled "Contribution to the Actinology of the Atlantic Ocean". *Ann. Mag. nat. Hist.* (*5*) *13*: 192–107.

LINNAEUS, C. 1758. *Systema naturae ... I.* Ed. 10, 824 pp.

— 1767. *Systema naturae ... I*, 2. Ed. 12, pp. 533–1327.

LIVINGSTON, H. D. & THOMPSON, G. 1971. Trace element concentrations in some modern corals. *Limnol. Oceanogr. 16* (5): 786–796.

MACINTYRE, I. G. 1970. New data on the occurrence of tropical reef corals on the North Carolina continental shelf. *J. Elisha Mitchell sci. Soc. 86* (4): 178.

MARENZELLER, E. VON 1904. Steinkorallen. *Wiss. Ergebn. deut. Tiefsee-Exped. Valdivia 1898–1899, 7*: 261–318, pls. 14–18.

— 1904a. Stein- und Hydrokorallen. *Bull. Mus. comp. Zool. 43* (2): 75–87, 3 pls.

— 1907. Über den Septennachwuchs der Eupsamminen E.H. Expeditionen S.M. Schiff "Pola" in das Rote Meer. Zoologische Ergebnisse 24: *Denkschr. Kais. Wiss. 80*: 1–12, 7 figs.

— 1907a. Tiefseekorallen. Exped. Pola in das Rote Meer. Zool. Ergebn. 25: *Denkschr. Akad. Wiss. 80*: 13–25, 2 pls.

MICHELOTTI, G. 1838. *Specimen zoophytologiae diluvianae.* Turin, 222 pp., 7 pls.

MILNE EDWARDS, H. & HAIME, J. 1848. Recherches sur les polypiers. Mémoire 2. Monographie des Turbinolides. *Ann. Sci. nat. Paris* (*3*) *9*: 211–344, pls. 7–10.

— 1848a. Recherches sur les polypiers. Mémoire 3. Monographie des Eupsammides. *Ann. Sci. nat., Paris* (*3*) *10*: 65–114, 1 pl.

— 1848b. Recherches sur les polypiers. Mémoire 4. Monographie des Astréides. *Ann. Sci. nat., Paris* (*3*) *10*: 209–320, pls. 5–9.

— 1849. Mémoire sur les polypiers appartenant à la famille des Oculinides, au groupe intermédiaire des pseudastréides et à la famille des Fongides. *Acad. Sci. Paris C. R. 29*: 67–73.

— 1850. *A monograph of the British fossil corals. Part 1. Introduction: Corals of the Tertiary and Cretaceous formations.* Paleontolographical Society, London, lxxxv + 71 pp., 11 pls.

— 1850a. Recherches sur les polypiers. Mémoire 5. Monographie des Oculinides. *Ann. Sci. nat., Paris* (*3*) *13*: 63–110, pls. 3–4.

— 1857–1860. *Histoire naturelle des Coralliaires ou polypes proprement dits.* Roret, Paris. *1* (1857), viii + 326 pp.; *2* (1857), 633 pp.; *3* (1860), 560 pp.; *atlas* (1857), 31 pls.

MOORE, D. R. & BULLIS, H. R. 1960. A deep-water coral reef in the Gulf of Mexico. *Bull. mar. Sci. 10* (1): 125–128, 2 figs.

MOSELEY, H. N. 1876. Preliminary report to Professor Wyville Thomson ... on the true corals dredged by the H.M.S. Challenger in deep water between the dates Dec. 30th, 1870, and August 31st, 1875. *Proc. roy. Soc. London 24*: 544–569, 1 fig.

— 1881. Report on certain Hydroid, Alcyonarian, and Madreporarian corals procured during the voyage of the H.M.S. Challenger, in the years 1873–1876. Part 3. On the deep-sea Madreporaria. *Rep. sci. Res. Challenger* (*Zool.*) *2*: 127–208, 16 pls., 21 text-figs.

NOBRE, A. 1931. *Contribuições para o estudo dos Coelenterados de Portugal.* Porto, 82 pp., 20 pls.

PACKARD, A. S. 1873. Occurrence of a deep-sea Floridian coral near Cape Cod. *Amer. Nat. 7*: 744–745.

PALLAS, P. S. 1766. *Elenchus Zoophytorum.* Hague-Comitum, xvi + 28 + 451 pp.

PHILIPPI, R. A. 1842. Zoologische Beobachtungen. 6. Verzeichniss der im Mittelmeer von mir beobachteten Arten Cyathina Ehrenberg. *Arch. Naturgesch. 8* (1): 40–45.

PORTER, J. W. 1972. Ecology and species diversity of coral reefs on opposite sides of the Isthmus of Panama. Pp. 89–116 *in* M. L. JONES, ed. The Panamic Biota: some observations prior to a sea-level canal. *Bull. Biol. Soc. Wash. 2.*

POURTALÈS, L. F. 1867. Contributions to the fauna of the Gulf Stream at great depths. *Bull. Mus. comp. Zool. 1* (6): 103–120.

— 1868. Contributions to the fauna of the Gulf Stream at great depths. (second series). *Bull. Mus. comp. Zool. 1* (7): 121–141.

— 1871. Deep-Sea corals. *Illustr. Cat. Mus. comp.* Zool. *4*: 93 pp., 8 pls. (*Mem. Mus. comp. Zool. 2*).

— 1874. Zoological results of the Hassler expedition. Crinoids and Corals. *Illustr. Cat. Mus. comp. Zool. 8*: 33–50, pls. 6–9. (*Mem. Mus. comp. Zool. 4*).

— 1878. Reports on the results of dredging ... by the Blake. Corals. *Bull. Mus. comp. Zool. 5* (9): 197–212, 1 pl.

— 1880. Reports on the results of dredging ... by the Blake. Report on the corals and Antipatharia. *Bull. Mus. comp. Zool. 6* (4): 95–120, 3 pls.

RALPH, P. M. & SQUIRES, D. F. 1962. The extant Scleractinian corals of New Zealand. *Zool. Publ. Victoria Univ. Wellington 29*: 1–19, 8 pls., 1 text-fig.

RATHBUN, R. 1888. Catalogue of the specimens of corals belonging to the genus Madrepora, contained in the United States National Museum. *Proc. U.S. Nat. Mus. 10*: 10–19.

RIDLEY, S. O. 1881. Account of the zoological collections made during the surevy of H.M.S. Alert in the Straits of Magellan and on the coast of Patagonia. X. Coelenterata. *Proc. Zool. Soc. London, 1881*: 101–107, pl. 6.

ROOS, P. J. 1971. The shallow-water stony corals of the Netherlands Antilles. *Stud. Fauna Curaçao 37* (103): 108 pp., 53 pls.

ROSSI, L. 1958. Contributo allo studio della fauna di profundita vivente presso la reviera Ligure di Levante. *Doriana 2* (92): 1–13, 2 figs.

— 1960. Madréporaires. Rés. sci. Camp. Faial Portugal 1957. *Gab. Est. Pesc. 3*: 1–13, 3 pls.

— 1961. Études sur le seuil Siculo-Tunisien. 6. Madréporaires. *Ann. Inst. océanogr. 39*: 33–48.

ROULE, L. 1896. Coelentérés. *Rés. sci. Camp. Caudan 2*: 299–323. (*Ann. Univ. Lyon 26*).

SCATTERDAY, J. W. 1974. Reefs and associated coral assemblages off Bonaire, Netherlands Antilles, and their bearing on Pleistocene and Recent reef models. Pp. 85–106 *in* A. M. CAMERON *et al.*, eds. *Second Intern. Sympos. Coral Reefs*. Great Barrier Reef Committee, Brisbane.

SCLATER, W. L. 1886. On a new Madreporarian coral of the genus Stephanocyathus from the British seas, with notes on its anatomy. *Proc. zool. Soc. London, 1886*: 128–136, pls. 12–14.

SEGUENZA, G. 1864. Disquisizioni paleontologiche intorno ai Corallarii fossili delle rocce terziarie del distretto di Messina. *Mem. real. Acad. Sci. Torino* (*2*) *21*: 399–560, 15 pls.

SEMPER, C. 1872. Ueber Generationswechsel bei Steinkorallen und über das M.-Edwards'sche Wachstumsgesetz der Polypen. *Zeitschr. wiss. Zool. 22*: 235–280, pls. 16–21.

SORAUF, J. E. & JELL, J. S. 1977. Structure and incremental growth in the ahermatypic coral Desmophyllum cristagalli from the North Atlantic. *Paleontology 20* (1): 1–19, pls. 1–8.

SORAUF, J. E. & PODOFF, N. 1977. Skeletal structure in deep water ahermatypic corals. Pp. 2–11, pls. 1–4 *in* J. P. CHEVALIER, ed., *Proc. Second Intern. Sympos. Corals and fossil coral reefs*. Paris.

SQUIRES, D. F. 1958. Stony corals from the vicinity of Bimini, Bahamas, British West Indies. *Bull. amer. Mus. nat. Hist. 115* (4): 221–262, pls. 28–43.

— 1959. Deep sea corals collected by the Lamont Geological Observatory. 1. Atlantic corals. *Amer. Mus. Novit. 1965*: 1–42, 24 figs.

— 1961. Deep sea corals collected by the Lamont Geological Observatory. 2. Scotia Sea corals. *Amer. Mus. Novit. 2046*: 1–48, 31 figs.

— 1963. Modern tools probe deep water. *Nat. Hist. 72* (6): 22–29, 11 figs.

— 1964. Biological results of the Chatham Islands 1954 expedition. Part 6. Scleractinia. *Bull. N. Z. Dep. sci. ind. Res. 139* (6): 1–31.

— 1964a. New stony corals (Scleractinia) from Northeastern New Zealand. *Rec. Auckland Inst. Mus. 6* (1): 1–9, 2 pls.

— 1965. A new record for Leptopenus, a rare deep-water coral. *Nature 207* (4999): 878–879, 1 fig.

— 1967. The evolution of the deep-sea family Micrabaciidae. *Stud. trop. Oceanogr. 5*: 502–510.

— 1969. Distribution of selected groups of marine invertebrates in waters south of 35° latitude: Scleractinia. *Antarctic Map Folio Series, Amer. Geog. Soc. New York 11*: 15–18, pl. 6.

SQUIRES, D. F. & KEYES, I. W. 1967. The marine fauna of New Zealand: Scleractinian corals. *Bull. N. Z. Dep. sci. ind. Res. 185*: 1–46, 6 pls., 7 text-figs.

STEPHENS, J. 1909. Alcyonarian and Madreporarian corals of the Irish coasts. *Fisheries Ireland, sci. Invest. 1907*, 5: 1–28, 1 pl.

STETSON, T. R. & SQUIRES, D. F. & PRATT, R. M. 1962. Coral banks occurring in deep water on the Blake Plateau. *Amer. Mus. Novit. 2114*: 1–39, 15 figs.

STUDER, T. 1878. Übersicht der Steinkorallen aus der Familie der Madreporaria aporosa, Eupsammina und Turbinarina, welche auf der Reise S.M.S. Gazelle

um die Erde gesammelt wurden. *Monatber. kön. preuss. Akad. Wiss. Berlin 1877*: 625–655, 4 pls.
— 1879. Neue Trochosmilia von Westafrika. *Abhandl. Mitth. naturf. Ges. Bern* 1 (1878): 176.
— 1879a. Übersicht der Anthozoa Alcyonaria, welche während der Reise S.M.S. Gazelle um die Erde gesammelt wurden. *Monatber. kön. preuss. Akad. Wiss. Berlin 1878*: 632–688, 5 pls.
TEICHERT, C. 1958. Cold- and deep-water coral banks. *Bull. Amer. Assoc. Pet. Geol. 42* (5): 1064–1082, 3 figs.
TENISON-WOODS, J. E. 1878. On some Australian Tertiary corals. *J. Proc. roy. Soc. New South Wales 11*: 183-195, 2 pls.
— 1879. On some Australian Tertiary fossil corals and Polyzoa. *J. Proc. roy. Soc. New South Wales 12*: 57–61, 1 pl.
THOMPSON, J. A. 1931. Alcyonarians and solitary corals. *Rep. sci. Res. Michael Sars North Atlantic Deep-Sea Exped. 1910, 5*: 1–10, 2 pls.
THOMSON, C. W. 1878. *The voyage of the Challenger. Volume 2. The Atlantic.* New York. 340 pp., pls. 15–42, 62 figs.
TIZARD, R. N. & MOSELEY, H. N. & BUCHANAN, J. Y. & MURRAY, J. 1885. Narrative. *Report on the scientific results of the voyage of the H.M.S. Challenger during the years 1873–76.* Volume *1*, part 2: 510–1100, pls. F–O, XX–XXXV, text-figs. 179–340.
TOMMASI, L. R. 1970. Nota sôbre os fundos detríticos do circalitoral inferior da plataforma continental Brasileira ao sul do Cabo Frio (RJ). *Bolm. Inst. oceanogr. S. Paulo 18* (1): 55–62, 8 figs.
UTINOMI, H. 1965. A revised catalogue of Scleractinian corals from the southwest coast of Sikoku in the collections of the Ehime University and the Ehime Prefectural Museum, Matuyama. *Publ. Seto mar. biol. Lab. 13* (3): 243–261.
VAUGHAN, T. W. 1901. The stony corals of the Porto Rican waters. *Bull. U.S. Fish Comm., 1900, 20* (2): 290–320, 38 pls.
— 1906. A new species of Coenocyathus from California and the Brazilian astrangid corals. *Proc. U.S. nat. Mus. 30* (1477): 847–850, pls. 77–78.
— 1906a. Reports on the scientific results of the expedition to the eastern tropical Pacific ... by the U.S. Fish Commission Steamer Albatross from October, 1904, to March, 1905. 6. Madreporaria. *Bull. Mus. comp. Zool. 50* (3): 61–72, pls. 1–10.
— 1907. Recent Madreporaria of the Hawaiian Islands and Laysan. *Bull. U.S. nat. Mus. 59*: 427 pp., 96 pls.
— 1919. Fossil corals from Central America, Cuba, and Porto Rico, with an account of the American Tertiary, Pleistocene, and Recent coral reefs. *Bull. U.S. nat. Mus. 103*: vi + 189–524 pp., pls. 68–152.
VAUGHAN, T. W. & WELLS, J. W. 1943. Revision of the suborders, families, and genera of the Scleractinia. *Geol. Soc. Amer., Spec. Pap. 44*: 363 pp., 51 pls., 39 text-figs.
VERRILL, A. E. 1870. Contributions to zoology from the museum of Yale College. Number 7. Descriptions of new corals. *Amer. J. Arts Sci.* (*2*) *49*: 370–375, 4 figs.
— 1878. Brief contributions to zoology from the museum of Yale College. Number 39. Notice of recent additions to the marine fauna of the eastern coast of North America, no. 2. *Amer. J. Arts Sci.* (*3*) *16*: 371–378.

— 1882. Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England, no. 5. *Amer. J. Arts Sci* (*3*) *23*: 309–316.

— 1882a. Notice of the remarkable marine fauna occupying the outher banks off the southern coast of New England, no. 6. *Amer. J. Arts Sci.* (*3*) *23*: 406–408.

— 1883. Reports on the results of dredging ... by the U.S. Coast Survey Steamer Blake. Report on the Anthozoa, and on some additional species dredged by the Blake in 1877–79, and by the U.S. Fish Commission Steamer Fish Hawk in 1880–82, number 21. *Bull. Mus. comp. Zool. 11* (1): 1–72, 8 pls.

— 1885. Notice of the remarkable marine fauna occupying the outer banks off the southern coast of New England, no. 11. *Amer. J. Arts Sci.* (*3*) *29*: 149–157.

— 1885a. Results of the explorations made by the Steamer Albatross, off the northern coast of the United States, in 1883. *Ann. Rep. U.S. Comm. Fish Fisheries, 1883*: 503–699, 44 pls.

— 1901. Variations and nomenclature of Bermudian, West Indian, and Brazilian coral reefs, with notes on various Indo-Pacific corals. *Trans. Connecticut Acad. Arts Sci. 11*: 63–168, pls. 10–35.

— 1908. Some singular cases of regeneration and increase in a deep-sea coral by agamic endogenesis. *Science 27*: 449.

— 1908a. Distribution and variations of the deep-sea stony corals from off the coast of the United States. *Science 27*: 494.

WAGENAAR HUMMELINCK, P. 1953. Description of new localities. *Stud. Fauna Curaçao 4* (17): 1–108, 8 pls., 26 figs.

— 1977. Marine localities. *Stud. Fauna Curaçao 51* (167): 1–68, 55 pls., 14 figs.

WEISBORD, N. E. 1968. Some late Cenozoic stony corals from northern Venezuela. *Bull. amer. Paleont. 55* (246): 281 pp., 12 pls.

WELLS, J. W. 1933. Corals of the Cretaceous of the Atlantic and Gulf coastal plain and western interior of the United States. *Bull. amer. Paleont. 18* (67): 85–288, pls. 1–16.

— 1936. The nomeclature and type species of some genera of Recent and fossil corals. *Amer. J. Arts Sci.* (*5*) *31*: 97–134.

— 1937. Coral studies. Part 1. Two new species of fossil corals. *Bull. amer. Paleont. 23* (79): 237–241, 1 pl.

— 1947. Coral studies. Part 3. Three new Cretaceous corals from Texas and Alabama. *Bull. amer. Paleont. 31* (123): 165–168, pl. 10.

— 1947a. Coral studies. Part 5. A new Coenocyathus from Florida. *Bull. amer. Paleont. 31* (123): 170–171, pl. 11.

— 1956. Scleractinia. Pp. 328–444, figs. 222–339 *in* R. C. MOORE, ed. *Treatise on Invertebrate Paleontology, Part F, Coelenterata.* Lawrence, Kansas.

— 1958. Scleractinian corals. *Rep. B.A.N.Z. Antarctic Res. Exped. 1929–1931,* (*B*) *6* (11): 257–275, 2 pls.

— 1964. Ahermatypic corals from Queensland. *Univ. Queensland Pap. Dep. Zool. 2* (6): 107–121, 3 pls.

— 1972. Some shallow-water ahermatypic corals from Bermuda. *Postilla 156*: 10 pp., 3 pls.

— 1973. New and old Scleractinian corals from Jamaica. *Bull. mar. Sci. 23* (1): 16–55, 36 figs.

— 1973a. Guynia annulata (Scleractinia) in Jamaica. *Bull. mar. Sci. 23* (1): 59–63, 3 figs.

— 1976. Eocene corals from Eua, Tonga. *Geol. Survey prof. Pap. 640–G*: 1–13, 3 pls., 2 text-figs.

WELLS, J. W. & LANG, J. C. 1973. Systematic list of Jamaican shallow-water Scleractinia. *Bull. mar. Sci.* *23* (1): 55–58.

YABE, H. & EGUCHI, M. 1932. Deep-water corals from the Riukiu Limestone of Kikai-jima, Riukiu Islands. *Proc. imp. Acad. Japan* *8* (9): 442–445, 1 fig.

— 1937. Notes on Deltocyathus and Discocyathus from Japan. *Sci. Rep. Tôhoku imp. Univ.* (*2*) *Geol.*, *19*: 127–147, pl. 20.

— 1942. Fossil and Recent simple corals from Japan. *Sci. Rep. Tôhoku imp. Univ.* (*2*) *Geol.*, *22* (2): 105–178, pls. 9–12.

ZIBROWIUS, H. 1968. Note préliminaire sur la présence à Marseille de quatre Madréporaires peu connus: Desmophyllum fasciculatum (Risso, 1826), Guynia annulata (Duncan, 1872), Stenocyathus vermiformis (Pourtalès, 1868), et Conotrochus magnaghii (Cecchini, 1914). *Bull. Soc. zool. Fr.* *93* (2): 325–330.

— 1971. Remarques sur la faune sessile des grottes sous-marines et de l'étage bathyal en Méditerranée. *Rapp. Comm. int. Mer Médit.* *20* (3): 243–245, 1 fig.

— 1973. Révision des espèces actuelles du genre Enallopsammia Michelotti, 1871 et description de E. marenzelleri, nouvelle espèce bathyale à large distribution: Océan Indien et Atlantique Central (Madréporaires, Dendrophylliidae). *Beaufortia* *21* (276): 37–54, 3 pls.

— 1974. Redescription of Sclerhelia hirtella from Saint Helena, South Atlantic, and remarks on the Indo-Pacific species erroneously referred to the same genus (Scleractinia). *J. nat. Hist.* *8*(5): 563–575, 3 pls.

— 1974a. Scléractiniaires des îles Saint Paul et Amsterdam (sud de l'Océan Indien). *Téthys* *5* (4): 747–778, 3 pls.

— 1974b. Caryophyllia sarsiae n. sp., and other Recent deep-water Caryophyllia (Scleractinia) previously referred to little-known fossil species (C. arcuata, C. cylindracea). *J. mar. biol. Assoc. U.K.* *54* (4): 769–784, 3 pls.

— 1974c. Révision du genre Javania et considérations générales sur les Flabellidae (Scléractiniaires). *Bull. Inst. océanogr.* *71* (1429): 1–48, 5 pls.

— 1976. *Les Scléractiniaires de la Méditerranée et de l'Atlantique nord-oriental.* Thèse Univ. Aix-Marseille, CNRS Archives originales 11. 515, 302 pp., 106 pls., supplement of 29 maps, 20 pp. (Unpublished).

ZIBROWIUS, H. & GRIESHABER, A. 1977. Scléractiniaires de l'Adriatique. *Téthys* *4*: 375–384.

ZIBROWIUS, H. & SALDANHA, L. 1976. Scléractiniaires récoltés en plongée au Portugal et dans les archipels de Madère et les Açores. *Bolm. Soc. port. Ciên. nat.* *16*: 91–114, 25 figs.

ZIBROWIUS, H. & SOUTHWARD, E. C. & DAY, J. H. 1975. New observations on a little-known species of Lumbrineris (Polychaeta) living on various Cnidarians, with notes on its Recent and fossil Scleractinian hosts. *J. mar. biol. Assoc. U.K.* *55* (1): 83–108, 4 pls., 1 text-fig.

PLATES

PLATE 1

Figs. 1–2, 4–5. *Madracis myriaster* (Milne Edwards & Haime). 1. BM 1884.6.30.56, location and depth unknown; 2. USNM 45776, P-1140, 12 cm across; 4. Syntype of *Stylophora mirabilis* Duchassaing & Michelotti, MIZS type 358, St. Thomas, Virgin Islands, basal diameter 10.7 mm; 5. Syntypes of *Axohelia schrammii* Pourtalès, MCZ 2765, off Guadeloupe, base of larger branch 5.2 mm in diameter.
Figs. 3, 6. *Fungiacyathus crispus* (Pourtalès). Lectotype of *D. crispa*, MCZ 5618, 8.7 mm long.
Figs. 7–8. *Fungiacyathus symmetricus* (Pourtalès). USNM 45825, P-861, cd = 10.6 mm, stereo pair.

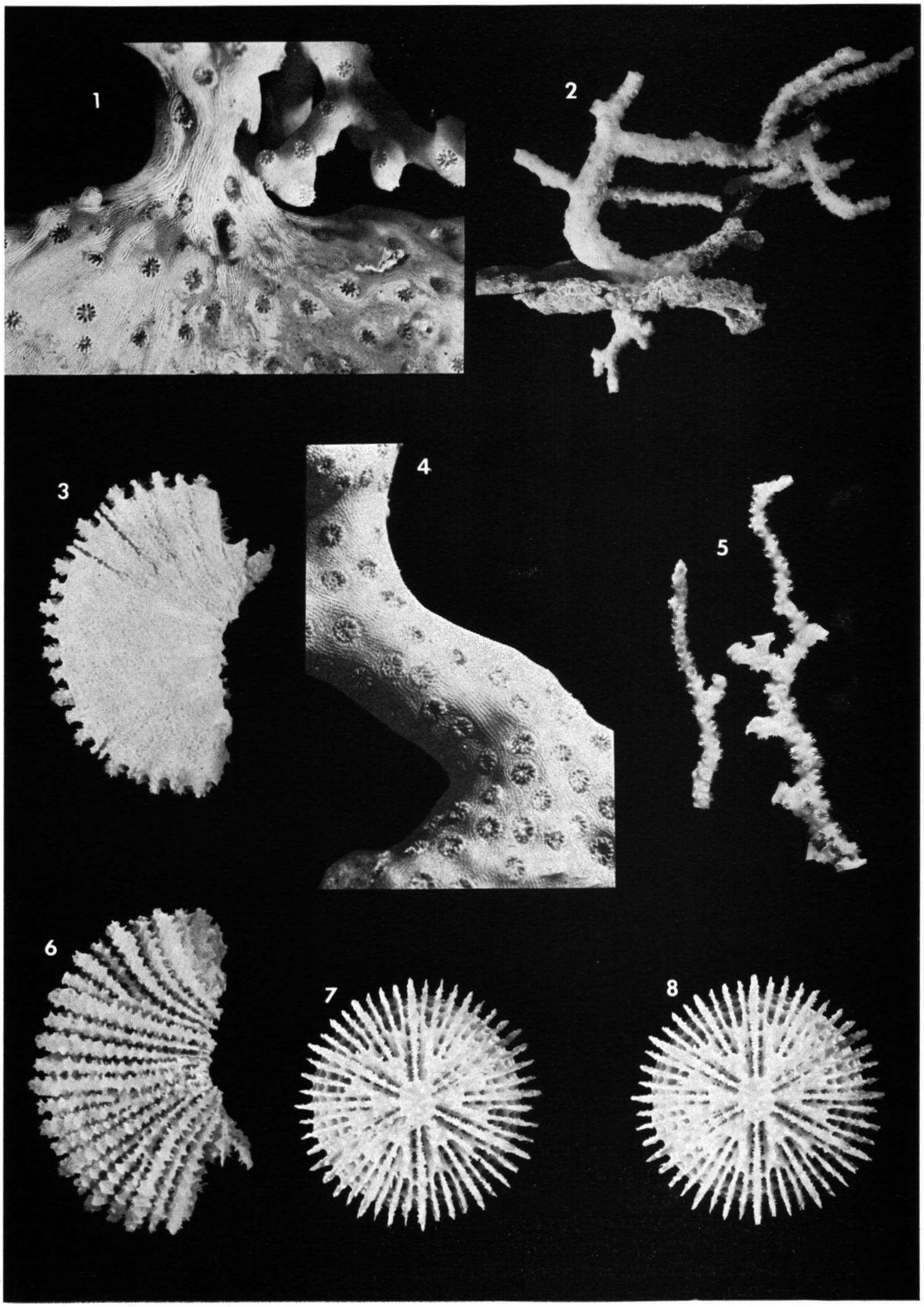

1
2
3
4
5
6
7
8

PLATE II

Fig. 1. *Fungiacyathus symmetricus* (Pourtalès). USNM 45827, P-943, cd = 6.8 mm, SEM of base.
Figs. 2–3, 5. *Fungiacyathus pusillus* (Pourtalès). 2–3. USNM 45833, P-587, cd = 11.2 mm, stereo pair; 5. Syntype of *Diaseris pusilla* Pourtalès, MCZ 5596, one septum.
Figs. 4, 7. *Fungiacyathus crispus* (Pourtalès). 4. Paralectotype, MCZ 5593, "Boschma 5", cd = 5.4 mm; 7. Paralectotype, MCZ 5618, 5.5 mm long.
Figs. 6, 8–9. *Fungiacyathus marenzelleri* (Vaughan). 6. USNM 45839, P-1429, cd = 17.4 mm; 8–9. Same specimen, stereo pair.

