Stylasteridae (Hydrozoa: Hydroida) of the Galápagos Islands

STEPHEN D. CAIRNS

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY · NUMBER 426

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ABSTRACT

Cairns, Stephen D. Stylasteridae (Hydrozoa: Hydroida) of the Galápagos Islands. *Smithsonian Contributions to Zoology*, number 426, 42 pages, 27 figures, 2 tables, 1 map, 1986.—The 14 species of stylasterids known from the Galápagos Islands are described and illustrated by scanning electron photomicrographs. Nine species are described as new. Seven of the 14 species were examined histologically. A historical review of the previous work on stylasterids from the Galápagos is given. All 14 species are endemic to the Galápagos; however, at the generic level there is a strong affinity with the western Pacific. To help distinguish among the 25 species of *Crypthelia* found worldwide, six of which occur in the Galápagos, a tabulation of ampullae and efferent pore arrangements was constructed: there are three types of female arrangements and eight male variations. Of a possible total of 24 permutations of male-female combinations, only twelve have thus far been discovered.

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Contents

Stylasteridae (Hydrozoa: Hydroida) of the Galápagos Islands

Stephen D. Cairns

Introduction

The first stylasterid corals to be reported from the Galápagos were *Errina macrogastra* and *Stylaster divergens*, both described by Marenzeller (1904a) from two *Albatross* stations made in 1891. In the same paper he also reported *Stenohelia profunda* Moseley, 1881, the specimens of which were used as types of *Stenohelia robusta* by Boschma (1964a). Fisher (1938), in his review of the stylasterids of the North Pacific, briefly described another species from the Galápagos, *Crypthelia gigantea*, based on several specimens from an earlier *Albatross* station made in 1888. He failed to mention that from the same station (*Albatross*-2818) there were dozens of additional colonies of *Crypthelia* representing several species. Boschma published four papers relating to Galápagos stylasterids in 1964. First, he (Boschma, 1964a) described the new species, *Stenohelia robusta* for the previously misidentified *Stenohelia profunda* of Marenzeller (1904a), and briefly diagnosed a second new species, *Stenohelia concinna*, from *Albatross* station 4642 made in 1904. His second paper (Boschma, 1964b) was a full description of *Stenohelia concinna*. The third paper (Boschma, 1964c) was a redescription of *Stylaster divergens* Marenzeller, 1904, based on the type material and specimens from two additional *Albatross* stations. The fourth paper (Boschma, 1964d) was a redescription of *Errina macrogastra* Marenzeller, 1904, based on the type material. To summarize, only five species of stylasterids were previously known from the Galápagos, collected from only six *Albatross* stations (Table 1) made between 1888–1904.

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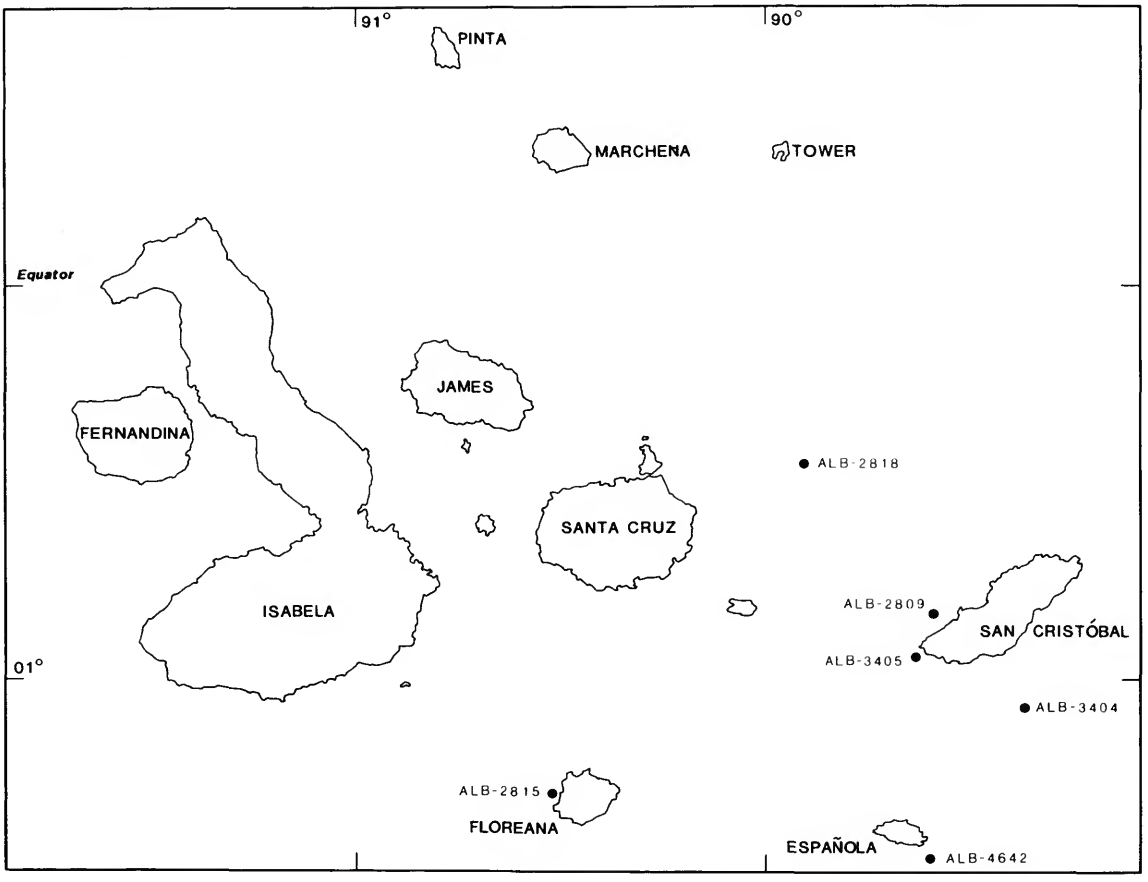
ABBREVIATIONS.—In reporting the location of the types of the species, the following abbreviations of institutions or vessels have been employed.

ALB	research vessel *Albatross*
BM	British Museum (Natural History)
MCZ	Museum of Comparative Zoology, Harvard University
NMNH	National Museum of Natural History, Smithsonian Institution
USNM	former United States National Museum, collections in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

ACKNOWLEDGMENTS.—I would like to thank H. Zibrowius (Station Marine d'Endoume, Marseille) and F.M. Bayer (NMNH) for critically reading the manuscript and offering valuable suggestions. I am grateful to H. Tsujimura (Biological Laboratory, Japanese Imperial Household) for the loan of type specimens of *Lepidotheca japonica* and to R. Van Syoc (California Academy of Sciences) for the loan of additional paratypes of *Crypthelia gigantea*. M. Pettibone identified the symbiotic polynoid polychaetes. I would also like to thank H. Wimer for her prep-



MAP 1.—The Galápagos Islands (excluding two northern-most islands), showing the six *Albatross* stations at which stylasterids were collected.

aration of the histological serial sections. This paper is based on work supported by the National Science Foundation under grant number BSR-8217278. The scanning electron micrographs were taken in the S.E.M. laboratory of the National Museum of Natural History, Smithsonian Institution.

