A Revision of the Northwest Atlantic Stylasteridae (Coelenterata: Hydrozoa)

STEPHEN D. CAIRNS

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ABSTRACT

Cairns, Stephen D. A Revision of the Northwest Atlantic Stylasteridae (Coelenterata: Hydrozoa). *Smithsonian Contributions to Zoology*, number 418, 131 pages, 53 figures, 3 tables, 25 maps, 1986.—The 42 species of stylasterid corals (Hydrozoa: Athecata: Stylasteridae) known from the Northwest Atlantic are described and illustrated, and their distributions are mapped. Twenty-one new species are described. The study is based on specimens collected from approximately 330 localities, including the collections of the National Museum of Natural History (USNM), Museum of Comparative Zoology (Harvard), and Rosenstiel School of Marine and Atmospheric Science, University of Miami (UMML). Previous literature on the fauna is reviewed. All species are illustrated by scanning electron micrographs, and about half of the species were examined by histological serial section of decalcified specimens. A dichotomous key to the eight western Atlantic genera and tabular keys to the species of *Distichopora*, *Stylaster*, and *Crypthelia* are provided.

Distributional patterns of the western Atlantic stylasterids and comparisons to the distributional patterns of the ahermatypic Scleractinia are discussed. Few stylasterids have widespread distributions; 93% of the species are endemic to the western Atlantic. *Stylaster roseus*, the only shallow-water species, has the broadest distribution in the Caribbean. Unlike the deep-water Scleractinia, stylasterids are not present in waters directly adjacent to continental land masses, and thus do not occur in the Gulf of Mexico, off northern continental South America, or off Central America. Stylasterids are usually found in shallower water than ahermatypic Scleractinia: their depth range is rarely less than 100 m or more than 1000 m, but most commonly 150–440 m. Both groups, however, are most diverse in the Lesser Antilles and share several distributional patterns, i.e., Antillean, insular Straits of Florida, and continental slopes off the southeastern United States.

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Contents

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Introduction

Stylasterid corals are common throughout the western Atlantic, particularly in the Antilles, Bahamas, and Florida Keys at continental shelf and slope depths, but, because only one of the 42 known species occurs in shallow water, these corals are often overlooked. Pourtalès, who published in the latter half of the nineteenth century, was the only systematist who was seriously interested in this fauna, having described most of the previously known species. This revision adds 21 new species to the western Atlantic fauna, doubling the number previously known from this area. Even so, based on numerous unidentified specimens in the USNM collections of the National Museum of Natural History, Smithsonian Institution, and in the Museum for Comparative Zoology, Harvard (MCZ), there are probably many more species yet to be described.

This paper forms a companion to my revision of the deep-water ahermatypic Scleractinia of the western Atlantic (Cairns, 1979), the other major group of stony corals. Both revisions were based on similar collection sources.

ABBREVIATIONS.—The following abbreviations are used in the text.

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MUSEUMS

BM	British Museum (Natural History), London
IRCZM	Indian River Coastal Zone Musuem, Ft. Pierce
MCZ	Museum of Comparative Zoology, Harvard, Cambridge
NMNH	Natural Museum of Natural History, Smithsonian Institution, Washington, D.C.
RM	Naturhistoriska Riksmuseet, Stockholm
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden
RSMAS	Rosenstiel School of Marine and Atmospheric Science, University of Miami (Invertebrate Museum abbreviated UMML)
UMML	University of Miami Marine Laboratory (now RSMAS), Miami
USNM	Collections of the old United States National Museum, now in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C.
YPM	Yale Peabody Museum, New Haven
ZMC	Zoologisk Museum, Copenhagen

VESSELS AND EXPEDITIONS

ALB	U.S. Fish Commission Steamer *Albatross*
B-A	University of Iowa Barbados-Antigua Expedition (1918)
BL	U.S. Coast Survey Steamer *Blake*
G	R/V *Gerda* (RSMAS)
Gos	R/V *Gosnold*
JSL	R/V *Johnson Sea-Link* (Harbor Branch Foundation)
J-S	Johnson-Smithsonian Deep-Sea Expedition (1933)
O	M/V, R/V *Oregon* and *Oregon II*
P	R/V *Pillsbury* (RSMAS)

OTHER TERMS

H:W	Height-to-width ratio of a gastrostyle (Cairns, 1983b)
SEM	Scanning electron microscope/microscopy

σ Standard deviation of the sample (about 68% of the variation of a population falls within ± one standard deviation of the mean)
HS Histological slide (serial sections)

ACKNOWLEDGMENTS.—I would like to thank H. Zibrowius (Station Marine d'Endoume, Marseille), F.M. Bayer (NMNH), and E.J. Cairns (my father) for carefully reading this manuscript and providing helpful suggestions. This revision would not have been possible without the willing and timely cooperation of several museum curators, namely: G.L. Voss (RSMAS), K. Sebens and A. Johnston (MCZ), K.W. Petersen (ZMC), R. Oleröd (RM), P.F.S. Cornelius (BM), and J.E. Miller (Harbor Branch Foundation). I would like to acknowledge M. Pettibone (NMNH) for her identifications of the commensal polychaetes. Helen F. Wimer (NMNH) skillfully prepared the serial histological sections.

I gratefully acknowledge the support of the administration of the Smithsonian Institution and the National Museum of Natural History in allowing me to pursue this study at the National Museum in the capacity of a research associate. This paper was based on work financially supported by the National Science Foundation under Grant Number BSR-8217278.

Historical Résumé

The first stylasterid species to be described from the western Atlantic was *Stylaster roseus* (Pallas, 1766), which is not surprising, because it is the only shallow-water species known from this region. The following century produced only occasional reports of this species, some based on Pallas's original description (see Boschma, 1965).

The first and only person to work extensively on the western Atlantic stylasterids was Pourtalès, who published five papers (Pourtalès, 1867, 1868, 1871, 1874, 1878) that included records of western Atlantic species. Most of his specimens were collected in the Straits of Florida and off Barbados aboard the research vessels *Corwin*, *Bibb*, *Hassler*, and *Blake*. Pourtalès described 17 new species, only one of which is considered to be a junior synonym. Pourtalès undoubtedly would have described many more new species had he reported on the specimens collected at *Blake* stations 100–300 from the species-rich Lesser Antilles, as he did for the deep-water Scleractinia (Pourtalès, 1880b). He obviously examined this *Blake* collection and tentatively identified many of the species, but he did not publish the results. Boschma (1964a) and Zibrowius and Cairns (1982) published accounts of new species based on specimens from this collection; the remainder of these *Blake* specimens are included in this report.

At the time of Pourtalès's publications, Lindström (1877) reported two additional species from off Anguilla and Salt Island, Virgin Islands. His new species, *Cryptohelia virginis*, is a junior synonym of *Stylaster complanatus* Pourtalès, 1867.

In his report on the stylasterids collected aboard the *Challenger*, Moseley (1881) reported two species from station 23 off St. Thomas, Virgin Islands, including the new species *Stenohelia profunda*; one *Crypthelia* from station 24 in the Virgin Islands; and one dubious record of *Stylaster duchassaingi* from station 122 off Brazil. He included a detailed histological analysis of *Pliobothrus symmetricus*, one of the earliest and finest accounts of the soft parts of a stylasterid coral.

Broch (1936) was the next to consider western Atlantic stylasterids in a general treatise on stylasterids. Based on specimens from four stations, he identified four species, two of them new. His *Stylaster echinatus* is synonymized with *S. filogranus*, and his *S. eximius* forma *atlantica* is raised to specific status. His other two species are based on misidentifications of mixtures of specimens from *Albatross* station 2354. Several years later, Broch (1942) also reported *Distichopora sulcata* from *Albatross* 2354; these specimens are probably *D. yucatanensis*.

Boschma (1955, 1957, 1962a, 1964a,b,d, 1965, 1967) published a series of papers concerned exclusively or partially with the western Atlantic stylasterid fauna. He provided an excellent discussion of the synonymy and morphology

of *S. roseus* (Boschma, 1955, 1965); a detailed account of *S. miniatus* (Boschma, 1962a); notes on western Atlantic *Stenohelia* (Boschma, 1964b,d, 1967, 1968b); a description of the new species *Errina decipiens* (Boschma, 1964a); and complete, but uncritical, synonymies of all species (Boschma, 1957).

The first scanning electron photomicrographs of stylasterid corals were published by Sorauf (1974) and Fenninger and Flajs (1974), both publications included western Atlantic species.

In his note on stylasterids originally identified as bryozoans, Zibrowius (1982) discussed two western Atlantic species. Slightly later, Zibrowius and Cairns (1982) listed the 23 valid species known from the western Atlantic (including synonymies and dubious records), described a new species, and made remarks concerning the systematics of some of the species. With regard to their list of 23 species, three of these species are herein considered junior synonyms (*Stylaster echinatus*, *S. punctatus*, and *Stenohelia virignis*); and one "synonym" (*Stylaster atlanticus*) is resurrected, resulting in 21 previously valid species.

Finally, in my generic revision of the Stylasterina (Cairns, 1983b), I described and illustrated three western Atlantic species and also illustrated *Stenohelia profunda* for comparative purposes.

Other papers containing one or more records of western Atlantic stylasterids include: Duchassaing and Michelotti (1864), Rathbun (1879), Nutting (1895), Boone (1933), Squires (1965), Laborel (1971), Roos (1971), Colin (1978), and Cairns (1982).

Material and Methods

MATERIAL.—As of 1984, approximately 136 lots of stylasterid corals from about 116 stations had been reported from the western Atlantic. This paper is based on an examination of approximately 560 lots from about 330 localities (Map 25 and Appendix), including most of the previously reported specimens. Three institutional collections house the bulk of these specimens: the USNM (specimens from 129 stations, primarily from cruises of the *Albatross*, *Oregon*, and *Gosnold*); the RSMAS (specimens from 107 stations, primarily from the *Gerda* and *Pillsbury*); and the MCZ (specimens from 76 stations, primarily from the *Blake* and *Bibb*). Altogether, specimens from 26 research vessels were examined (see Appendix).

Types of all nominal species described from the western Atlantic have been examined, with the exception of *Stylaster roseus* (Pallas, 1766), which is presumed to be lost, and the types of the two junior synonyms originally described as bryozoans (Zibrowius, 1982). Previously reported specimens of historical interest were examined from the following museums: MCZ (Pourtalès, 1867–1878; Boschma, 1964a; Zibrowius and Cairns, 1982 (part)); NMNH (USNM collections) (Squires, 1965; Zibrowius and Cairns, 1982 (part); Cairns, 1983b); RM, Stockholm (Lindström, 1877; Broch, 1936 (part); Broch, 1942); ZMC (Broch, 1936 (part)); BM (Moseley, 1881); and the YPM (Pourtalès, 1867–1878, duplicate set of syntypes of many species). Specimens were also examined on loan from the Harbor Branch Foundation, Fort Pierce, Florida, and Texas A & M University.

METHODS.—The advent of scanning electron microscopy and its application to stylasterids (e.g., Cairns, 1983a,b) has greatly facilitated the study and illustration of species. Many new characters have been revealed, some consistent at the species level, others at the generic level. The use of SEM is strongly encouraged in revisionary work but is not considered essential for routine identification of species. The methodology concerning specimen preparation for SEM and histology is discussed by Cairns (1983b:427, 431). In this paper, however, the microscopy was done by the author on a Cambridge Stereoscan 100. I might add that coenosteal texture can usually be discerned by brushing the specimen with a colored felt-tipped marker on a small section of coenosteum and then examining it at a magnification of 50 with a dissecting microscope.

The morphological terminology used in this paper is also discussed by Cairns (1983b:431–

432); however, several more terms are added or clarified here. In some species of *Stylaster*, in addition to the normal dactylostyle, each dactylopore has one or more stout elements (sometimes arranged in short rows) on both sides of the pore. These elements are usually the same height as, but two to three times the diameter, of the normal dactylostyle elements. Rows of these structures are called lateral dactylostyles (Figures 38E, 39J). Within the cyclosystems of the sames species of *Stylaster* there is often a horizontal platform through which the gastropore tube penetrates (Figures 35G, 37G). This platform, called the shelf, usually bears a low ridge encircling the gastropore tube. The term lip refers to an abcauline enlargement of several pseudosepta (Figure 39C,D) or, in the case of genera without cyclosystems, a triangular abcauline projection (Figures 5B, 10B, 21E, 22D) that partially covers the gastropore. On the other hand, a lid refers to an abcauline enlargement of one pseudoseptum that may be greatly broadened to cover the entire gastropore and cyclosystem (Figures 47G, 50B, 52C). Each mature female ampulla of most species releases its planula through a round efferent pore 0.10–0.20 mm in diameter, usually located on the side of the ampulla (Figures 17G, 18G, 26B, 39H, 42B). Sometimes the pore is placed at the end of a short, tapered, lateral tube, termed the efferent tube (Figures 15I, 22C, 38B, 43A). The coenosteum in the region of the efferent pore is a thin porous concavity, which is progressively absorbed or dissolved just prior to planula release. A notable exception to this generality are the female efferent pores of some species of *Crypthelia*, which often exit beneath the cyclosystem lid and enter the cyclosystem cavity (Figure 46B). Male ampullae are invariably smaller and usually release their gametes through one or more tiny (<0.1 mm in diameter) efferent pores located near the top of the ampulla (Figures 32C, D, 35G, 39I). Again, the male efferent pores of some species of *Crypthelia* are usually modified, being protected by apical extensions (Figure 47C) or by opening into dactylotomes within the cyclosystem cavity (Figure 49B). Finally, papillae are conical, apically perforate nematocyst-bearing structures that occur on the coenosteum of some species (Figures 35D, 39G, 41D, E).

Tissue of only 25 of the 42 species was available for histological examination. Most of these specimens were collected up to a century ago, so preservation was often poor; in some cases the complete cnidom probably is not reported. I have found that formalin fixation followed by preservation in 70% alcohol is the best preparation for histology.

Species synonymies include only pertinent references, i.e., distributional records or comments of systematic or biological importance. Exhaustive, uncritical synonymies are given by Boschma (1957).

Most holotypes and paratypes of newly described species are deposited in the USNM collections. Additional paratypes are also deposited at the MCZ, RSMAS, and BM, as indicated in the species accounts.

A dichotomous key is provided to the genera of western Atlantic stylasterids, and tabular keys are included for the species of the three largest genera: *Distichopora*, *Stylaster*, and *Crypthelia* (Tables 1–3). Because not all of the western Atlantic species have been described, caution is urged in the use of the tabular keys for identification. One should always check the description and figures, and if discrepancies arise one should consider the possibility of an undescribed species.

STYLASTERIDAE Gray, 1847

Key to the Genera of the Northwest Atlantic Stylasteridae

1. Gastro- and dactylopores not arranged in cyclosystems 2
   Gastro- and dactylopores arranged in cyclosystems 6

2. Gastropore lacking gastrostyle ..... ***Pliobothrus***
   Gastropore with gastrostyle 3
3. Gastro- and dactylopores arranged in rows, with gastropores aligned on lateral branch edge and dactylopores aligned on one or both (usually both) sides of gastropore row; gastropores never lipped; gastrostyle usually quite long and highly ridged ..... ***Distichopora***
   Gastro- and dactylopores usually randomly arranged, or with gastropores on anterior face and dactylopores uniserially arranged on branch edge; gastropores sometimes lipped; gastrostyles moderately along and unridged or only slightly ridged 4
4. Dactylopores are apically perforate cones ..... ***Lepidopora***
   Dactylopores are U-shaped spines 5
5. Dactylopore spines abcauline (slit directed distally) ..... ***Lepidotheca***
   Dactylopore spines adcauline (slit directed proximally) ..... ***Errina***
6. Cyclosystem lid present; double-chambered gastropore tube; gastro- and dactylostyles absent ..... ***Crypthelia***
   Cyclosystem lid absent (although abcauline lips may be present); gastropore tube cyclindrical; gastro- and dactylostyles present 7
7. Cyclosystems unifacial, larger than distal branch diameter; gastropore tube long, usually curved 90°; ampullae usually clustered near cyclosystems ..... ***Stenohelia***
   Cyclosystems randomly or sympodially arranged, smaller than distal branch diameter; gastropore tubes usually short and straight; ampullae scattered randomly over coenosteum ..... ***Stylaster***, 8
8. Cyclosystems randomly arranged; branch tips blunt . ***Stylaster*** (Group A)
   Cyclosystems sympodially arranged or derived from a sympodial origin; branch tips attenuate 9
9. Cyclosystems primarily sympodially arranged but additional cyclosystems often present on anterior and posterior branch faces ..... ***Stylaster*** (Group B)
   Cyclosystems sympodially arranged on lateral or anterolateral branch edges ..... ***Stylaster*** (Group C)

Lepidopora Pourtalès, 1871

DIAGNOSIS.—Coordination of gastro- and dactylopores usually random; however, in some species dactylopores uniserially arranged on branch edges and gastropores on anterior and anterolateral branch faces. Dactylopores never biserially arranged. Coenosteal texture variable, including reticulate-granular, linear-granular, linear-imbricate, and tufted. Gastropores of some species with abcauline lip; gastro- and dactylopore tubes long. Gastrostyles usually not ridged and with moderately high H:W ratios. Dactylopores apically perforate cones; no dactylostyles.

TYPE-SPECIES.—*Errina glabra* Pourtalès, 1867, by subsequent designation (Boschma, 1963a).

DISCUSSION.—The *Lepidopora* species with linearly arranged dactylopores, particularly *L. biserialis*, are similar to those *Distichopora* with laterally unequal or unilaterally arranged dactylopores, such as *D. foliacea* and *D. uniserialis*. In both cases, however, the gastropores of the *Distichopora* species are always lateral and their dac-

tylopores antero- or posterolateral, whereas in *L. biserialis* the dactylopores are lateral and the gastropores anterolateral. Furthermore, although *D. foliacea* has apically perforate conical dactylopores, it often has two rows of dactylopores and never has abcauline gastropore lips. Likewise, although *D. uniserialis* has exclusively unilateral dactylopores, it has flush elliptical dactylopores and no gastropore lips.

1. *Lepidopora clavigera*, new species

FIGURES 1A–I, 53A–B

DESCRIPTION.—Largest colony examined (the holotype) a branch fragment only 25 mm tall; branch tips slightly clavate and compressed, one measuring 2.5 × 1.8 mm in diameter. Broken basal section 2.7 × 2.5 mm in diameter. Colony uniplanar, with very regular, dichotomous branching, forming U-shaped axils. Coenosteum composed of short, longitudinal, discontinuous strips about 90 μm wide and 0.1–0.4 mm long, the shorter strips approximating rhomboids. Space between adjacent strips 26–38 μm wide, filled in with irregularly shaped tufts of calcium carbonate approximately 14 μm in diameter, some originating from lateral sides of strip.

Gastro- and dactylopores evenly scattered over coenosteum but with a slight tendency for dactylopores to concentrate on lateral branch edges. Gastropores round, 0.22–0.25 mm in diameter, and flush with branch surface; no lower lip. Illustrated gastrostyle 0.51 mm tall and 0.08 mm wide (H:W = 6.4), bluntly tipped, and deeply set in a long cylindrical gastropore tube 1.2 mm long and 0.18 mm in diameter; no ring palisade. Style slightly ridged; the ridges bearing long, cylindrical, bluntly tipped, simple spines up to 70 μm long and 9 μm in diameter. Dactylopores round, 70–110 μm in diameter, and slightly elevated on mounds up to 0.1 mm high.

Ampullae about 1.0 mm in diameter, forming low bulges in coenosteum. No evidence of sexual dimorphism or efferent pores was seen.

Gastrozooids cylindrical, 0.10–0.11 mm in diameter, and up to 1.1 mm long. Two to four short tentacles present per gastrozooid, each about 15 μm in diameter. Dactylozooids about 30 μm in diameter and quite long; in longitudinal section each dactylozooid is subdivided by numerous parallel closely spaced membranes (Figure 53A). Dactylozooid nematocysts kidney shaped, about 10 × 5 μm.

DISCUSSION.—In colony size and shape *L. clavigera* is very similar to *Pliobothrus symmetricus*. Its deeply set gastrostyles, not visible in an undamaged cyclosystem increase its resemblance to *Pliobothrus*. In longitudinal section, however, gastrostyles are clearly evident. This, along with its distinctive coenosteal texture, readily differentiates it from *P. symmetricus*. Within *Lepidopora*, *L. clavigera* is similar to *L. glabra* in coenosteal texture: only these two species of stylasterids are known to have small tufts of calcium carbonate attached in between and to the sides of coenosteal strips. But the relative widths of the coenosteal strips and area between strips are quite different for the two species. Also, the gastro- and dactylopores of *L. clavigera* are less orderly and the gastropores lack a lower lip.

ETYMOLOGY.—The specific name *clavigera* (Latin for "club bearing") refers to the slightly clavate branch tips.

MATERIAL EXAMINED.—Types.

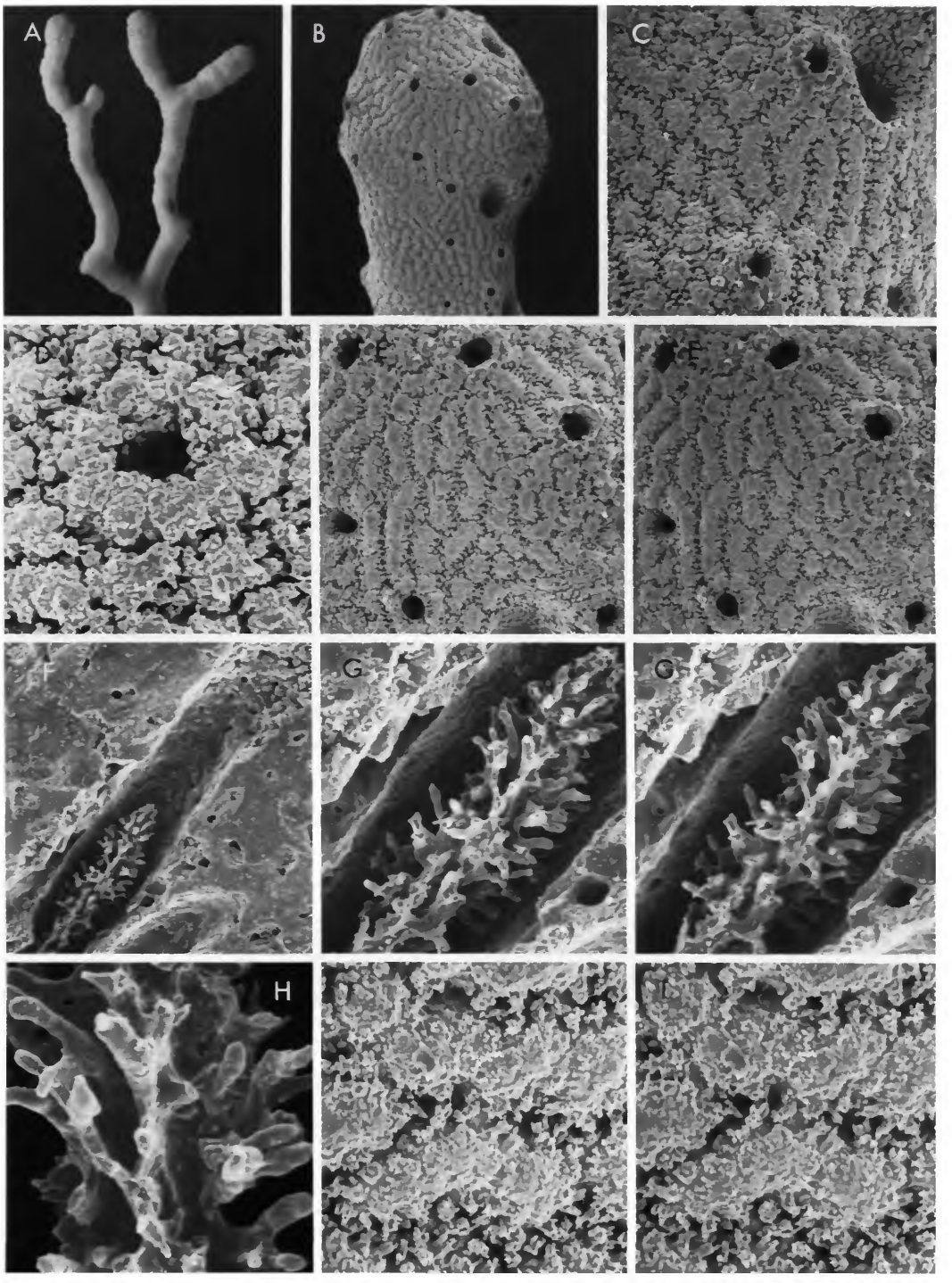
TYPES.—*Holotype:* B-A 4 (sex unknown), USNM 60362.

Paratypes: B-A 4 (1 branch) USNM 60363; *BL*-282 (1 branch) USNM 71753, (1 colony) MCZ; *BL*-300 (2 colonies) USNM 71754, (2 branches) MCZ.

TYPE-LOCALITY.—4 km NW of Pelican Island, Barbados, 201 m.

DISTRIBUTION.—Known only from off Barbados (Map 1; pattern 2b); 150–282 m.

FIGURE 1.—*Lepidopora clavigera* (A, holotype; B–I, paratypes from B-A 4): A, holotype colony, × 2.6; B, clavate branch tip, × 18; C–E, dactylopores and coenosteal texture, × 57, × 150, × 43, respectively (E is a stereo pair); F–H, gastrostyle, × 57, × 150, × 365, respectively (G is a stereo pair); I, stereo pair of tufted coenosteum, × 68.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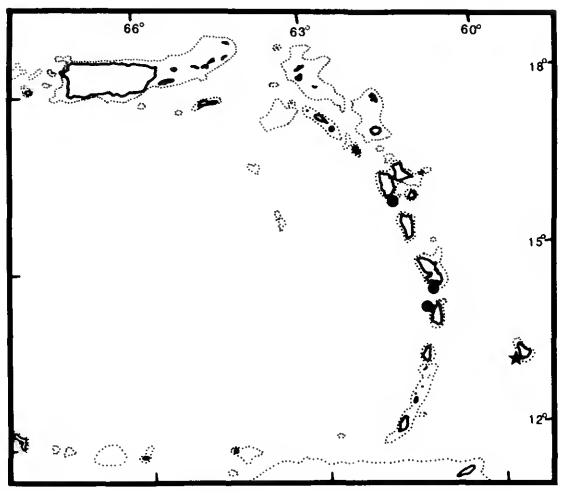


MAP 1.—Distribution of *Lepidopora decipiens* (circles) and *L. clavigera* (star).

2. *Lepidopora decipiens* Boschma, 1964

FIGURES 2A–F, 53F

Errina (*Lepidopora*) *decipiens* Boschma, 1964a:56–61, figs. 1–4, pl. 1; 1968a:207.—Zibrowius and Cairns, 1982:211.
Lepidopora decipiens.—Cairns, 1983b:428.

DESCRIPTION.—Colonies small and uniplanar; holotype only 21 mm tall, 31 mm broad, and 3.5 mm in basal branch diameter. Branching equal and dichotomous, producing U-shaped branch axils (much like the branching pattern of *Pliobothrus symmetricus*). Branches cylindrical and attenuate. Coenosteum white. Distal branches composed of linear strips 80–140 μm wide; large branches covered by a reticulate arrangement of strips of equal width. Strips composed of tall, very irregularly shaped granules 14–50 μm in diameter, which produce a rough or gritty texture.

Gastro- and dactylopores evenly scattered over branch surfaces. Gastropores round, 0.3–0.4 mm in diameter, and not lipped. Gastropore tube deep and cylindrical, without a ring palisade or tabulae. Gastrostyles cylindrical, unridged, and up to 1 mm long and about 0.1 mm in diameter (H:W ranges from 4 to 10). Style covered with long cylindrical spines up to 31 μm long and 7 μm in diameter; spines sharp and usually simple, but some are bifurcate. Dactylopores usually raised on conical mounds up to 0.55 mm tall, although sometimes flush with surface. On distal branches, mounds inclined toward branch tip. Dactylopores round, 0.08–0.13 mm in diameter.

Ampullae hemispherical, 0.5–0.75 mm in diameter, and scattered irregularly over coenosteum.

Gastrozooids long and cylindrical, about 0.16 mm in diameter and up to 1.0 mm long. Dactylozooid nematocysts rod shaped, 6–7 × 3 μm. Oval nematocysts 4 × 3 μm and larger rod-shaped nematocysts 10 × 4 μm are also found in the coenosarc.

DISCUSSION.—*Lepidopora decipiens* is distinguished from its western Atlantic congeners by its distinctive coenosteal texture and its relatively tall dactylopore mounds.

MATERIAL EXAMINED.—*BL*-171, USNM 72111, MCZ; *BL*-205, MCZ; *BL*-219, MCZ.—Types.

TYPES.—The holotype and six fragments of the holotype from *BL*-164 are deposited at the MCZ (5549).

TYPE-LOCALITY.—15°55′55″N, 61°41′35″W (off Guadeloupe), 276 m.

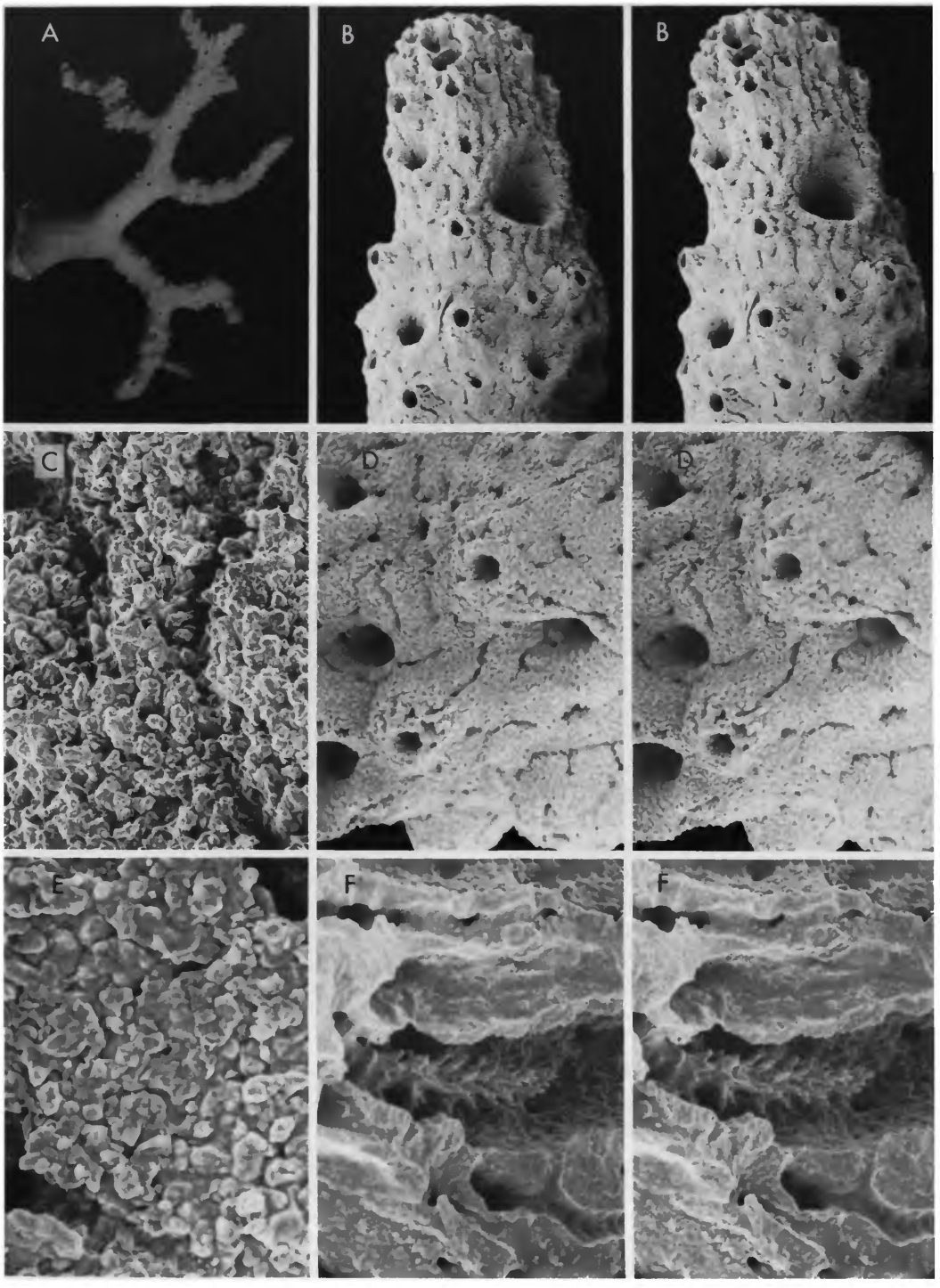
DISTRIBUTION.—Known only from the Lesser Antilles between Guadeloupe and St. Lucia (Map 1; pattern 2b); 276–607 m.

3. *Lepidopora carinata* (Pourtalès, 1867)

FIGURE 3A–F

Heliopora carinata Pourtalès, 1867:118.
Pliobothrus carintus.—Pourtalès, 1868:141.
Errina carinata.—Pourtalès, 1871:39, pl. 6: fig. 5.—Moseley, 1881:84.—Hickson, 1912a:880.—Boschma, 1957: 52. [Not *E. carinata*.—Pourtalès, 1878:211 (= *Lepidotheca pourtalesi*).]

FIGURE 2.—*Lepidopora decipiens* (A, holotype; B–C, *BL*-171; D–F, fragments from holotype): A, holotype colony, × 2.2; B, branch tip, × 24, stereo pair; C,E, coenosteal texture, × 210, × 360, respectively; D, gastro- and dactylopores and coenosteal texture, × 50, stereo pair; F, gastrostyle, × 125, stereo pair.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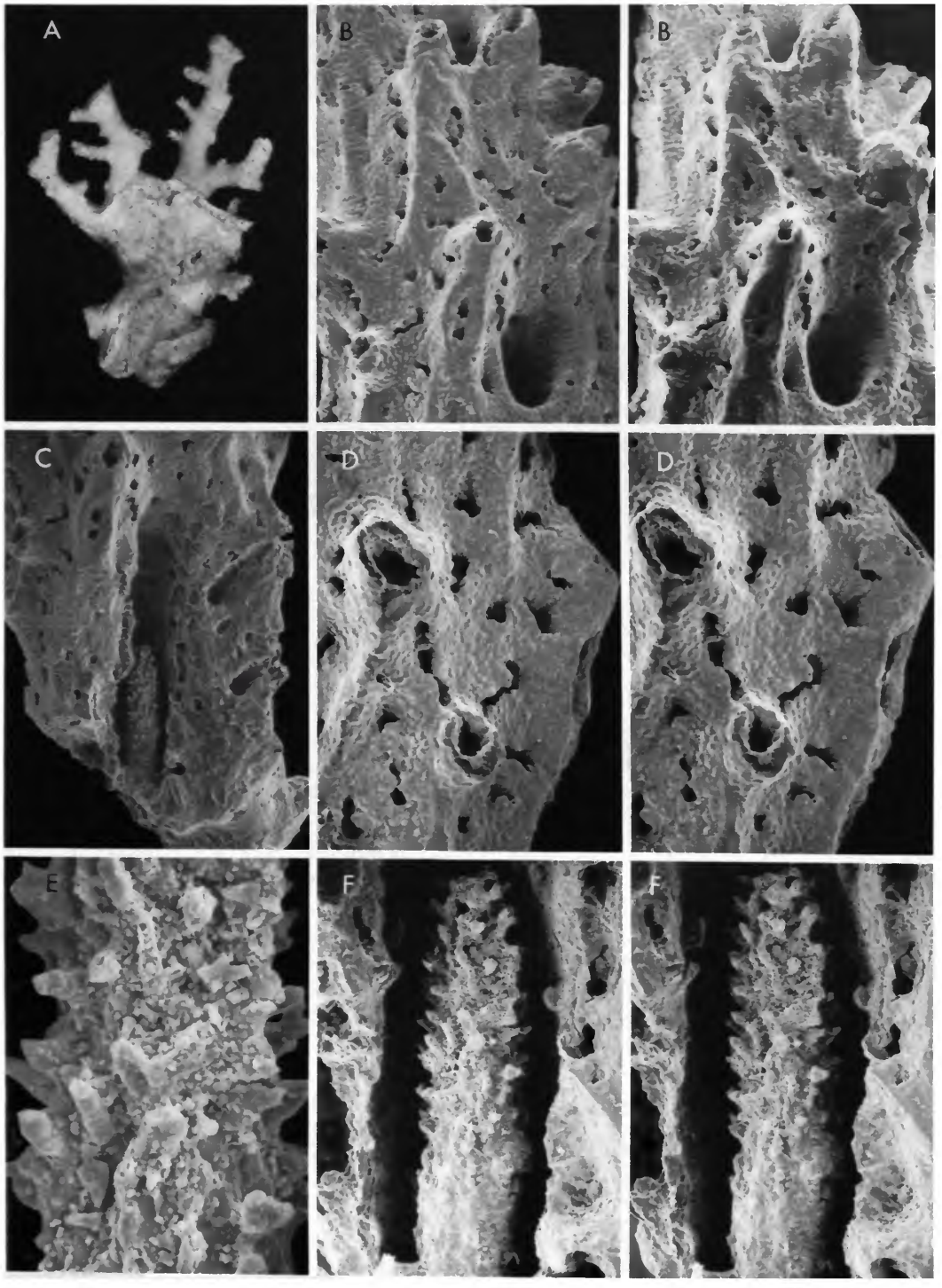
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Errina (*Lepidopora*) *carinata*.—Boschma, 1963a:338; 1963b:395; 1964a:60; 1968a:206.—Ziborwius and Cairns, 1982:211.

Lepidopora carinata.—Cairns, 1983b:428, 435, figs. 4H, I [neotype designation].

DESCRIPTION.—Neotype 17.5 mm tall, 15.2 mm broad, with a basal branch diameter of 2.3 mm. Colony uniplanar and slightly worn (probably dead when collected), encrusted basally by a bryozoan. Branches cylindrical. Delicate lateral branches about 0.9 mm in diameter originate from larger-diameter main branches. Coenosteum white, linear-imbricate in texture. Coenosteal strips 0.10–0.12 mm wide, bordered by thin discontinuous slits.

Gastro- and dactylopores randomly arranged on anterior and anterolateral branch surfaces. Gastropores elliptical, their greater axes aligned with the branch axis, about 0.12 × 0.15 mm in diameter. No gastropore lips. Gastropore tube cylindrical and deep, with a diffuse ring palisade. Gastrostyle deep-seated, occupying only lower half of cavity. Style cylindrical, robust, and not ridged. Illustrated style 0.34 mm tall and 0.07 mm in diameter, bearing cylindrical spines up to 25 μm long and 9 μm in diameter. (This particular H:W ratio of 4.8 is low because the tip of the style is broken.) Dactylopore mounds conical, up to 0.18 mm tall, and strongly inclined toward branch tip. Dactylopores small, round to elliptical, about 40 μm in diameter. Proximal to each dactylopore mound is a prominent ridge, which extends along the branch up to 0.7 mm from the pore.

Ampullae hemispherical mounds about 0.7 mm in diameter, restricted to posterior branch surfaces.

DISCUSSION.—*Lepidopora carinata* is the most poorly known of the western Atlantic stylasterids. It was only cursorily described by Pourtalès, and the type-specimen is missing from the MCZ. The neotype, which is small and slightly worn, is the only specimen now known of this species. Therefore only a limited amount of SEM could be performed on this species and nothing is known of its variation. Fortunately, the distinctive characteristic of the keeled dactylopore mounds distinguishes it from all other species.

MATERIAL EXAMINED.—Neotype.

TYPES.—Pourtalès's holotype of *L. carinata* is the only one of his stylasterid types missing from the MCZ. A neotype designated by Cairns (1983b) is deposited in the USNM collections (15991).

TYPE-LOCALITY.—Off Havana, Cuba (*Corwin*-2 or 4), 494 m.

DISTRIBUTION.—Known only from off Havana, Cuba (pattern 2c); 60–494 m.

FIGURE 3.—*Lepidopora carinata* (A–F, neotype): A, neotype colony, × 2.6; B, branch tip with ridged dactylopores, × 61, stereo pair; C, E, F, gastrostyle, × 61, × 535, × 175, respectively (F is a stereo pair); D, ridged dactylopore mounds, × 105, stereo pair.

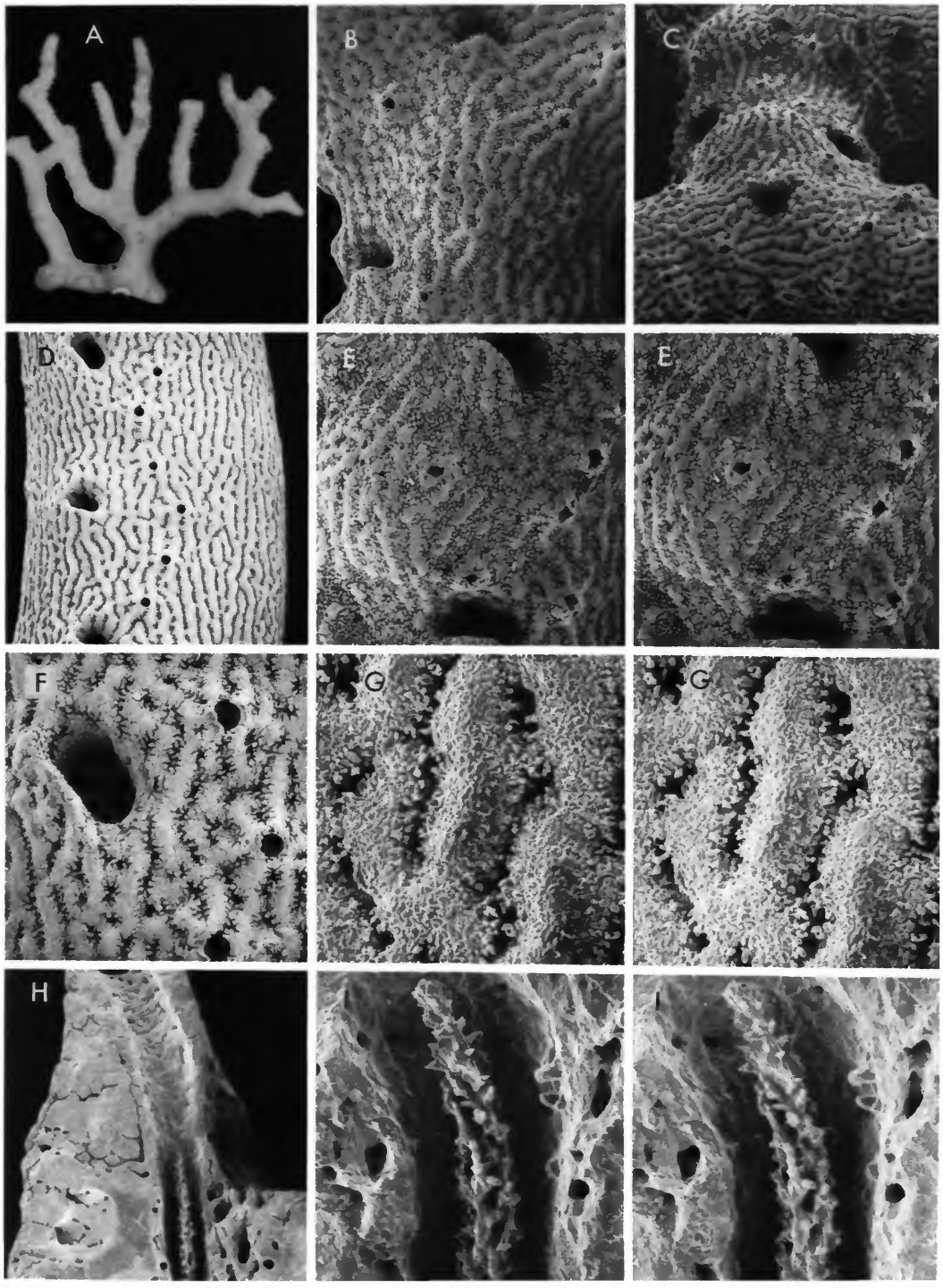
4. *Lepidopora biserialis*, new species

FIGURES 4A–I, 53E

Lepidopora glabra.—Cairns, 1983b:435 [in part: *ALB*-2167, *ALB*-2332, *ALB*-2333, *ALB*-2336, *Eastward*-26549].

DESCRIPTION.—Holotype 23.5 mm tall, 25 mm broad, with a basal branch diameter of 2.5 mm. Colony uniplanar, with slightly compressed branches, a terminal branch being about 1.5 × 1.3 mm in diameter. Coenosteum white, composed of more or less parallel, convex ridges 60–90 μm wide, between which are irregular tufts of calcium carbonate, each about 20–28 μm in width. Coenosteal texture very similar to that of *L. glabra*.

Gastropores arranged in two irregular rows on anterolateral branch surfaces, rarely on an anterior branch face. Gastropores alternating in arrangement and located near dactylopore row. Gastropores 0.24–0.30 mm in diameter, each usually bordered by a small abcauline tip. Gastropore tube cylindrical and very deep (up to 2.0 mm), with a diffuse ring palisade and no tabulae. Gastrostyles needle shaped, up to 1.0 mm tall, and about 50 μm in diameter (H:W = 20). Styles ridged, the ridges bearing simple attenuate spines up to 30 μm long. Dactylopores raised on conical mounds directed perpendicular to the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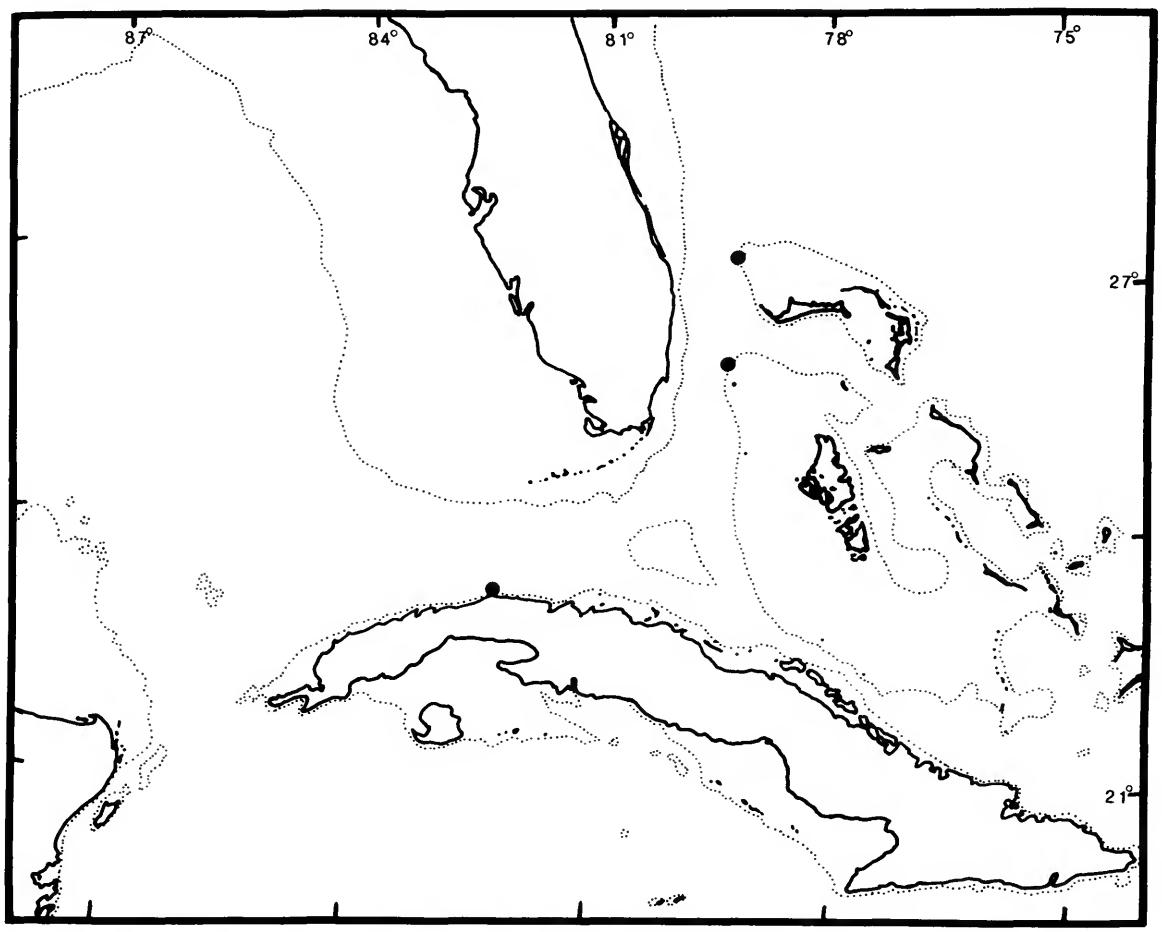


MAP 2.—Distribution of *Lepidopora biserialis*.

branch and arranged in discrete rows on the lateral branch edges. Mounds about 0.1 mm tall; dactylopores round and about 62 μm in diameter. Dactylopore centers about 0.3 mm apart.

Hemispherical female ampullae 0.9–1.0 mm in diameter occur on both anterior and posterior branch faces. Female efferent pore up to 0.20 mm in diameter. Male ampullae low bulges in coenosteum about 0.45 mm in diameter.

In histological section, small pits about 50 μm in diameter and 70 μm deep are scattered over the coenosteal surface (Figure 53E). At the base of each pit are 6–10 rod-shaped nematocysts about 10 × 15 μm.

DISCUSSION.—*Lepidopora biserialis* is very similar to *L. glabra*, especially in its coenosteal texture and shape and location of its dacylopores. It differs primarily in the biserial arrangement of its gastropores, which are located near the dactylopore rows (not uniserially on the anterior branch face as in *L. glabra*); smaller gastropore lips; coarser branches; and larger dactylopores.

FIGURE 4.—*Lepidopora biserialis* (A, holotype; B–C, E, paratype from *ALB*-2336; D, F–I, paratype from *ALB*-2333): A, holotype colony, × 1.9; B–F, branches showing anterolateral arrangement of lipped gastropores and lateral rows of dactylopores, × 29, × 18, × 19, × 35, × 50, respectively (E is a stereo pair); G, coenosteal texture, × 140 (G is a stereo pair); H–I, gastrostyle, × 35, × 115, respectively (I is a stereo pair).

ETYMOLOGY.—The specific name *biserialis* (Latin for "two series") refers to the biserial arrangement of the gastropores on the branches.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: ALB*-2336 (female) USNM 15988.

Paratypes: BL-76 (3 colonies) MCZ, (3 HS), USNM; *ALB*-2167 (1 colony) USNM 15996; *ALB*-2332 (1 colony) USNM 16035; *ALB*-2333 (1 colony, 1 branch) USNM 60511; *G*-713 (3 colonies) USNM 71755, (1 colony) UMML; *Eastward*-26549 (2 colonies) USNM 60355.

TYPE-LOCALITY.—23°10′48″N, 82°18′-52″W (off Havana, Cuba), 287 m.

DISTRIBUTION.—Known only from the insular side of Straits of Florida from Little Bahama Bank to Havana (Map 2; pattern 2c); 196–370 m.

5. *Lepidopora glabra* (Pourtalès, 1867)

FIGURE 5A–H

Errina glabra Pourtalès, 1867:117.—Boschma, 1957:54.

Lepidopora glabra.—Pourtalès, 1871:40, pl. 7, figs. 8–9; 1878:211.—Cairns, 1983b:428, 433–435, figs. 1A–I [in part: not *ALB*-2167, *ALB*-2332, *ALB*-2333, *ALB*-2336, *Eastward*-26549; all = *L. biserialis*].

Errina (*Inferiolabiata*) *glabra.*—Boschma, 1956c:F102, fig. 84:1a.

Errina (*Lepidopora*) *glabra.*—Boschma, 1963a:336, 338; 1963b:395; 1964a:60; 1968a:205.—Zibrowius and Cairns, 1982:211.

DESCRIPTION.—Uniplanar colonies up to 5.5 cm tall. Distal branches slender, pointed, and compressed, about 0.5 mm in diameter; basal branches up to 7 mm in diameter, elliptical in cross section. Coenosteum white, composed of closely adjacent, irregularly shaped, nongranular tufts of calcium carbonate, each 21–25 μm in diameter. Adjacent tufts fuse into slightly elevated longitudinal ridges, which run the length of the branches. These ridges about 44 μm wide and separated by about 0.12 mm of individual, nonfused tufts.

Gastropores, about 0.2 mm in diameter, primarily on anterior face of colony, except on larger-diameter branches where they also occur on anterolateral branch surface at branch axils. Each gastropore bordered by a large, broad, triangular abcauline lip. Gastropore tube cylindrical, with a diffuse ring palisade, its clavate spines up to 30 μm tall and 25 μm in diameter. No tabulae. Gastrostyles long, cylindrical, unridged, and bear simple cylindrical spines up to 30 μm long and 6.5 μm in diameter. Illustrated style 0.42 mm tall, with H:W = 9.1. Dactylopores occur in rows on the lateral branch edges, their centers about 0.2 mm apart. Dactylopore mounds about 0.11 mm wide, 60–80 μm tall, each apically perforated by a pore 30–38 μm in diameter.

Ampullae 0.82–0.90 mm in diameter, some with efferent tubes 0.15 mm in diameter. Ampullae usually restricted to posterior side.

DISCUSSION.—*Lepidopora glabra* is most similar to *L. biserialis;* these two species are compared in the preceding species account.

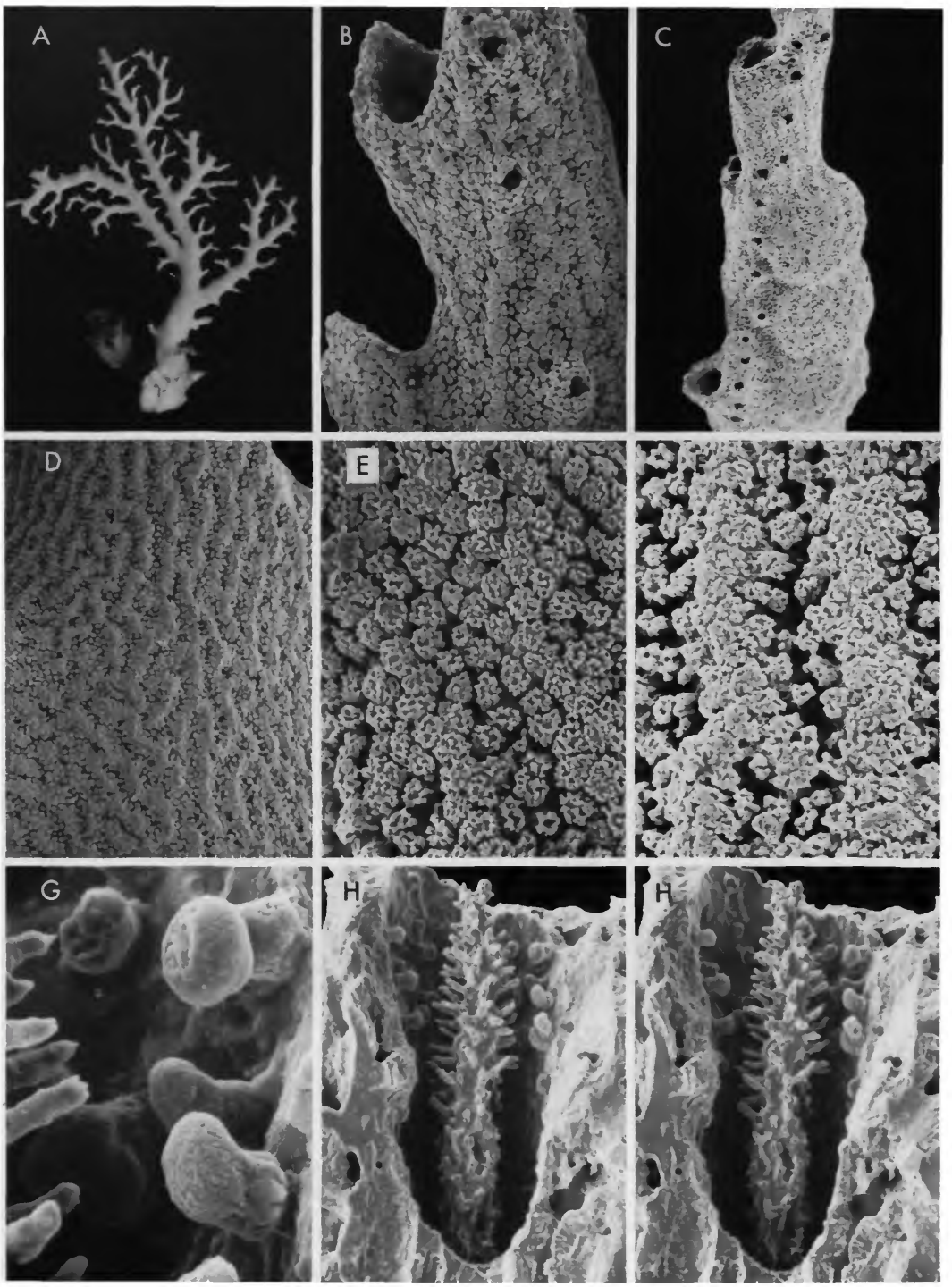
MATERIAL EXAMINED.—*BL*-24, MCZ; *BL*-100, MCZ; *ALB*-2152, USNM 7167; *ALB*-2153, USNM 15986; *ALB*-2161, USNM 15987; *Atlantis*-3367, MCZ; *G*-169, UMML; *Eastward*-26537, USNM 60353; *Eastward*-26538, USNM 60354. Types.

TYPES.—Most of the syntypes of *L. glabra* are deposited at the MCZ. The largest and best-preserved colony is numbered 3926; five other branches or fragments are present, one of which is numbered 5530. In addition, one syntype is deposited in the USNM collections (71814) and one at the YPM.

TYPE-LOCALITY.—Off Havana, Cuba, 494 m (*Corwin*-2 or 4).

DISTRIBUTION.—Insular side of Straits of Florida and off northeastern Cuba (Map 3, pattern 2c); 267–1170 m, but most commonly collected at 500–800 m.

FIGURE 5.—*Lepidopora glabra* (A, *ALB*-2153; B–H, *ALB*-2152): A, typical colony, × 1.3; B, branch tip showing large gastropore lips, × 71; C, branch tip with several ampullae, × 29; D–F, coenosteal texture, × 43, × 215, × 250, respectively; G, elements of ring palisade, × 715; H, gastrostyle, × 145 (H is a stereo pair).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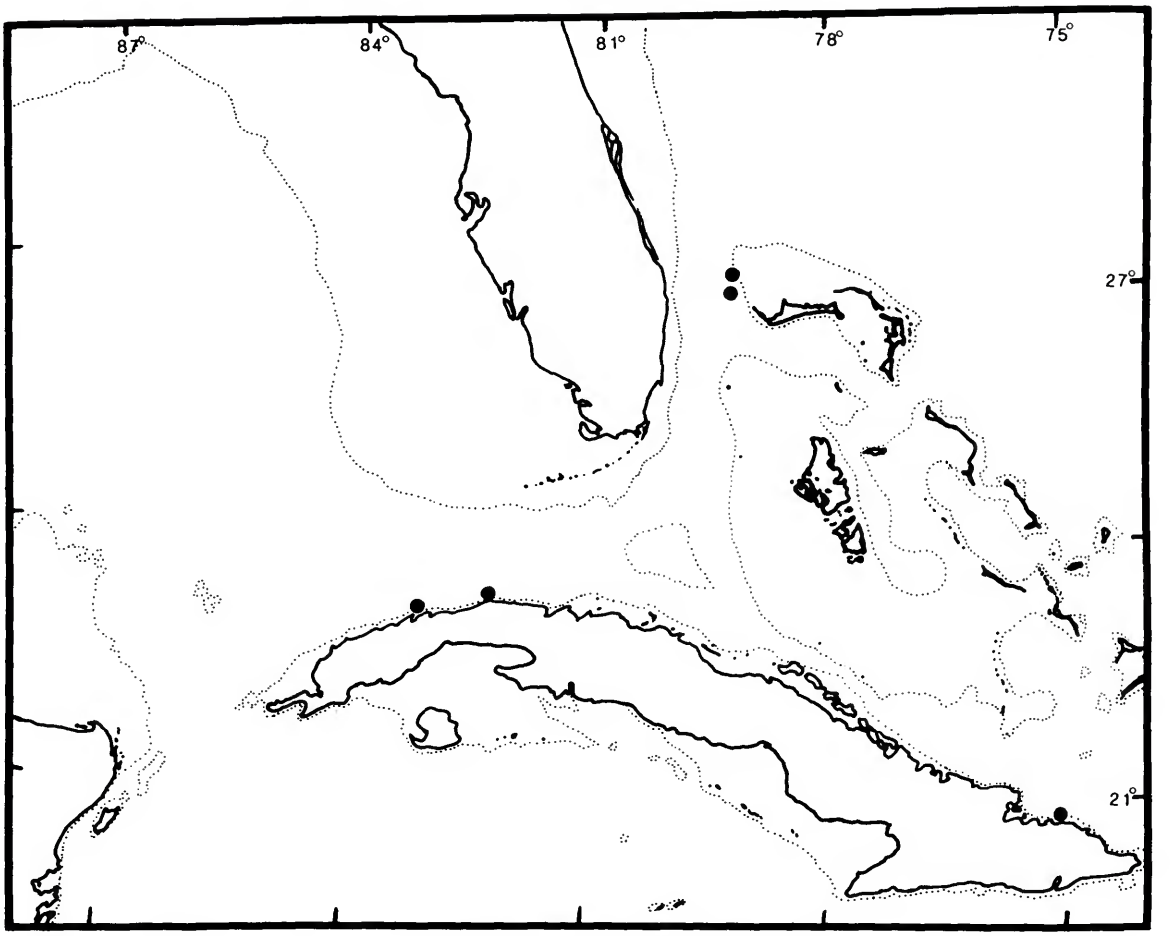


MAP 3.—Distribution of *Lepidopora glabra*.

Pliobothrus Pourtalès, 1868

DIAGNOSIS.—Gastro- and dactylopores randomly arranged. Coenosteal texture linear-imbricate, sometimes also spinose. Coenosteal pores large. Gastropore tube double chambered (see Cairns, 1983b:439); no gastrostyles. Dactylopore mounds conical or tubular; dactylopore tubes quite long; no dactylostyles. Ampullae usually internal.

TYPE-SPECIES.—*Pliobothrus symmetricus* Pourtalès, 1868, by subsequent designation (Kühn, 1928).

6. *Pliobothrus symmetricus* Pourtalès, 1868

FIGURE 6A–H

Pliobothrus symmetricus Pourtalès, 1868:141.—Duncan, 1870:297.—Pourtalès, 1871:57, pl. 4: figs. 7–8.—Duncan, 1873:336, pl. 49:fig. 7.—Pourtalès, 1878:211.—Moseley, 1881:47–50, 84, pl. 8, figs. 2–3 [in part; not specimen from *Challenger*-23; = *P. tubulatus*].—Agassiz, 1888:138–139, fig. 444.—Nutting, 1895:84, 177.—Hickson, 1912b:465–466.—Broch, 1914:3–7, pl. 1: figs. 1–3; pl. 3: figs. 19–20,28–29; pl. 4: figs. 34,40–42.—Dons, 1939:196–197, figs. 1–2.—Boschma, 1956c:F104, fig. 85:1*a–b*; 1957:59–60.—Squires, 1965:24, pl. 2: figs. 7–8.—Boschma, 1967:333–335, pl. 1: figs. 5–6.—Zi-

browius, 1981:269; 1982:982.—Zibrowius and Cairns, 1982:211, 212.—Cairns, 1983b:428, 439–441, figs. 3A–H, 24G, 25G, 27B [part: not J-S 43; = *P. echinatus*].
Hornera gravieri Calvet, 1911:7, fig. 5.