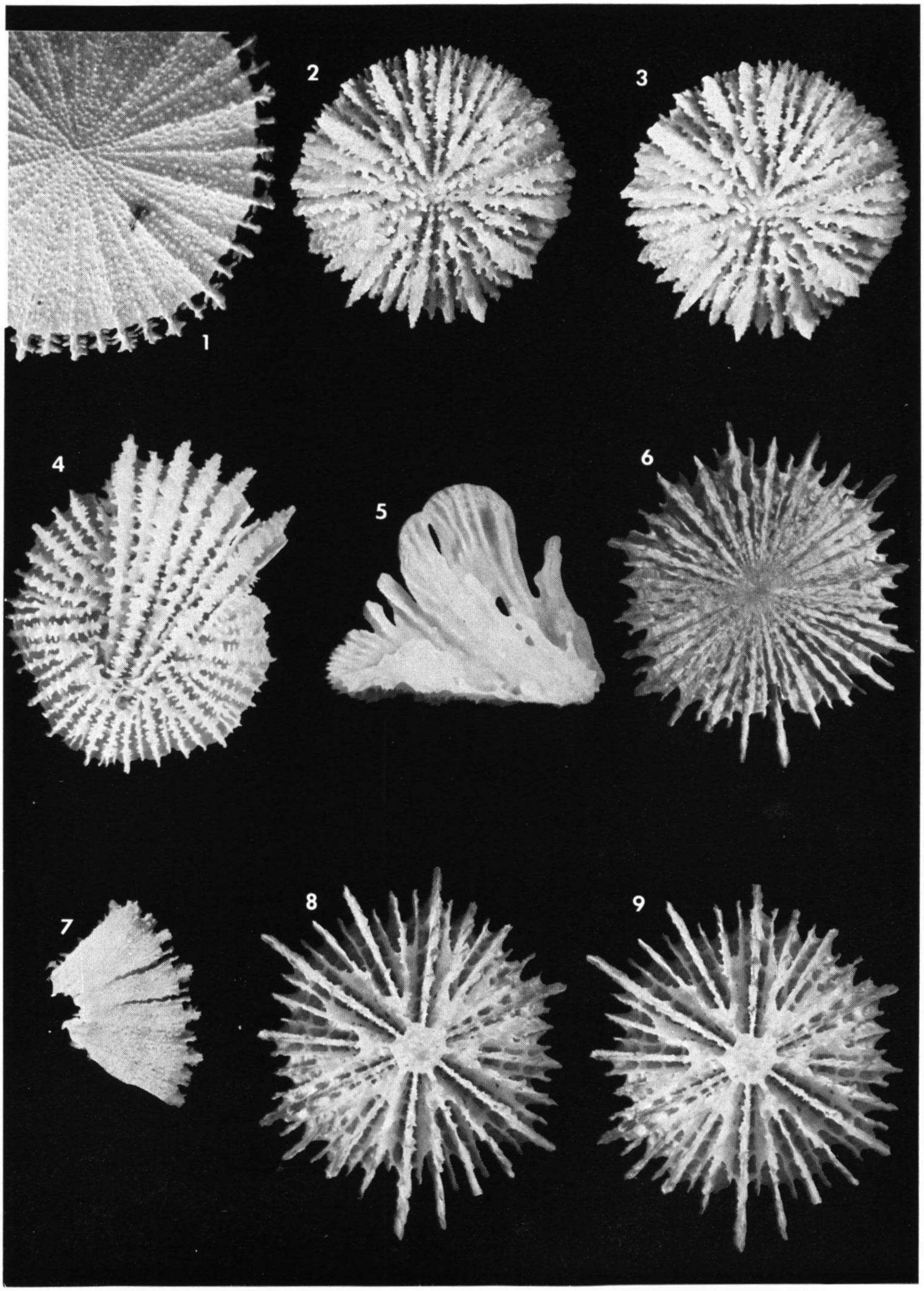

1
2
3
4
5
6
7
8
9

PLATE III

Fig. 1. *Fungiacyathus symmetricus* (Pourtalès). USNM 45827, P-943, × 54, SEM of base at calicular edge.
Fig. 2. *Madrepora oculata* L. USNM 45892, P-747, × 92, SEM of an incipient S_3 flanked by an S_1 and an S_2.
Figs. 3, 8. *Fungiacyathus marenzelleri* (Vaughan). 3. Holotype, USNM (no number), Alb-4721, cd = 23.5 mm; 8. USNM (no number), Alb-4397, cd = 26.0 mm.
Figs. 4–7. *Leptopenus discus* Moseley. 4–5. Syntype, BM 1880.11.25.159, Chall-147, cd = 18.9 mm, stereo pair; 6. Syntype, BM (number unknown), Chall-323, original cd = 28.0 mm, calicular view; 7. Same specimen, base.

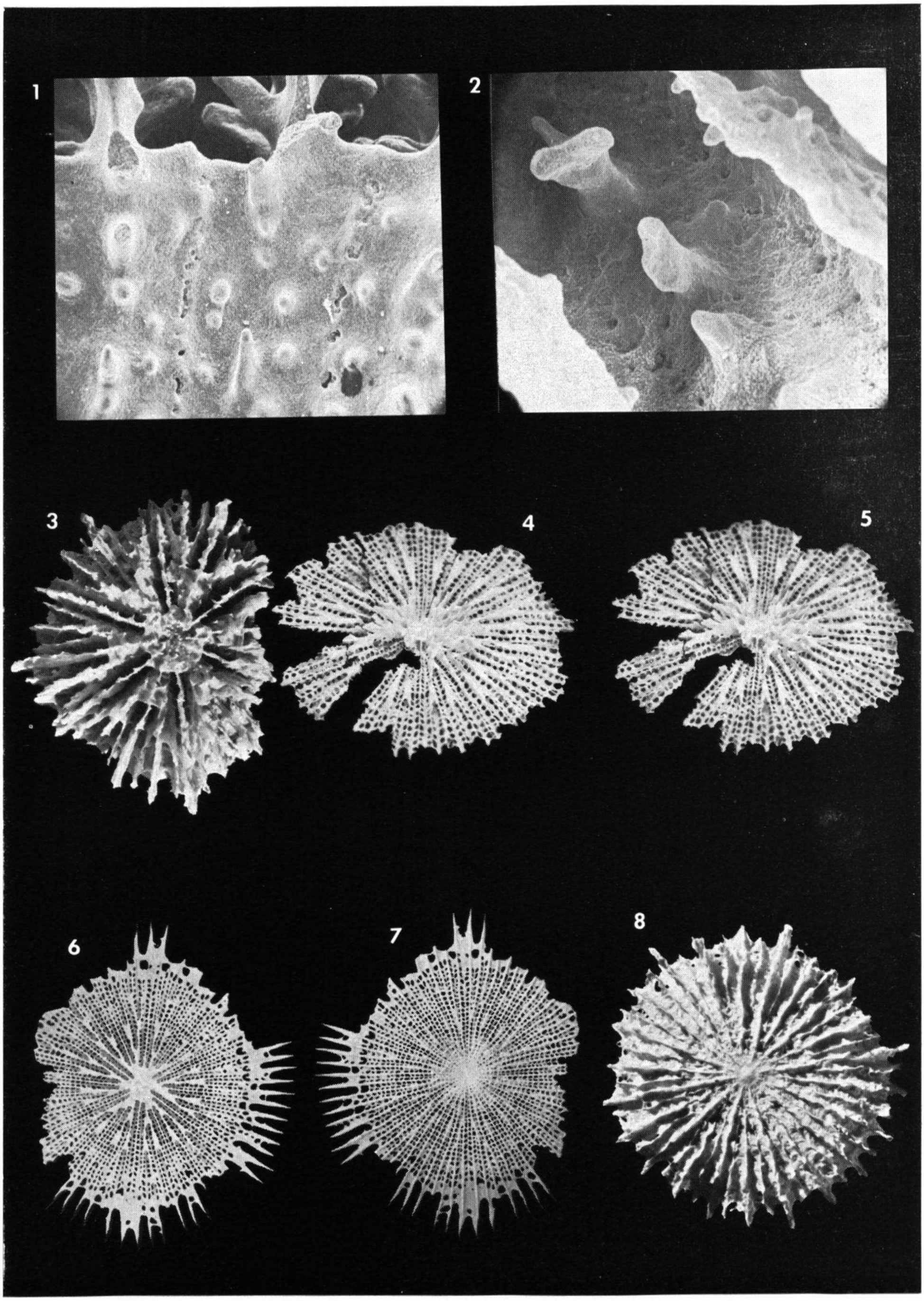

1
2
3
4
5
6
7
8

PLATE IV

Figs. 1–4. *Madrepora carolina* (Pourtalès). 1. USNM 45909, G-692, 36 cm tall; 2. Syntype of *Lophohelia exigua* Pourtalès, MCZ 2778; 3. USNM 45908, G-691, base 25 mm in diameter; 4. Holotype of *Lophohelia carolina* Pourtalès, MCZ 2764, 17.7 cm long.
Fig. 5. *Madrepora oculata* L. USNM 45901, GS(G)-13, 65 mm across.

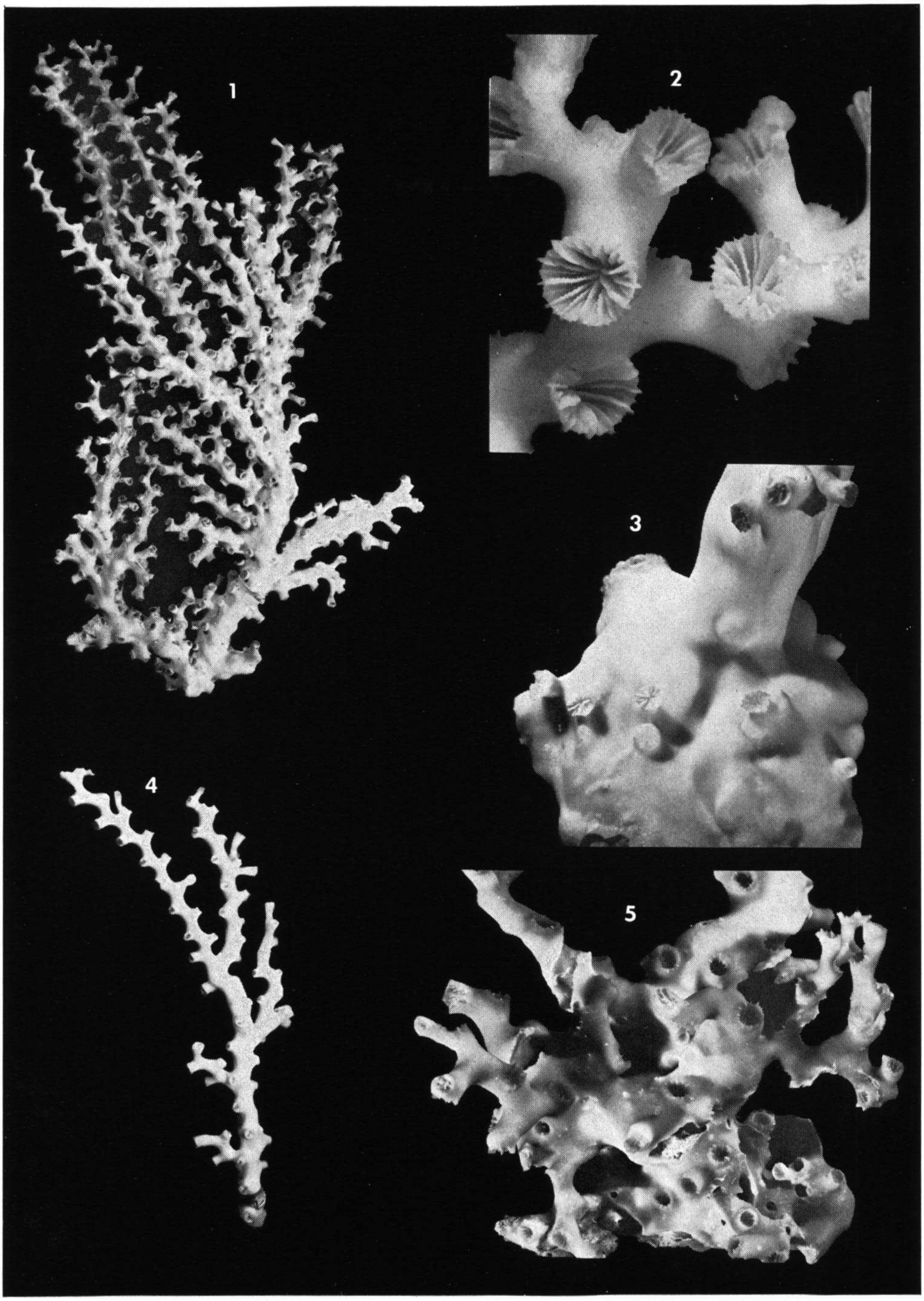

1
2
3
4
5

PLATE V

Figs. 1–3. *Madrepora oculata* L. 1. USNM 45892, P-747, cd = 2.6 mm, SEM; 2. USNM 45878, G-936, cd = 3.6 mm, SEM; 3. Syntype of *Lophohelia candida* Moseley, BM 1880.11.25.95, Chall-23, basal diameter 5.6 mm.
Fig. 4. *Caryophyllia ambrosia caribbeana* n. subsp. Holotype, USNM 45972, P-388 cd = 33.8 mm.
Figs. 5–7. *Anthemiphyllia patera* Pourtalès. 5. USNM 45916, P-861, cd = 12.9 mm; 6–7. Same specimen, stereo pair.
Figs. 8–10. *Caryophyllia antillarum* Pourtalès. 8. MCZ 5477i, BL-157, 12 mm tall; 9–10. Same specimen, cd = 8.6 mm, stereo pair.

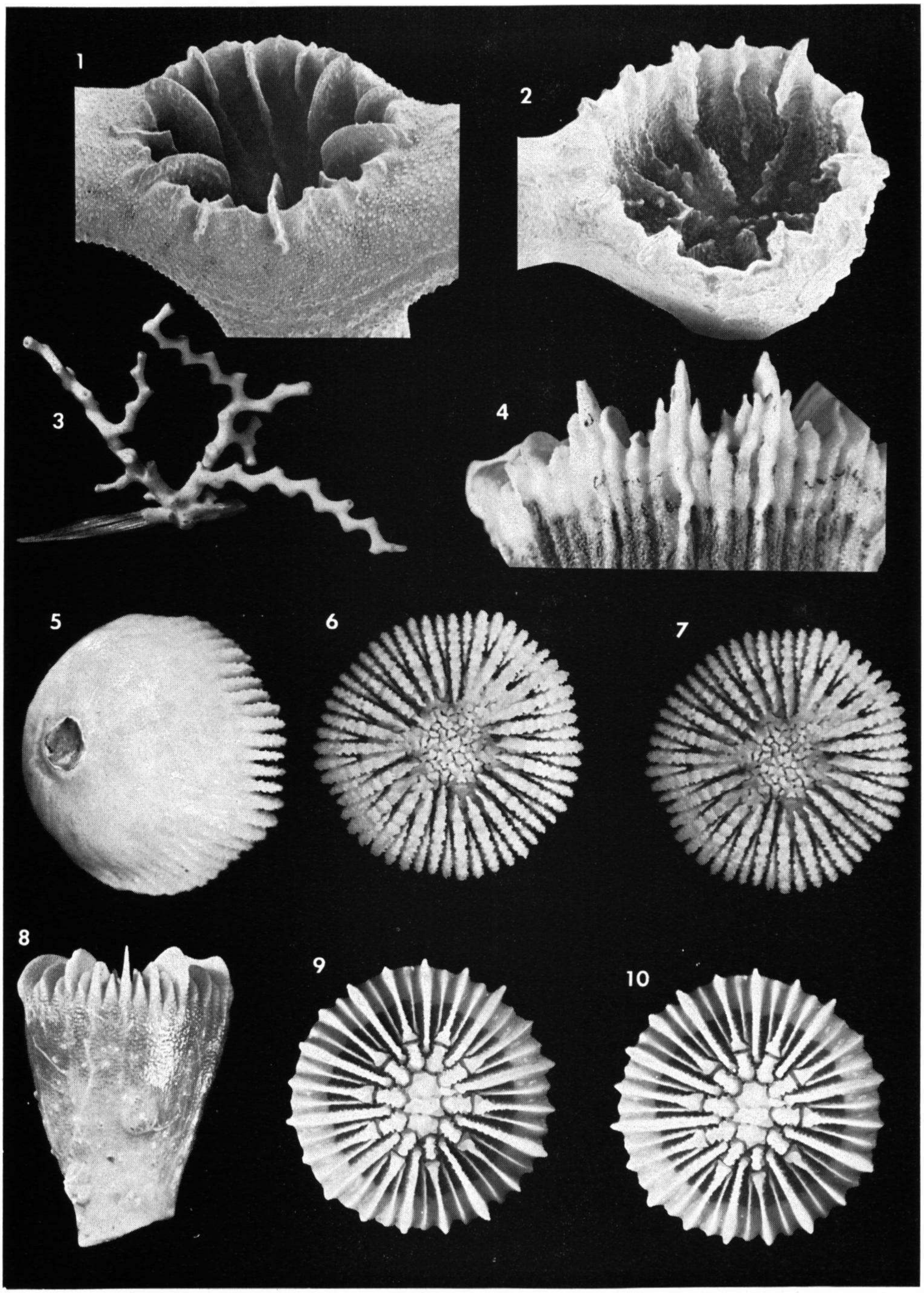

1
2
3
4
5
6
7
8
9
10

PLATE VI

Figs. 1–3, 9. *Caryophyllia ambrosia caribbeana* n. subsp. USNM 45981, P-741, cd = 35.1 mm; 2–3. Holotype, USNM 45972, P-388, cd = 33.8 mm, stereo pair; 9. UMML 8: 349, P-682, close-up of costal granulation.
Figs. 4–8. *Caryophyllia berteriana* Duchassaing. 4, 7. Syntype of *C. formosa* Pourtalès, MCZ 2756, Corwin station, cd = 13.8 × 12.5 mm, 24.4 mm tall; 5–6. USNM 45998, P-209, cd = 16.3 mm, stereo pair; 8. USNM 45995, G-1329, cd = 17.2 mm.

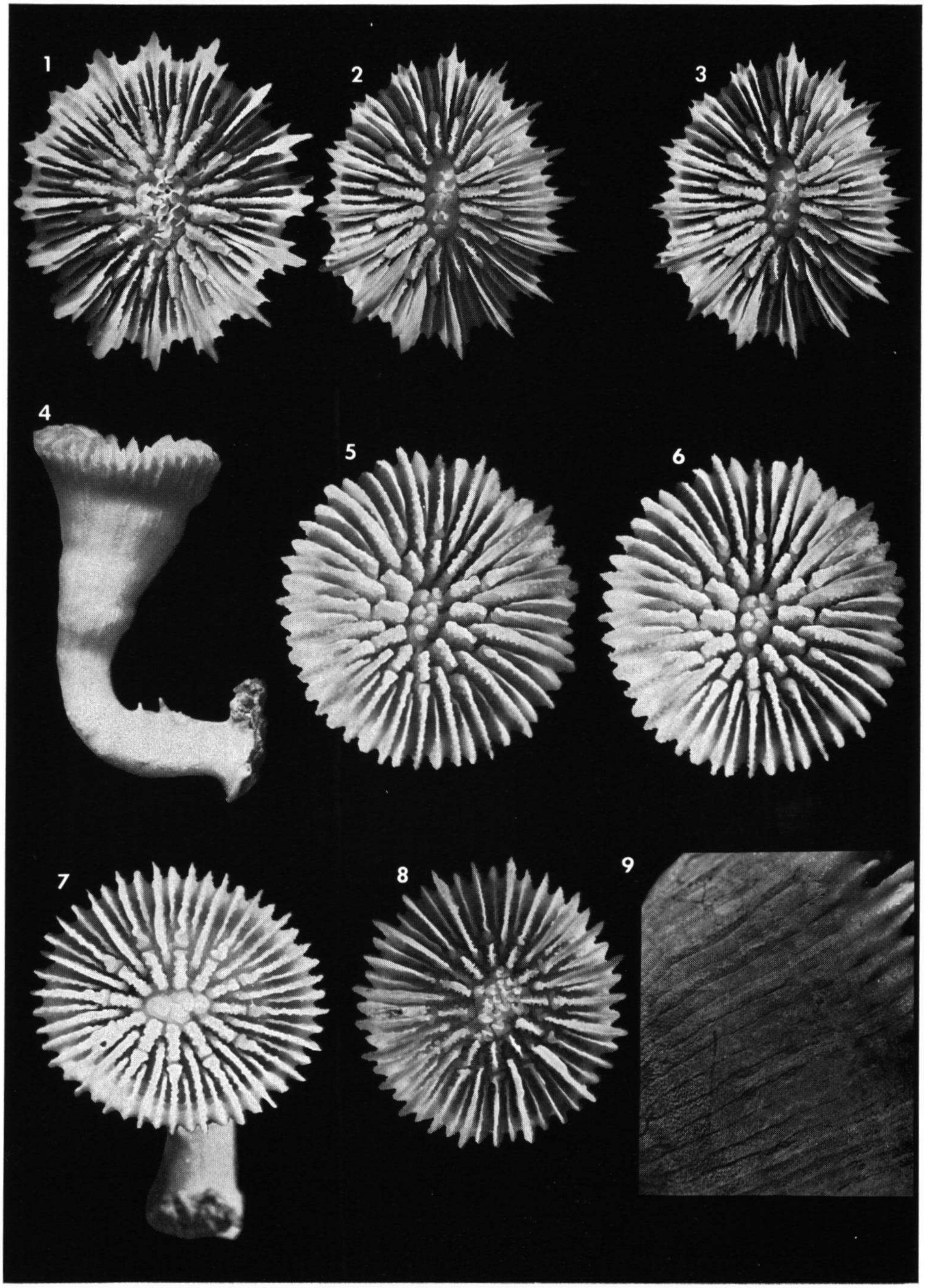

1
2
3
4
5
6
7
8
9

PLATE VII

Fig. 1. *Caryophyllia berteriana* Duchassaing. USNM 45995, G-1329, pedicel diameter 6.4 mm.
Figs. 2–5. *Caryophyllia cornuformis* Pourtalès. 2. USNM 46030, G-299, 15 mm tall; 3. Lindström's (1877) *C. pourtalesi*, NRM (# 101), cd = 5.5 mm; 4. USNM 46029, G-289, cd = 7.5 mm; 5. Syntype of *C. pourtalesi* Duncan, BM 1883. 12.10.22, cd = 6.8 mm.
Figs. 6–9. *Caryophyllia polygona* Pourtalès. 6, 9. Syntype, MCZ 5476, BL-41, cd = 14.1 × 12.2 mm, 20.6 mm tall; 7–8. USNM 46050, P-634, cd = 8.8 mm, 27.2 mm tall.