Material and Methods

All previously reported specimens from the Galápagos were examined, most of which are deposited at the NMNH. Three paratypes of *C. gigantea* are deposited at the California Academy of Sciences. In addition to this material more specimens were studied from *Albatross* stations 2818 and 4642, specimens apparently ignored or overlooked by Fisher and Boschma. Nine new species were described from this neglected material.

The methodology and terminology used in this paper are summarized in Cairns (1983b, 1986). One new descriptive term is added in this paper, the "gastropore ring consticition," defined as the skeletal ring that constricts the gastropore tube at the junction of the upper and lower gastropore chambers of certain species of *Crypthelia* (Figures 19A, 20F).

TABLE 1.—Station list.

Albatross station number	Longitude	Latitude	Depth (m)	Date	Bottom temperature (°C)
2809	0°50′S	89°36′W	82	4 Apr 1888	23.4
2815	1°17′30″S	90°30′15″W	61	9 Apr 1888	?
2818	0°29′S	89°54′30″W	717	15 Apr 1888	6.6
3404	1°03′S	89°28′W	704	28 Mar 1891	6.2
3405	0°57′S	89°38′W	97	28 Mar 1891	15.5
4642	1°30′30″S	89°35′W	549	7 Nov 1904	9.3

All holotypes and most paratypes of newly described species are deposited at the NMNH. Paratypes of new species are also deposited at the British Museum (Natural History).

Zoogeography

All fourteen species of stylasterids from the Galápagos are endemic to this group of islands. This serves to reinforce the hypothesis that the Galápagos Islands should be considered as a separate province (Briggs, 1974) but does little to illuminate the history of the fauna.

In general, the shallow-water marine invertebrates of the Galápagos show a strong affinity to both the Panamic Province and the Indo-West Pacific Region, as well as a strong endemic component and a weak tie to the Caribbean (Ekman, 1953:45, 46; Briggs, 1974:50, 51). Only three stylasterid genera are known to occur in the entire eastern Pacific (*Errinopora, Stylaster* (Group A), and *Stylantheca*); none of these occur off the Galápagos. However, of the six genera that do occur off the Galápagos, five are also present in the western Pacific. The sixth, *Errina,* is found predominantly in the Atlantic and Antarctic and also occurs off subantarctic southern Chile. Thus, at the generic level, the Galápagos stylasterid fauna has a strong link with the western Pacific and a weaker affinity to the western Atlantic and no genera in common with the eastern Pacific. It must be remembered, however, that 13 of the 14 species of Galápagos stylasterids have bathymetric ranges deeper than 500 m; only *Stylaster divergens* occurs in shallow water (61–97 m). The Panamic component of the Galápagos fauna is usually attributed to several westerly flowing surface currents, such as the Peru Coastal and Oceanic Currents, the California Current, and currents from the Gulf of Panama (Briggs, 1974; Glynn and Wellington, 1983), which probably transport larvae of shallow-water invertebrates to the Galápagos. Because the Galápagos stylasterid fauna is a deep-water fauna, it is probably not influenced by surface currents from South and Central America but instead by deeper currents from the west, such as the Equatorial Undercurrent, which Glynn and Wellington (1983:168) have hypothesized "must supply ahermatypic coral larvae and other related deep-water tropical organisms to the Galápagos." The Equatorial Undercurrent is about 200 m thick, has a core depth at about 100 m, and is 15°–17°C.

The oldest fossiliferous beds of the Galápagos Islands are Pliocene in age (Hertlein, 1972), and the volcanic rock of the Galápagos has been dated at 2.4–3.0 m.y. old (Bailey, 1976). It is therefore hypothesized that after the formation of the Galápagos in the Pliocene the continental slopes of these islands were colonized by the planulae of deep-water stylasterids transported by the Equatorial Undercurrent. No shallow-water stylasterids are now known from the shallow-water Panamic Province that could have dispersed to the Galápagos. The species that reached the Galápagos (representing 5 of the 7 genera that occur in the western Pacific) then

evolved, particularly *Crypthelia,* which produced an adaptive radiation of at least six species, all of which are now sympatric.

Species Accounts

Lepidotheca Cairns, 1983

DIAGNOSIS.—Gastro- and dactylopores usually randomly arranged. Coenosteum linear-imbricate, sometimes spinose. Abcauline gastropore lips common. Dactylopore spines U-shaped, with slit directed distally; walls of dactylopore spines thin; dactylostyles usually lacking. Ampullae superficial, female ampullae usually with an efferent pore.

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

Lepidotheca macropora, new species

FIGURES 1A–G, 2A–C

DESCRIPTION.—Of the nine branch fragments available for study, tallest branch 4.3 cm, broadest fragmentary colony (holotype) 3.3 cm wide, and greatest basal branch diameter 5.7 mm. Terminal branches slender, about 1.75 mm in diameter. Branching axils U-shaped. Coenosteum white. Coenosteal strips flat, about 0.16 mm wide, and bordered by large, deep, elliptical to elongate, coenosteal pores 50–65 μm wide. Platelets broad, often as wide as coenosteal strip; each longitudinally carinate, having 5–9 low, rounded ridges.