DESCRIPTION.—Colonies uniplanar, up to 9 cm tall and 8 cm broad. Branching equal and dichotomous. Branches round to elliptical in cross section, the latter shape common to branch tips. Branches robust: terminal branches 2.5–3.5 mm in diameter, sometimes larger (e.g., in clavate or very flattened branches) prior to branch bifurcation. Coenosteum white, composed of parallel strips 60–145 μm wide. Strips covered either by broad, ridged imbricate platelets or very narrow (4–11 μm) individual imbricate platelets. Spines not present on coenosteal strips. Strips bordered by broad, linearly arranged coenosteal pores 45–75 μm broad and up to 0.17 mm long, the pores usually round to slightly elliptical.

Gastro- and dactylopores randomly arranged but more common on anterior and lateral branch surfaces. Gastropores round to elliptical, the greater axis up to 0.41 mm long. Gastropore tube cylindrical, leading to a larger-diameter spherical chamber below. This lower chamber envelops lower edge of gastropore tube and is basally infilled with a spongy network of calcium carbonate. Dactylopores on mounds up to 0.20 mm tall. Dactylopores 90–110 μm in diameter and sometimes obliquely oriented on the tip of tube, such that the lower edge is proximal.

Ampullae large, spherical, and internal, with an internal diameter of 0.8–0.9 mm. Mature ampullae lead to the surface by a narrow efferent pore. A spongy, porous area about 0.2–0.3 mm in diameter often covers each ampulla.

Gastrozooids have at least five small tentacles; mouth cruciform. Dactylozooids simple, with a central lumen. Nematocysts of two kinds: larger nematocysts (39.3–43.8 × 7.8–12.5 μm) common in coenosteal canals and coenosarc; smaller ones (8.0–9.5 × 3.0–3.2 μm) rare in the coenosarc of gastrozooid. Each male ampulla contains one compound gonophore, i.e., a compartmentalized mass containing "pseudofollicles" (Broch, 1914); each gonophore contains sperm at varying stages of development.

DISCUSSION.—See Cairns (1983b:439–441).

MATERIAL EXAMINED.—*Bibb*-46, MCZ; *Bibb*-62, MCZ; *Bibb*-unknown station off Sand Key, 135 fms, MCZ; *ALB*-2672, USNM 14455; *BL*-155, MCZ; *BL*-157, MCZ; *BL*-166, MCZ; *BL*-176, MCZ; *BL*-209, MCZ; *BL*-218, MCZ; *BL*-232, MCZ; *BL*-269, MCZ; *BL*-271, MCZ; *BL*-272, MCZ; *G*-132, USNM 72112 and MCZ; *G*-134, UMML; *G*-482, UMML; *G*-598, USNM 72113; *G*-785, USNM 72114; *G*-1102, UMML; *P*-861, USNM 72115; *P*-874, UMML; *P*-891, USNM 72116; *JSL*-1360, USNM 72117; specimens listed by Cairns (1983b:441). Types.

TYPES.—The lectotype and one paralectotype are deposited at the MCZ (5529 and 5550, respectively). One paralectotype is also present at the YPM.

TYPE-LOCALITY.—24°17′N, 81°43′W (off Key West), 262 m (*Bibb*-64).

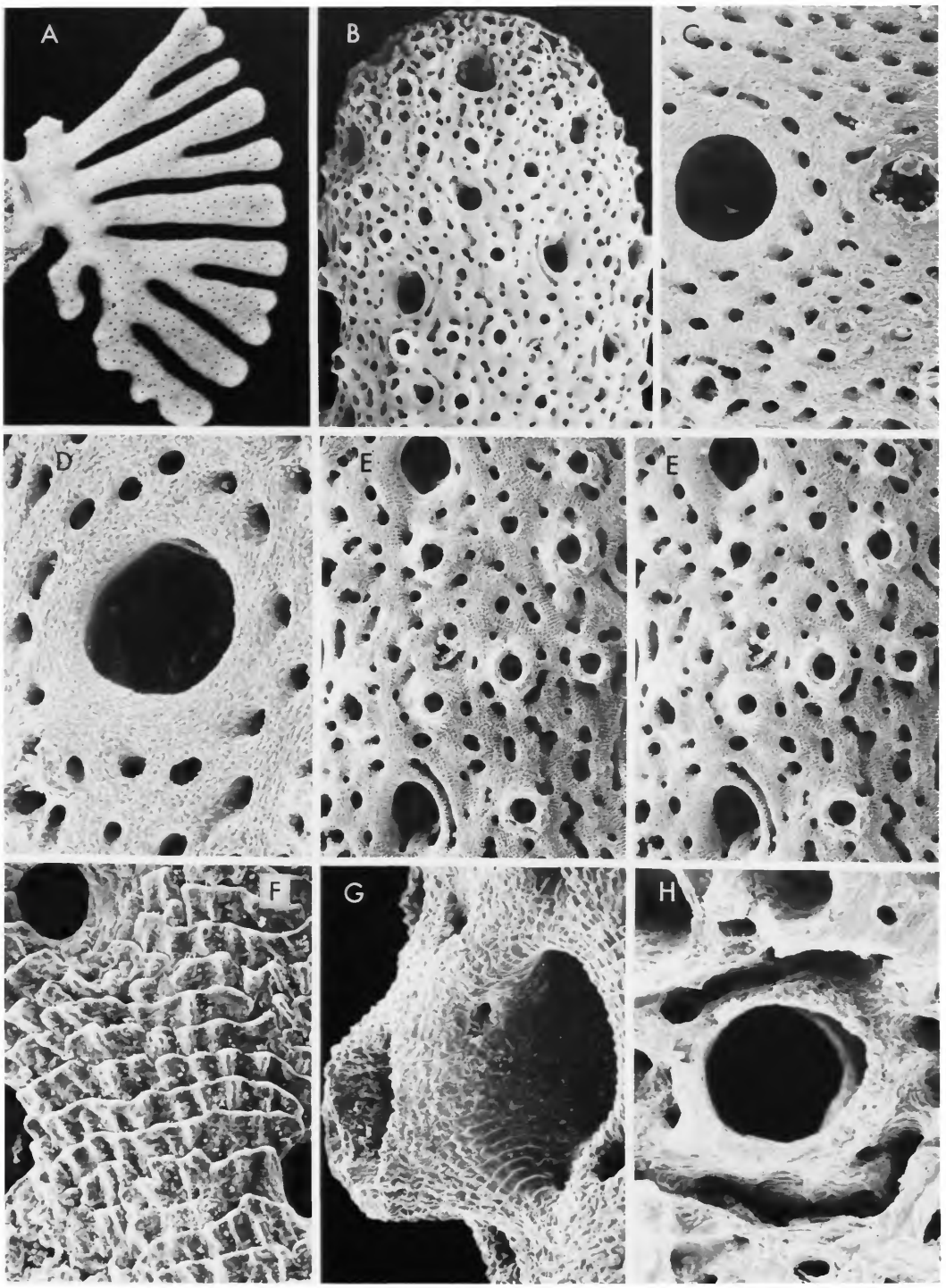
DISTRIBUTION.—Western Atlantic: from the Blake Plateau off South Carolina through the Lesser Antilles, including the Pourtalès Terrace (Map 4; pattern 4). Also known from Iceland, off Norway, Faeroe Channel, Celtic Sea, Hyères Banc, and the Azores; 80–1600 m. In western Atlantic most common at 150–400 m.

7. *Pliobothrus tubulatus* (Pourtalès, 1867)

FIGURES 7A–H, 53G–H

Heliopora tubulata Pourtalès, 1867:117–118.
Pliobothrus tubulatus.–Pourtalès, 1868:141; 1871:58, pl. 4: fig. 9; 1878: 211.—Moseley, 1879:502–503; 1881:48, 84.—Broch, 1914:3.—Boschma, 1957:60; 1963a:339–342.—Squires, 1965:24, pl. 2: figs. 5,6.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:428, 441, fig. 3I. [Not *P. tubulatus*.—Hickson, 1912b:465 (= *Lepidopora eburnea* (Calvet, 1903)).]
Pliobothrus n. sp.—Moseley, 1876a:548.
Pliobothrus symmetricus.—Moseley, 1881:84 [*Challenger*-23]. [Not *P. symmetricus* Pourtalès, 1868:141.]

DESCRIPTION.—Colonies uniplanar, up to 5 cm tall and 4.5 cm broad. Basal branch diameter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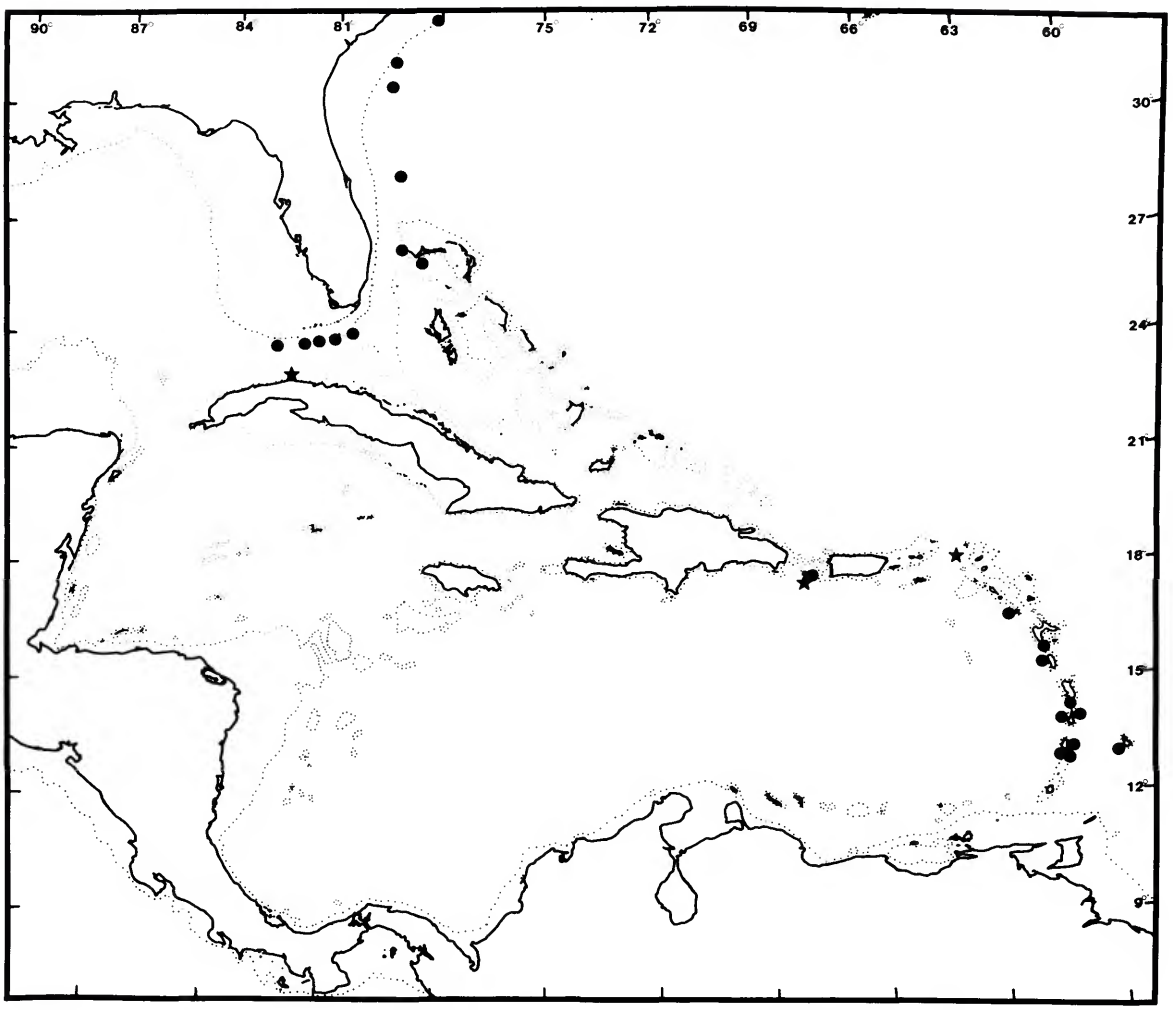
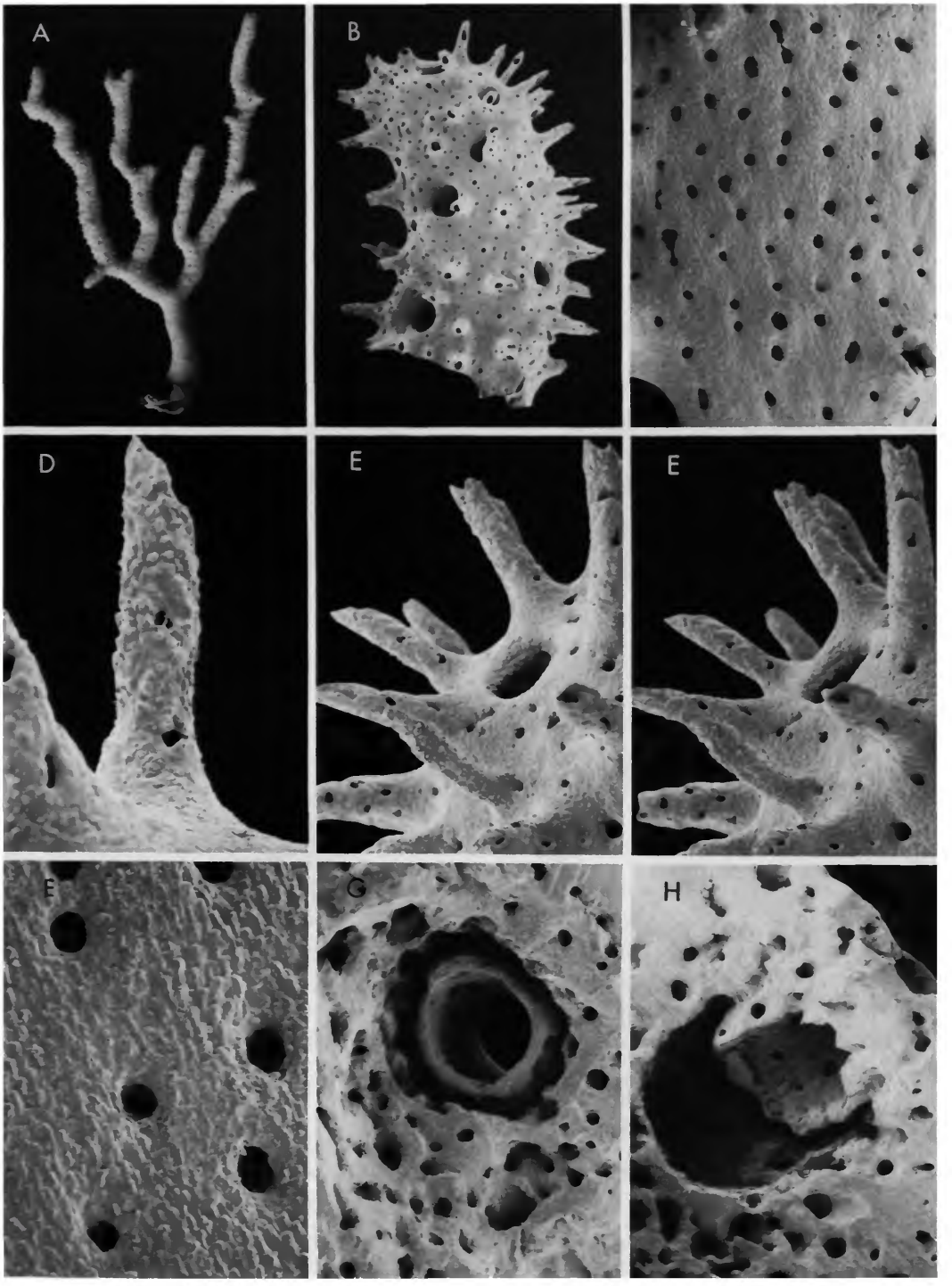


MAP 4.—Distribution of *Pliobothrus symmetricus* (circles) and *P. tubulatus* (stars). *P. symmetricus* is also known from the north and eastern Atlantic.

of large colony 3.5 mm. Branching equal and dichotomous, producing a relatively symmetrical branching pattern on both sides of the flabellum. Branches cylindrical, gradually tapering to blunt tips 1.0–1.5 mm in diameter. Coenosteum white and linear-imbricate. Coenosteal strips flat, 0.14–0.16 mm wide, and without spines. Strips bordered by linearly arranged, round to elliptical pores 40–50 μm in diameter. Platelets narrow (15–20 μm wide), 6–9 of them occurring across the width of a strip.

Gastro- and dactylopores occur equally on all sides of branches. Gastropores round to slightly ellipitical, 0.25–0.35 mm in diameter, and, as in *P. symmetricus,* the gastropore tube opens into a larger spherical chamber about twice the gastro-

FIGURE 6.—*Pliobothrus symmetricus* (A, lectotype; B, E–G, *G*-598; C, D, H, specimen from off Marathon, Florida, USNM 49692): A, lectotype, × 1.1; B, branch tip, × 20; C, gastropore with efferent pore to right, × 46; D, gastropore surrounded by coenosteal pores, × 71; E, gastro- and dactylopores, coenosteal pores, and coenosteal texture, × 33 (E is a stereo pair); F, coenosteal texture, × 270; G, dactylopore, × 140; H, cross section of gastropore viewed from below, × 96.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pore diameter. There is no spongy network of calcium carbonate in the lower chamber. Dactylopore tubes up to 0.80 mm tall and 0.11–0.13 mm in diameter; apical dactylopore 60–90 μm in diameter and often oriented obliquely on tip of tube. Dactylopore tubes project perpendicular to the branch, bearing round to slit-like coenosteal pores and covered by low, rounded granules 9–11 μm in diameter.

Ampullae internal, about 0.7 mm in diameter.

Epithelial nematocysts large, about 32 × 9 μm, scattered irregularly over the surface. Male ampullae compound, as in *P. symmetricus*, each containing compartmentalized gonophores with sperm in different stages of maturity.

DISCUSSION.—*Pliobothrus tubulatus* is distinguished from *P. symmetricus* by its much longer dactylopore tubes, its more slender branches, and its smaller epithelial nematocysts.

MATERIAL EXAMINED.—*BL*-16, MCZ; *Challenger*-23, BM 1880.11.25.169; *ALB*-2152, USNM 15990; J-S 43, USNM 60365. Types.

TYPES.—Three syntypes, collected either at *Corwin*-2 or 4, are deposited at the MCZ (5536).

TYPE-LOCALITY.—Off Havana, Cuba, 494 m.

DISTRIBUTION.—Known only from off Havana; off Mona Island, Jamaica; and off Sombrero Island, Dutch West Indies (Map 4; pattern 2a); 419–708 m.

8. *Pliobothrus echinatus*, new species

FIGURE 8A–K

Pliobothrus symmetricus.—Cairns, 1983b:441 [in part: J-S 43].

DESCRIPTION.—Colonies uniplanar and small, the holotype only 38 mm tall with a basal branch diameter of 3.4 mm. Branching equal and dichotomous, usually producing a symmetrical branching pattern. Terminal branches blunt, round in cross section, and usually delicate (about 2 mm in diameter); however, one robust specimen has a branch diameter of 4.5 mm. Coenosteum white with linear-imbricate coenosteal texture, but imbrication not always present on all branch surfaces. Coenosteal strips 0.10–0.13 mm wide, convex, and bordered by well-defined elongate slits about 40 μm wide. Platelets broad and smooth, producing a glistening aspect to the surface. A row of tall, blunt spines occurs on the midline of each strip, the spines up to 45 μm tall and 15 μm in diameter.

Gastropores elliptical, up to 0.60 × 0.35 mm in diameter. Gastropore tubes as in *P. tubulatus*. Dactylopores most common on anterior and lateral branch surfaces, the tallest dactylopore tubes (up to 0.4 mm) on lateral surfaces. Lateral dactylopore tubes sometimes have spinose vertical ridges; otherwise, dactylopore tubes unridged cones usually less than 0.10 mm tall. Dactylopores round, 0.10–0.11 mm in diameter.

Ampullae internal, about 0.6 mm in diameter, leading to branch surface by an efferent pore about 0.13 mm in diameter.

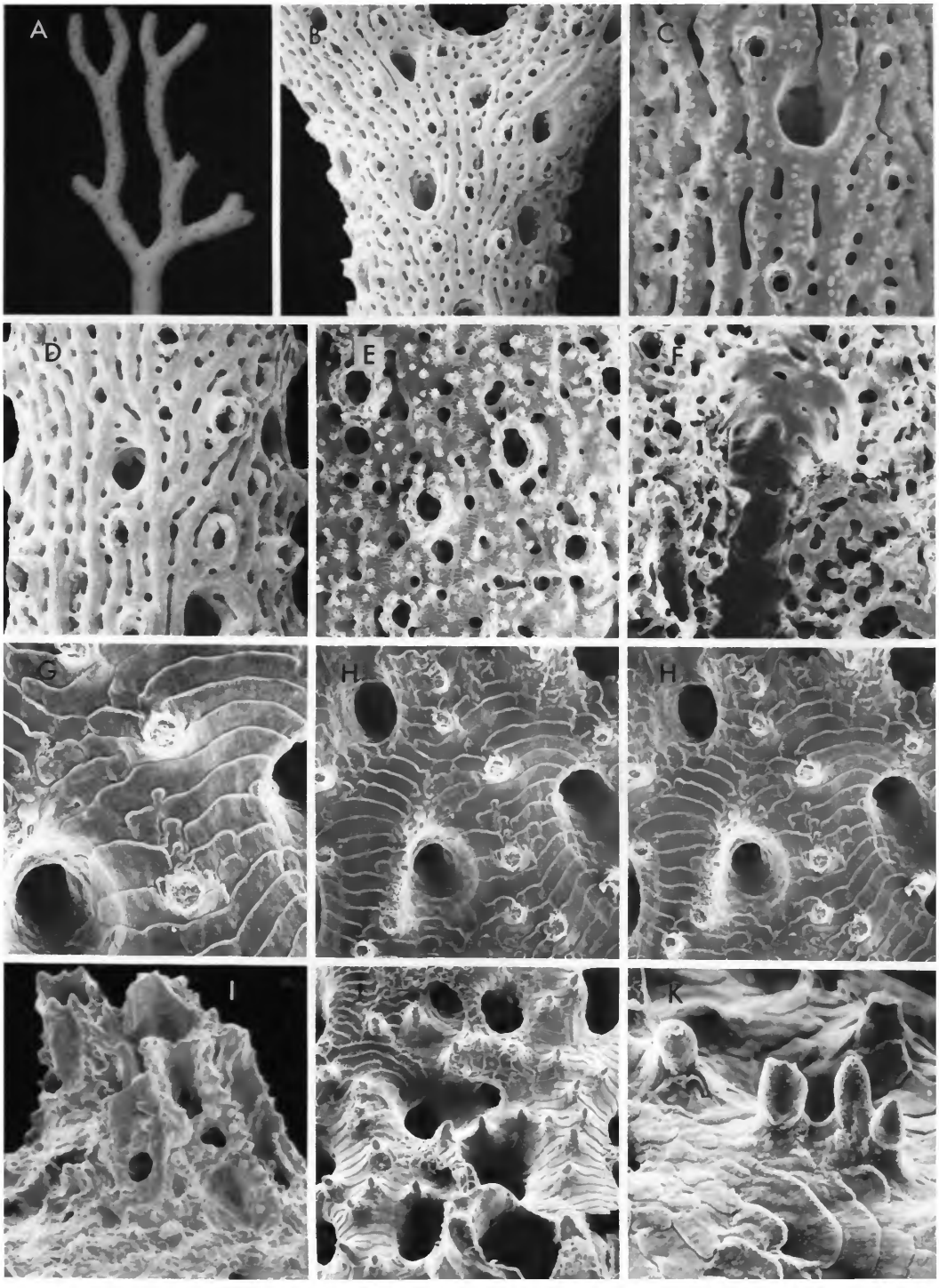
Epithelial nematocysts about 24 × 6–7 μm. Polyps not sectioned.

DISCUSSION.—*Pliobothrus echinatus* is distinguished from the previously described species by its broad, glistening coenosteal platelets; spination on the coenosteal strips; longer coenosteal slits, which form better-defined strips; larger gastropores; and smaller epithelial nematocysts.

It is not understood why some specimens have imbricate platelets covering the entire corallum, whereas in other specimens the platelets occur on only parts of branches. It does not seem to be a function of age, because some terminal branchlets do not have platelets; perhaps the platelets simply have not yet developed in places. Whatever the case, the spination is consistently present somewhere on every corallum.

ETYMOLOGY.—The specific name *echinatus* (Latin for "echinate, spiny") refers to the spines occurring on all coenosteal strips.

FIGURE 7.—*Pliobothrus tubulatus* from *ALB*-2152: A, colony, × 1.3; B branch tip, × 13; C, F, coenosteal texture, × 39, × 145, respectively; D, E, tall dactylopore tubes, × 115, × 44, respectively (E is a stereo pair); G, H, cross section and longitudinal sections through a gastropore tube, × 50, × 54, respectively.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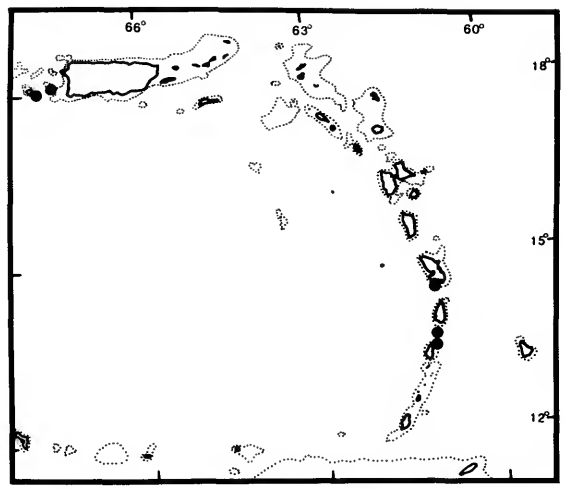


MAP 5.—Distribution of *Pliobothrus echinatus*.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* *P*-881, USNM 71756.

Paratypes: *P*-881 (4 branches) USNM 71757; *ALB*-2753 (1 branch) USNM 60364; J-S 43 (2 colonies, 1 branch) USNM 71758; J-S 47 (1 colony, 4 HS) USNM 71759; *P*-907 (1 colony) UMML.

TYPE-LOCALITY.—13°21'N, 61°02'W (off St. Vincent), 708 m.

DISTRIBUTION.—Lesser Antilles from off Mona Island to off St. Vincent (Map 5; pattern 2b); 164–708 m.

Lepidotheca Cairns, 1983

DIAGNOSIS.—Gastro- and dactylopores usually randomly arranged, except for *L. brochi* in which gastropores are on anterior face and dactylopores are aligned on branch edges. Coenosteum linear-imbricate, sometimes accompanied by spines. Abcauline gastropore lips common; gastrostyle present. Dactylopore spines U-shaped, with slit directed distally; walls of dactylopore spines thin; usually no dactylostyles. Ampullae superficial.

TYPE-SPECIES.—*Errina fascicularis* Cairns, 1983a, by original designation (Cairns, 1983b).

FIGURE 8.—*Pliobothrus echinatus* (A, holotype; B, D, paratypes from *P*-907; C, paratype from J-S 43; E, G–I, K, paratypes from *P*-881; F, J, paratypes from *ALB*-2753): A, colony, × 1.5; B–E, branches showing gastro- and dactylopores and echinulate coenosteal strips, × 15, × 27, × 26, × 36, respectively; F, longitudinal section of a gastropore tube, × 27; G, H, coenosteal texture, × 250, × 142, respectively (H is a stereo pair); I, echinulate dactylopore, × 105; J, K, coenosteal spines, × 115, × 370, respectively.

9. *Lepidotheca pourtalesi*, new species

FIGURE 9A–H

Errina carinata—Pourtalès, 1878:211 [in part: *BL*(Sigsbee)-5].

DESCRIPTION.—Colonies delicate and uniplanar, up to 6.6 cm tall and 5 cm broad. Branches round in cross section, 0.61–0.92 mm in diameter distally, and up to 4.3 mm at basal attachment. Coenosteum white and linear-imbricate. Coenosteal strips flat, 0.10–0.12 mm wide, bordered by round coenosteal pores and elongate grooves connecting two or more of these pores. Coenosteal pore diameter about 20 μm and length of grooves up to 0.13 mm, together producing a discontinuous line bordering each strip. Coenosteal platelets broad, often continuous across boundary defining strips in regions where the grooves and pores do not occur. Platelets low and smooth; approximately 70 leading edges per mm.

Gastro- and dactylopores concentrated on anterior and lateral branch surfaces, although on some branches they also occur on posterior face or uniformly around branch tips. Gastropores round to elliptical, the latter about 0.20 × 0.12 mm in diameter, with their greater axis aligned with the branch axis; no gastropore lips. Gastropore tube cylindrical and deep, with a diffuse ring palisade in vicinity of upper third of gastrostyle. Ring palisade composed of strongly clavate elements. No tabulae. Illustrated gastrostyle 0.43 mm tall and 0.045 mm in diameter (H:W = 9.6), seated in a gastropore tube 0.75 mm deep. Basal half of style without ornamentation; upper half with sharp spines inclined distally, measuring up to 22 μm long and 5 μm in diameter. Spines not arranged in apparent rows or on ridges.

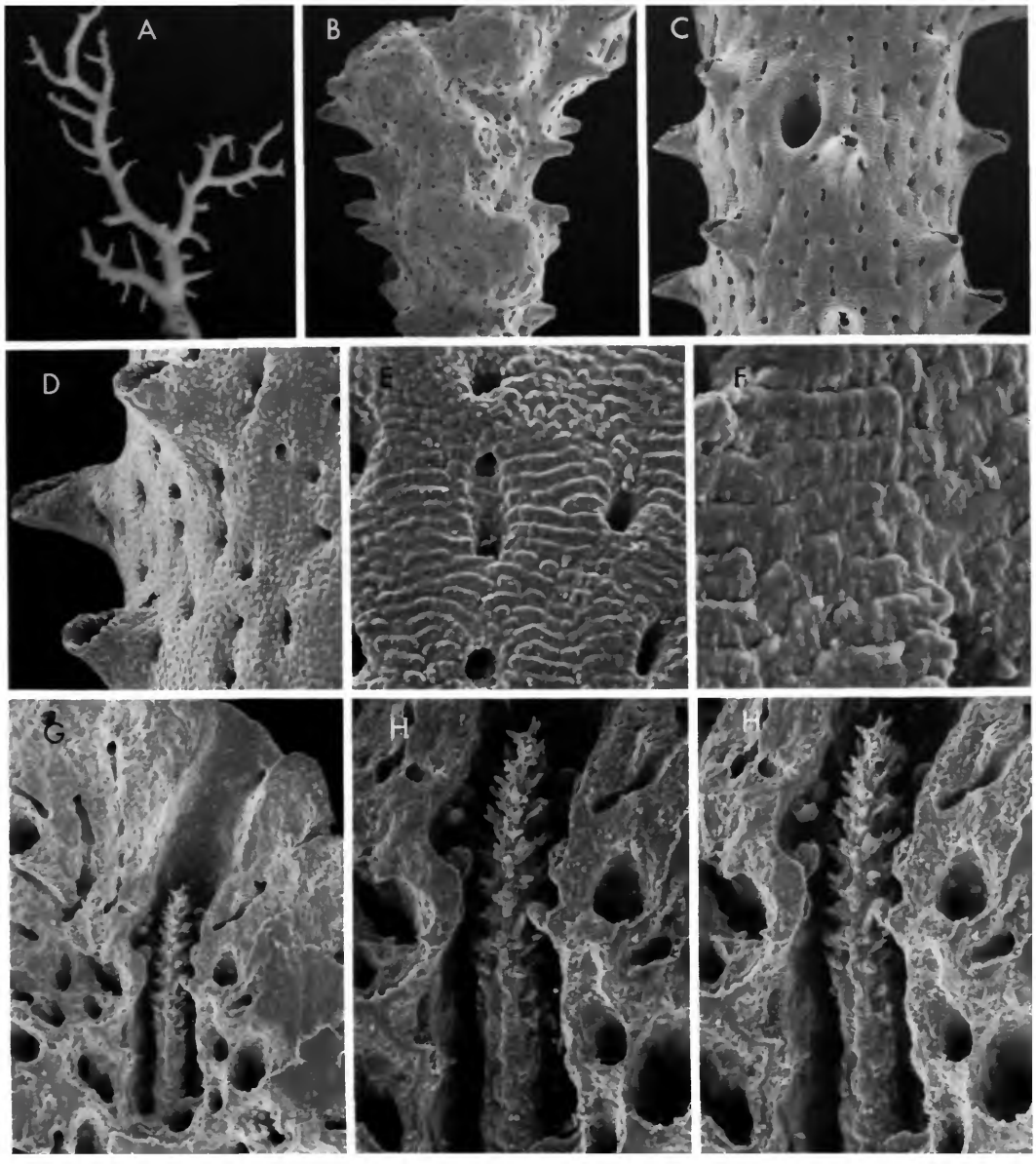


FIGURE 9.—*Lepidotheca pourtalesi* (A, C–E, H, holotype; B, G, paratypes from *ALB*-2166; F, paratype from *ALB*-2334): A, holotype colony, × 1.3; B, branch with ampullae, × 25; C, branch with several dactylopore spines and one gastropore, × 43; D, dactylopore spines, × 93; E, F, coenosteal texture, × 180, × 535, respectively; G–H, gastrostyle, × 82, × 155, respectively (H is a stereo pair).

Dactylopore spines up to 0.28 mm tall and 68 μm wide, the slit about 35 μm wide. Dactylopore spines project perpendicularly from main branches but are slightly inclined anteriorly on distal branches, altogether producing a spiny texture.

Ampullae hemispherical, 0.8–0.9 mm in diameter, and relegated to the posterior faces of branch tips.

DISCUSSION.—*Lepidotheca pourtalesi* is distinguished from the other eight congeners (Cairns, 1983b) by its arrangement of gastro- and dactylopores, which tend to be concentrated on the anterior and lateral branch surfaces; not uniserially, randomly, or at branch axils.

ETYMOLOGY.—This species is named in honor of Louis F. Pourtalès, who was the first to comprehensively study the deep-water stylasterids of the western Atlantic.

MATERIAL EXAMINED.—*BL*(Sigsbee)-5 (=, *BL* 69), MCZ 5551; *BL*-52 or 59, MCZ. Types.

TYPES.—*Holotype:* *ALB*-2331, USNM 15992. *Paratypes:* *ALB*-2331 (1 colony, 4 branches) USNM 71760, (1 colony) MCZ; *ALB*-2166 (1 colony, 1 branch) USNM 15994; *ALB*-2167 (1 colony) USNM 15995; *ALB*-2334 (1 colony, 3 branches) USNM 15993.

TYPE-LOCALITY.—23°10′31″N, 82°19′ 55″W (off Havana, Cuba), 209 m.

DISTRIBUTION.—Known only from the Straits of Florida off Havana, Cuba (pattern 2c); 123–368 m.

10. *Lepidotheca brochi*, new species

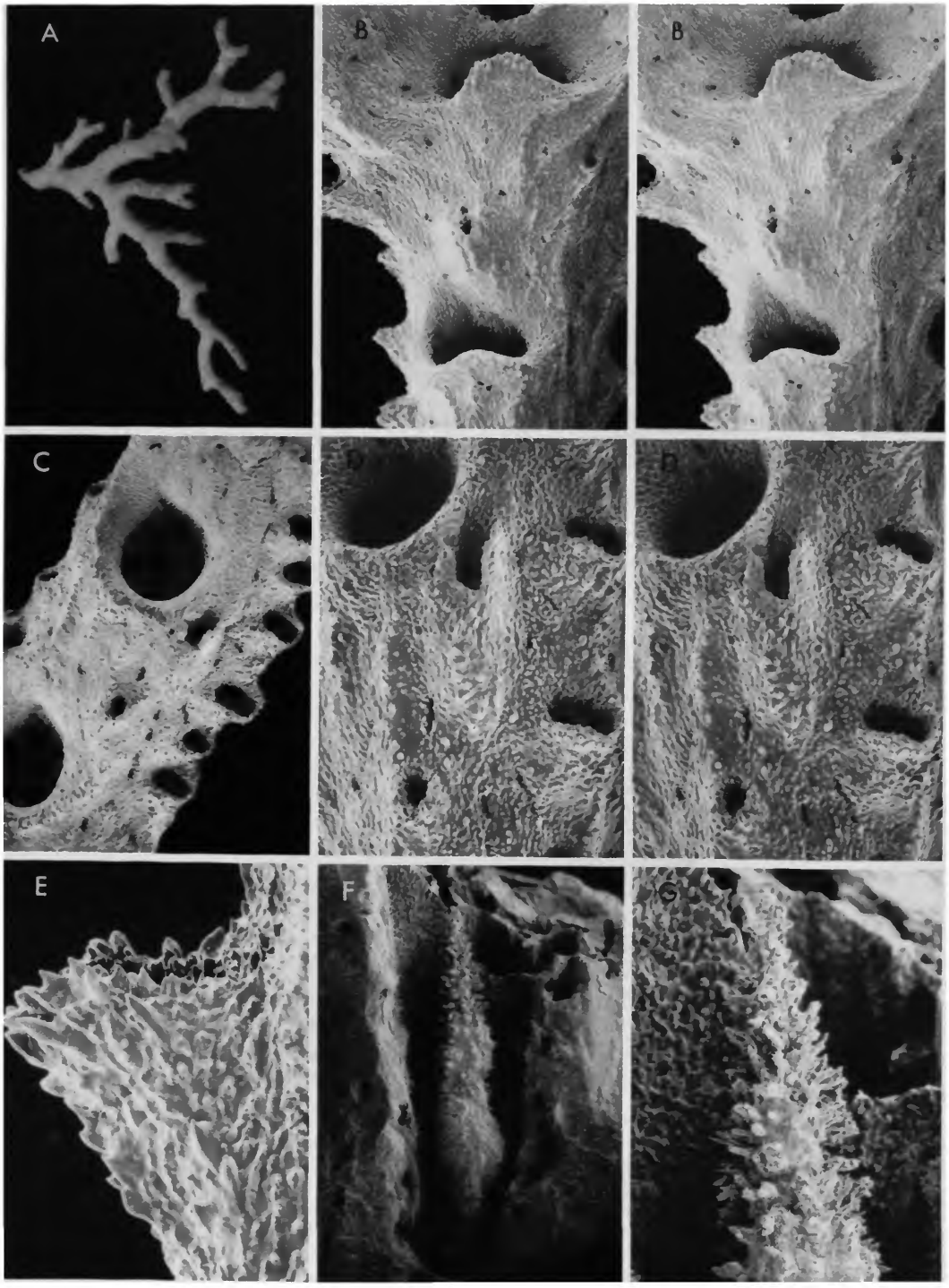
FIGURE 10A–G

DESCRIPTION.—Holotype colony uniplanar, 22 mm tall, 38 mm broad, with a basal branch diameter of 2.4 mm. Tips of terminal branches flattened in plane of flabellum, about 0.8 mm in greater diameter; however, larger-diameter branches elliptical in cross section, the greater axis being perpendicular to the flabellar plane (e.g., 2.6 × 2.1 mm in diameter). Coenosteum white, composed of broad convex strips up to 0.4 mm wide. Strips often ridged, bearing small spines along the ridge that measure about 45 μm long and 20 μm in diameter. Coenosteal texture a combination of two types, both of which occur on each colony (Figure 10D). Predominant texture small irregularly shaped granules; secondary texture composed of broad, ridged platelets, the latter architecture being more common around gastropores. Coenosteal pores slitlike and not common.

Gastropores uniserially arranged on anterior face of terminal branches but in an alternating arrangement on anterolateral edges of larger-diameter branches. Gastropores round to elliptical, 0.35–0.42 mm in diameter, and usually, though not always, bordered by a broad abcauline lip. Gastropore tube cylindrical, without a ring palisade or tabulae. Illustrated gastrostyle 1.04 mm long and about 0.14 mm in diameter (H:W = 7.4); however, only distal third ornamented with long cylindrical spines up to 30 μm long and 7 μm in diameter. Style pointed and not ridged. One row of dactylopores occurs on lateral branch edges; however, additional dactylopores also occur on anterior and posterior branch faces at distal end of coenosteal ridges, and in one specimen from *BL*-205, short rows of dactylopores also present on anterolateral branch edges. Dactylopore spines up to 0.25 mm tall, the slit about 0.07 mm wide and directed distally and slightly toward anterior face. Dactylopore spines bear prominent granules like those on coenosteal ridges, which sometimes fuse longitudinally, such that a dactylopores spine might have four or five short parallel ridges running the length of spine.

Ampullae small and roughly hemispherical, about 0.6 mm in diameter, occurring primarily on posterior branch face.

DISCUSSION.—Of the eight other described species of *Lepidotheca* (see Cairns, 1983b:446), *L. brochi* differs by having uniserially arranged dactylopores. In this regard it has the same gastrodactylopore coordination as *Lepidopora biserialis* and *L. glabra*, the other species of both genera having a random coordination of pores. Other-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wise, the spinose coenosteal strips and spinose dactylopores of *L. brochi* are very similar to those of *L. horrida* (Hickson and England, 1905), and the broad abcauline gastropore lips are like those of *L. fascicularis* (Cairns, 1983a).

Another unique feature of *L. brochi* is its dual coenosteal texture. Broad coenosteal strips covered by imbricate platelets are common to all species of *Lepidotheca* but occur only secondarily in *L. brochi.*

Lepidotheca brochi superficially resembles some species of *Distichopora*, especially those having dactylopores primarily on only one side of the gastropore row. The specimen from *BL*-205 is particularly similar to *D. anomala,* both species having linear-imbricate texture and a similar coordination of gastro- and dactylopores. *L. brochi* is distinguished by having prominent coenosteal spines, larger gastropores, smaller ampullae, abcauline gastropore lips, and unridged gastrostyles.

ETYMOLOGY.—This species is named in honor of Hjalmar Broch for his many contributions to stylasterine systematics.

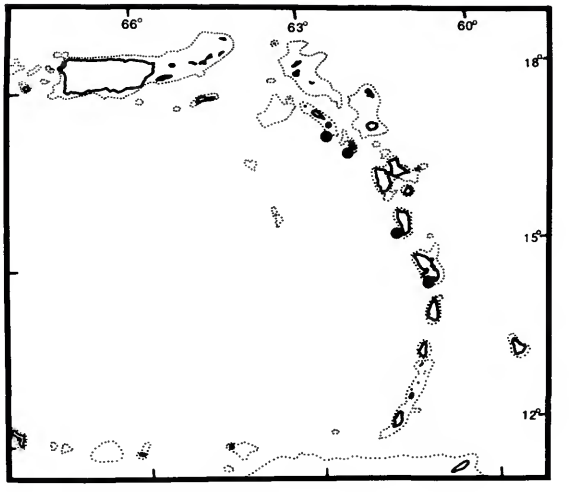
MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: P*-954, USNM 71761.

Paratypes: P-954 (6 branches) UMML, (2 branches) BM 1984.3.14.1; *BL*-154 (2 branches) MCZ; *BL*-187 (1 colony) USNM 71762 ; *BL*-205 (1 colony) USNM 71763.

TYPE-LOCALITY.—16°57′N, 62′44′W (off Nevis), 864 m.

DISTRIBUTION.—Known only from Lesser Antilles between Nevis and Martinique (Map 6; pattern 2c); 545–864 m.



MAP 6.—Distribution of *Lepidotheca brochi.*

Distichopora Lamarck, 1816

DIAGNOSIS.—Gastropores usually aligned on lateral branch surfaces, flanked on either side by a row of dactylopores, together forming a pore row. In some species, however, the dactylopores on one side of gastropore row are lesser in number or completely absent, and in other species the pore row meanders over branch surface. Coenosteal texture variable, including reticulate-granular, tuberculate, tufted, and linear-imbricate accompanied by spines. Gastropores never lipped; gastro- and dactylopore tubes long. Gastrostyle usually highly ridged and very elongate; tabulae common. Dactylopores usually elliptical; no dactylostyles.

TYPE-SPECIES.—*Millepora violaceae* Pallas, 1766, by monotypy.

DISCUSSION.—The nine western Atlantic species are arbitrarily arranged in two groups: the first five having a bilaterally equal arrangement of dactylopores, the last four having an unequal or unilateral arrangement of dactylopores (Table 1).

11. *Distichopora sulcata* Pourtalès, 1867

FIGURE 11A–I

Distichopora sulcata Pourtalès, 1867:117; 1871:38, pl. 4: fig. 14, pl. 7: fig. 7; 1878:210.—Moseley, 1881:85.—?Nutting, 1895:85.—Boschma, 1957:46.—Sorauf, 1974:40, pl. 7: figs. 1–4.—Zibrowius and Cairns, 1982:211.—

FIGURE 10.—*Lepidotheca brochi* (A, holotype; B–G, paratype from *P*-954): A, holotype colony, × 1.8; B–D, branches showing anterior arrangement of lipped gastropores and lateral arrangement of dactylopores, × 33, × 36, × 53, respectively (B and D are stereo pairs); E, dactylopore spine, × 170; F–G, gastrostyle, × 56, × 165, respectively.

Cairns, 1983b:429. [Not *D. sulcata*.—Fisher, 1938:545, pl. 74 (= *D. yucatanensis*).—Broch, 1942:18–20, fig. 4. pl. 2: fig. 6, (= ?*D. yucatanensis*).—Boschma, 1959:158 (= *D. nitida*).]

DESCRIPTION.—Colonies uniplanar and large, up to 25 cm tall and 30 cm broad, with a basal branch diameter up to 2.4 × 1.3 cm. Branches anastomose only in large colonies. Terminal branches quite flattened, rectangular in cross section (e.g., 2.5 × 1.2 mm in dimension), with rounded branch tips. Coenosteum white, composed of flat to slightly convex strips, about 0.1 mm wide, arranged longitudinally along small branches and in a reticulate pattern on larger branches. Strips covered with cylindrical, multibranched granules up to 50 μm tall and about 20 μm in diameter, which produce a very rough, gritty texture.

Gastropores round, about 0.20–0.22 mm in diameter, and usually occurring in a continuous pore row on lateral branch edges; however, sometimes pore rows are short, resulting in only one or two gastropore surrounded by a ring dactylopores. These short rows, which sometimes resemble cyclosystems, are found on most of the syntypes. Gastropore tube cylindrical, with a diffuse ring palisade of short clavate elements; no tabulae. Gastrostyle about 0.10 mm in diameter and of variable length, depending on the age (thickness) of the branch. Styles highly ridged with sharp, slender spines on the ridges. Dactylopores usually present in equal numbers on both sides of gastropore row; however, sometimes there are twice as many on one side, e.g., 5.5 dactylopores per mm vs. 2.2 dactylopores per mm. Dactylopore slits elliptical, about 65 μm wide, and oriented perpendicular to pore row. Outer edge of dactylopore spines elevated about 0.12 mm, producing a shallow sulcus for gastropores. Width of pore row about 0.7 mm.

Female ampullae superficial hemispheres up to 1.0 mm in diameter, often with a round, porous, concave efferent pore about 0.3 mm in diameter. Male ampullae primarily internal with a diameter of about 0.4 mm. They are usually clustered in groups of 10–15, each having an irregularly shaped efferent pore about 0.1 mm in diameter on small bulges on the ampullar coenosteum.

Dactylozooid nematocysts about 7 × 3 μm; larger nematocysts occur throughout coenosarc and epidermis, 13 × 7 μm.

DISCUSSION.—Only two of the nine western Atlantic *Distichopora* have reticulate-granular coenosteum and a relatively equal number of dactylopores on either side of the gastropore row: *D. sulcata* and *D. contorta*. These species are compared in the discussion of the latter species and in Table 1.

Fisher (1938) and probably Broch (1942) misidentified *D. yucatanensis* as *D. sulcata*. The former is distinguished by linear-imbricate coenosteum and an orange corallum.

MATERIAL EXAMINED.—*ALB*-2152, USNM 7194; *ALB*-2153, USNM 7191; *ALB*-2156, USNM 7199; *ALB*-2159, USNM 7335 and MCZ; *ALB*-2161, USNM 7381; *ALB*-2164, USNM 10192; *ALB*-2167, USNM 10745; *ALB*-2319, USNM 10861; *ALB*-2321, USNM 15972; *ALB*-2322, USNM 72118; *ALB*-2323, USNM 72119; *ALB*-2324, USNM 10773; *ALB*-2325, USNM 72120; *ALB*-2327, USNM 10154; *ALB*-2333, USNM 72121; *ALB*-2338, USNM 72122; *ALB*-2346, USNM 72123; *Atlantis*-2999, MCZ. Syntypes from off Havana, 270 fms.

TYPES.—Five syntype branches collected from off Havana at 270 fms (*Corwin*-2 or 4) are deposited at the MCZ (5527). Another syntype branch from this lot is at the USNM (71815). The syntypes from 31°32′N, 78°20′W were not found at the MCZ.

TYPE-LOCALITY.—Off Havana, Cuba (494 m) and 31°32N, 78°20′W (off South Carolina), 1097 m.

DISTRIBUTION.—Known only from off Havana, Cuba (pattern 2c); 60–708 m. Records from off Cozumel (Fisher, 1938; Broch, 1942) are based on misidentifications; records from Bahamas (Nutting, 1895) and off South Carolina (Pourtalès, 1867) are based on dubious identifications.

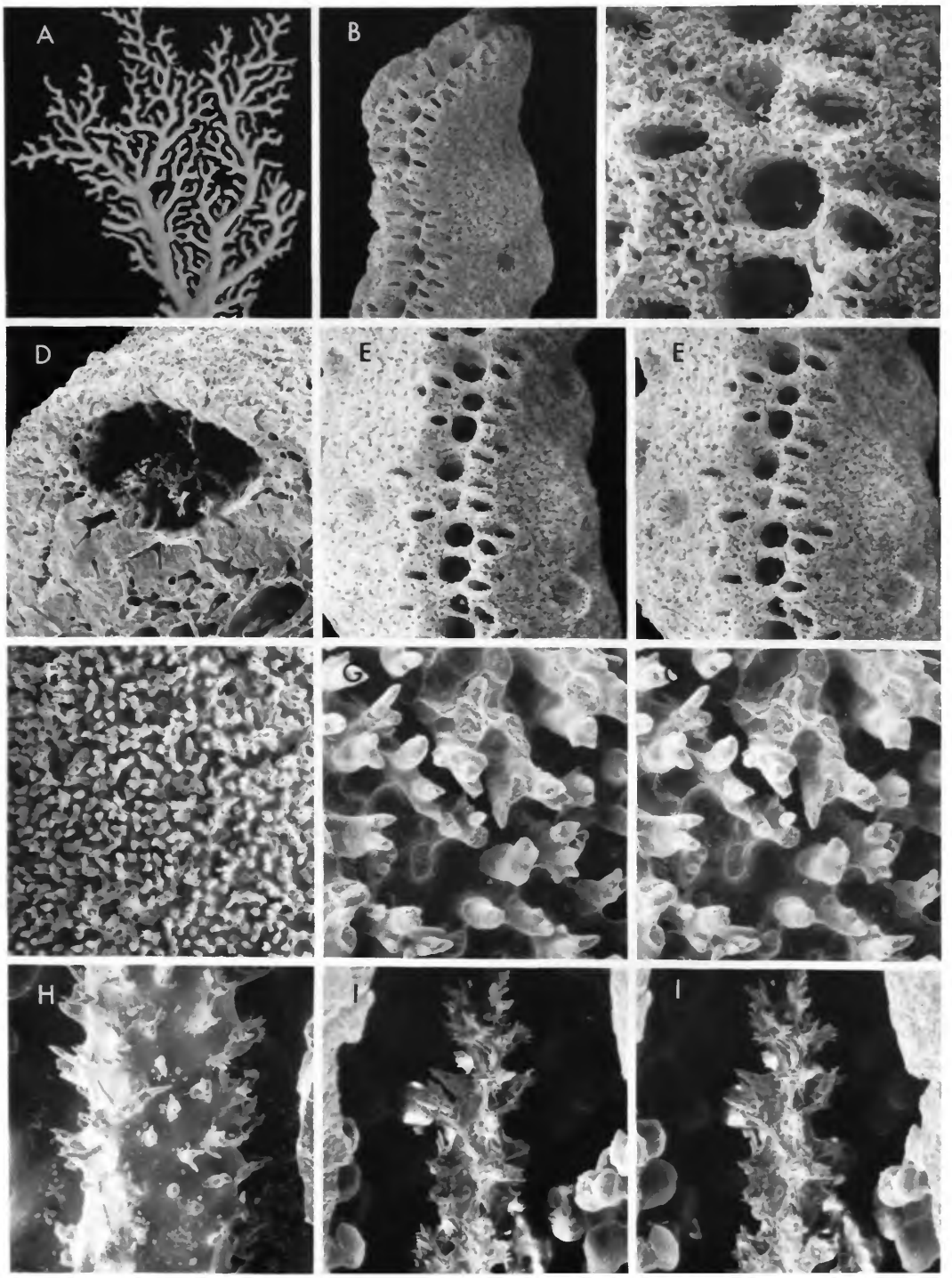
TABLE 1.—Tabular key to the Northwest Atlantic species of *Distichiopora*.

Character	*D. sulcata*	*D. contorta*	*D. cervina*	*D. barbadensis*	*D. yucatanensis*	*D. anomala*	*D. foliacea*	*D. roslindae*	*D. uniserialis*
Arrangement of dactylopores[1]	Bilateral-equal, 1:1–1:2	Bilateral-equal, 1:2	Bilateral-equal, 1:1	Bilateral-equal, 1:1	Bilateral-equal, 1:1	Bilateral-unequal, 1:4–1:9	Bilateral-unequal (variable ratio), usually 1:4	Bilateral-unequal (variable ratio), 1:1–1:8	Exclusively unilateral
Coenosteal texture	Reticulate-papillose	Reticulate-granular, carinate	Linear-imbricate, broad platelets	Linear-imbricate, broad platelets	Linear-imbricate, broad platelets	Linear-imbricate, narrow platelets	Tufts and linear ridges (unique)	Linear to reticulate-granular (unique)	Reticulate granular (porcellaneous)
Coenosteal spines	None	None	Midline of coenosteal strip	Midline of coenosteal strip	Midline of coenosteal strip	Spines scattered over platelets	None	None	None
Color	White	White	White	Light orange	Orange	White	Light orange	Orange	White
Dactylopore shape	Elliptical	Elliptical	Elliptical	Elliptical	Elliptical	Elliptical	Round, conical	Round, flush	Elliptical
Corallum size[2]	Large	Small	Small	Small	Large	Small	Small	Large	Small
Pore row width (mm)	0.70	1.35	0.9–1.0	0.70	0.75	1.10	0.90	0.75	0.57[3]
Shape and size of gastropore (mm)	Round, 0.20	Round, 0.40	Round, 0.25	Elliptical, 0.3 × 0.2	Elliptical, 0.29 × 0.17	Elliptical, 0.3 × 0.2	Round, 0.3	Round, 0.25	Elliptical 0.45 × 0.30
Other characters	Gastropores recessed in sulcus	Lower row of dactylopores on exsert ridge	Female ampullae radially ridged		Gastrostyles only moderately ridged	Female ampullae prominently ridged; dactylopore spines often very tall (e.g., 0.4 mm)	Female ampullae radially ridged	Gastrostyles only moderately ridged	Female ampullae very large (e.g., 1.9 mm in diameter)

[1] Ratio of dactylopores on either side of gastropore row. Ratio 1:1–1:2 considered equal; 1:2–1:9 considered unequal.

[2] Colonies over 15 cm tall considered as large; those less than 10 cm considered as small.

[3] Includes only one row of dactylopores.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12. *Distichopora contorta* Pourtalès, 1878

FIGURES 12A–I, 53C,L

Distichopora contorta Pourtalès, 1878:210–211, pl. 1: fig. 9.—Moseley, 1881:85.—Nutting, 1895:84.—Boschma, 1957:43.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:429.

DESCRIPTION.—Colonies uniplanar, up to 6 cm tall and 5 cm broad, with a basal branch diameter of 8.0 mm. Branch tips rounded and strongly flattened in plane of flabellum, about 4.0 × 2.2 mm in diameter. Posterior branch faces convex; anterior faces flat to slightly concave and more narrow. Longitudinal ridges about 0.11 mm wide and equally tall sometimes present on anterior face. Coenosteum white, reticulate-granular in texture. Coenosteal strips flat, about 90 μm wide, bearing simple and multitipped slender granules up to 40 μm tall and 10–15 μm in diameter. Granules also occur on coenosteal ridges, altogether producing a gritty texture.

Gastropore row often discontinuous on larger-diameter branches resulting in short series of gastropores surrounded by dactylopores. Isolated gastropores entirely or partially surrounded by dactylopores also present on anterior branch face. Gastropores round, up to 0.4 mm in diameter, and arranged uniserially or slightly alternating along pore row. Gastropore tube cylindrical, with a diffuse ring palisade composed of tall slender elements up to 0.10 mm tall and 23 μm in diameter; no tabulae. Gastrostyle highly ridged, with sharp spines on ridges. Illustrated style over 2.25 mm tall and 0.15 mm in diameter, for a H:W over 15. Length of style highly dependent on thickness of branch. Lower row of dactylopores (those with their slits directed toward anterior face) set in a prominent, continuous ridge raised up to 0.8 mm above the gastropore row. Upper row of dactylopores usually not elevated on a ridge and thus much lower in relief and usually only half as frequent as those in lower row (e.g., 3 dactylopores per mm in lower row vs. 1.5 dactylopores per mm in upper row). Dactylopore slits about 0.1 mm wide and up to 0.5 mm long. Short spines, like those of the ring palisade, occur in the upper dactylopore tube. Pore row about 1.35 mm wide.

Female ampullae superficial hemispheres up to 0.95 mm in diameter; mature ampullae with a round, porous, concave efferent pore about 0.25 mm in diameter. Male ampullae internal, about 0.3–0.4 mm in diameter, visible at surface only as small, round to stellate pores 65–75 μm in diameter. Male ampullae usually clustered. Both types of ampullae primarily on anterior face.

Gastrozooids 0.2 mm in diameter, dactylozooids 0.10 mm in diameter; both polyps elongate. Nematocysts in gastrozooid tentacles and in dactylozooids oval, 6 × 2 μm. Larger kidney-shaped nematocysts about 16 × 8 μm and elliptical nematocysts 10 × 4.5 μm also present in coenosarc, especially in the epidermis.

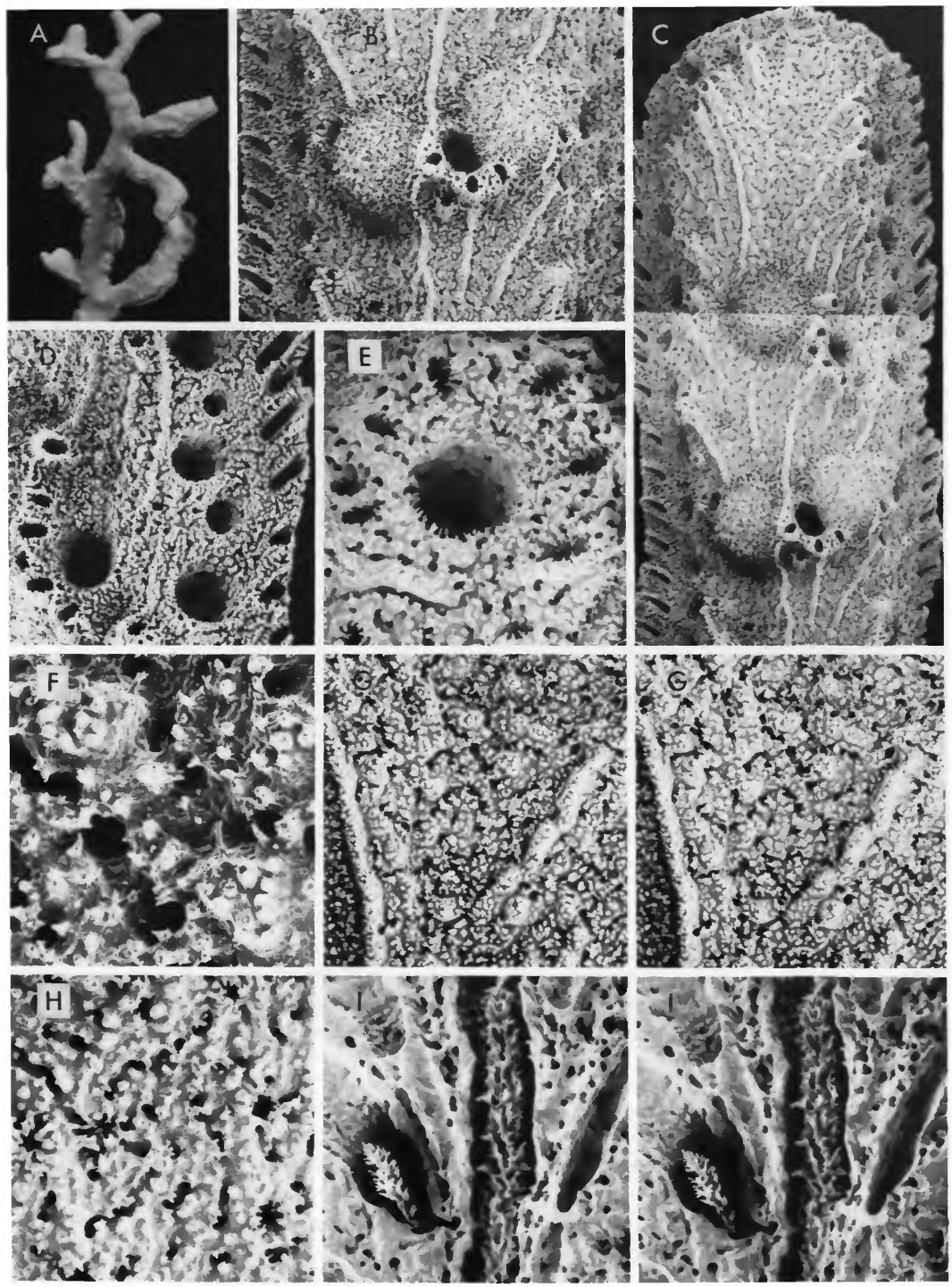
DISCUSSION.—*Distichopora contorta* is most similar to *D. sulcata*, particularly with regard to the expression of its sexual dimorphism and certain aspects of its pore row arrangement and coenosteal texture. *D. contorta* is most easily differentiated by its highly ridged lower dactylopore row, its larger gastropores, and its broader pore row.

Pourtalès's holotype is unusual in that the branches are somewhat twisted, and thus the colony is not uniplanar. All subsequently collected specimens have been uniplanar with straight, flat branches.