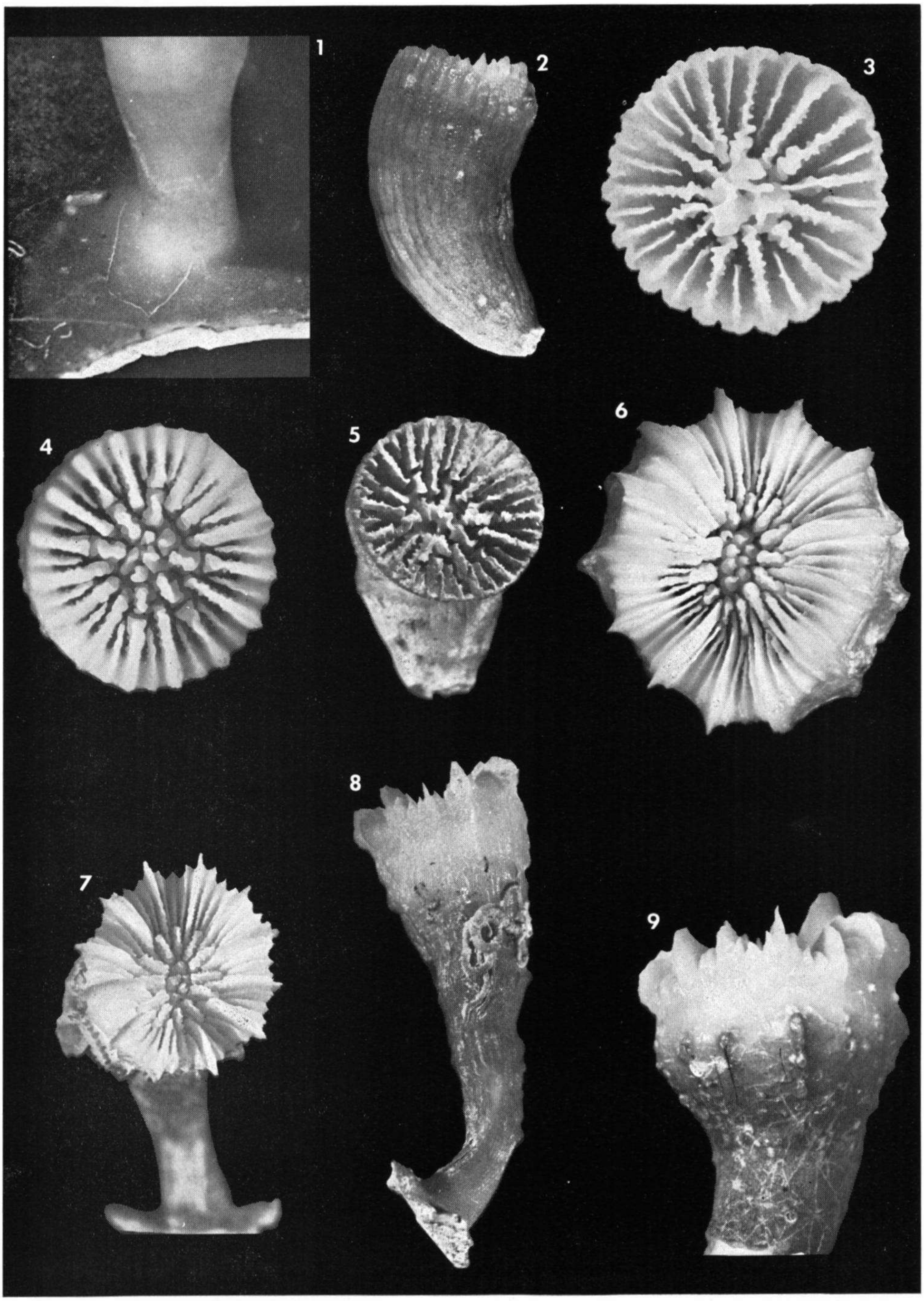

1
2
3
4
5
6
7
8
9

PLATE VIII

Figs. 1–6. *Caryophyllia paucipalata* Moseley. 1. Lectotype, BM 1880.11.25.34, Chall-24, 17.4 mm tall; 2–3. Same specimen, stereo pair; 4. MCZ 5477f, BL-266, 13.9 mm tall; 5–6. BM 1938.3.1.83–91, Rosaura-34, 12.6 mm tall, cd = 11.2 mm.
Figs. 7–9. *Caryophyllia barbadensis* n. sp. 7. Holotype, MCZ 5432, Hassler station off Barbados, 12.9 mm tall; 8–9. Same specimen, cd = 6.0 × 5.5 mm, stereo pair.

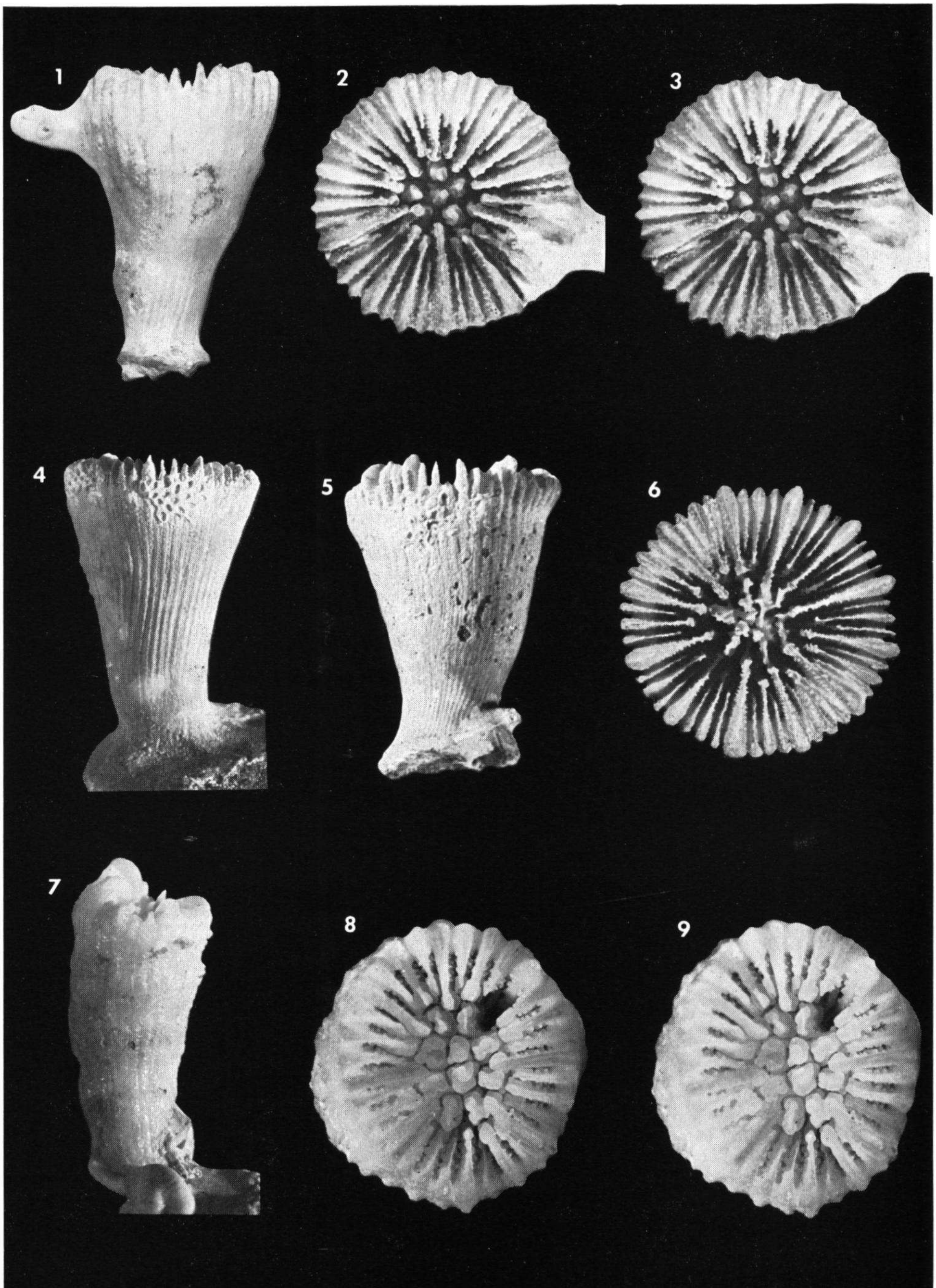

1
2
3
4
5
6
7
8
9

PLATE IX

Fig. 1. *Caryophyllia barbadensis* n. sp. Paratype, MCZ 5477, Hassler station off Barbados, cd = 5.1 mm.
Figs. 2–5. *Caryophyllia corrugata* n. sp. 2–3. Holotype, MCZ (no number), BL-69, cd = 9.0 × 7.8 mm, stereo pair; 4. Paratype, USNM 46859, P-991, cd = 9.8 × 8.6 mm; 5. Paratype, USNM 46860, SB-3494, cd = 6.7 × 5.8 mm.
Figs. 6–8. *Caryophyllia parvula* n. sp. 6, 8. Holotype, USNM 46865, P-1140, cd = 6.1 × 5.0 mm, 5.8 mm tall; 7. Paratype, MCZ (no number), BL-139, cd = 4.9 × 4.7 mm.

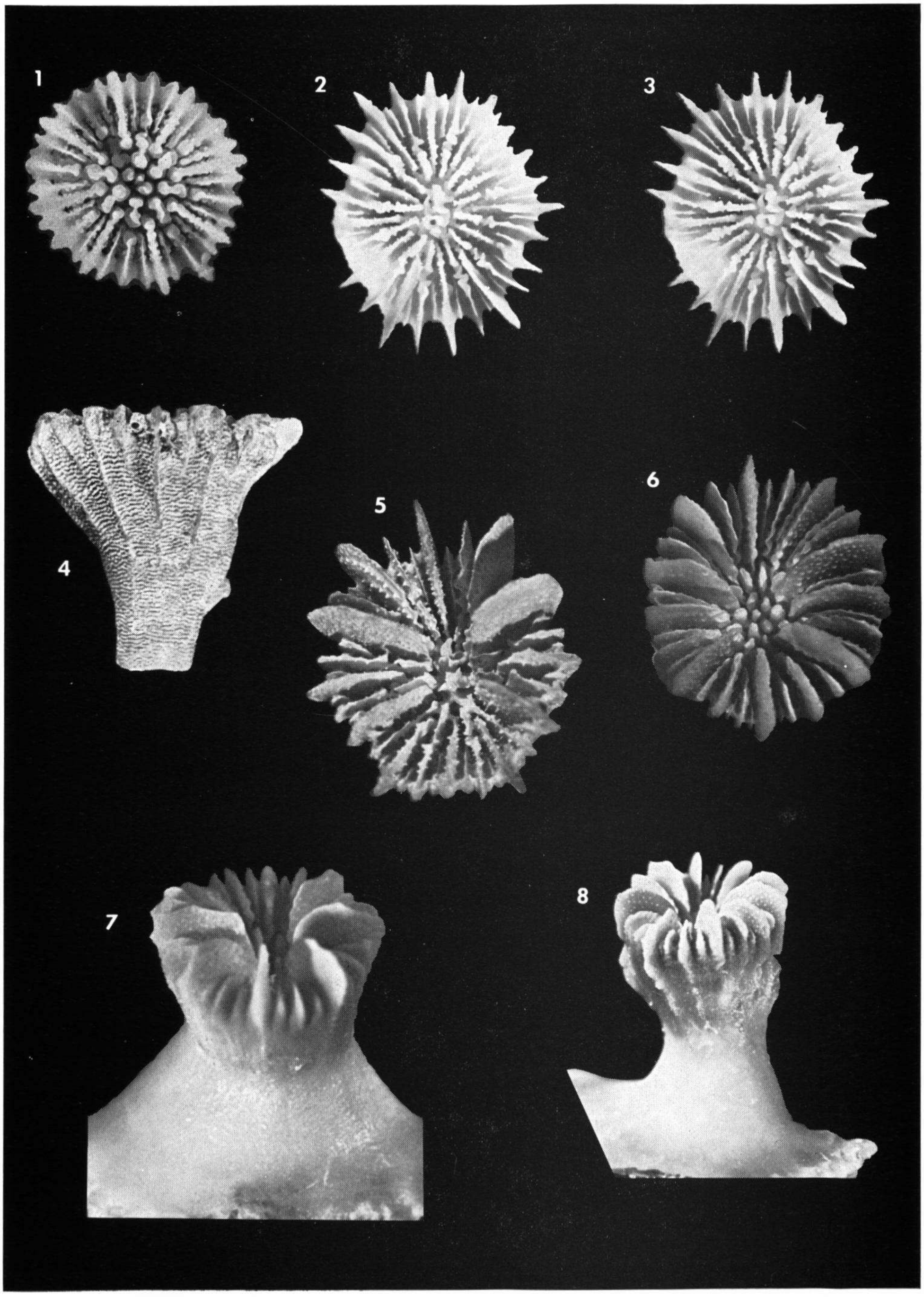

1
2
3
4
5
6
7
8

PLATE X

Figs. 1–4. *Caryophyllia zopyros* n. sp. 1–2. Holotype, MCZ 5577, BL-273, cd = 10.4 mm; 3–4. Same specimen, stereo pair.
Figs. 5–6. *Caryophyllia parvula* n. sp. Holotype, USNM 46865, P-1140, cd = 6.1 × 5.0 mm.
Figs. 7–9. *Oxysmilia rotundifolia* (Milne Edwards & Haime). 7. USNM 46057, G-725, cd = 30.3 mm; 8–9. ?Type, MNHNP, cd = 23.1 × 19.7 mm; 38.0 mm tall.

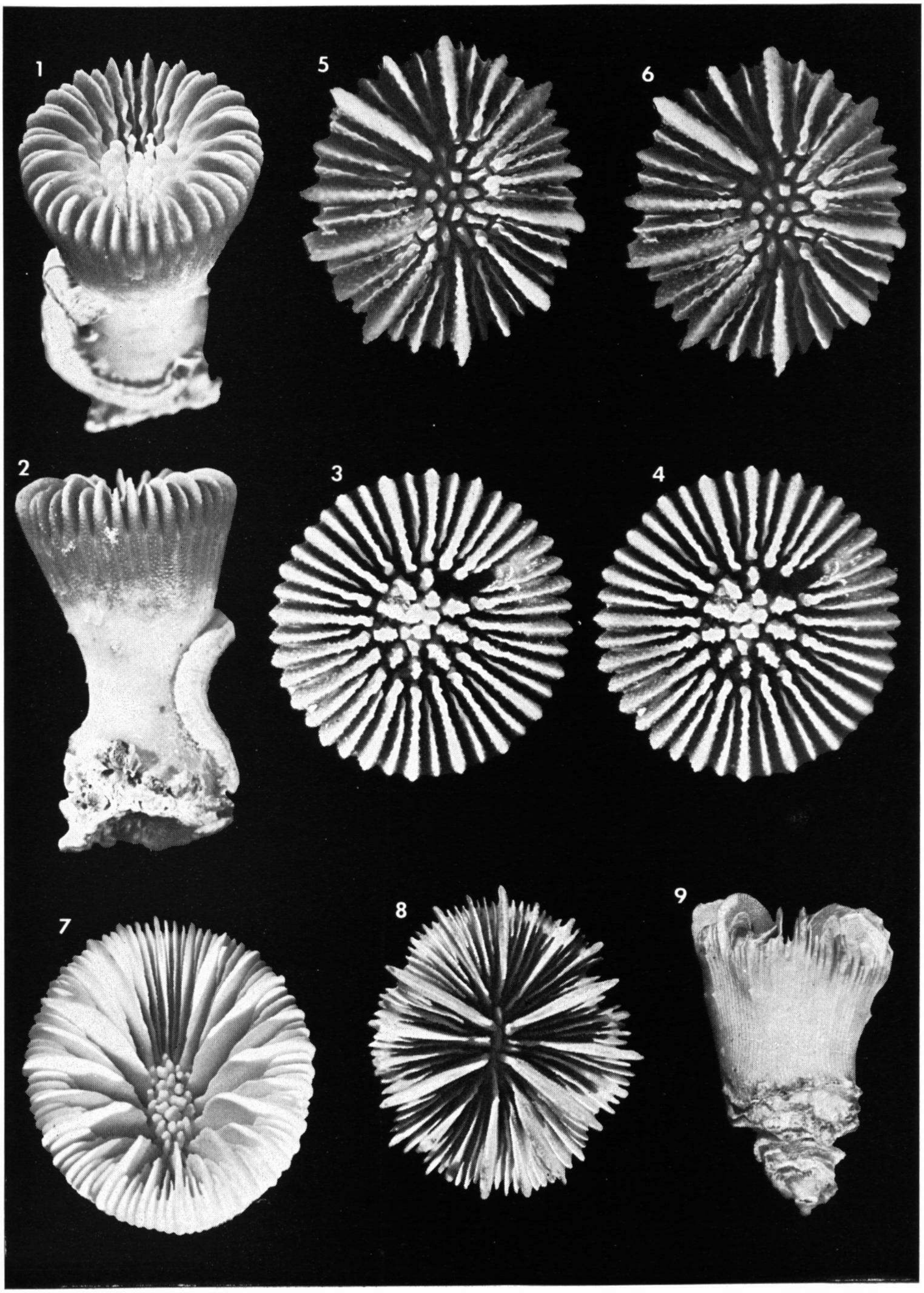

1
5
6
2
3
4
7
8
9

PLATE XI

Figs. 1–4. *Oxysmilia rotundifolia* (Milne Edwards & Haime). 1. BM 1921.11.23.2, off Barbados, 121 m, close-up of columella; 2–3. Holotype of *Desmophyllum incertum* Duchassaing & Michelotti, MIZS 318, off Guadeloupe, cd = 24.1 × 20.0 mm, stereo pair; 4. Holotype of *Parasmilia* ? *punctata* Lindström, NRM 114, off Anguilla, cd = 8.2 × 7.2 mm.
Figs. 5–9. *Cyathoceras squiresi* n. sp. 5. Holotype, USNM 46874, CI-246, 14.5 mm tall; 6. Paratype, USNM 46882, G-44, 12.7 mm tall; 7–8. Holotype, cd = 10.7 mm, stereo pair; 9. Paratype, USNM 46882, G-44, cd = 9.6 mm.
Figs. 10–11. *Labyrinthocyathus* sp. BM (no number), 30°47′S, 30°40′E, 457 m, cd = 9.7 × 9.3 mm.

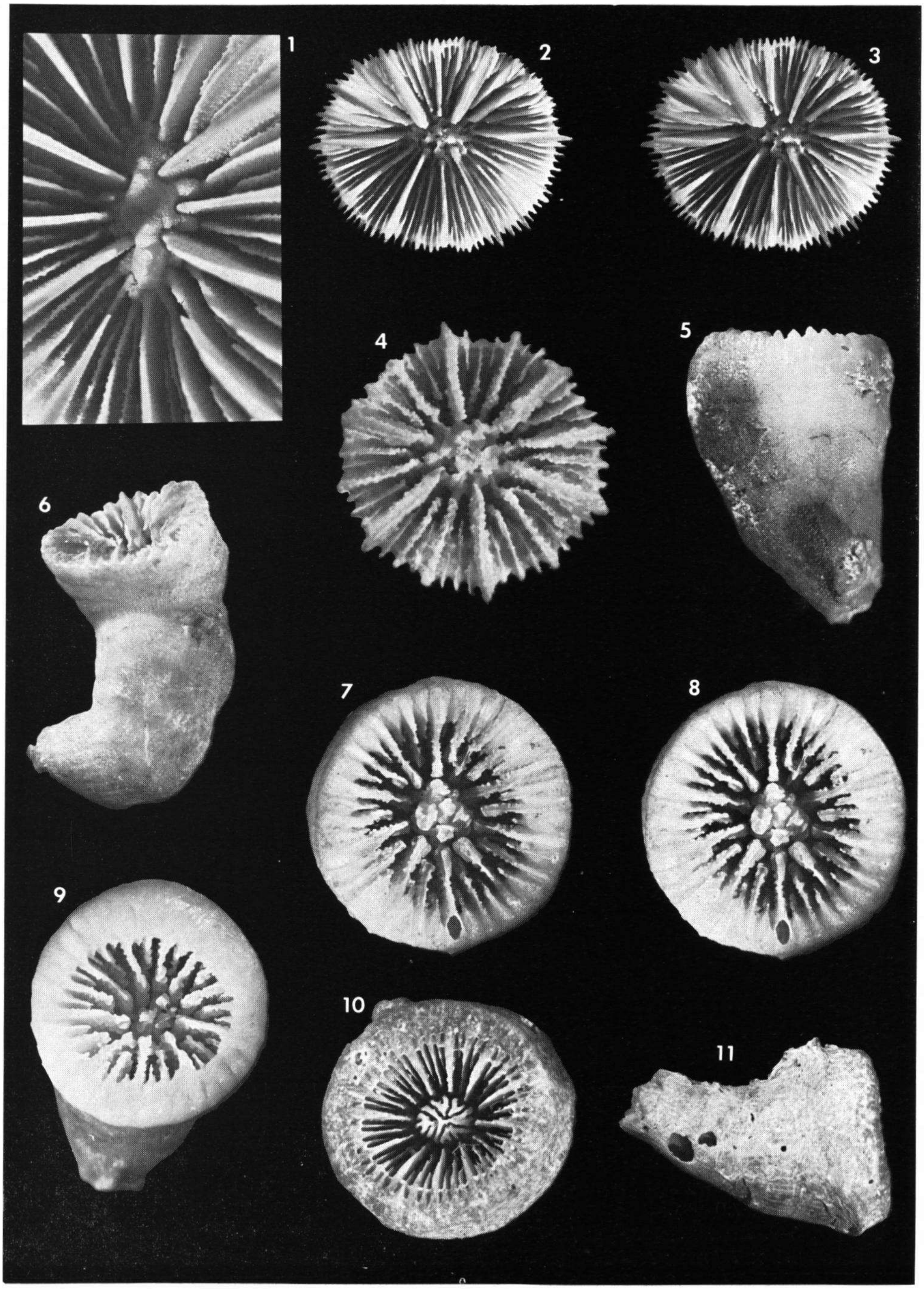

1
2
3
4
5
6
7
8
9
10
11

PLATE XII

Figs. 1, 3. *Cyathoceras cornu* Moseley. Lectotype, BM 1880.11.25.59, Chall-320, cd = 11.2 mm, 22.7 mm tall.
Figs. 2, 4. *Cyathoceras* sp. cf. *C. cornu*. 2. USNM (no number), G-889, cd = 8.1 × 7.3 mm; 4. USNM (no number), G-893, cd = 7.5 × 6.7 mm.
Fig. 5. *Crispatotrochus inornatus* T.-Woods. Holotype, Macleay Museum, Sydney, cd = 8.8 × 7.0 mm.
Figs. 6–9. *Labyrinthocyathus facetus* n. sp. 6. Paratype, USNM 46880, O-11722, cd = 8.1 × 7.7 mm; 7. Holotype, USNM 46879, GS(G)-16, 21.1 mm tall; 8–9. Same specimen, cd = 10.2 × 10.0 mm, stereo pair.

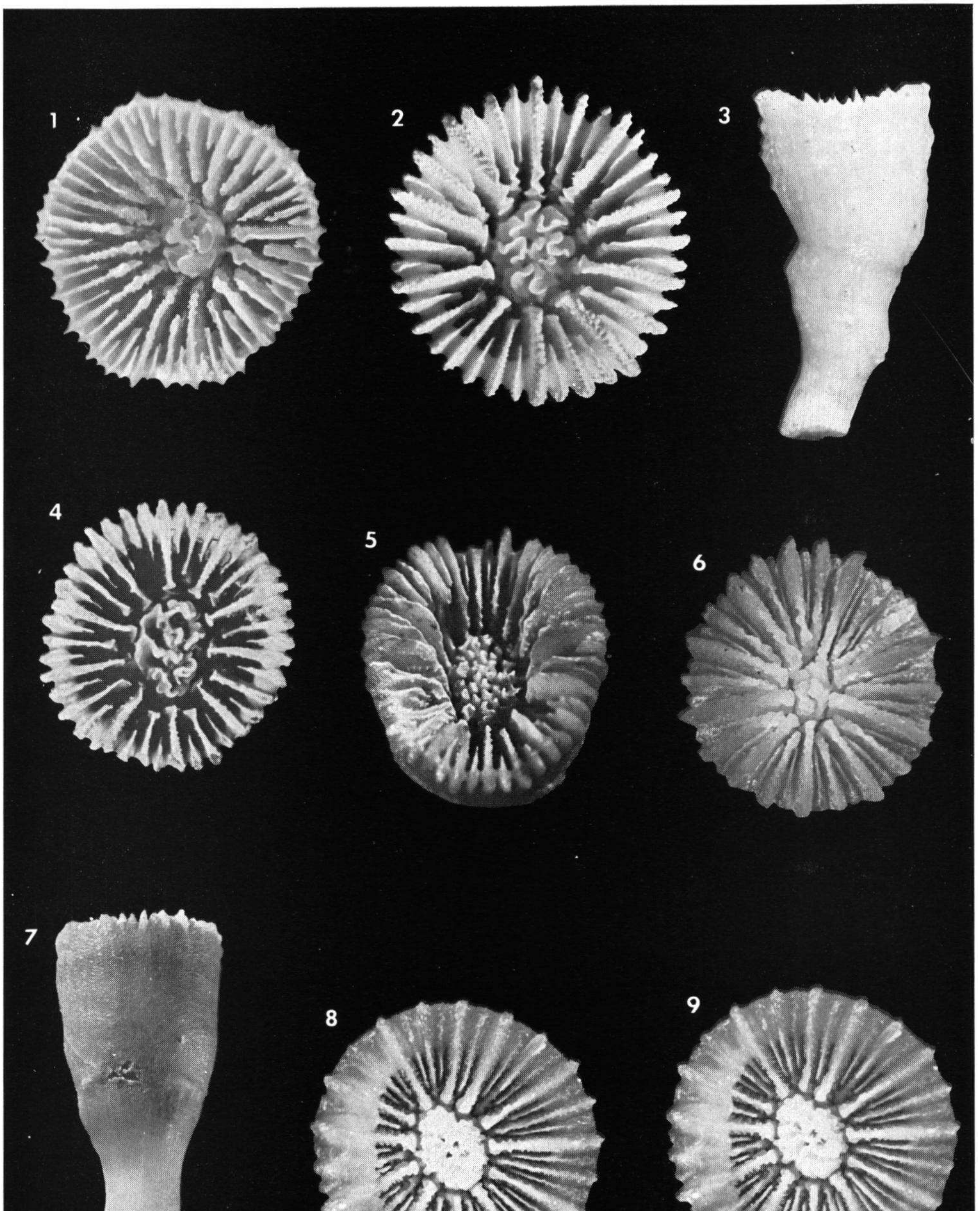

1
2
3
4
5
6
7
8
9

PLATE XIII

Figs. 1–4. *Labyrinthocyathus langi* n. sp. 1. Holotype, USNM 46871, E-26017, 14.6 mm tall; 2–3. Same specimen, cd = 12.0 mm, stereo pair; 4. Paratype, MCZ (no number), Atl-3341, cd of larger calice 9.0 × 7.8 mm.
Figs. 5–7. *Trochocyathus rawsonii* Pourtalès. 5, 7. USNM 46083, G-1036, cd = 25.3 × 22.5 mm; 6. Syntype of *T. rawsonii*, MCZ 2762, Hassler station off Barbados, cd = 10.9 mm.
Figs. 8–11. *Tethocyathus cylindraceus* (Pourtalès). 8. USNM (no number), off Sand Key, Florida, 220 m, 7.0 mm tall; 9. USNM 46070, G-708, cd = 7.6 mm; 10–11. Syntype, MCZ 2763, cd = 9.4 mm, stereo pair.