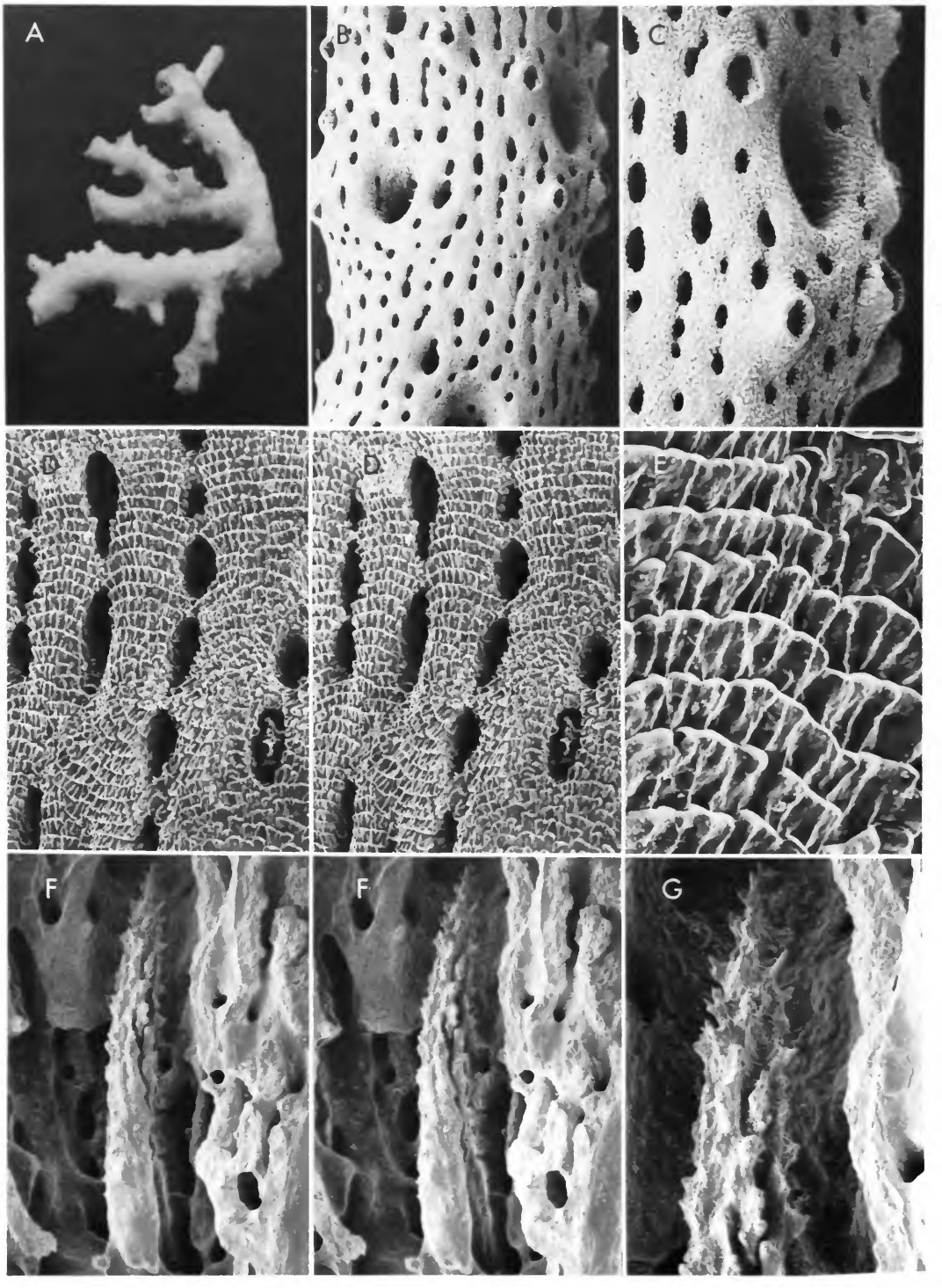
Gastro- and dactylopores randomly arranged on larger diameter branches, but both pore types concentrated on lateral branch edges of slender distal branches. Gastropores elliptical, about 0.41 × 0.29 mm in diameter, the greater axis aligned with branch axis; no lower lips. Gastropore tube long and cylindrical; no ring palisade or tabulae. Gastrostyle long, slender, and pointed; illustrated style 0.95 mm tall and 0.10 mm in diameter (H : W = 9.5). Basal half of style smooth; upper half longitudinally ridged, with short spines about 36 μm long arranged on the ridges. Dactylopore spines infrequent and very small (thus easily overlooked): about 0.10 mm broad and equally tall, with a slit width of about 0.061 mm. On large diameter branches dactylopore spines almost flush with coenosteum.

Female ampullae large hemispheres up to 1.4 mm in diameter with efferent pores up to 0.33 mm in diameter. A short efferent tube is sometimes present. Male ampullae low bulges in coenosteum, about 0.89 mm in diameter. On large diameter branches male ampullae almost entirely internal, evidenced only by low bulges in coenosteum. Male ampullae covered by coenosteal strips separated by slits of greater than average width, the latter of which are infilled by a porous deposit. Discrete efferent pores not observed. Both types of ampullae concentrate on anterior and posterior branch faces.

DISCUSSION.—Eight of the nine previously described species of *Lepidotheca* (see Cairns, 1983b, 1986) have been examined by the author. *Lepidotheca macropora* is distinguished from all of these by its very large coenosteal pores. Other distinctive characters, although not necessarily unique ones, are its ridged gastrostyles and very low dactylopore spines. Specimens of *L. hachijoensis* (Eguchi, 1968) were not examined because the types of this species could not be located in the collections of His Imperial Majesty, Tokyo or the Tohoku University. Although similar to *L. macropora* in colony size and shape, *L. hachijoensis* differs in having a compact coenosteum, smaller gastropores, a ring palisade, and dactylopores on the ampullae.

ETYMOLOGY.—The specific name is from a combination of the Greek *macros* ("large") plus *poros* ("pore") in reference to the large coenosteal pores of this species.

FIGURE 1.—*Lepidotheca macropora* (A, D–G, holotype; B, C, male paratype from ALB-2818): A, holotype colony, × 1.65; B, C, branch coenosteum showing gastro- and dactylopores and large coenosteal pores, × 27, × 58, respectively; D, E, imbricate coenosteal texture, × 100, × 430, respectively (D is a stereo pair); F, G, gastrostyle, × 68, × 145, respectively (F is a stereo pair).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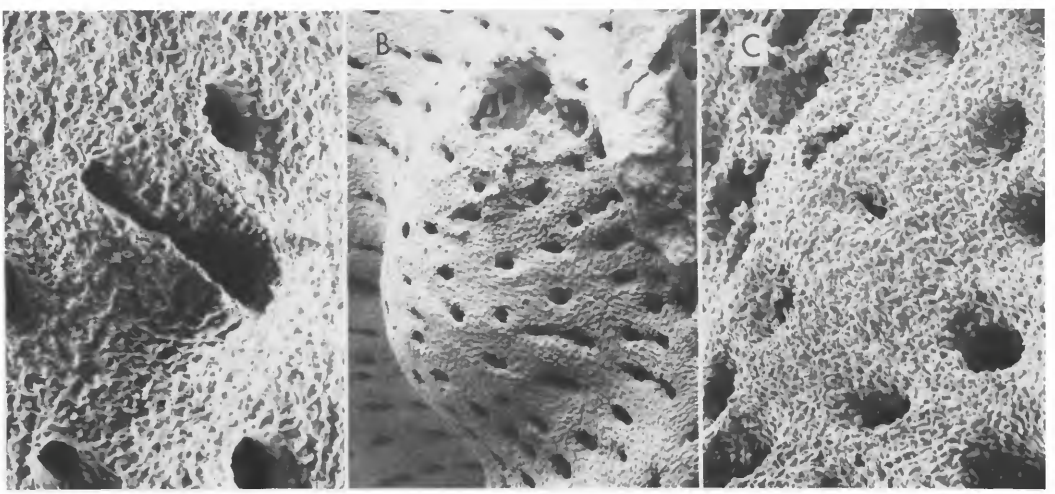


FIGURE 2.—*Lepidotheca macropora* (A, C, holotype; B, female paratype from ALB-2818): A, dactylopore spine, × 170; B, female ampulla with efferent pore, × 39; C, male ampulla, × 115.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype*: ALB-2818 (male colony) USNM 72090.

Paratypes: ALB-2818 (4 male and 2 female branch fragments) USNM 72091; ALB-2818 (1 male colony, BM 1984.9.28.1); ALB-4642 (1 male branch fragment) USNM 72092.

TYPE-LOCALITY.—00°29′S, 89°54′30″W, 717 m.

DISTRIBUTION.—Known only from the Galápagos Islands east of Santa Cruz and southeast of Española; 549–717 m.

Distichopora Lamarck, 1816

DIAGNOSIS.—Gastropores usually aligned on lateral branch surfaces and flanked on both sides by a row of dactylopores, together forming a pore row. Coenosteal texture variable, including reticulate-granular, tuberculate, tufted, and linear-imbricate. Gastropores never lipped; gastropore and dactylopore tubes long. Gastrostyles usually slender, highly ridged, and very elongate; tabulae common. Dactylopores usually elliptical, oriented perpendicular to gastropore row; no dactylostyles. Ampullae usually superficial.