MATERIAL EXAMINED.—*ALB*-2159, USNM 15955; *ALB*-2161, USNM 15954; *ALB*-2167, USNM 15959; *ALB*-2320, USNM 15953; *ALB*-2323, USNM 15956; *ALB*-2327, USNM 15958; *ALB*-2330, USNM 16127; *ALB*-2331, USNM 15952; *ALB*-2334, USNM 15957. Holotype.

TYPES.—The holotype, from an undetermined *Blake* station, is deposited at the MCZ

FIGURE 11.—*Distichopora sulcata* (A, *ALB*-2319; B–E, H–I, *ALB*-2164; F–G, *ALB*-2153): A, colony, × 0.45; B–C, pore row, × 13, × 62, respectively; D, longitudinal section of an ampulla, × 40; E, pore row flanked by several efferent tubes from female ampullae, × 23, stereo pair; F–G, coenosteal texture, × 71, × 285, respectively (G is a stereo pair); H–I, gastrostyle and elements of ring palisade, × 270, × 225, respectively (I is a stereo pair).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(5548). A fragment of the holotype is in the USNM collections (71816).

TYPE-LOCALITY.—Off Havana, Cuba, 320 m.

DISTRIBUTION.—Known only from off Havana, Cuba (pattern 2c); 125–368 m.

13. *Distichopora cervina* Pourtalès, 1871

FIGURE 13A–H

Distichopora cervina Pourtalès, 1871:39; 1874:43, pl. 7: fig. 11.—Moseley, 1881:85.—Boschma, 1957:42.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:429.

DESCRIPTION.—Colonies uniplanar and small, up to 36 mm tall and 35 mm broad, with a basal branch diameter of about 3.6 mm. Branching dichotomous but unequal, resulting in numerous short side branches. Terminal branches rectangular (sometimes square) in cross section and about 1.3 mm in width; branch tips rounded. Coenosteum white and linear-imbricate. Short spines about 25 μm tall occur at the center of the leading edge of about every third or fourth platelet of some coenosteal strips. These coenosteal spines are variable in occurrence but commonly found on ampullae and on ridge linking dactylopores. Strips flat to slightly convex, 0.11–0.14 mm wide, and bordered by round to elongate pores 25–30 μm wide. Platelets broad, each extending across an entire strip and sometimes continuous with adajacent strips (Figure 13E).

Gastropores round to slightly elliptical, about 0.25 mm in diameter, and arranged uniserially. Gastropore tubes cylindrical, with a diffuse ring palisade composed of long cylindrical elements up to 61 μm tall and 13 μm in diameter; tabulae present in long gastropore tubes. Gastrostyles slender, 50–60 μm in diameter, and of variable length (depending on the length of gastropore tube). Style ridged, the ridges having sharp spines up to 35 μm long and 9 μm in diameter. Dactylopores of about equal number on both sides of gastropore row, slightly alternating in arrangement. Dactylopore slits 66–68 μm wide and 0.13–0.15 mm long. Dactylopore spines on terminal branches linked by a continuous ridge, producing a sharp edge to pore row. On larger-diameter branches this ridge absent, making these lateral branch edges more rounded. Width of pore row 0.9–1.0 mm.

Female ampullae large hemispherical mounds, 0.85–0.95 mm in diameter, usually with 8 or 9 highly ridged coenosteal strips radiating from the apex. Coenosteum between strips very porous. A large efferent pore present on mature female ampullae. Male ampullae low irregular mounds about 0.6 mm in diameter with small irregularly shaped efferent pores about 0.13 mm in diameter.

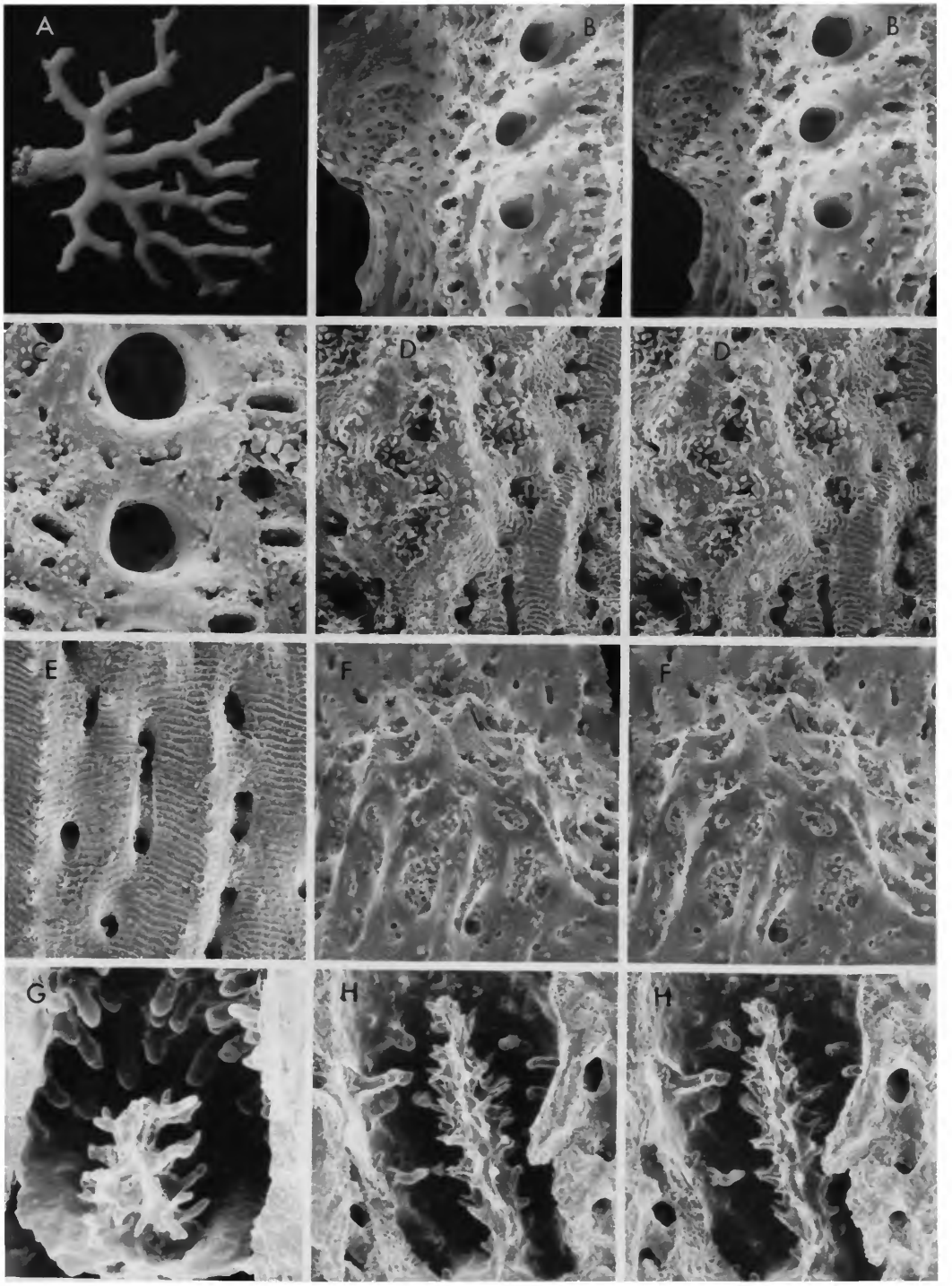
DISCUSSION.—*Distichopora cervina* is one of four western Atlantic *Distichopora* that have linear-imbricate coenosteal texture (i.e., *D. cervina*, *D. barbadensis*, *D. yucatanensis*, and *D. anomala*; see Table 1). It is most similar to *D. barbadensis*, and both have uniserial coenosteal spines in addition to imbricate platelets. Although the two species are similar, *D. cervina* differs in having: (1) white coenosteum, (2) a slightly different branching pattern having short side branches, (3) slightly larger branches and pore rows, and (4) a better defined platelet structure. Details of the structure of the gastropore and gastrostyle of *D. barbadensis* may further differentiate the two when these become known.

MATERIAL EXAMINED.—*BL*-166, MCZ; *BL*-177, MCZ; *O*-5062, USNM 72124; *O*-24237, USNM 72125; *O*-24273, USNM 72126; *P*-887, USNM 72127; *P*-924, USNM 72128; *P*-926, USNM 72129 and UMML. Holotype.

TYPES.—The holotype (male), now fragmented into five pieces, is deposited at the MCZ (5533). An additional fragment is at the NMNH (USNM 71817).

TYPE-LOCALITY.—St. Thomas, Virgin Islands, depth unknown.

FIGURE 12.—*Distichopora contorta* (A, E, H–I, *ALB*-2323; B–D, F–G, *ALB*-2320): A, colony, × 1.0; B–C, branch tip showing pore row, ampullae, and disjunct gastropores on anterior face, × 18, × 13, respectively; D, pore row, × 22; E, disjunct gastropore, × 41; F–G, coenosteal texture, × 140, × 35, respectively (G is a stereo pair); H, coenosteum with several male efferent pores, × 53; I gastrostyles, × 32 (I is a stereo pair).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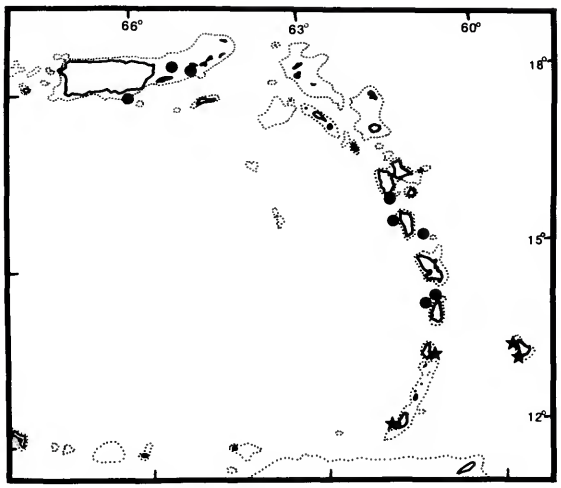


MAP 7.—Distribution of *Distichopora cervina* (circles) and *D. barbadensis* (stars).

DISTRIBUTION.—Lesser Antilles from St. Thomas to St. Vincent (Map 7; pattern 2b); 68–384 m.

14. *Distichopora barbadensis* Pourtalès, 1874

FIGURE 14A–G

Distichopora barbadensis Pourtalès, 1874:43, pl. 7: fig. 10.—Moseley, 1881: 85.—Boschma, 1957:41.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:429.

DESCRIPTION.—Colonies small and uniplanar, the largest corallum examined only 26 mm tall and 26 mm broad. Branching equal, dichotomous, and fairly symmetrical; the main stem rarely bifurcates more than four times. Branch axils U-shaped. Terminal branches blunt and rectangular in cross section, both faces flat. A typical branch tip measures 1.5 mm broad and 0.7 mm thick. No anterior/posterior differentiation. Coenosteum light orange and linear-imbricate in texture. Coenosteal strips 0.12–0.15 mm wide and convex, each usually having a row of blunt spines up to 24 μm tall and 15 μm in diameter. Platelets broad and flat, hardly distinguishable. Toward branch tips the strips become flattened, producing a glistening appearance.

Gastropores elliptical, 0.3 × 0.2 mm in diameter, and arranged uniserially in the pore row; gastropores not depressed in a sulcus. Details of gastropore tube and gastrostyle not known. Equal number of dactylopores on both sides of gastropore row. Dactylopore slits about 70 μm wide and 0.15 mm long, the outer edge of the dactylopore spines raised about 0.10 mm. Dacylopore spines isolated, about 2.5 per mm. Width of pore row same as that of branch edge, about 0.7 mm.

Ampullae (male?) low mounds about 0.6 mm in diameter.

DISCUSSION.—Comparisons to *D. cervina* were made in the previous species account (also see Table 1).

MATERIAL EXAMINED.—*BL*-247, MCZ; *BL*-269, MCZ; *BL*-272, MCZ; *BL*-273, MCZ; *BL*-276, MCZ; *BL*-290, MCZ; *BL*-292, MCZ; B-A 9, USNM 72130; *P*-875, USNM 72131. Types.

TYPES.—Twelve syntypes are deposited at the MCZ (5532). One syntype is at the NMNH (USNM 71818) and another at the BM (91.2.4.30).

TYPE-LOCALITY.—*Hassler* station off Sandy Bay, Barbados, 183 m.

DISTRIBUTION.—Known only from off Barbados, St. Vincent, and Grenada (Map 7; pattern 2b); 102–311 m.

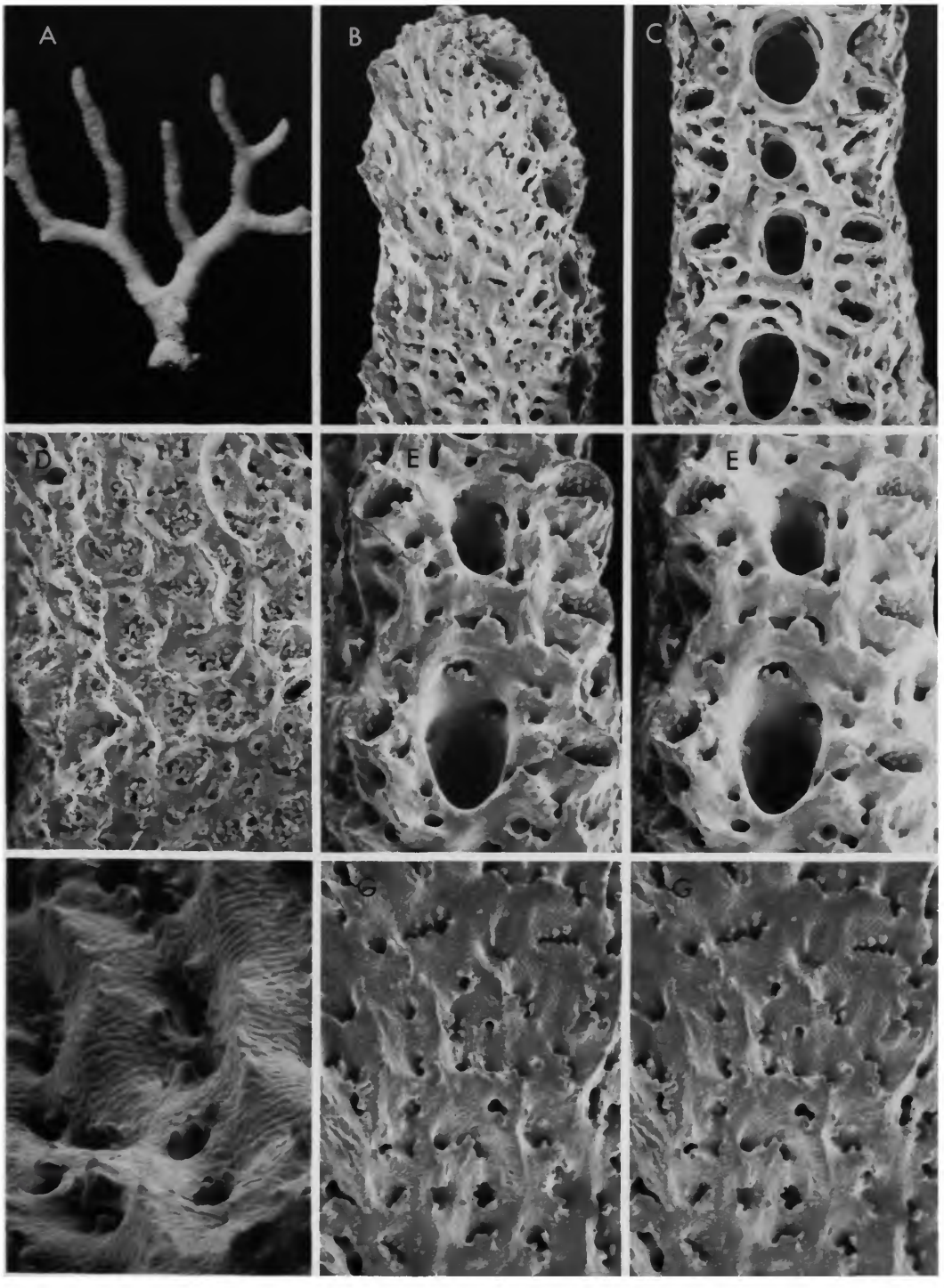
15. *Distichopora yucatanensis*, new species

FIGURE 15A–L

Distichopora sulcata.—Fisher, 1938:545, pl. 74.—?Broch, 1942:18–20, pl. 2: fig. 6. [Not *D. sulcata* Pourtalès, 1867:117.]

DESCRIPTION.—Colonies uniplanar and large, up to 20 cm tall and 17 cm broad. Basal branch diameter massive, up to 2.5 cm in diameter, sometimes composed of several fused basal

FIGURE 13.—*Distichopora cervina* (A–B, E–F, H, *P*-924; C–D, G, fragment of holotype): A, colony, × 1.3; B–C, pore row, × 30, × 48, respectively (B is a stereo pair); D–E, linear-imbricate, spinose coenosteal texture, × 70, × 94, respectively (D is a stereo pair); F, ridged female ampulla, × 45 (F is a stereo pair); G–H, gastrostyle held by tabula, diffuse ring palisade, × 210, × 165, respectively (H is a stereo pair).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branches. Some colonies have many short side branches, but branch anastomosis is rare. Terminal branches round to slightly flattened, about 1.8 mm in diameter. Coenosteum orange, with a hard, glistening texture. Terminal branches composed of parallel, convex to slightly ridged coenosteal strips about 0.12–0.13 mm wide. Strips anastomotic and disordered (reticulate) on larger-diameter branches. Strips covered by inconspicuous, smooth, broad platelets; however, some strips also have a row of short spines along their midline. Coenosteal pores round to slightly elliptical, about 35 μm in diameter. Larger irregularly shaped pores about 0.11 mm in diameter also present (Figure 15G). These pores not associated with adjacent ampullae and are of unknown function.

Gastropores elliptical, about 0.29 × 0.17 mm in diameter. Gastropore tube with a diffuse ring palisade near gastrostyle tip composed of short clavate elements. Tabulae present in long gastropore tubes. Gastrostyles 0.07–0.11 mm in diameter and up to 1.3 mm long (H:W = 20^{+}), the length depending on the position of the gastropore tube and branch diameter. Styles have low longitudinal ridges, each ridge bearing short apically directed spines about 30 μm long. Dactylopore slits rectangular, about 0.17 mm long and 0.06 mm wide, oriented perpendicular to gastropore row. Dactylopores raised about 0.10 mm at outer edge. About 2.7 dactylopores per mm on either side of gastropore row.

Female ampullae large hemispheres 0.9–1.1 mm in diameter, each with a large efferent tube 0.2 mm in diameter. Female ampullae often clustered, occurring on both faces of colony. Male ampullae less prominent, about 0.65–0.73 mm in diameter, and also clustered.

DISCUSSION.—Of the four western Atlantic *Distichopora* with imbricate coenosteum, *D. yucatanensis* is most similar to *D. cervina*. It can be distinguished by its larger colony size, orange coenosteum, more rounded branches (in cross section), and less spinose strips. Furthermore, *D. cervina* is known only from the Lesser Antilles, *D. yucatanensis* only from the western Caribbean.

Fisher's (1938) illustrated specimen of *D. sulcata* is used as the holotype for *D. yucatanensis*. Its resemblance to *D. sulcata* is superficial (see Table 1), based primarily on its size and similarity of pore rows. Broch's (1942) specimens of *D. sulcata*, also collected at *ALB*-2354, are also probably *D. yucatanensis*, but their small size and poor condition does not allow a definite identification.

ETYMOLOGY.—This species is named *yucatanensis* because most of the specimens were collected off the Yucatan Peninsula.

MATERIAL EXAMINED.—Broch's (1942) *D. sulcata*, *ALB*-2354, RM 43. Types.

TYPES.—*Holotype:* *ALB*-2354 (male) USNM 10286.

Paratypes: *ALB*-2354 (12 colonies) USNM 15973 and 53423, (1 colony) MCZ, (1 colony) UMML, (1 colony) BM 1984.3.14.5; *O*-4932 (1 branch) USNM 71767; *G*-889 (2 colonies, 10 branches) USNM 71764, (1 colony, 1 branch) UMML; *G*-890 (3 branches) USNM 71765; *P*-592 (4 branches) USNM 71766.

TYPE-LOCALITY.—20°59′30″N, 86°23′45″W (off Arrowsmith Bank), 238 m.

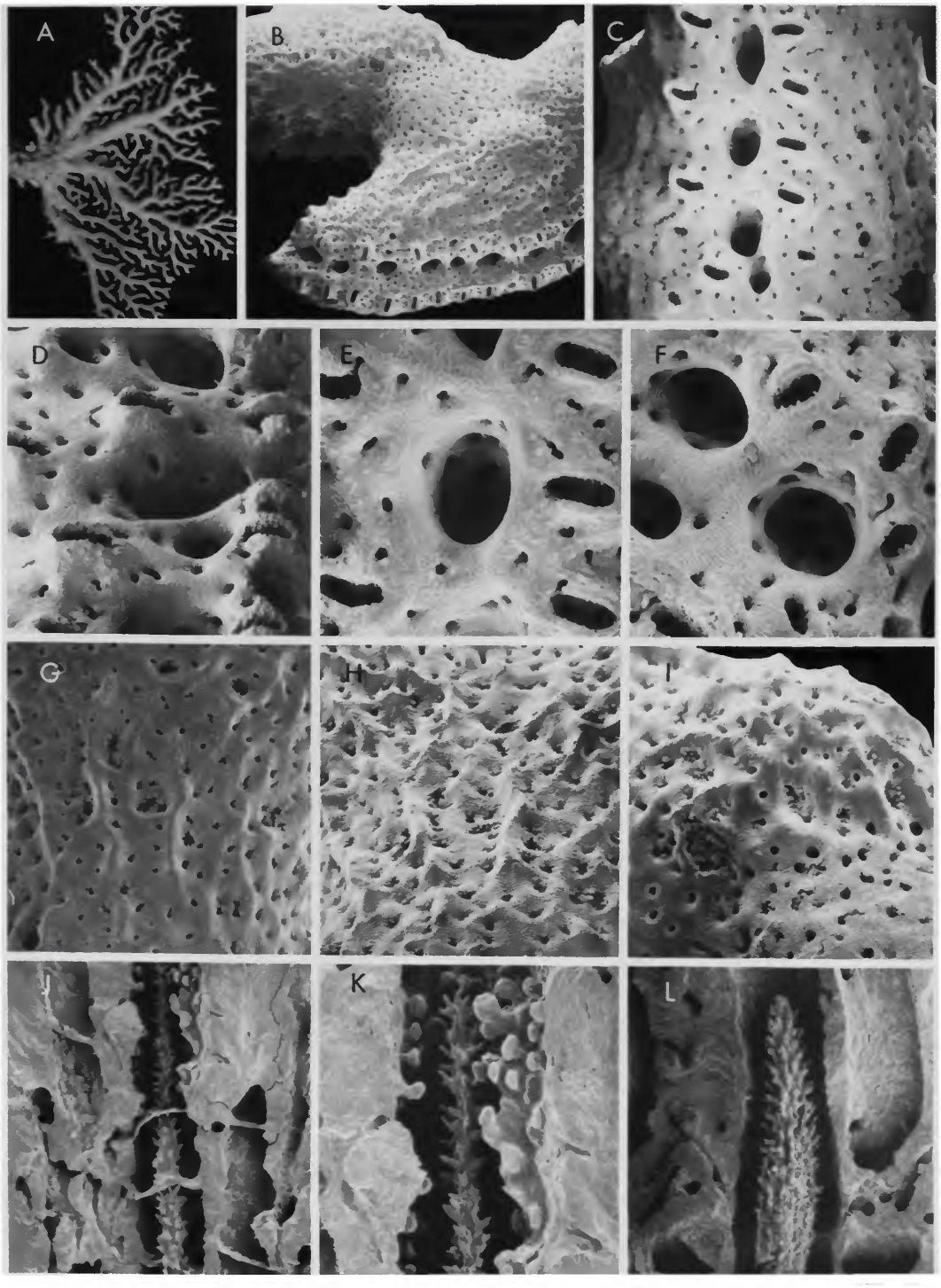
DISTRIBUTION.—Off Arrowsmith Bank, Yucatan, and west of Rosalind Bank (between Honduras and Jamaica) (Map 8; pattern 5); 39–261 m.

16. *Distichopora anomala*, new species

FIGURES 16A–I, 17A–C

DESCRIPTION.—Colonies uniplanar, often broader than tall, up to 32 mm tall and 55 mm wide, with a basal branch diameter of 5.0 mm. Branching of holotype almost symmetrical, but in other colonies short side branches are not uncommon; anastomosis of branches occurs in large colonies. Terminal branches flattened, otherwise branches cylindrical. Coenosteum white with a linear-imbricate texture. Longitudinal

FIGURE 14.—*Distichopora barbadensis* (A, syntype from MCZ; B–G, syntype from USNM 71818): A, syntype colony, × 2.5; B, branch tip, × 27; C, E, pore row, × 47, × 63 (E is a stereo pair); D, F, G, coenosteal texture, × 35, × 150, × 55, respectively (G is a stereo pair).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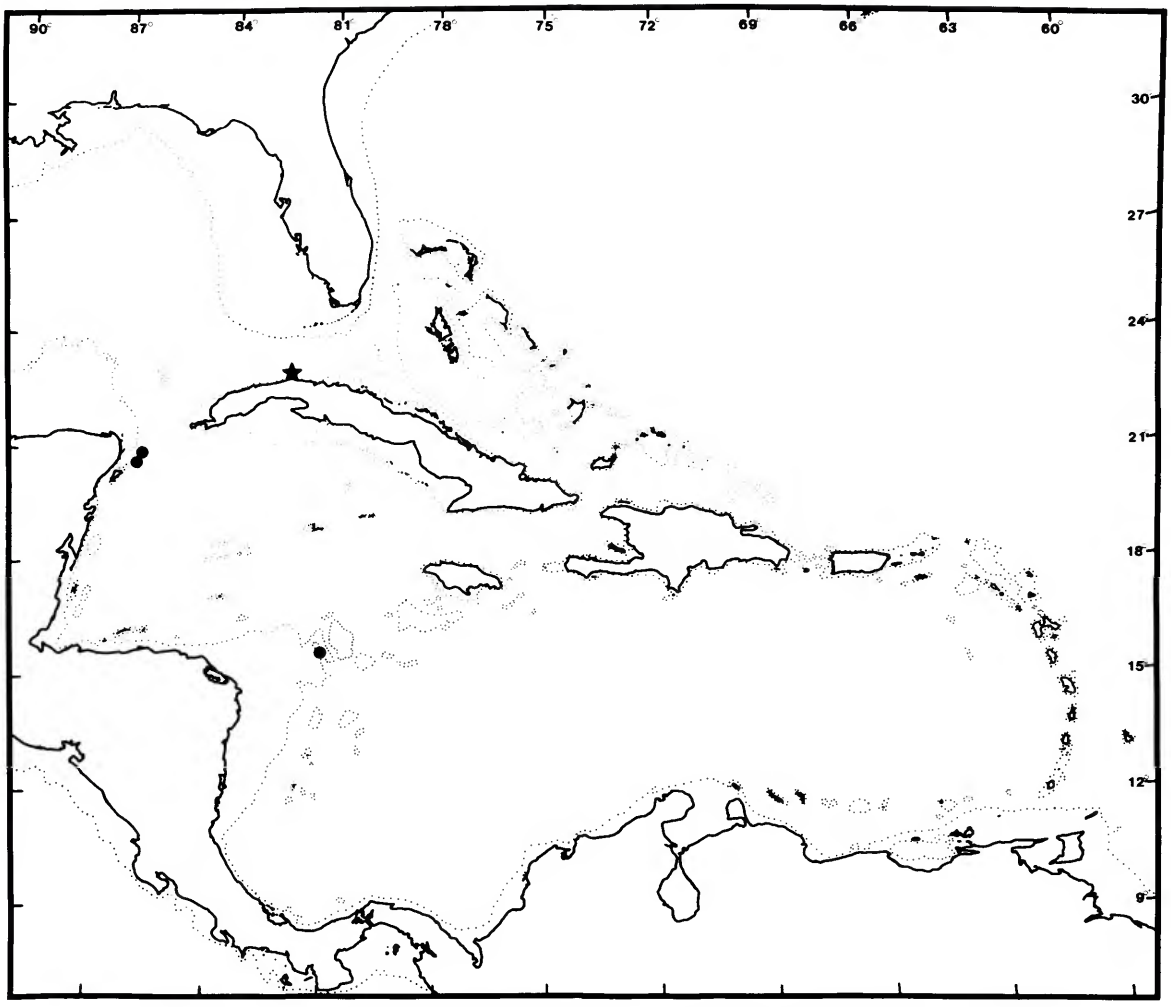
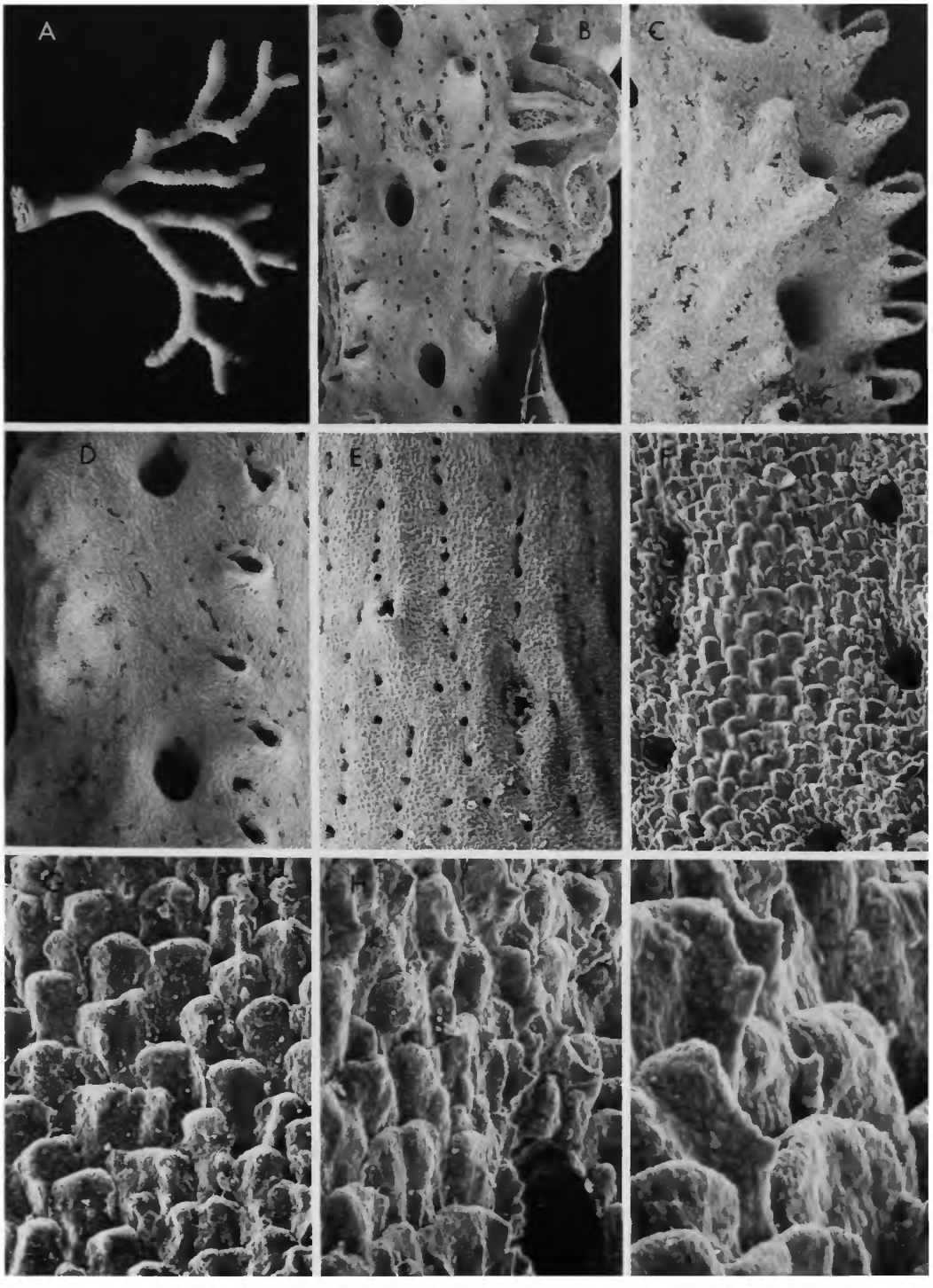


MAP 8.—Distribution of *Distichopora yucatanensis* (circles) and *D. uniserialis* (star).

ridges sometimes present on distal branches. Coenosteal strips flat to slightly convex, up to 0.3 mm wide, and bordered by round pores about 35 μm in diameter. Platelets narrow (about 30 μm wide) and irregular in arrangement; 7–9 across width of a strip. Some platelets have a short anteriorly directed spine about 8 μm long originating from middle of platelet.

Gastropores on anterolateral surfaces of distal branches but restricted to lateral edges of larger branches. Gastropores elliptical, about 0.3 × 0.2 mm in diameter, and widely spaced: gastropore centers about 1.2 mm apart. Gastropore tube has a diffuse ring palisade but no tabulae. Gastrostyle about 0.05 mm in diameter and often over 0.5 mm tall, producing H:W ratios over 10. Styles

FIGURE 15.—*Distichopora yucatanensis* (A, holotype; B–L, paratypes from *ALB*-2354): A, holotype colony, × 0.37; B, branch tip and pore row, × 13; C–F, pore row, × 28, × 62, × 64, × 67, respectively (F shows some platelet structure); G–H, irregularly arranged coenosteal pores, × 29, × 36, respectively; I, female ampulla with efferent tube, × 41; J–L, gastrostyle with ring palisade and tabulae, × 59, × 115, × 65, respectively.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ridged, with sharp spines on ridges. Dactylopores arranged uniserially but usually much more common on one side of gastropore row (herein defined as the posterolateral edge) where they occur with a frequency of about 2.5 per mm. Dactylopores on anterolateral row usually ¼ to ⅑ as abundant. Dactylopore spines often very tall (up to 0.4 mm) and tubular, with slit directed at a 45° angle between the gastropore row and the branch tip; slits about 70 μm wide. Width of pore row about 1.1 mm.

Each female ampulla a large hemisphere 1.1–1.3 mm in diameter with broad ridges radiating from its apex. Coenosteum between radiating ridges very porous. Some female ampullae have a round efferent pore about 0.3 mm in diameter. Male ampullae also superficial, about 0.7 mm in diameter, and usually clustered in an irregular mass.

DISCUSSION.—Pourtalès applied the museum name *"anomala"* to this species, probably because of the inequality of dactylopores on the opposite sides of the gastropore row. Although this ratio is usually 1:4–1:9 (anterolateral:posterolateral dactylopores), one specimen with a regenerated branch tip had a ratio of 1:4 proximal to the fracture and 1:1 on the regenerated tip.

Distichopora anomala is one of four species of western Atlantic *Distichopora* with linear-imbricate coenosteum (Table 1) and is most similar to *D. cervina*. It is distinguished from the latter by having more widely spaced gastropores, an inequality in number of dactylopores on opposite sides of the gastropore row, taller dactylopore spines, larger ampullae, and by lacking medially arranged coenosteal spines. Comparisons of *D. anomala* to *Lepidotheca brochi* are made in the discussion of the latter species.

ETYMOLOGY.—The specific name *anomala* (Latin for "irregular, abnormal") refers to the variation in the ratio of the number of dactylopores on either side of the gastropore row.

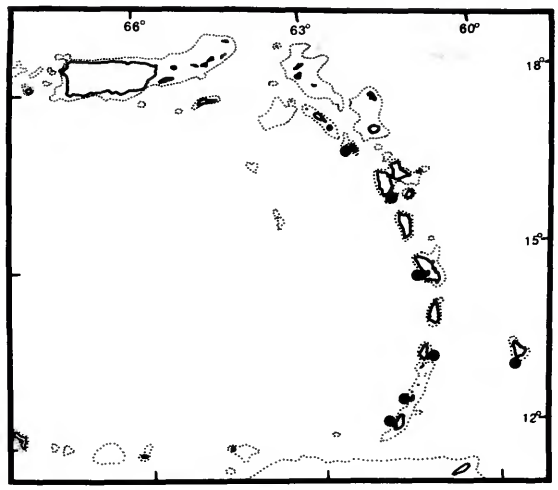
MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: BL*-241 (male) USNM 71768.

Paratypes: BL-241 (1 colony, 1 branch) USNM 71813, (2 colonies, 7 branches) MCZ, (1 colony) UMML, (1 colony) BM 1984.3.14.3; *BL*-157 (1 colony) MCZ; *BL*-158 (1 colony) MCZ; *BL*-166 (2 colonies, 9 branches) USNM 71769; *BL*-198 (2 colonies, 1 branch) MCZ; *BL*-199 (5 branches) MCZ; *BL*-232 (2 branches) USNM 71770; *BL*-246 (2 colonies, 5 branches) USNM 71771; *BL*-247 (1 colony) MCZ; *BL*-272 (1 colony) MCZ; *BL*-273 (2 colonies) MCZ.

TYPE-LOCALITY.—12°28′22″N, 61°32′18″W (off Carriacou, Grenadines), 298 m.

DISTRIBUTION.—Lesser Antilles from Montserrat to Grenada, including Barbados (Map 9; pattern 2b); 139–311 m.



MAP 9.—Distribution of *Distichopora anomala*.

FIGURE 16.—*Distichopora anomala* (A, holotype; B, E–I, paratype from *BL*-241; C, paratype from *BL*-166; D, paratype from *BL*-246): A, holotype colony, × 1.8; B, pore row and ridged ampullae, × 23; C, pore row with dactylopore spines, × 35; D, pore row, × 40; E–I, linear-imbricate, spinose coenosteal texture, × 165, × 390, × 520, × 1310, respectively.

17. *Distichopora foliacea* Pourtalès, 1868

FIGURE 18A–G

Distichopora foliacea Pourtalès, 1868:137; 1871:38–39, pl. 4: figs. 12–13.—Moseley, 1881:85.—Agassiz, 1888:140, fig. 447.—Broch, 1942:22–24, fig. 6, pl. 2: fig. 7.—

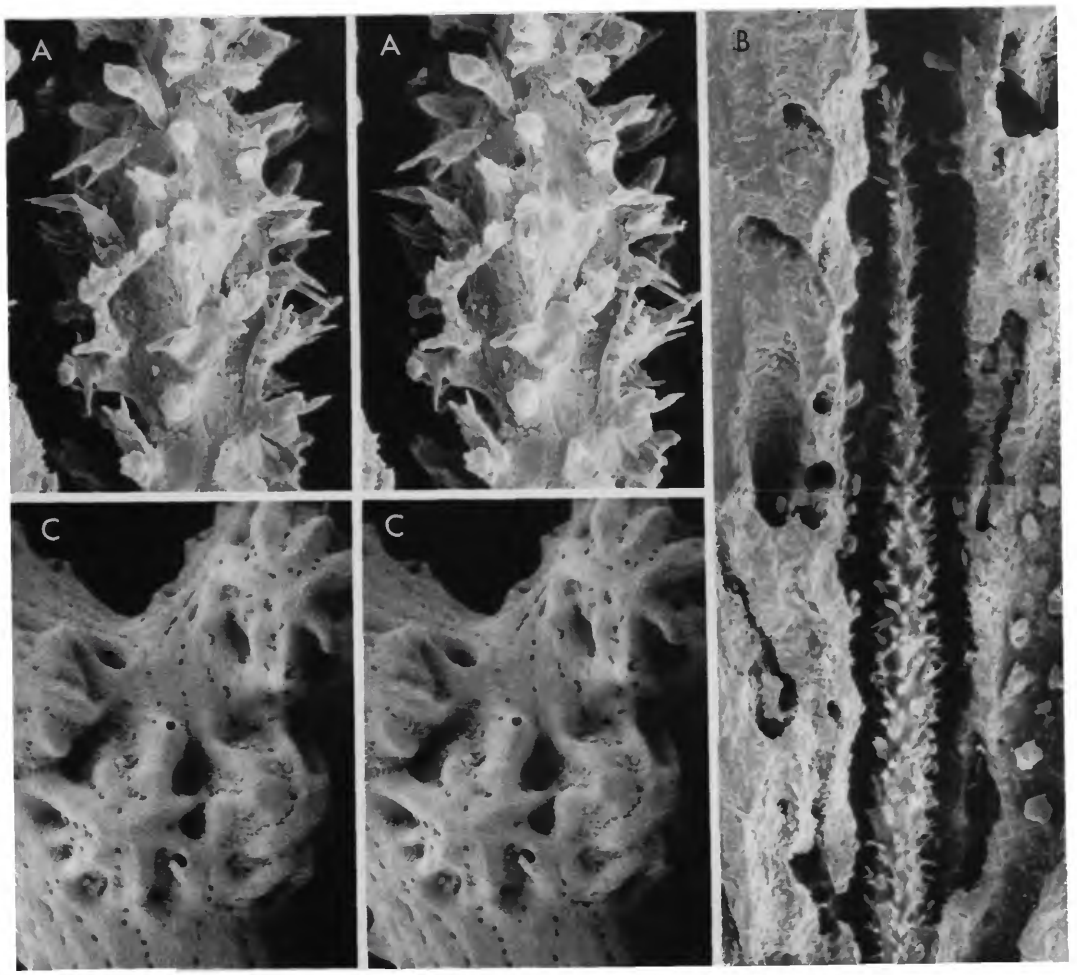


FIGURE 17.—*Distichopora anomala* (A–B, paratype from *BL*-246; C, paratype from *BL*-241): A–B, gastrostyle, × 375, × 103, respectively (A is a stereo pair); C, carinate female ampullae, × 24, stereo pair.

Boschma, 1957:43–44.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:429.

DESCRIPTION.—Colonies uniplanar, up to 5.5 cm tall and 7.0 cm broad, with a basal branch diameter up to 5.8 mm. Terminal branches of syntypes quite broad and flattened, resembling compressed lobes (e.g., 5.0 × 1.8 mm in diameter); however, more delicately branched colonies have branches about 2.2 × 1.1 mm in diameter. Posterior branch faces often flat. Coenosteum light orange, with a texture remarkably similar to that of *Lepidopora glabra*. Coenosteum covered by low, subparallel ridges about 60 μm wide and separated by about 1 mm. Between these ridges are irregularly shaped, multitipped tufts of calcium carbonate 12–30, μm in diameter.

Gastropores round to slightly elliptical, about 0.30 mm in diameter, and restricted to branch edges. Diffuse ring palisade present but no tabulae, even in the longest gastropore tubes. Gastrostyle about 60 μm in diameter and of variable length; one style was over 2.1 mm long (H:W >

36). Styles highly ridged with spines on the ridges. Dactylopore rows very unequal regarding frequency of dactylopores. Pores on posterolateral row closely spaced (about 3.3 mm) and united by a ridge, producing a continuous serrate edge. Frequency of dactylopores in anterolateral row quite variable, ranging from equal to that of posterolateral row to completely absent, but most often about one-fourth the number in the posterolateral row. These pores usually alternating and not united by ridges, but have several ridges radiating from the apical pore of each dactylopore mound. Dactylopores round, about 90 μm in diameter, and elevated on conical mounds about 0.13 mm tall. Width of pore row about 0.9 mm.

Female ampullae large hemispheres 0.9–1.2 mm in diameter with concave efferent pores about 0.20 mm in diameter. Each female ampulla with 8–10 low ridges radiating from its apex. Male ampullae superficial, about 0.6 mm in diameter.

Nematocysts in dactylozooids, 5–6 × 2 μm; larger ones occur throughout the coenosarc, 11.0–11.5 × 4.5–5.0 μm.

DISCUSSION.—Four of the nine western Atlantic *Distichopora* have their dactylopores concentrated primarily or exclusively on one side of the gastropore row: *D. anomala*, *D. uniserialis*, *D. rosalindae*, and *D. foliacea*. The latter three have nonimbricate coenosteum, and the latter two have round (not elliptical) dactylopores. *Distichopora foliacea* is distinguished from *D. rosalindae* by having conical dactylopores, a smaller coral-lum, and ridged ampullae.

Although a member of a different genus, *D. foliacea* is also similar to *Lepidopora biserialis*. It is distinguished by its linked dactylopore mounds, which occur on both sides of the gastropore row and its unlipped gastropores.

MATERIAL EXAMINED.—*ALB*-2672, USNM 15970; *O*-1348, USNM 72132; *Silver Bay*-2418, USNM 72133; *G*-132, UMML; *G*-134, USNM 72134; *G*-135, USNM 72135; *G*-480, USNM 72136; *G*-598, USNM 72137; *G*-813, USNM 72138; *G*-835, USNM 72139; *G*-865, UMML; *G*-972, USNM 72140; *G*-973, USNM 72141; *Gerda*, unknown station, 24°15′N, 81°19′W, 329 m, 4 June 1962, UMML 5.47 and USNM 72142; *Discoverer*, 31°33.9′N, 78°59.7′W, 418 m, USNM 72143; *Alaminos* 65A9-21, Texas A & M University 5-0544; Triton, off Sombrero Light, 183 m, USNM 49693; *P*-595, UMML. Syntypes at MCZ, USNM, RMNH, and BM.

TYPES.— Thirteen syntypes are deposited at the MCZ, seven numbered 5547 and six numbered 5528. One additional syntype is deposited at each of the following: USNM (71819); BM (69.10.25.12); RMNH, Leiden; and RM, Stockholm.

TYPE-LOCALITY.—Pourtalès Terrace, off Florida, 183–366 m.

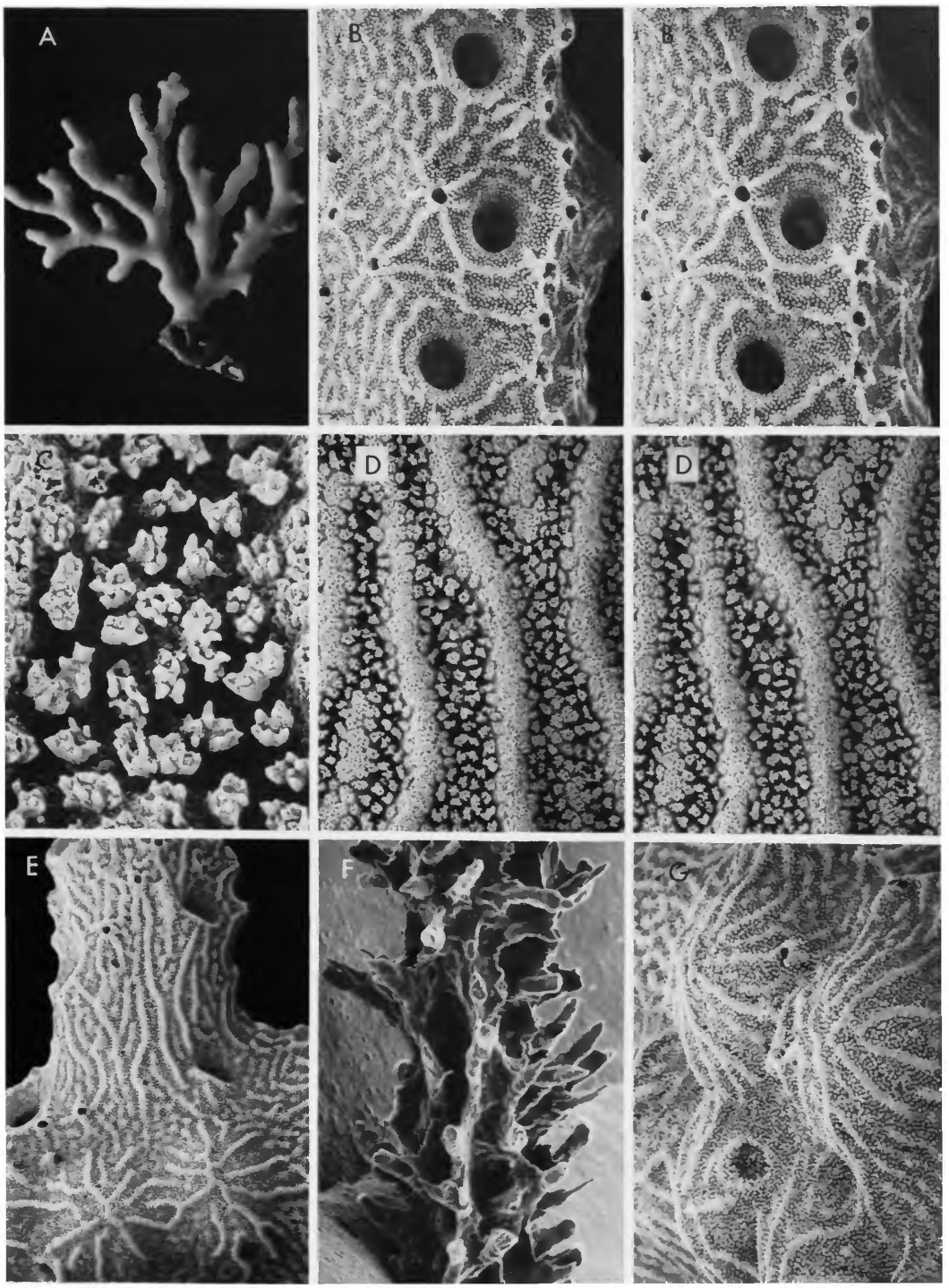
DISTRIBUTION.—Blake Plateau off Georgia; Pourtalès Terrace; southeastern Gulf of Mexico; and off Arrowsmith Bank, Yucatan Peninsula (Map 10; pattern 3); 183–527 m.

18. *Distichopora rosalindae*, new species

FIGURE 19A–I

DESCRIPTION.—Colonies uniplanar and massive, with a maximum height of over 15 cm and a basal branch diameter of 1.5 cm. Terminal branches round to slightly flattened in cross section, about 2.3 mm in diameter. Branch faces convex, never flat. Coenosteum orange but branch tips usually white. Coenosteal strips 80–90 μm wide: convex, long and subparallel at center of branch faces but shorter and anastomotic toward branch edges (Figure 19C). Tops and sides of strips and coenosteum between strips covered by cylindrical blunt granules about 21 μm tall and 8 μm in diameter.

Gastropores round, about 0.25 mm in diameter, and closely spaced on branch tips. On larger-diameter branches, gastropores not as closely spaced, the pore row sometimes becoming disjunct and/or meandering along lateral edge. Gastropore tube long, cylindrical, and often curved, with a diffuse ring palisade. Tabulae present in long tubes. Gastrostyles about 0.10 mm in diameter and up to 1.5 mm long (H:W = 15), the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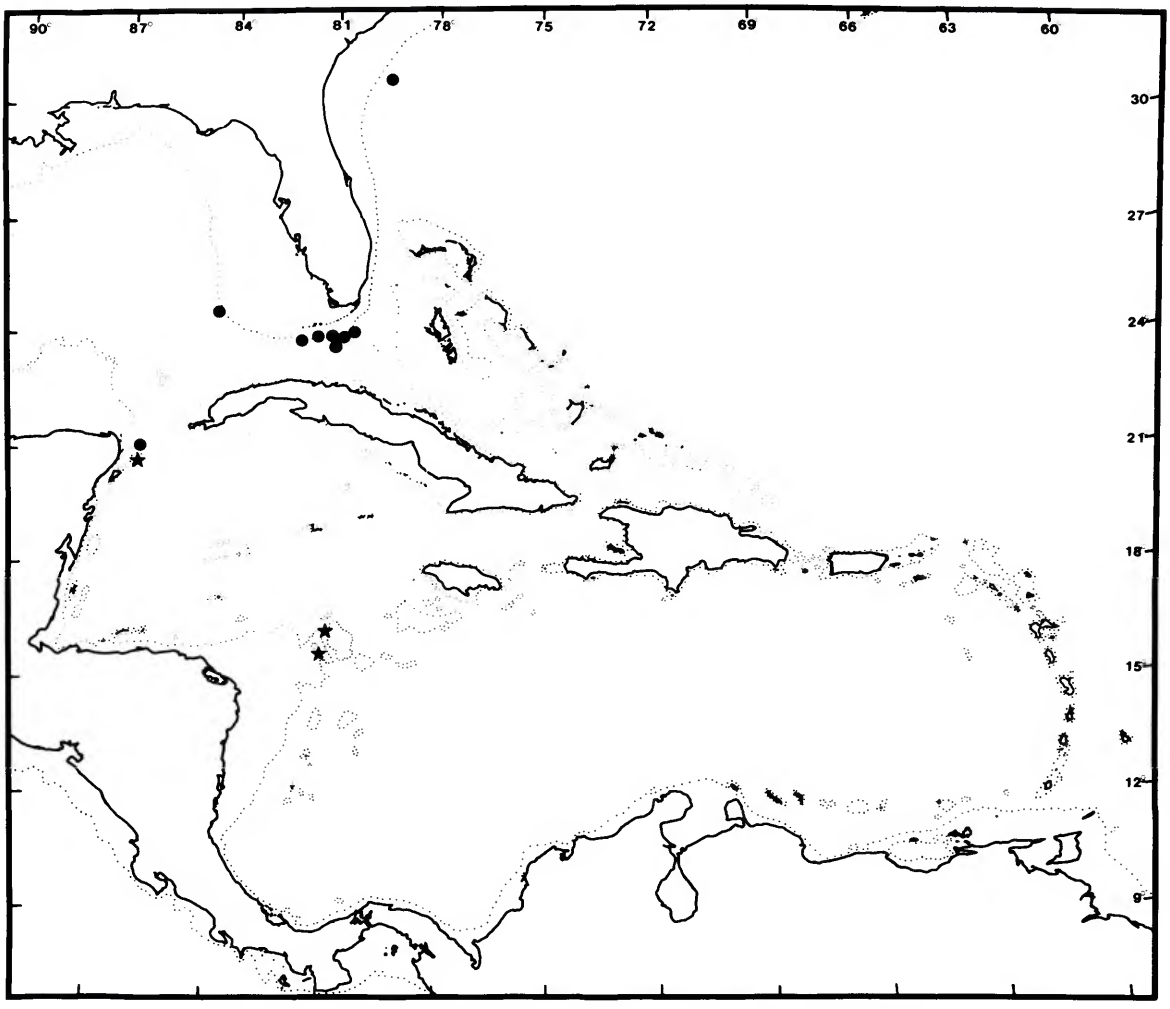
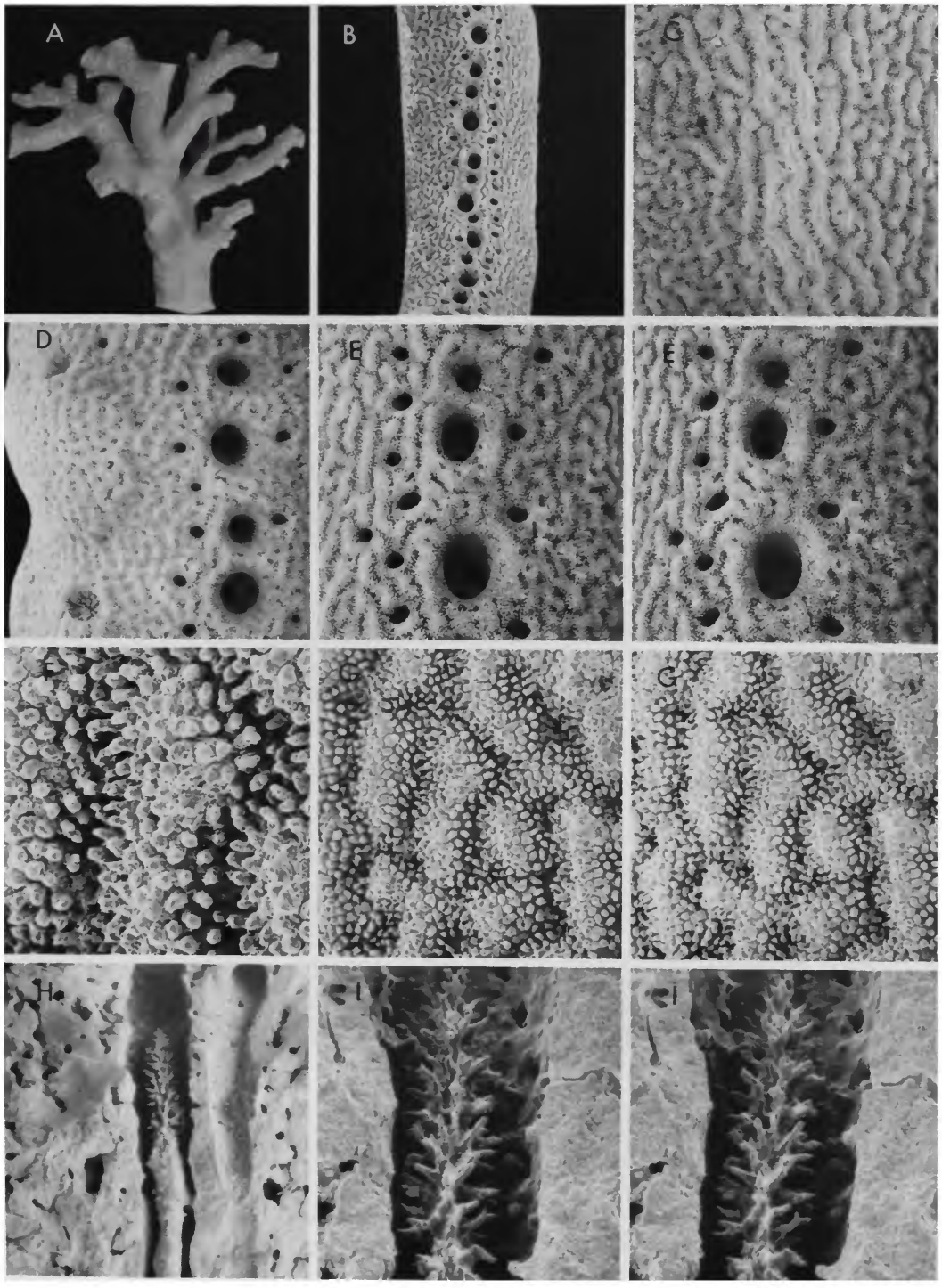


MAP 10.—Distribution of *Distichopora foliacea* (circles) and *D. rosalindae* (stars).

length depending on thickness of branch. Base of style often smooth; however, upper part bears long, cylindrical, simple, bluntly tipped spines up to 44 μm long. Spines arranged in vertical rows on poorly defined ridges. Dactylopores round, about 0.1 mm in diameter, and flush with coenosteal surface (even on terminal branches). Frequency of dactylopores per mm varies from 0.5–4.0, the extremes occurring opposite the same gastropore row, but the average is 1–2 dactylopores per mm. Dactylopores in crowded row sometimes alternating especially on large-diameter branch. Width of pore row about 0.75 mm.

Female ampullae low hemispheres 1.0 mm in diameter with concave efferent pores 0.22 mm in diameter. Male ampullae lower and smaller, about 0.60 mm in diameter. No radial ridges on ampullae.

FIGURE 18.—*Distichopora foliacea* (A, *G*-835; B–G, *G*-134): A, colony, × 1.0; B, pore row, × 29, stereo pair; C–D, tufted coenosteal texture, × 350, × 86, respectively (D is a stereo pair); E, branch tip with two female ampullae and efferent pores, × 18; F, section of a gastrostyle, × 320; G, female ampullae with efferent pores, × 30.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DISCUSSION.—Among the western Atlantic *Distichopora*, *D. rosalindae* is most similar to *D. foliacea*, particularly with regard to its round dactylopores, inequality of dactylopore rows, and orange, granular coenosteum; however, it is easily distinguished by its larger corallum, flush dactylopores, and rounded branch edges.

ETYMOLOGY.—This species is named after the type-locality, off Rosalind Bank.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* *O*-4932 (male) USNM 71772.

Paratypes: *O*-4932 (30 branches) USNM 71773, (2 branches) MCZ, (2 branches) UMML, (2 branches) BM 1984.3.14.6; *O*-1890 (11 branches) USNM 71774; *G*-889 (2 colonies, 5 branches) USNM 71775.

TYPE-LOCALITY.—16°06′N, 81°10.5′W (southwest of Rosalind Bank, Honduras), 165 m.

DISTRIBUTION.—Western Caribbean off Rosalind Bank, and off Arrowsmith Bank, Yucatan Peninsula (Map 10; pattern 5); 165–198 m.

19. *Distichopora uniserialis*, new species

FIGURE 20A–H

DESCRIPTION.—Colonies uniplanar, usually broader than tall: up to 5.5 cm tall, 8 cm broad, with a basal branch diameter of 8 mm. Branch tips flattened, rounded apically, somewhat clavate, and about 2.3 × 1.5 mm in diameter. Coenosteum white with a reticulate-granular texture. Coenosteal strips flat, about 0.14–0.17 mm wide. Near branch tips the coenosteal slits that delimit strips are elongate and deep, but away from branch tip slits reduced to scattered round pores about 25 μm in diameter. This infilling of coenosteal slits produces a smooth, dense coenosteum, which appears porcelaneous. Coenosteum covered by small triangular granules about 16 μm tall and equally broad at base.

Gastropores large and elliptical, about 0.45 × 0.30 mm in diameter, and arranged unilinearly. Tabulae common, even in short gastropore tubes: one tabula about every 0.5 mm. No ring palisade observed. Gastrostyle about 0.17 mm in diameter and highly ridged, with sharp slender spines on ridges. Length of style depends on gastropore tube but H:W often over 10. Dactylopores elliptical, about 0.18 × 0.12 mm in diameter, occurring exclusively on one side of gastropore row. Dactylopores flush with coenosteal surface or projecting only slightly. Dactylopores arranged unilinearly without staggering, about 3.5 dactylopores per mm.

Female ampullae very large bulges, up to 1.9 mm in diameter, often with efferent pores. Male ampullae also superficial but lower in relief, 0.9–1.1 mm in diameter, and usually clustered.

Decalcified tissue not well preserved. Nematocysts of gastrozooid tentacles and dactylozooids ovoid, 6–7 × 2–3 μm.

DISCUSSION.—*Distichopora uniserialis* is readily distinguished from its congeners by its distinctive coenosteal texture, very large female ampullae, and exclusively unilaterally arranged dactylopores (Table 1).

ETYMOLOGY.—The specific name *uniserialis* (Latin for "one series") refers to the exclusively unilaterally arranged dactylopores.

MATERIAL EXAMINED.—Types.