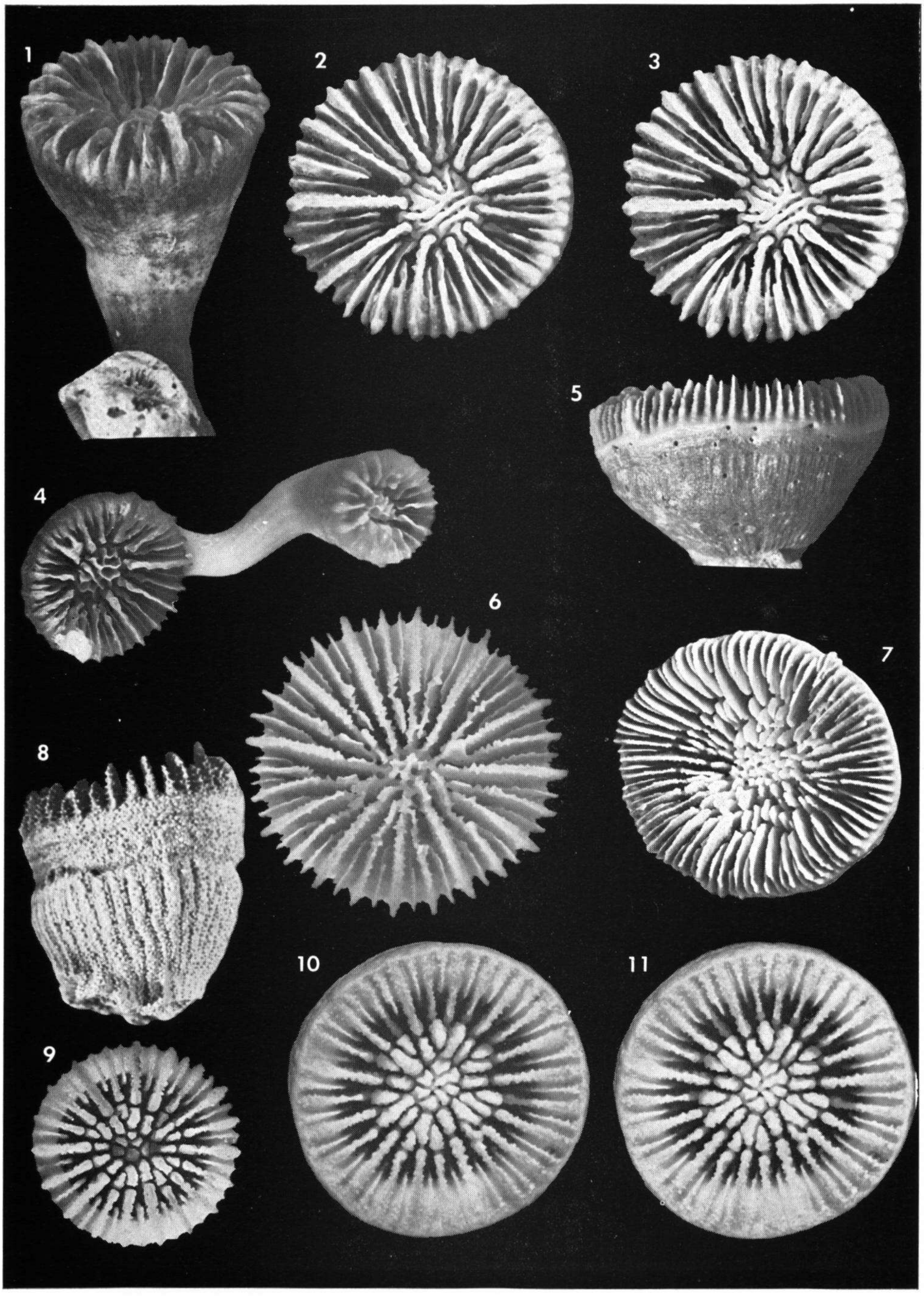

1
2
3
4
5
6
7
8
9
10
11

PLATE XIV

Figs. 1–6. *Trochocyathus rawsonii* Pourtalès. 1. Syntype of *Paracyathus laxus* Pourtalès, MCZ 5482, BL-214, 28.0 mm tall; 2–3. Same specimen, cd = 18.5 mm, stereo pair; 4. Syntype of *T. rawsonii*, MCZ 5627, off west coast of Florida, cd = 13.9 mm; 5–6. Holotype of *Montlivaultia poculum* Pourtalès, MCZ 2759, cd = 22.0 mm, stereo pair.
Figs. 7–9. *Tethocyathus recurvatus* (Pourtalès). 7–8. USNM 46102, G-688, cd = 7.2 mm, stereo pair; 9. Same specimen.
Fig. 10. *Trochocyathus fasciatus* n. sp. Holotype, USNM 16116, Alb-2354, 16.1 mm tall.

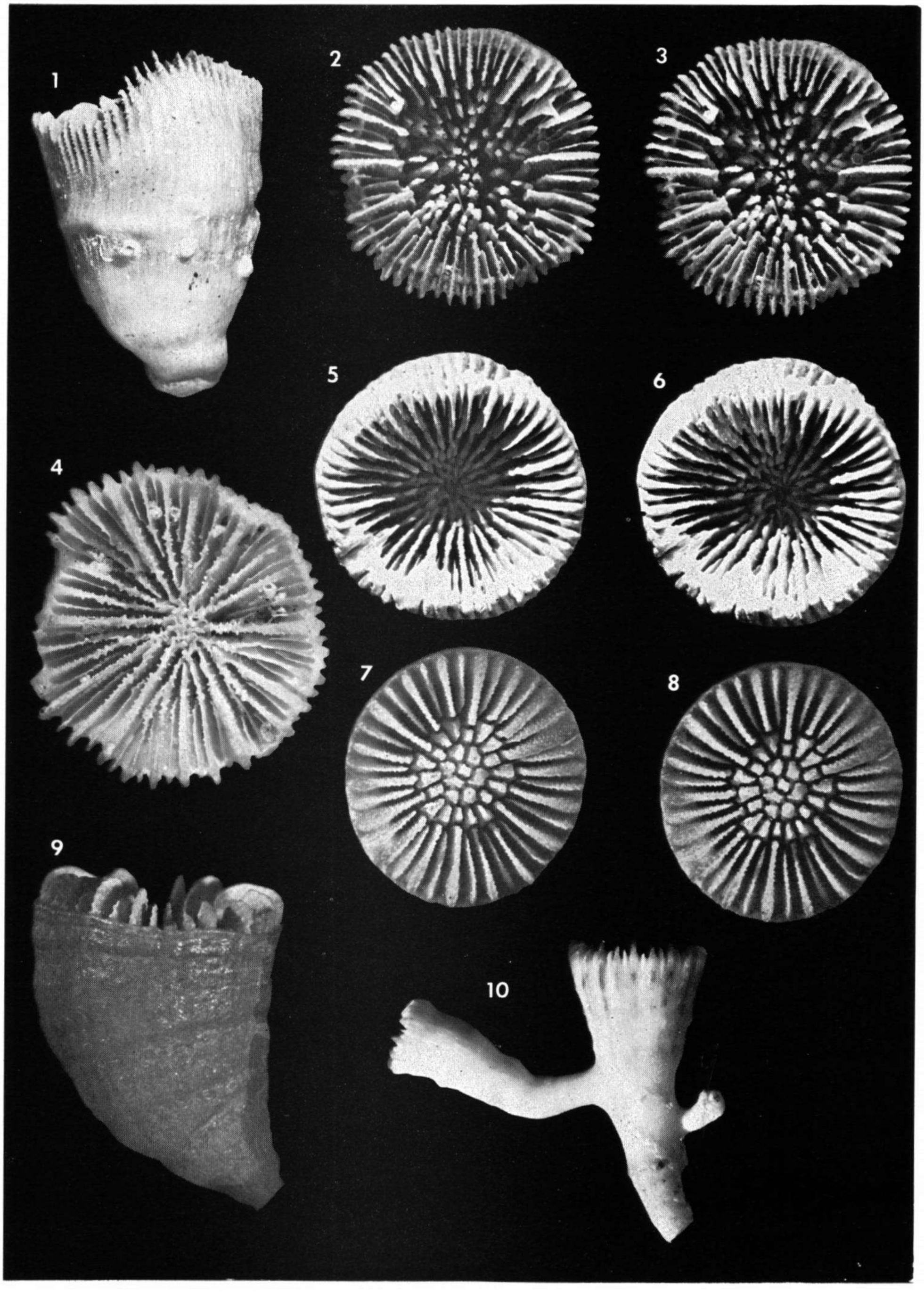

1
2
3
4
5
6
7
8
9
10

PLATE XV

Figs. 1–3. *Trochocyathus fasciatus* n. sp. 1. Paratype, USNM 46913, Alb-2354, cd = 7.7 × 5.8 mm; 2–3. Holotype, USNM 16116, Alb-2354, cd = 7.3 × 6.2 mm, stereo pair.
Figs. 4–6, 11. *Trochocyathus fossulus* n. sp. 4. Paratype, USNM 46882, CI-6, cd = 11.0 × 10.4 mm; 5–6, 11. Holotype, USNM 46881, P-991, cd = 10.2 × 9.7 mm, 16.8 mm tall.
Figs. 7–10. *Tethocyathus variabilis* n. sp. 7. Paratype, USNM 46981, P-861, cd = 8.0 mm; 8. Paratype, USNM 46981, P-861, cd = 7.6 mm; 9. Holotype, USNM 46980, P-861, cd = 7.6 mm, palus-like elements arranged before S_2 and S_3; 10. Paratype, USNM 46982, P-929, cd = 8.0 mm.

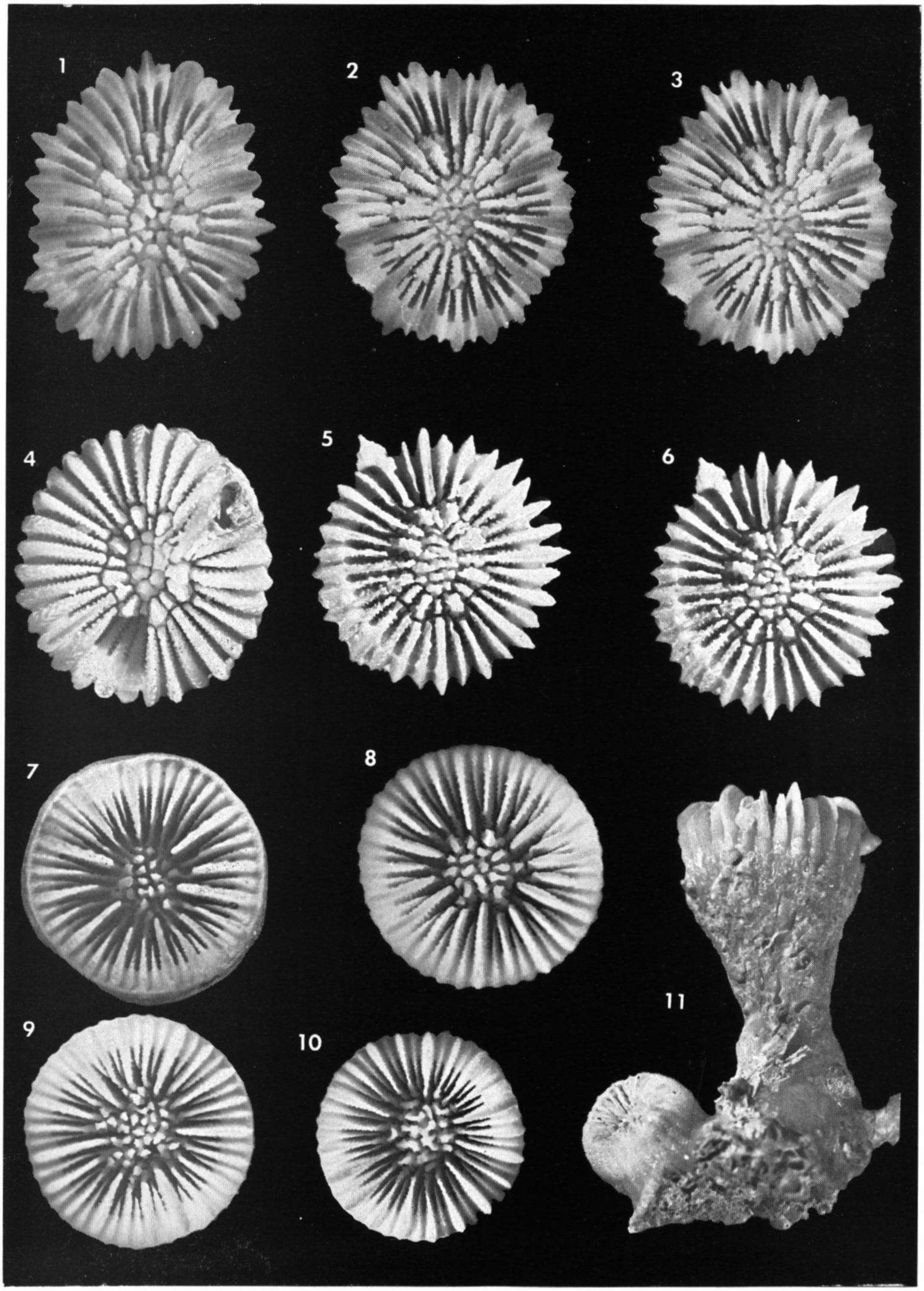

1
2
3
4
5
6
7
8
9
10
11

PLATE XVI

Figs. 1–6. *Paracyathus pulchellus* (Philippi). 1–2. USNM (no number), Faial, Azores, cd = 13.3 mm; 3–4. USNM 46107, G-135, cd = 12.7 mm; 5. USNM 46059, P-707, cd = 10.0 mm, very shallow fossa; 6. USNM 46009, G-577, cd = 8.0 mm.
Figs. 7–12. *Concentrotheca laevigata* (Pourtalès). 7, 12. USNM 46238, G-849, cd = 8.0 mm, cross-section showing polycyclic base; 8. USNM (no number), Combat station off Jacksonville, Florida, 321 m, 10 mm in diameter, young specimen showing four concentric thecal rings; 9. Syntype, MCZ (no number), Bibb-169, cd = 5.8 mm; 10. Syntype, MCZ (no number), Bibb-169, cd = 8.1 mm; 11. Syntype, MCZ 2772, cd = 4.7 mm.

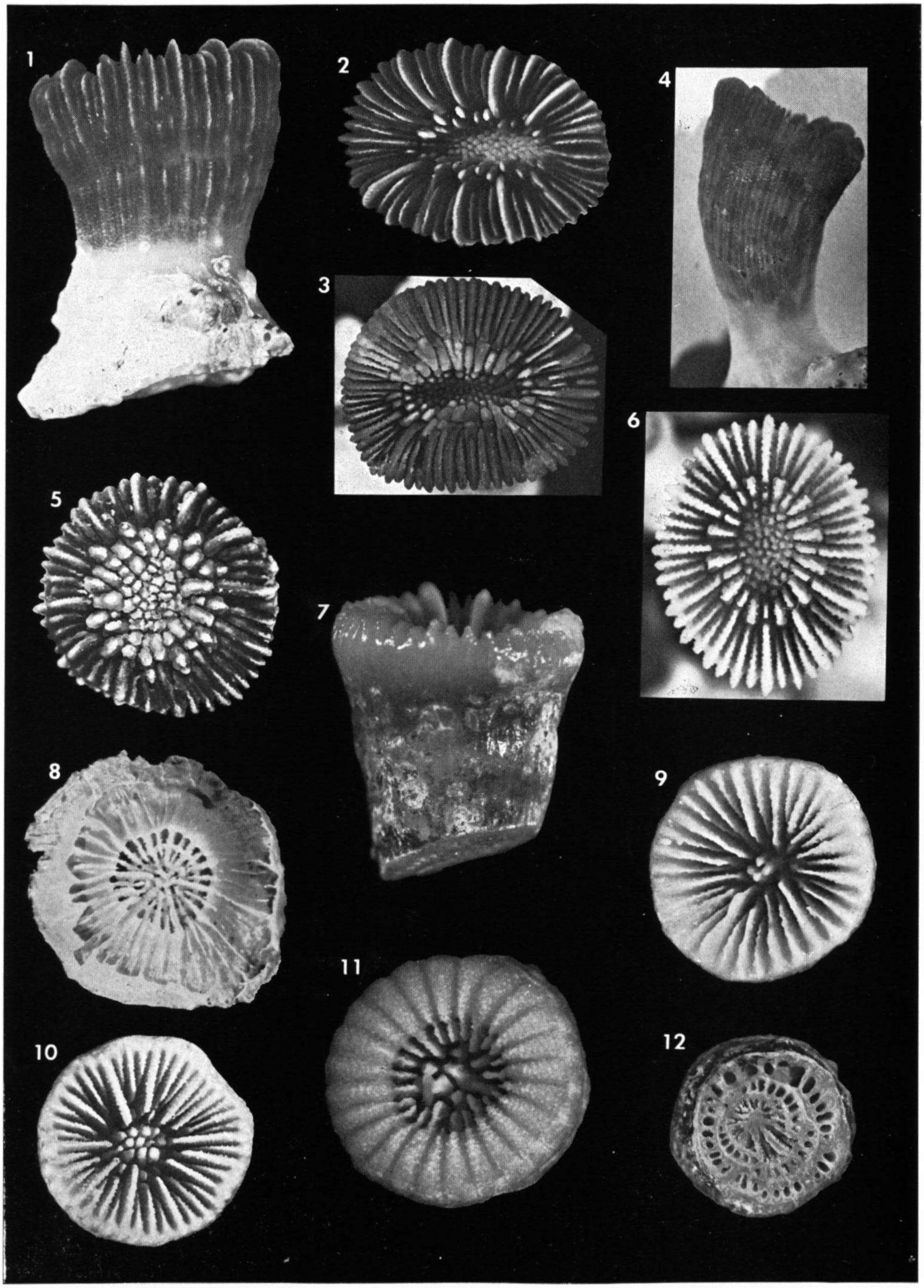

1
2
3
4
5
6
7
8
9
10
11
12

PLATE XVII

Figs. 1–3. *Deltocyathus* sp. cf. *D. italicus* Michelotti. 1. USNM 46183, G-301, cd = 10.6 mm; 2–3. Same specimen, stereo pair.
Figs. 4–6. *Deltocyathus agassizii* Pourtalès. 4. Syntype, MCZ (no number), Corwin-4, cd = 10.8 mm; 5–6. Same specimen, stereo pair.
Figs. 7–10. *Deltocyathus calcar* Pourtalès. 7. USNM 46261, P-874, cd = 13.6 mm; 8. USNM 46252, G-985, cd = 10.9 mm, aberrant five-pointed specimen; 9. USNM 46261, P-874, cd = 12.5 mm; 10. USNM 46283, O-4226, cd = 9.3 mm, specimen coated with NH_4Cl.

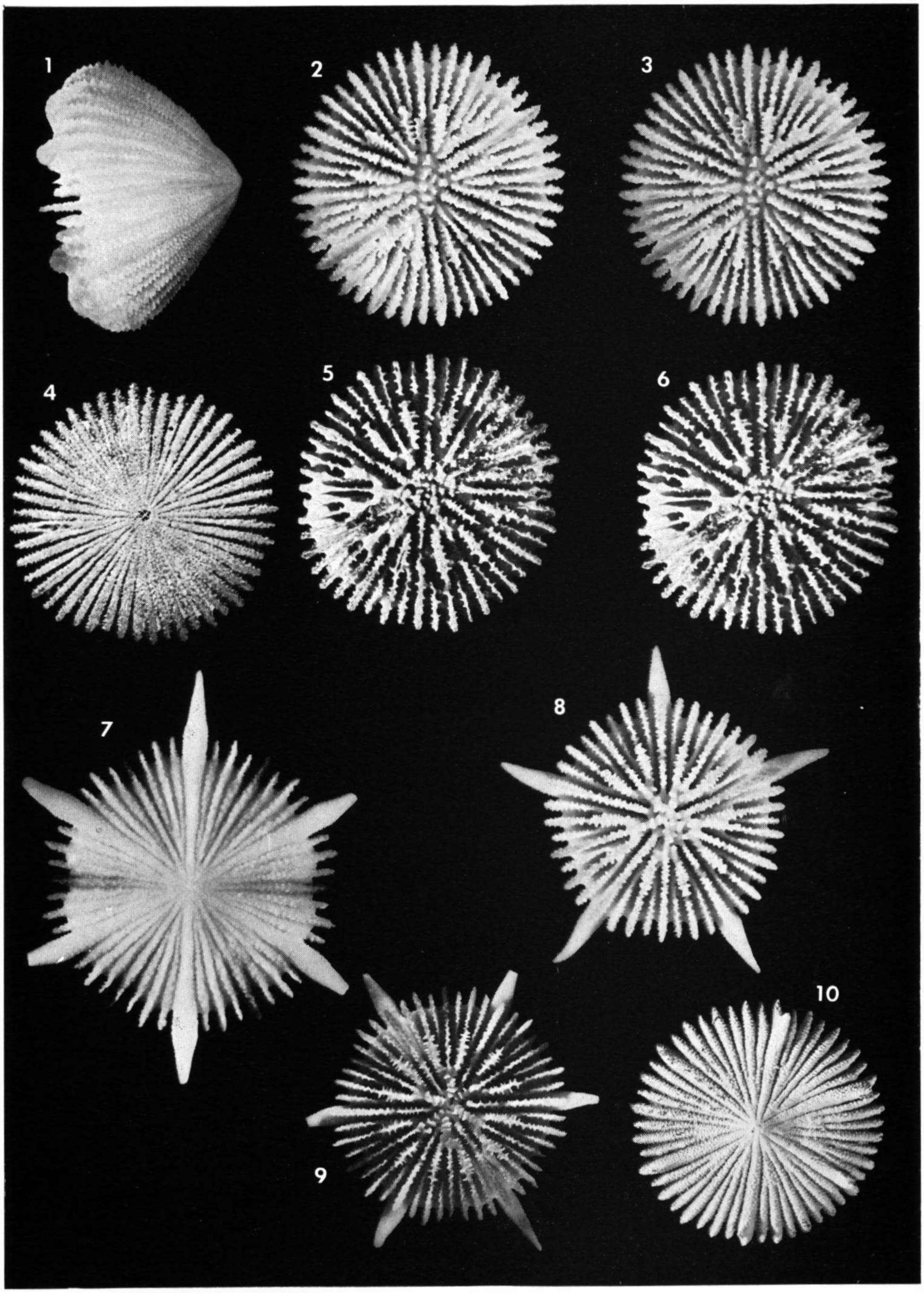

1
2
3
4
5
6
7
8
9
10

PLATE XVIII

Figs. 1–3. *Deltocyathus moseleyi* n. sp. 1. Holotype, USNM 46984, P-876, cd = 11.4 mm; 2–3. Same specimen, stereo pair.
Figs. 4–6. *Deltocyathus pourtalesi* n. sp. 4. Paratype, USNM 46884, P-209, cd = 11.0 mm; 5–6. Same specimen, stereo pair.
Fig. 7. *Deltocyathus calcar* Pourtalès, USNM 46283, O-4226, cd = 12.7 mm.
Figs. 8–11. *Deltocyathus eccentricus* n. sp. 8–9. Holotype USNM 46986, P-881, cd = 14.6 mm, stereo pair; 10. USNM 46430, P-891, cd = 10.7 mm; 11. USNM 46430, P-891 cd = 12.3 mm.