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

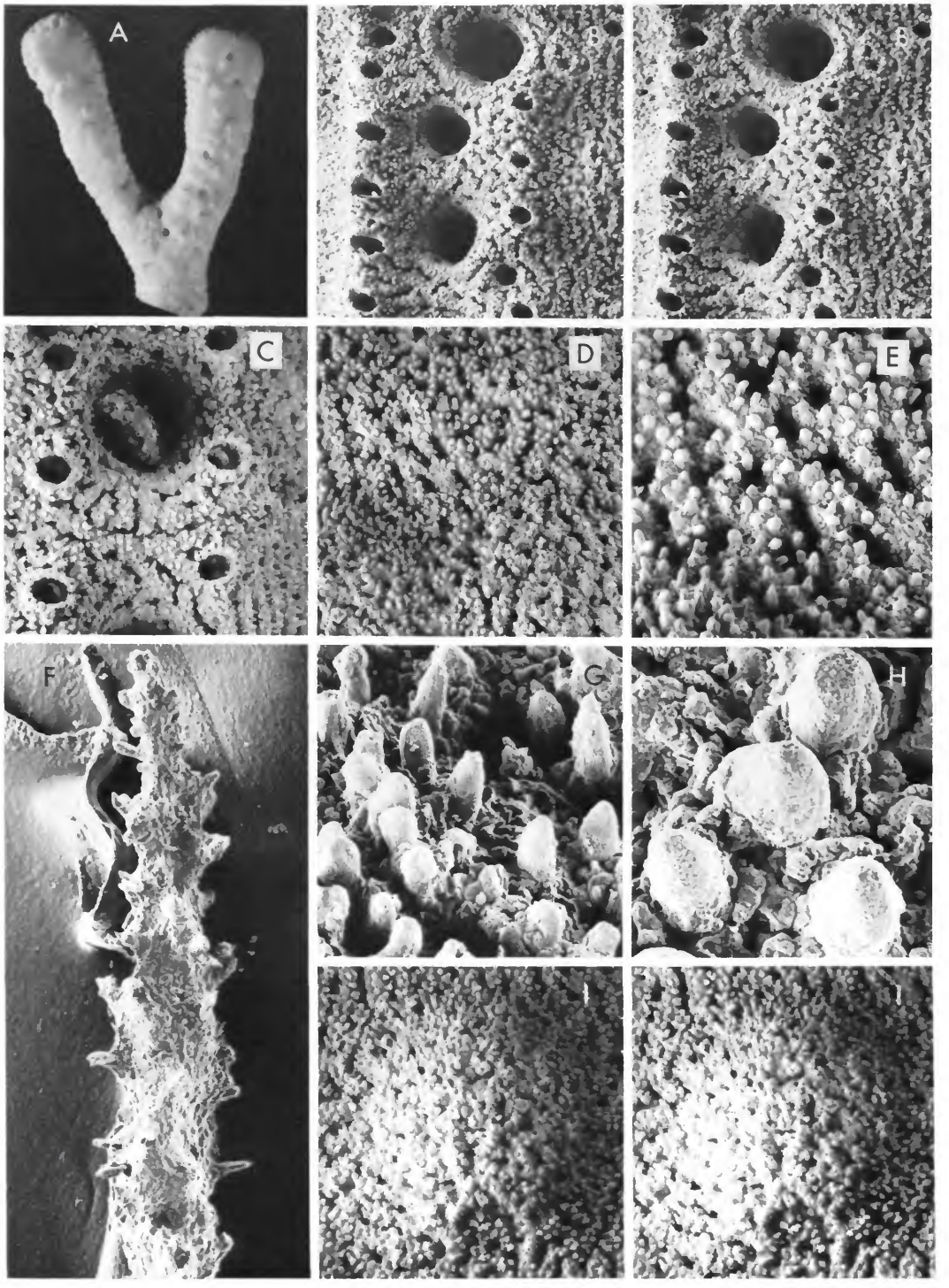
Distichopora laevigranulosa, new species

FIGURE 3A–I

DESCRIPTION.—Holotype branch fragment 24 mm tall, with two slightly clavate, flattened distal branches, each about 5.4 mm broad and 2.5 mm thick. Distal branch faces of larger diameter branch slightly convex. Branching axil U-shaped. Coenosteum white, composed of anastomosing strips 75–85 μm wide arranged in a roughly longitudinal manner. Coenosteal slits about 25 μm wide. Strips covered by prominent granules up to 45 μm tall and about 20 μm in basal diameter. Granules smooth, with blunt, slightly tapered tips.

Gastropores round and variable in size, ranging from 0.2–0.5 mm in diameter. Most gastropores arranged uniserially along center of pore

FIGURE 3.—*Distichopora laevigranulosa* (A–I, holotype): A, holotype, × 2.3; B, C, pore row, × 21, × 31, respectively (B is a stereo pair); D, E, G, H, coenosteal texture, × 36, × 80, × 290, × 590, respectively; F, tip of gastrostyle, × 150; I female ampulla with efferent pore, × 34, stereo pair.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row; however, some pores slightly alternating or even two abreast. Individual gastropores also occur on anterior face, each surrounded proximally by a crescent of three or four dactylopores. Twelve to 16 gastropores per cm on branch edges but on branch tips gastropores more crowded, up to 17 per cm. The one poorly preserved gastrostyle examined was needle-shaped: 0.10 mm in diameter and well over 1 mm long, for a H : W > 10. Approximately equal numbers of dactylopores on either side of gastropore row, ranging from 16–20 per cm on branch edges and up to 26 per cm on branch tips. Dactylopores elliptical, about 0.23 mm wide and 0.27 mm long, with a slit width of about 0.13 mm. Outer edges of dactylopore spines (edge away from gastropore row) slightly elevated, up to 0.4 mm near branch tip, producing a shallow sulcus. Pore row 1.35–1.50 mm wide.

Female ampullae low bulges on coenosteum 1.0–1.1 mm in diameter, occurring on both branch faces. A very short efferent tube is sometimes present (Figure 3I), culminating in an efferent pore about 0.27 mm in diameter. Male ampullae unknown.

DISCUSSION.—Ordinarily I would not describe a new species based on only one branch fragment; however, the holotype is very well preserved, easily differentiated from the other 20 described Recent species of *Distichopora,* and is the first record of this genus from the eastern Pacific. The 20 species are listed in Cairns (1983b, 1986), and most of the 11 Indo-West Pacific species are thoroughly discussed and keyed by Boschma (1959). *Distichopora laevigranulosa* is most similar to *D. serpens* Broch, 1942 (Philippines, 91–183 m), particularly in branch shape, but can be distinguished by its larger gastropores, wider pore row, longer gastrostyles, and nonridged female ampullae. It fits the description of *D. profunda* Hickson and England, 1909 (Chagos Archipelago, 220–274 m), but when compared to Hickson and England's figures it is clearly different, particularly with regard to its narrower pore row, less crowded and round gastropores (not polygonal as in *D. profunda*), and larger female ampullae. Distinctive features of *D. laevigranulosa* are its unique coenosteal texture; its large, round gastropores; and its relatively wide pore row.