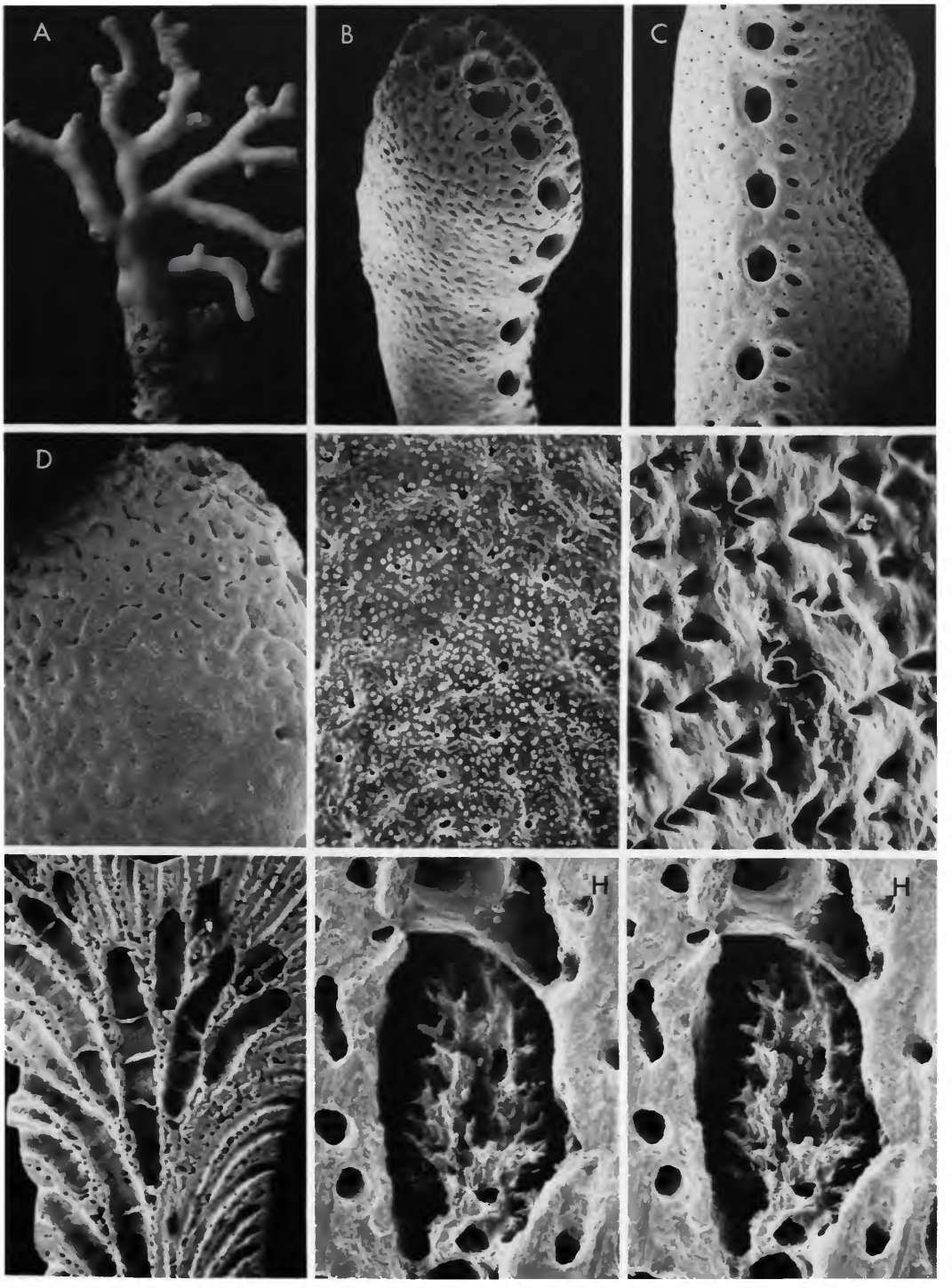
TYPES.—*Holotype:* *ALB*-2346 (male) USNM 71776.

Paratypes: *ALB*-2346 (4 colonies, 5 branches, 4 HS) USNM 15969, (1 colony) MCZ, (1 colony) UMML, (1 colony) BM 1984.3.14.4; *ALB*-2339 (1 branch) USNM 15981; *ALB*-2349 (2 branches) USNM 15968.

TYPE-LOCALITY.—23°10′39″N, 82°20′21″W (off Havana, Cuba), 366 m.

DISTRIBUTION.—Known only from off Havana, Cuba (Map 8; pattern 2c); 333–366m.

FIGURE 19.—*Distichopora rosalindae* (A, holotype, B–I, paratypes from *O*-4932): A, holotype colony, × 0.85; B, E, pore row, × 10, × 30, respectively (E is a stereo pair); C, F–G, coenosteal texture, × 27, × 210, × 96, respectively (G is a stereo pair); D, pore row with adjacent female ampullae with efferent pores, × 24; H–I, gastrostyle, × 39, × 145, respectively (I is a stereo pair).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H

Errina Gray, 1835

DIAGNOSIS.—Gastro- and dactylopores usually randomly arranged; however, in some species gastropores restricted to anterior face or lateral branch edges. Coenosteal texture usually reticulate-granular but may be linear-imbricate. Abcauline gastropore lips common; gastrostyles present. Dactylopore spines U-shaped, with slit directed proximally; walls of dactylopore spines thick; no dactylostyles. Ampullae superficial.

TYPE-SPECIES.—*Millepora aspera* Linnaeus, 1767, by monotypy.

20. *Errina cochleata* Pourtalès, 1867

FIGURES 21A–K, 53J

Errina cochleata Pourtalès, 1867:116–117; ?1868:137.—Moseley, 1881:84.—Hickson, 1912a:880.—Cairns, 1983b:428.

Lepidopora cochleata.—Pourtalès, 1871:40, pl. 3: figs. 17–19; 1878:211.—Moseley, 1879:502–503.—Boschma, 1956b:287; 1957:52–53.

Hornera galeata Smitt, 1872:10, pl. 4: figs. 23–25 [described as a bryozoan].

Errina (*Lepidopora*) *cochleata.*—Boschma, 1962a:338; 1963b:395; 1964a:60; 1968a:205–206.—Zibrowius, 1982:981.—Zibrowius and Cairns, 1982:211, 212.

DESCRIPTION.—Colonies uniplanar, up to 9 cm tall and 6 cm broad. Distal branches of delicate colonies (e.g., the syntypes) round to very slender, about 0.3–0.4 mm in diameter. Robust colonies with distal branches about 0.7 mm in diameter. Basal branch diameter up to 6 mm. Coenosteum white with a linear-imbricate texture. Coenosteal strips flat and parallel, 50–70 μm wide. Strips bordered by fairly continuous slits about 7 μm wide and very irregular in outline. Platelets slender (7–10 μm wide) and low in relief, usually with a multilobate leading edge. Platelets often change orientation of their leading edges and sometimes extend laterally across coenosteal slits to adjacent strips (Figure 21F). Coenosteum at base of colony smooth to touch.

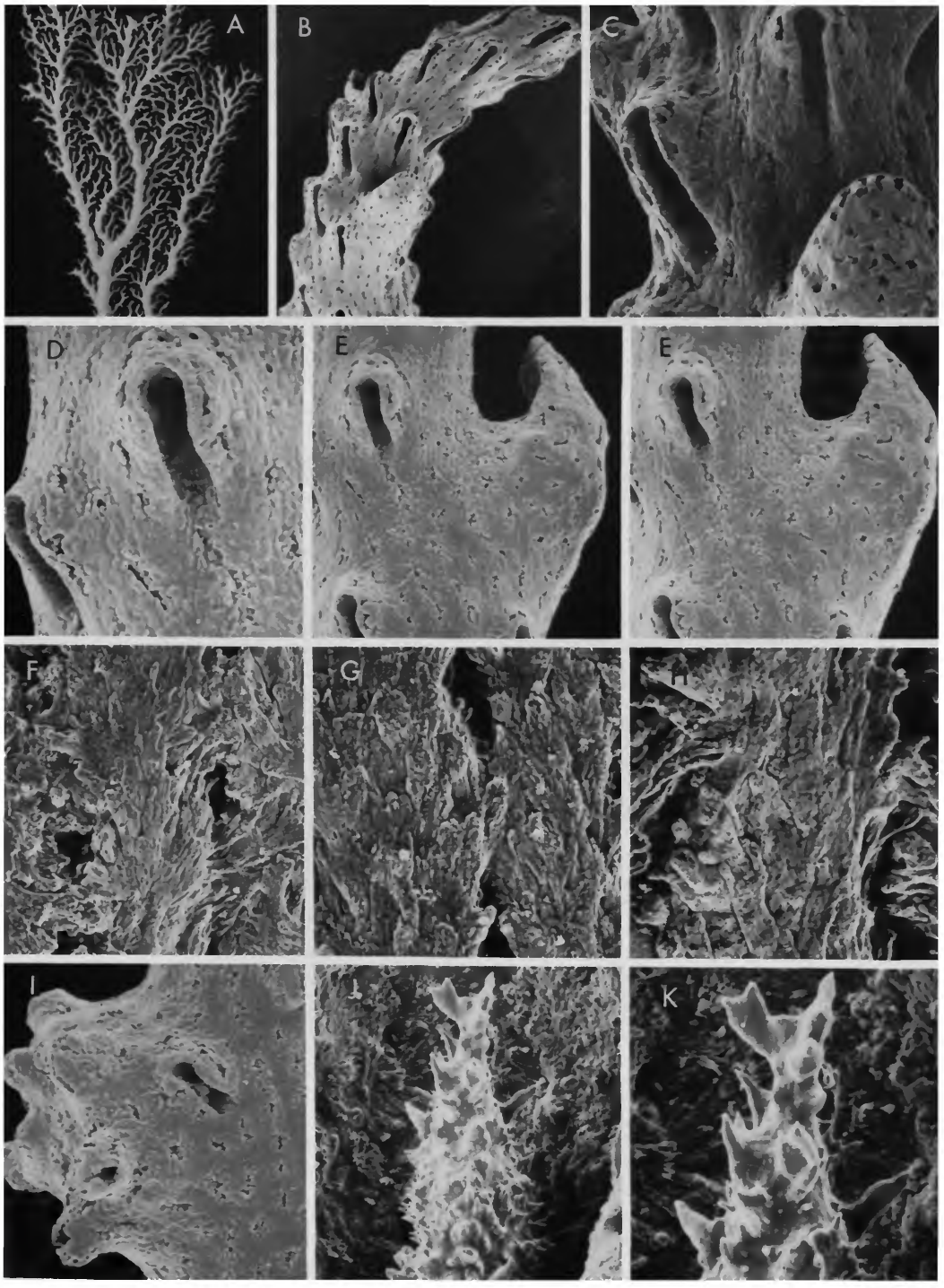
Gastropores occur only on center of anterior branch face and at branching axils, each pore hooded by a prominent abcauline lip, serving to extend the gastropore tube above coenosteal surface. Gastropore lips about 0.22 mm broad at base and up to 0.4 mm long, concave below, and often triangular, with a pointed tip. Gastropore tube lacking tabulae and ring palisade. Illustrated style 0.19 mm tall and 53 μm in diameter (H:W = 3.6), bearing pointed spines 6–24 μm tall. Style unridged, projecting slightly above coenosteal surface, the gastrostyle (and presumably the gastrozooid) being protected by the large gastropore lip. Dactylopores not clustered and randomly arranged but more common on posterior and lateral branch surfaces. Dactylopore spines about 0.10–0.13 mm wide and 0.10 mm tall, with a slit width of about 35 μm.

Ampullae prominent hemispheres 0.4–0.6 mm in diameter, usually covered with reduced dactylopore spines, producing an echinulate aspect.

DISCUSSION.—*Errina cochleata* clearly has adcauline-grooved dactylopore spines (not conical mounds) and thus belongs to the genus *Errina*, not *Lepidopora*, as suggested by Boschma (1968a), Zibrowius (1982), and Zibrowius and Cairns (1982). It is most similar to *E. altispina*, discussed later. Another Atlantic species, *E. dabneyi* Pourtalès, 1871, from the Azores, is distinguished by having reticulate-granular coenosteal texture and clustered dactylopore spines. The coenosteal texture of *E. cochleata* (i.e., unusually shaped platelets) is unique among the stylasterids.

MATERIAL EXAMINED.—*BL* station off Havana, 335 m, MCZ; *BL*-16, MCZ; *BL*-277, MCZ; *ALB*-2343, USNM 15985; *G*-169, UMML; *G*-251, USNM 72144 and UMML; *G*-270, USNM 72145 and UMML; *G*-693, USNM 72146; *G*-697, USNM 72147; *Alvin*-764, USNM 59479; *Eastward*-26538, USNM 72148; *JSL*-

FIGURE 20.—*Distichopora uniserialis* (A, holotype; B, D, G–H, paratype from *ALB*-2346; C, E–F, paratype from *ALB*-2349): A, holotype colony, × 1.15; B, branch tip, × 14; C, pore row and two female ampullae, × 16; D–F, coenosteal texture, × 21, × 48, × 335, respectively; G, longitudinal section of branch showing gastro- and dactylopores, gastrostyles, and tabulae, × 13; H, gastrostyle and tabula, × 91, stereo pair.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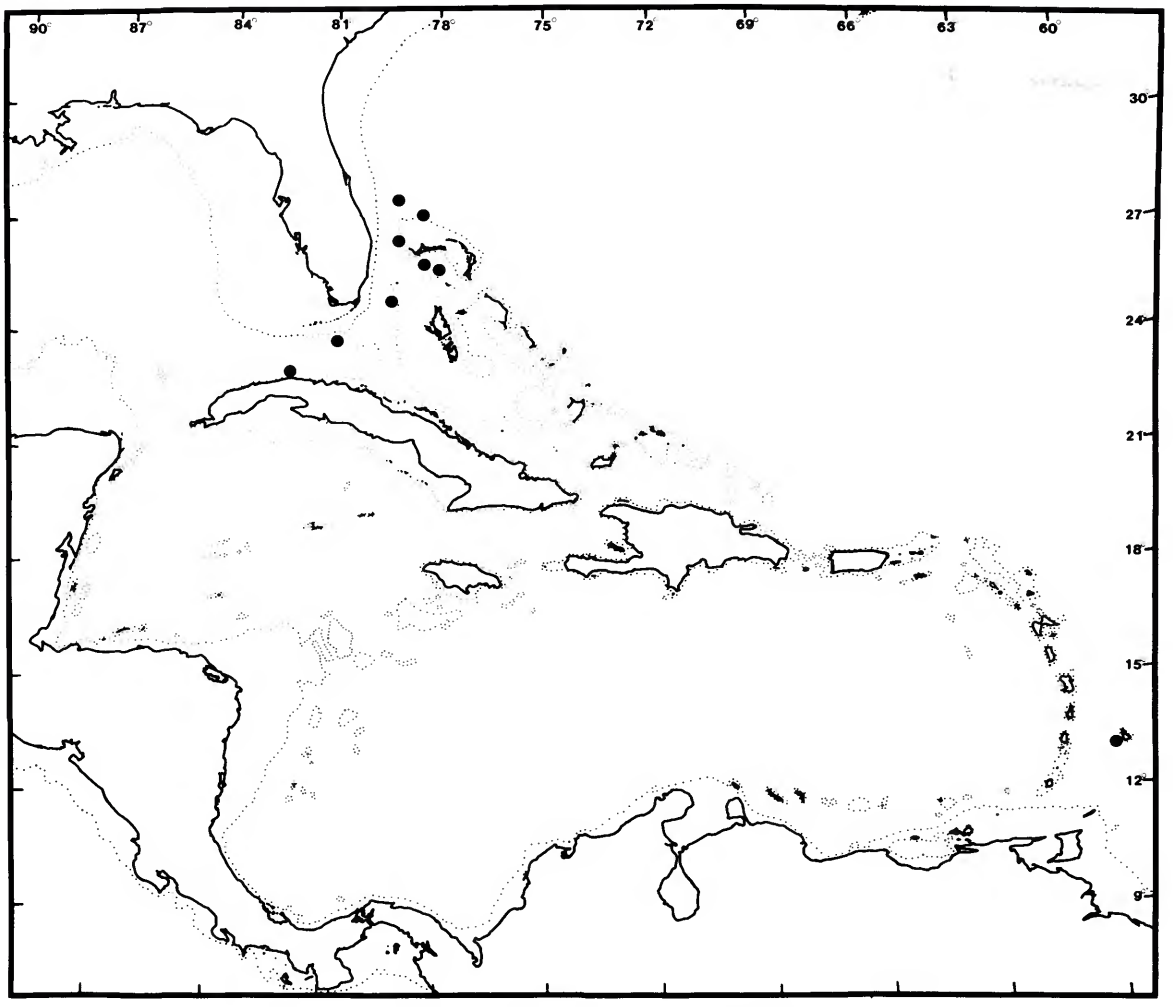


MAP 11.—Distribution of *Errina cochleata*.

1354, USNM 72149; *JSL*-1357, USNM 72150. Types of *E. cochleata*.

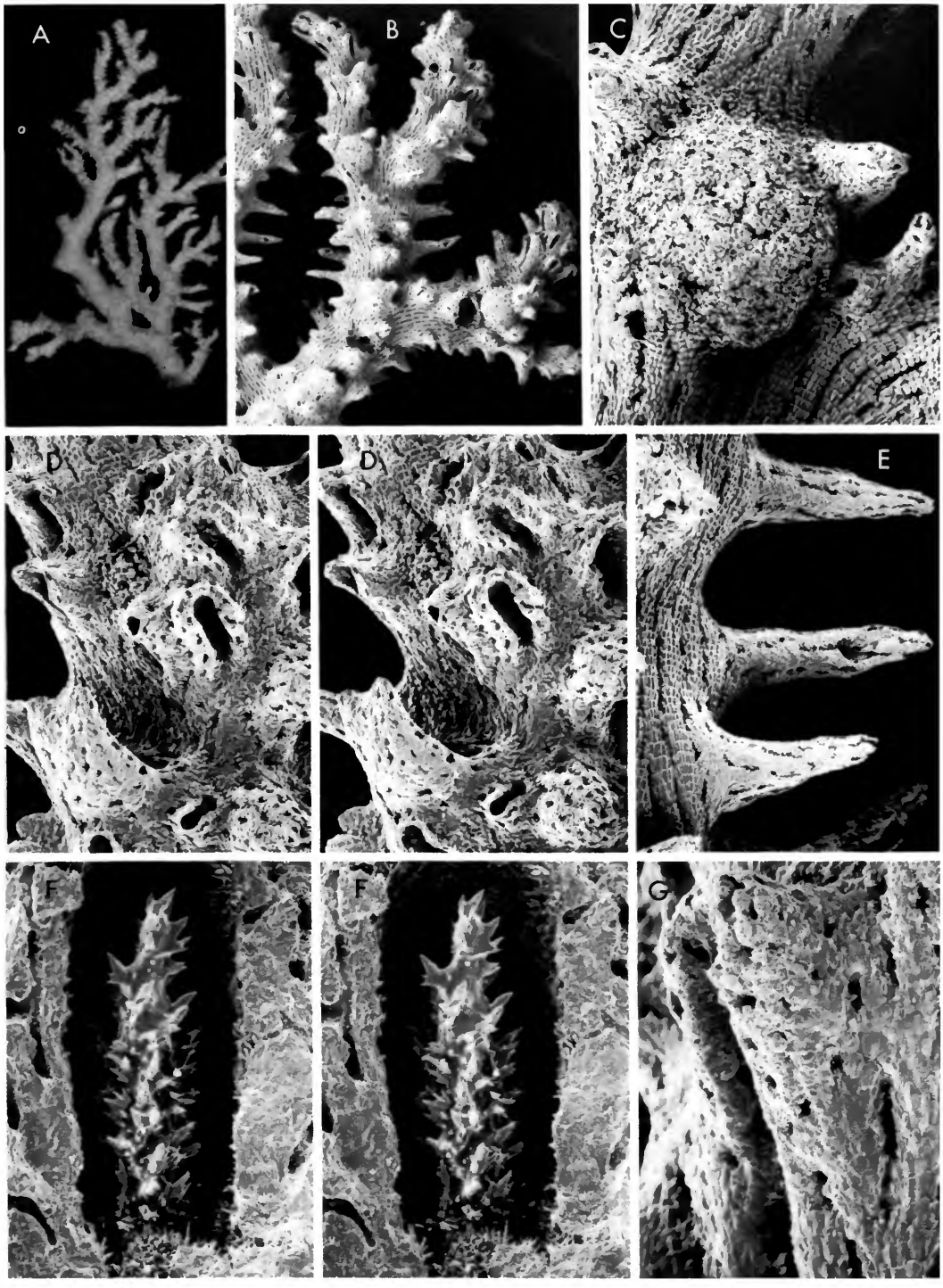
TYPES.—Two syntypes of *E. cochleata* are deposited at the MCZ (5331) and one syntype is at the USNM (71820).

TYPE-LOCALITY.—Off Havana, Cuba, 494 m.

Two syntypes of *H. galeata* are deposited at the RM, Stockholm.

DISTRIBUTION.—Insular side of Straits of Florida from Little Bahama Bank to Havana, Cuba, including Northwest Providence Channel; off Barbados (Map 11; pattern 2c); 194–534 m. The record from Pourtalès Terrace (Pourtalès, 1868) was not verified.

FIGURE 21.—*Errina cochleata* (A, JSL-1354; B–C, F–H, J–K, *G*-251; D–E, I, *ALB*-2343): A, colony, × 0.71; B, branch tip, × 38; C–E, dactylopore spines and hood-like abcauline gastropore lip, × 125, × 165, × 86, respectively (E is a stereo pair); F–H, coenosteal texture, × 400, × 600, × 745, respectively; I, ampulla covered by dactylopore spines, × 100; J–K, gastrostyle, × 330, × 580, respectively.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21. *Errina altispina*, new species

FIGURES 22A–G, 23A–E

DESCRIPTION.—Colonies uniplanar and delicately branched, up to 7 cm tall and 3 cm broad, with a basal branch diameter up to 4 mm. Colonies have broad, encrusting bases from which other colonies arise and on which are randomly scattered gastro- and dactylopores. Basal encrustation and basal branches densely covered by short conical papillae about 44 μm in diameter and 25 μm tall with an apical pore 9–12 μm in diameter, producing a rough texture to basal coenosteum. Coenosteum white, branches linear-imbricate in texture. Strips flat, 40–50 μm wide, and bordered by deep, well-defined slits about 7 μm wide. Broad platelets, each having three or four longitudinal ridges and grooves, extend across the entire width of a strip. About 60 platelet leading edges per mm.

Gastropores occur on both anterior and posterior branch faces. Each is bordered by a broad, prominent abcauline lip, which extends far beyond gastropore. Dactylopores often present on gastropore lips. Gastropore tube without tabulae or ring palisade. Illustrated gastrostyle 0.27 mm tall and 55 μm in diameter (H:W = 4.9), bearing pointed spines. Style not ridged. Dactylopores on branch tips identical in size and shape to those of *E. cochleata;* however, away from branch tip they progressively increase in height, some becoming tubular projections up to 0.5 mm tall. Dactylopores randomly arranged and not clustered.

Female ampullae prominent hemispheres about 0.5 mm in diameter with efferent tubes about 0.15 mm long and 0.12 mm in diameter.

DISCUSSION.—*Errina altispina* is quite similar to *E. cochleata*, especially with regard to its gastrostyle, gastropore lips, distal branch dactylopores, and size and shape of the colony and branches. *Errina altispina* differs in its coenosteal texture, its taller dactylopore spines, and in having gastropores on both sides of the branch.

Most of the 19 species of *Errina* (see Cairns, 1983b:428) have reticulate-granular coenosteal texture; some species having, in addition, a coarse platelet structure on their dactylopore spines. Only three species have exclusively linear-imbricate coenosteum: *E. altispina*, *E. Cochleata*, and *E. macrogastra* Marenzeller, 1904 (the latter from the Galápagos Islands). The linear-imbricate texture of *E. macrogastra* led Hickson (1912a) and Broch (1942) to question its placement in *Errina*. Boschma (1964f:285), giving less importance to coenosteal texture and more weight to the adcauline dactylopore spines, assigned it to *Errina*. Cairns (1983b:461) reviewed the genus and discussed these problems. I tend to agree with Boschma that coenosteal texture is of secondary importance in defining the genus.

The more stylasterids I examine by SEM the less conservative I find the character of coenosteal texture to be. Coenosteal texture may be different not only among different species of a genus (e.g., *Errina*, *Lepidopora*, and *Stenohelia*), but also among specimens within a population (e.g., *Pliobothrus echinatus*), and even between different parts of the same colony. For instance, the branch coenosteal texture of *E. altispina* is quite different from that of the basal encrustation. *Lepidotheca brochi* has two textures: irregularly shaped granules on the coenosteum and ridged platelets around the gastropore. Some species of Antarctic *Errina* (see Cairns, 1983a) have reticulate-granular coenosteum but large imbricate platelets covering the dactylopore spines. Sometimes, as in *Distichopora uniserialis* and *Stylaster laevigatus*, the original coenosteal texture, most obvious at branch tips, is obscured or changed to another texture by addition of stereome. Differential wear caused by age can also cause differences in texture. Nonetheless, coenosteal texture can still be used as a valuable character at the species level in many cases and

FIGURE 22.—*Errina altispina* (A, holotype; B–G, paratypes from *P*-595): A, holotype colony, × 2.4; B, branch tips, × 14; C, ampulla with efferent tube, × 85; D, low dactylopore spines and large abcauline gastropore lip, × 68, stereo pair; E, tall, slender dactylopore spines, × 74; F, gastrostyle, × 200, stereo pair; G, low dactylopore spine, × 200.

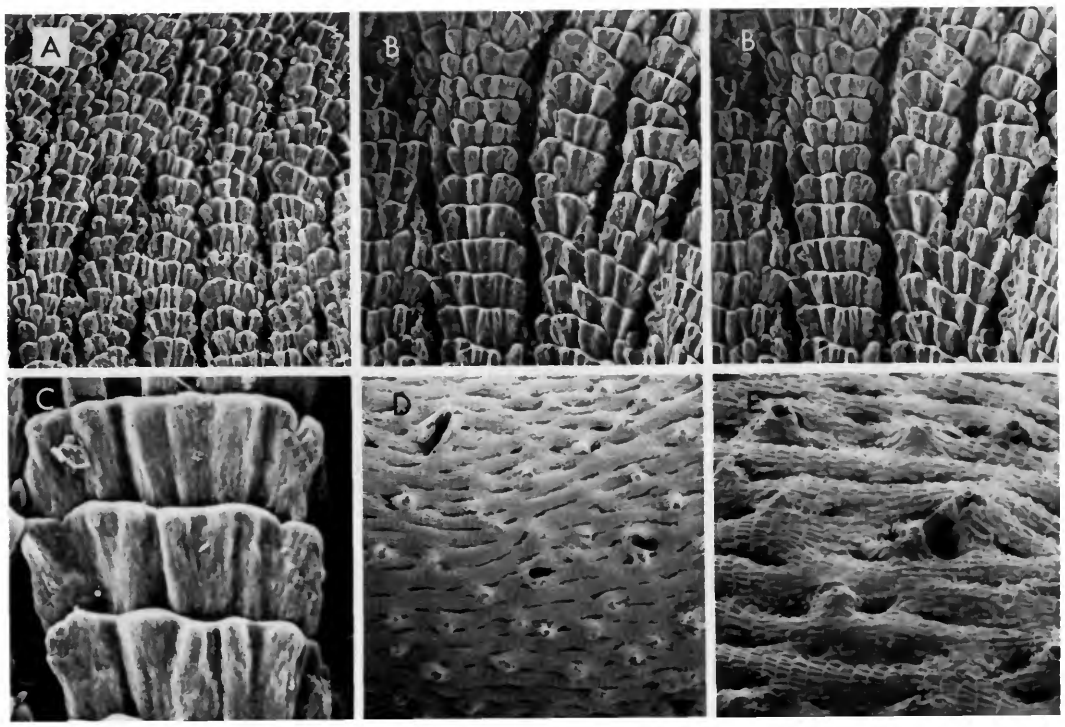


FIGURE 23.—*Errina altispina* (A–C, paratype from *P*-595; D–E; paratype from *G*-889): A–C, coenosteal texture, × 175, × 260, × 855, respectively (B is a stereo pair); D–E, coenosteal papillae, × 52, × 130, respectively.

sometimes even at the generic level, but it must be used with caution.

ETYMOLOGY.—The specific name *altispina* (Latin for "high spine") refers to the tall dactylopore spines of this species.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype*: *P*-595 (female) USNM 71777.

Paratypes: *P*-595 (1 colony, 2 branches) USNM 71778; *ALB*-2354 (1 branch) USNM 71779; *G*-889 (5 colonies, 6 branches) USNM 71780, (1 colony) UMML, (1 colony, 1 branch) MCZ, (1 colony) BM 1984.3.14.2.

TYPE-LOCALITY.—21°08′N, 86°27′W (off Arrowsmith Bank, Yucatan Peninsula), 309 m.

DISTRIBUTION.—Known only from off Arrowsmith Bank, Yucatan Peninsula, Mexico; 198–309 m.

Stylaster Gray, 1831

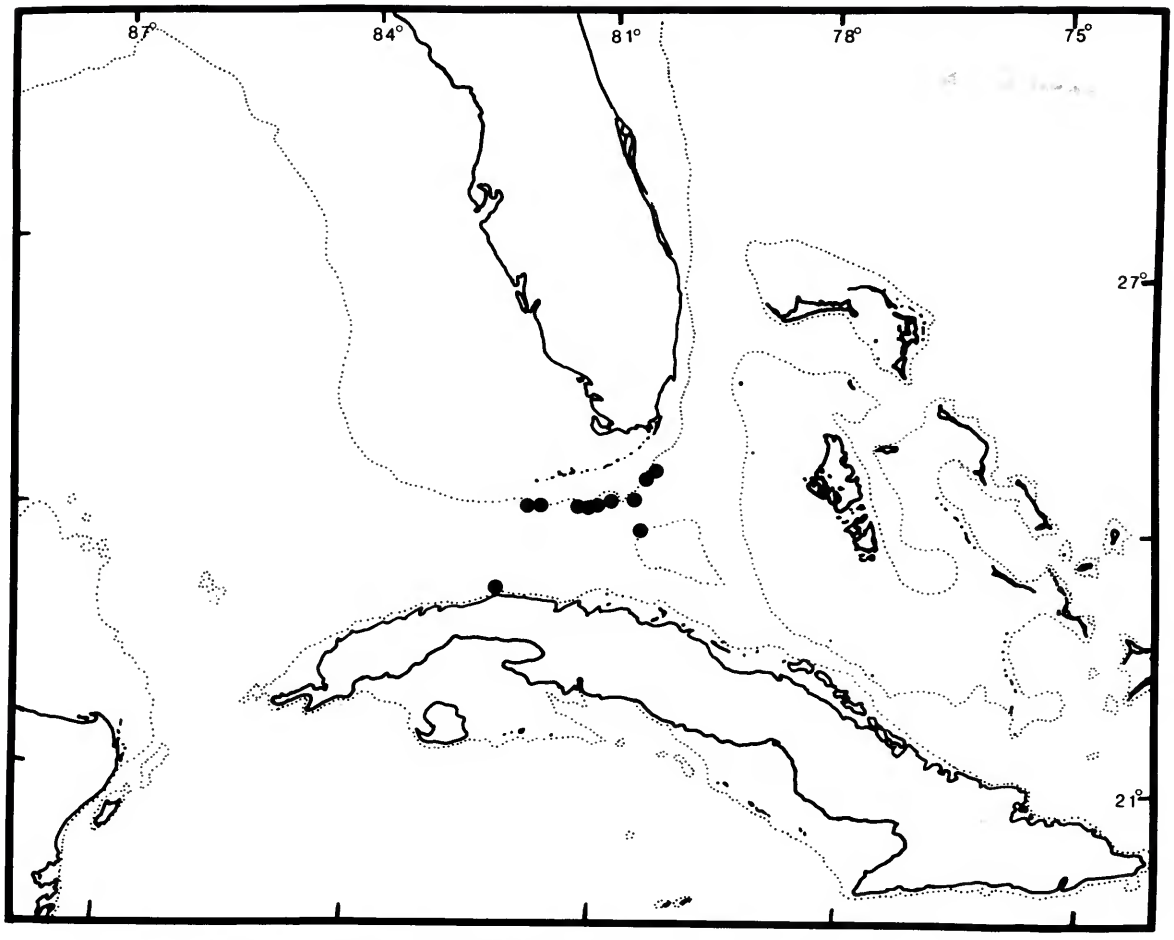
GROUP A

DIAGNOSIS.—Cyclosystems randomly arranged on all branch surfaces. Branches robust, often bluntly tipped. Coenosteal color variable; texture reticulate-granular. Usually 7–9 dactylopores per cyclosystem. Gastro- and dactylostyles present; dactylostyles usually robust. Ring palisade often present. Ampullae low superficial bulges.

22. *Stylaster miniatus* (Pourtalès, 1868)

FIGURES 24A–H, 25A–C

Allopora miniata Pourtalès, 1868:136–137; 1871:37–38, pl. 3: figs. 14–16.—Moseley, 1881:85, pl. 2: fig. 14.—Boschma, 1957:23; 1961:220; 1962a:195–203, fig. 1*a–e*,

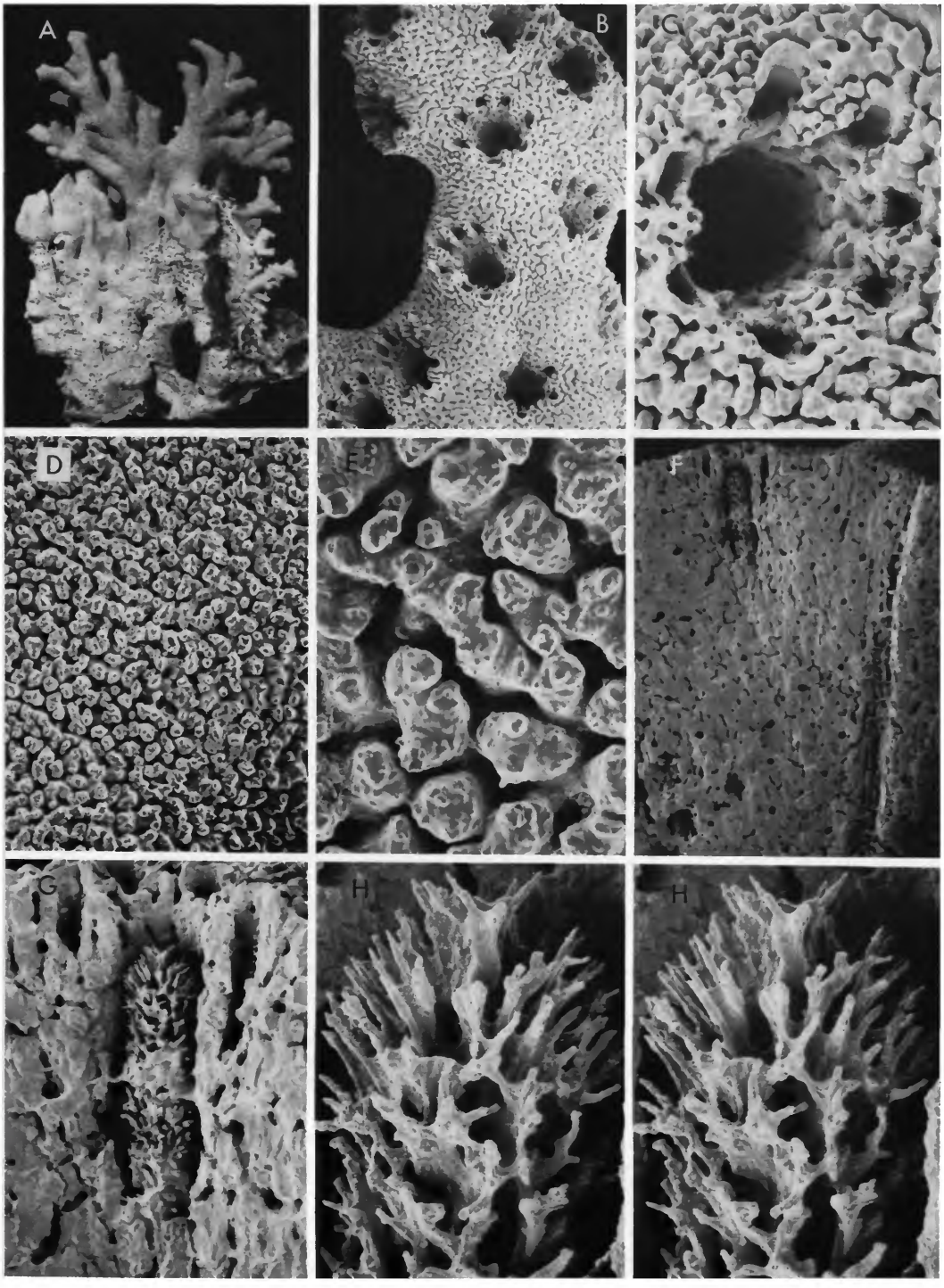


MAP 12.—Distribution of *Stylaster miniatus*. Known also from off South Carolina.

2 pl. 1: figs. 1–4.—Zibrowius and Cairns, 1982:211.
Allopora miniacea.—Agassiz, 1888:141, fig. 448.—?Nutting, 1895:177.
Stylaster miniatus.—Cairns, 1983b:429.

DESCRIPTION.—Colonies massive, uniplanar, and erect; up to 20 cm tall and 15 cm broad. In large colonies basal branches often fused into a lamellar base, up to 7 × 2 cm in cross section. Branch tips blunt, round to strongly flattened in cross section, varying from 2–6 mm in diameter. Coenosteum white, covered by tall, extremely coarse granules about 0.1 mm in diameter, which are themselves granulate. Coarse granules often fused together into short coenosteal strips.

Cyclosystems abundant on anterior and lateral branch surfaces but usually less common on posterior face; however, cyclosystem density on posterior face varies from equivalent to that on anterior face to being completely absent. Cyclosystems randomly arranged, never sympodial, and sometimes united in linear groups of two to four by a common ring of dactylopores, this being particularly common on massive branches. Cyclosystems round, about 1.1 mm in diameter, and flush with coenosteum or raised only slightly (0.04 mm) above branch surface. According to Boschma's (1962a) examination of 250 cyclosystems, there is a range of 5–11 dactylopores per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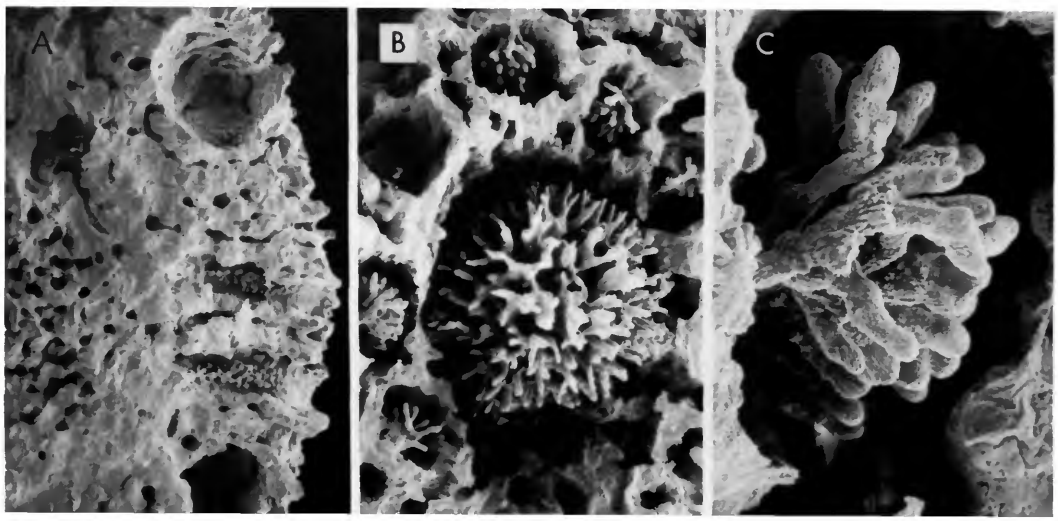


FIGURE 25.—*Stylaster miniatus* (A, syntype; B–E, *O*-1346): A, branch cross section revealing two internal ampullae and two dactylostyles, × 40; B, damaged cyclosystem revealing gastrostyle and dactylostyles, × 91; C, robust dactylostyle, × 440.

cyclosystem, with an average of 8.62, and a mode of 9. No diastemas.

Gastropores round, about 0.6 mm in diameter. Gastropore tube cylindrical, without a ring palisade. Tabulae present in longer tubes. Gastrostyles robust and cylindrical, about 0.30 mm in diameter, extending almost to branch surface. Length of styles varies with branch diameter: H:W ratios usually little over 1, but one exceptional style measured 4.2 mm long (H:W = 14). Style slightly greater in diameter just proximal to tip, which is caused by the extension of extremely long slender spines up to 0.1 mm long. Spines occur on very high transverse anastomotic ridges. Dactylostyles quite robust, composed of numerous cylindrical elements up to 60 μm long and 12 μm in diameter, which radiate from a narrow linear base (Figure 25C).

Female ampullae superficial hemispheres 0.9–1.0 mm in diameter, without specialized efferent pores. Male ampullae internal, about 0.6 mm in diameter.

Nematocysts of gastrozooid tentacles and dactylozooids 5 × 2.0–2.5 μm. Larger, robust nematocysts 11–12 × 6 μm occur throughout coenosarc.

DISCUSSION.—*Stylaster miniatus* is the only western Atlantic species belonging to *Stylaster* Group A sensu Cairns, 1983b:476. The geographically closest species in this group is the northeastern Atlantic *S. norvegicus* (Gunnerus, 1768); detailed comparisons are made by Boschma (1962a).

All specimens examined have white coenosteum and usually pale orange tissue, none being brick red as described by Pourtalès (1868). Also, Pourtalès (1871) and Boschma (1962a:203) inferred that this species is attached to the substrate by one of its faces and/or grows horizontal to the substrate. There was no indication of this growth mode in the specimens examined.

MATERIAL EXAMINED.—*O*-1346, USNM 72151; *O* -1348, USNM 72152; *O*-1349, USNM 72153; *Silver Bay*-2418, USNM 72154; *Gos*-1589, USNM 72155; *Gos*-1767, USNM 72156;

FIGURE 24.—*Stylaster miniatus* (A–C, F–H, *G*-134; D–E, *G*-598): A, colony, × 0.35; B, branch tip, × 12; C, individual cyclosystem, × 43; D–E, coenosteal texture, × 24, × 100, respectively; F–H, gastrostyle and tabulae, × 13, × 35, × 145, respectively (H is a stereo pair).

G-132, USNM 72157; *G*-134, USNM 72158 and UMML; *G*-135, USNM 72159; *G*-480, UMML; *G*-580, USNM 72160; *G*-598, USNM 72161, UMML,MCZ; *G*-813, USNM 72162; *G*-835, USNM 72163; *G*-836, UMML; *G*-838, UMML; *G*-865, USNM 72164; *G*-977, USNM 72165; *Gilliss* (Geology)-44, UMML; *Gilliss*-71-7, USNM 72166; off Morro Light, Cuba, 530 m, MCZ. Types.

TYPES.—Twenty-one syntype colonies and branches are deposited at the MCZ (5504). One syntype is at the NMNH (USNM 71821); one at the YPM; two at the BM (1891.2.4.33 and 1891.12.18.2); and three at the RMNH.

TYPE-LOCALITY.—"Florida Reefs," 183–592 m.

DISTRIBUTION.—Most records are from the Pourtalès Terrace but also known from Blake Plateau off South Carolina; off Cay Sal Bank; and off Morro Light, Cuba (Map 12; pattern 3); 146–530 m

GROUP B

DIAGNOSIS.—Like Group C, but, in addition to sympodially arranged cyclosystems, there are cyclosystems on anterior and posterior branch faces.

TYPE-SPECIES.—*Madrepora rosea* Pallas, 1766, by subsequent designation (Milne Edwards and Haime, 1850).

23. *Stylaster erubescens* Pourtalès, 1868

Figure 26 A–H

Stylaster erubescens Pourtalès, 1868:135–136; 1871:34, pl. 4: figs. 10–11; 1878:210.—Boschma, 1955:136–138; 1957:8; 1965:236, 245–247, pl. 4.—Zibrowius and Cairns, 1982:210, 212.—Cairns, 1983b:430. [Not *S. erubescens*.—Moseley, 1876b:94 (= *S. densicaulis*); 1881:81.—Boschma, 1953b:166, 169.]

Stylaster roseus.—Broch, 1914:12–15, figs. 8–11, 17, 22, 36, 39, 43, 47; 1936:15.

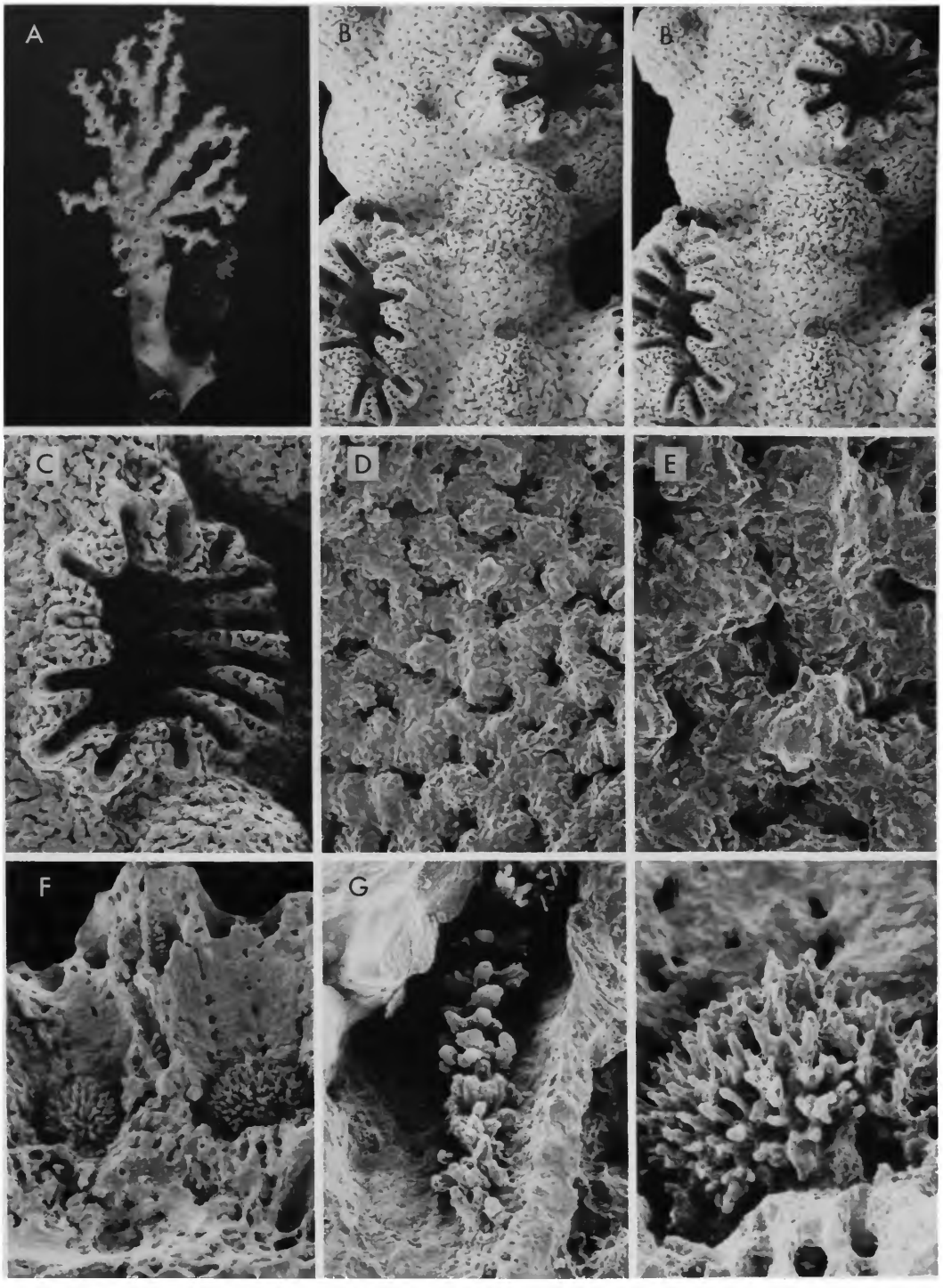
DESCRIPTION.—Colonies uniplanar and large, up to 16 cm tall and 19 cm broad, with a basal branch diameter up to 20 × 11 mm. Colonies often attached to dead fragments of the scleractinian coral *Enallopsammia profunda*. Terminal branches slender, about 1.6 mm in diameter. Coenosteum white, reticulate-granular in texture; however, granules irregular in size and shape. Coenosteal strips about 0.1 mm wide, flat, and bordered by shallow, discontinuous slits. Coenosteum of some specimens porcelaneous.

About half of colonies examined lived in association with symbiotic polychaetes, *Harmothoe* sp., which induce the corallum to secrete a large calcareous tube on posterior face of colony. Worm tubes about 3 × 2 mm in diameter, following main branching sequence of corallum. Worm tube not porous, except for both open ends and periodic lateral openings, also about 3 × 2 mm in diameter. Sometimes coenosteum forming the tube is highly papillose. In some large colonies, the polychaete vacates the worm tube along the basal branches, allowing the cavity to fill with coenosteum, which forms a very massive branch.

Cyclosystems sympodially arranged and highly exsert; round, elliptical, or irregular in shape. On branches having symbiotic polychaetes, cyclosystems usually dislocated to anterolateral branch surfaces but their sympodial origin is still apparent. On massive basal branches the original sympodial arrangement may be obscured by additional cyclosystems, not unlike cyclosystem arrangement in some species of *Stylaster* Group A. Cyclosystems large, 1.0–1.7 mm in diameter. Based on 50 cyclosystems the range of dactylopores per cyclosystem is 8–14; average is 12.12 (σ = 1.58), and the mode is 13.

Gastropore tube short, the upper two-thirds infundibuliform leading to a large elliptical lower chamber filled almost entirely by the gastrostyle.

FIGURE 26.—*Stylaster erubescens* (A, *ALB*-2415; B–E, *G*-386; F–H, *ALB*-2662): A, colony containing polychaete tube on posterior face, × 1.15; B, cyclosystems and female ampullae with efferent pores, × 18, stereo pair; C, cyclosystem, × 32; D–E, coenosteal texture, × 59, × 135, respectively; F, longitudinal section of two cyclosystems revealing gastrostyles and several dactylostyles, × 39; G, dactylostyle, × 220; H, gastrostyle, × 127.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No tabulae or ring palisade. Gastrostyles short and squat with H:W ratios often less than one. Illustrated style 0.31 mm tall and 0.35 mm wide, completely covered by long slender spines up to 65 μm long and 14 μm in diameter. Tip of style extends just above junction of upper and lower chambers and, because the lower part of the style is broader than the lower part of the upper chamber, when viewed from above the style looks quite massive. Dactylopore slits bout 0.15 mm wide. No diastemas. Dactylostyles robust, composed of tall, cylindrical, blunt elements up to 80 μm tall and 12 μm in diameter, which are linearly arranged two or three abreast.

Female ampullae hemispherical, about 1 mm in diameter, with a large efferent tube terminating in a porous, round concavity about 0.2 mm in diameter. Male ampullae also superficial, about 0.6 mm in diameter. Both ampullar types clustered on both faces of colony.

Tentacular nematocysts 5–6 × 2 μm; larger ones, 11 × 5.5 μm, found throughout coenosarc.

DISCUSSION.—*Stylaster erubescens* is most easily confused with *S. miniatus*, and both are often found at the same stations. *S. erubescens* can be differentiated by its exclusively sympodial branch form on terminal branches, its less coarse coenosteal texture, and its more deeply seated gastrostyles. It is one of two western Atlantic stylasterids that are known to have a symbiotic relationship with polychaetes.

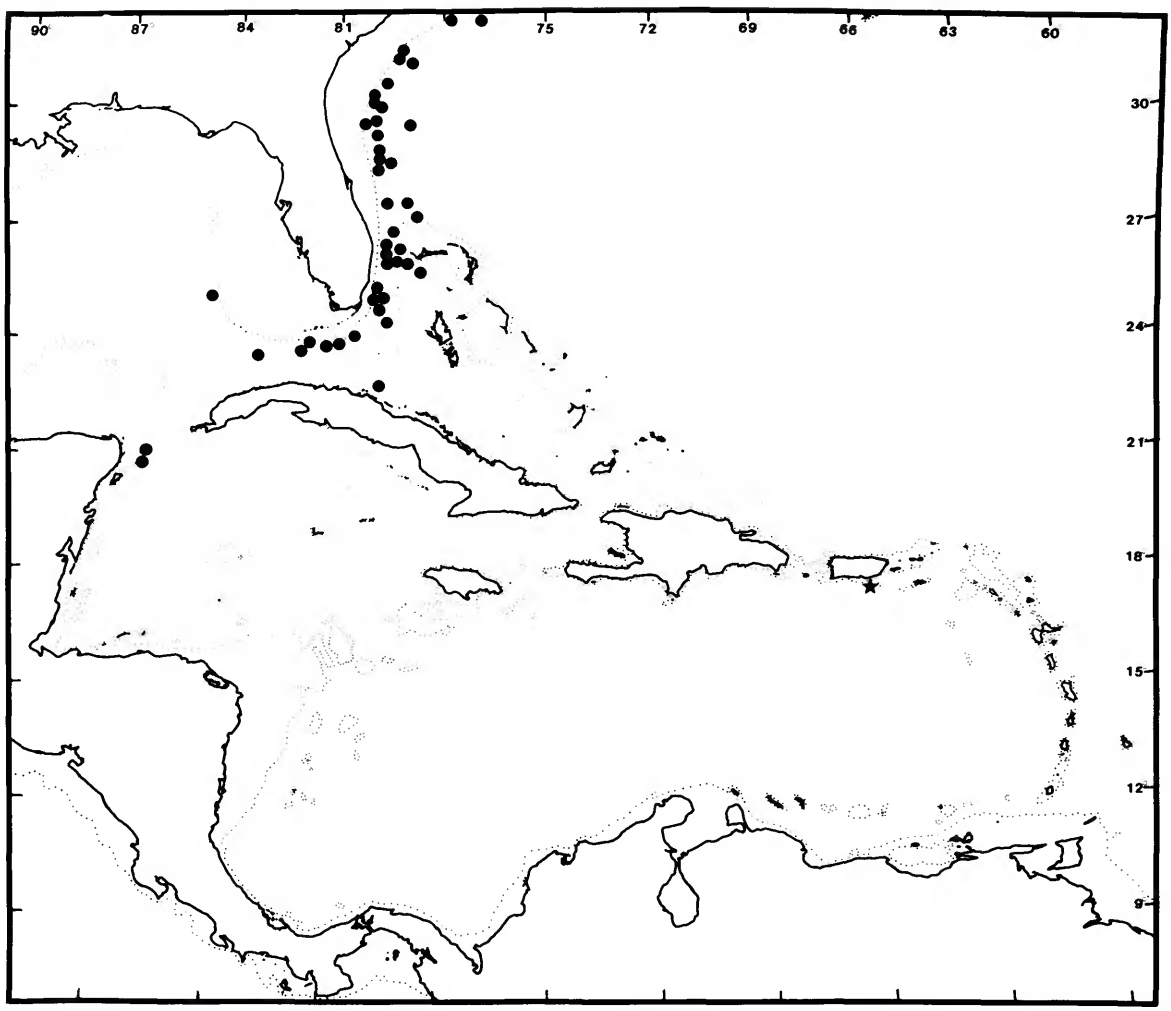
Stylaster erubescens was the most commonly collected stylasterid in the study material.

MATERIAL EXAMINED.—*Bibb*-169, MCZ; *Bibb*-216, MCZ; *BL*-44, MCZ; *BL*-319, MCZ; *ALB*-2415, USNM 10514 and 52231; *ALB*-2416, USNM 10542; *ALB*-2628, USNM 52226; *ALB*-2661, USNM 72167; *ALB*-2662, USNM 16001; *ALB*-2667, USNM 52227; *ALB*-2671, USNM 14454; *Fish Hawk*-7298, USNM 52228; *Atlantis*-2987, MCZ; *Atlantis*-3782, MCZ; *O*-1328, USNM 72168 ; *O*-1346, USNM 72169 ; *O*-1348, USNM 72170 ; *O*-6690, USNM 72171; *O*-11725, USNM 72172; *Silver Bay*-2416, USNM 10542; *Silver Bay*-2418, USNM 72173; *Gos*-1591, USNM 72174; *Gos*-1601, USNM 72175; *Gos*-1607, USNM 72176; *Gos*-1630, USNM 72177; *Gos*-1641, USNM 72178; *Gos*-1643, USNM 72179; *Gos*-1644, USNM 72180; *Gos*-1647, USNM 72181; *Gos*-1650, USNM 72182; *Gos*-1653, USNM 72183; *Gos*-1731, USNM 72184; *Gos*-1733, USNM 72185; *Gos*-1734, USNM 72186; *Gos*-1742, USNM 72187; *Gos*-1743, USNM 72188; *Gos*-1748, USNM 72189; *G*-44, UMML; *G*-103, USNM 72191; *G*-114, UMML; *G*-132, USNM 72192; *G*-134, UMML and USNM 72193; *G*-135, USNM 72194; *G*-170, UMML; *G*-177, USNM 72195; *G*-293, UMML; *G*-298, USNM 72197; *G*-304, USNM 72198; *G*-317, USNM 72199; *G*-354, USNM 72200; *G*-386, USNM 72201; *G*-403, USNM 72202; *G*-480, USNM 72203 and UMML; *G*-580, USNM 72204; *G*-598, USNM 72205; *G*-661, UMML; *G*-663, USNM 72206; *G*-670, USNM 72207; *G*-708, USNM 72208; *G*-808, USNM 72209; *G*-835, USNM 72210; *G*-865, UMML; *G*-866, UMML; *G*-885, USNM 72211; *G*-889, UMML; *G*-936, UMML; *G*-974, USNM 72212; *G*-976, USNM 72213; *G*-977, UMML; *G*-978, USNM 72214; *G*-1103, USNM 72215; *P*-112, USNM 72216; *Columbus Iselin*-246, USNM 72217; *Vema* 15-1, USNM 72218; *Vema* 17-RD-29, USNM 60004; *Bartlett* 52 C-5, USNM 60005; *Discoverer*, 31°35′N, 78°25′W, 531 m, USNM 72219; *Eastward*-26037, USNM 72220; BLM-2H, USNM 49164. Syntypes.

TYPES.—One large syntype is deposited at the MCZ (5514). Additional syntype branches are at the USNM (71822), the YPM, and the RMNH.

TYPE-LOCALITY.—Pourtalès Terrace, 220–592 m.

DISTRIBUTION.—Western Atlantic: continental shelf and slope from the Blake Plateau off South Carolina to off southwestern Florida; off Little Bahama Bank; off Cay Sal Bank; and off Arrowsmith Bank (Map 13; pattern 3); 146–965 m, however, most common between 650–850 m. Elsewhere: off southern and southeastern Greenland (Denmark Strait), and the Reykjanes and Faroe-Iceland Ridges off Iceland; 204–1400 m. The specimens from the northeast Atlantic appear to be the same as those from off Florida, although there is a distributional gap extending from South Carolina to Greenland.



MAP 13.—Distribution of *Stylaster erubescens* (circles) and *S. spatula* (star). *S. erubescens* is also known from the North Atlantic.

24. *Stylaster roseus* (Pallas, 1766)

FIGURES 27A–H, 28A–C, 53D

Madrepora rosea Pallas, 1766:312–313.

Stylaster roseus.—Gray, 1831:37.—Boschma, 1955:134–138; 1965:227–247, pls. 1–3 [complete synonymy].—Roos, 1971:45, pl. 4.—Scatterday, 1974:86.—Colin, 1978:141, 144 [color fig.], 151.—Kruijf and Kruijf, 1980: 86–92.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:479–480, figs. 17A–I, 25A, 26D, 28F, H. [Not *S. roseus*.—Verrill, 1864:45; Lindstrom, 1877:15 (identity unknown).—Broch, 1914:12–15 (= *S. erubescens*).—Boone, 1933:31 (identity unknown).]

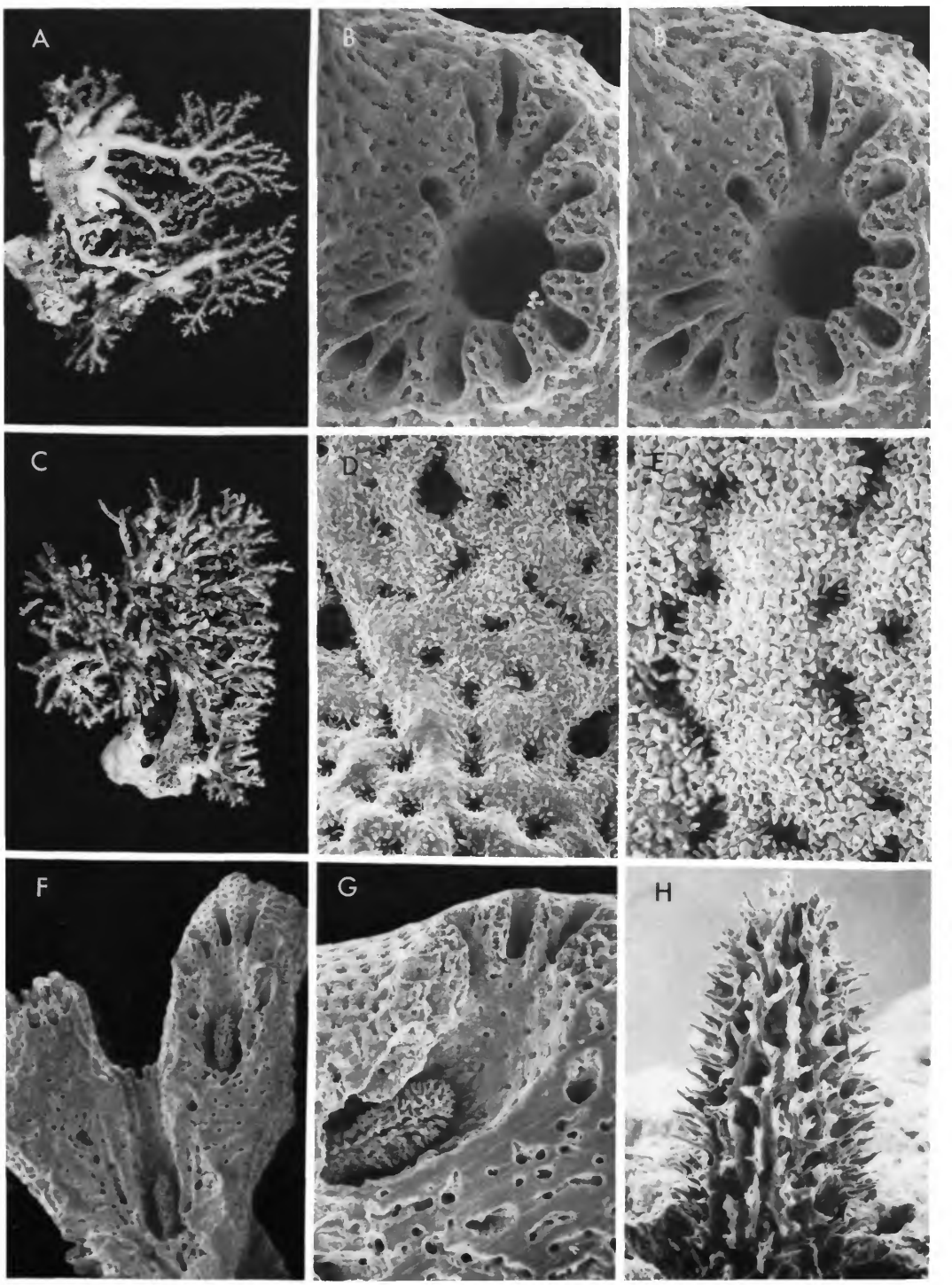
Stylaster punctatus Pourtalès, 1871:36.—Boschma, 1957:14.—Zibrowius and Cairns, 1982:210, 211. [Not *S. punctatus*.—Pourtalès, 1874:43, pl. 7: figs. 8, 9; 1878:210.]