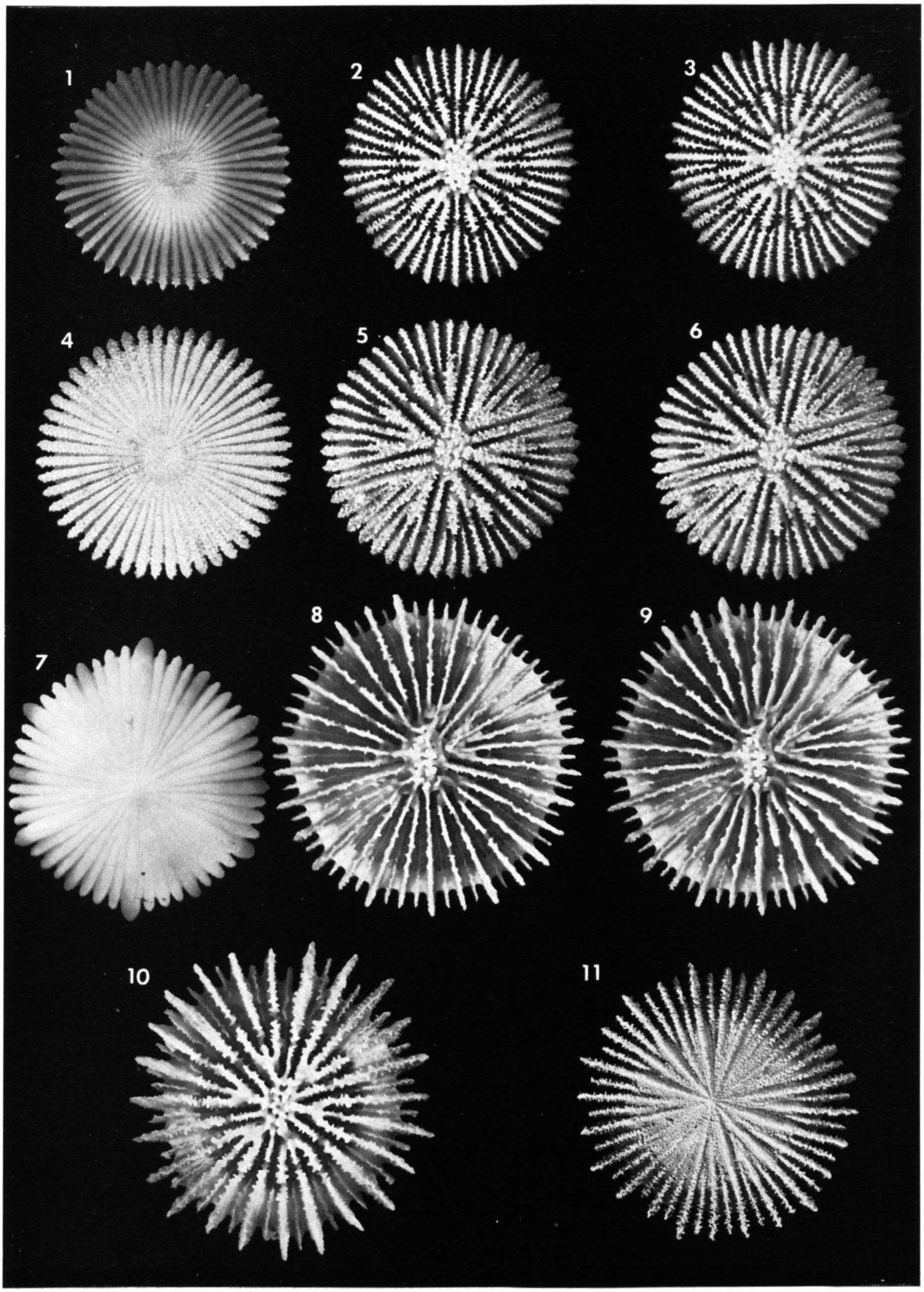

1
2
3
4
5
6
7
8
9
10
11

PLATE XIX

Figs. 1–6. *Stephanocyathus* (*S.*) *diadema* (Moseley). 1. USNM 46325, P-338, cd = 59.5 mm; 2. USNM 46302, G-858, cd = 44.4 mm; 3. Holotype of *Stephanotrochus* (*S.*) *discoides* Moseley, BM 1880.11.25.56, Chall-120, cd = 22.3 mm; 4–5. Same specimen, stereo pair; 6. USNM 46354, CI-376, cd = 21.2 mm (across widest diameter 28.2 mm).
Figs. 7–9, 11. *Stephanocyathus (S.) paliferus* Cairns. 7–8, 11. Holotype, USNM 45755, G-1017, cd = 42.0 mm, stereo pair, base; 9. Paratype, USNM 45757, G-694, cd = 31.7 mm.
Fig. 10. *Stephanocyathus (S.) laevifundus* Cairns. Holotype, USNM 45751, G-293, cd = 38.0 mm.

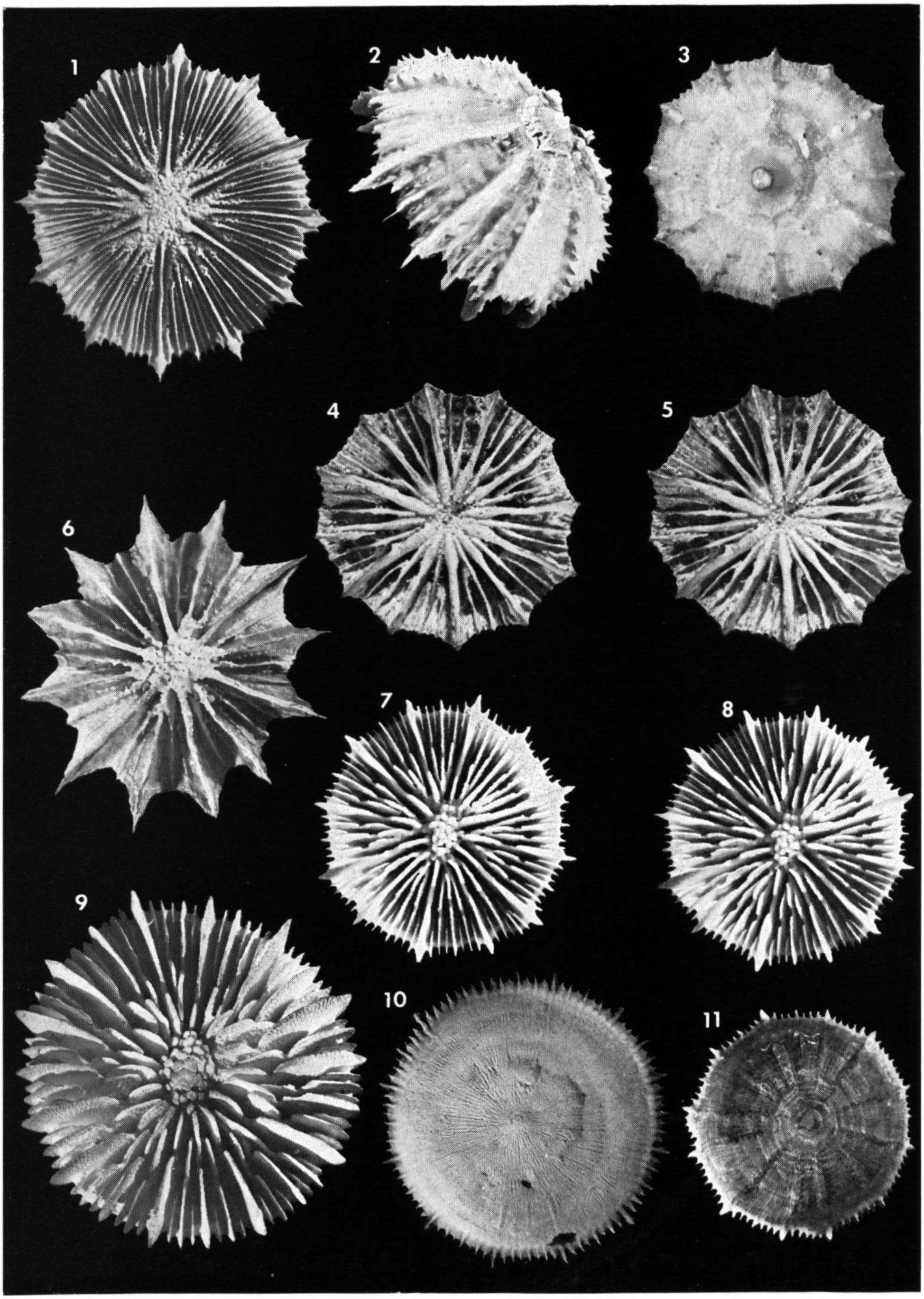

1
2
3
4
5
6
7
8
9
10
11

PLATE XX

Figs. 1–4. *Stephanocyathus* (*S.*) *laevifundus* Cairns. 1, 4. Holotype, USNM 45751, G-293, cd = 38.0 mm; 2–3. Same specimen, stereo pair.
Figs. 5–6, 8–9. *S.* (*Odontocyathus*) *coronatus* (Pourtalès). 5–6. USNM 46472, P-892, cd = 31.4 mm, stereo pair; 8. Same specimen; 9. MCZ (no number), Atl-2992.
Figs. 7, 10. ?*Stephanocyathus* (*O.*) *nobilis* (Moseley). USNM 36442, Alb-2756, cd = 42.1 × 37.5 mm.
Fig. 11. *Peponocyathus stimpsonii* (Pourtalès). Lindström's (1877) *Leptocyathus stimpsonii*, NRM, illustrated specimen (pl. 1, fig. 8).

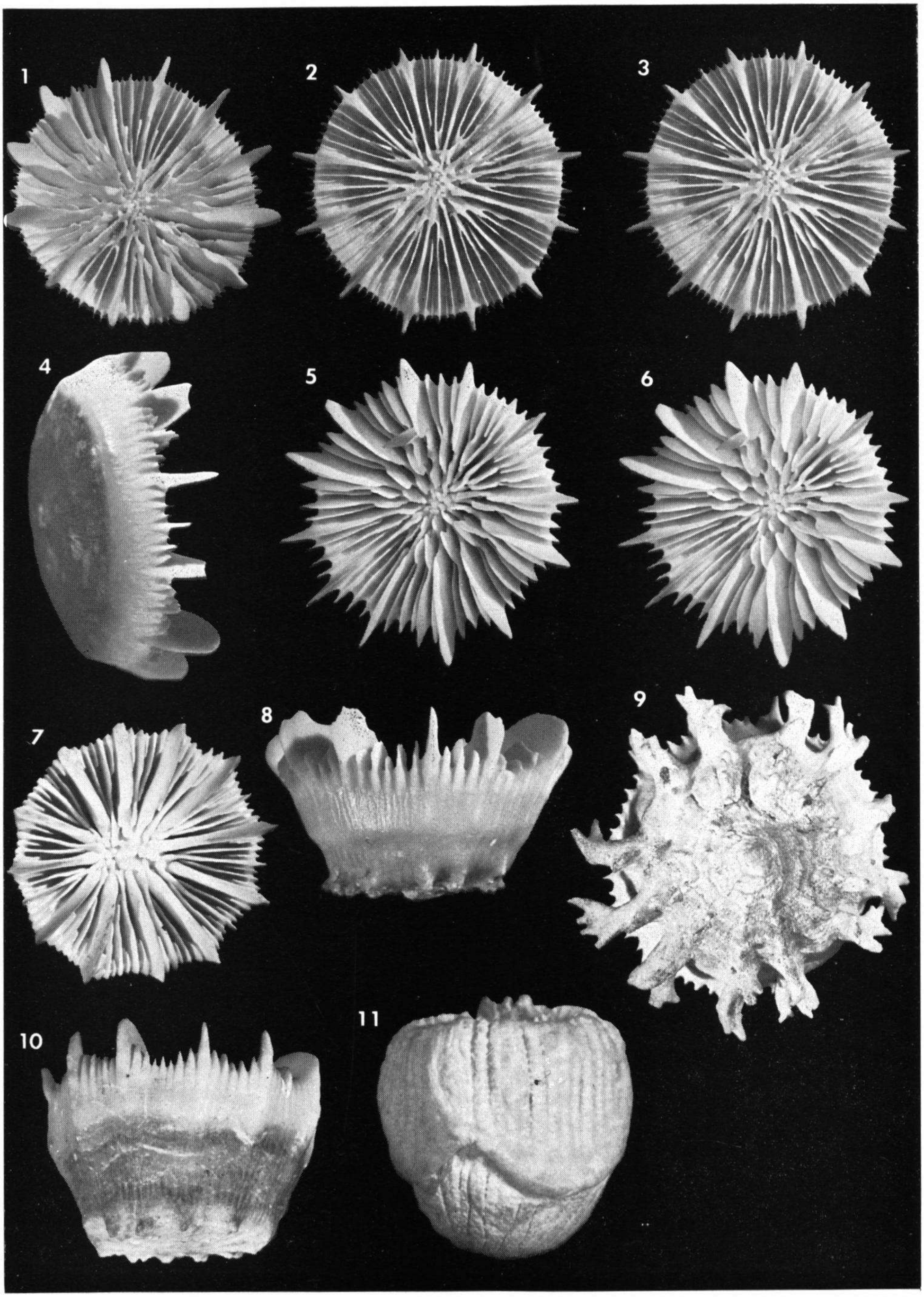

1
2
3
4
5
6
7
8
9
10
11

PLATE XXI

Figs. 1, 3–4, 6. *Trematotrochus corbicula* (Pourtalès). 1, 3. USNM 46477, Atl-2987D, cd = 2 mm, SEM; 4. Same specimen, × 54, SEM of costae; 6. Same specimen, × 270, SEM of thecal pores from inside calice.
Figs. 2, 5. *Trematotrochus fenestratus* (T.-Woods). 2. USNM (no number), topotypic specimen, cd = 2.5 mm, SEM; 5. Same specimen, × 54, SEM of costae.
Figs. 7–8. *Desmophyllum cristagalli* Milne Edwards & Haime. Holotype, MNHNP, Travailleur, cd = 27.2 × 20.2 mm, 39.2 mm tall.

Pl. XXI

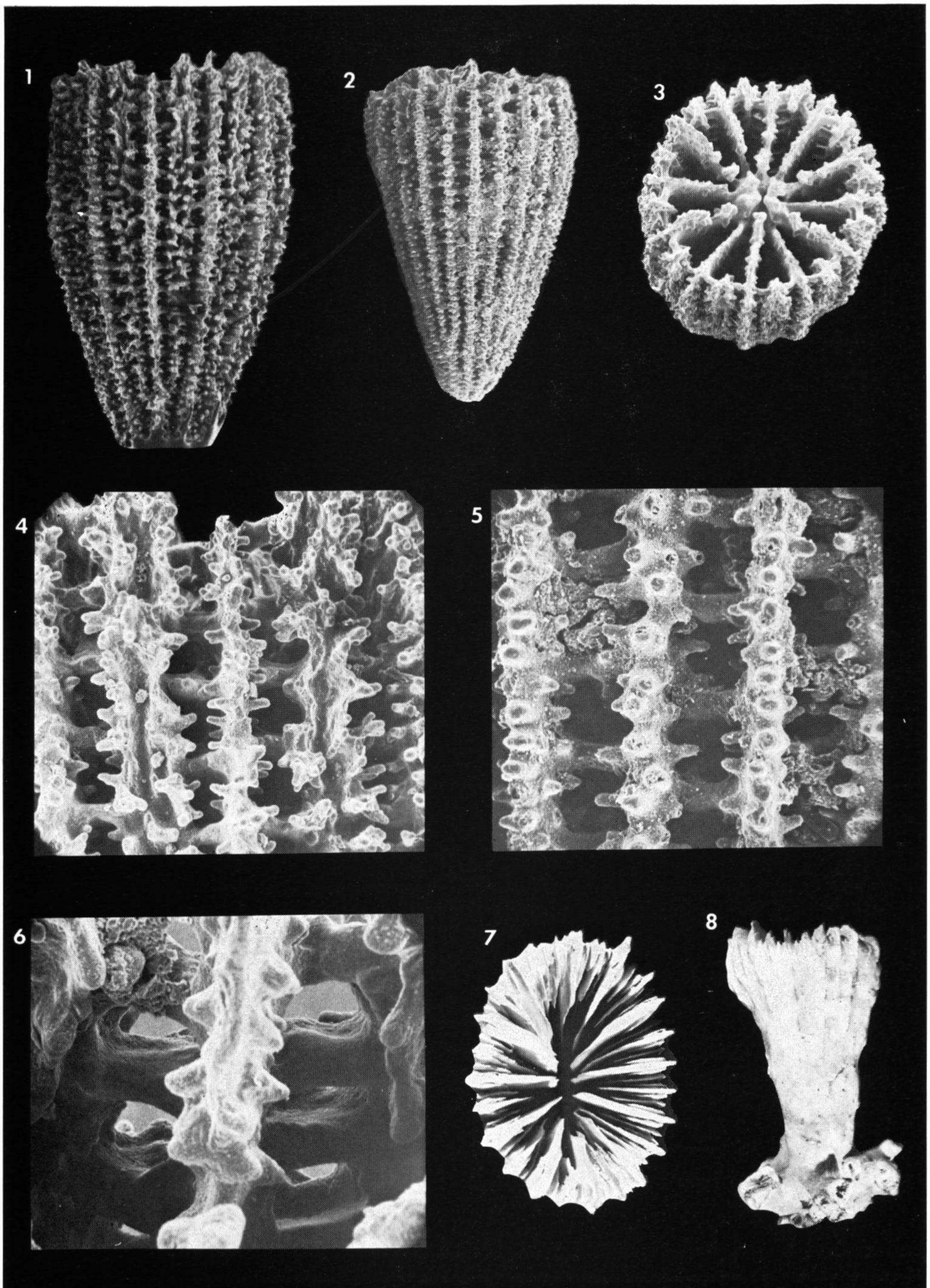


PLATE XXII

Figs. 1–4. *Peponocyathus folliculus* (Pourtalès). 1–2, 4. USNM (no number), Gos-1590, cd = 2.7 mm, 2.7 mm tall, SEM; 3. NMC (no number), Hudson-4B, cd = 3.0 mm.
Figs. 5–7. *Peponocyathus stimpsonii* (Pourtalès). 5–6. USNM (no number), O-4226, cd = 4.0 mm, SEM; 7. Syntype of *Leptocyathus stimpsonii* Pourtalès, MCZ 5572, Bibb-201, cd = 7.1 mm.
Fig. 8. *Desmophyllum cristagalli* Milne Edwards & Haime. USNM 46485, unknown CI station in Tongue of the Ocean, Bahamas, cd = 43.5 × 34.8 mm.
Fig. 9. *Desmophyllum striatum* n. sp. Holotype, USNM 46886, CI-6, 8.7 mm tall.

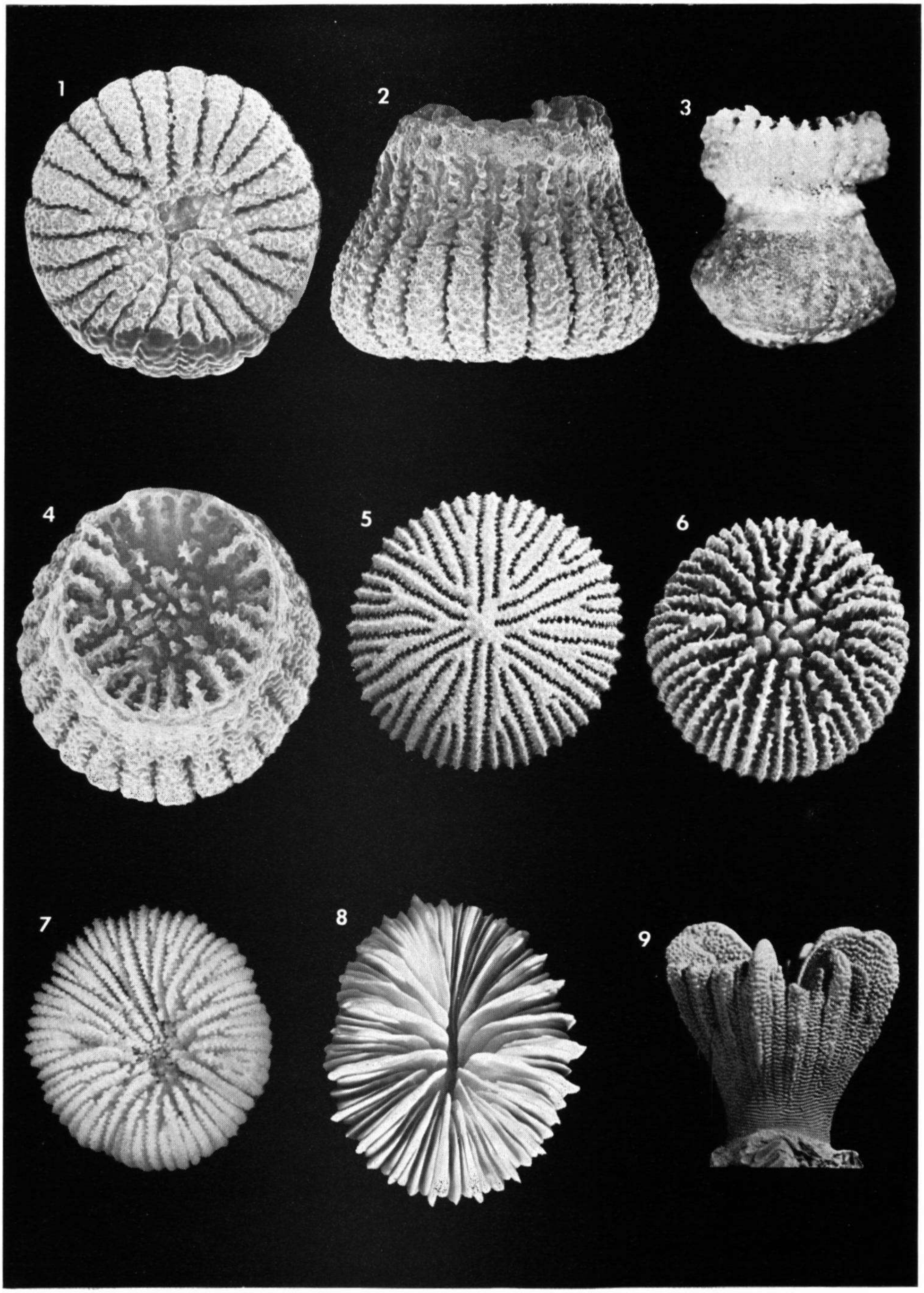

1
2
3
4
5
6
7
8
9

PLATE XXIII

Figs. 1, 4–6, 9–10. *Thalamophyllia riisei* (Duchassaing & Michelotti). 1, 6. USNM 46495, Cardiff Hall, Jamaica, 39 m, cd = 9.4 × 7.4 mm, 10.9 mm tall; 4. USNM (no number), Cardiff Hall, Jamaica, 36 m, cd = 8.8 mm, "*solidum*" form; 5, 9. Holotype of *Desmophyllum simplex* Verrill, YPM 3862; 10. Holotype of *Desmophyllum solidum* Pourtalès, MCZ 2760, Bibb-141, cd = 7.8 × 6.8 mm.
Figs. 2–3. *Desmophyllum striatum* n. sp. Holotype, USNM 46886, CI-6, cd = 9.7 × 8.7 mm, stereo pair.
Figs. 7–8, 11. *Thalamophyllia gombergi* n. sp. 7–8. Holotype, USNM 46890, GS(G)-25, cd = 7.0 × 6.8 mm, stereo pair; 11. Holotypic colony, 10.8 mm tall.

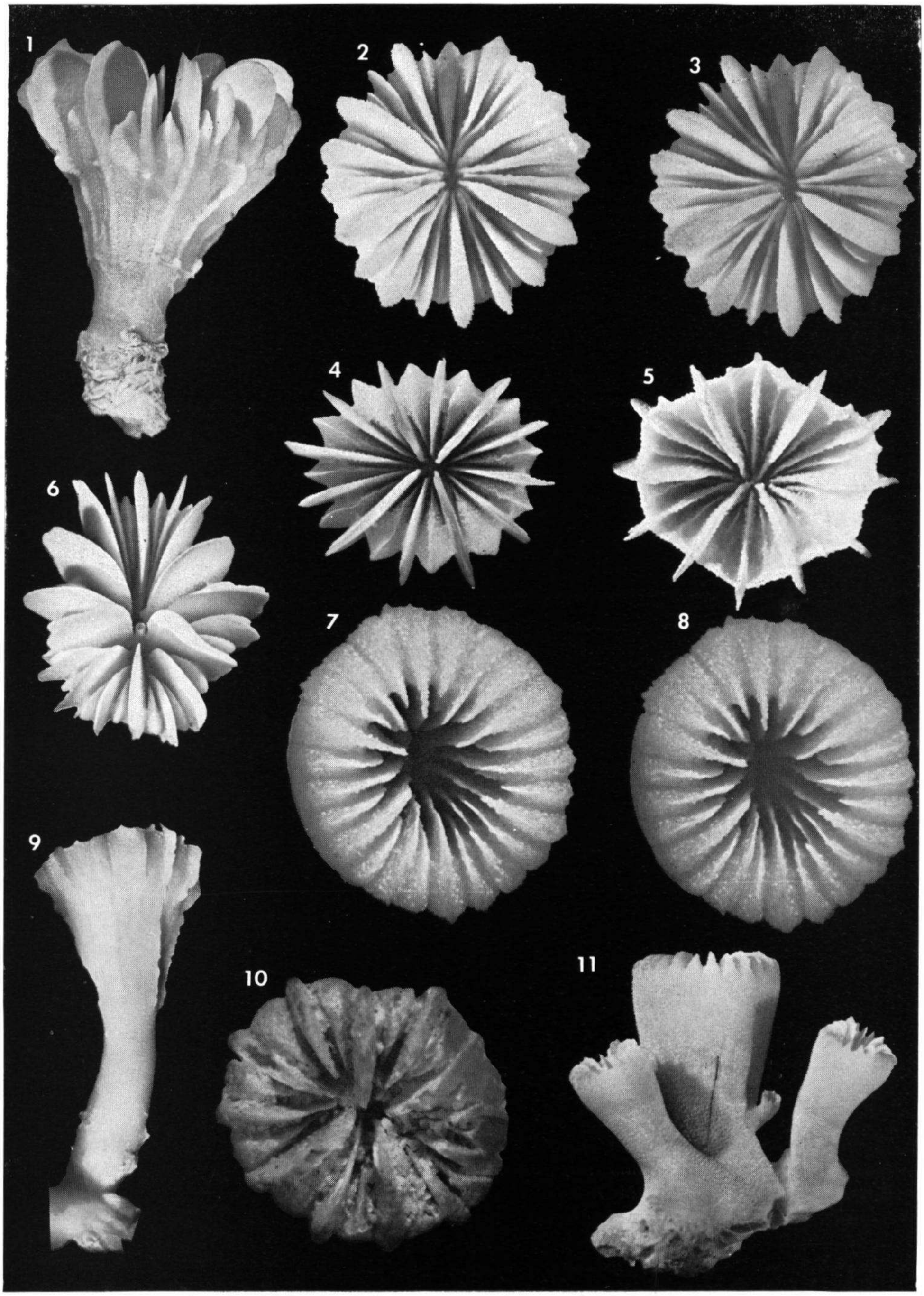

1
2
3
4
5
6
7
8
9
10
11

PLATE XXIV

Figs. 1–5. *Lophelia prolifera* (Pallas). 1, 3. USNM 46013, G-170, cd = 10.5 mm, "*brachycephala*" form; 2. USNM 46026, E-28028, large calice 18.0 mm in diameter; 4. USNM 46013, G-170, 53.5 mm long, "*gracilis*" form; 5. USNM 46009, G-177, 83.3 mm long.
Figs. 6–8. *Anomocora fecunda* (Pourtalès). USNM 46499, P-199, 87.3 mm long, cd = 10.0 mm.
Figs. 9–11. *Coenosmilia arbuscula* Pourtalès. 9, 11. MCZ (no number), Blake station off Havana, 443 m, cd = 17 mm; 10. MCZ (no number), BL-134.