ETYMOLOGY.—The specific name is from the Latin *laevigranulosa* ("having smooth granules") in reference to the unique granular coenosteal texture.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* ALB-2818 (1 female branch fragment) USNM 72093.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (east of Santa Cruz), 717 m.

DISTRIBUTION.—Known only from the type-locality.

Errina Gray, 1835

DIAGNOSIS.—Gastro- and dactylopores usually randomly arranged. Coenosteal texture reticulate-granular or 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.

Errina macrogastra Marenzeller, 1904

FIGURES 4A–G, 5A–C

Errina macrogastra Marenzeller, 1904a:81–83, pl. 2: fig. 1, pl. 3: fig. 1; 1904b:91.—Hickson, 1912:878–880.—Broch, 1942:39.—Boschma, 1953:167; 1957:55; 1963: 334, 337; 1964d:281–286, figs. 1, 2, pl. 1.—Cairns, 1983b: 428, 461; 1986:53.

DESCRIPTION.—Colony small and essentially uniplanar, the largest corallum 3.1 cm tall, 2.4 cm broad, and 4.1 mm in basal branch diameter. Eight to 14 mm above point of corallum basal attachment there is often a perforate spherical cavity caused by the symbiosis with a polynoid polychaete. From this bulbous cavity radiate several (four to seven) branches, usually diverging in a plane from the upper 180°–200° of arc

above the cavity; however, sometimes branches diverge out of the plane, producing a slightly bushy corallum. Branches robust, cylindrical, and straight, tapering to slender tips about 0.7 mm in diameter. Coenosteum white and linear-imbricate in texture. Coenosteal strips 60–70 μm wide, covered by broad, flat platelets that span entire width of a strip. Approximately 50 platelet leading edges per mm.

Gastropores round, 0.20–0.30 mm in diameter, and bordered by a small abcauline lip. Gastropores most common on anterior face and lateral branch edges. Gastropore tube lacking ring palisade and tabulae. Gastrostyles long and slender, tapering to a point that reaches almost to coenosteal surface. Illustrated typical gastrostyle (Figure 4G) 0.34 mm tall and 0.069 mm in diameter (H : W = 4.9); however, one robust style (Figure 4F) was 0.27 mm tall and 0.12 mm in diameter (H: W = 2.25), and Boschma (1964d) noted styles up to 0.43 mm tall and 0.07 mm in diameter (H : W = 6.1). Style not ridged, but covered uniformly with sharp, slender spines up to 16 μm tall and ranging from 4–10 μm in diameter. Main shaft of style clearly visible. Dactylopore spines also occur primarily on anterior face and branch edges. They are about 0.12 mm wide and 0.11 mm long, with a slit width of about 45–55 μm and low distal edges (edge toward branch tip), only 0.07–0.10 mm tall.

Female ampullae smooth and spherical, about 0.75 mm in diameter; also restricted to the anterior face and branch edges. Efferent tubes not present; efferent pores about 0.25–0.30 mm in diameter. Depressions in coenosteum are common: sites of spent female ampullae. Male ampullae hemispherical, 0.45–0.55 mm in diameter, and clustered on anterior side. Each male ampulla has two to five conical efferent pores about 50 μm in diameter located on the top of the ampulla. Exhausted male ampullae also leave concavities in the coenosteum.

Gastrozooid tentacular nematocysts about 5.5 × 2 μm.

REMARKS.—Almost every colony of *E. macrogastra* examined had a symbiotic polynoid polychaete, *Harmothoe irritans* (Marenzeller, 1904b), which induced the stylasterid to form a bulbous cavity in the main stem about 10 mm above the point of corallum attachment. The cavities are 6–17 mm in diameter with an upper aperture of about 2.5 mm. The tube wall is solid, except for elongate, irregularly shaped pores 0.7–1.5 mm long.

DISCUSSION.—As Cairns (1986) noted, only three of the 19 species of *Errina* have linear-imbricate coenosteal texture. Although many characters distinguish *E. macrogastra* from the other two species (*E. cochleata* Pourtalès, 1867, and *E. altispina* Cairns, 1986, both known only from the Caribbean), *E. macrogastra* is most easily distinguished by its very small gastropore lips and distinctively shaped ampullae.

MATERIAL EXAMINED.—ALB-4642 (1 male colony) USNM 62714; ALB-3404 (6 male, 2 female, 4 indeterminate colonies) MCZ. Syntypes.

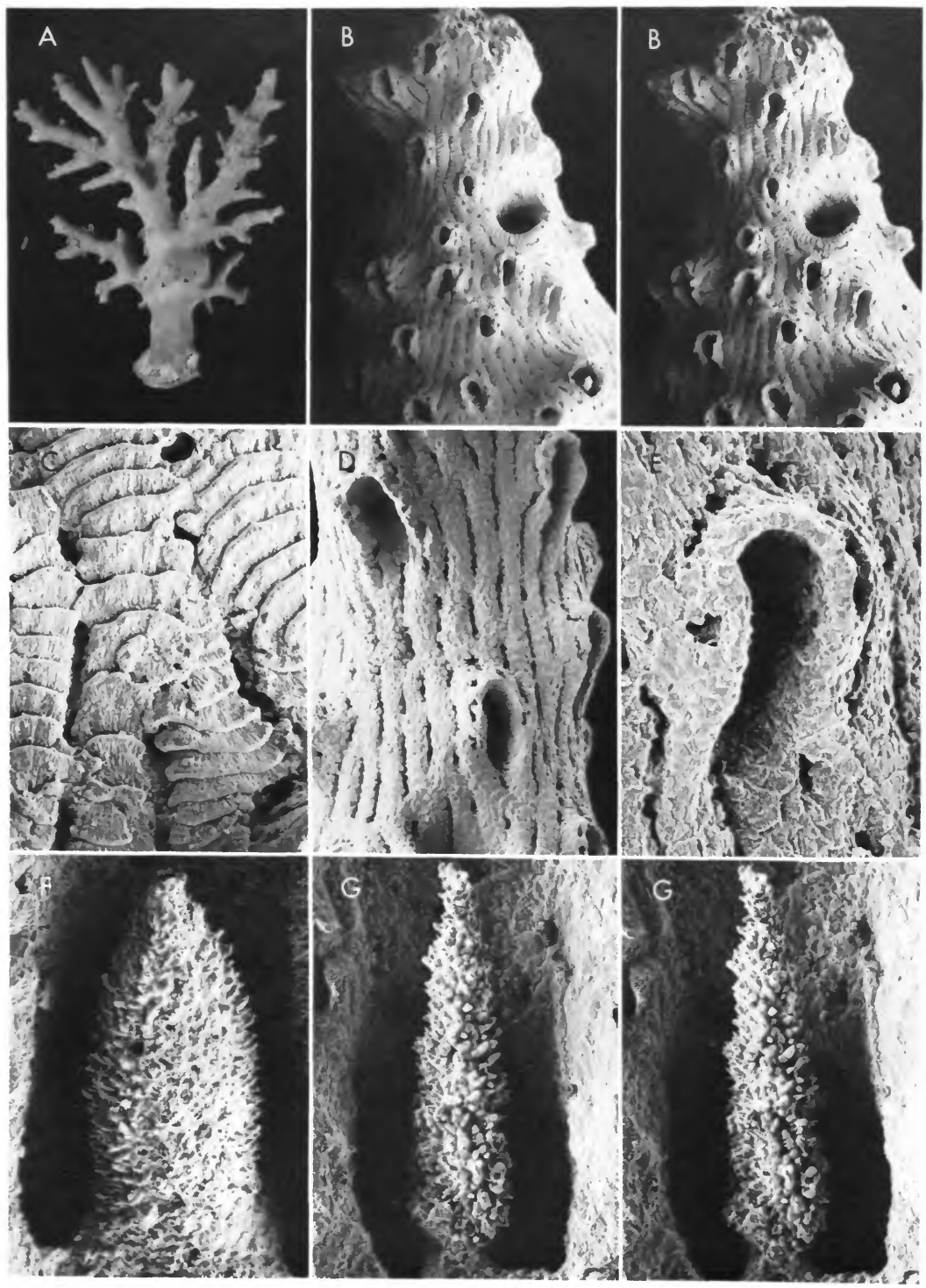
TYPES.—Twenty-five colonies, all syntypes from ALB-3404, are deposited at the USNM. Of these, eight are male, six are female, and 11 are of indeterminate sex. Marenzeller's (1904a) two illustrated colonies are cataloged as 21280; the other 23 colonies and six histological slides are numbered 21281. Nineteen of the colonies are preserved in alcohol; six are dry.