Stylaster sanguineus.—Pourtalès, 1871:83 [in part: specimen from Cuba].

Stylaster sp.—Rathbun, 1879:542.

Stylaster duchassaingi.—Laborel, 1971:224, pl. 8: fig. 4.

DESCRIPTION.—Colonies flabellate to bushy, up to 7 cm tall and 11 cm broad. Branches slightly elliptical in cross section and nonanastomotic; distal branches not much larger in diam-


A
B
B
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D
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H

eter than diameter of a cyclosystem (about 1 mm). Coenosteum deep purple, white with rose cyclosystems, completely white, or rose colored, in order of frequency of occurrence in the USNM collections. Coenosteum of most specimens pierced with small round pores 45–50 μm in diameter, presumably the dactylopores of the isolated dactylozooids described by Goedbloed (1962a). Coenosteal texture linear-imbricate with a tendency toward reticulate structure near ampullae and cyclosystems. Strips usually 65–80 μm wide, covered by a very irregular arrangement of platelets 5–34 μm in width. Slits separating strips narrow and deep, bearing elongate granules.

Cyclosystems variable in arrangement. On distal branches they are usually arranged in a regular sympodial manner, which may continue throughout the colony or may be augmented by additional cyclosystems on the anterior and posterior faces. Some colonies have entirely sympodially arranged cyclosystems; on others they are mostly randomly arranged; and yet others have both arrangements on different branches of the same colony. It appears that bushy colonies have a greater tendency for the irregular arrangement. Cyclosystems round to slightly elliptical, 0.75–1.0 mm in diameter. Based on 1003 cyclosystems, Boschma (1965) found the range of dactylopores per cyclosystem to be 5–15, average = 9.7, and mode = 10.

Gastrostyles lanceolate and highly ridged, 0.32–0.50 mm tall and 0.11–0.20 mm in diameter (H:W = 2.1–3.6). Gastrostyle spines fused along vertical ridges; spines slender and pointed, up to 32 μm long. A distinct ring palisade present, encircling upper third of style, composed of vertical ridges up to 52 μm long and 15 μm wide. Both dactylopore slits and pseudosepta 60–70 μm wide; however, a small abcauline diastema is sometimes present, measuring three to four times the width of a pseudoseptum. Dactylostyles rudimentary; composed of widely spaced, linearly arranged, cylindrical to clavate elements 25–27 μm tall and 11 μm in diameter.

Ampullae prominent hemispheres 0.5–0.7 mm in diameter, usually smooth but occasionally ridged or warty. Young ampullae very porous (Figure 28 B). Mature female ampullae have a short efferent tube, which terminates in a porous concavity 0.12–0.17 mm in diameter.

Gastrozooids cylindrical, short, and blunt, each with several tentacles. Dactylozooids within cyclosystems usually adnate (Goedbloed, 1962a); however, some are simple and greatly elongated (hair dactylozooids as described by Kruijf, 1977). Isolated simple dactylozooids also occur with varying frequency. Nematocysts of gastrozooid tentacles and dactylozooids about 6 × 2 μm; slightly larger swollen nematocysts 7 × 4 μm occur on the pseudosepta. Colonies may be hermaphroditic, but individual ampullae are exclusively male or female (Goedbloed, 1962b). Coenosteal canals about 5 μm in diameter.

DISCUSSION.—More complete synonymies are given by Boschma (1965) and Cairns (1983b), and the former discusses this species in great detail.

Stylaster punctatus Pourtalès, 1871, was described on the basis of two specimens: one from Orange Key, Bahamas (*Bibb*-162) and one from Double-Headed Shot Key, Cay Sal Bank (*Bibb*-141). The second specimen is no longer at the MCZ and is presumed to be lost. Therefore the specimen from *Bibb*-162 is designated as the lectotype. This specimen is identical to *S. roseus*. It has numerous isolated dactylopores (not unusual for *S. roseus*), which is probably why Pourtalès named it *punctatus*.

Stylaster roseus is most often collected in shallow water between 0.5 and 30 m; however, deeper-water, dredged colonies are known from depths as great as 373 m. These deeper specimens, collected primarily off Havana, Cuba and

FIGURE 27.—*Stylaster roseus* (A, specimen collected near Buenaventura, Panama, USNM 72255: B, F–G, specimen collected at Carrie Bow Cay, Belize, USNM 47807; C, specimen collected off Cozumel, Mexico, 6 m, USNM 72245; D–E, H, specimen collected off Carrie Bow Cay, Belize, USNM 72247): A, flabellate colony, × 0.67; B, cyclosystem, × 71, stereo pair; C, bushy colony, × 0.70; D–E, coenosteal texture, × 135, × 220, respectively; F, longitudinal section of branch revealing two gastrostyles, × 29; G–H, gastrostyle, × 64, × 170 respectively.

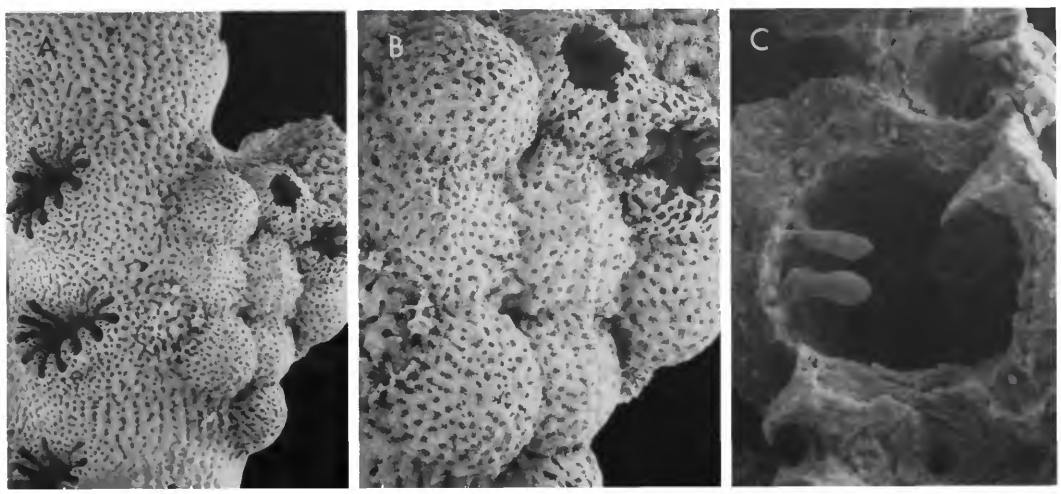


FIGURE 28.—*Stylaster roseus* (A–B, specimen collected from Carrie Bow Cay, Belize, USNM 72247; C, specimen collected from Carrie Bow Cay, Belize, USNM 47807): A–B, cluster of 10 female ampullae showing progressive developmental stages in the formation of ampullar wall, × 20, × 40, respectively; C, dactylostyle, × 430.

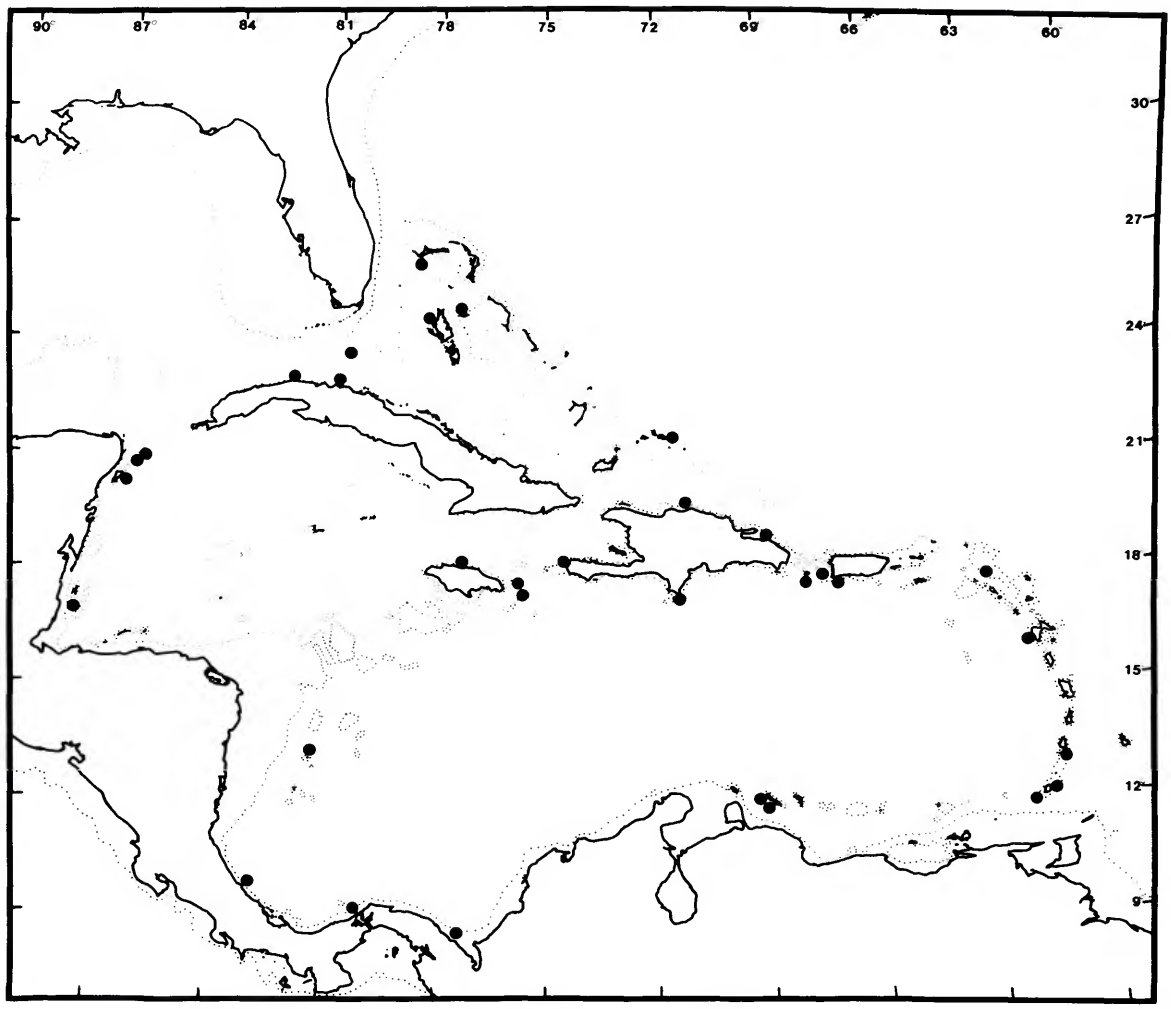
Arrowsmith Bank, are usually more delicate, have smaller cyclosystems, and are pale orange in color.

MATERIAL EXAMINED.—*ALB*-2136, USNM 7173; *ALB*-2147, USNM 7154; *ALB*-2157, USNM 16024; *A:LB*-2159, USNM 16016; *ALB*-2167, USNM 16028; *ALB*-2319, USNM 16018; *ALB*-2323, USNM 52222; *ALB*-2324, USNM 10132; *ALB*-2325, USNM 72221; *ALB*-2333, USNM 52224; *ALB*-2334, USNM 16027; *ALB*-2335, USNM 16022; University of Iowa West Indies station 75, Little Cat Island, Eleuthera, 18 July 1893, 6–24 m, USNM 72244; J-S 43, USNM 72222; J-S 45, USNM 72223; *O*-4941, USNM 72224; *G*-533, UMML; *G*-887, UMML; *G*-897, USNM 72225; *G*-940, UMML; *G*-954, USNM 72226; *G*-983, USNM 72228; *G*-1246, UMML; *G*-1270, USNM 72229; *G*-1275, USNM 72230; *P*-410, UMML; *P*-589, USNM 72231; *P*-852, USNM 72232; *P*-855, USNM 72233; *P*-858, USNM 72234; *P*-867, USNM 72235; *P*-978, USNM 72236; *P*-979, UMML; *P*-1149, USNM 72237; *P*-1157, USNM 72239; *P*-1184, USNM 72240; *P*-1196, UMML; *P*-1284, USNM 72241; *P*-1350, USNM 72242; *P*-1423, USNM 72243; *Calypso*-44, USNM 72246. [11 records from off Carrie Bow Cay, Belize, all deposited at the NMNH:11 May 1975, USNM 47807; 22 May 1980, USNM 59804; 18.3 m, USNM 47806; 12 Aug 1980, 6–7 m, USNM 72247; 12 Dec 1980, USNM 60001; 6 April 1981, USNM 72248; 24 April 1981, 6 m, USNM 72249; 6 May 1981, USNM 72250; 12 May 1981, USNM 72251; 13 May 1981, USNM 72252; 26 Mar 1982, USNM 72253]. Off Cahuita, Limón, Costa Rica, 3–4 m, 15 Mar 1982, USNM 72254; Buenaventura, Panama, USNM 72255; Plaja Djerimi, Curaçao, 11 Dec 1948, USNM 72256; off Cozumel, 6 m, USNM 72245; off Gambier, New Providence, Bahamas, USNM 43766 and 44071; south of Mona Island, Puerto Rico, 15 m, 25 Mar 1975, USNM 54481; off Cruz del Padre, Cuba, MCZ. Lectotype of *S. punctatus;* Laborel's (1971) specimens.

TYPES.—Pallas's types of *S. roseus* have not been traced. The lectotype of *S. punctatus* is deposited at the MCZ (5506).

TYPE-LOCALITY.—For *S. roseus,* the type-locality is off Santo Domingo; depth unknown. For *S. punctatus,* it is Orange Key, Bahamas, 17 m.

DISTRIBUTION.—*Stylaster roseus* is the only shallow-water stylasterid known from the western Atlantic and also is the only species recorded for the southern Caribbean. It has the most wide-



MAP 14.—Distribution of *Stylaster roseus*. Known also from off Brazil.

spread distribution within the Caribbean of any stylasterid species, ranging from the Bahamas throughout the Caribbean and off Pernambuco State, Brazil, and Fernando de Noronha (Map 14; pattern 1); 0.5–73 m.

GROUP C

DIAGNOSIS.—Cyclosystems sympodially arranged on lateral, anterolateral, or anterior branch surfaces. In latter case cyclosystems slightly alternating. Branches usually slender with pointed tips. Coenosteal color and texture variable: linear-imbricate and reticulate-granular most common textures. Coenosteal papillae often present. Usually 10–15 dactylopores per cyclosystem. Gastropore usually with a ring palisade and sometimes with inner shelf. Gastro- and dactylostyles present; dactylostyles usually rudimentary. Ampullae superficial; each female ampulla usually with an efferent tube and pore.

DISCUSSION.—The eleven western Atlantic species are arranged according to their cyclosystem orientation (Table 2). In a previous paper (Cairns, 1984), I suggested that a random orientation of cyclosystems was plesiomorphic and

TABLE 2.—Tabular key to the Northwest Atlantic species of *Stylaster* (A, L, and AL stand for anterior, lateral, and anterolateral arrangement of cyclosystems on branch; cs = cyclosystem).

Character	*S. miniatus*	*S. erubescens*	*S. roseus*	*S. antillarum*	*S. duchassaingi*	*S. atlanticus*	*S. corallium*
Cyclosytem orientation	Random	Sympodial (L), some cs on anterior and posterior branch faces	Sympodial (L), some cs on anterior and posterior branch faces	Sympodial (L)	Sympodial (L)	Sympodial (L)	Sympodial (L)
Size of dactylostyle; presence of lateral dactylostyle	Robust; absent	Robust; absent	Rudimentary; absent	Rudimentary; absent	Rudimentary; absent	Rudimentary; absent	Rudimentary; absent
Gastropore shelf	Absent	Absent	Absent	Absent	Present	Absent	Absent
Abcauline gastropore lip	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Coenosteal texture	Reticulate-granular (coarse)	Reticulate-granular	Linear-imbricate and reticulate-imbricate	Reticulate-granular	Linear-imbricate	Linear-imbricate	Linear-imbricate
Coenosteal papillae	Absent	Absent	Absent	Absent	Common	Absent	On base of colony and ampullae
Coenosteal color	White	White	Purple, rose, red	White	White	Orange	Pink-rose
Range and average no. of dactylopores/cyclosystem	5–11, 8.6	8–14, 12.1	5–15, 9.7	10–18, 14.4	7–16, 11.6	8–17, 13.2	5–15, 11.2
Average cyclosystem diameter (mm)	1.1	1.0–1.7	0.75–1.0	1.6 × 1.0	1.0	0.95	0.40–0.75
Typical gastrostyle H:W	1–14	<1	2.1–3.6	2.9	5.0	4.4	9.4
Other characters	Branch tips blunt; ring palisade absent; gastrostyles extend almost to surface	Ring palisade absent; commensal worm tube often present	Only shallow-water species; isolated dactylozooids present	Gastropore tube quite deep (cannot see gastrostyle tip)			Corallum dense

TABLE 2—*Continued.*

Character	*S. filogranus*	*S. spatula*	*S. inornatus*	*S. laevigatus*	*S. aurantiacus*	*S. complanatus*
Cyclosystem orientation	Sympodial (primarily L, some AL)	Sympodial (primarily AL, some L)	Sympodial (AL)	Sympodial (primarily AL, some A)	Sympodial (primarily AL, some A)	Sympodial (primarily A, some AL)
Size of dactylostyle; presence of lateral dactylostyle	Rudimentary; present	Rudimentary; absent	Rudimentary; present	Rudimentary; present	Rudimentary; present	Rudimentary; present
Gastropore shelf	Absent	Present	Present	Presnt	Present	Present
Abcauline gastropore lip	Absent	Present	Absent	Present	Present	Present
Coenosteal texture	Linear-imbricate	Linear-imbricate	Reticulate-granular	Linear-imbricate and linear-granular	Linear-granular	Linear-granular and reticulate-granular
Coenosteal papillae	Absent	Present	Absent	Absent	Present	Common
Coenosteal color	Pink	White	White	White	Orange	White
Range and average no. of dactylopores/cyclosystem	7–13, 10.0	10–17, 12.7	6–13, 9.8	5–16, 11.5	7–15, 11.0	10–20, 14.3
Average cyclosystem diameter (mm)	0.8–1.0	1.0	0.65	0.95	1.2 × 0.5	1.0
Typical gastrostyle H:W	3.6	3.5	6.3	5.7	2.5–5.1	6.0
Other characters	Cyclosystems closely spaced	Coenosteal protuberances; worm symbiont common				Gastrostyle tip extends beyond gastropore shelf

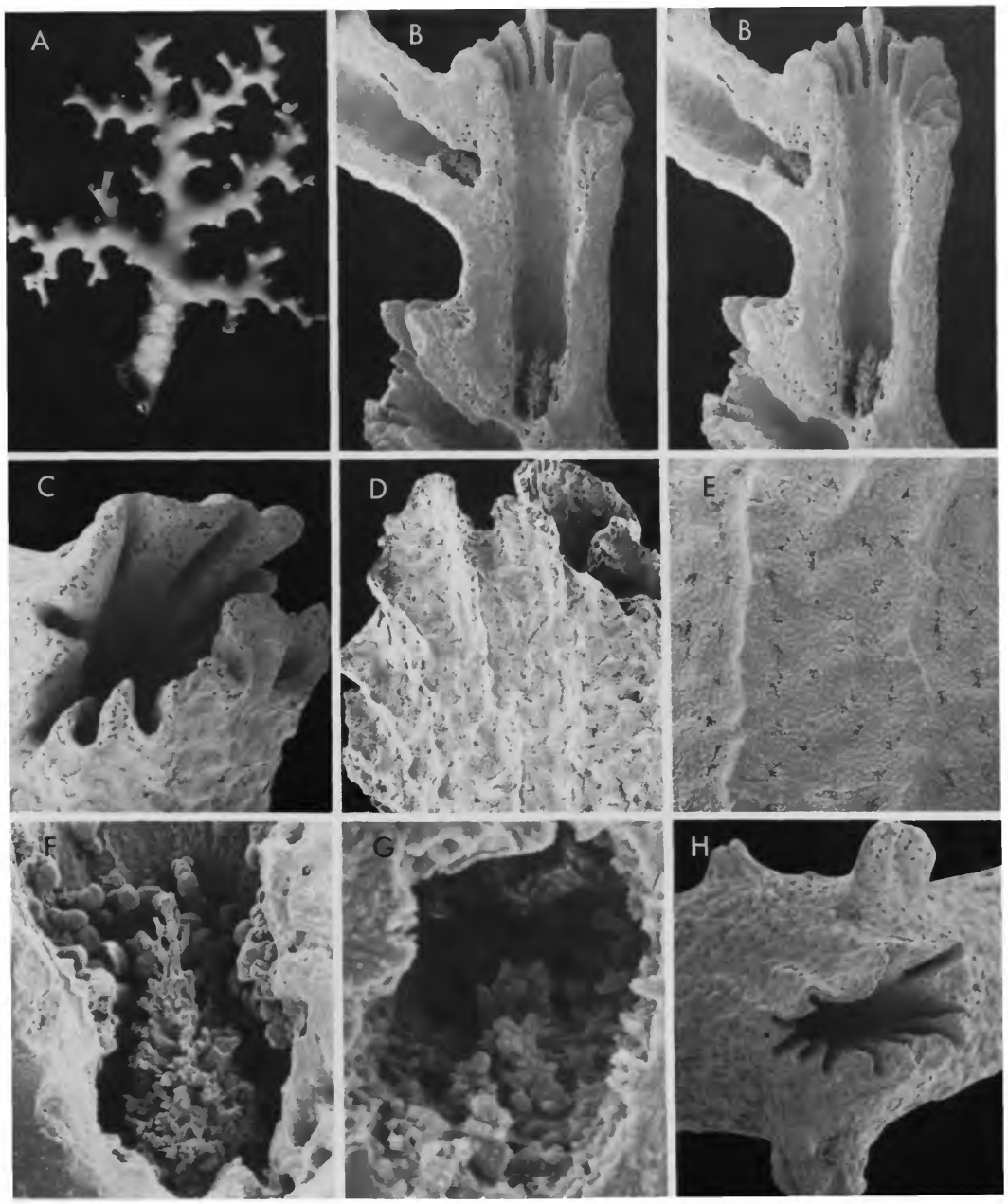
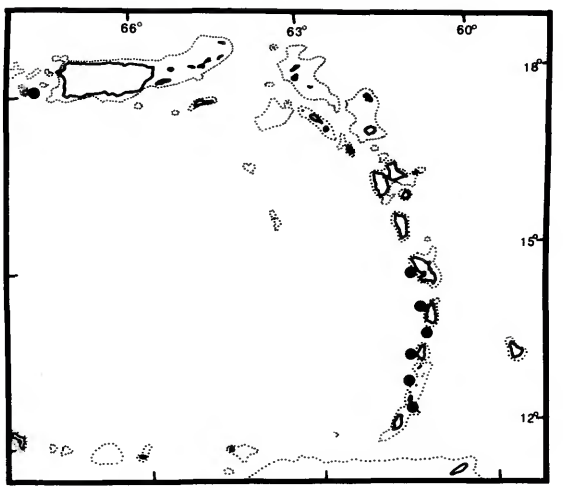


FIGURE 29.—*Stylaster antillarum* (A, holotype; B–E, G–H, paratype from *BL*-216; F, paratype from *BL*-219): A, holotype colony, × 1.4; B, longitudinal section of cyclosystem and gastropore tube, × 20, stereo pair; C, cyclosystem, × 41; D–E, coenosteal texture, × 39, × 90, respectively; F, gastrostyle, × 93; G, dactylostyle, × 570; H, cyclosystem flanked by irregularly shaped ampullae, × 25.

a unifacial arrangement was apomorphic. Within Group C there is a transition from an exclusively lateral alternating arrangement (sympodial) to an almost exclusively unifacial arrangement of cyclosystems. The first five species discussed have cyclosystems arranged in an exclusively lateral arrangement; *S. filogranus* has predominantly lateral cyclosystems with some anterolateral; *S. spatula* has predominantly anterolateral cyclosystems with some lateral; *S. inornatus* has anterolateral cyclosystems; *S. laevigatus* and *S. aurantiacus* have primarily anterolateral cyclosystems with some anterior; and *S. complanatus* has predominantly anterior (unifacial) cyclosystems with only a slight alternation. *S. complanatus* is similar to *Calyptopora* and *Stenohelia* in this regard.



MAP 15.—Distribution of *Stylaster antillarum*.

25. *Stylaster antillarum* Zibrowius and Cairns, 1982

FIGURE 29A–H

Stylaster antillarum Zibrowius and Cairns, 1982:213–219, figs. 1–4.—Cairns, 1983b:430.

DESCRIPTION.—Colonies uniplanar, up to 4 cm tall and equally broad; basal branch diameter up to 7.5 mm. Coenosteum white and longitudinally carinate, one carina corresponding to each dactylopore. Carinae 32–37 μm wide and up to 64 μm tall. Coenosteum between carinae covered by small irregularly shaped deposits 3–6 × 2–3 μm in size, not rounded granules. Coenosteal slits 20–80 μm long and 8–9 μm wide.

Cyclosystems sympodially arranged exclusively on branch edges. Cyclosystems flattened to elliptical in cross section, diameters up to 1.6 × 1.0 mm, the greater axis aligned with the branch axis. Based on 200 cyclosystems there is a range of 10–18 dactylopores per cyclosystem; average is 14.35, with a mode of 14.

Gastropore tube cylindrical and extremely deep, up to 3 mm long and 0.40–0.43 mm in diameter. Style relegated to basal ⅕ of tube, its tip rarely visible in an undamaged cyclosystem. Highly developed ring palisade present near gastrostyle tip, composed of clavate elements about 50 μm tall and 35–40 μm in diameter. These elements sometimes fuse, together forming a considerable constriction of the gastropore tube. Illustrated gastrostyle 0.55 mm tall and 0.20 mm in diameter; H:W ratios vary from 2.67–2.90. Styles not ridged but bear numerous sharp spines up to 36 μm tall and 8 μm in diameter. Dactylopore slits about 80 μm wide. Although there are no diastemas, those pseudosepta adjacent to anterior and posterior branch faces very broad and prominent, up to 5–7 times width of pseudosepta adjacent to lateral branch edges. Dactylostyle rudimentary, composed of irregular cylindrical elements about 15 μm tall and 5 μm in diameter.

Ampullae variable in shape: some hemispherical (female ?) and 0.60–0.85 mm in diameter, the larger ones having efferent tubes; others (male?) 0.57–0.61 mm in diameter and covered by irregular knobs and crests.

Gastrozooid tentacular nematocysts 5 × 2 μm.

DISCUSSION.—*Stylaster antillarum* is distinguished from the other western Atlantic species by its extremely deep gastropore tube and its very broad lateral pseudosepta.

The specimens from Puerto Rico (J-S 43) do not have coenosteal carinae, instead, the coenosteal strips are arranged in a reticulate manner, and the coenosteum is smooth.

MATERIAL EXAMINED.—*ALB*-2753, USNM 52206; J-S 43, USNM 72257. Types.

TYPES.—The holotype and most of the paratypes are deposited at the MCZ. Two paratypes are at the USNM (60349 and 60350 from *BL*-219 and *BL*-216, respectively).

TYPE-LOCALITY.—12°28′22″N, 61°32′18″W (off Cariacou, Grenadines), 298 m.

DISTRIBUTION.—Antilles from Mona Island, Puerto Rico, to the Grenadines (Map 15; pattern 2b); 174–653 m.

26. *Stylaster duchassaingi* Pourtalès, 1867

FIGURES 30A–K, 31A–B

Stylaster elegans Duchassaing and Michelotti, 1864:68–69, pl. 9: fig. 4.

Stylaster duchassaingi Pourtalès, 1867:115 [new name for *S. elegans*, Duchassaing and Michelotti, 1864, which was preoccupied by *Stylaster elegans* Verrill, earlier in 1864]; 1871:35 [in part: white specimens], pl. 6: figs. 1–2.—?Moseley, 1881:81, 87.—Boschma, 1951a:451; 1953a:360–361; 1956a:148; 1957:5–6 [uncritical synonymy]; 1962b:291—Zibrowius and Cairns, 1982:210, 211.—Cairns, 1983b:430. [Not *S. duchassaingi*.—Laborel, 1971:224 (= *S. roseus*).—Boschma, 1953b:166, 169.]

Stylaster eximius Kent, 1871:278 [nom. nov]. [Not *S. eximius*.—Hickson and England, 1905:9–11; 1909:345.—Ritchie, 1911:867–869 (= *S. incompletus*); Broch, 1936:18–23.]

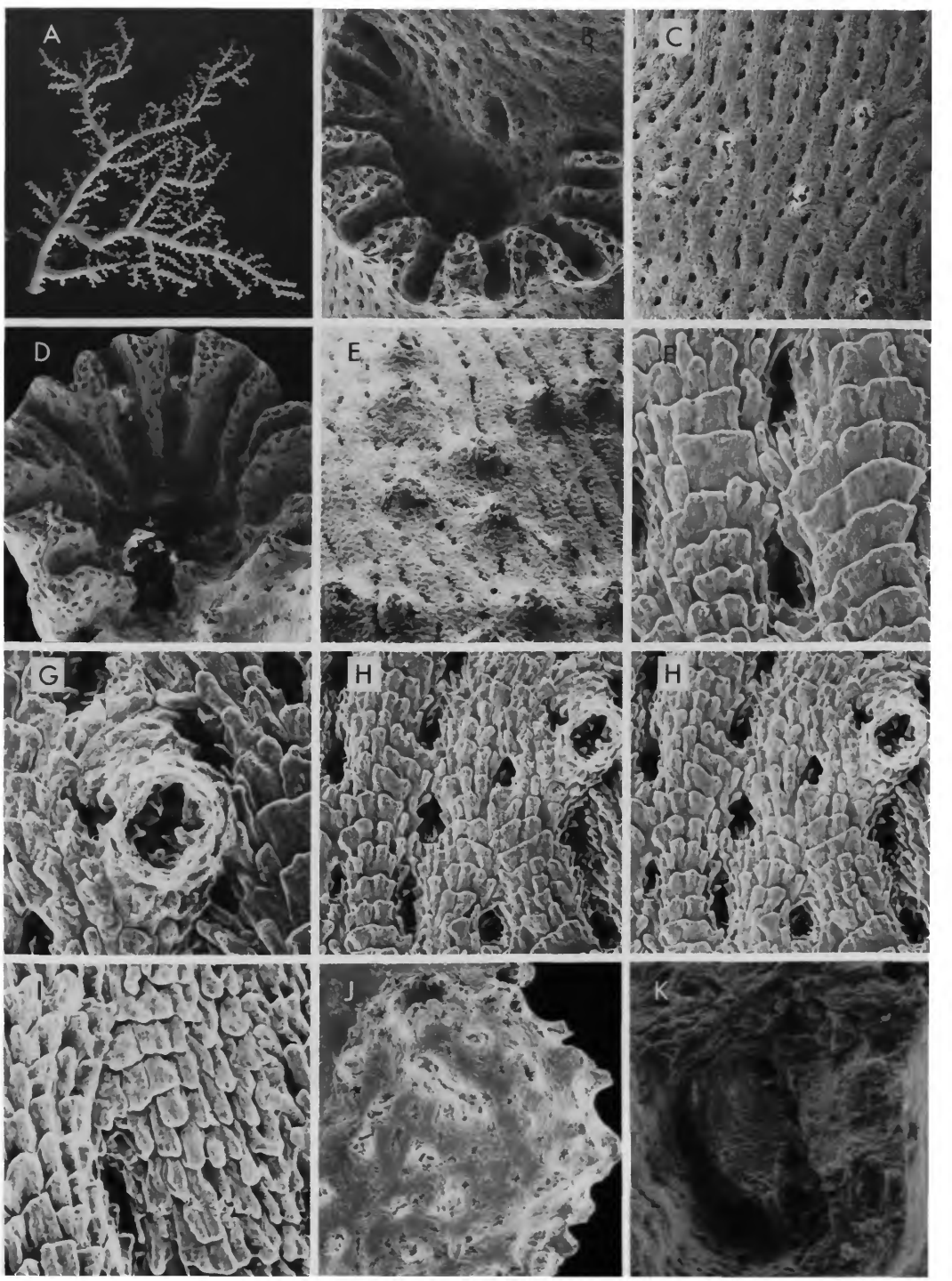
DESCRIPTION.—Colonies uniplanar and delicate, up to 16 cm tall and 18 cm broad, with a basal branch diameter up to 12 mm. Branch anastomosis rare, occurring only in thick basal branches. Branching frequent and at right angles to parent branch, producing a lacy pattern. Branch tips slender, each tip supporting a terminal cyclosystem. Coenosteum white and linear-imbricate in texture. Coenosteal strips well defined, 55–70 μm wide, and bordered by long shallow grooves about 15 μm wide, which are periodically penetrated by deep elliptical pores. Platelets broad and highly ridged or divided into three or four sections across a strip. Apically perforate, conical to cylindrical papillae usually scattered over coenosteum, most common on larger-diameter branches and ampullae. Papillae up to 0.15 mm tall and 0.11 mm in diameter, often occurring at a density of 25–30/mm^2, producing a spiny texture. Some papillae have small teeth, about 8 μm long, projecting inward toward center of apical pore.

Cyclosystems closely spaced and exclusively sympodially arranged, i.e., restricted to the lateral branch edges, except at branching axils where they sometimes occur on anterior face. Cyclosystems on distal branches round to elliptical, usually without a diastema. As a branch increases in diameter, cyclosystems become irregular in shape and develop broad adcauline diastemas. Older cyclosystems have only a crescent of dactylopores proximal to gastropore, the upper dactylopores having become obsolete or dislocated to the lateral position. These older cyclosystems broader than high, bout 1 mm wide. Based on 50 cyclosystems, the range of dactylopores per cyclosystems is 7–16, the average is 11.58 (σ = 2.06), and the mode is 13.

Gastropore tubes cylindrical, about 0.25 mm in diameter. Gastropore sometimes encircled by a narrow shelf within the ring of dactylopores. Ring palisade present in gastropore tube at level of gastrostyle tip, composed of irregularly shaped elements up to 50 μm long. Illustrated gastrostyle 0.37 mm tall and 0.074 mm in diameter (H:W = 5). Styles ornamented with linearly arranged spines up to 30 μm long, some elevated on low ridges. Spines multitipped and often bifurcate (Figure 31A). Dactylopore slits about 65 μm wide; pseudosepta variable in width. In older cyclosystems, dactylopores sometimes alternate in height and proximity to gastropore. Dactylostyle rudimentary, composed of a single row of widely spaced blunt cylinders up to 25 μm tall and 6 μm in diameter.

Ampullae hemispherical, about 0.6 mm in diameter, and restricted to posterior face. Some

FIGURE 30.—*Stylaster duchassaingi* (A, neotype; B–C, F–I, *ALB*-2354; D, J, K, *G*-493; E, *ALB*-2319): A, neotype colony, × 0.70; B, cyclosystem, × 58; C, E, G, H, coenosteum bearing papillae, × 52, × 81, × 410, × 210, respectively (H is a stereo pair); D, cyclosystem with inner shelf, × 68; F, I, coenosteal texture, × 350, × 400, respectively; J, ampulla covered with papillae, × 76; K, dactylostyle, × 415.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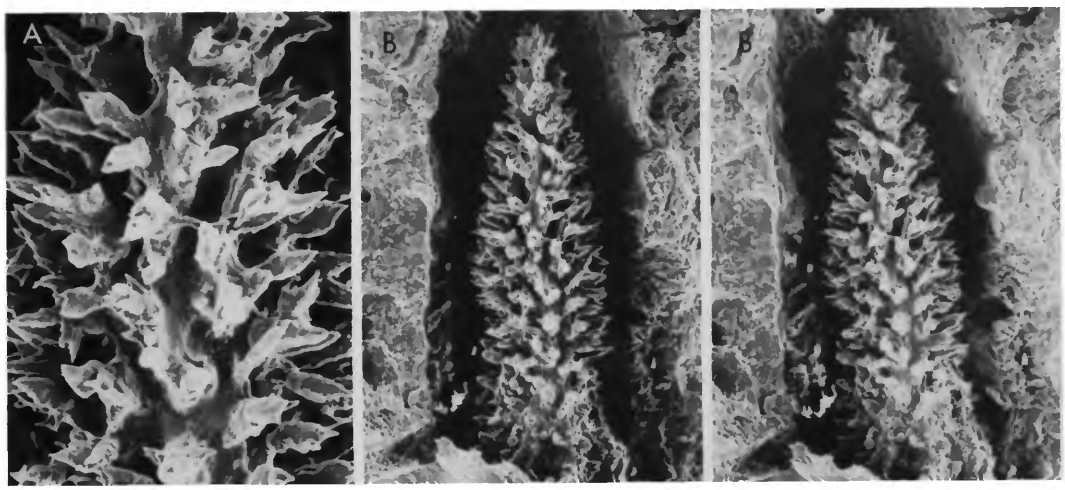


FIGURE 31.—*Stylaster duchassaingi*: A–B, gastrostyle of specimen from *ALB*-2319, × 490, × 175, respectively (B is a stereo pair).

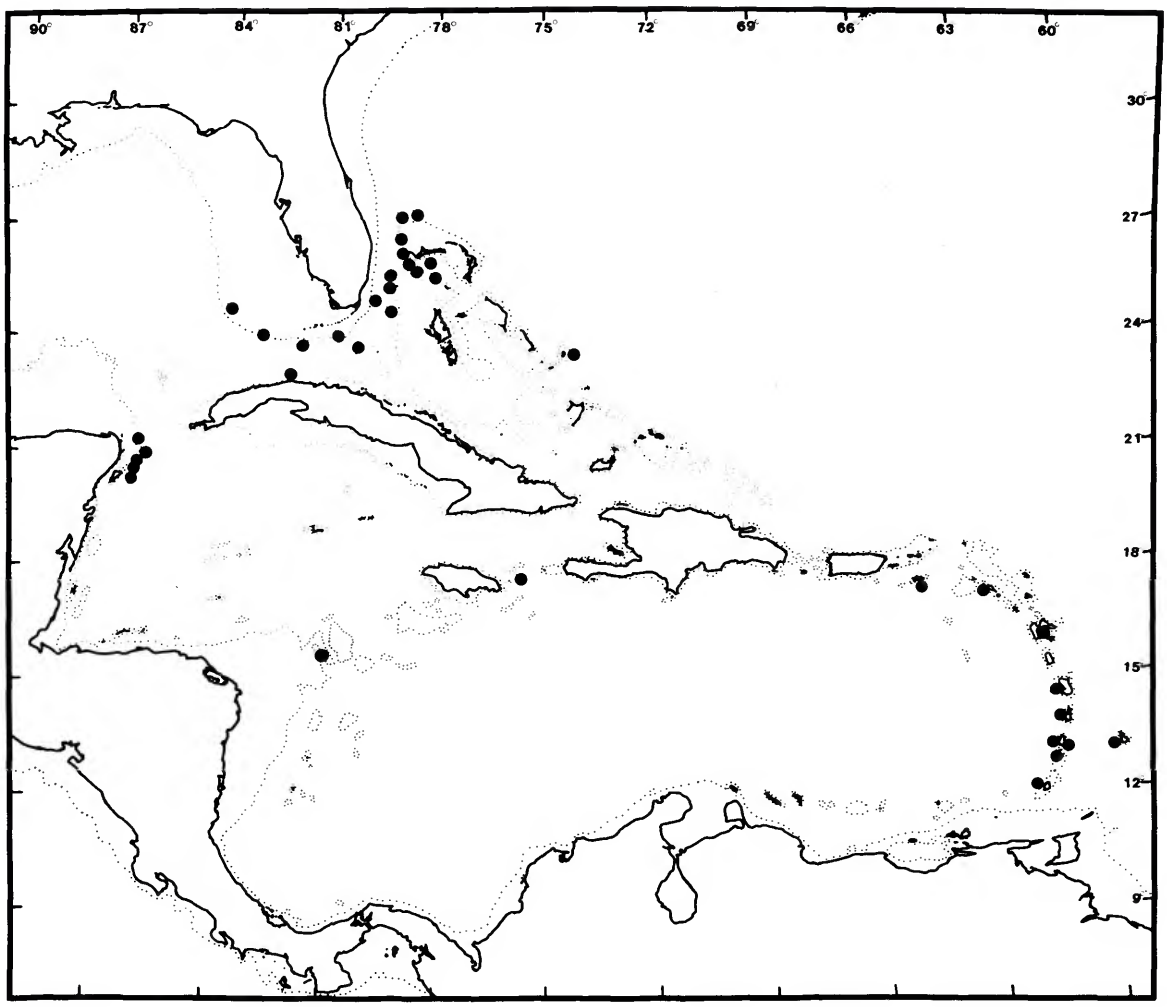
large ampullae (female?) have small efferent pores about 0.1 mm in diameter, but no efferent tubes.

In histological section papillae appear as pits about 45 μm in diameter and 80–100 μm deep, containing nematocysts 5 × 2 μm. Nematocysts were not found in the gastrozooids, dactylozooids, or coenosarc.

DISCUSSION.—Despite its relatively long synonymy, *S. duchassaingi* was previously known from remarkably few records. Discounting Moseley's (1881) record from Brazil and the types of Duchassaing and Michelotti (1864)—the latter presumed to be lost—it was known from only one specimen reported by Pourtalès (1871). Fifty-eight new records are reported here, making it the second most commonly collected stylasterid coral in the study material.

Boschma (1957), Zibrowius and Cairns (1982), and Cairns (1983b) all implied that *S. eximius forma atlantica* Broch, 1936, was a junior synonym of *S. duchassaingi*, but examination of Broch's type shows it to be quite different (discussed under *S. atlanticus*).

MATERIAL EXAMINED.—*Bibb* station off Tortugas, 43 fms, USNM 16068 and MCZ; *BL*-199, MCZ; *BL*-231, MCZ; *BL*-238, MCZ; *BL*-247, MCZ; *BL* station off Havana, 175 fms, MCZ; *BL*-XXX, MCZ; *ALB*-2138, USNM 7106; *ALB*-2159, USNM 16012; *ALB*-2160, USNM 7186; *ALB*-2164, USNM 10192; *ALB*-2167, USNM 16011; *ALB*-2319, USNM 10213; *ALB*-2322, USNM 72258; *ALB*-2323, USNM 52209; *ALB*-2326, USNM 10142; *ALB*-2333, USNM 52204 and 52205; *ALB*-2334, USNM 16013; *ALB*-2338, USNM 72259; *ALB*-2354, USNM 10747 and 52208; *O*-1025, USNM 72260; *O*-1348, USNM 72261; *O*-4932, USNM 72262; *O*-4938, USNM 72263; *Silver Bay*-3468, USNM 72264; B-A 47, USNM 72265; *G*-135, USNM 72266; *G*-251, USNM 72267; *G*-270, UMML and USNM 72268; *G*-276, USNM 72269; *G*-382, UMML; *G*-393, USNM 72271; *G*-522, USNM 72273; *G*-636, UMML; *G*-691, USNM 72274; *G*-703, USNM 72275; *G*-713, UMML; *G*-798, USNM 72276; *G*-882, USNM 72277; *G*-889, USNM 72278; *G*-956, USNM 72279; *G*-984, USNM 72280; *G*-1276, UMML; *G*-1329, USNM 72281; *P*-592, UMML; *P*-875, USNM 72282; *Eastward*-26538, USNM 72283; *Eastward*-26542, USNM 72284; *Eastward*-26549, USNM 72285; *Eastward*-31281, USNM 72286; *JSL*-1273, USNM 72287; *JSL*-1354, USNM 72288 and MCZ; *JSL*-1355, USNM 72289; *JSL*-1357,



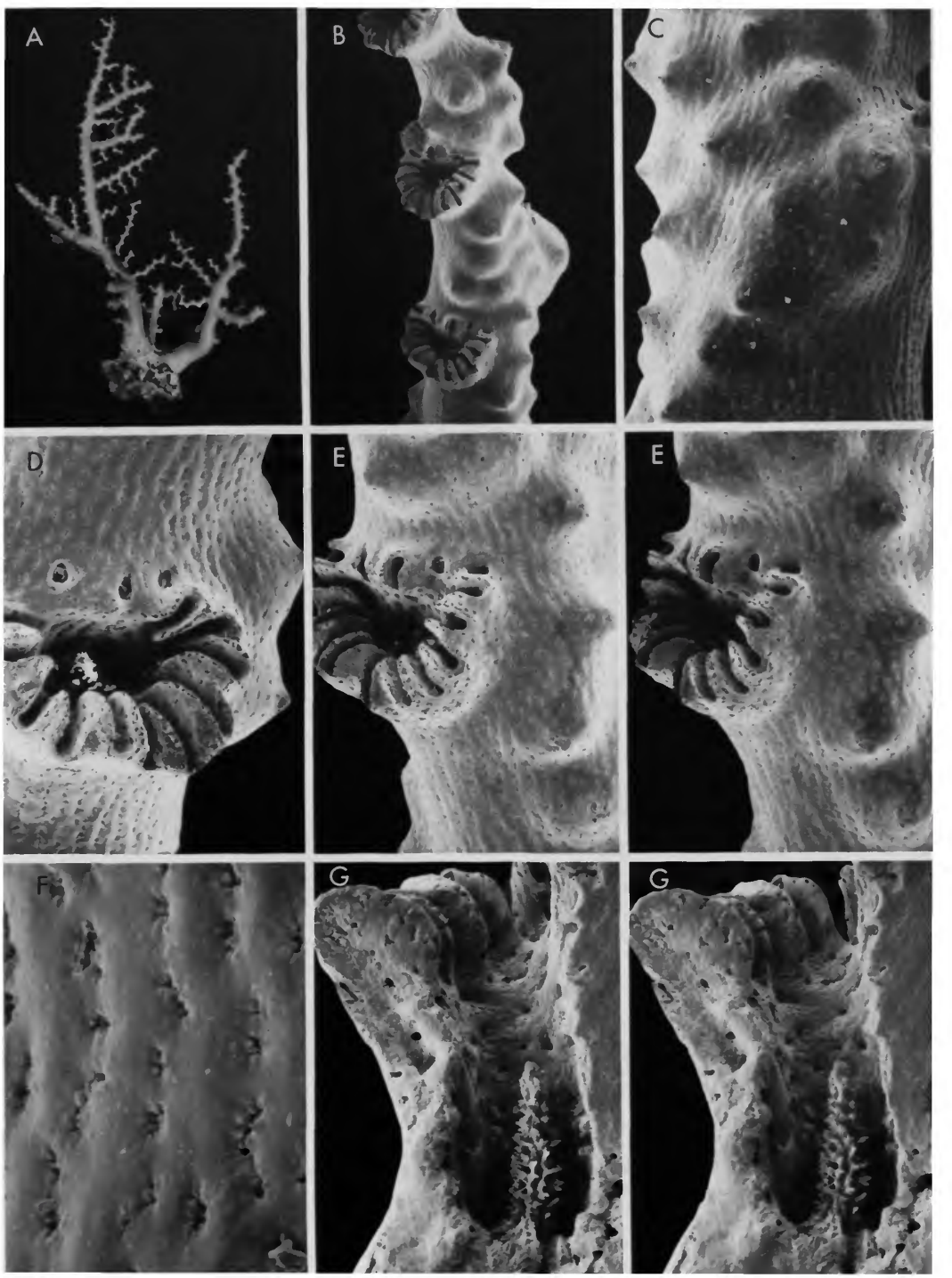
MAP 16.—Distribution of *Stylaster duchassaingi*.

USNM 72290; *JSL*-1360, USNM 72291 and Harbor Branch IRCZM 10:00012; 17°39.9′N, 64°39.1′W, 549–1280 m, USNM 72293; off Bimini, 91 m, USNM 52431; off St. Lucia, 165 m, USNM 72295. Neotype.

TYPES.—The two syntypes of *S. elegans* Duchassaing and Michelotti, 1864, are not listed in the type catalog of the Museo e Istituto di Zoologia Sistematica, University of Torino, and are presumed to be lost. The new names proposed by Pourtalès (1867) and Kent (1871) are nomenclatural conventions, not based on additional specimens. Because there has been substantial confusion in the past regarding this species and because there are several species similar to *S. duchassaingi*, I choose to designate a neotype from *G*-493 (USNM 71823).

TYPE-LOCALITY.—26°32′N, 78°55′W (Northwest Providence Channel), 183–549 m.

DISTRIBUTION.—Bahamas; Antilles from Cuba to Barbados; Pourtalès Terrace; Arrowsmith Bank; off Rosalind Bank. Moseley's (1881) record from off Pt. Calvo, Brazil (732 m), although not examined, is strongly queried. (Map 16; pat-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tern 1); 42–692 m, but most often collected between 200–400 m.

27. *Stylaster atlanticus* Broch, 1936, new status

FIGURE 32A–G

Stylaster eximius forma *atlantica* Broch, 1936:20–22, fig. 2, pl. 1: fig. 2.

DESCRIPTION.—Holotype uniplanar, 6.9 cm tall, 4.4 cm broad, with a basal branch diameter of 6.5 mm. Coenosteum light orange; some branch tips white. Texture linear-imbricate but platelets usually worn, resulting in a smooth surface; platelet structure not often discernible. Coenosteal strips about 50 μm wide, bordered by short, thin slits about 5 μm wide.

Cyclosystems sympodially arranged on lateral branch surfaces. Cyclosystems round to slightly elliptical, 0.85–0.95 mm in diameter, and usually slightly flared on distal branches. The 9 or 10 abcauline and lateral pseudosepta of a cyclosystem often form an exsert crescent beneath a gastropore; the remaining 3 or 4 adcauline dactylopores usually flush with coenosteum, and lack dactylotomes (Figure 32D). Based on a sample of 100 cyclosystems, Broch (1936) found a range of 8–17 dactylopores per cyclosystem; the average was 15.15, with a mode of 13.

Gastropore tube cylindrical, about 0.20 mm in diameter and 0.60 mm deep. Ring palisade present, encircling gastrostyle at about ½–⅔ of its height. Illustrated gastrostyle 0.35 mm tall and 80 μm in diameter (H:W = 4.4). Style vertically ridged, the ridges bearing simple spines up to 25 μm long. Dactylopore slits about 43 μm wide; pseudosepta variable in width. Dactylostyle rudimentary, composed of a row of widely spaced cylindrical elements about 30 μm tall and 7 μm in diameter.

Male ampullae hemispherical, abut 0.42 mm in diameter, bearing an apical papilla up to 25 μm tall. The papilla is often penetrated by the efferent pore, which is about 17 μm in diameter. As an ampullae-bearing branch increases in diameter the ampullae are engulfed in the coenosteum until only the apical papillae are visible. Ampullae usually clustered on one face. Female ampullae unknown.

DISCUSSION.—Boschma (1957) and Zibrowius and Cairns (1982) suggested that *S. atlanticus* was a junior synonym of *S. duchassaingi*. Although there are many points of similarity, such as coenosteal texture, average number of dactylopores per cyclosystem, and gastrostyle size and shape, *S. atlanticus* can be distinguished by its orange coenosteum, lack of coenosteal papillae, and a slightly different arrangement of dactylopores in the cyclosystem.

MATERIAL EXAMINED.—Types.

TYPES.—The illustrated colony and 17 branch fragments (syntypes) are deposited at the ZMC. One syntype branch fragment is at NMNH (USNM 71824).

TYPE-LOCALITY.—18°25′N, 65°21′W (off Culebra), 823 m.

DISTRIBUTION.—Known only from the type-locality (Map 17; pattern 2b); 823 m.

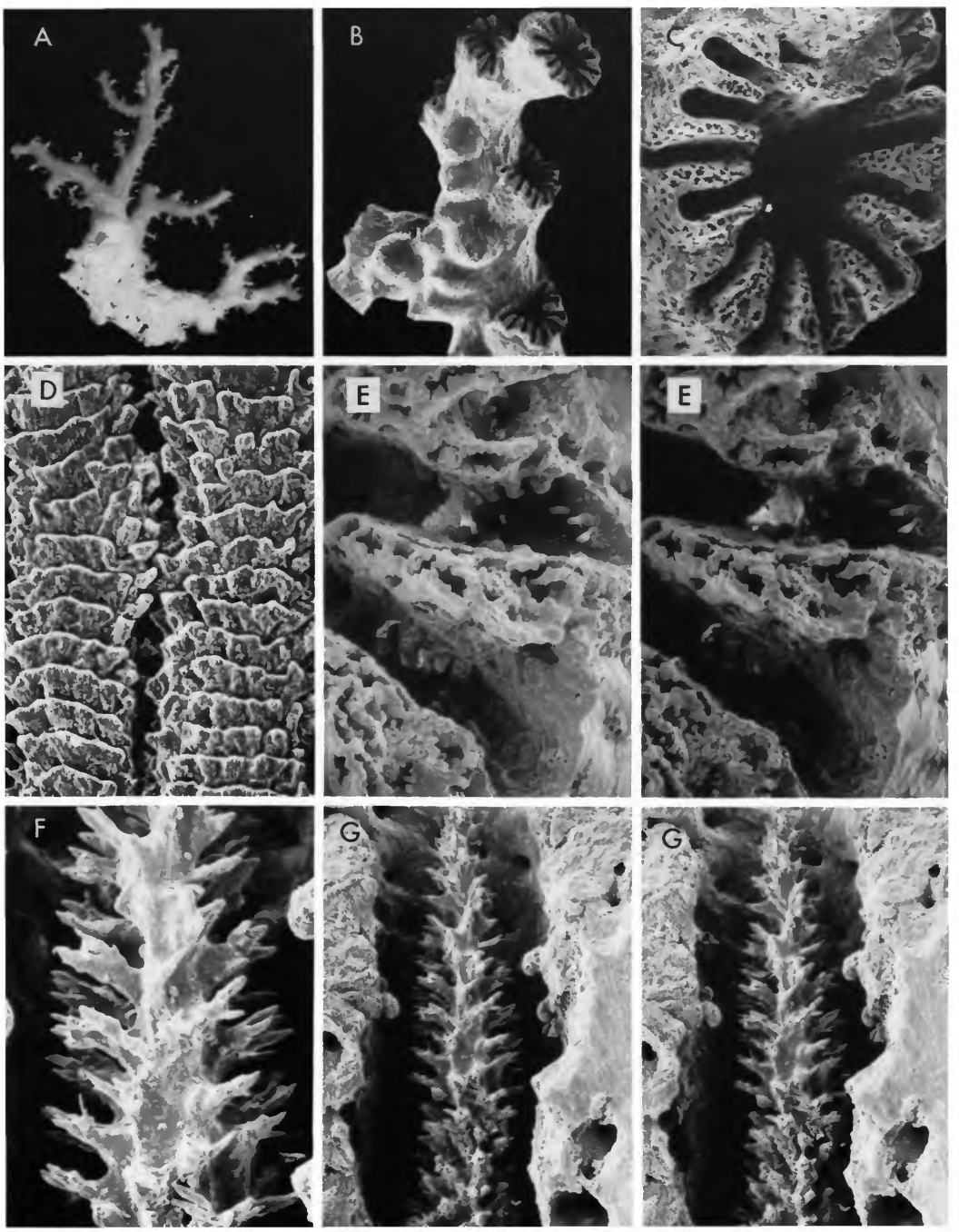
28. *Stylaster corallium*, new species

FIGURE 33A–G

DESCRIPTION.—Corallum uniplanar, up to 10 cm tall and 7 cm broad, with a basal branch diameter up to 6 mm. Branching sparse. Coenosteum light pink to rose pink, often with white branch tips. Coenosteal texture linear-imbricate but platelets usually worn or covered by additional coenosteum, producing a smooth surface. Strips 50–75 μm wide, well defined by elongate slits about 25 μm wide. Platelets, when distinguishable, broad and ridged. Coenosteum dense. Small papillae sometimes present in great density on basal branches.

Cyclosystems exclusively sympodially arranged, round to slightly elliptical, and 0.40–

FIGURE 32.—*Stylaster atlanticus* (A, holotype; B–G, fragments of holotype): A, holotype colony, × 0.83; B–E, cyclosystems and male ampullae, × 16, × 34, × 46, × 39, respectively (E is a stereo pair); F, coenosteal texture, × 230; G, longitudinal section of a cyclosystem revealing gastrostyle, × 76, stereo pair.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0.75 mm in diameter. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 5–15; the average is 11.20 (σ = 2.27), with a mode of 12. Cyclosystems on larger-diameter branches have a lower range of cyclosystem diameters and fewer dactylopores per cyclosystem. Short diastemas sometimes present on adcauline side of terminal-branch cyclosystems.

Gastropore tube cylindrical, about 0.20 mm in diameter. Ring palisade present. Illustrated gastrostyle 0.46 mm tall and 0.049 mm in diameter (H:W = 9.4). Style not ridged. Spines on style often multitipped, up to 33 μm long. Dactylopore slits about 37 μm wide. Dactylostyle composed of a single row of tall cylindrical elements up to 50 μm tall and 8 μm in diameter. Some specimens also have lateral dactylostyles composed of elements about half as tall as twice as broad (Figure 33E).

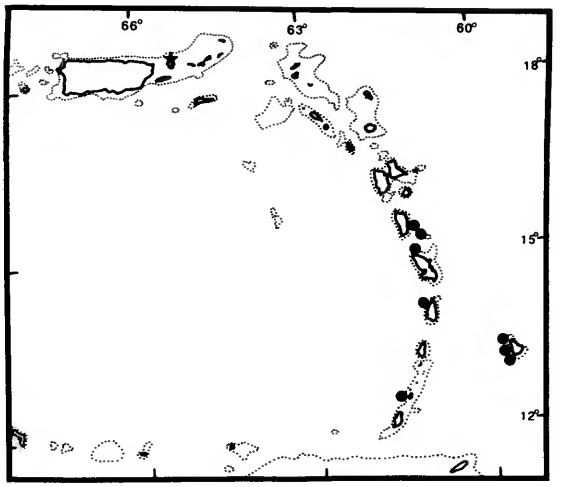
Female ampullae hemispherical, 0.5–0.6 mm in diameter; each mature ampulla with an efferent tube and pore, each about 0.10 mm in diameter. Female ampullae usually smooth but may be papillose. Male ampullae mammiform, about 0.35 mm in diameter, with 1–3 apical or subapical pores. As a male ampullae-bearing branch increases in diameter, the ampullae become much less conspicuous.

Elongate nematocysts 8.5–9.0 × 2.5 μm common in dactylozooids and gastrozooid tentacles.

DISCUSSION.—*Stylaster corallium* is most similar to *S. atlanticus* but can be distinguished by its smaller cyclosystems, differently colored coenosteum, shallower depth range, and slightly lower average number of dactylopores per cyclosystem, although the last character is not significantly different.

ETYMOLOGY.—The specific name *corallium* (Latin for "coral") is a reference to its similarity of coenosteal color and density to species of the octocorallian genus *Corallium*.

FIGURE 33.—*Stylaster corallium* (A, holotype; B, *O*-5933; C–G, *O*-5949): A, holotype colony, × 0.69; B, branch tip, × 16; C, cyclosystem, × 70; D, coenosteal texture, × 435; E, dactylostyle, × 200, stereo pair; F–G, gastrostyle, × 330, × 145, respectively (G is a stereo pair).



MAP 17.—Distribution of *Stylaster atlanticus* (star) and *S. corallium* (circles).

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* *P*-924 (female) USNM 71827.

Paratypes: *P*-924 (6 branches) USNM 71828, (2 branches) UMML; *BL*-241 (1 colony) MCZ; *BL*-278 (1 colony) MCZ; *BL*-285 (1 colony) MCZ; *BL*-286 (1 colony) MCZ; *BL*-290 (1 colony) MCZ, (1 branch) USNM 71836; B-A 64 (4 colonies) USNM 71829; B-A 70 (1 colony, 3 branches) USNM 71830; *O*-5000 (1 colony) USNM 71831; *O*-5933 (2 colonies, 9 branches) USNM 71832; *O*-5949 (2 colonies, 3 branches) USNM 71833; *O*-24273 (3 colonies, 2 branches, 4 HS) USNM 71834; *P*-926 (1 colony, 10 branches) USNM 71835.

TYPE-LOCALITY.—15°13′N, 61°00′W (Dominica Channel), 68 m.

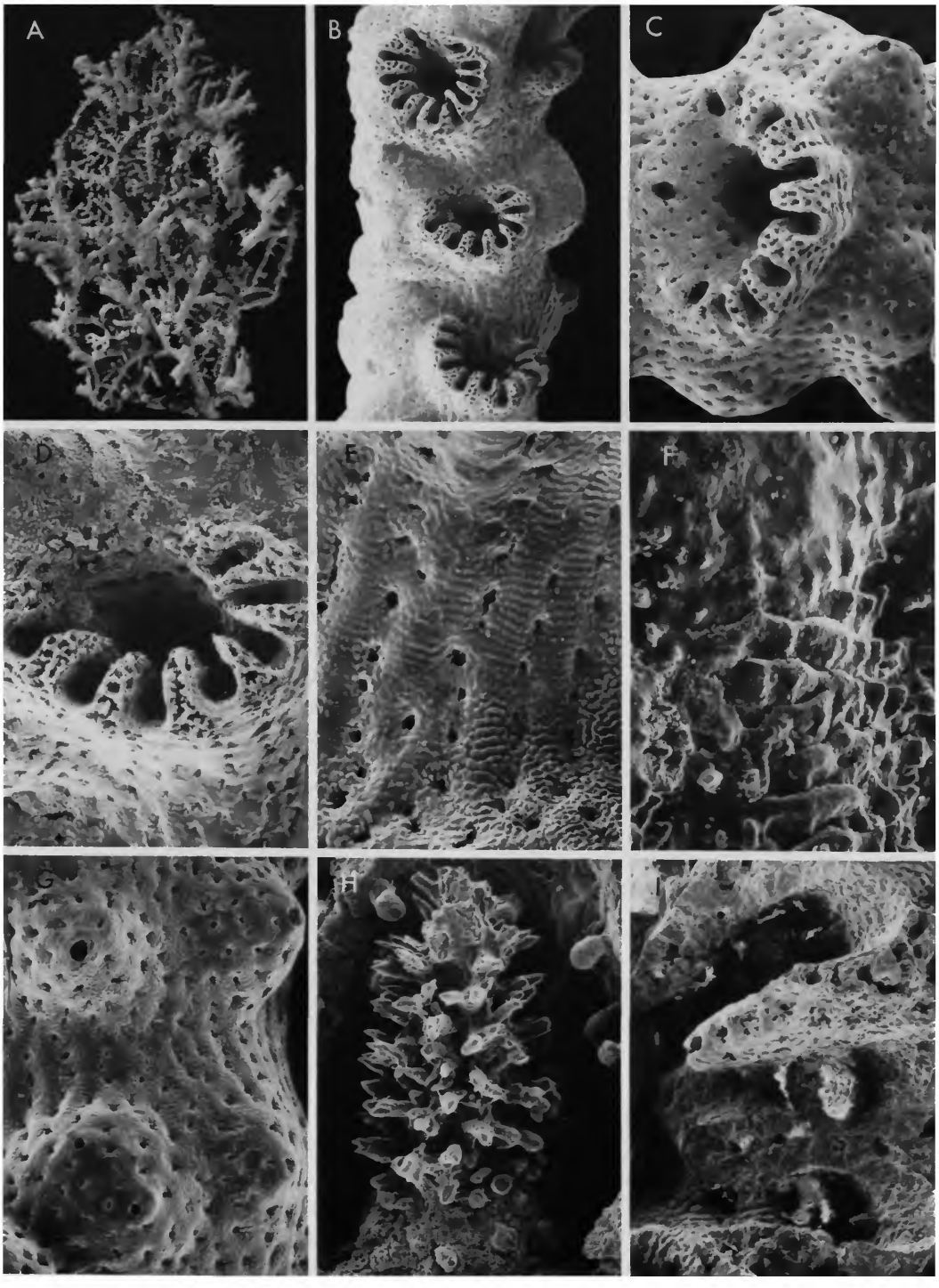
DISTRIBUTION.—Lesser Antilles from Dominica to the Grenadines (Map 17; pattern 2b); 13–298 m.