1
2
3
4
5
6
7
8
9
10
11

PLATE XXV

Figs. 1–3, 8–9. *Dasmosmilia lymani* (Pourtalès). 1. USNM 11021, Alb-2422, 39.7 mm long, broken corallum showing dissepiments and paliform lobes; 2–3. USNM 46564, G-866, cd = 14.3 mm, stereo pair; 8. USNM 46561, G-19, 8.2 mm long fragment with three buds; 9. USNM 46564, G-866, 46.6 mm long.
Figs. 4–7, 10. *Dasmosmilia variegata* (Pourtalès). 4. Syntype of *Parasmilia variegata* Pourtalès, MCZ 5624, 15.9 mm tall; 5–6. MCZ 5575, BL-254, cd = 16.4 × 12.0 mm, stereo pair; 7. MCZ 5575, BL-254, 22.2 mm long section; 10. MCZ 5575, BL-254, 23.4 mm long fragment showing paliform lobes.

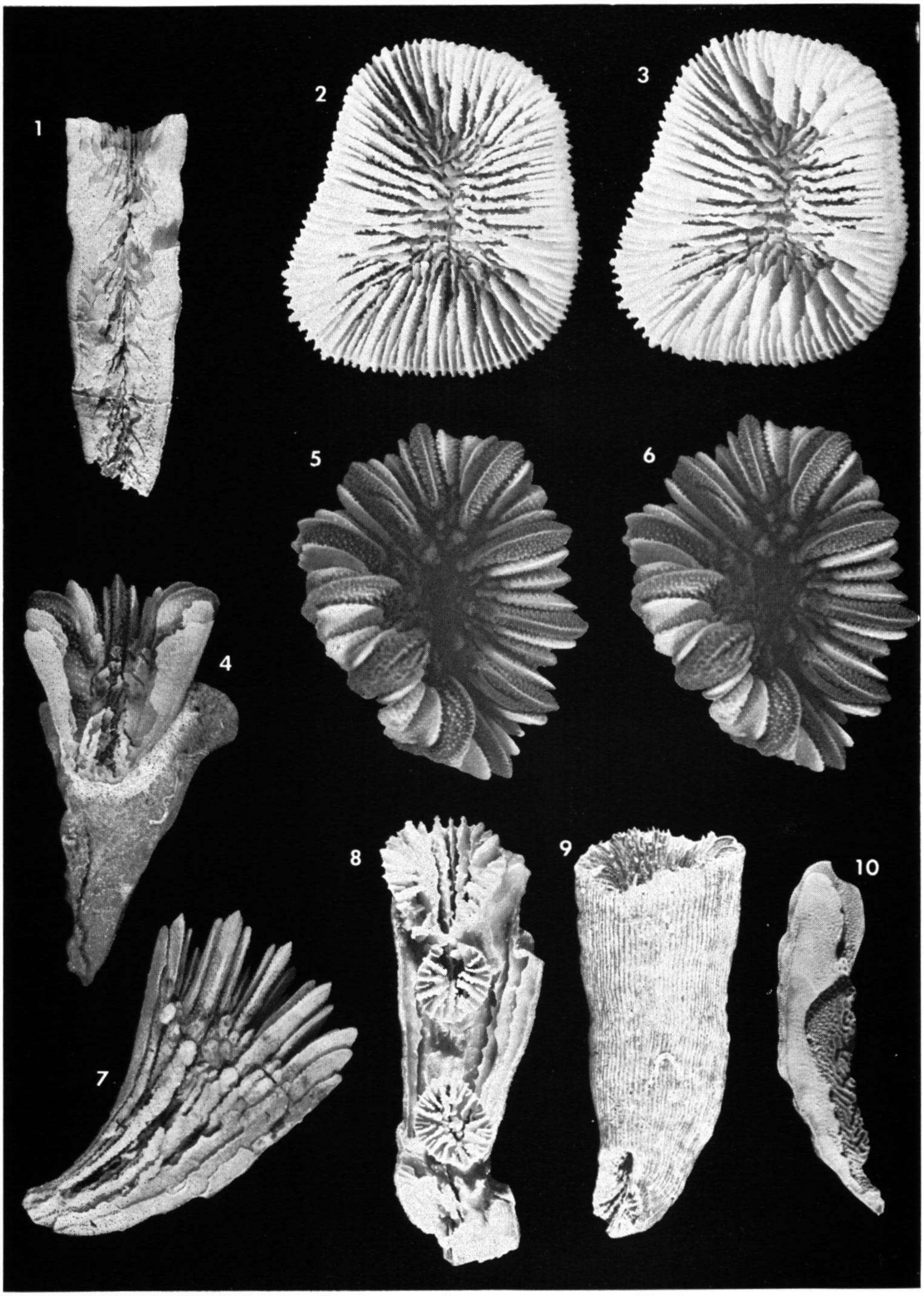
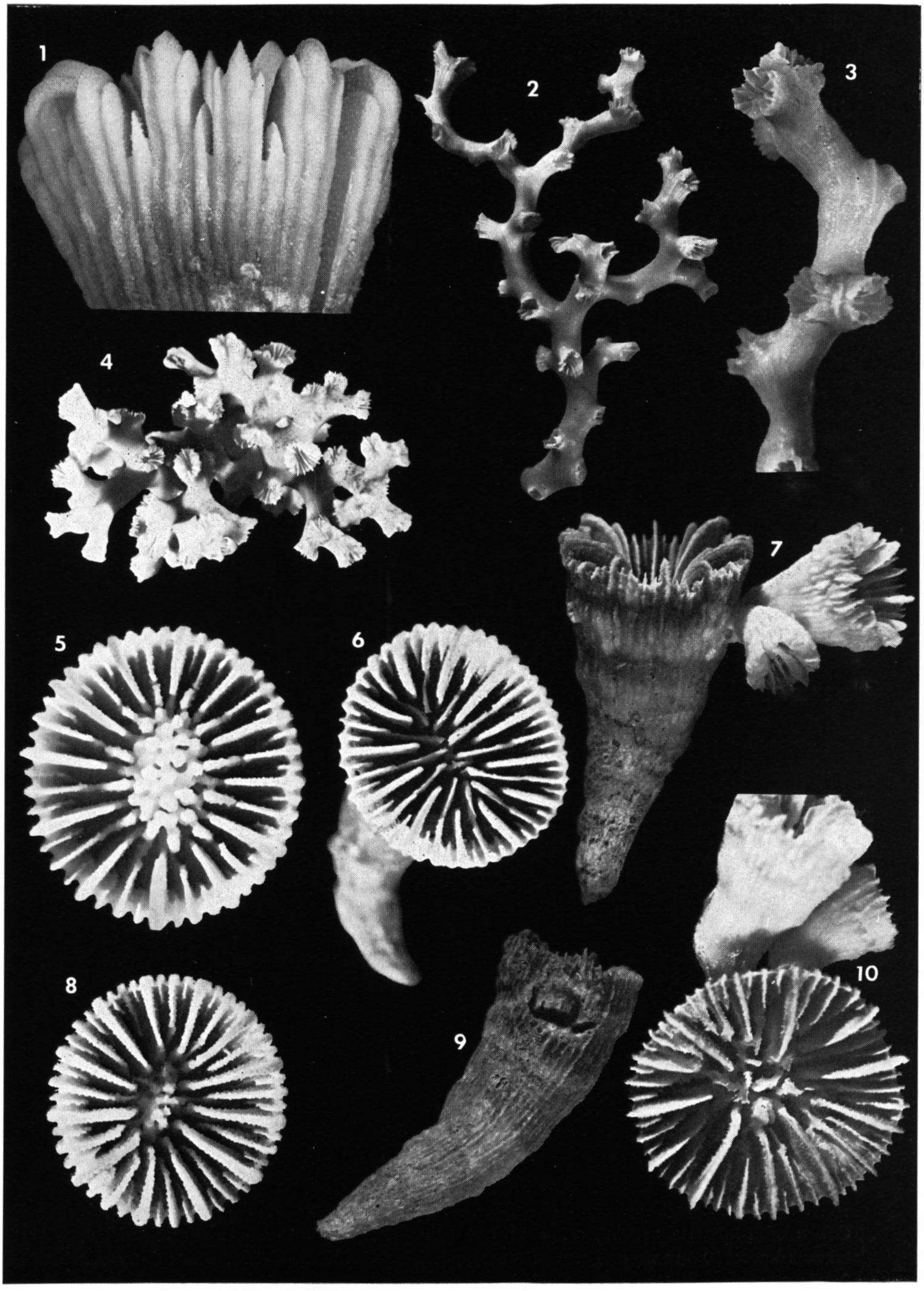

1
2
3
4
5
6
7
8
9
10

PLATE XXVI

Fig. 1. *Dasmosmilia variegata* (Pourtalès). MCZ 5575, BL-254, cd = 17.7 × 12.8 mm.
Figs. 2–4. *Solenosmilia variabilis* Duncan. 2. USNM 46574, P-891, 58.8 mm long; 3. Same lot (P-891), branch diameter 2.5 mm; 4. MCZ (no number), BL-100.
Figs. 5–6, 8. *Asterosmilia prolifera* (Pourtalès). 5. USNM 46777, P-198, cd = 12.1 × 11.2 mm; 6. Same lot (P-198), cd = 10.6 × 9.5 mm; 8. Same lot (P-198), cd = 11.1 × 10.2 mm, no pali present.
Figs. 7, 9–10. *Asterosmilia marchadi* (Chevalier). 7, 10. USNM 46614, P-734, 19.2 mm long, cd = 11.1 × 10.5 mm; 9. USNM 46613, P-198, 25.9 mm long, crab impression on side.



1
2
3
4
5
6
7
8
9
10

PLATE XXVII

Figs. 1–4. *Phacelocyathus flos* (Pourtalès). 1. USNM 46077, 26°33′N, 78°34′W, 76 m; 2. Same colony, cd = 13.7 × 11.3 mm; 3. USNM 46075, P-1432, 12.3 mm tall; 4. Same colony as figs. 1–2, cd = 9.7 × 9.2 mm.
Figs. 5–8. *Rhizosmilia gerdae* Cairns. 5. Holotypic colony, USNM 46812, G-725; 6. Calice of holotypic colony, cd = 11.3 × 10.0 mm; 7. Calice of holotypic colony, cd = 13.6 × 10.6 mm; 8. Base of paratype, USNM 46813, G-725, basal diameter 8 mm.

Pl. XXVII

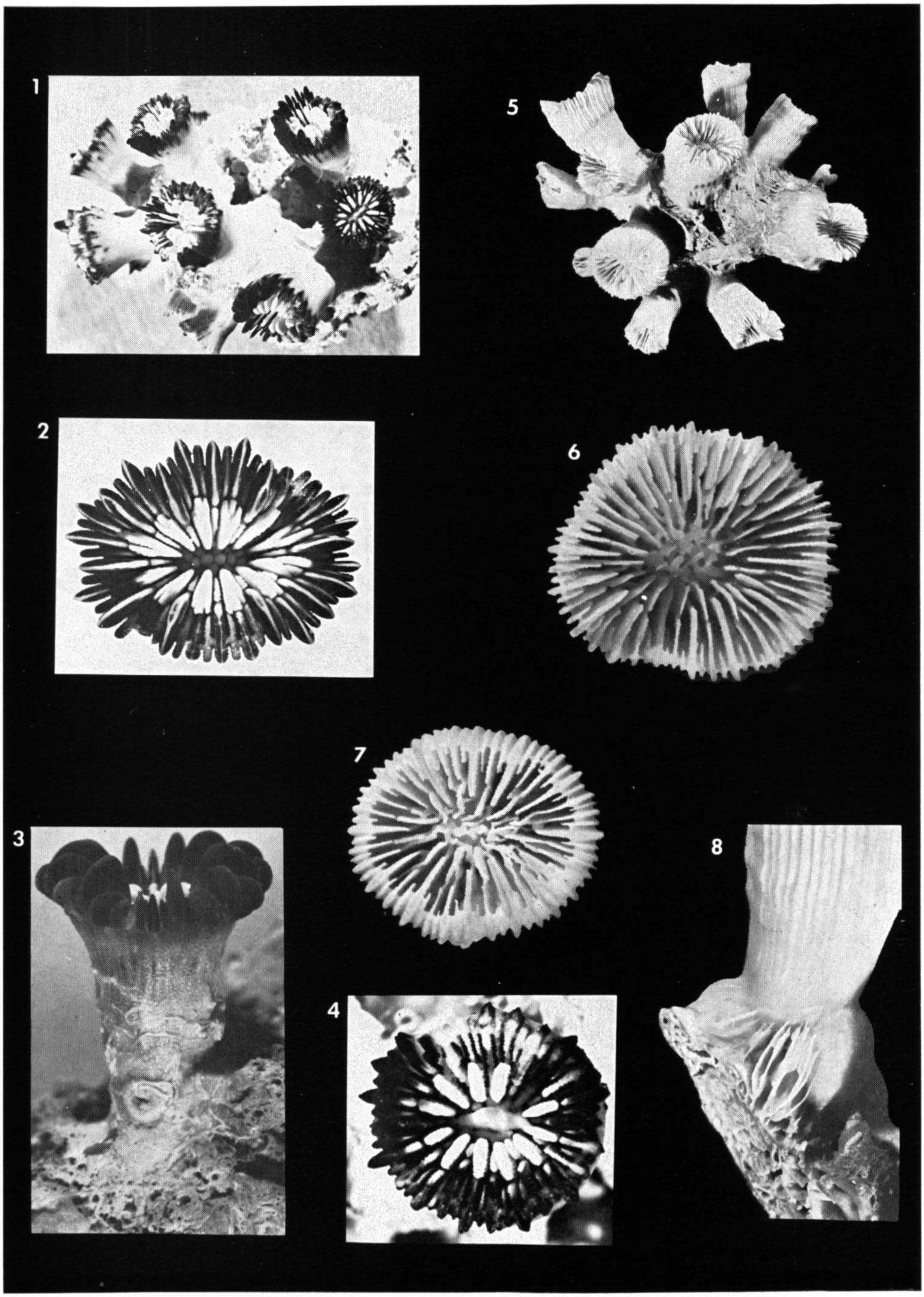


PLATE XXVIII

Figs. 1–3. *Flabellum moseleyi* Pourtalès. USNM 46582, P-478, greater cd = 45.5 mm.
Figs. 4–7. *Flabellum pavoninum atlanticum* n. subsp. 4–6. Holotype of new subspecies, USNM 46895, G-179, cd = 48.5 × 39.8 mm, 44.7 mm tall; 7. Paratype, USNM 46899, G-666, 30.7 mm across costal wings.
Figs. 8–12. *Javania cailleti* (Duchassaing & Michelotti). 8–9. USNM 46770, P-587, cd = 18.9 × 17.4 mm, stereo pair; 10. Same specimen; 11. Broken base of same specimen showing layers of stereome; 12. USNM 46753, G-679, pedicel near base 5.0 mm in diameter.

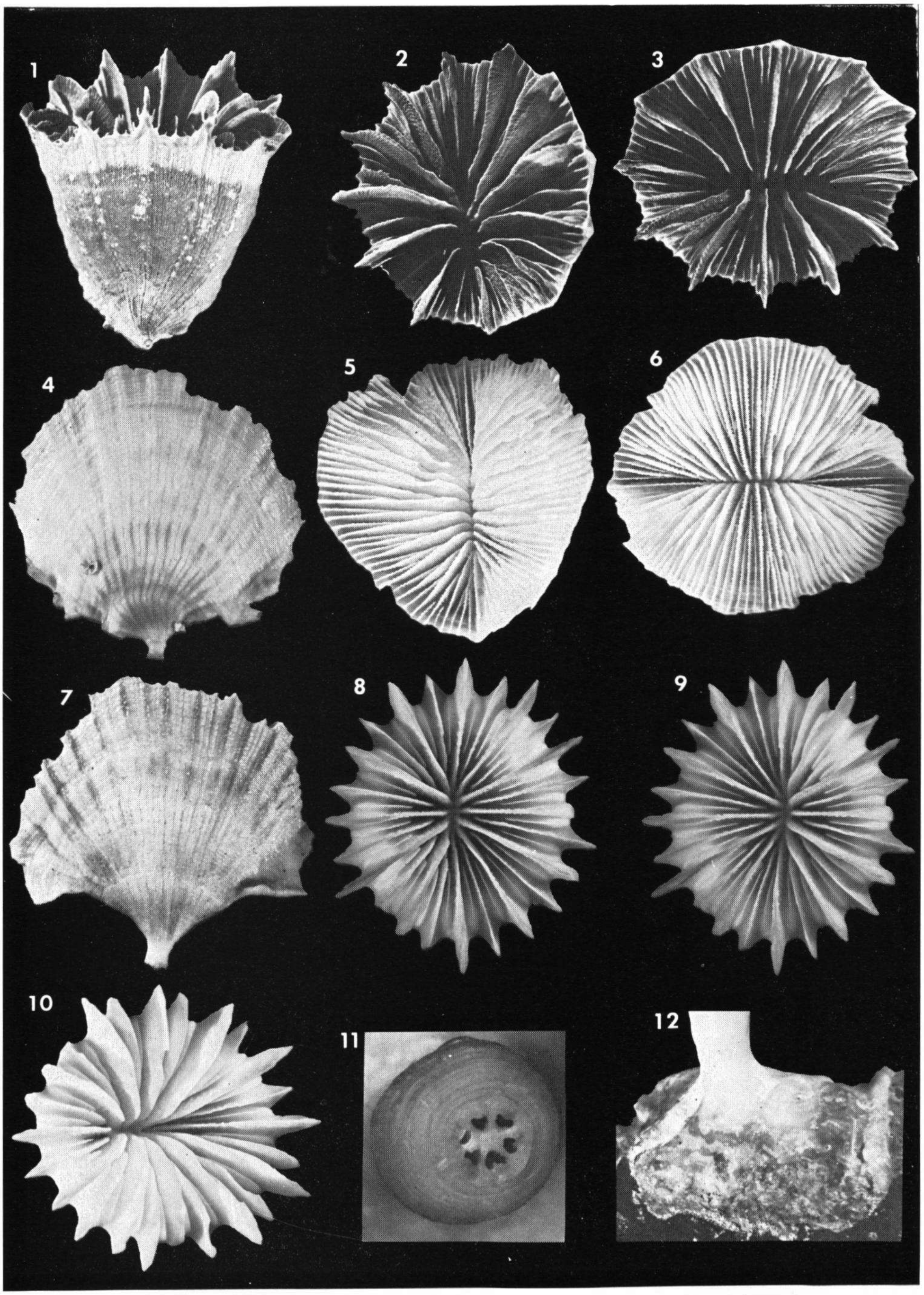

1
2
3
4
5
6
7
8
9
10
11
12

PLATE XXIX

Figs. 1–3, 7. *Flabellum fragile* Cairns, 1. Holotype, USNM 45764, Hourglass station "E", 19.4 mm tall; 2–3. Same specimen, cd = 18.2 × 16.6 mm, stereo pair; 7. Paratype, USNM 45767, southeast of Alligator Reef, Florida, cd = 20.0 × 17.4 mm. Figs. 4–6, 8–9. *Placotrochides frusta* n. sp. 4. Holotype, USNM 36451, Alb-2750, 8.0 mm tall, coated with NH_4Cl; 5. NMC (no number), Hudson-4B, greater cd = 3.6 mm; 6, 8. USNM (no number), Hudson-4B, 3.6 mm tall, cd = 4.0 × 3.2 mm, SEM; 9. Same specimen, × 27, SEM view from inside calice.

Pl. XXIX

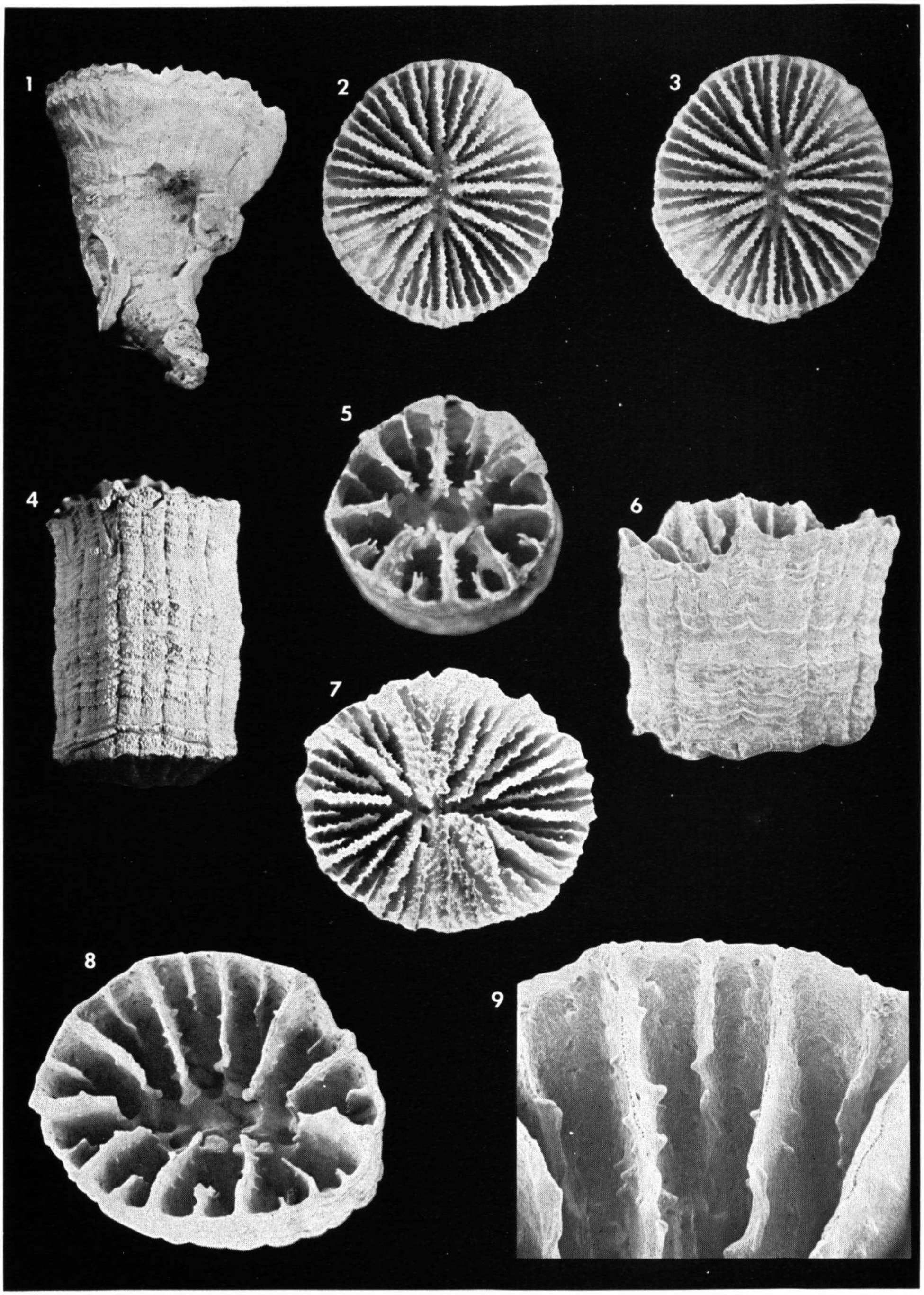


PLATE XXX

Figs. 1, 4. *Javania cailleti* (Duchassaing & Michelotti). 1. USNM 46770, P-587. 24.5 mm tall; 4. Syntype of ***Desmophyllum eburneum*** Moseley, BM 1880.11.25.65, Chall-306.
Figs. 2–3, 5–8. *Polymyces fragilis* (Pourtalès). 2–3. NMC (no number), off Barbados, 137–183 m, cd = 15.2 × 12.4 mm, form *tulipa*; 5–6. Syntype of *Rhizotrochus fragilis* Pourtalès, MCZ 5451, cd = 15.7 × 14.2 mm, stereo pair; 7–8. A different syntype, MCZ 5451, close-up of basal rootlets, stereo pair.
Figs. 9–10. *Javania pseudoalabastra* Zibrowius. USNM 46611, CI-46, cd = 43.8 × 21.4 mm, 34.2 mm tall.