TYPE-LOCALITY.—1°03′S, 89°28′W (south of San Cristóbal), 704 m.

DISTRIBUTION.—Known only from the Galápagos south of San Cristóbal and southeast of Española; 549–704 m.

Stylaster Gray, 1831

DIAGNOSIS.—Gastro- and dactylopores arranged in cyclosystems. Cyclosystems variable in location, ranging from a uniform coverage of all branch surfaces (Group A) to a strictly sympodial arrangement (Group C), with many intermediate arrangements (Group B). Coenosteal color and texture variable: most common textures linear-imbricate and reticulate-granular. Gastro- and dactylostyles present. Gastrostyles usually ridged;dactylostyles can be quite robust (Group A) or rudimentary (Groups B and C). Ring pali-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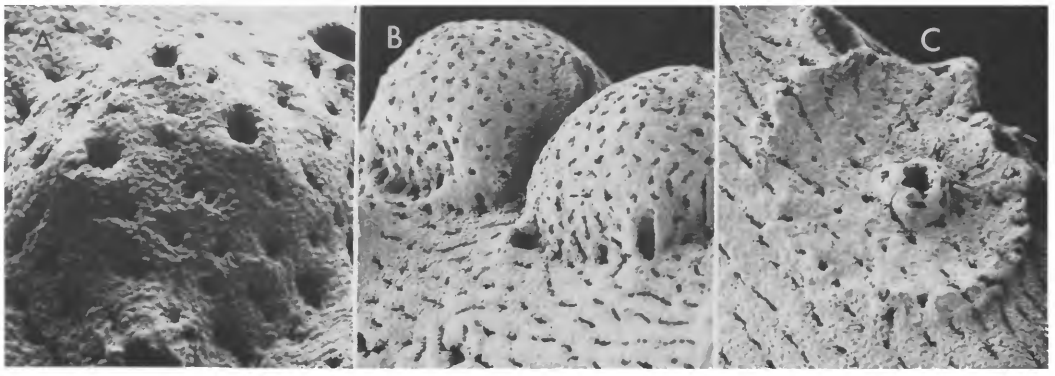


FIGURE 5.—*Errina macrogastra* (A, male syntype from ALB-3404; B, C, female syntype from ALB-3404): A, male ampulla with three efferent pores, × 95; B, female ampullae, one with efferent pore, × 45; C, concave coenosteal depression left by spent female ampulla, × 51.

sade often present; gastropore inner shelf also often present in Group C. Ampullae superficial, usually with distinct efferent pores.

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

Stylaster divergens Marenzeller, 1904

FIGURES 6A–G, 7A–C

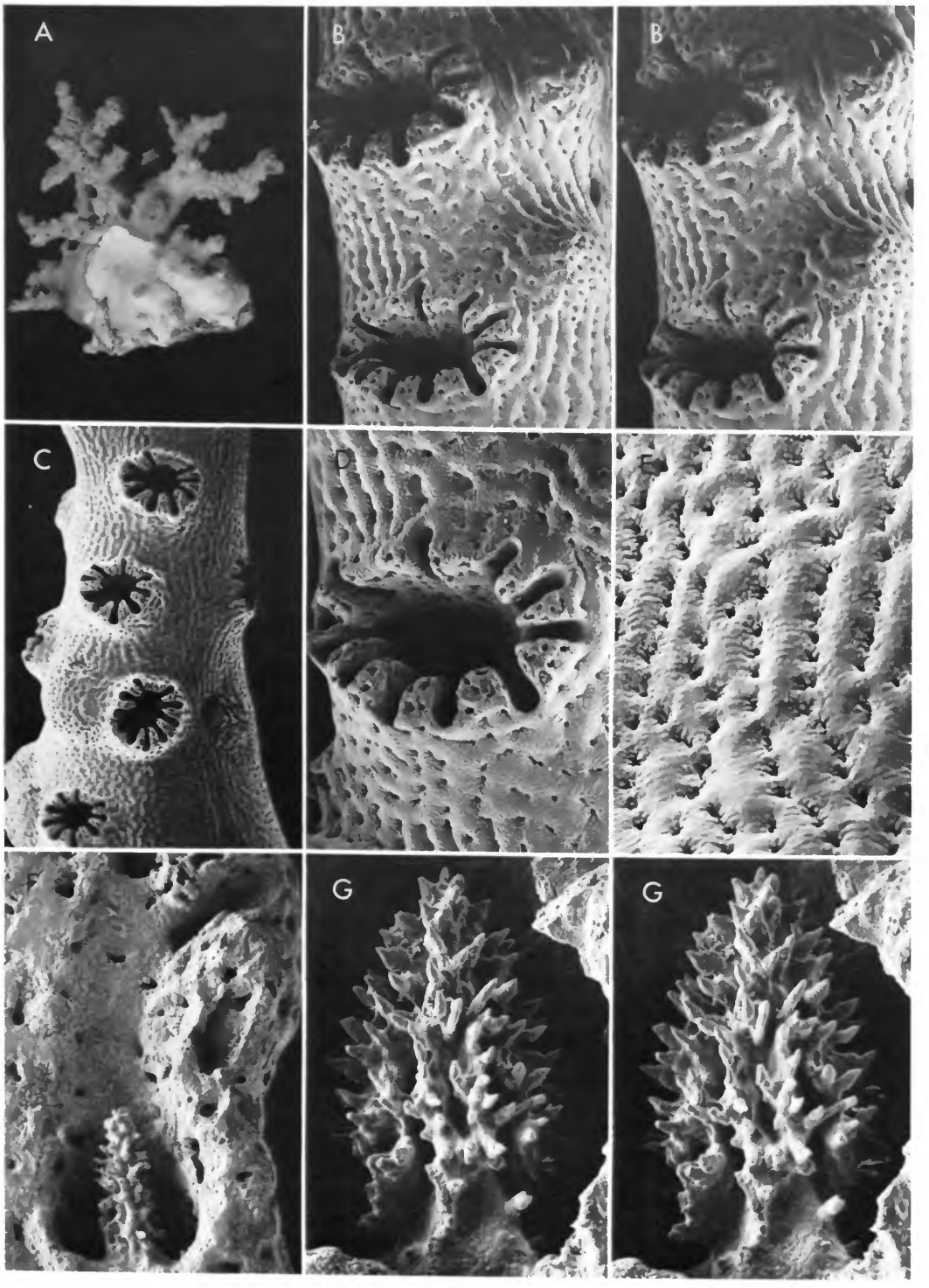
Stylaster divergens Marenzeller, 1904a:83–86, pl. 2: fig. 3, pl. 3: fig. 2.—Broch, 1914:7.—Cairns, 1983b:430.
Allopora divergens.—Boschma, 1953:166; 1957:21; 1964c: 109–118, figs. 1–3, pl. 1.