29. *Stylaster filogranus* Pourtalès, 1871

FIGURE 34A–I

Stylaster roseus.—Verrill, 1864:45.

Stylaster filogranus Pourtalès, 1871:35, pl. 5: figs. 13–14; ?1878:210.—Moseley, 1881:87.—Agassiz, 1888:139–140, fig. 446.—?Nutting, 1895:84.—Boschma, 1957:8–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9; ?1964e:109.—Zibrowius and Cairns, 1982:210.—Cairns, 1983b:430.

Stylaster sanguineus.—Pourtalès, 1871:83 [in part: three specimens from Florida Straits]; 1880a: pl. 3: figs. 18–24.—Moseley, 1881:86 [in part: specimens from off Florida].—Boschma, 1965:233.

Not *Stylaster filogranus*.—England, 1926:267–273.—Broch, 1936:44–47 [= *S. inornatus*, *S. duchassaingi*, *Stylaster* sp. (specimen from Demerara), and *Errina* sp.]; 1942:77–78.—Boschma, 1953b:166, 169.

Stylaster (*Eu-Stylaster*) *echinatus* Broch, 1936:39–40, fig. 10.—Boschma, 1957:7.—Zibrowius and Cairns, 1982:210.—Cairns, 1983b:430.

Not *Stylaster* (*Eu-Stylaster*) sp. aff. *echinatus*.—Broch. 1936:41–42, pl. 6: fig. 17.

DESCRIPTION.—Colonies large and primarily uniplanar, up to 16 cm tall and 12 cm wide, with a basal branch diameter up to 11 mm. Short branchlets often diverge perpendicular to flabellar plane, particularly from large diameter basal branches. Branch anastomosis common, sometimes forming a strongly reinforced basal reticulum. Coenosteum usually light pink with white branch tips but some colonies entirely white. Coenosteal texture linear-imbricate with well-defined parallel strips 60–80 μm wide bordered by round to elliptical pores about 15 μm wide. Platelets broad and ridged but often entirely or partially obscured by a covering of smooth stereome. No papillae.

Cyclosystems sympodially arranged on lateral or anterolateral branch surfaces, the latter arrangement found only on larger-diameter branches. On branch edges cyclosystems are very closely spaced, invariably less than one cyclosystem diameter apart. Cyclosystems round to elliptical, diameters ranging from 0.8–1.0 mm, the greater axis transverse to branch axis. Based on 50 cyclosystems, there is a range of 7–13 dactylopores per cyclosystem, with an average of 10.04 (σ = 2.13), and a mode of 10. Diastemas sometimes but not always present.

Gastropore tube slightly constricted by a ring palisade of clavate elements about 31 μm tall and 20 μm in diameter. Illustrated gastrostyle 0.29 mm tall and 0.08 mm in diameter (H:W = 3.6), covered by long, slender, pointed spines up to 38 μm long. Pseudosepta on proximal side of cyclosystems exsert, forming a rim beneath each gastropore. Dactylopore slits 70–80 μm wide. Dactylostyles rudimentary, composed of a row of straight to slightly staggered cyclindrical elements about 33 μm tall and 11 μm in diameter. In addition, lateral dactylostyles also present (Figure 34I) composed of elements of same height but twice the diameter, similar in size and shape to the elements of the ring palisade.

Female ampullae hemispherical to slightly elliptical, 0.55–0.65 mm in diameter, often with an efferent tube terminating in a pore about 0.16 mm in diameter. Male ampullae also superficial, 0.40–0.45 mm in diameter, usually with one or two apical pores 25–52 μm in diameter. Ampullae often occur in great numbers on branches, resembling clusters of grapes.

Nematocysts measuring 7 × 5 μm found throughout coenosarc.

DISCUSSION.—*Stylaster filogranus* is distinguished from the other western Atlantic species by the combination of its pink coenosteum, very closely spaced cyclosystems, and its lateral dactylostyles (Table 2). Furthermore, it appears to be restricted to the Pourtalès Terrace.

Stylaster echinatus Broch, 1936, known only from the holotypic branch fragment 12.8 mm long, is extremely similar to a branchlet of *S. filogranus*, differing only by having tall, flattened coenosteal lobes up to 0.4 mm tall. These lobes are similar to but taller than those of *S. spatula*, and often bifurcate. Otherwise, the branch shape, coenosteum, cyclosystem shape and arrangement, number of dactylopores per cyclosystem, gastropore and gastrostyle shape, and male ampullae of *S. echinatus* are the same as those of *S. filogranus* with white coenosteum. The type of *S. echinatus*, a species never subsequently

FIGURE 34.—*Stylaster filogranus* (A, *G*-134; B, D, F, I, fragment from syntype; C, E, G, *G*-135; H, *O*-1346): A, colony, × 0.50; B, lateral branch edge, × 23; C, cyclosystem and male ampullae, × 48; D, cyclosystem, × 68; E–F, coenosteal texture showing transition from imbricate to smooth aspect, × 120, × 675, respectively; G, male ampullae, × 62; H, gastrostyle, × 225; I, dactylostyles, × 140.

reported, is thus considered to be an aberrant specimen of *S. filogranus*.

Following his description of *S. echinatus*, Broch (1936), in the same paper, described another specimen collected off Nova Scotia at 732 m, which he called *S.* sp. aff. *echinatus*. This specimen differs from *S. filogranus* in having a very broad encrusting base, light orange coenosteum, and numerous very small coenosteal spines. Its identity is unknown, and I prefer to wait until more specimens are collected from this region before assigning it to a species.

Broch's (1936) record of *S. filogranus* from *ALB*-2354 (RM, Stockholm, #44) contains three species, none of them *S. filogranus*; however, his specimens from a telegraph cable off Demerara (Guyana) (ZMC) are very similar to typical *S. filogranus*. As with *S.* sp. aff. *echinatus*, I would like to examine more specimens from off South America before confidently identifying this specimen.

MATERIAL EXAMINED.—*O*-1346, USNM 72296; *O*-1348, USNM 72297; *O*-1349, USNM 72298; *G*-134, USNM 72299; *G*-135, USNM 72300 and UMML; *G*-480, USNM 72301; *G*-978, USNM 72302 and UMML; *Gilliss* (Geology)-44, UMML; off Sombrero Light, Florida, USNM 72303. Syntypes of *S. filogranus*; holotype of *S. echinatus*; specimens of *S.* sp. aff. *echinatus* (RM, Stockholm 41); Broch's (1936) specimens of *S. filogranus* from Cozumel and Demerara (RM, Stockholm and ZMC, respectively).

TYPES.—Pourtalès's (1871) illustrated specimen of *S. filogranus* is present at the MCZ (5512), along with several dozen branch fragments presumably from the same locality. Two syntype branches are also deposited in the USNM collections (71825) and one at the YPM. The holotype of *S. echinatus* is deposited at the ZMC.

TYPE-LOCALITY.—The type-locality for *S. filogranus* is west of Tortugas; depth unknown. The holotype of *S. echinatus* was collected in the Antilles, depth unknown.

DISTRIBUTION.—Known only from the western Straits of Florida (Map 18; pattern 3); 183–274 m. The specimen representing Pourtalès's (1878) record from off Havana was not found at the MCZ. Likewise, Nutting's (1895) Bahamian record has not been verified.

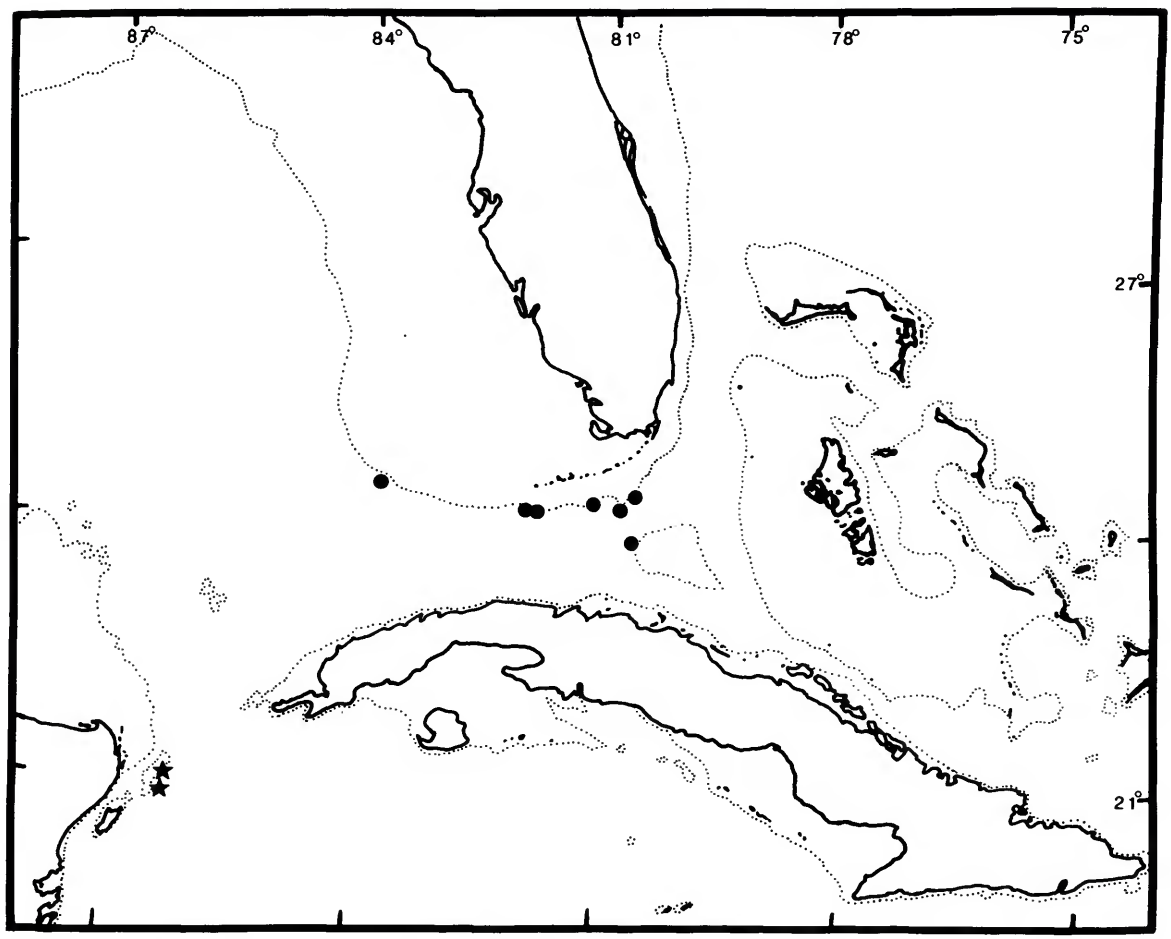
30. *Stylaster spatula*, new species

FIGURE 35A–I

DESCRIPTION.—Colonies uniplanar, up to 6 cm tall and 5 cm broad, with a basal branch diameter of about 10.5 × 8.5 mm. Coenosteum white, linear-imbricate in texture. Coenosteal strips 55–70 μm wide, bordered by discontinuous slits about 7 μm wide. Platelets broad and only slightly ridged, producing a glistening aspect. Coenosteum densely covered with conical papillae about 50 μm tall and 0.10 mm in basal diameter, each with a round apical pore about 30 μm in diameter. Coenosteum also bears numerous tall, flattened lobes, which project perpendicularly to branch surface. Lobes 0.10–0.60 mm wide, up to 0.30 mm tall, about 30 μm thick, and apically porous.

Cyclosystems sympodially arranged but variable in position, ranging from an exclusively lateral branch position to anterolateral or even anterior, all arrangements ocurring on the same colony. Cyclosystems round to irregular in shape, about 1 mm in diameter. Based on 40 cyclosystems, there is a range of 10–17 dactylopores per cyclosystem; the average is 12.70 ($\sigma = 1.60$), and the mode is 13.

Pseudosepta on outer edge of cyclosystem often quite exsert, forming a projecting abcauline lip beneath each cyclosystem. Broad diastemas common on cyclosystems away from branch tips. Within cyclosystems a horizontal shelf surrounds each gastropore, and sometimes there is a low ridge or several coarse granules on the inner edges of the shelf. Ring palisade also present lower in gastropore tube. Gastrostyle robust and cylindrical; illustrated style 0.33 mm tall and 95 μm in diameter (H:W = 3.5), bearing transversely aligned, thick, pointed spines up to 26 μm long. Dactylopore slits about 50 μm wide; pseudosepta variable in width. Dactylostyle rudimentary, composed of a single row of cylindri-



MAP 18.—Distribution of *Stylaster filogranus* (circles) and *S. inornatus* (stars).

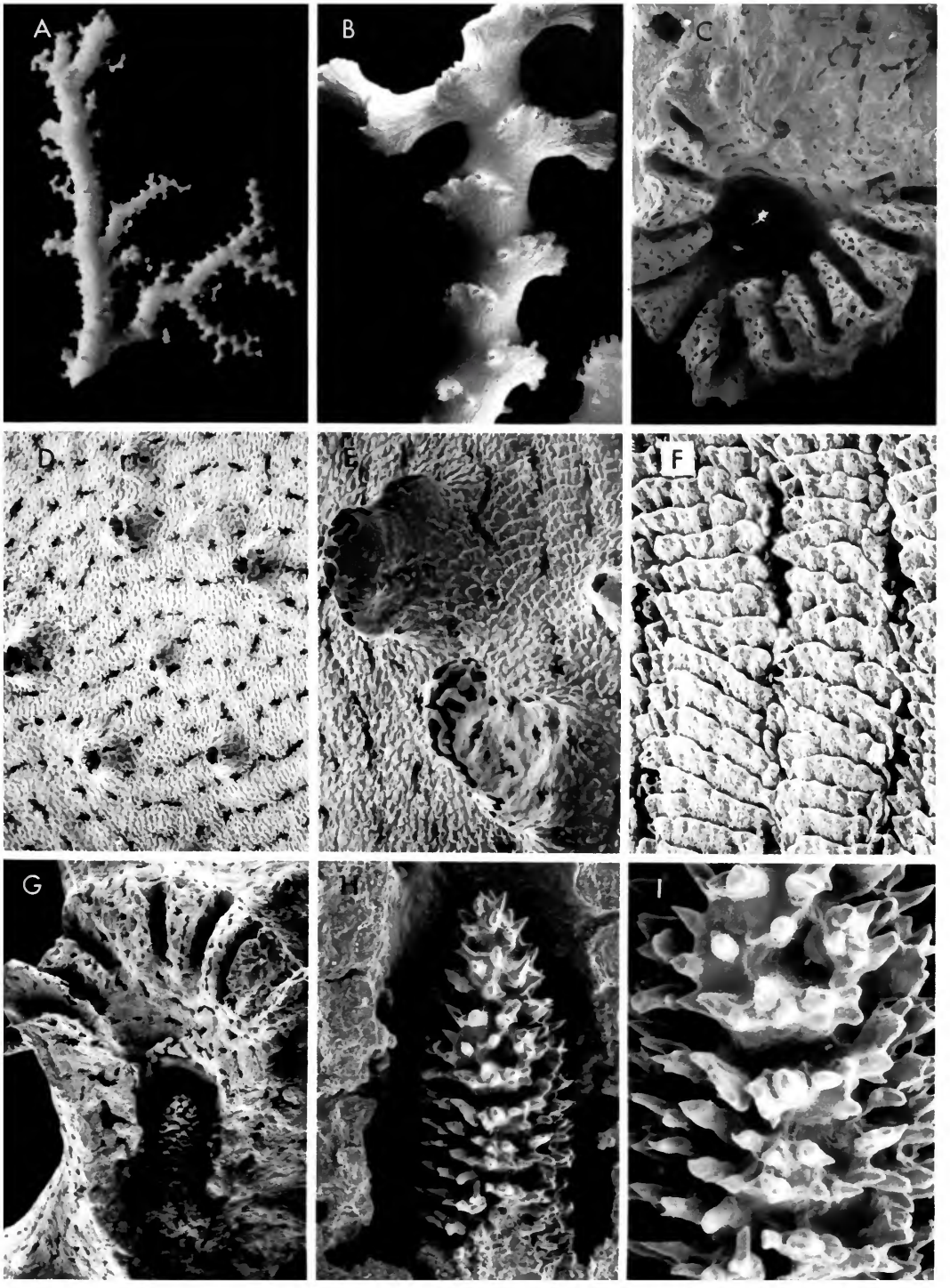
cal elements about 33 μm tall and 8 μm in diameter.

Female ampullae hemispherical, about 0.6 mm in diameter, with lateral efferent pores. Male ampullae small mounds about 0.45 mm in diameter. Numerous tall, slender, often tubular coenosteal lobes frequently project from the ampullae.

Nematocysts of gastrozooid tentacles and dactylozooids measure 6.0–6.5 × 2 μm. In a developing egg at the stage of gastulation there are numerous rod-shaped nematocysts 11 × 3 μm in the outer layer of cells, oriented perpendicularly to the surface. Nematocysts of this size also present in adult coenosarc.

DISCUSSION.—*Stylaster spatula* is most similar to *S. duchassaingi*, particularly with regard to its arrangement of dactylopores, coenosteal texture, and occurrence of conical papillae. It differs in having tall coenosteal lobes, abcauline cyclosystem lips, smooth platelets (which create a glistening texture), and a tendency for an anterolateral or anterior placement of cyclosystems.

REMARKS.—Several specimens were infested by polychaete worms, which produce tubular burrows about 0.25 mm in diameter within the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branch axes. These tubes frequently communicate to the coenosteal surface where they are expressed as apically perforate cylinders that project up to 0.60 mm above the coenosteum and are 0.65 mm in diameter, with a pore diameter of about 0.37 mm. The only other western Atlantic stylasterid having a worm symbiont is *S. erubescens*, in which the worms produce a much larger superficial tube. The polychaete symbiont of *S. spatula* was not well enough preserved for identification.

ETYMOLOGY.—The specific name *spatula* (Latin for small, broad, flat blade) refers to the flattened coenosteal lobes, which project perpendicular to the coenosteum.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype*: *O*-24237 (female) USNM 71781.

Paratypes: *O*-24237 (8 colonies, 15 branches, 2 HS) USNM 71782, (1 branch) MCZ, (1 colony) UMML, (2 branches) BM 1984.3.14.10; *O*-24238 (1 colony, 3 branches) USNM 71783.

TYPE-LOCALITY.—17°50′N, 66°08′W (off southeastern Puerto Rico), 384 m.

DISTRIBUTION.—Known only from off southeastern Puerto Rico (Map 13; pattern 2b); 384–549 m.

31. *Stylaster inornatus*, new species

FIGURE 36A–H

Stylaster filogranus.—Broch, 1936:44 [in part: 1 of 6 branch fragments from *ALB*-2354].

Stylaster (*Stenohelia*) *complanatus*.—Broch, 1936:81–84 [in part; figs. 28*a–c*, *e*; pl. 2: figs. 9–10; 17 of 36 branch fragments].

DESCRIPTION.—Colonies uniplanar, up to 7.6 cm tall and 6.5 cm broad, with a basal branch diameter up to 7.7 mm. Branches round in cross section. Coenosteum white, reticulate-granular in texture. Coenosteal strips 60–65 μm wide, bordered by irregularly shaped coenosteal pores about 14 μm in diameter. Strips covered by low, rounded granules about 8 μm in diameter; texture smooth. No papillae.

Cyclosystems round to slightly irregular in shape, about 0.65 mm in diameter, and arranged sympodially on anterolateral branch faces. Based on 50 cyclosystems the range of dactylopores per cyclosystem is 6–13; the average is 9.80 (σ = 1.44), and the mode is 11.

Within each cyclosystem is a horizontal shelf surrounding the gastropore on which is a low ridge surrounding the gastropore. Gastropore tube cylindrical, about 0.31 mm in diameter. Diffuse ring palisade present, containing elements about 38 μm in diameter. Illustrated gastrostyle 0.39 mm tall and 62 μm in diameter (H:W = 6.3). Style covered by slender spines up to 32 μm tall, often fused and aligned on vertically oriented ridges. Dactylopore slits about 68 μm wide. Pseudosepta convex above and equally spaced; no diastemas. Dactylostyle composed of a row of tall slender cylinders about 40 μm tall and 9 μm in diameter. Lateral dactylostyles also present, the elements measuring about 22 μm in diameter. There is also usually a massive tubercle opposite the dactylostyle measuring up to 30 μm in diameter.

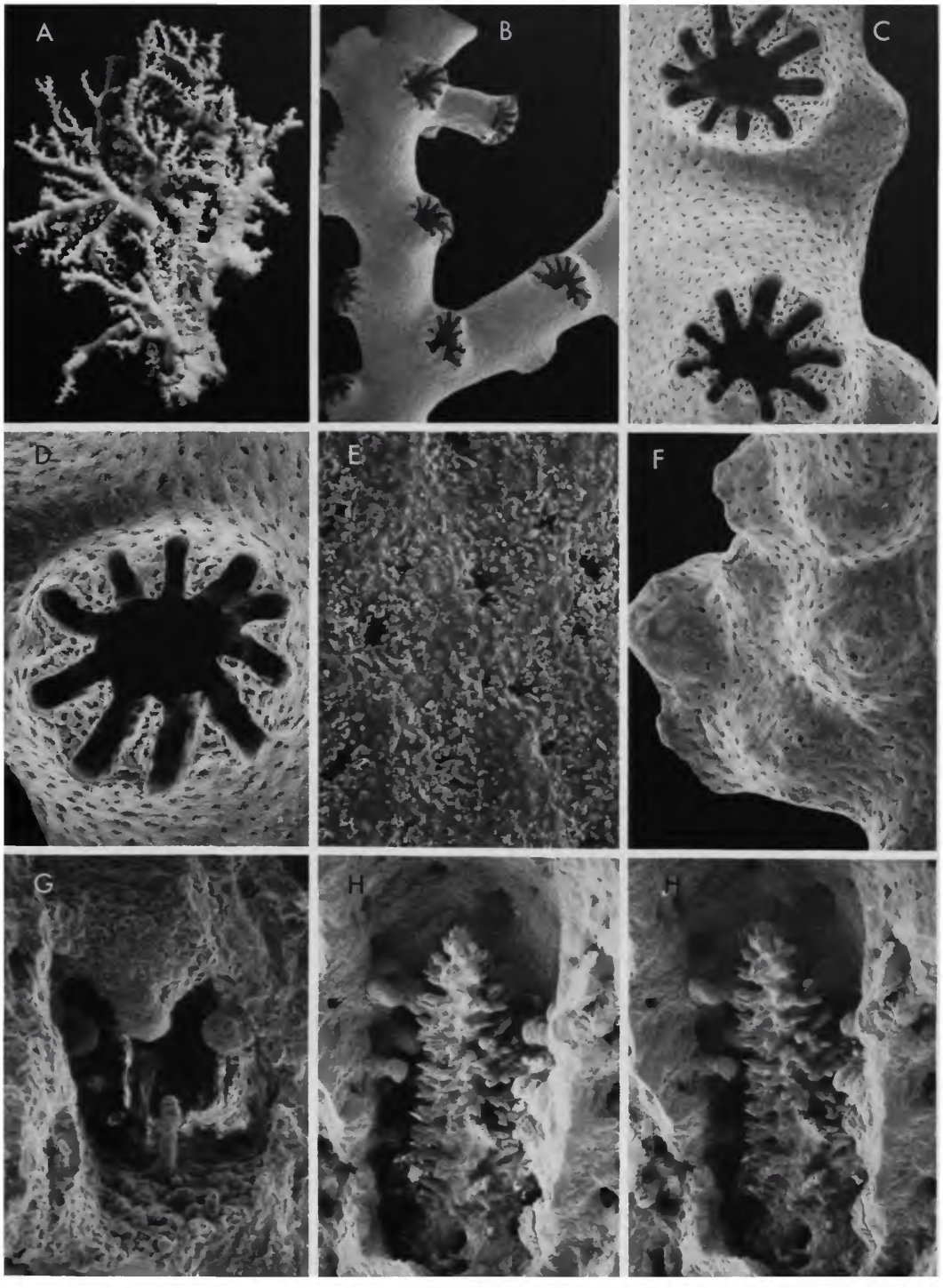
Female ampullae hemispherical, 0.55–0.61 mm in diameter, each with a short efferent tube. Male ampullae also hemispherical, about 0.45 mm in diameter, usually bearing one or two short apical papillae. Both types of ampullae usually clustered on posterior branch faces.

Dactylozooid nematocysts 7 × 2 μm.

DISCUSSION.—*Stylaster inornatus* is distinguished from the other western Atlantic *Stylaster* by the combination of its anterolateral cyclosystems, reticulate-granular coenosteal texture, and lateral dactylostyles. It also has the smallest cyclosystems and the lowest average number of dactylopores per cyclosystem of the western Atlantic species (Table 2).

ETYMOLOGY.—The specific name *inornatus*

FIGURE 35.—*Stylaster spatula* (A, holotype; B–I, paratype from *O*-24237): A, holotype colony, × 1.4; B, anterior branch face, × 12; C, cyclosystem, × 57; D, coenosteal papillae, × 89; E, flattened coenosteal lobes, × 160; F, coenosteal texture, × 370; G, longitudinal section of a cyclosystem revealing gastrostyle and shelf, × 57; H–I, gastrostyle, × 190, × 405, respectively.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(Latin for "unadorned") refers to the lack of specialized surface skeletal characters.

MATERIAL EXAMINED.—Broch's (1936) specimens from *ALB*-2354 (RM, Stockholm). Types.

TYPES.—*Holotype: ALB*-2354 (female) USNM 71784.

Paratypes: ALB-2354 (9 colonies, 20 branches, 4 HS) USNM 50571, (1 colony) MCZ, (1 colony) UMML, (1 colony) BM 1984.3.14.7; *G*-889 (2 colonies, 13 branches) USNM 71785; *P*-595 (2 branches) USNM 71786.

TYPE-LOCALITY.—20°59′30″N, 86°23′45″W (Arrowsmith Bank, Yucatan Peninsula), 238 m.

DISTRIBUTION.—Known only from off Arrowsmith Bank, Yucatan Channel (Map 18); 198–309 m.

32. *Stylaster laevigatus*, new species

FIGURES 37A–G, 38A–F

DESCRIPTION.—Colonies large and uniplanar, up to 12 cm tall and 17 cm wide, with a massive basal branch diameter up to 12 × 17 mm. Large colonies sometimes have branchlets perpendicular to flabellar plane. Coenosteum white, composed of parallel convex strips 70–95 μm wide. Sometimes strips alternate in degree of convexity, especially near a cyclosystem. Parts of coenosteum covered by imbricate platelets but usually coenosteum quite smooth, covered by very low granules about 6 μm in diameter. This smooth or polished microtexture produces a porcelaneous aspect. Coenosteal slits short, about 10 μm wide. No papillae.

Cyclosytems sympodially arranged on anterolateral or anterior branch faces. Cyclosystems round to elliptical in cross section, about 0.95 mm in diameter if round and about 1.4 × 0.60 mm in diameter if elliptical. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 5–16; the average is 11.48 ($\sigma = 2.37$), and the mode is 10.

Gastropore tube divided into two sections: the upper section and the lower gastrostyle chamber. Upper section, about 0.45 mm in diameter, bordered by dactylotomes and inner edges of pseudosepta peripherally, and by a horizontal shelf basally. In center of shelf is the round opening to the gastrostyle chamber, which is about 0.25 mm in diameter. Upper part of gastrostyle chamber invariably extends slightly above level of shelf as a low ridge producing a slight extension of the gastrostyle chamber. Lower gastrostyle chamber cylindrical with an annular ring palisade. Illustrated gastrostyle 0.31 mm tall and about 54 μm in diameter (H:W = 5.7) bearing fused and sometimes multitipped spines up to 26 μm long. Spines arranged on irregular vertical ridges. Dactylopore slits about 60 μm wide. Pseudosepta on outer edge of cyclosystem sometimes quite exsert, forming a prominent abcauline lip, much as in *S. spatula*. Dactylostyles composed of a single row of blunt cylindrical elements about 50 μm tall and 9 μm in diameter. In addition, prominent lateral dactylostyles, about 30 μm in diameter, are clearly visible, even in undamaged cyclosystems.

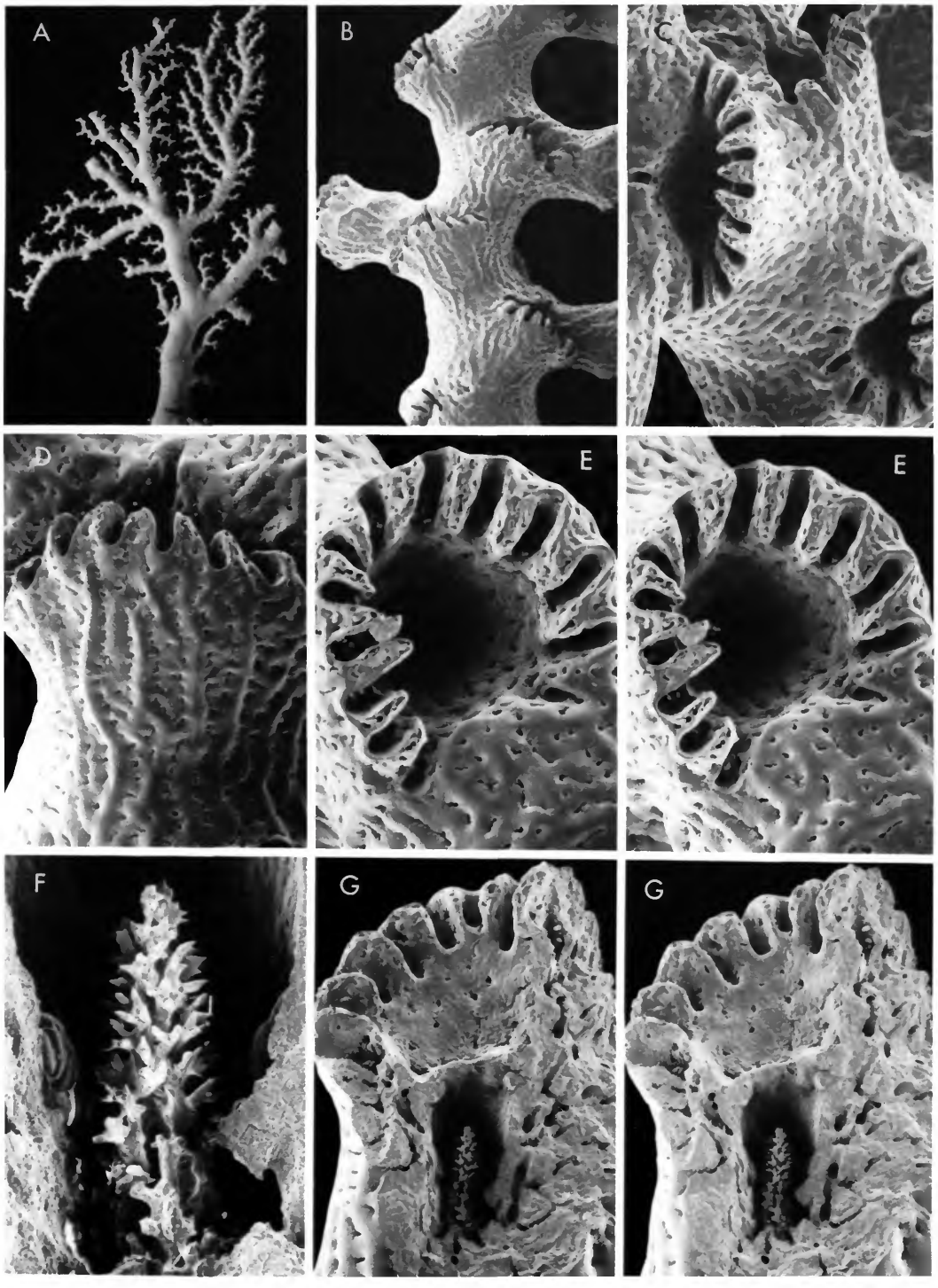
Female ampullae hemispherical, 0.8–0.9 mm in diameter, each with a short efferent tube terminating in a round, porous concavity about 0.18 mm in diameter. Female ampullae usually smooth but some densely covered with very tall spines. Male ampullae superficial to slightly submerged in coenosteum, about 0.40 mm in diamter.

Nematocysts of gastrozooid tentacles and dactylozooids 6 × 2.5 μm.

ETYMOLOGY.—The specific name *laevigatus* (Latin for "polished, smooth") refers to the porcelaneous coenosteal texture of this species.

DISCUSSION.—*Stylaster laevigatus* bears some resemblance to *S. spatula*, particularly in its anterolateral arrangement of cyclosystems, cyclosystem shape, and presence of an inner cyclosystem shelf. It is distinguished by its distinctive

FIGURE 36.—*Stylaster inornatus* (A, holotype; B–H, paratype from *ALB*-2354): A, holotype colony, × 0.81; B, branch tip, × 12; C–D, cyclosystems, × 38, × 64, respectively; E, coenosteal texture, × 250; F, ampullae, × 47; G, dactylostyle, × 275; H, gastrostyle, × 130, stereo pair.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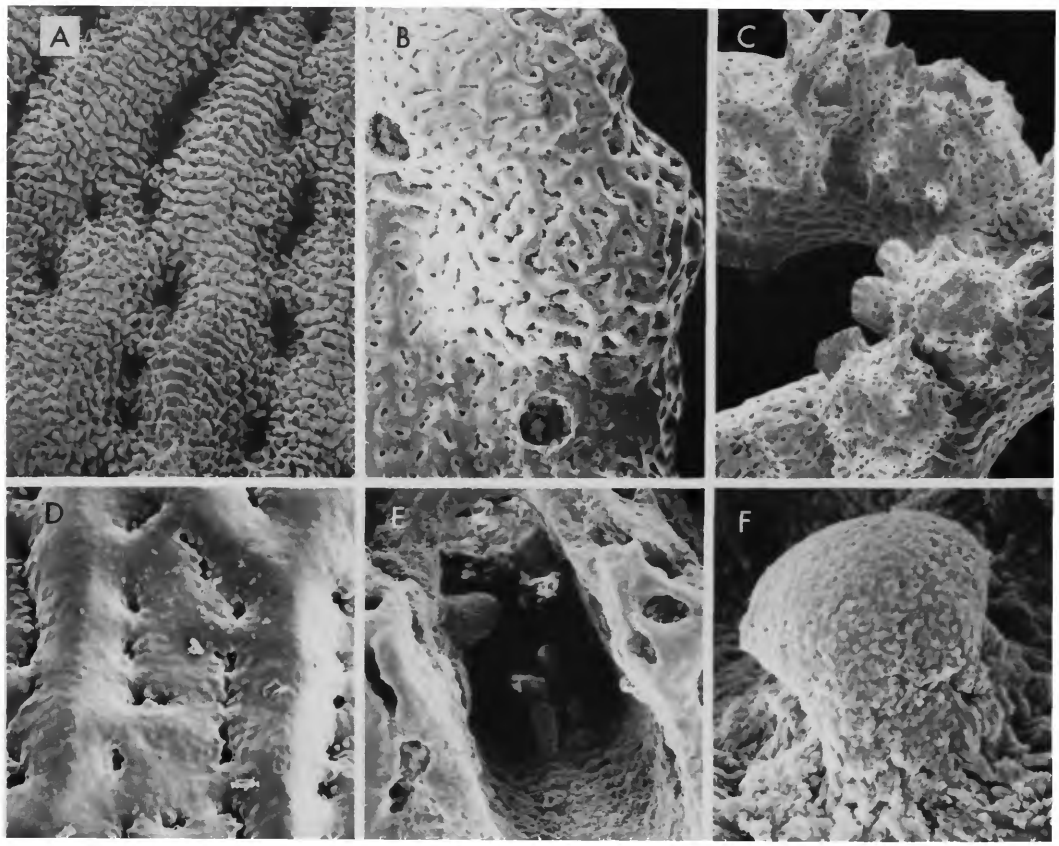


FIGURE 38.—*Stylaster laevigatus* (A–C, *ALB*-2337; D–F, *G*-533): A, D, imbricate and smooth coenosteal strips, the former rare, × 165, × 155, respectively; B, female ampullae with efferent tubes, × 45; C, spinose female ampullae, × 23; E, dactylostyle, × 285; F, element of lateral dactylostyle, × 1730.

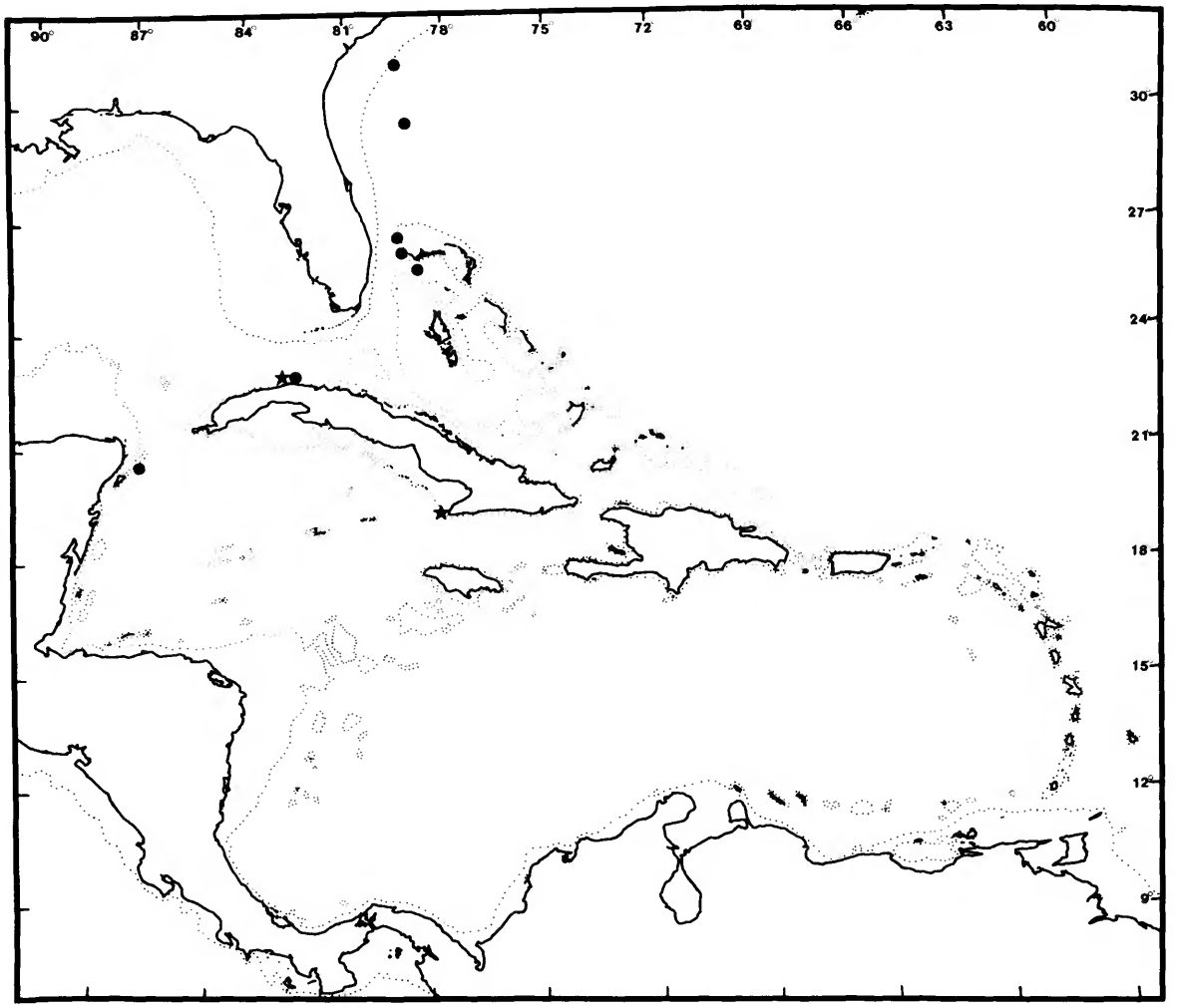
lateral dactylostyles, its smoother coenosteal texture, and by its lack of coenosteal modifications, such as lobes and papillae. Comparisons to *S. aurantiacus* are made in the account of that species and in Table 2.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: ALB*-2337 (female) USNM 52215.

FIGURE 37.—*Stylaster laevigatus* (A, holotype; B–G, paratype from *G*-533): A, holotype colony, × 0.59; B, anterior branch face, × 14; C–D, cyclosystems from above and from side, × 30, × 47, respectively; E, cyclosystem, × 50, stereo pair; F, gastrostyle, × 205; G, longitudinal section of cyclosystem revealing gastrostyle and shelf, × 55, stereo pair.

Paratypes: ALB-2337 (9 colonies, 10 branches, 8 HS) USNM 10233 and 44201, (1 colony) UMML, (1 colony) BM 1984.3.14.9; *ALB*-2159 (4 branches) USNM 16002; *ALB*-2167 (1 branch) USNM 16003; *ALB*-2321 (1 colony) USNM 16061; *ALB*-2327 (1 colony) USNM 52223; *ALB*-2334 (1 branch) USNM 16030; *ALB*-2338 (2 colonies) USNM 52203; *ALB*-2346 (5 colonies) USNM 52217; *ALB*-2347 (1 colony) USNM 16032; *ALB*-2353 (1 colony) USNM 52216; *Atlantis*-3367 (2 colonies) USNM 71787, (10 colonies) MCZ; *Vema* 15-1 (2 colonies) USNM 71788; *G*-533 (2 colonies, 2 branches) USNM 71789; *Eastward*-26549 (2 branches) USNM



MAP 19.—Distribution of *Stylaster laevigatus* (circles) and *S. aurantiacus* (stars).

71790; *Eastward*-31281 (1 colony) USNM 71791; *JSL*-1354 (2 colonies, 20 branches) USNM 71792, (2 branches) Harbor Branch IRCZM 10:00011; *JSL*-1362 (1 colony) USNM 71793.

TYPE-LOCALITY.—23°10′39″N, 82°20′-21″W (off Havana, Cuba) 364 m.

DISTRIBUTION.—Blake Plateau off South Carolina; off Grand Bahama Bank and Northwest Providence Channel; off Havana; off Arrowsmith Bank, Yucatan (Map 19; pattern 2c); 123–759 m, although most records are between 300 and 400 m.

33. *Stylaster aurantiacus*, new species

FIGURES 39A–J, 40A–B, 53I

DESCRIPTION.—Colonies uniplanar and small, less than 5 cm tall and 3.5 cm broad, with a basal branch diameter less than 4 mm. Coenosteum light orange, composed of parallel convex coenosteal strips about 90 μm wide. No trace of

imbricate platelets found on any specimens; instead, coenosteum smooth, covered by very low granules about 6 μm in diameter. Coenosteal slits about 15 μm wide and often elongate. Posterior side of most basal branches covered by conical, apically perforate papillae up to 80 μm tall. Papillae also sometimes present on distal branches.

Cyclosystems sympodially arranged on anterolateral or anterior branch surfaces, the latter arrangement common on terminal branches. Cyclosystems usually strongly compressed, the greater axis transverse to branch axis (*e.g.*, 1.2 × 0.5 mm in diameter). Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 7–15; the average is 11.04 ($\sigma = 1.97$), and the mode is 11.

Upper gastropore chamber shallow, bordered by a horizontal shelf below. In center of shelf is a round opening to the gastrostyle chamber, which is about 0.21 mm in diameter. There is usually a low, circular ridge on the shelf encircling the gastropore. Annular ring palisade present in gastrostyle chamber. Illustrated gastrostyle 0.31 mm tall and 60 μm in diameter (H:W = 5.1); however, stouter styles occur with H:W ratios as low as 2.5. Style bluntly tipped with robust, individualized cylindrical spines up to 32 μm long. Style vertical ridges and spines not aligned in vertical rows. Spines oriented almost perpendicular to shaft of gastrostyle. Dactylopore slits about 60 μm wide; diastema often present but not always. Pseudosepta on outer edge of cyclosystem often quite exsert, forming an abcauline lip. Dactylostyle a single row of slightly clavate cylindrical elements up to 35 μm tall and 10 μm in diameter. Lateral dactylostyles also present, easily visible in an undamaged cyclosystem. Elements of lateral dactylostyles clavate, up to 20 μm tall and 25 μm in diameter.

Female ampullae hemispherical, 0.8–1.0 mm in diameter, and covered by numerous conical papillae up to 0.11 mm tall. Each mature female ampulla has a concave efferent pore about 0.14 mm in diameter. Male ampullae also superficial, about 0.45–0.65 mm in diameter, and usually clustered on posterior side. Male ampullae usually have 1–3 apical "papillae" (efferent pores?)

Dactylozooid nematocysts 6 × 2.5 μm; kidney-shaped nematocysts 9 × 3–3.5 μm also present in coenosarc.

ETYMOLOGY.—The specific name *aurantiacus* (Latin for the color "orange") refers to the color of the coenosteum.

DISCUSSION.—*Stylaster aurantiacus* is very similar to *S. laevigatus*, especially with regard to its prominent lateral dactylostyles, linear-granular coenosteal texture, cyclosystem shape and orientation, and gastropore tube shape. I first thought that *S. aurantiacus* was simply a color morph of *S. laevigatus*; however, closer examination showed that, aside from the difference in coenosteal color, *S. aurantiacus* can be differentiated by having coenosteal papillae and a smaller colony size. It is also less porcelaneous than *S. laevigatus*.

MATERIAL EXAMINED.—*BL* station off Havana, 320 m, MCZ; *BL*-XXIV, MCZ. Types.

TYPES.—*Holotype:* *ALB*-2320 (male) USNM 71794.

Paratypes: *ALB*-2320 (14 colonies, 16 branches) USNM 16009, (1 colony) UMML, (1 colony) BM 1984.3.14.8; *ALB*-2159 (4 branches) USNM 16005; *ALB*-2160 (9 colonies, 15 branches) USNM 16006 and 52211; *ALB*-2323 (3 colonies) USNM 52213; *ALB*-2325 (2 colonies) USNM 52212; *ALB*-2326 (2 colonies) USNM 16008; *ALB*-2330 (1 colony) USNM 10161; *ALB*-2333 (1 colony) USNM 52214; *ALB*-2334 (3 colonies, 2 branches) USNM 16007; *ALB* station off Havana (13 colonies, 8 branches, 3 HS) USNM 16010 and 16057.

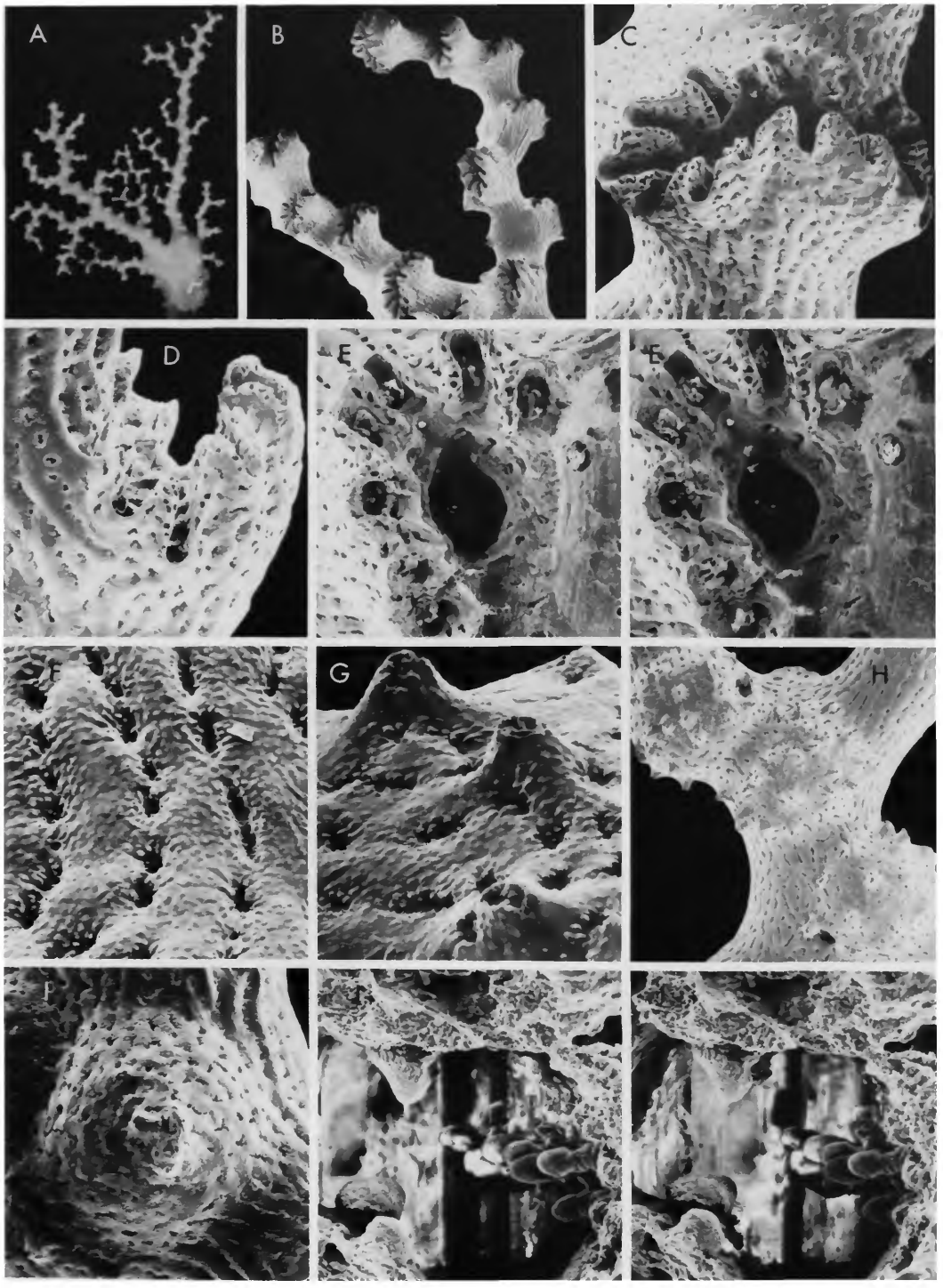
TYPE-LOCALITY.—23°10′39″N, 82°18′-48″W (off Havana, Cuba), 238 m.

DISTRIBUTION.—Off Havana, Cuba and off Cape Cruz (southern Cuba) (Map 19; pattern 2c); 123–377 m.

34. *Stylaster complanatus* Pourtalès, 1867

FIGURE 41A–I

Stylaster complanatus Pourtalès, 1867:115–116; 1871:36, pl. 2: figs. 16–17; 1878:210.—Moseley, 1881:87.—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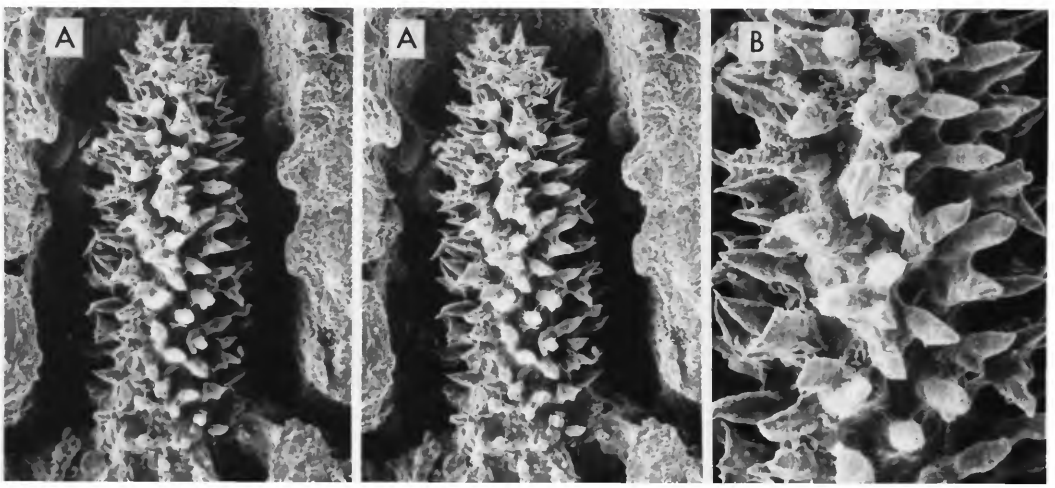


FIGURE 40.—*Stylaster aurantiacus*: A, B, gastrostyle of paratype from *ALB*, USNM 16010, × 195, × 425, respectively (A is a stereo pair).

Boschma, 1953a:360–361.—Zibrowius and Cairns, 1982:210, 211.

Stenohelia complanata:—Kent, 1870:123.—Boschma, 1957:31; 1964b:67–69; 1964d:83–84; 1967:328–329; 1968b:438.

Cryptohelia virginis Lindström, 1877:14–15, pl. 2: fig. 24.—Boschma, 1951b:45.

Stylaster virginis.—Moseley, 1881:87. [Not *S. virginis.*—Hickson and England, 1905:13–14.]

Stylaster (*Stenohelia*) *complanatus.*—Broch, 1936:81–84 [in part: fig. 28d; only 2 of 36 branch fragments].

Stenohelia virginis.—Boschma, 1953b:171; 1957:33; 1964b:68–69; 1964d:83–84.—Zibrowius and Cairns, 1982:211.

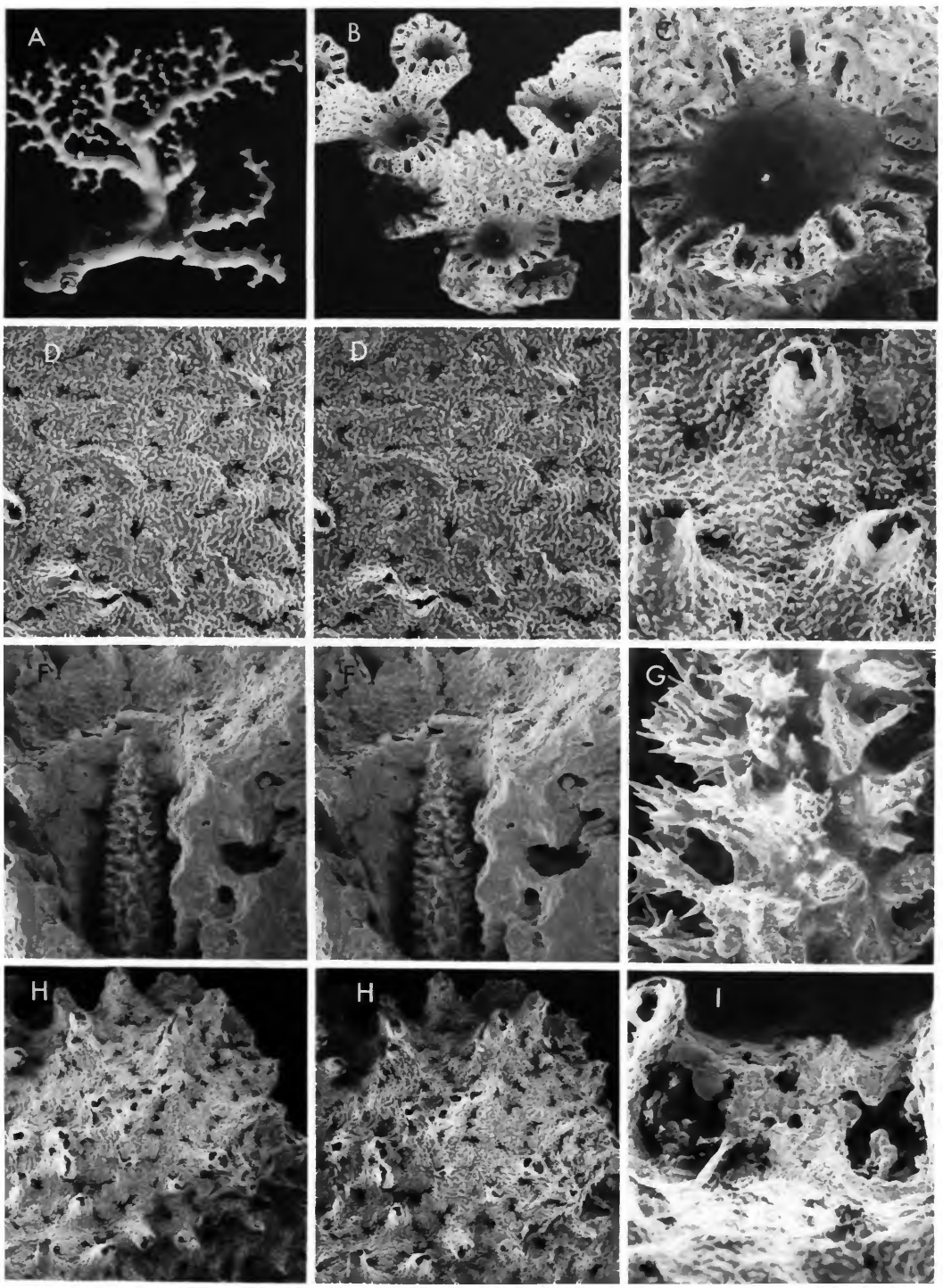
Calyptopora complanata.—Cairns, 1983b:430, 486.

DESCRIPTION.—Colonies uniplanar, small, and delicate. Coralla often broader than tall, up to 6.3 cm tall and 6.5 cm broad, with a basal branch diameter up to 5.5 mm. Coenosteum white. Coenosteal strips parallel and longitudinally arranged on terminal branches and near cyclosystems; however, they are arranged in a reticulate pattern on larger-diameter branches. Strips 70–80 μm wide, covered by irregularly shaped granules about 9 μm in diameter. There is no trace of imbrication. Tall, tubular, apically perforate papillae up to 0.10 mm tall cover the coenosteum, producing a spiny texture. Papillae particularly tall and abundant on ampullae. Apical pores irregularly shaped and large, up to 35 μm in diameter.

Cyclosystems arranged unilinearly on anterior branch faces. Only in large-diameter basal branches are cyclosystems slightly alternating, suggesting a sympodial origin. Cyclosystems elliptical to strongly compressed, the greater axis of the ellipse transverse to branch axis. Cyclosystems average about 1.0 mm in diameter; however, strongly compressed cyclosystems up to 1.4 × 0.7 mm in diameter. Based on 50 cyclosystems there is a range of 10–20 dactylopores per cyclosystem; the average is 14.34 (σ = 2.24), and the mode is 14. Diastemas sometimes present.

Upper gastropore chamber very shallow and strongly flared, bordered beneath by a horizontal shelf. A cyclindrical gastrostyle chamber penetrates center of shelf, which is often ringed by a

FIGURE 39.—*Stylaster aurantiacus* (A–D, G, I, holotype; E, J, *ALB*-2160; F, H, *ALB*, USNM 16010): A, holotype colony, × 1.2; B, anterior branch face, × 9; C–D, cyclosystem viewed from anterior and lateral sides, × 45, × 66, respectively; E, broken cyclosystem revealing dactylostyles, × 65, stereo pair; F, coenosteal texture, × 145; G, papillae, × 175; H, female ampullae with efferent pores, × 26; I, apical papilla of male ampulla, × 53; J, dactylostyle, × 440, stereo pair.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low ridge. Gastrostyle chamber cylindrical, about 0.23 mm in diameter, bearing an annular ring palisade. Gastrostyle tall, slender, and pointed; the tip extending just above level of shelf. Illustrated style 0.43 mm tall and 72 μm in diameter (H:W = 6). Style bears large multitipped spines up to 33 μm tall, each having 5–7 slender points. Spines not arranged in rows or on ridges. Dactylopore slits about 80 μm wide. Pseudosepta on outer edge of cyclosystems often quite exsert, forming an abcauline lip. Dactylostyle composed of a row of blunt, cylindrical elements, each up to 45 μm tall and 12 μm in diameter. Small lateral dactylostyles also present, measuring about 16 × 18 μm. There is often another broad, squat element up to 23 μm in diameter opposite the dactylostyle, on the inner margin of the dactylopore chamber.

Female ampullae large hemispheres 0.75–0.85 mm in diameter, often with a small efferent pore. Male ampullae also superficial, about 0.45 mm in diameter, and clustered on the posterior branch faces.

Coenosteal papillae contain dense concentrations of large nematocysts 16–18 × 5 μm. Gastrozooid nematocysts 6 × 2 μm.

DISCUSSION.—*Stylaster complanatus* is the third of three species of *Stylaster* characterized by anterior to anterolateral cyclosystems, gastropore shelves, abcauline cyclosystem lips, and lateral dactylostyles (Table 2). It is the only species having a gastrostyle that extends beyond the gastrostyle chamber and predominantly anterior-facing cyclosystems. In this last character it is similar to *Calyptopora*, and I previously placed it in that genus (Cairns, 1983b). I now believe that this species belongs to *Stylaster* and is closely related to the two previously described species. *Stylaster complanatus* differs from *Calyptopora* in that its cyclosystem lip is composed of several pseudosepta and is not consistently present, whereas the lid of *Calyptopora* is composed of one greatly enlarged pseudoseptum that is consistently present. Also, the cyclosystems of *S. complanatus* are sometimes slightly alternating, whereas those of *Calyptopora* are always unilinearly arranged on the anterior face. Furthermore, *Calyptopora* does not have lateral dactylostyles or gastropore shelves.

The type of *Crypthelia virginis* Lindström, 1877, was examined and found to have cyclosystems about 1.3 × 0.9 mm in diameter, not 2 mm as stated by Lindström. It is a junior synonym of *S. complanatus*.