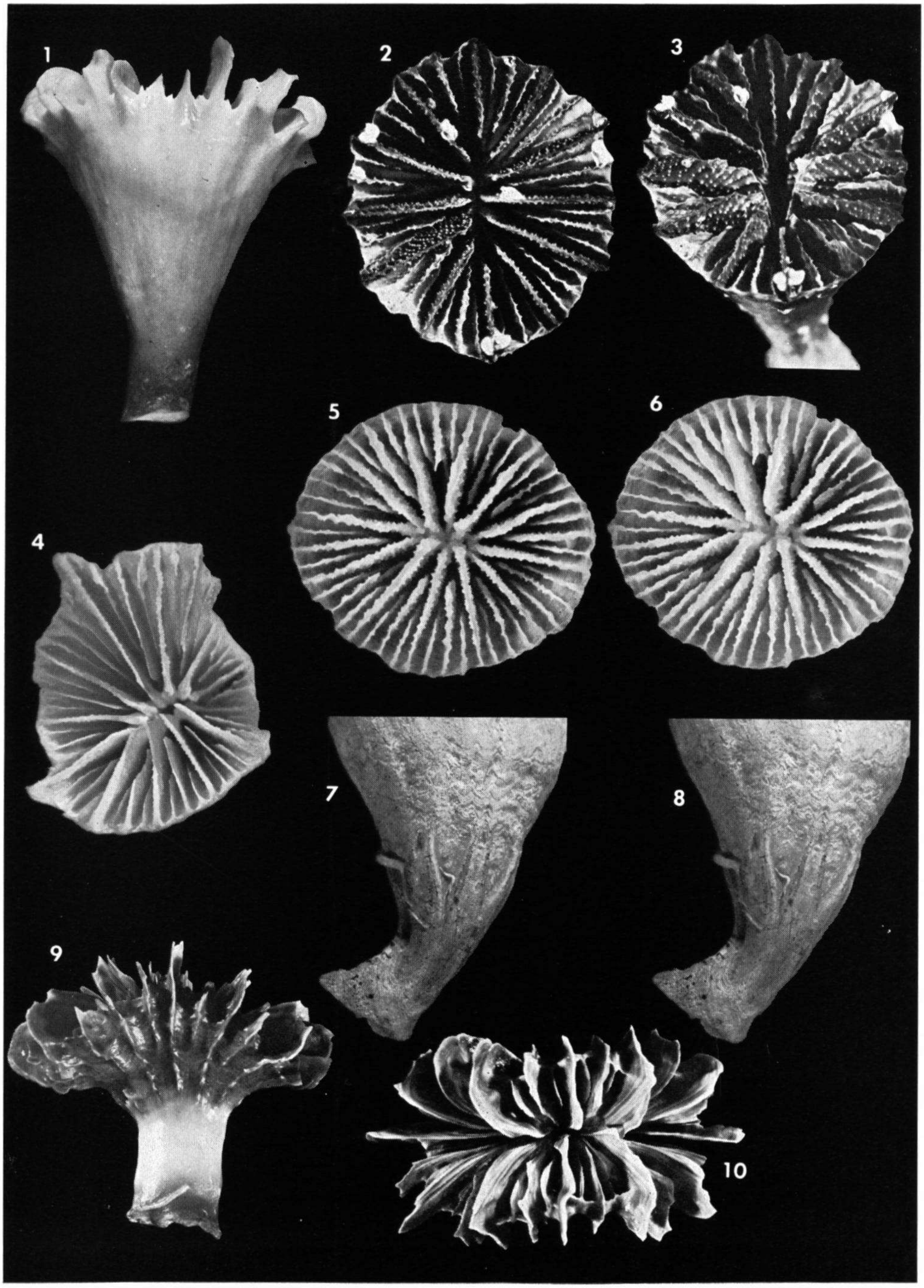

1
2
3
4
5
6
7
8
9
10

PLATE XXXI

Figs. 1–3. *Gardineria simplex* (Pourtalès). 1. Lectotype of *Colangia simplex* Pourtalès, MCZ 5566, BL-22, cd = 10.6 × 10.4 mm; 2–3. Same specimen, stereo pair.
Figs. 4–6, 10. *Gardineria paradoxa* (Pourtalès). 4. Syntype of *Duncania barbadensis* Pourtalès, MCZ 2757, Hassler station off Barbados, 24.6 mm tall; 5–6. Syntype of *Duncania barbadensis* from same lot (MCZ 2757), cd = 10.8 mm, stereo pair; 10. USNM 46618, Gosnold station southwest of Jamaica, 39.6 mm long.
Figs. 7–9. *Gardineria minor* Wells. 7. USNM 46620, G-984, 10.6 mm long; 8–9. USNM 46632, off Andros Island, Bahamas, cd = 7.5 mm, stereo pair.

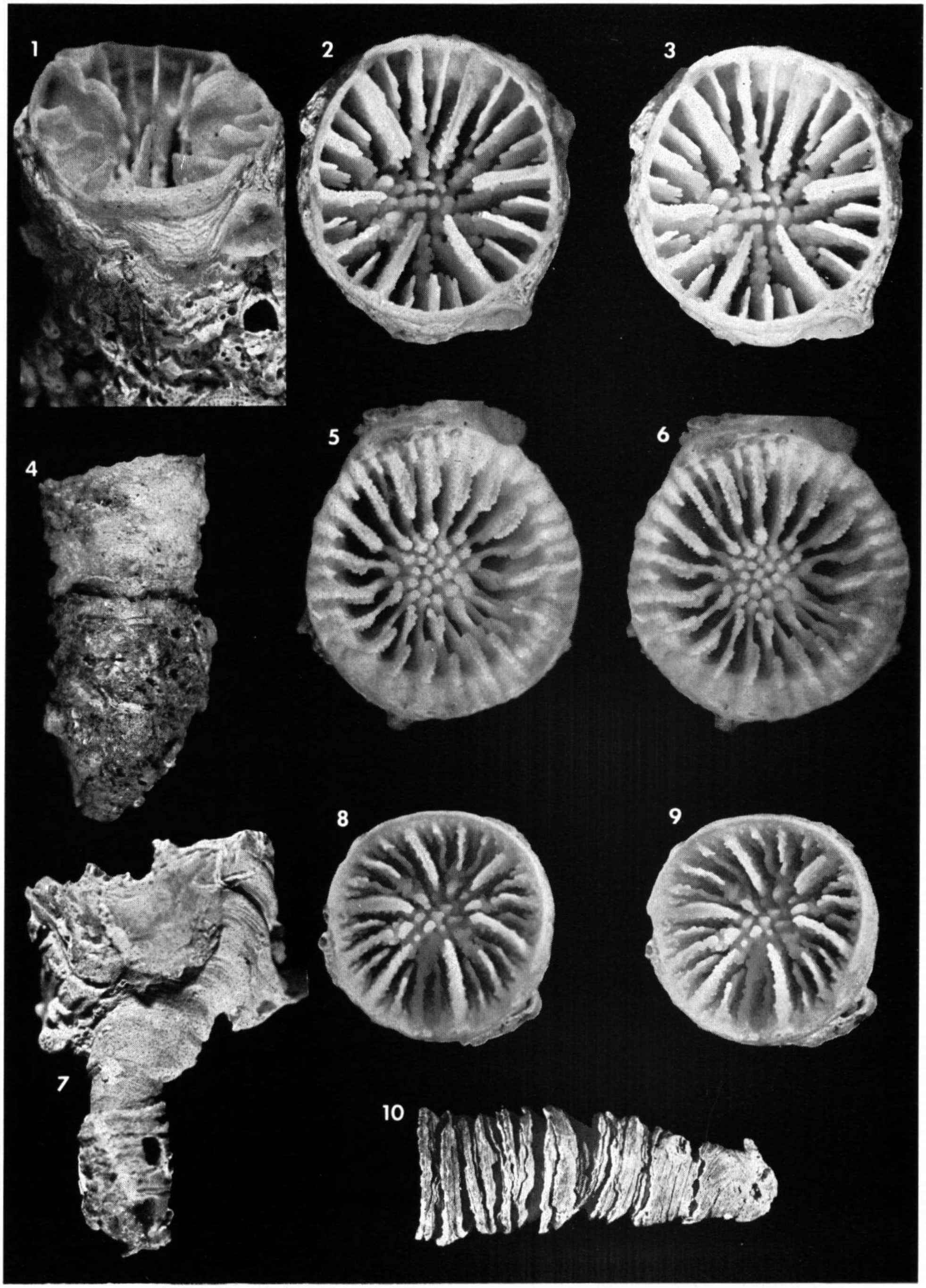

1
2
3
4
5
6
7
8
9
10

PLATE XXXII

Figs. 1–3. *Guynia annulata* Duncan. 1. USNM 46635, P-1303, 4 mm long, SEM, part of theca broken away revealing columella; 2. Same specimen, × 54, SEM of "mural pores" on inside of calice; 3. Same specimen, cd = 1.5 mm.
Figs. 4–7. *Schizocyathus fissilis* Pourtalès. 4. USNM (no number), Hummelinck-1443, cd = 3.2 mm, SEM; 5. Same lot, cd = 3.1 mm, SEM of incipient fragmentation of the corallum, mural spots are not revealed by the SEM view; 6. Syntype, MCZ 2791, Hassler station off Barbados, 8 mm long, longitudinal lines and some mural spots visible with conventional photography; 7. Same specimen as fig. 5, × 35, SEM view from inside calice of small S_2 flanked by incipient fracture lines.
Figs. 8–10. *Stenocyathus vermiformis* (Pourtalès). 8. USNM 46649, P-861, cd = 2.7 mm; 9. USNM 46644, G-1102, 52.5 mm long, calice on both ends; 10. USNM 46646, GS(G)-13, 26.9 mm long.

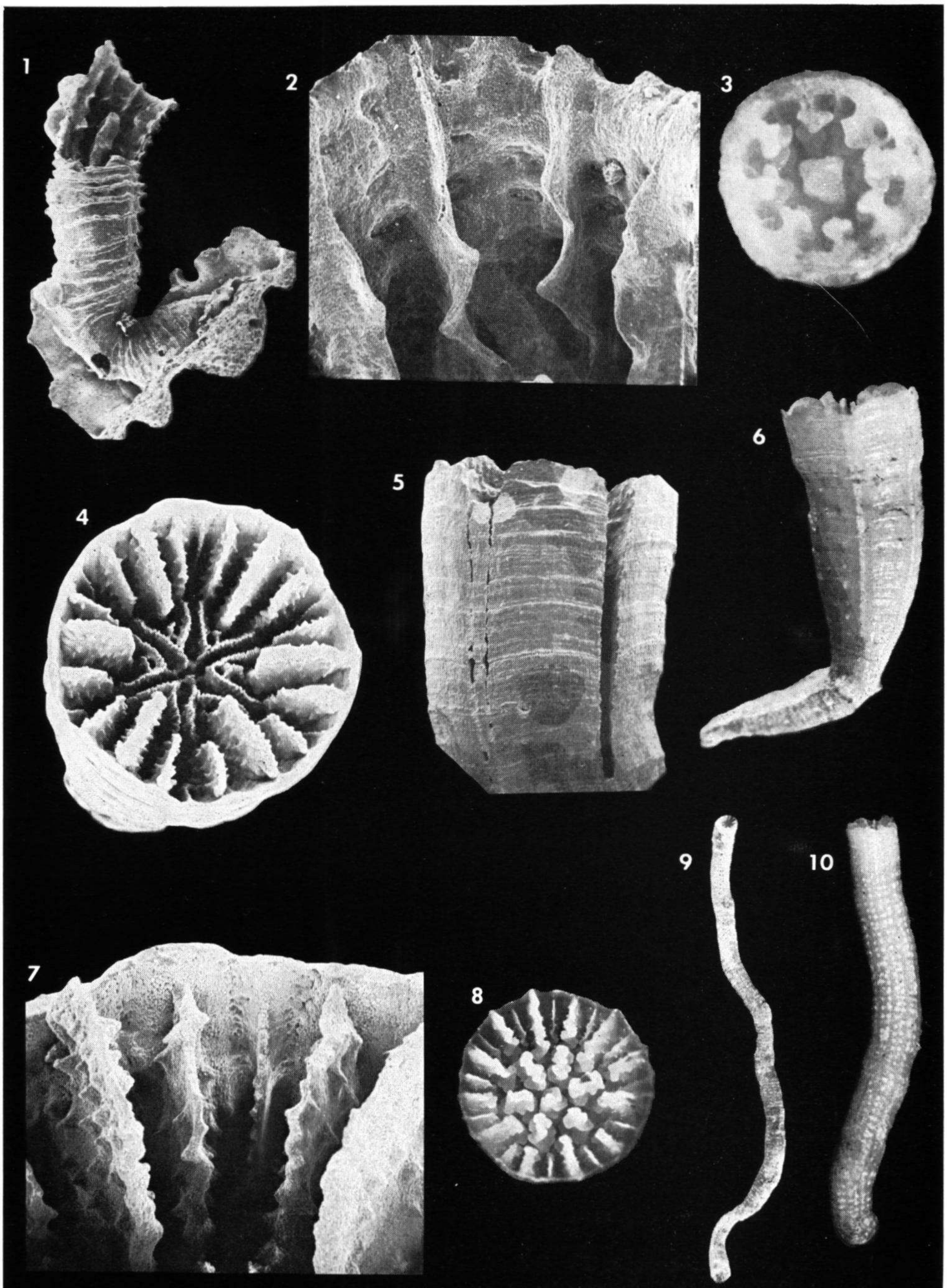

1
2
3
4
5
6
7
8
9
10

PLATE XXXIII

Figs. 1–2. *Stenocyathus vermiformis* (Pourtalès). 1. Holotype of *Caryophyllia carpenteri* Duncan, BM 1883.12.10.23, cd =2.7 mm; 2. Holotype of *Caryophyllia simplex* Duncan, BM 1883.12.10.24.
Figs. 3–8. *Pourtalocyathus hispidus* (Pourtalès). 3. USNM (no number), Bay of Pigs, Cuba, 183–273 m, cd = 4.2 mm, SEM; 4. USNM 46663, P-984, cd = 5.1 mm, hispid theca; 5–6. Same specimen, stereo pair; 7. USNM (no number), SB-3494, 4.9 mm long, SEM, smooth theca; 8. USNM 46661, G-1018, cd = 3.0 mm.
Figs. 9–10. *Balanophyllia cyathoides* (Pourtalès). Holotype of *Dendrophyllia cyathoides* Pourtalès, MCZ 2774, Corwin station, 27.1 mm tall.

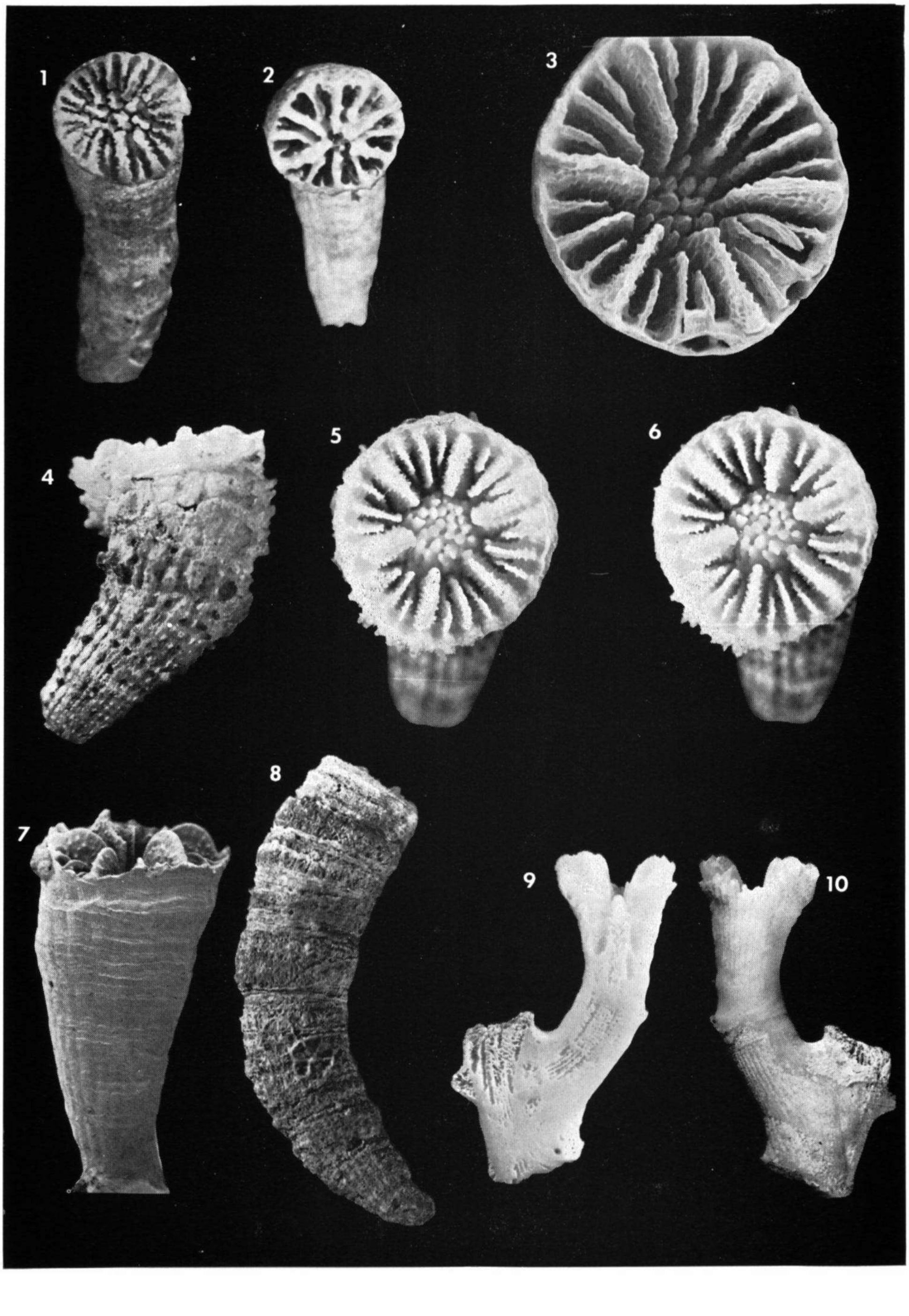

1
2
3
4
5
6
7
8
9
10

PLATE XXXIV

Figs. 1–2. *Balanophyllia cyathoides* (Pourtalès). 1. Holotype, MCZ 2774, lesser cd = 9.6 mm; 2. USNM 46665, G-251, cd = 10.9 × 8.3 mm.
Figs. 3–7. *Balanophyllia palifera* Pourtalès. 3. Paralectotype, MCZ 5438, BL-68, cd = 6.9 × 6.0 mm; 4. Lectotype, MCZ 5438, BL-68, 16 mm tall; 5–6. Same specimen, cd = 6.6 × 6.0 mm, stereo pair; 7. USNM 16098, Alb-2152, cd = 10.2 × 8.0 mm.
Figs. 8–9. *Balanophyllia wellsi* Cairns. 8. Paratype, MCZ (no number), Atl-2980B, cd = 16.8 × 15.0 mm; 9. Paratype (different specimen from same lot), cd = 17.5 × 14.4 mm.

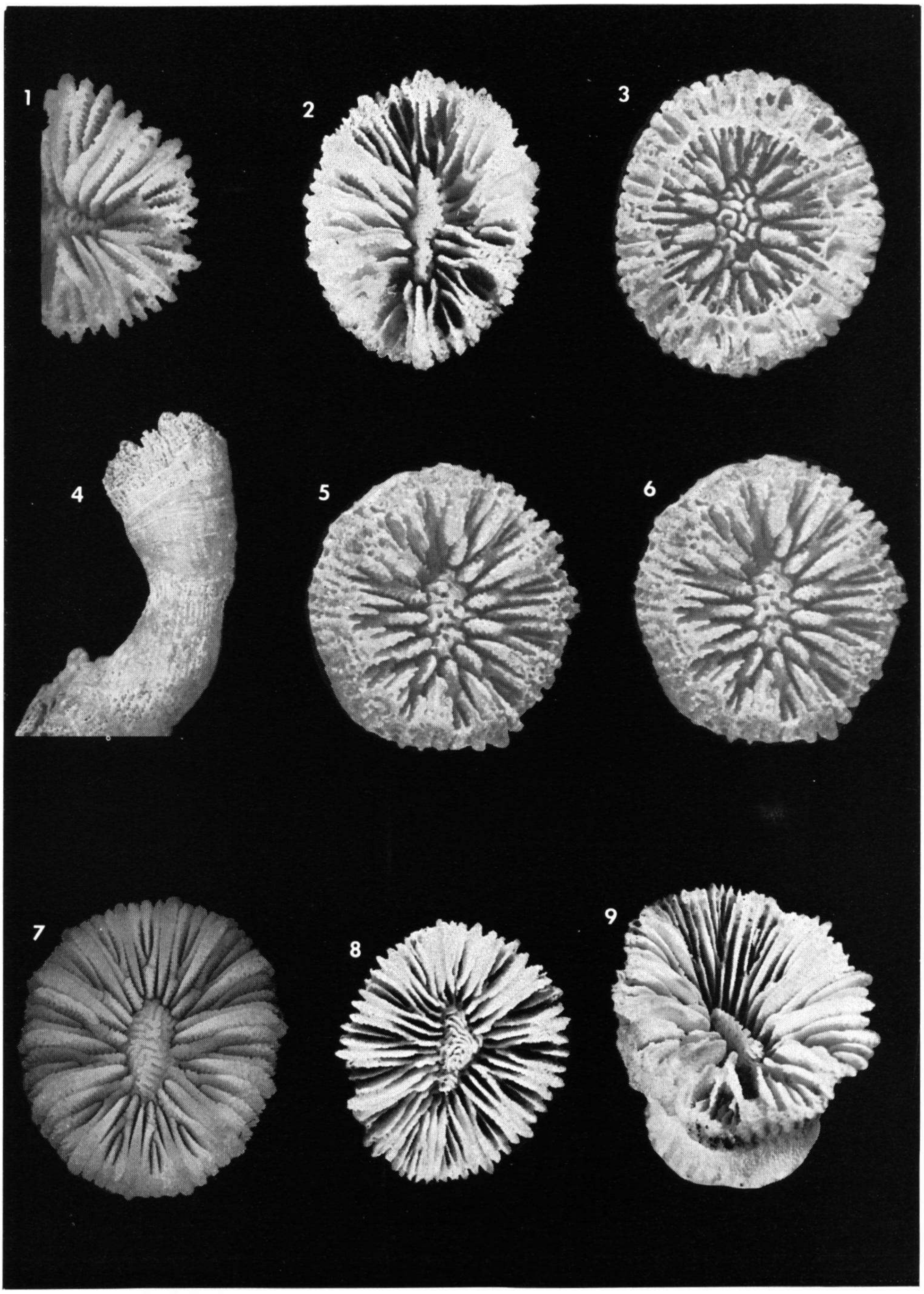

1
2
3
4
5
6
7
8
9

PLATE XXXV

Figs. 1–3. *Balanophyllia wellsi* Cairns. 1. Holotype, USNM 45855, G-1312, 30.0 mm tall; 2–3. Same specimen, cd = 20.0 × 15.2 mm, stereo pair.
Figs. 4–6. *Balanophyllia hadros* n. sp. 4. Holotype, USNM 46906, O-4834, 28.5 mm tall, coated with NH_4Cl; 5–6. Paratype, USNM 46907, O-4834, cd = 26.2 × 20.7 mm, stereo pair.
Figs. 7–9. *Balanophyllia bayeri* n. sp. 7. Paratype, USNM 46910, O-4940, 25.0 mm tall, coated with NH_4Cl; 8–9. Paratype, USNM 46912, P-596, cd = 12.2 × 10.3 mm srereo pair.