DESCRIPTION.—Colonies small, compact, and bushy, with a massive basal branch diameter up to 10 × 13 mm. Largest colony only 26 mm tall and 38 mm broad. Corallum attached by a broad encrusting base from which other colonies bud. Branches cylindrical and attenuate, with a distal diameter of about 0.9 mm. Coenosteum white or light violet. Coenosteal strips 75–85 μm wide and slightly convex, arranged in a parallel, longitudinal manner on distal branches but in a reticulate arrangement on large diameter branches. Linear-imbricate texture obscured by additional granular stereome, which produces a smooth, porcelaneous aspect with an underlying transverse corrugation (Figure 6E).

Cyclosystems variable in placement. On some branches, particularly distal ones, cyclosystems occur on all branch surfaces in equal number. On larger diameter branches, cyclosystems usually absent from posterior face. On still other branches of the same colony the arrangement is primarily sympodial with some cyclosystems on anterior face. Cyclosystems slightly exsert, round (0.65–0.90 mm in diameter) to slightly elliptical (e.g., 0.81 × 0.55 mm), the greater axis transverse to branch axis. Based on 240 cyclosystems, Boschma (1964c) found the range of dactylopores per cyclosystem to be 4–12, average = 8.65, and mode = 9.

Gastropore tube deep (two to three times length of gastrostyle) and 0.16–0.20 mm in diameter; ring palisade and tabulae lacking. Gastrostyles lanceolate, ranging from 0.26–0.40 mm tall and from 0.03–0.15 mm in diameter; illustrated gastrostyle 0.26 mm tall and 0.11 mm in diameter (H : W = 2.36). One exceptionally slender style was 0.335 mm tall and 0.032 mm in diameter (H : W = 10.5). Style longitudinally

FIGURE 4.—*Errina macrogastra* (A, female syntype, USNM 21280; B, C, F, male syntype from ALB-3404; D, E, G, female syntype from ALB-3404): A, syntype colony, × 1.8; B, branch tip, × 32, stereo pair; C, imbricate coenosteal texture, × 250; D, E, dactylopore spines, × 73, × 205, respectively; F, robust gastrostyle, × 220; G, slender gastrostyle, × 205, stereo pair.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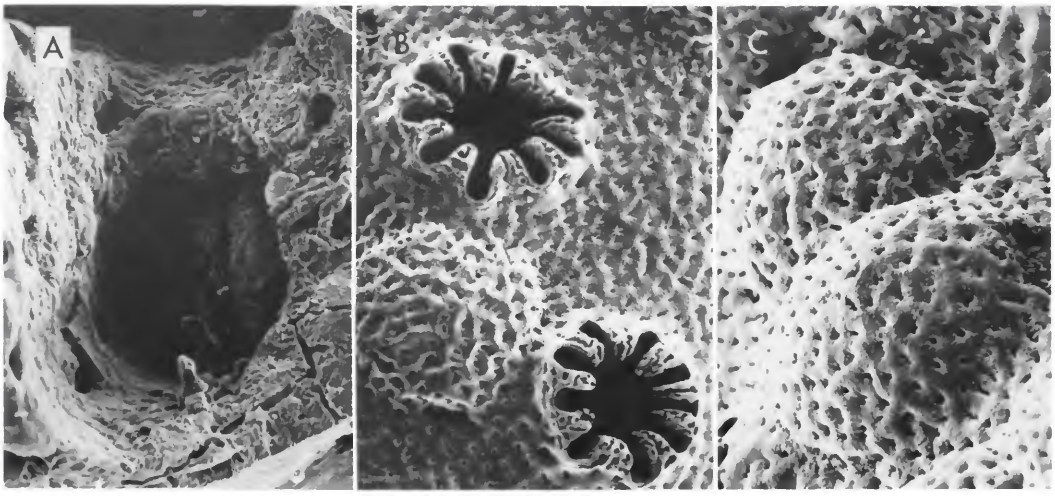


FIGURE 7.—*Stylaster divergens* (A, male from ALB-2809; B, C, female from ALB-2809): A, dactylostyle, × 315; B, C, cyclosystems and female ampullae with efferent pores, × 38, × 55, respectively.

ridged; bearing robust, pointed spines on the ridges; the spines up to 30 μm tall and 10 μm in diameter. Dactylopore slits consistently about 70 μm wide; pseudosepta usually broader than slits and not consistent in width. Short, adcauline diastemas sometimes present (Boschma, 1964c, fig. 3d). Dactylostyles rudimentary: composed of a single row of elements up to 30 μm tall and 9 μm in diameter.

Female ampullae low, smooth hemispheres 0.60–0.70 mm in diameter, each with an efferent pore about 0.13 mm in diameter. Male ampullae smaller, 0.40–0.50 mm in diameter, mammiform, and clustered on anterior face and branch edges. Each mature male ampulla has one to three small apical efferent pores.

Gastro- and dactylozooid nematocysts 5.5–6.0 × 2–3 μm; nematocysts measuring 9 × 2.5 μm also present throughout coenenchyme.

FIGURE 6.—*Stylaster divergens* (A, male syntype from ALB-3405; B, D, male from ALB-2809; C, E–G, female from ALB-2809): A, syntype colony, × 1.8; B, two cyclosystems and two male ampullae, × 38, stereo pair; C, branch with cyclosystems and female ampullae, × 18; D, cyclosystem, × 59; E, coenosteal texture, × 105; F, G, gastrostyle, ×90, × 245, respectively (G is a stereo pair).

DISCUSSION.—Based on the arrangement of cyclosystems, *S. divergens* belongs in *Stylaster* (Group B). Cairns (1983b) listed 15 Recent species in that group, and Boschma (1964c) meticulously compared *S. divergens* to the three most similar species: those with bushy coralla and attenuate branch tips. *Stylaster divergens* is compared to *S. marenzelleri* in the account of the latter species.

MATERIAL EXAMINED.—ALB-2809 (2 female and 1 male colonies) USNM 72094; ALB-2815 (1 male colony) USNM 72095; ALB-3405 (3 male, 1 female, and 1 indeterminate colonies and 4 histological slides) USNM 21284; unknown *Velero III* station, Feb. 1938 (1 male colony) MCZ. Syntypes.