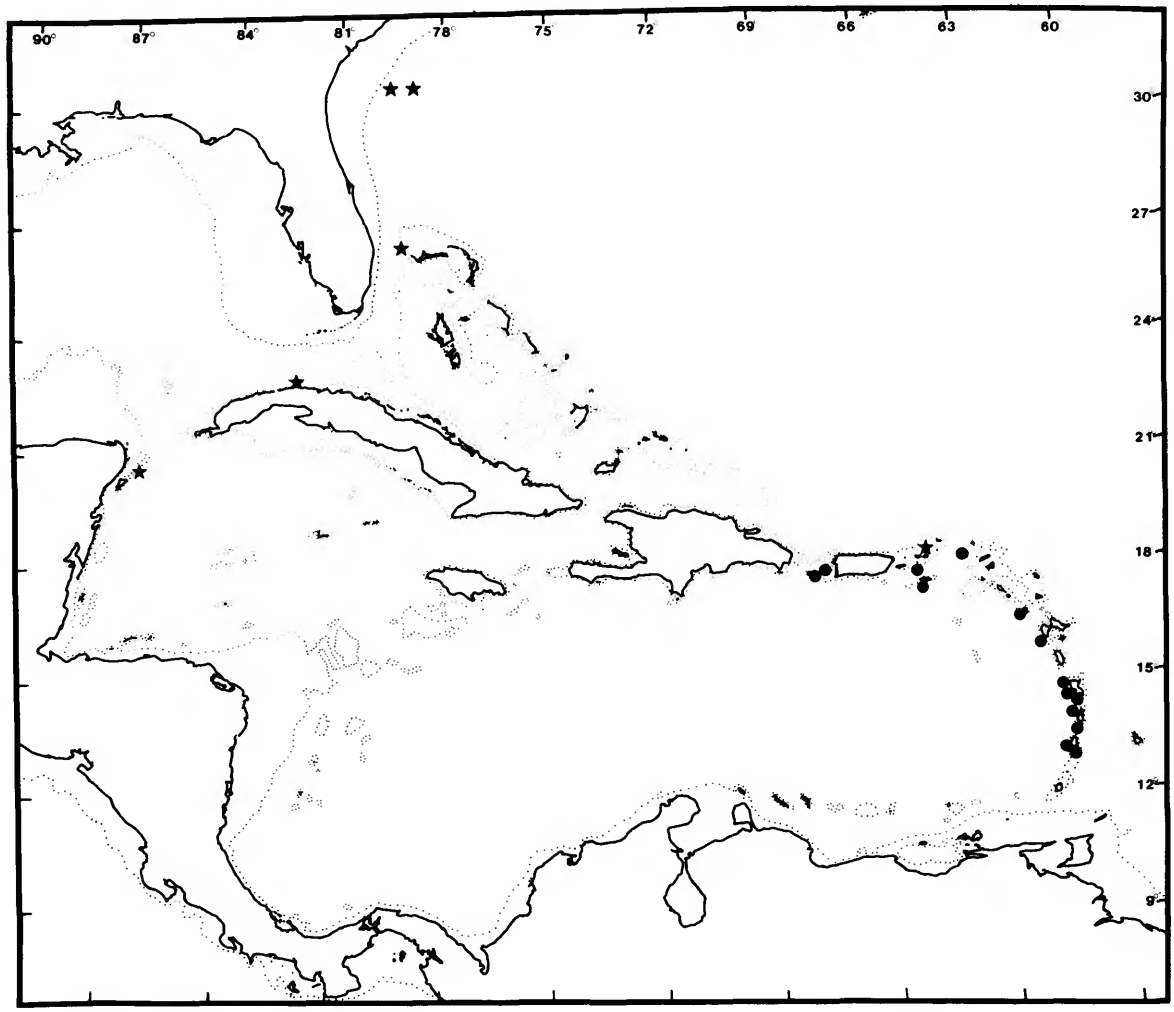
Broch's (1936) report of *S. complanatus* from off Cozumel (*ALB*-2354) is based on 36 branch fragments. This particular station and geographic area is an extremely rich one for stylasterids, and at least three species are represented in Broch's identified material of *S. complanatus*: *S. inornatus* (17 branches), *S. complanatus* (2 branches), and *Errina* sp. cf. *E. altispina* (1 branch); 16 fragments are too small or worn for identification. Except for figure 28*d*, all of Broch's illustrations and the text pertain to *S. inornatus*. Only figure 28*d* is *S. complanatus*.

MATERIAL EXAMINED.—*BL*-16, MCZ and USNM 16062; *BL*-68, MCZ and USNM 16063; *BL*-69, MCZ; *BL*-76, MCZ; *BL*-100, MCZ; *ALB*-2152, USNM 16025; *ALB*-2157, USNM 7195; *ALB*-2343, USNM 10245; *ALB*-2672, USNM 16026; *G*-169, USNM 72305 MCZ, and UMML; *G*-386, UMML and USNM 72306; *G*-889, USNM 72307; *Discoverer*, 31°55′N, 78°25′W, 531 m, USNM 72308. Syntypes of *S. complanatus*; holotype of *C. virginis*; Broch's (1936) specimens of *S. complanatus* from *ALB*-2354 (RM, Stockholm #42).

TYPES.—Three syntypes of *S. complanatus* are at the MCZ (5516, 5517), one at the USNM (71826), and one at the YPM. The holotype of *C. virginis* is at the RM, Stockholm (3088).

TYPE-LOCALITY.—The syntypes of *S. complanatus* were collected off Havana, Cuba, 494 m.

FIGURE 41.—*Stylaster complanatus* (A, *ALB*-2343, B–I, *G*-169): A, colony, × 1.15; B, terminal branches, × 17; C, cyclosystem, × 42; D–E, coenosteal texture and tubular papillae, × 86, × 200, respectively (D is a stereo pair); F–G, gastrostyle and shelf, × 82, × 450, respectively (F is a stereo pair); H, ampulla covered with papillae, × 59, stereo pair; I, dactylostyles, × 175.



MAP 20.—Distribution of *Stylaster complanatus* (stars) and *Stenohelia profunda* (circles). *S. profunda* is known also from off Surinam.

The holotype of *C. virginis* is from Salt Island, Virgin Islands, 366–585 m.

DISTRIBUTION.—Blake Plateau off Georgia; Little Bahama Bank; off Yucatan Peninsula; off Virgin Islands (Map 20; pattern 4); 183–707 m.

Stenohelia Kent, 1870

DIAGNOSIS.—Cyclosystems exclusively on anterior side. Coenosteum usually reticulate-granular but sometimes linear-imbricate. Gastropores long and usually strongly curved; gastrostyles present and usually accompanied by a robust ring palisade. Cyclosystems lacking lids and lips; pseudosepta concave above. Dactylostyles rudimentary. Ampullae superficial, often clustered around base of cyclosystem.

TYPE-SPECIES.—*Allopora maderensis* Johnson, 1862, by subsequent designation (Broch, 1936).

35. *Stenohelia profunda* Moseley, 1881

FIGURES 42A–G, 43 A–F

Stenohelia profunda Moseley, 1879:503 [nomen nudem]; 1881:82, 88, pl. 12: figs. 1–4 [in part: *Challenger*-23, not *Challenger*-171].—*Boschma*, 1953b:171 [in part: specimens from *Challenger*-23]; 1960:402; 1964b:65–70 [in part: specimens from *Challenger*-23].—Zibrowius and Cairns, 1982:213.—Cairns, 1983b:431, 487, figs. 20C, H–I, 24D, 27E–F. [Not *Stenohelia profunda*.—Marenzeller, 1904:86 (= *S. robusta* Boschma, 1964).—Boschma, 1956c:F100, fig. 81:4 (specimen from *Challenger*-171).]

Stylaster (*Stenohelia*) *challengeri* Boschma, 1951a:457 [new name, unnecessary].

Stenohelia challengeri.—Boschma, 1957:30–31; 1964b:69 [in part: specimens from *Challenger*-23, not pl. 1: figs. 11–12]; 1964c:74–77 [in part: specimens from *Challenger*-23] ; 1964d:78–80 [in part: specimens from *Challenger*-23]; 1968b:437 [in part: specimens from West Indies].—Vervoort and Zibrowius, 1981:26.—Zibrowius and Cairns, 1982:211.

Stenohelia maderensis.—Boschma, 1964c:76; 1964d:80–83, fig 1, pl. 2; 1967:327–328 [in part: specimens from West Indies]; 1968b:437 [in part: specimens from West Indies].

?*Stenohelia* sp.—Fenninger and Flajs, 1974, pl. 5: fig. 5.

DESCRIPTION.—Colonies uniplanar and moderately large, up to 7 cm tall and 7.5 cm broad, attaining a basal branch diameter of 1 cm. Terminal branches slender and delicate, always less than the width of a cyclosystem in diameter (e.g., 0.77 mm). Branch anastomosis not uncommon. Coenosteum white to light brown. Coenosteum on terminal branches composed of parallel, longitudinal, convex strips about 80 μm wide. These strips sometimes bear imbricate platelets but are usually covered with fine irregularly shaped granules. Coenosteum of larger-diameter branches composed of reticulate strips covered by similar irregularly shaped granules. No nematopores, papillae, or any kind of specialized nematocyst-bearing structures.

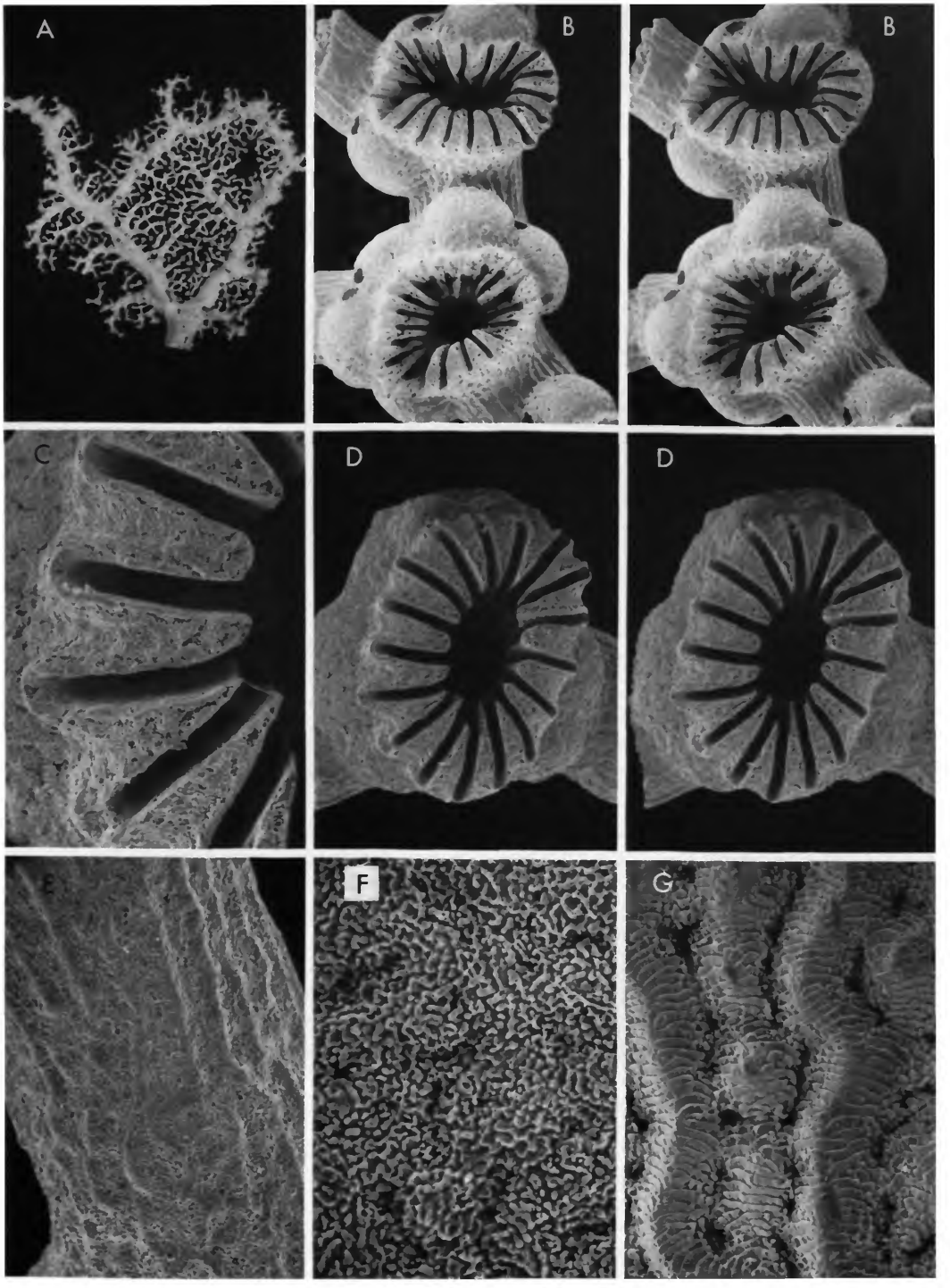
Cyclosystems unilinearly arranged on anterior branch faces with no suggestion of a sympodial origin. Cyclosystems project upwards about 1 mm perpendicular to branch face and are round to quite irregular in shape, often triangular. Cyclosystems usually 1.2–1.5 mm in diameter but a strongly compressed one may have a greater diameter up to 2.0 mm. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 12–22; the average is 16.70 (σ = 2.14), and the mode is 17.

Gastropores round, about 0.4–0.5 mm in diameter. Gastropore tube quite long, up to 2.5 mm, and invariably bent about 90° just beneath the gastropore. Ring palisade robust, composed of numerous closely spaced clavate elements up to 75 μm tall and 38 μm in diameter. Ring palisade annular, encircling gastrostyle ⅔–¾ of its height. Gastrostyle tapered to a point; illustrated style 0.52 mm tall and 0.13 mm in diameter (H:W = 4). Gastrostyle occupying only basal ¼–⅕ of gastropore tube and gastropore tube strongly curved, thus gastrostyle tip never seen in an undamaged cyclosystem. Gastrostyle bears slender spines up to 50 μm long arranged in poorly defined vertical ridges. Spines often distally bifurcate. Dactylopore slits about 77 μm wide. Pseudosepta wedge-shaped, 0.10–0.17 mm wide, and concave above; no diastema. Dactylostyles robust, composed of a thick row of closely spaced cylindrical elements up to 52 μm tall and 10 μm in diameter.

Female ampullae hemispherical, 0.8–0.9 mm in diameter, with 5–6 clustered around cyclosystem base. Each mature female ampulla has a short efferent tube and a concave efferent pore. Male ampullae hemispherical, about 0.45 mm in dimaeter, and also clustered in numbers of up to a dozen around base of cyclosystems. Both kinds of ampullae sometimes occur on posterior branch faces directly opposite a cyclosystem.

Gastrozooids robust and cylindrical, about 0.5 mm tall, each with a whorl of about 7 tentacles below an extended hypostome (Cairns, 1983b, figs. 27E–F). Dactylozooids adnate. Nematocysts measuring 5.0–5.5 × 2.0–2.5 μm common in gastrozooid tentacles and dactylozooids.

DISCUSSION.—Boschma (1951b) established the new name *S. challengeri* for *S. profunda* in order to avoid homonymy with *Allopora profunda* Moseley, 1879, in case *Allopora* and *Stenohelia*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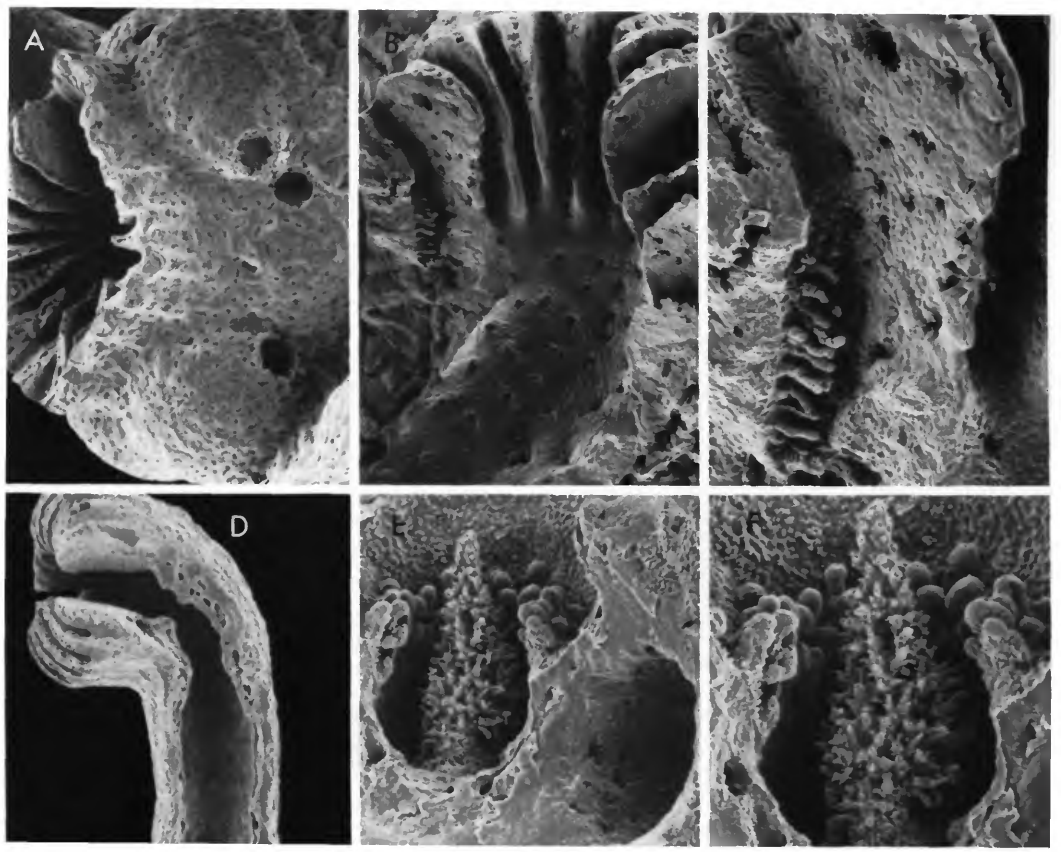


FIGURE 43.—*Stenohelia profunda* (A–C, J-S 43; D–F, *ALB*-2753): A, cyclosystem surrounded by female ampullae with efferent pores, × 32; B–C, longitudinal section of upper gastropore tube revealing a dactylostyle, × 55, × 140, respectively; D, gastropore tube, × 25; E–F, gastrostyle and ring palisade, × 71, × 105, respectively.

should be considered synonymous. Because *Stenohelia* is considered to be a separate genus, the name *challengeri* becomes unnecessary.

Boschma (1964b) identified specimens from *BL*-224 as *Stenohelia maderensis* (Johnson, 1862) but did not explain how they differed from *S. profunda*. Later (Boschma, 1964d), he suggested that although the *Blake* specimens were very similar to *S. profunda*, they could be distinguished by a higher average number of dactylopores per cyclosystem (17.33 for the *Blake S. maderensis* vs. 15.30 for the *Challenger*-23 *S. profunda*). He also noted that *S. maderensis* has more compressed cyclosystems than *S. profunda*. In 1967, Boschma further noted that specimens of *S. maderensis* from Cape Verde had an average of 13.50 dactylopores per cyclosystem, considerably shorter gastropore tubes than those found in specimens from *BL*-224, and warty ampullae (the *Blake* specimens have smooth ampullae). Nonetheless he maintained that the *Blake* specimens were true *S. maderensis* with a higher than

FIGURE 42.—*Stenohelia profunda* (A, *BL*-241; B, G, J-S 43; C–F, *ALB*-2753): A, colony, × 0.75; B, cyclosystems surrounded by female ampullae with efferent pores, × 17, stereo pair; C, pseudosepta, × 71; D, cyclosystem, × 29, stereo pair; E–G, coenosteal texture, × 64, × 180, × 140, respectively.

average number of dactylopores per cyclosystem. Finally, Boschma (1968b) indicated that the *Blake* specimens might not be *S. maderensis*.

I have examined the *Blake* specimens, the types of *S. profunda*, and the specimens of *S. maderensis* from Cape Verde, and conclude that the *Blake* specimens are typical *S. profunda*. *S. profunda* can be distinguished from *S. maderensis* by its having a significantly greater average number of dactylopores per cyclosystem (16.7 vs. 13.5), a much longer gastropore tube, which prevents viewing the gastrostyle tip (the gastrostyle tip can be seen in undamaged cyclosystems of *S. maderensis*), larger cyclosystems (see Cairns, 1983b:487), and smoother ampullae (those of *S. maderensis* are warty and ridged). Considering the average number of dactylopores per cyclosystem derived in this paper for *S. profunda* (16.70, $\sigma = 2.14$), both the *BL*-224 and *Challenger*-23 averages of 17.33 and 15.30, respectively, fall within the range of one standard deviation, whereas *S. maderensis* from Cape Verde is significantly outside that range (13.50). Furthermore, cyclosystems of *S. profunda* are often transversely compressed like those of *S. maderensis*. *Stenohelia maderensis* is thus far known only from Madeira and the Cape Verde Islands between 91–275 m (Cairns, 1983b).

As Moseley (1881) noted, three of the six syntypes of *S. profunda* from *Challenger*-23, including the designated lectotype, have very oddly shaped ampullae: tall cones up to 0.9 mm in height. The ampullae of the other types are of the typical hemispherical form. Conical ampullae were not noted in any of the other specimens examined and thus the syntypes having these are presumed to be aberrant specimens.

MATERIAL EXAMINED.—*BL*-119, MCZ; *BL*-126, MCZ; *BL*-134, MCZ; *BL*-139, MCZ; *BL*-157, MCZ; *BL*-158, MCZ; *BL*-171, MCZ; *BL*-194, MCZ; *BL*-205, MCZ; *BL*-211, MCZ; *BL*-213, MCZ; *BL*-216, MCZ; *BL*-218, MCZ; *BL*-219, MCZ; *BL*-220, MCZ; *BL*-224, MCZ, RMNH; *BL*-232, MCZ; *BL*-238, MCZ; *BL*-241, MCZ, USNM 72309; *BL*-259, MCZ; *BL*-269, MCZ; *BL*-273, MCZ; *ALB*-2753, USNM 52224; *ALB*-2754, USNM 52242; J-S 43, USNM 72310; J-S 45, USNM 72311; J-S 47, USNM 72312; *P*-901, UMML. Types of *S. profunda*.

TYPES.—There are six syntypes of *S. profunda* from *Challenger*-23 (BM 1880.11.25.182) and one syntype from *Challenger*-171 (BM 1880.11.25.183) deposited at the BM. There are two more syntypes from *Challenger*-171 at the Manchester Museum. Moseley's (1881:82) indication of *Challenger*-191 is an error for station 171, as is the longitude of 197° an error for 177°. Boschma (1957) restricted the type-locality to *Challenger*-23. The specimens from the Kermadecs (*Challenger*-171) and the West Indies (*Challenger*-23) are extremely similar, but it is highly unlikely that they are the same species (Zibrowius and Cairns, 1982). For this reason, I designate a lectotype from *Challenger*-23 (Moseley, 1881, pl. 12: fig. 1) and the other eight specimens as paralectotypes.

TYPE-LOCALITY.—18°24′N, 63°28′W (off St. Thomas, Virgin Islands), 823 m.

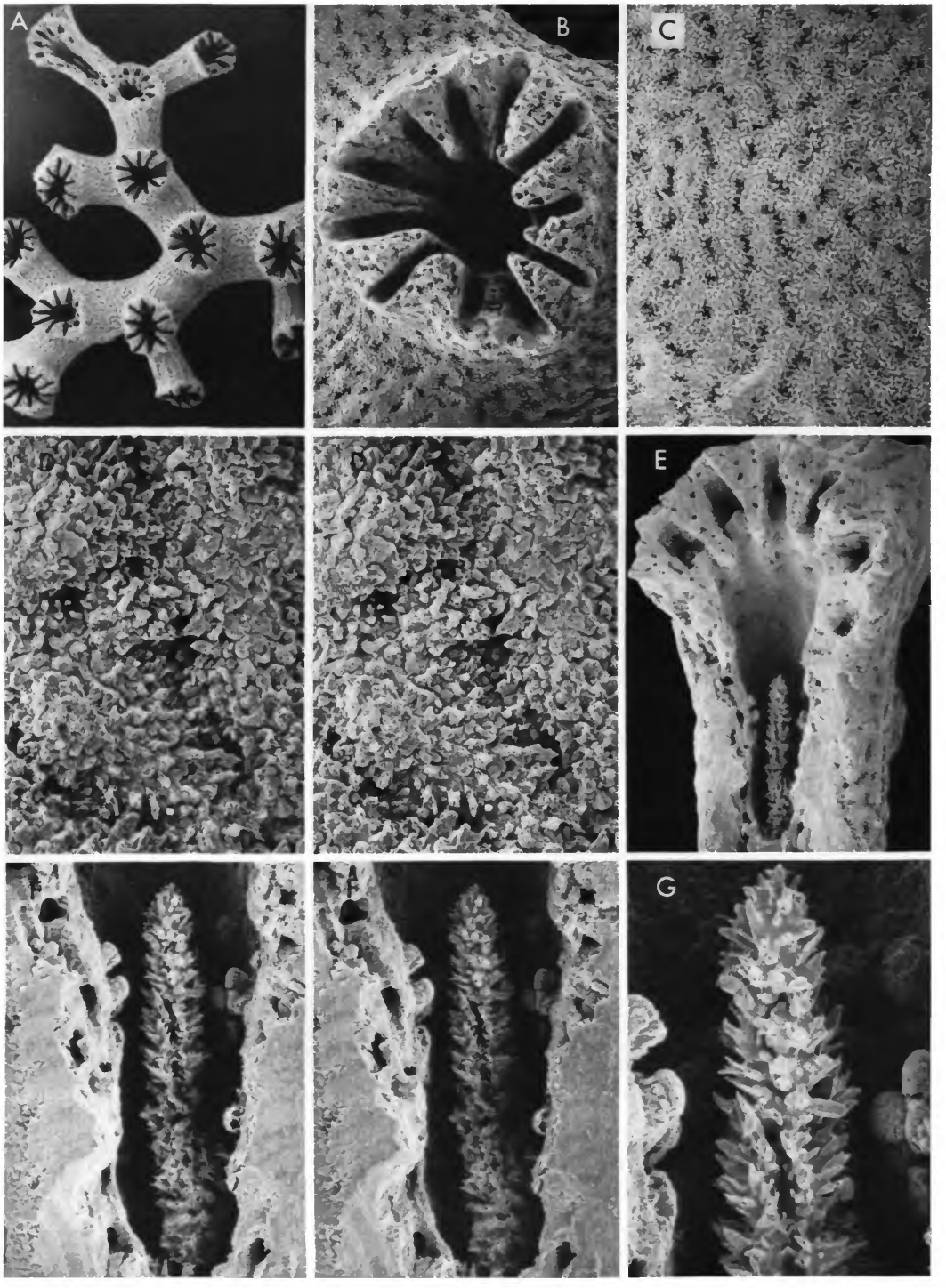
DISTRIBUTION.—Lesser Antilles from Mona Island to Grenada (including Barbados) and a seamount off Surinam (Map 20; pattern 2b); 159–2021 m, however most records between 200–650 m. This is the deepest known stylasterid from the western Atlantic. The record from off the Kermadec Islands is highly doubtful. Fenninger and Flajs's (1974) record from "off Florida" is enigmatic, as no other *Stenohelia* are known from this region.

36. *Stenohelia pauciseptata*, new species

FIGURE 44A–G

DESCRIPTION.—Colonies uniplanar to slightly bushy, delicate, and small: usually less than 3 cm tall and 2.5 cm broad, with a basal branch diameter up to 4.5 mm. Branch anastomosis not uncommon. Coenosteum white. Terminal

FIGURE 44.—*Stenohelia pauciseptata* (A–G, paratype from *P*-901): A, colony, × 13; B, cyclosystem, × 70; C–D, coenosteal texture, × 94, × 350, respectively (D is a stereo pair); E–G, longitudinal section of cyclosystem revealing gastrostyle, × 63, × 155, × 340, respectively (F is a stereo pair).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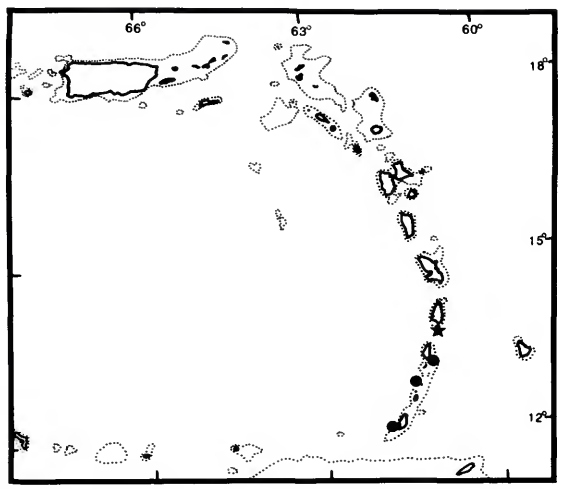


MAP 21.—Distribution of *Stenohelia pauciseptata* (star) and *Crypthelia insolita* (circles).

branch coenosteum composed of parallel longitudinal strips, whereas on larger-diameter branches strips are reticulate. Strips 50–70 μm wide, covered by narrow (about 15–20 μm), highly ridged platelets arranged in a very disorganized manner, producing a rough texture.

Cyclosystems restricted to anterior branch faces, usually unilinearly arranged but sometimes slightly alternating on large-diameter branches. Cyclosystems project upwards about 0.30 mm perpendicular to branch face and are usually round but may be slightly irregular in outline. Those of specimens from *P*-901 are 0.68–0.75 mm in diameter, whereas those from *ALB*-2753 are 0.9–1.0 mm in diameter. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 9–14; the average is 10.82 ($\sigma = 1.14$), and the mode is 10. Those specimens from the deeper station (*ALB*-2753) had, on the average, one more dactylopore per cyclosystem than those from *P*-901.

Gastropores round, 0.20–0.25 mm in diameter. Gastropore tube about 0.75 mm long and curved just beneath the gastropore. Robust annular ring palisade present, as in *S. profunda*. Gastrostyle tall and slender; illustrated style 0.42 mm tall and 52 μm in diameter (H:W = 8.1). Gastrostyle occupying over half of gastropore tube, its tip invariably visible in undamaged cyclosystems. Style bears slender spines up to 15 μm long, arranged on broad vertical ridges. Dactylopore slits about 50 μm wide. Pseudosepta wedge-shaped and flat to slightly concave above; no diastemas. Dactylostyles rudimentary, composed of a row of cylindrical elements about 25 μm in maximum height.

Ampullae hemispherical and smooth, about 0.45 mm in diameter, and usually clustered on posterior branch faces, often opposite a cyclosystem. Each mature female ampulla has an efferent pore about 0.11 mm in diameter.

DISCUSSION.—*Stenohelia pauciseptata* is distinguished from the only other western Atlantic congener, *S. profunda*, by its smaller colonies and cyclosystems, shorter gastropore tubes, higher gastrostyle H:W, significantly lower average number of dactylopores per cyclosystem, and its placement and size of ampullae. It is distinguished from the eastern Atlantic species *S. maderensis* by its smaller colonies, greater gastrostyle H:W, significantly lower average number of dactylopores per cyclosystem, and its size and placement of ampullae (see Cairns, 1983b:487).

ETYMOLOGY.—The specific name *pauciseptata* (Latin for "few septa") refers to the relatively low number of dactylopores per cyclosystem.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: P*-901 (female) USNM 71795.

Paratypes: P-901 (36 branches) USNM 71796, (2 branches) MCZ, (2 branches) UMML, (2 branches) BM 1984.3.14.11; *ALB*-2753 (6 colonies, 12 branches) USNM 71797.

TYPE-LOCALITY.—13°38′N, 60°56′W (off St. Lucia), 300 m.

DISTRIBUTION.—Known only from southwest of St. Lucia (Map 21; pattern 2b); 300–514 m.

Crypthelia Milne Edwards and Haime, 1849

DIAGNOSIS.—Cyclosystems unifacial, each covered partially or entirely by a fixed lid. Coenos-

teum linear-imbricate, usually with ridged platelets that are often spinose. Nematopores common, especially on lids and pseudosepta. Gastropore double chambered; no gastro- or dactylostyles. Ampullae superficial and large, usually clustered on gastropore lid or around cyclosystems. Efferent pores sometimes open into cyclosystem.

TYPE-SPECIES.—*Crypthelia pudica* Milne Edwards and Haime, 1849, by monotypy.

DISCUSSION.—The six species of western Atlantic *Crypthelia* are arranged arbitrarily by increasing cyclosystem diameter (Table 3).

37. *Crypthelia peircei* Pourtalès, 1867

FIGURES 45A–G, 46A–C

Crypthelia peircei Pourtalès, 1867:115.—Boschma, 1951b:45; 1957:36.—Zibrowius and Cairns, 1982:211.—Cairns, 1983b:431.

Cryptohelia peircei.—?Pourtalès, 1871:37, pl. 2: figs. 18–19; ?1878:211.—Moseley, 1881:88.—Agassiz, 1888:139, fig. 445.

Cryptohelia pudica.—Moseley, 1881:83, 88 [in part: probably *Challenger*-24].

DESCRIPTION.—Colonies uniplanar, up to 6 cm tall and 6 cm broad, with a basal branch diameter up to 6 mm. Branch anastomosis not uncommon. Terminal branchlets cylindrical, about 0.40 mm in diameter, considerably less than diameter of cyclosystems they bear. Coenosteum white, linear-imbricate in texture. Strips well defined, slightly convex, and 60–75 μm wide. Platelets broad but highly ridged and often divided into two or three segments across a strip. Round nematopores 40–50 μm in diameter present on tops and/or outer edges of pseudosepta, ampullae, and occasionally on coenosteal strips. Nematopores flush with coenosteum.

Cyclosystems round to slightly elliptical, 1.0–1.3 mm in diameter. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 10–16; the average is 13.00 ($\sigma = 1.41$), and the mode is 13.

Diameter of upper gastropore chamber about 0.33 mm; diameter of aperture leading to lower chamber about 0.25 mm. Gastropore partially covered by a short, narrow lid, which projects upward at about a 45° angle. Distal margin of lid usually rectangular in outline. Because lid is short and obliquely oriented, aperture to lower chamber is often partially visible when cyclosystem is viewed from directly above. Dactylopore slits about 45 μm wide. Pseudosepta wedge-shaped, variable in width, and usually concave above.

Female ampullae massive, almost spherical in shape, and up to 1.8 mm in diameter in well-developed cyclosystems. Ampullae occur in proximal section of cyclosystem lid and proximal third of cyclosystem wall. Each mature female ampulla has a short, round efferent pore about 0.25 mm in diameter opening into the cyclosystem on the lower side of cyclosystem lid. Male ampullae hemispherical, about 0.40 mm in diameter, clustering in groups of as many as five in same regions as described for female. Each male ampulla has a lateral or apical efferent pore about 0.11 mm in diameter. Despite size of ampullae, distal edge of cyclosystem lid usually remains thin.

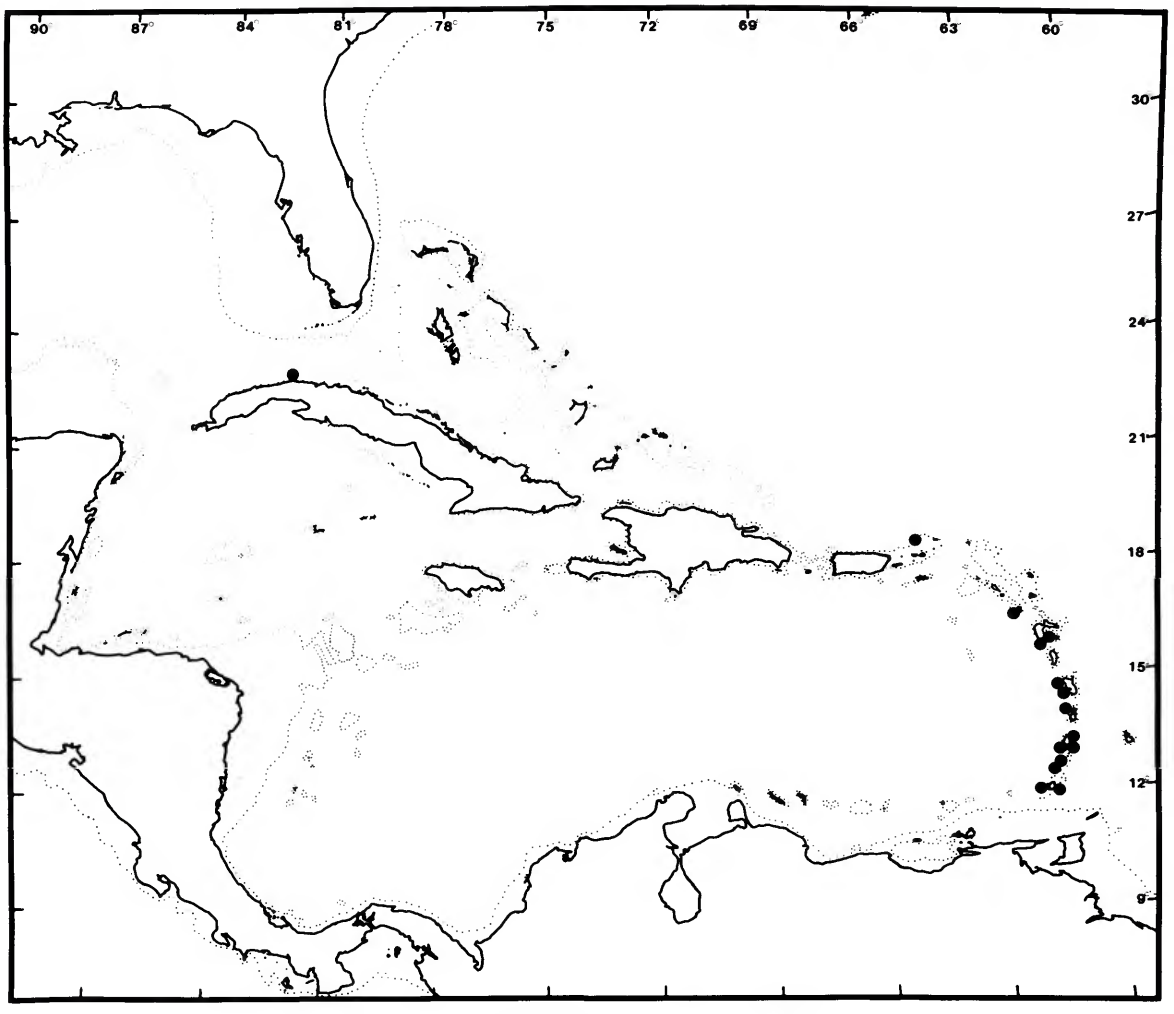
DISCUSSION.—*Crypthelia peircei* is distinguished from the other western Atlantic species by its small cyclosystems; small, angled cyclosystem lids; and ampullae that are restricted to the proximal cyclosystem lid and wall (Table 3).

MATERIAL EXAMINED.—*BL*(Sigsbee)-5 (= *BL*-69), MCZ; *BL*-157, MCZ; *BL*-166, MCZ; *BL*-170, MCZ; *BL*-194, MCZ; *BL*-198, MCZ; *BL*-220, MCZ; *BL*-232, MCZ; *BL*-238, MCZ; *BL*-241, MCZ, USNM 72313; *BL*-259, MCZ; *BL*-271, MCZ; *Rosaura*-34, BM and USNM 72314; *P*-881, UMML; *P*-991, UMML. Types.

TYPES.—Pourtalès (1867) mentioned specimens from two localities in his original description of *C. peircei*: a few small fragments from off Havana at 270 fms (*Corwin*-2 or 4) and worn fragments from off Georgia at 600 fms. The *Corwin* syntypes are present at the MCZ as two branch fragments, one with 8 cyclosystems, the other with only one cyclosystem (MCZ 5537). The specimens from off Georgia could not be found. Because the *Corwin* specimens obviously

TABLE 3.—Tabular key to the Northwest Atlantic species of *Crypthelia* (amp = ampullae, cs = cyclosystems, ep = efferent pores, ps = pseudosepta).

Character	*C. peircei*	*C. insolita*	*C. glossopoma*	*C. papillosa*	*C. floridana*	*C. tenuiseptata*
Cyclosystem diameter (mm) and flare of cyclosystem	1.0–1.3	1.0–1.3	1.5–1.8, flared	1.5–1.9, flared	1.8–2.2, slight-flared	3.0–3.2, quite flared
Lid orientation, shape, and % cover of cyclosystem (viewed from above)	Oblique; rectangular; 40%	Horizontal; rounded; 100–150%	Horizontal; tongue-shaped; 50%	Horizontal; rounded, concave; 80–110%	Oblique; narrow; 20–30%	Horizontal; rounded, concave above; 80–90%
Nematopore size, elevation, and location	40–50 μm; flush; tops and edges of ps, amp, coenosteum	40–65 μm; flush/raised; tops and edges of ps, amp, lids, coenosteum	70–80μm; flush; outer edges ps, lid, and coenosteum	30–35 μm; elevated; upper and outer ps, lid, and coenosteum	65 μm; flush; tops of ps, lid, and coenosteum	Absent
Range and average no. of dactylopores/cyclosystem	10–16, 13.0	10–14, 11.8	16–21, 17.9	16–22, 18.0	16–21, 18.9	15–22, 19.4
Location of female ampullae	Proximal lid, proximal cs wall	Lid and proximal cs wall	Base of lid and sometimes around cs	Top of lid	Proximal cs wall, not lid	Unknown
Location of male ampullae and nature of efferent pores	Proximal lid, proximal cs wall; apical ep	Lid, conical with extension; apical ep beneath extension	Encircle cs; ep in dactylotomes	Unknown	Encircle cs; apical ep	Encircle cs and base of lid; ep in dactylotomes
Upper pseudosepta and width of pseudosepta in relation to dactylopore slit	Concave; broad	Concave; equal	Slightly concave; slender	Concave; quite broad	Concave; broad	Not concave; very slender
Coenosteal platelet width and presence of spines on platelets	Broad; no spines	Broad; no spines	Narrow; spinose	Broad; no spines	Broad; spinose	Broad; spinose



MAP 22.—Distribution of *Crypthelia peircei*.

form the basis of his description and subsequent illustration (Pourtalès, 1871), and because the Georgian specimens are worn, apparently lost, and probably represent a different species (e.g., *C. floridana*), I designate the larger branch from the *Corwin* station as the lectotype and the other specimens as paralectotypes.

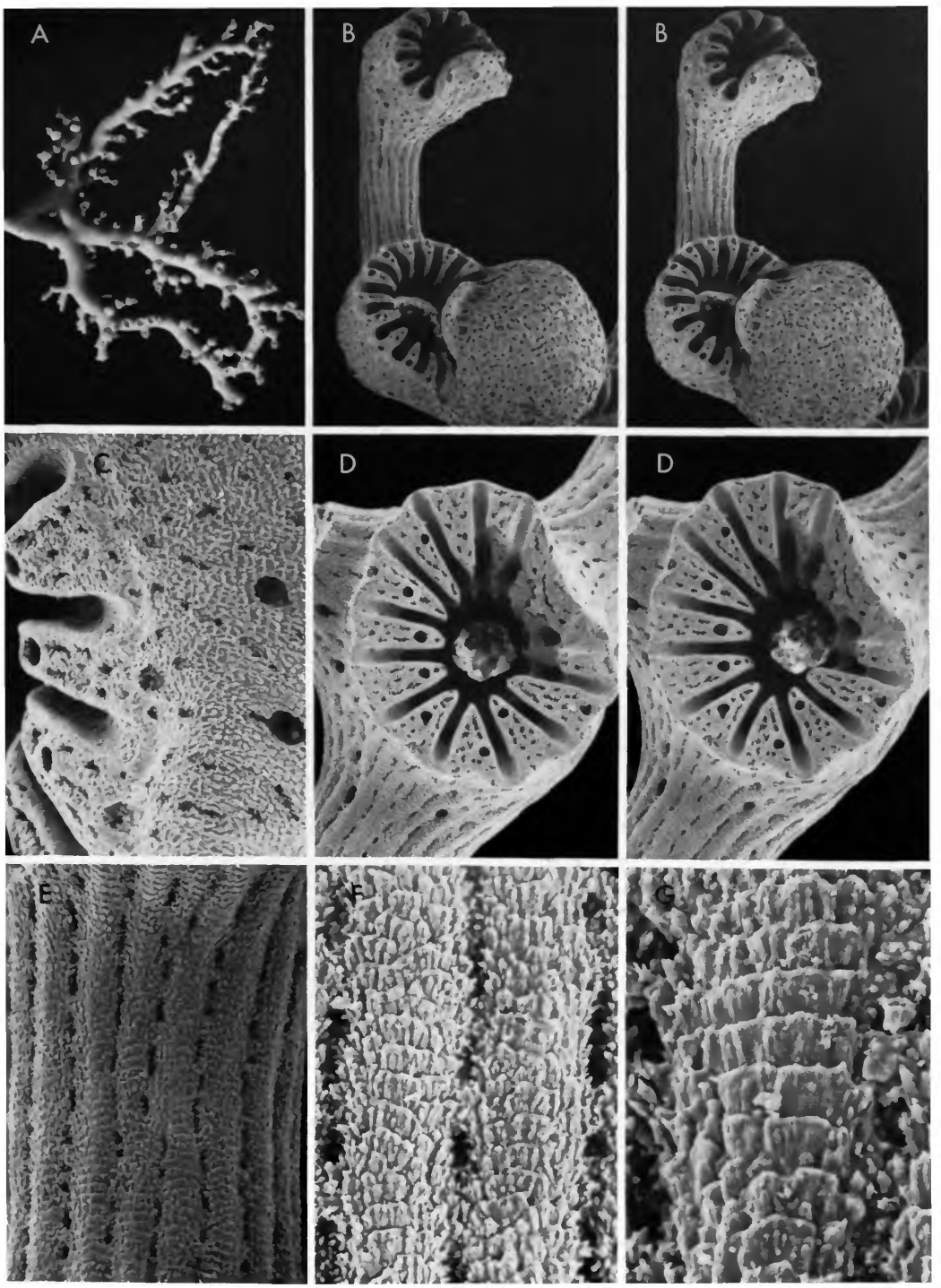
TYPE-LOCALITY.—Off Havana, Cuba, 494 m.

DISTRIBUTION.—Antilles from Havana to Grenada (Map 22; pattern 2a); 159–837 m. Pourtalès's (1871, 1878) records from off southern and western Florida could not be found at the MCZ and thus were not included on the distribution map. Likewise, the paralectotype(s) from off Georgia are not plotted on the map. Moseley's (1881) *C. pudica* from *Challenger*-24, just kilometers from *P*-901, is probably C. *peircei*, but this specimen could not be found at the BM.

38. *Crypthelia insolita*, new species

FIGURE 47A–L

DESCRIPTION.—Colonies uniplanar and delicate, up to 3.9 cm tall and 3.5 cm broad, with a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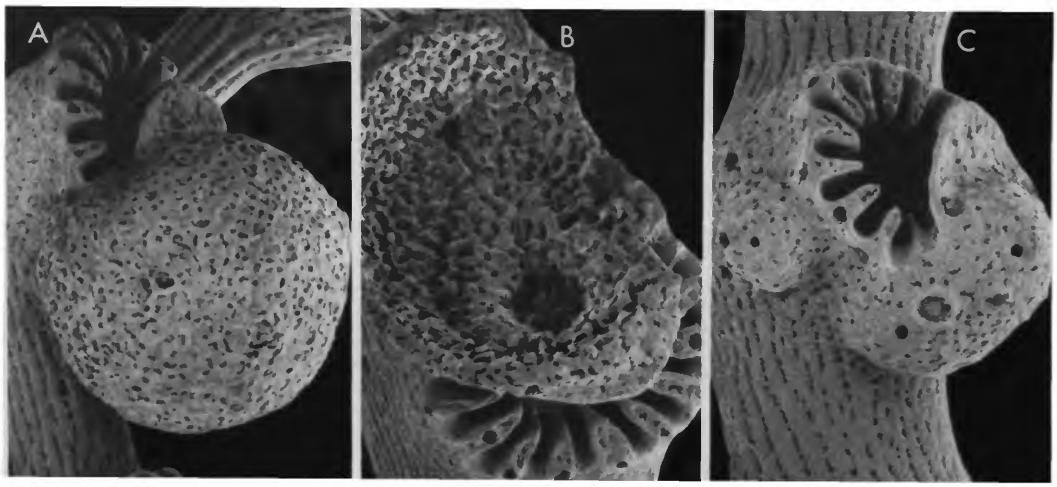


FIGURE 46.—*Crypthelia peircei* from *BL*-241: A, female ampulla, × 35; B, damaged female ampulla revealing incipient efferent pore leading into cyclosystem, × 38; C, male ampullae, × 40.

basal branch diameter not exceeding 2.7 mm. Distal branches cylindrical and very slender, about 0.33 mm in diameter. Coenosteum white, linear-imbricate in texture. Coenosteal strips well defined, 50–85 μm wide, and covered by broad, ridged platelets with a frequency of about 66 leading edges per mm. One to three round nematopores, each about 40–65 μm in diameter and flush with coenosteal surface, occur on upper and outer edges of each pseudoseptum. Additional nematopores, often slightly elevated on mounds up to 40 μm tall, also occur on ampullae, lids, and coenosteal strips.

Cyclosystems elliptical, the greater axis of ellipse transverse to branch. Typical cyclosystems about 1.3 × 1.0 mm in diameter. Based on 50 cyclosystems there is a range of 10–14 dactylopores per cyclosystem; the average is 11.84 (σ = 1.06), and the mode is 12. Because of the broad attachment of cyclosystem lid, almost half of cyclosystem perimeter unavailable for dactylopores.

Diameter of shallow upper gastropore chamber about 0.45 mm. Aperture leading to lower chamber about 0.21 mm in diameter and usually slightly serrate. Cyclosystem lid quite large; viewed from above it completely covers cyclosystem and usually extends significantly beyond cyclosystem margin (e.g., up to 1.6 × 1.3 mm in diameter). Lid horizontal and often slightly concave beneath. Dactylopore slits about 60 μm wide. Pseudosepta wedge-shaped and concave above, about 90 μm wide at cyclosystem edge.

Female ampullae massive, up to 1.3 mm tall and 1.2 mm broad, one per cyclosystem located on the lid and proximal part of cyclosystem. Each mature female ampulla has an efferent pore on underside of lid. As many as three male ampullae can be found on a male lid. Ampullae hemispherical, about 0.60 mm in diameter, and capped with a solid, tapered, curved extension about 0.10 mm in diameter and up to 0.25 mm long. At base of extension, on its concave side, is the male efferent pore (Figure 47C), about 0.10 mm in diameter.

DISCUSSION.—*Crypthelia insolita* is similar to *C. peircei* in size of cyclosystems, average number of

FIGURE 45.—*Crypthelia peircei* (A–B, *BL*-241; C–G, fragment from holotype): A, female colony, × 1.05; B, cyclosystem with female ampulla, × 23, stereo pair; C, outer edge of pseudosepta showing nematopores, × 115; D, cyclocysystem, × 46, stereo pair; E–G, coenosteal texture, × 93, × 275, × 465, respectively.

dactylopores per cyclosystem, and distributional range, and they are often collected together at the same stations. It is distinguished by its much broader and horizontal lid and the shape and position of its ampullae (Table 3). One other species of *Crypthelia* has a curved apical extension covering the efferent pore of its male ampullae; *C. cryptotrema* Zibrowius, 1981, known only from off New Caledonia. The extensions of *C. cryptotrema* are much smaller and limited to one per ampulla, however, and its ampullae are located in the proximal cyclosystem wall.

ETYMOLOGY.—The specific name *insolita* (Latin for "unusual, odd") refers to the unusually shaped male ampullae.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: Rosaura*-34 (male) BM 1938.3.1.82a.

Paratypes: Rosaura-34 (2 branches) USNM 71798, (1 branch) UMML; *BL*-232 (2 colonies) MCZ; *BL*-238 (1 branch) MCZ; *BL*-259 (2 colonies) USNM 71799; *BL*-269 (4 colonies, 6 branches) USNM 71800.

TYPE-LOCALITY.—12°05′N, 61°49′W (off St. George, Grenada), 720–800 m.

DISTRIBUTION.—Known only from the southernmost Lesser Antilles from St. Vincent to Grenada (Map 21; pattern 2b); 159–720 m.

39. *Crypthelia glossopoma*, new species

FIGURES 48A–G, 49A–B

DESCRIPTION.—Colonies uniplanar, up to 4.5 cm tall and 3.5 cm broad, with a robust basal branch diameter up to 5 mm. Terminal branchlets cylindrical, about 0.82 mm in diameter. Coenosteum white, linear-imbricate in texture. Strips well defined, slightly convex, and 90–110 μm wide. Platelets narrow and arranged in an unorganized manner. Many platelets bear longitudinal ridges which terminate anteriorly as short spines up to 11 μm long. Nematopores round and shallow, 70–80 μm in diameter, and occur on outer edges of almost every pseudoseptum. Some nematopores also present on lids and scattered over coenosteum. Nematopores flush with surface.

Cyclosystems elliptical in cross section, diameters varying from 1.5 × 1.3 to 1.65 × 1.46 to 1.8 × 1.3 mm the greater axis transverse to branch. Upper margin of cyclosystems slightly flared, producing an open fossa. Based on 50 cyclosystems the range of dactylopores per cyclosystem is 16–21; the average is 17.92 ($\sigma = 0.99$), and the mode is 18.

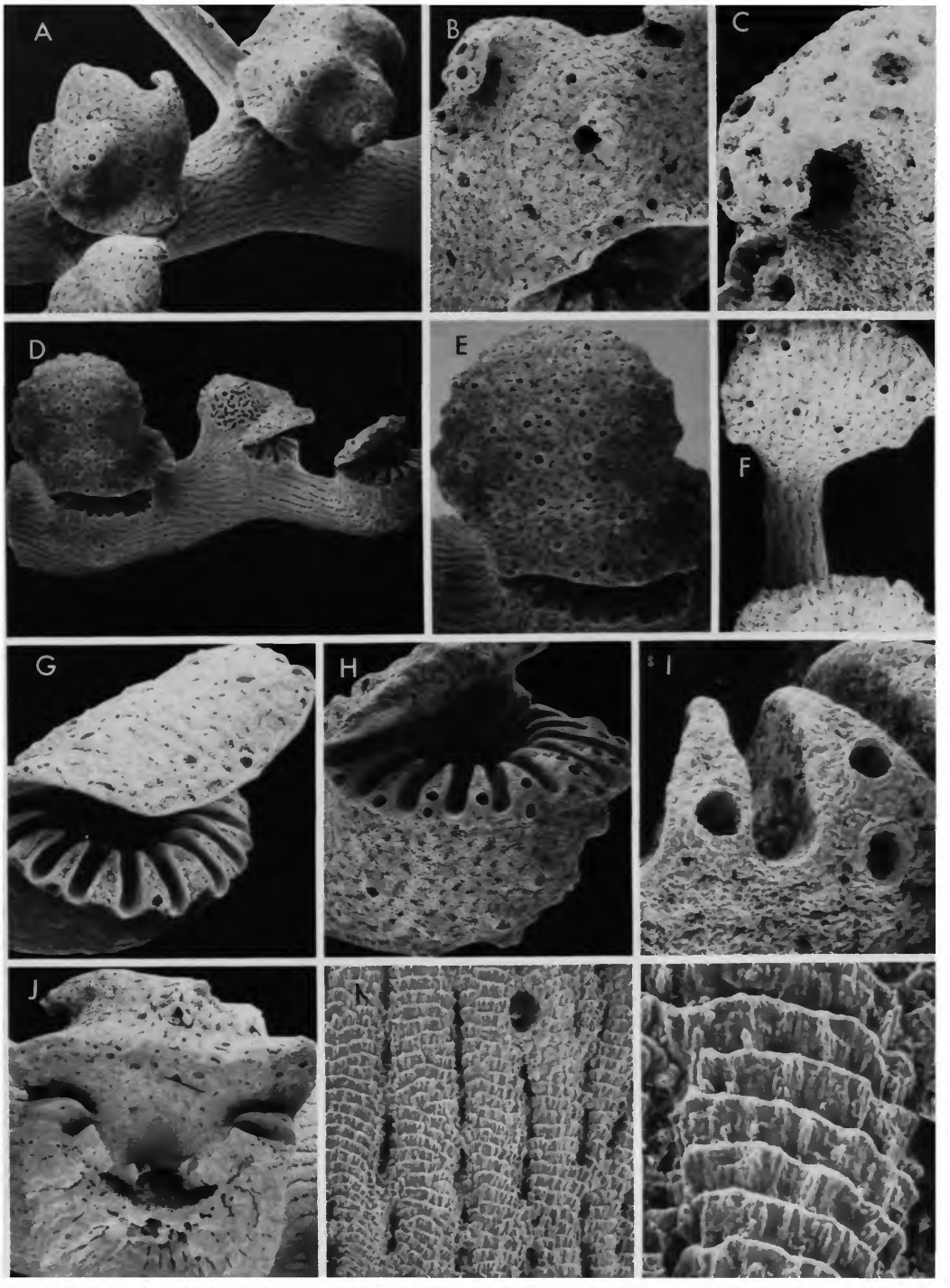
Diameter of upper gastropore chamber about 0.62 mm; aperture leading to lower chamber about 0.46 mm in diameter. Cyclosystem lid tongue shaped and slightly concave above, with rounded distal margins. Viewed from above, lid covers entire gastropore chamber but not outer edges of pseudosepta; maximum width of lid about 0.9 mm. Lid horizontal and thin, swelling only in its vertical basal region to accommodate ampullae. Dactylopore slits about 0.10 mm wide. Pseudosepta wedge-shaped, concave above, and very slender, only about 70 μm wide at cyclosystem edge.

Female ampullae not hemispherical, rather each is a massive bulge in coenosteum at base of cyclosystem lid, sometimes extending partially around cyclosystem wall. Efferent pore about 0.21 mm in diameter, opening beneath cyclosystem lid. Male ampullae form a compartmentalized ring entirely encircling cyclosystem but concentrated near lid region. Each ampulla has a small efferent pore 60–70 μm in diameter, which opens into two or three interpseudoseptal regions (dactylotomes) adjacent to the lid.

DISCUSSION.—Among the western Atlantic species, *C. glossopoma* is unique in having a moderately sized, tongue-shaped cyclosystem lid. It is most similar to *C. papillosa*, which is discussed in the account of that species (also see Table 3).

ETYMOLOGY.—The specific name *glossopoma*

FIGURE 47.—*Crypthelia insolita* (A–C, F–G, J, paratype from *Rosaura*-34; E–F, H–I, K–L, *BL*-269): A–B, triads of male ampullae on cyclosystem lids, × 21, × 40, respectively; C, male efferent pore beneath extention, × 110; D–E, female ampullae covered with nematopores, × 17, × 31, respectively; F–G, broad cyclosystem lid, × 26, × 45, respectively; H–I, nematopores on pseudosepta, × 48, × 165, respectively; J, longitudinal section of a cyclosystem, × 34; K–L, coenosteal texture, × 140, × 575, respectively.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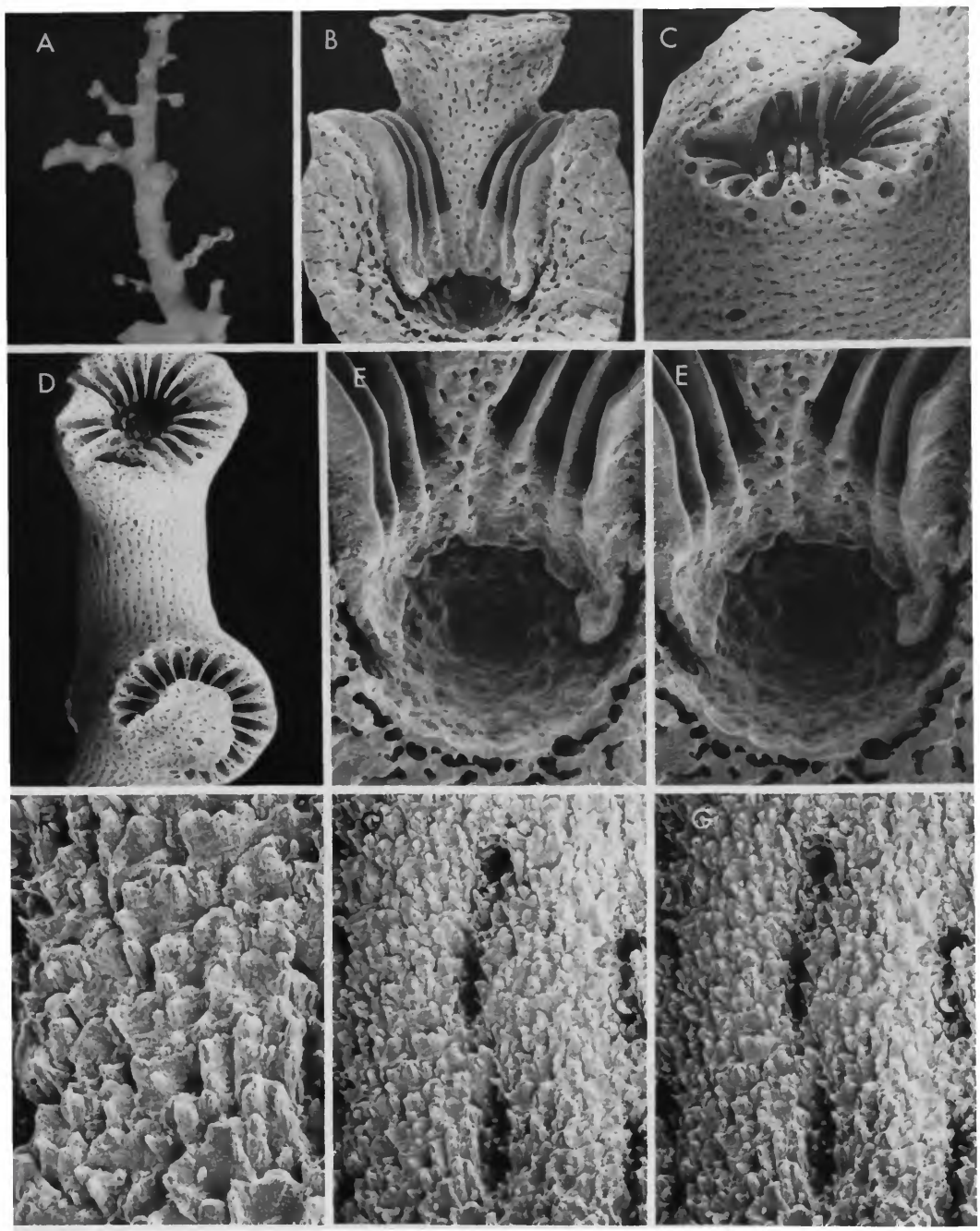


FIGURE 48.—*Crypthelia glossopoma* (A, holotype; B, E, *G*-169; C–D, F–G, *P*-944): A, holotype colony, × 1.35; B, E, longitudinal section through cyclosystem, × 31, × 59, respectively (E is a stereo pair); C, cyclosystem showing nematopore arrangement, × 32; D, two cyclosystems, × 15; F–G, coenosteal texture, × 505, × 240, respectively (G is a stereo pair).

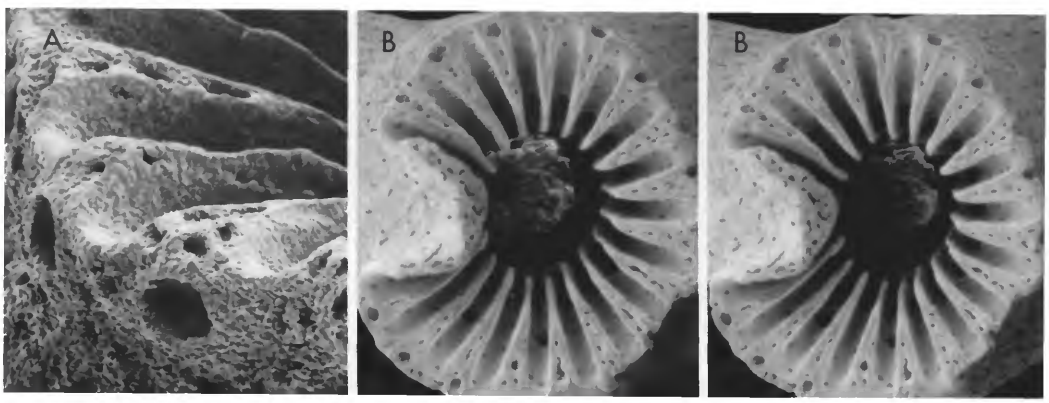


FIGURE 49.—*Crypthelia glossopoma* (A, paratype from *P*-944; B, paratype from *P*-954): A, outer edges of pseudosepta showing placement of nematopores, × 115; B, male cyclosystems with two efferent pores opening into third and fifth dactylotomes counterclockwise from lid, × 33, stereo pair.