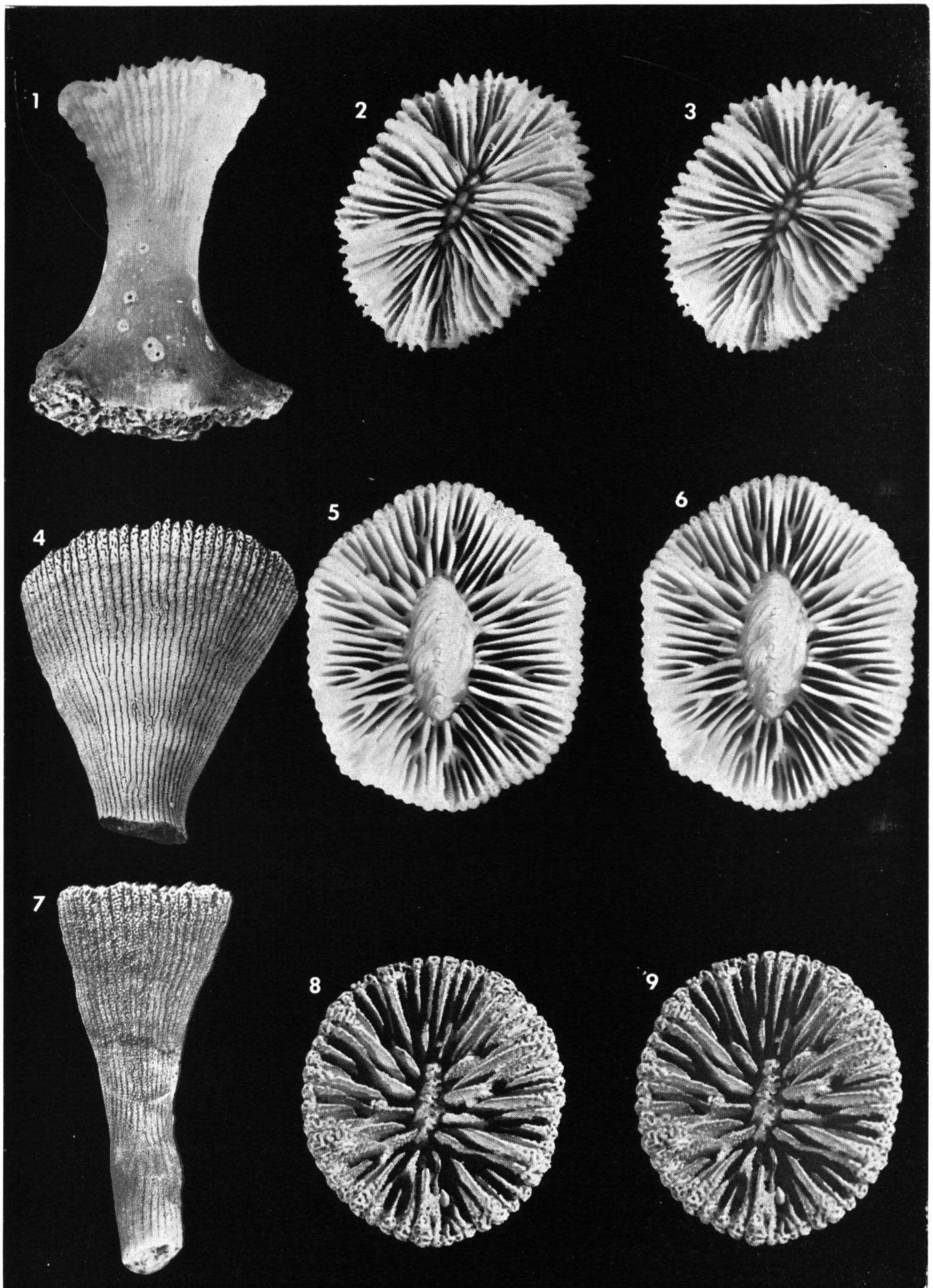

1
2
3
4
5
6
7
8
9

PLATE XXXVI

Figs. 1–4. *Dendrophyllia cornucopia* Pourtalès. 1. USNM 22023, FH-7286, 11.4 cm long; 2–3. Syntype, MCZ 2752, Bibb-173, cd = 17.4 × 15.0 mm, stereo pair; 4. Same specimen, 80 mm long.
Figs. 5–10. *Dendrophyllia gaditana* (Duncan). 5–6. USNM 10289, Alb-2354, 29.1 mm long, greater cd = 8.8 mm; 7, 9. Specimen from same lot, greater cd = 8.0 mm, 18.0 mm tall, coated with NH_4Cl; 8. Specimen from same lot, 36.3 mm tall; 10. Specimen from same lot, 46.2 mm long.

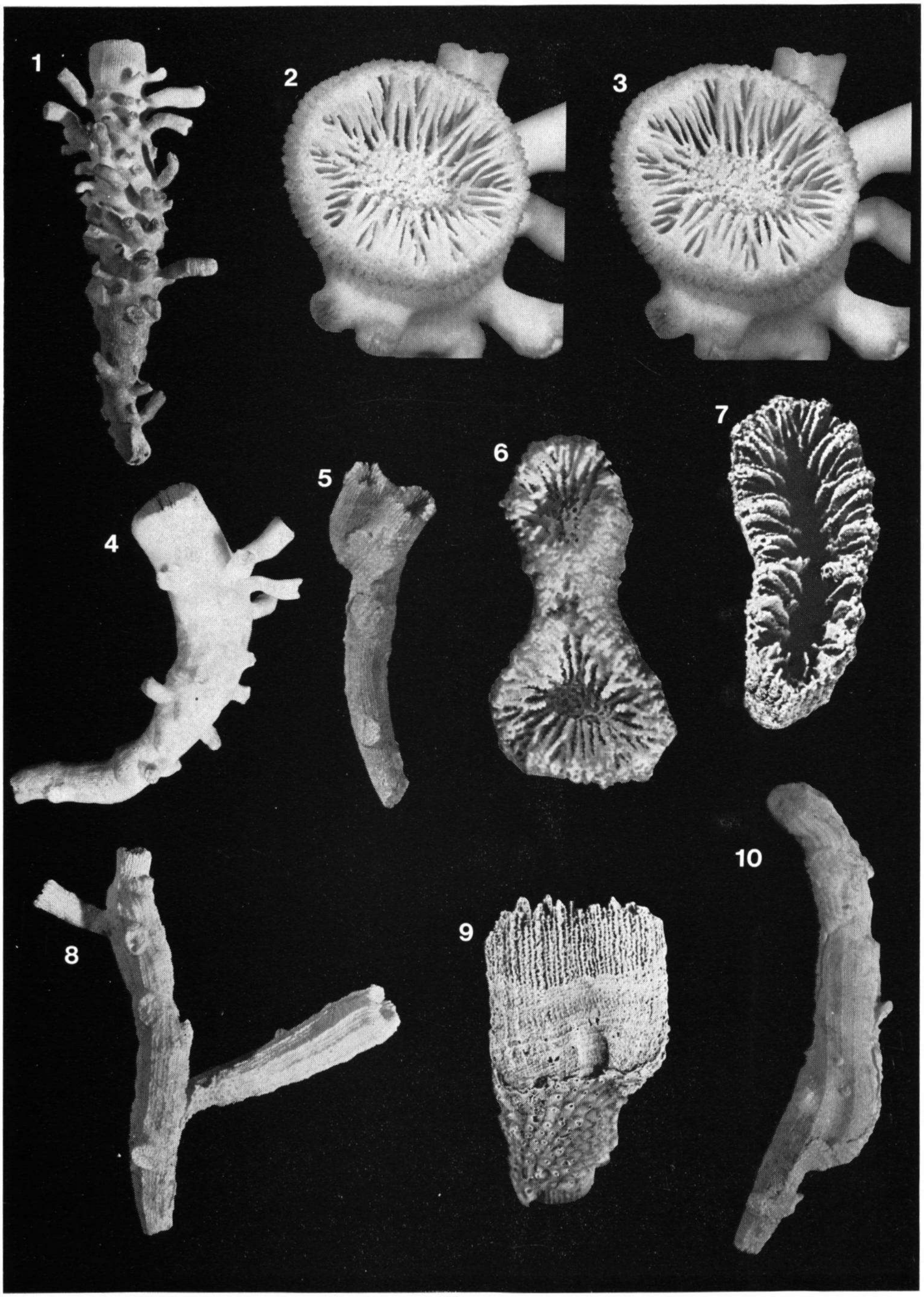

1
2
3
4
5
6
7
8
9
10

PLATE XXXVII

Figs. 1, 4, 8. *Dendrophyllia alternata* Pourtalès. 1. Syntype, MCZ 5440, BL-209, 10.3 cm long; 4. Same specimen, branch diameter 10.9 × 10.3 mm; 8. Same specimen.
Figs. 2–3, 6. *Enallopsammia rostrata* (Pourtalès). 2–3. USNM 46693, P-1262, calices about 3.8 mm in diameter, stereo pair; 6. SME (no number), Jean Charcot- 158, 37°26′N, 25°52′W, 835–1000 m, large colony with barnacle galls.
Figs. 5, 7. *Enallopsammia profunda* (Pourtalès). 5. USNM 46591, CI-140, cd = 4.9 mm; 7. USNM 16155, Alb-2662–2672, branch diameter 12.0 mm.

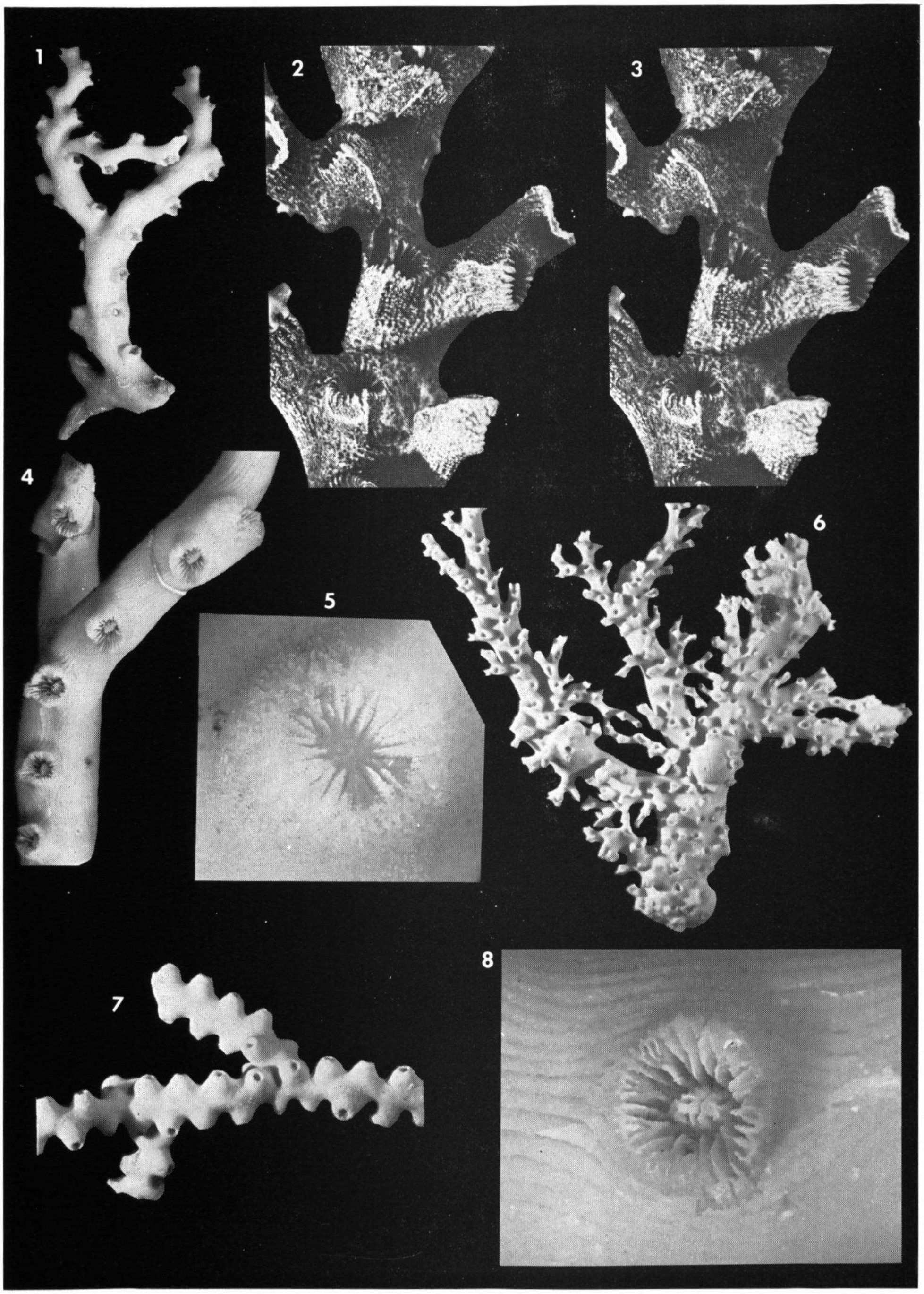

1
2
3
4
5
6
7
8

PLATE XXXVIII

Figs. 1–3. *Bathypsammia tintinnabulum* (Pourtalès). 1. Lectotype, MCZ 2768, 16.2 mm tall; 2–3. Same specimen, cd = 14.7 × 12.5 mm, stereo pair.
Figs. 4–6. *Bathypsammia fallosocialis* Squires. 4. USNM 46710, G-354, 13.5 mm tall; 5–6. Same specimen, cd = 14.6 × 13.0 mm, stereo pair.
Figs. 7–9. *Thecopsammia socialis* Pourtalès. 7. Syntype, MCZ 5601, 18.4 mm tall; 8–9. Same specimen, cd = 15.5 × 14.9 mm, stereo pair.

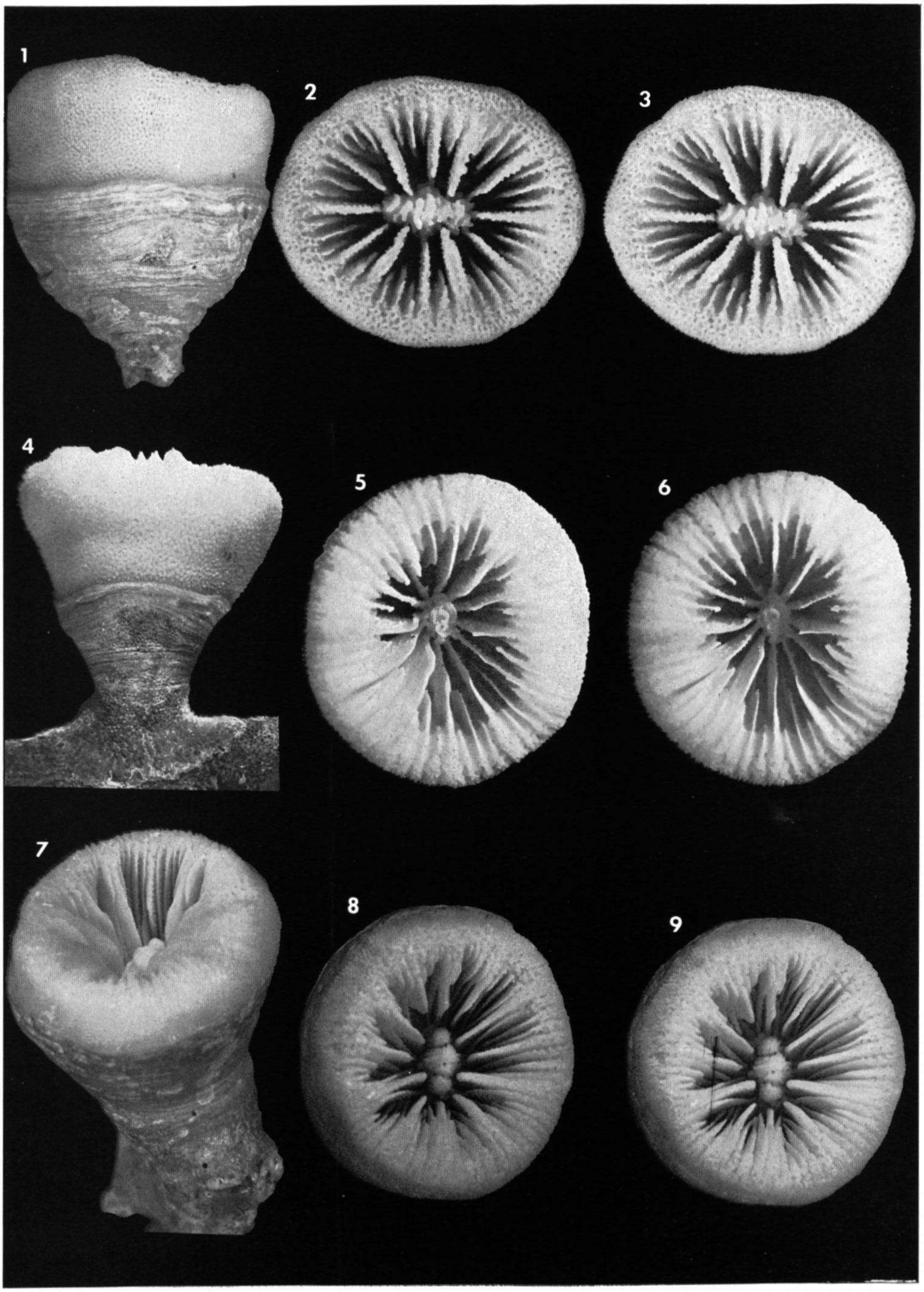

1
2
3
4
5
6
7
8
9

PLATE XXXIX

Fig. 1. ***Bathypsammia tintinnabulum*** (Pourtalès). USNM 46518, G-131, cd = 14.5 mm.

Figs. 2-6. ***Rhizopsammia manuelensis*** Chevalier. 2. USNM (no number), G-134, small colony; 3. USNM (no number), off Cat Cay, Bahamas, 366 m; 4. USNM 46719, G-135, cd = 9.1 mm; 5. Holotype, MNHNP, cd = 2.6 × 3.0 mm; 6. USNM 46719, G-135.

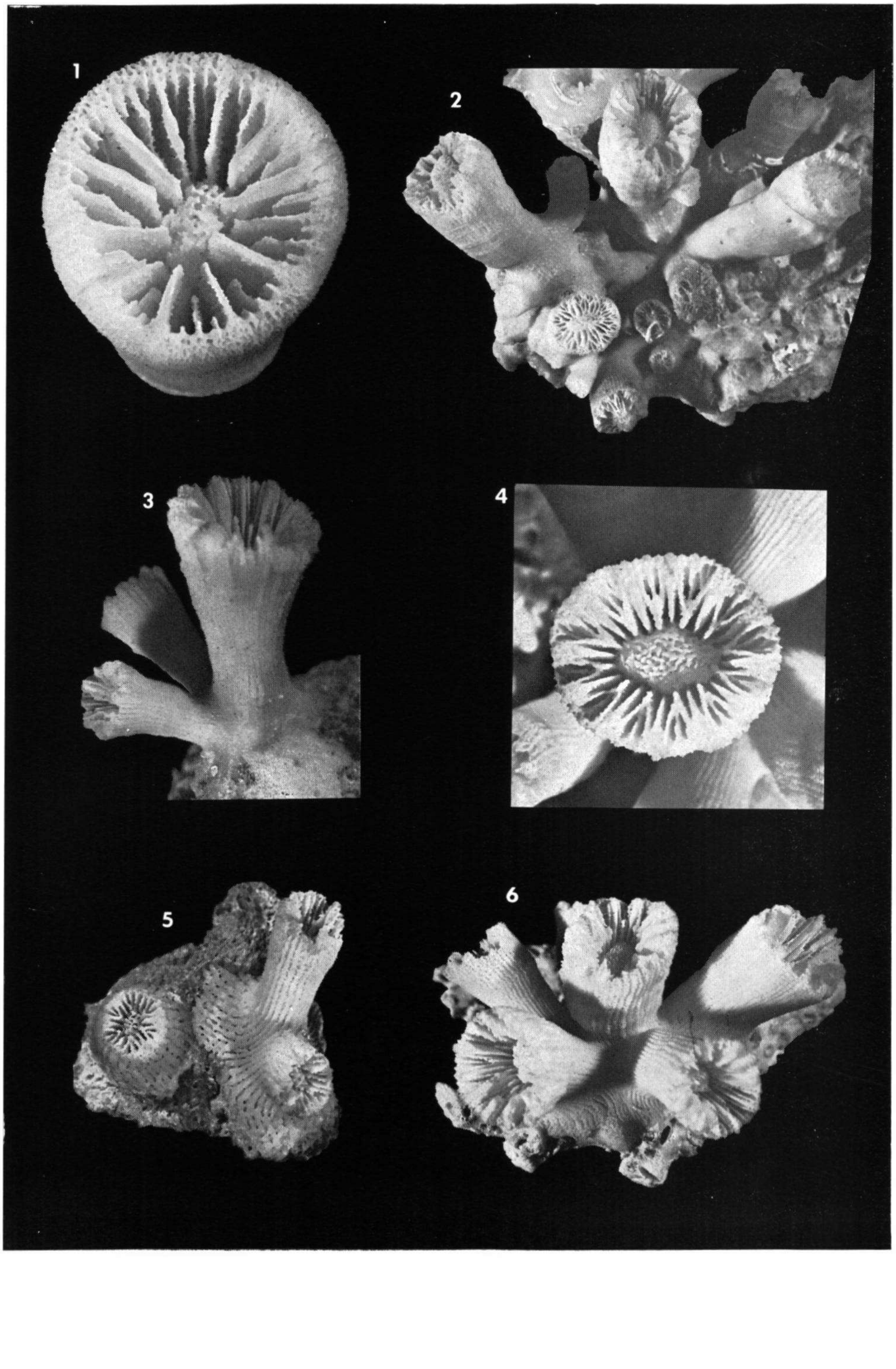
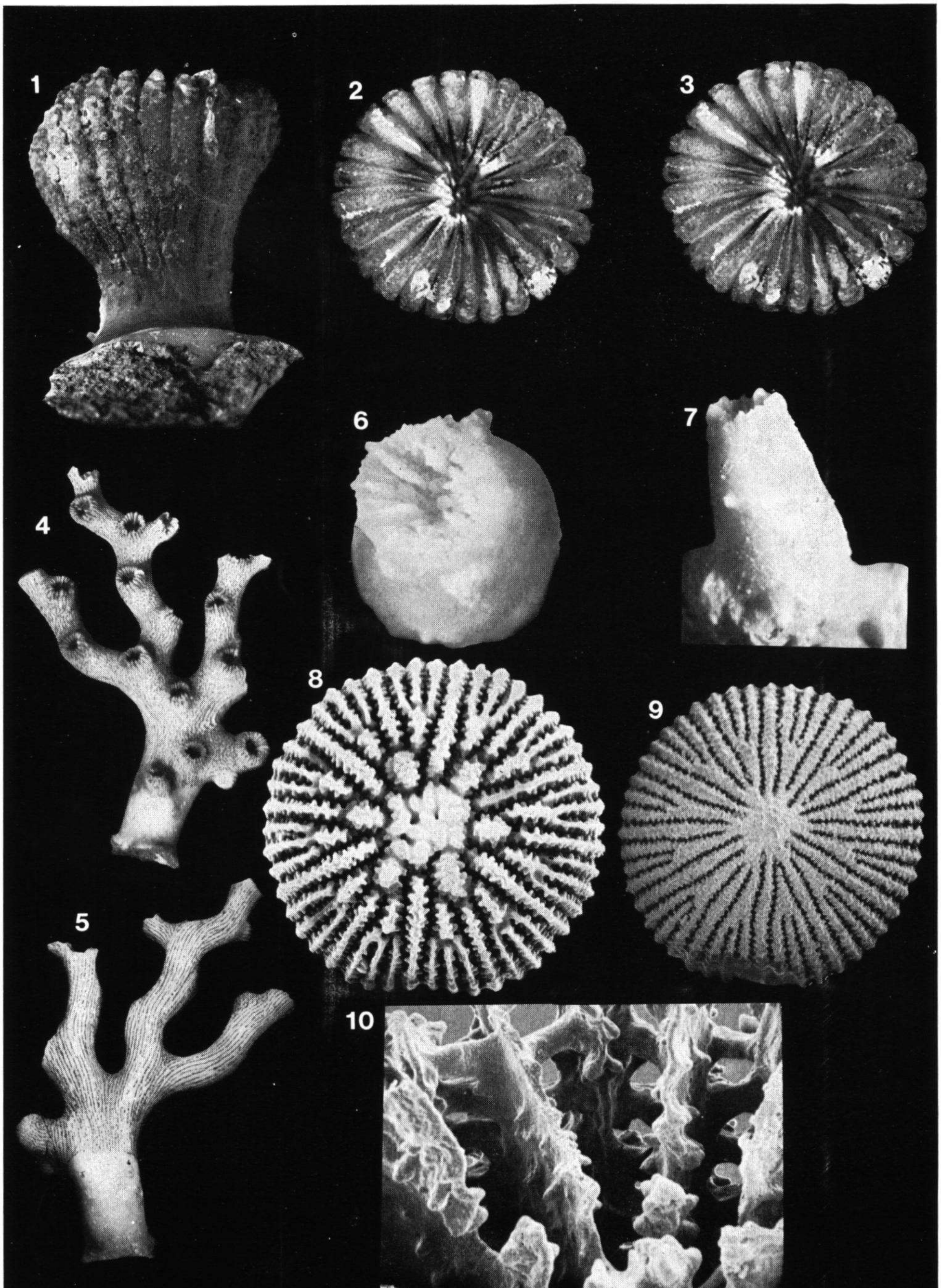

1
2
3
4
5
6

PLATE XL

Figs. 1–3. *Trochopsammia infundibulum* Pourtalès. 1. USNM 46722, G-114, 11.5 mm tall; 2–3. Same specimen, cd = 10.8 mm, stereo pair.
Figs. 4–5. *Enallopsammia amphelioides* (Alcock). SME (no number), Jean Charcot-238, 37°25′N, 25°45′W, 506 m, 52 mm long, calicular and acalicular sides of same branch (photographs by H. Zibrowius).
Figs. 6–7. "*Cylicia*" *inflata* Pourtalès. 6. Paralectotype, MCZ 5577, BL-69, cd = 1.4 mm; 7. Lectotype, MCZ 5577, BL-69, 3.8 mm tall.
Figs. 8–9. *Peponocyathus orientalis* Duncan. USNM (no number), Alb-5312, 21°30′N, 116°32′E, 256 m, cd = 4.5 mm, SEM.
Fig. 10. *Trematotrochus corbicula* (Pourtalès). USNM (no number), Atl-2987D, × 60, SEM view of porous theca from inside calice.


1
2
3
4
5
6
7
8
9
10

TAXONOMIC INDEX

New names in CAPITAL letters; other names in valid use in *italic* letters.
Page number of main reference in **bold** face print.
Pages with explanation of plates in *italics*.

ERRATA

Pages 70, 71, 73 and 276: for *L. langi* read *L. langae*.

Page 182: for *B. praecipua* read *B. praecipua*.