(Greek glōssa for "tongue" plus pōma for "lid"; compound noun in apposition) refers to the tongue-shaped lid covering the gastropore.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: P*-944 (male), USNM 71801.

Paratypes: BL-126 (1 branch) MCZ; *G*-169 (1 colony) USNM 71802; *G*-785 (1 branch) USNM 71803; *G*-889 (2 branches) USNM 71804; *P*-954 (2 branches) UMML.

TYPE-LOCALITY.—16°33′N, 61°37′W (off Guadeloupe), 390 m.

DISTRIBUTION.—Straits of Florida; Yucatan Channel; Lesser Antilles (Map 23; pattern 4); 198–864 m.

40. *Crypthelia papillosa*, new species

FIGURE 50A–G

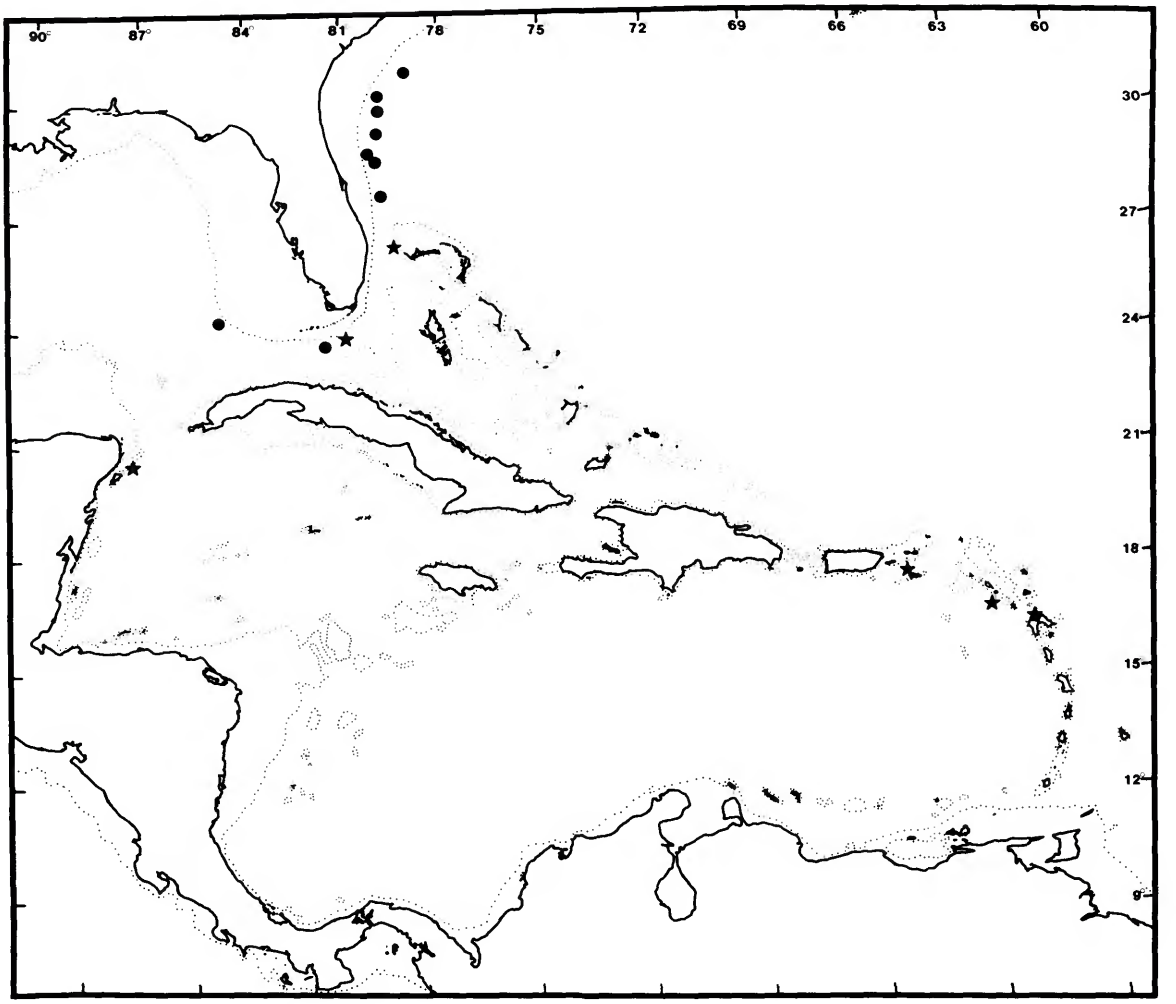
DESCRIPTION.—Specimens fragmentary, size and shape of colonies unknown. Terminal branches cylindrical, about 0.65 mm in diameter. Coenosteum white, linear-imbricate in texture. Strips well defined and convex, 60–95 μm wide. Platelets broad, with longitudinal ridges. Round nematopores, 30–35 μm in diameter, occur on cyclosystem lid (especially around outer edges), on branch coenosteum, and on upper and outer edges of pseudosepta. Nematopores usually elevated on small conical mounds up to 0.12 mm tall. Coenosteal nematopores often occur in high concentrations.

Cyclosystems elliptical, about 1.9 × 1.5 mm in diameter, their upper margins flared. Based on 31 cyclosystems, the range of dactylopores per cyclosystem is 16–22; the average is 17.96, (σ = 1.40) and the mode is 18.

Diameter of aperture to lower chamber about 0.34 mm. Cyclosystem lid broad and concave above, up to 80%–110% of the width of cyclosystem. Dactylopore slits narrow, about 51 μm wide. Pseudosepta wedge-shaped and broad, up to 0.24 mm wide. Tops of pseudosepta concave, rimmed by low ridges (Figure 50E).

Female ampullae massive, hemispherical, and up to 2.2 mm in diameter; restricted to cyclosystem lid. Efferent pores not present in material examined. Male ampullae unknown.

DISCUSSION.—*Crypthelia papillosa* is most similar to *C. glossopoma*, particularly in regard to cyclosystem size and average number of dactylopores per cyclosystem. It can be differentiated by its much broader pseudosepta; broader cyclosystem lids; smaller nematopores, which are usually raised on mounds; and different location of the female ampullae (Table 3).



MAP 23.—Distribution of *Crypthelia glossopoma* (stars) and *C. floridana* (circles).

ETYMOLOGY.—The specific name *papillosa* (Latin for "small pimples") refers to the elevated nematopores.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype: BL*-154 (female), USNM 71805.

Paratypes: BL-155 (3 branches) MCZ; *BL*-241 (1 branch) MCZ.

TYPE-LOCALITY.—16°41′N, 62°15′W (off Montserrat), 545 m.

DISTRIBUTION.—Lesser Antilles (Map 24; pattern 2b); 161–545 m.

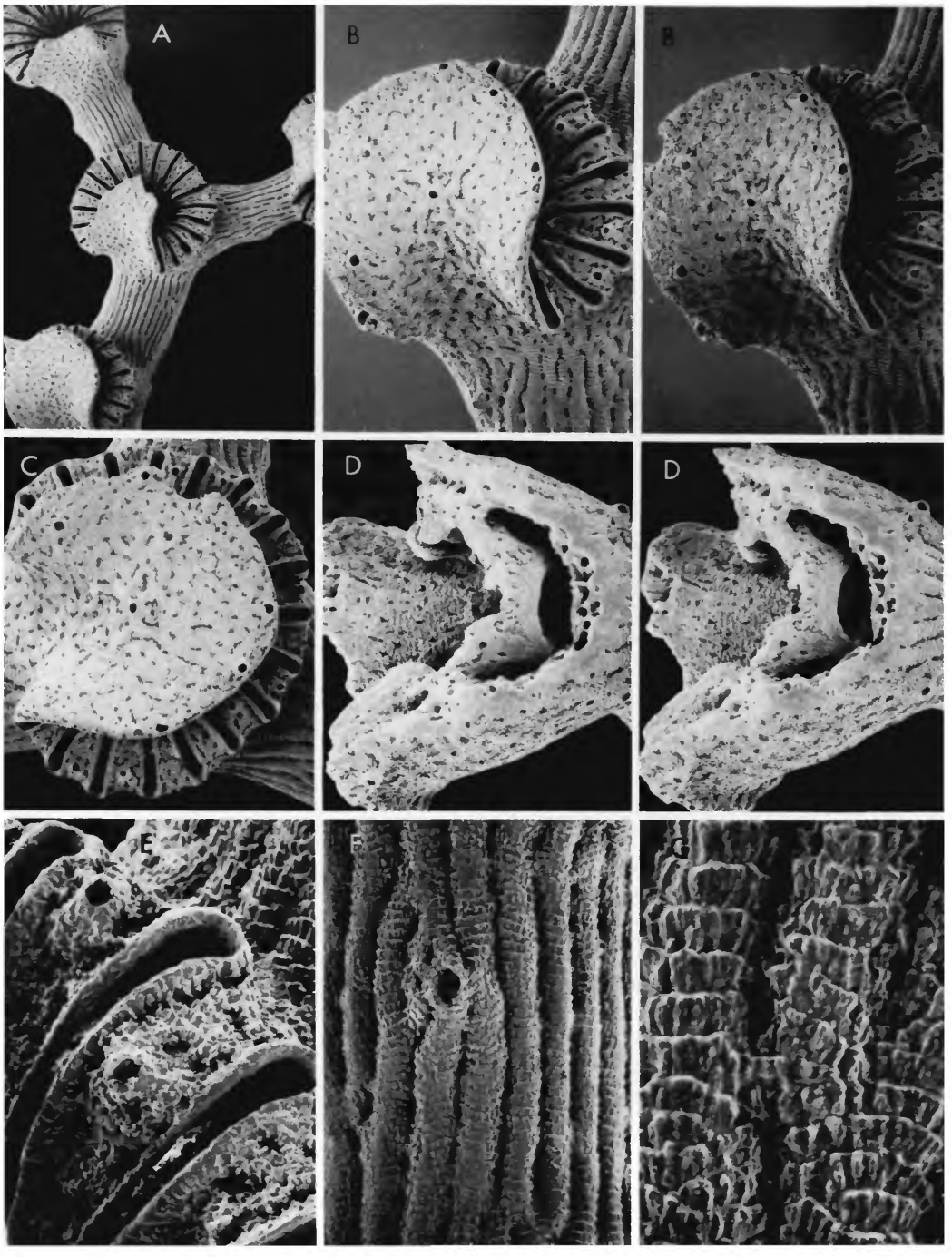
41. *Crypthelia floridana*, new species

FIGURE 51A–G

?*Crypthelia peircei* Pourtalès, 1867:115 [in part: probably specimen from off Georgia].

Crypthelia sp.—Fenninger and Flajs, 1974;75, pl. 5: figs. 1, 2, 7, pl. 10: fig. 3.

FIGURE 50.—*Crypthelia papillosa* (A–G, fragment of holotype): A, branchlet, × 12.5; B–C, cyclosystems, × 31, × 32, respectively (B is a stereo pair); D, longitudinal section through a cyclosystem revealing circular aperture to lower chamber, × 36, stereo pair; E, several pseudosepta, × 125; F–G, coenosteal texture, × 69, × 245, respectively.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DESCRIPTION.—Branch fragments uniplanar, colony size unknown. Distal branches about 0.65 mm in diameter. Coenosteum white, linear-imbricate in texture. Coenosteal strips highly convex, 60–85 μm wide. On larger-diameter branches every second, third, or fourth strip is higher and thinner (about 55 μm wide) than others, forming low ridges. Platelets broad and studded with longitudinally oriented spines up to 15 μm long. Round nematopores, about 65 μm in diameter, sometimes present on tops of pseudosepta near cyclosystem edge, but their occurrence there is erratic. Nematopores sometimes present on coenosteal strips and cyclosystem lid, and usually on ampullae. Nematopore flush with coenosteal surface.

Cyclosystems round to elliptical in shape, the greater axis transverse to branch axis: typical cyclosystem diameters are 2.2 × 1.7, 1.9 × 1.4, and 1.8 × 1.6 mm. Upper margin of cyclosystems slightly flared, producing an open fossa. Based on 50 cyclosystems (all specimens available) the range of dactylopores per cyclosystem is 16–21; the average is 18.91 ($\sigma = 1.14$), and the mode is 18.

Upper gastropore chamber cylindrical and deep, about 0.40 mm in diameter. Diameter of aperture to lower chamber only slightly less than diameter of upper chamber. Lower chamber about 0.61 mm in diameter. Cyclosystem lid small and oriented slightly obliquely, such that when viewed from above it usually covers less than half of gastropore. Lid about 0.75 mm wide, with rounded edges and slightly concave top. Some cyclosystems lack lid. Dactylopore slits about 75 μm wide. Pseudosepta wedge-shaped, elongate, concave above, and about 0.13 mm wide at cyclosystem edge. Lower, inner margins of pseudosepta extend along upper gastropore chamber almost to aperture.

Female ampullae large hemispheres up to 1.0 mm in diameter located on proximal cyclosystem wall. Efferent pores were not seen. Male ampullae form a swollen ring around cyclosystem wall, as in *C. glossopoma;* however, their efferent pores are located on the upper outer edges of every third or fourth pseudoseptum. Male efferent pores irregular in shape, about 50 μm in diameter. Internal diameter of a male ampulla 0.38 × 0.22 mm.

DISCUSSION.—*Crypthelia floridana* is most similar to *C. glossopoma.* It has slightly larger cyclosystems and a slightly higher average number of dactylopores per cyclosystem (Table 3). Both species have flared cyclosystems, tiny spines on the coenosteal platelets, and male ampullae that encircle the cyclosystem. *C. floridana* is distinguished by its ridged coenosteum, smaller cyclosystem lid, wider pseudosepta, more prominent female ampullae, and male efferent pores that open to the outside of the cyclosystem (not inside as in *C. glossopoma*).

Although not found at the MCZ, Pourtalès's (1867) record of *C. peircei* from off Georgia is presumed to be *C. floridana,* based on its locality.

ETYMOLOGY.—This species is named *floridana* because most of the known records are from off Florida.

MATERIAL EXAMINED.—Types.

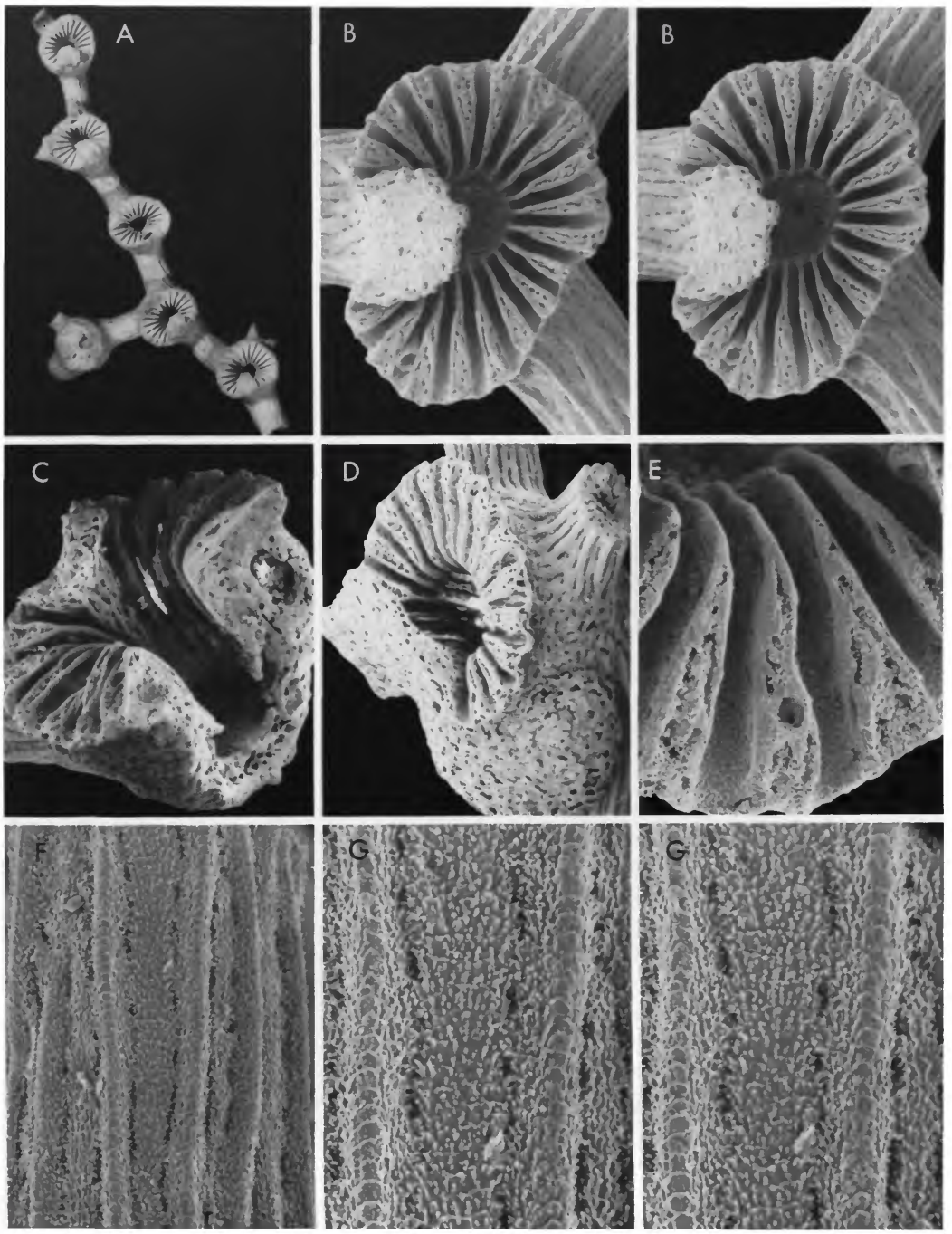
TYPES.—*Holotype: Gos*-1630 (male) USNM 71806.

Paratypes: Gos-1630 (7 branches) USNM 71807; *Bibb* station west of Tortugas (1 branch) MCZ; *Bibb*-22 (1 branch) MCZ; *ALB*-2662 (1 branch) USNM 15982; *Gos*-1643 (2 branches) USNM 71808; *Gos*-1644 (1 branch) USNM 71809; *Gos*-1653 (1 branch) UMML; *Gos*-1655 (1 branch) USNM 71810; *Silver Bay*-451 (1 branch) USNM 71811.

TYPE-LOCALITY.—28°02′N, 79°31′W (off Cape Canaveral, Florida), 783 m.

DISTRIBUTION.—Continental slope off eastern and southwestern Florida (Map 23; pattern 3); 593–823 m.

FIGURE 51.—*Crypthelia floridana* (A, holotype; B, E–G, paratype from *Gos*-1644; C, paratype from *Gos*-1630; D, paratype from *Bibb*-22): A, holotype colony, × 4.6; B, cyclosystems, × 28, stereo pair; C, longitudinal section of a cyclosystem and ringlike male ampullae encircling cyclosystem, × 28; D, cyclosystem with female ampullae, × 27; E, pseudosepta, × 83; F–G, coenosteal texture, × 71, × 140, respectively (G is a stereo pair).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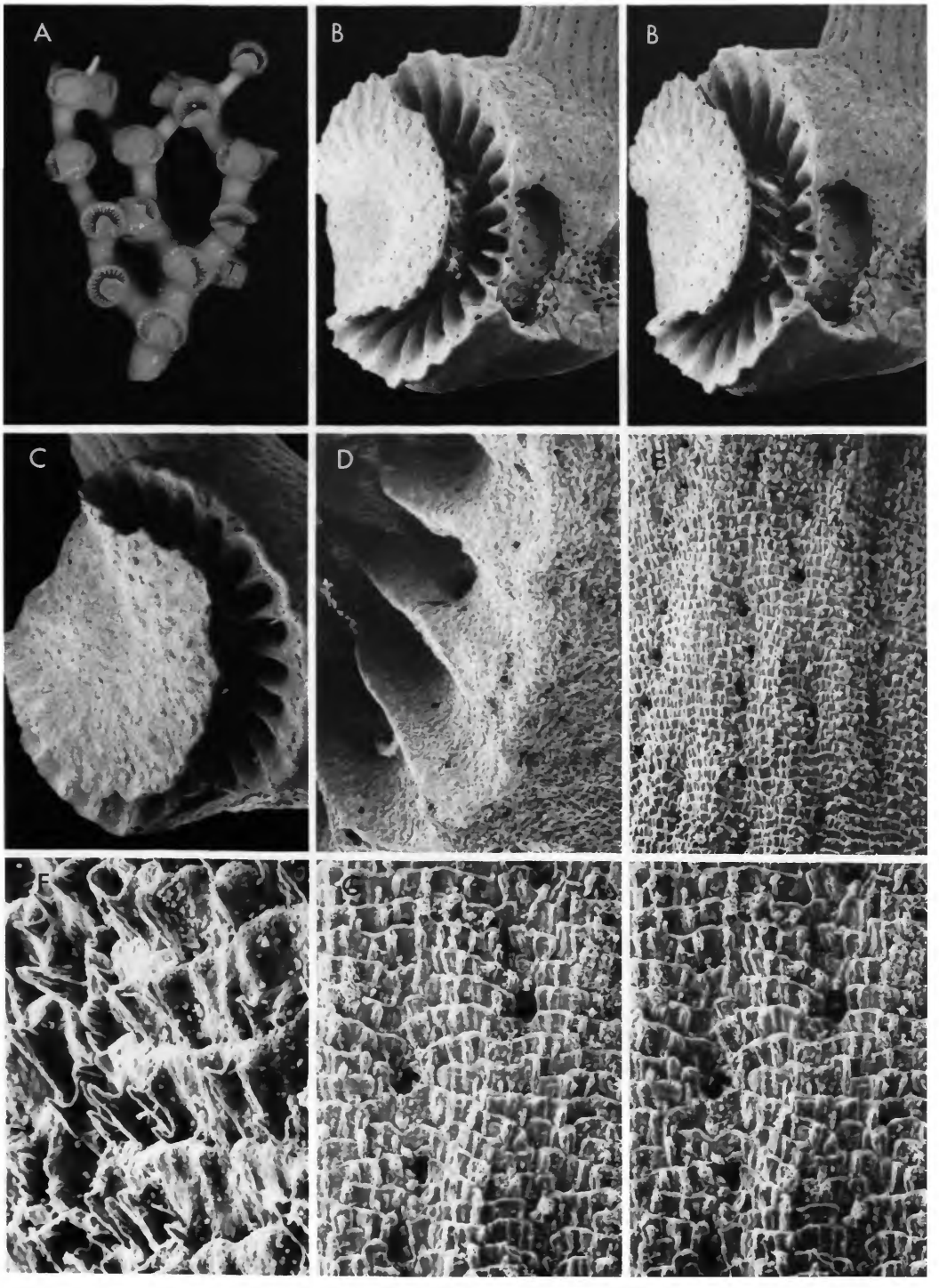
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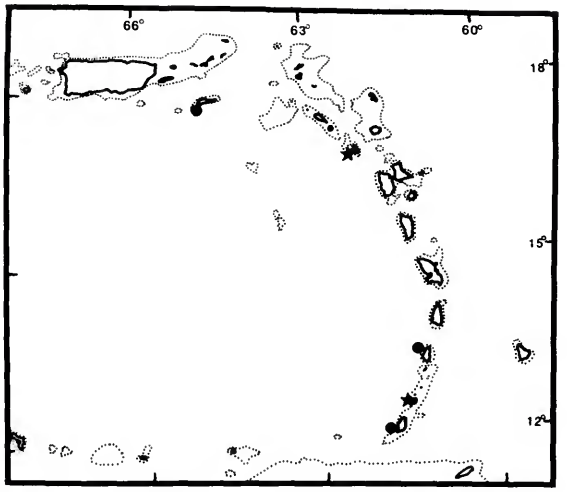


MAP 24.—Distribution of *Crypthelia papillosa* (stars) and *C. tenuiseptata* (circles). *C. tenuiseptata* is known also from eastern Atlantic.

42. *Crypthelia tenuiseptata*, new species

FIGURES 52A–G, 53K

Crypthelia sp.—Zibrowius and Cairns, 1982:212 [unnamed].

DESCRIPTION.—Branch fragments uniplanar, largest fragment 2.1 cm tall and 2.5 cm broad, with a basal branch diameter of 4.0 mm. Branch anastomosis common; distal branches cylindrical, about 0.80 mm in diameter. Coenosteum white, linear-imbricate in texture. Coenosteal strips broad and slightly convex, 0.12–0.14 mm wide. Platelets broad and ridged, each ridge bearing a spine up to 18 μm long and about 3.5 μm in diameter. Coenosteal nematopores not present.

Cyclosystems slightly elliptical, the greater axis transverse to branch axis. Typical cyclosystem diameters are 3.2 × 2.4 and 3.0 × 2.2 mm. Upper margin of cyclosystem quite flared, sometimes extending outward as a smooth rim without identations for dactylotomes. Based on 28 cyclosystems (all material available), there is a range of 15–22 dactylopores per cyclosystem; the average is 19.43 (σ = 1.77), and the two modes are 19 and 21.

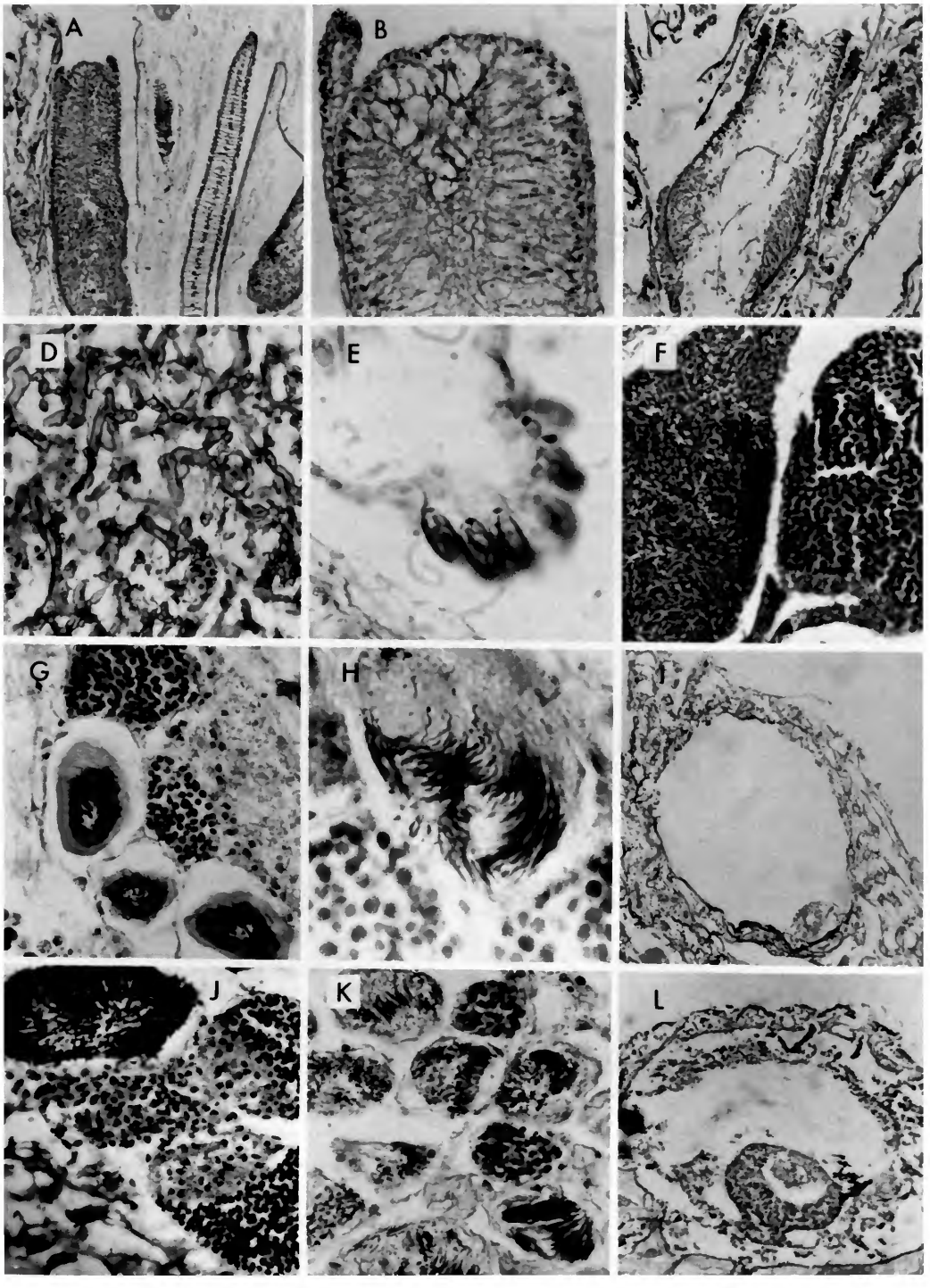
Upper gastropore chamber cylindrical and deep, and about 1.15 mm in diameter. Aperture to lower chamber about 0.70 mm in diameter. Cyclosystem lid large, horizontal, and slightly concave above; completely covering the gastropore and inner edges of pseudosepta. Fully intact lids up to 2.1 mm broad. Dactylopore slits about 0.18 mm wide. Pseudosepta not concave and quite slender, up to 0.12 mm wide at cyclosystem edge but narrowing to 40–60 μm near the gastropore. Lower, inner edges of pseudosepta extend almost to aperture to lower chamber.

Female ampullae unknown. Male ampullae shaped as a continuous ring encircling the cyclosystem and sometimes extending into base of cyclosystem lid. Multiple efferent pores about 0.10 mm in diameter open inside the cyclosystem in dactylotome cavities. In one cyclosystem with 18 dactylopores there were 9 efferent pores equally spaced around the inside of the cyclosystem.

Dactylozooid nematocysts 8.5–9.0 × 3.0–3.5 μm. Nematocysts of epithelium and nematophores 19–20 × 5 μm. Nematopores not distinguishable on coenosteum but nematophores present in histological section, occurring on branch coenosarc and ampullae epithelium. Thus nematophores are apparently not located in pits on the branch surface. Circular ampullae divided into 15–20 compartments, each having 20–30 "pseudofollicles" (sensu Broch, 1914) containing sperm in varying degrees of development. In this respect the gonophores are compound, such as those reported for *Pliobothrus*.

DISCUSSION.—*Crypthelia tenuiseptata* has by far the largest cyclosystems of all the Atlantic congeners. It is the only species not to have coenosteal pits to contain its nematophores, and shares only with *C. glossopoma* the character of internally opening male efferent pores (Table 3).

FIGURE 52.—*Crypthelia tenuiseptata* (A–G, holotype): A, holotype colony (preserved in alcohol), × 3.7; B–C, broken cyclosystem revealing ringlike male ampullae, × 17, × 21, respectively (B is a stereo pair); D, thin outer edges of pseudosepta, × 70; E–G, coenosteal texture, × 72, × 560, × 150, respectively (G, is a stereo pair).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ETYMOLOGY.—The specific name *tenui septata* (Latin for "thin septa") refers to the narrow pseudosepta of the cyclosystems.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* *BL*-264 (1 male colony) MCZ, (3 HS) USNM 72315.

Paratypes: *BL*-131 (1 branch) MCZ 6092; *BL*-230 (1 colony) USNM 71812.

TYPE-LOCALITY.—12°03'N, 61°49'W (off Grenada), 761 m.

DISTRIBUTION.—Lesser Antilles and, according to Zibrowius and Cairns (1982), off Hyères Bank, Azores, and Madeira (Map 24; pattern 2b); 761–1061 m.

Distribution

PATTERNS OF DISTRIBUTION.—As stated in the "Introduction," there are probably many more species of stylasterids to be described from the Caribbean, and there is certainly much more to be learned about the geographic ranges of most species. Nonetheless, based on current knowledge, there are five general patterns of distribution that can be discerned in the Caribbean and adjacent waters.

1. Widespread in Caribbean and adjacent waters
2. Antillean (Greater and Lesser Antilles, Bahamas, and Jamaica)
   a. Throughout Antilles
   b. Restricted to Lesser Antilles (but including Puerto Rico)
   c. Insular margin of Straits of Florida
3. Continental slopes of southeastern United States
4. Antilles and continental slopes of southeastern United States
5. Western Caribbean

Two species are widespread throughout the Caribbean (pattern 1). *Stylaster roseus* has the broadest distribution and also has the shallowest bathymetric range. It is the only species known to occur off Panama and the Netherlands Antilles but has never been found off the Florida coast. *Stylaster duchassaingi* is also broadly distributed but is not found in the southwestern Caribbean.

Two-thirds of the species (28) are restricted to the Greater and/or Lesser Antilles, a pattern termed Antillean by Ekman (1953:53) and called the West Indian Province by Briggs (1974). Because many of these species appear to be highly localized, this pattern has been subdivided into three components. Only two of the 28 species occur throughout the Antilles (pattern 2a); 16 are restricted to the Lesser Antilles (pattern 2b); and 10 are found only on the insular margin of the Straits of Florida (pattern 2c). Two of the 10 species in the last group also have outlying records off the Yucatan Peninsula.

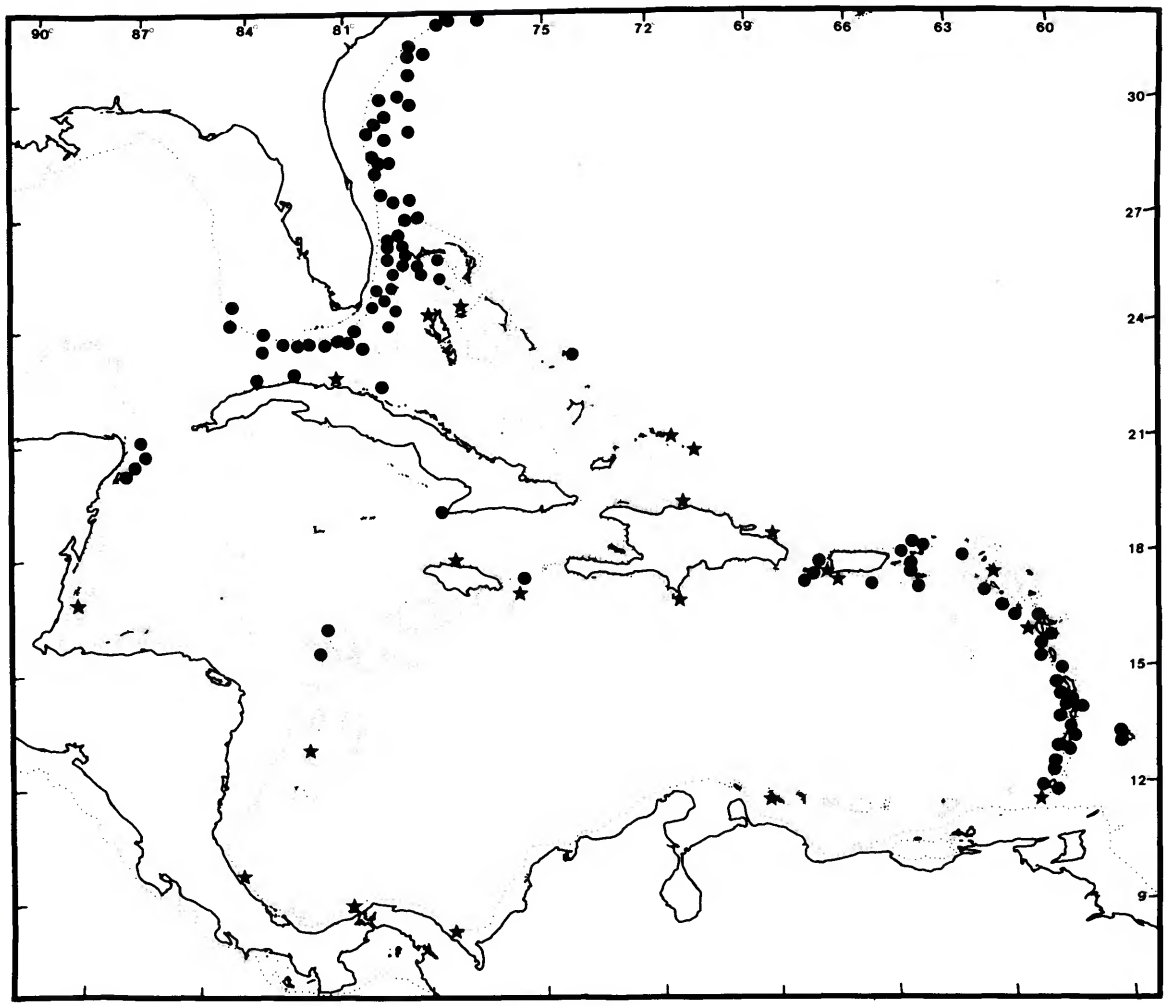
Five species, or 12% of the fauna, have distributions restricted to the continental slopes of the southeastern United States, often from the Florida Keys to as far north as the Blake Plateau off South Carolina (pattern 3). Of these species, *Stylaster erubescens*, is also found off the Yucatan Peninsula and off Cay Sal Bank.

Three species are found in the Antilles and the continental slopes off the southeastern United States, or a combination of patterns 2 and 3, designated pattern 4. Two of these species are also found off the Yucatan Peninsula.

Finally, two species of *Distichopora* are known only from the western Caribbean (pattern 5).

Two species, *Errina altispina* and *Stylaster inornatus*, are known only from off Arrowsmith Bank, Yucatan Peninsula. This is apparently a transitional area zoogeographically because it forms a natural part of patterns 1 and 5 and is

FIGURE 53.—Histological section of various species: A, *Lepidopora clavigera*, *BL*-282, longitudinal section of gastrozooid (left) and dactylozooid (right), × 115; B, *L. clavigera*, BL-282, tip of gastrozooid, × 425; C, *Distichopora contorta*, *ALB*-2334, longitudinal section of gastrozooid with tentacles, × 100; D, *Stylaster roseus*, Carrie Bow Cay, Belize, USNM 72248, section through coenosteal canals, × 450; E, *Lepidopora biserialis*, *BL*-76, longitudinal section through a nematophore pit, × 1060; F, *Lepidopora decipiens*, *BL*-171, male gonophores, × 415; G, *Pliobothrus tubulatus*, J-S 43, compound male ampulla containing gonophores at various stages of maturity, × 405; H, same as G, a gonophore containing sperm, × 970; I, *Stylaster aurantiacus*, *ALB*, USNM 16010, incipient female gonophore, × 110; J, *Errina cochleata*, *Alvin*-764, male gonophores, × 380; K, *Crypthelia tenuiseptata*, *BL*-264, compartmentalized male gonophores in various stages of maturation, × 425; L, *Distichopora contorta*, *ALB*-2334, incipient female gonophore, × 100.



MAP 25.—Map showing all localities at which stylasterids have been collected in the western Atlantic. Stars represent shallow-water stations at which *Stylaster roseus* was collected; circles represent all other species.

also sometimes appended to distributional patterns 2c, 3, and 4. Therefore, species with records only from off the Yucatan Peninsula cannot be assigned to any particular pattern.

COMPARISONS TO DEEP-WATER SCLERACTINIAN FAUNA.—Scleractinia and stylasterids are quite similar in many ways, e.g., morphologically, ecologically, and physiologically. They are both coelenterates with internal calcium carbonate skeletons, which support polyps that feed by means of nematocyst-bearing tentacles. Presumably they eat the same kind of food: zooplankton. They both require low-turbidity water but relatively high water current to supply food and oxygen to their stationary feeding polyps and to remove waste products. They both reproduce via the planula larva, which in both cases requires a hard substrate on which to settle and subsequently support itself. And yet there are striking differences in the distributions of the two groups.

The most apparent difference is the complete absence of stylasterids from the Gulf of Mexico, continental southern Caribbean, and off Bermuda. In fact, stylasterids are never found close to continental land masses (Map 25). The closest records to Colombia are actually off the Netherlands Antilles; those off Honduras, Panama, Mexico, and Costa Rica are considerably offshore, usually associated with an island or bank; those off Florida are associated with the Florida Keys or are many kilometers offshore on the Blake Plateau. Apparently stylasterids are much more sensitive to the variable hydrographic conditions near large land masses, such as lowered salinity and increased water turbidity.

Secondly, stylasterids are considerably more endemic than scleractinians. In a companion study of the deep-water (over 200 m) Scleractinia of the western Atlantic, I tabulated 60% endemic, 27% amphi-Atlantic, and 12% cosmopolitan components for the 90 deep-water ahermatypic species (Cairns, 1979). The western Atlantic stylasterids are 93% endemic, and 7% amphi-Atlantic. Only three species have distributions outside the western Atlantic: *Crypthelia tenuiseptata* and *Pliobothrus symmetricus* occur in the eastern Atlantic north of the Azores, and *Stylaster erubescens* extends southward to Ireland. No cosmopolitan species of stylasterids are yet known. The western Atlantic stylasterids, which are overwhelmingly a deep-water group, are more similar to the western Atlantic shallow-water hermatypic Scleractinia in this regard, which has an 87% species endemism and a 13% amphi-Atlantic component (Cairns, 1979). Also, 19% of the deep-water Scleractinia have widespread Caribbean distributions (pattern 1) and 17% have Antillean distributions (pattern 2a), whereas only two species (5%) of the stylasterids fall into each of these two categories.

A third difference is that Scleractinia occur in deeper water than stylasterids, which may account for the greater endemism of the latter. Based on the deep-water western Atlantic Scleractinia, Cairns (1979:208) found the greatest species diversity at about 300 m, with 22 species (22/117 or 19% of all ahermatypes) occurring at 1000 m and 10 species (8.5% of all ahermatypes) as deep as 1500 m. The deepest western Atlantic scleractinian occurs at 3475 m. In contrast, the western Atlantic stylasterids are most diverse between 200–300 m, with only three species (7%) occurring at 1000 m and only one species (2.6%) known at over 1500 m, i.e., *Stenohelia profunda*, at 2021 m.

The Scleractinia and stylasterids are similar in that both have their highest species diversity in the Antilles, especially in the Lesser Antilles and off northern Cuba. They also share some distributional patterns, e.g., Antillean (pattern 2a), insular Straits of Florida (pattern 2b), and continental slopes of the southeastern United States (pattern 3), but the common pattern of Antillean plus western Caribbean reported by Cairns (1979) for 22% of the ahermatypic Scleractinia is not found at all in the stylasterids.

Appendix

Station List

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
		U.S.F.C.S. *Albatross* (*ALB*)		
2136	17°43′40″	75°38′25″	95	29 Feb 1884
2138	17°44′05″	75°39′00″	42	29 Feb 1884
2147	9°32′20″	79°54′45″	62	2 Apr 1884
2152	off Havana, Cuba		708	30 Apr 1884
2153	23°10′19″	82°23′10″	518	30 Apr 1884
2156	23°10′35″	82°21′55°	508	30 Apr 1884
2157	23°10′04″	82°21′07″	53	30 Apr 1884
2159	23°10′39″	82°20′05″	179	30 Apr 1884
2160	23°10′31″	82°20′37″	305	30 Apr 1884
2161	23°10′36″	82°20′28″	267	30 Apr 1884
2164	23°10′39″	82°20′29″	351	1 May 1884
2166	23°10′36″	82°20′30″	358	1 May 1884
2167	23°10′40″	82°20′30″	368	1 May 1884
2319	23°10′37″	82°20′06″	262	17 Jan 1885
2320	23°10′39″	82°18′48″	238	17 Jan 1885
2321	23°10′54″	82°18′00″	421	17 Jan 1885
2322	23°10′54″	82°17′45″	210	17 Jan 1885
2323	23°10′51″	82°19′03″	298	17 Jan 1885
2324	23°10′25″	82°20′24″	60	17 Jan 1885
2325	23°10′48″	82°19′54″	311	17 Jan 1885
2326	23°11′45″	82°18′54″	355	17 Jan 1885
2327	23°11′45″	82°17′54″	333	17 Jan 1885
2330	23°10′48″	82°19′15″	221	17 Jan 1885
2331	23°10′31″	82°19′55″	209	17 Jan 1885
2332	23°10′38″	82°20′06″	285	19 Jan 1885
2333	23°10′36″	82°19′12″	309	19 Jan 1885
2334	23°10′42″	82°18′24″	123	19 Jan 1885
2335	23°10′39″	82°20′21″	373	19 Jan 1885
2336	23°10′48″	82°18′52″	287	19 Jan 1885
2337	23°10′39″	82°20′21″	364	19 Jan 1885
2338	23°10′40″	82°20′15″	346	19 Jan 1885
2339	23°10′40″	82°20′15″	349	19 Jan 1885
2343	23°11′35″	82°19′25″	510	19 Jan 1885
2346	23°10′39″	82°20′21″	366	20 Jan 1885
2347	23°10′39″	82°20′21″	395	20 Jan 1885
2349	23°10′40″	82°20′15″	333	20 Jan 1885
2353	20°59′00″	86°23′00″	305	22 Jan 1885
2354	20°59′30″	86°23′45″	238	22 Jan 1885
2415	30°44′00″	79°26′00″	805	1 Apr 1885
2416	31°26′00″	79°07′00″	505	1 Apr 1885
2628	32°24′00″	76°55′30″	966	21 Oct 1885
2661	29°16′30″	79°36′30″	801	4 May 1886

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
2662	29°24′30″	79°43′00″	794	4 May 1886
2667	30°53′00″	79°42′30″	499	5 May 1886
2671	31°20′00″	79°22′00″	512	5 May 1886
2672	31°31′00″	79°05′00″	507	5 May 1886
2753	13°34′00″	61°03′00″	514	4 Dec 1887
2754	11°40′00″	58°33′00″	1609	5 Dec 1887
		R/V *Atlantis*		
2987	23°22′	79°53′	512–549	13 Mar 1938
2999	23°10′	81°29′	263–421	17 Mar 1939
3367	20°46′	75°02′	1170	19 Apr 1939
3782	30°10′	78°37′	759	25 Feb 1940
		University of Iowa Barbados-Antigua Expedition of 1918 (B-A)		
4	near 13°08′	59°37′	201	15 May 1918
9	off Pelican Island, Barbados		183	16 May 1918
47	SW of Lazaretto, off Pelican Island, Barbados		46–132	27 May 1918
64	Paynes Bay, Barbados		91	31 May 1918
70	off Telegraph Station, Barbados		110–128	1 June 1918
		U.S.C.S.S. *Bibb*		
22	24°14′20″	80°59′40″	592	4 May 1868
46	24°19′10″	81°30′00″	229	9 May 1868
62	24°17′55″	81°43′50″	225	11 May 1868
64	24°17′00″	81°43′00″	262	11 May 1868
169	24°18′00″	81°50′15″	247	21 Apr 1869
216	25°27′00″	79°57′00″	525	13 May 1868
		U.S.C.S.S. *Blake* (*BL*)		
16	23°11′	82°23′	534	1877–1878
24	23°02′	83°13′	625	1877–1878
44	25°33′	84°35′	986	1877–1878
52	23°09′	82°23′	289	1877–1878
59	23°09′	82°11′	289	1877–1878
68	23°09′	82°01′	444–838	1877–1878
69	23°09′	82°01′	183	1877–1878
76	23°25′	83°11′	282	1877–1878
100	off Havana, Cuba		457–732	Dec 1878
119	18°07′15″	64°55′30″	2021	2 Jan 1879
126	17°46′20″	64°53′25″	413	4 Jan 1879
131	17°38′45″	64°50′50″	1061	5 Jan 1879
134	17°37′15″	64°48′20″	454	5 Jan 1879
139	17°46′45″	64°48′50″	399	7 Jan 1879
154	16°41′10″	62°14′50″	545	16 Jan 1879
155	16°41′54″	62°13′24″	161	16 Jan 1879
157	16°41′54″	62°13′24″	220	16 Jan 1879
158	16°41′54″	62°13′24″	271	16 Jan 1879
164	15°55′55″	61°41′35″	276	21 Jan 1879
166	15°55′50″	61°37′05″	274	21 Jan 1879
170	15°57′25″	61°43′40″	675	22 Jan 1879

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
171	15°58′20″	61°43′12″	335	22 Jan 1879
176	15°32′18″	61°30′55″	715	24 Jan 1879
177	15°32′18″	61°30′10″	216	24 Jan 1879
187	15°14′10″	61°24′20″	750	28 Jan 1879
194	14°43′18″	61°12′25″	807	5 Feb 1879
198	14°30′40″	61°06′50″	251	6 Feb 1879
199	14°30′40″	61°06′50″	251	6 Feb 1879
205	14°25′15″	60°56′35″	607	10 Feb 1879
209	14°26′15″	60°58′10″	346	11 Feb 1879
211	14°28′40″	61°06′08″	653	12 Feb 1879
213	14°32′38″	61°06′40″	653	12 Feb 1879
216	13°51′45″	61°03′30″	280	15 Feb 1879
218	13°49′12″	61°04′40″	300	15 Feb 1879
219	13°49′50″	61°03′50″	276	15 Feb 1879
220	13°50′15″	61°03′45″	212	16 Feb 1879
224	13°06′34″	61°12′45″	209	18 Feb 1879
230	13°13′20″	61°18′45″	849	20 Feb 1879
231	13°12′10″	61°17′18″	174	20 Feb 1879
232	13°06′45″	61°06′55″	159	21 Feb 1879
238	12°46′10″	61°23′35″	230	23 Feb 1879
241	12°28′22″	61°32′18″	298	24 Feb 1879
246	12°05′45″	61°45′40″	282	25 Feb 1879
247	12°05′25″	61°47′15″	311	25 Feb 1879
249	11°48′15″	61°48′45″	479	27 Feb 1879
259	12°03′15″	61°46′25″	291	28 Feb 1879
264	12°03′15″	61°48′30″	761	1 Mar 1879
269	13°07′55″	61°05′36″	227	3 Mar 1879
271	13°05′00″	61°13′00″	838	3 Mar 1879
272	13°04′12″	59°36′45″	139	5 Mar 1879
273	13°03′05″	59°36′18″	188	5 Mar 1879
276	13°03′50″	59°37′05″	172	5 Mar 1879
277	13°03′55″	59°38′25″	199	5 Mar 1879
278	13°04′50″	59°37′40″	126	6 Mar 1879
282	13°05′20″	59°40′00″	282	7 Mar 1879
285	13°05′12″	59°37′18″	24	7 Mar 1879
286	13°10′58″	59°38′25″	13	8 Mar 1879
290	13°11′54″	59°38′45″	134	9 Mar 1879
292	13°13′55″	59°38′50″	102	9 Mar 1879
300	13°06′30″	59°39′20″	150	10 Mar 1879
319	32°25′00″	77°42′30″	479	13 Jul 1880
XXIV	off Cape Cruz, Cuba		377	1880
XXX	21°26′30″	86°28′40″	93	1880
		H.M.S. *Challenger*		
23	18°24′	63°28′	823	15 Mar 1873
24	18°38′30″	65°05′30″	713	25 Mar 1873
		R/V *Eastward*		
26037	26°29′	79°06′	560–640	Nov 1974
26537	27°14.2′	79°15.5′	520	Mar 1975
26538	27°13′	79°14′	420	Mar 1975

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
26542	27°14′	79°14′	440	Mar 1975
26549	27°18′	79°13′	370	Mar 1975
31281	26°53.9′	79°07.3′	320	Mar 1977
		R/V *Gerda* (*G*)		
44	25°36′	79°45′	570–695	21 Jul 1962
103	25°22′	79°41′	824	10 May 1963
114	24°02′	83°02′	759–869	18 Jun 1963
132	24°23′	80°48′	275–302	21 Jun 1963
134	24°29′	80°58′	191	21 Jun 1963
135	24°29′	80°53′	220	21 Jun 1963
169	27°01′	79°22′	522–567	29 Jun 1963
170	27°06′	79°32′	659–677	29 Jun 1963
177	27°17′	79°34′	686	30 Jun 1963
251	27°25′	78°41′	293–311	15 Feb 1964
270	25°30′	79°21′	311–329	30 Mar 1964
276	25°23′	79°17′	329	31 Mar 1964
293	25°05′	79°21′	840–842	4 Apr 1964
298	25°55′	79°27′	650–677	5 Apr 1964
304	25°26′	79°23′	796	23 May 1964
317	25°39′	79°35′	779–791	25 May 1964
354	25°39′	79°32′	805–830	24 Aug 1964
382	26°10′	79°37′	686–699	18 Sept 1964
386	27°09′	79°18′	604	19 Sept 1964
393	27°21′	79°11′	165–174	19 Sept 1964
403	27°49′	78°50′	824	20 Sept 1964
480	24°30′	80°57′	192	26 Jan 1965
482	24°29′	80°54′	201–210	26 Jan 1965
493	26°32′	78°55′	183–549	3 Feb 1965
522	26°05′	78°49′	322–366	3 Mar 1965
533	26°27′	78°43′	384–403	4 Mar 1965
580	24°27′	81°27′	146	14 Apr 1965
598	24°47′	80°26′	183	15 Apr 1965
636	26°04′	79°13′	46–128	30 June 1965
661	27°07′	79°32′	695–718	17 Jul 1965
663	27°30′	79°22′	569–576	17 Jul 1965
670	28°09′	79°02′	805	18 Jul 1965
691	26°35′	78°24′	333–375	21 Jul 1965
693	26°34′	78°26′	275–293	21 Jul 1965
697	26°29′	78°39′	247–374	22 Jul 1965
703	26°29′	78°40′	27–165	22 Jul 1965
708	26°27′	78°46′	650	22 Jul 1965
713	25°59′	79°15′	190–201	2 Aug 1965
785	24°39′	80°40′	205–210	16 Aug 1966
798	25°56′	79°22′	402	12 Sep 1966
808	26°38′	79°33′	751	13 Sept 1966
813	24°32′	80°40′	201	21 Jun 1967
835	24°22′	81°11′	187–198	11 Jul 1967
836	24°26′	80°58′	198	11 Jul 1967
838	24°25′	80°58′	210–229	11 Jul 1967
865	24°31′	80°58′	174	29 Aug 1967

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
866	24°28′	81°09′	187	29 Aug 1967
881	21°00′	86°25′	27	8 Sep 1967
882	21°12′	86°20′	64–73	9 Sep 1967
885	21°10′	86°28′	419–433	9 Sep 1967
887	21°05′	86°28′	37–157	9 Sep 1967
889	20°55′	86°28′	177–220	10 Sep 1967
890	20°58′	86°25′	37–42	10 Sep 1967
897	20°59′	86°24′	210–293	10 Sep 1967
936	26°35′	79°20′	603	1 Oct 1967
940	21°07′	86°21′	48–55	27 Jan 1968
954	21°11′	86°30′	165–311	28 Jan 1968
956	20°50′	86°30′	46–183	29 Jan 1968
972	24°24′	80°52′	221–230	3 Feb 1968
973	24°22′	80°55′	274–329	3 Feb 1968
974	24°22′	80°57′	251	3 Feb 1968
976	24°30′	81°13′	183	3 Feb 1968
977	24°32′	81°08′	183	3 Feb 1968
978	24°32′	81°07′	183	3 Feb 1968
983	24°05′	80°20′	216	5 Mar 1968
984	24°05′	80°20′	155–230	5 Mar 1968
991	25°42′	80°03′	254–274	30 Mar 1968
1102	24°16′	81°34′	247–284	29 Apr 1969
1103	24°16′	80°55′	339–503	29 Apr 1969
1246	23°58′	80°29′	unknown	11 Mar 1970
1270	21°05′	86°31′	318	20 Aug 1970
1275	21°02′	86°29′	225–439	21 Aug 1970
1276	21°02′	86°28′	141–293	21 Aug 1970
1329	25°50′	78°22′	234–265	11 Dec 1971
		R/V *Gosnold* (*Gos*)		
1589	24°45.3′	80°33.1′	149	1 Jun 1964
1591	24°46.3′	80°24.3′	199	2 Jun 1964
1601	25°38.4	79°50.0′	683	2 Jun 1964
1607	26°07.8′	79°54.2′	284	3 Jun 1964
1630	28°02.2′	79°31.1′	783	4 Jun 1964
1641	28°52.2′	79°24.1′	777	5 Jun 1964
1643	29°01.0′	79°40.3′	822	5 Jun 1964
1644	29°09.8′	79°44.3′	802	5 Jun 1964
1647	29°41.5′	79°43.6′	727	6 Jun 1964
1650	30°01.0′	79°30.5′	779	6 Jun 1964
1653	30°22.5′	79°26.5′	835	6 Jun 1964
1655	30°40.7′	79°29.2′	797	6 Jun 1964
1731	30°11.0′	79°53.2′	534	14 Jun 1964
1733	30°14.3′	79°39.0′	861	14 Jun 1964
1734	30°20.4′	79°44.0′	664	14 Jun 1964
1742	30°44.7′	79°19.0′	752	14 Jun 1964
1743	30°51.0′	79°24.0′	802	14 Jun 1964
1748	31°11.4′	79°28.5′	524	16 Jun 1964
1767	31°49.6′	78°45.8′	455	17 Jun 1964
		R/V *Johnson Sea Link* (*JSL*)		
1273	24°07.5′	74°23.5′	265	7 Oct 1982
1354	Wood Cay, Grand Bahama Island		376–378	13 Jun 1983

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
1355	Wood Cay, Grand Bahama Island		231–301	13 Jun 1983
1357	Wood Cay, Grand Bahama Island		303	14 Jun 1983
1360	off Settlement Pt., Grand Bahama Island		306–313	16 Jun 1983
1362	off Settlement Pt., Grand Bahama Island		392	17 Jun 1983
1504	24°04.6′	74°33.1′	351	24 Oct 1983
1506	24°04.7′	74°33.1′	298	25 Oct 1983
	Johnson-Smithsonian Deep-Sea Expedition, 1933 (J-S)			
37	18°11′55″	67°42′50″	55	10 Feb 1933
43	18°03′45″	67°48′10″	439–549	11 Feb 1933
45	18°14′30″	67°25′30″	37–55	13 Feb 1933
47	18°17′05″	67°24′45″	512–612	13 Feb 1933
94	18°19′10″	65°03′30″	549–860	2 Mar 1933
102	18°51′	64°33′	256	4 Mar 1933
	M/V, R/V *Oregon I, II* (*O*)			
1025	25°12′	84°05′	137	19 Mar 1954
1328	24°55′	83°34′	366–549	9 Jul 1955
1346	24°28′	81°55′	183–220	18 Jul 1955
1348	24°29′	81°50′	274	18 Jul 1955
1349	24°03′	80°30′	274	18 Jul 1955
1890	16°35′	80°55′	183	24 Aug 1957
4932	16°06′	81°10.5′	165	9 Jun 1964
4938	20°31′	86°12′	274–300	11 Jun 1964
4941	20°59′	86°29′	201	12 Jun 1964
5000	14°53′	61°06′	73	10 Sep 1964
5062	14°04′	61°02′	79	29 Sep 1964
5933	15°25′	61°12′	110	5 Mar 1966
5949	14°04′	61°02′	66	8 Mar 1966
6690	29°17′	79°27′	878	9 May 1967
11725	31°44′	79°02′	543	22 Jan 1972
24237	17°50′	66°08′	384	18 Jul 1978
24238	17°50′	66°08′	549	18 Jul 1978
24273	14°04′	61°02′	73	8 Aug 1978
	R/V *Pillsbury* (*P*)			
112	32°08′	79°16′	70–95	28 Jul 1964
410	8°42.2′	77°28′	27–29	18 Jul 1966
589	21°14′	86°26′	311–492	14 Mar 1968
592	21°00′	86°23′	174–348	15 Mar 1968
595	21°08.5′	86°27′	33–586	15 Mar 1968
852	11°52.8′	61°53.3′	13	3 Jul 1969
855	12°07′	61°32.5′	27–29	3 Jul 1969
858	12°34.4′	61°20.7′	11–15	3 Jul 1969
861	12°42′	61°05.5′	18–744	4 Jul 1969
867	13°03′	61°06.8′	37	5 Jul 1969
874	13°11.2′	61°05.3′	156–201	6 Jul 1969
875	13°10.2′	61°05.5′	108–183	6 Jul 1969
881	13°20.8′	61°02.5′	576–842	6 Jul 1969
887	14°10.6′	60°55.8′	73–110	7 Jul 1969
891	14°05.2′	60°50.3′	265–567	7 Jul 1969
901	13°38′	60°56′	300	9 Jul 1969
907	14°26.8′	60°58.3′	115–214	9 Jul 1969

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
924	15°13.0′	60°56.9′	68	14 Jul 1969
926	15°13.2′	60°56.8′	73	14 Jul 1969
944	16°33.2′	61°36.8′	360–421	17 Jul 1969
954	16°55′	62°46.5′	686–1043	18 Jul 1969
978	17°46.5′	62°40.3′	44	22 Jul 1969
979	17°51.5′	62°38.7′	37	22 Jul 1969
1149	19°58.7′	71°33.7′	22–33	15 Jan 1970
1157	19°06.3′	69°01′	18–40	16 Jan 1970
1184	18°26′	74°35′	31	2 Jul 1970
1196	17°27.5′	75°57′	26	3 Jul 1970
1284	17°35′	71°25′	18–22	19 Jul 1970
1350	13°31.6′	81°20.6′	0–1	30 Jan 1971
1423	21°41.3′	71°22.8′	15–20	19 Jul 1971
		M/V, R/V *Silver Bay*		
451	29°48′	79°07′	823	11 Jun 1958
2416	24°18′	81°29′	229	28 Oct 1960
2418	24°15′	81°24′	265–293	28 Oct 1960
3468	27°26′	78°57′	137	25 Oct 1961
		R/V *Vema*		
15-1	31°54′	79°05′	220–413	29 Oct 1958
17-RD-29	60°27′	48°31′	326–366	4 Sep 1962
		Miscellaneous Stations		
		R/V *Alaminos*		
65A9-21	24°58′	84°17	399	14 Jul 1965
		Alvin		
764	27°55.8′	79°09.0	389	1 Jun 1977
		Bartlett		
52C-5	61°59′	26°35′	585	23 Sep 1975
		BLM		
2H	32°20′	78°10′	411	15 Feb 1977
		Calypso		
44	Ilotá Goyaves, Guadeloupe		10	Oct 1959
		R/V *Columbus Iselin*		
246	26°23′	79°37′	743–761	29 Oct 1974
		U.S.C.S.S. *Corwin*		
2 or 4	2.6 km off Chorrera, Cuba		494	24, 29 May 1867
		U.S.F.C.S. *Fish Hawk*		
7298	24°19′00″	81°39′45″	219	26 Feb 1902
		R/V *Gilliss* (Geology)		
44	24°26′	80°31′	275	unknown

Station	Latitude (°N)	Longitude (°W)	Depth (m)	Date
		R/V *Gilliss*		
71-7	24°43.6′	80°27.2′	165–200	unknown
		Rosaura		
34	12°05′	61°49′	720–800	27 Nov 1937

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