TYPES.—Although Marenzeller (1904a) mentioned "several specimens" of *S. divergens* from ALB-3405, he illustrated only two male specimens, which are the only ones from ALB-3405 that are labelled and cataloged as syntypes at the USNM (21279). The other five specimens from ALB-3405 are therefore not considered as types.

TYPE-LOCALITY.—0°57′S, 89°38′W (southwest of San Cristóbal), 97m.

DISTRIBUTION.—Known only from the Galá-

pagos Islands off San Cristóbal and Floreana; 61–97 m.

Stylaster marenzelleri, new species

FIGURES 8A–F, 9A,B

DESCRIPTION.—Colonies uniplanar, the largest corallum 5.2 cm tall, the broadest 4.2 cm wide, with a basal branch diameter up to 6.1 mm. Main stem and one or two branches of several colonies contain one to five cylindrical, parchment like eunicid polychaete tubes, each about 1.5 mm in diameter, which extend along branch axis and exit at branch tips. Branches cylindrical and slender, about 0.8–0.9 mm in diameter distally. Coenosteum light pink. Coenosteal strips 55–75 μm wide, arranged longitudinally, parallel to branch axis. Linear-imbricate texture usually obscured by overlying stereome, which, as in *Stylaster divergens*, produces a granular to smooth texture overlying transverse corrugations. Apically perforate conical papillae up to 70 μm tall very common on some specimens, rare on others.

Cyclosystems primarily sympodially arranged, with closely spaced cyclosystems on lateral branch edges; however, cyclosystems occasionally also on anterior face, especially on large diameter basal branches. Cyclosystems round (0.60–0.65 mm in diameter) to slightly elliptical, the latter shape caused by narrow diastemas on cyclosystems on distal branches. Based on 50 cyclosystems, there is a range of 4–10 dactylopores per cyclosystem, average = 8.00 (σ = 1.34), and mode = 9.

Gastropore tube about 0.9 mm deep and hourglass-shaped, the constriction about 0.24 mm in diameter. An annular ring palisade occurs just beneath constriction. Illustrated gastrostyle elongate-conical, 0.41 mm tall and 0.15 mm in diameter (H : W = 2.7), its tip projecting through gastropore tube constriction. Style spinose but not ridged. Dactylopore slits about 62 μm wide; pseudosepta usually broader than dactylopores. Diastema, when present, two to three times width of pseudoseptum (Figure 8D). Dactylostyles robust, composed of one or two rows of crowded cylindrical elements, each element 30–38 μm tall and 12 μm in diameter. A small lateral dactylostyle element is often present on either side of the dactylotome, each element about 18 μm tall and equally wide.

Female ampullae prominent smooth hemispheres 0.45–0.55 mm in diameter, each with a short efferent tube and efferent pore 0.09–0.10 mm in diameter. Some female ampullae have two different pores on opposite sides (Figure 9A), suggesting the presence of two planulae within. Male ampullae mammiform, 0.32–0.38 mm in diameter, and often covered with several coenosteal papillae. An efferent pore occurs at the apex of each one.

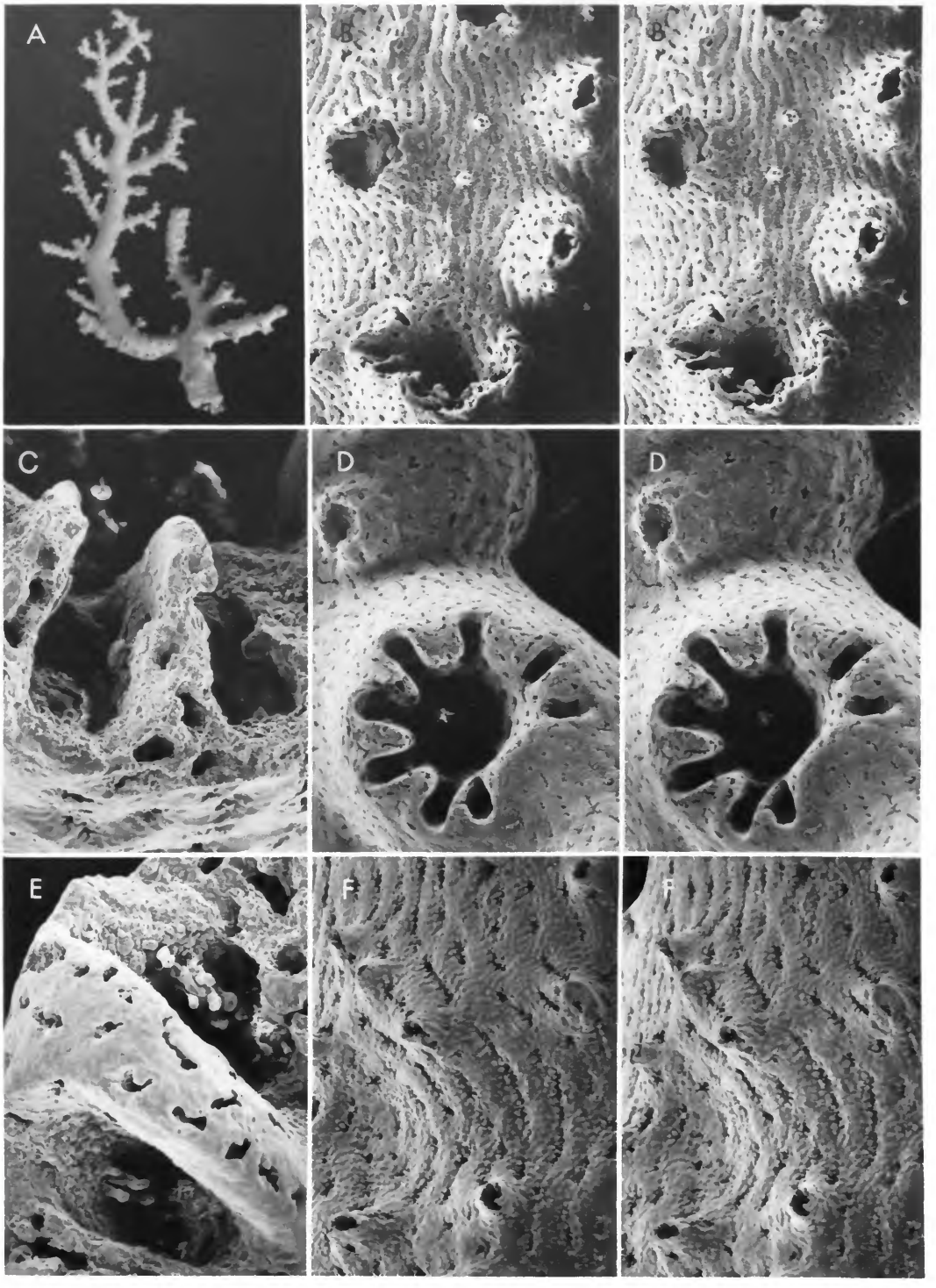
DISCUSSION.—*Stylaster marenzelleri* can be distinguished from most of the 15 other Recent species of *Stylaster* (Group B) by having relatively small cyclosystems with a low average number of dactylopores per cyclosystem and pink coenosteum. It is similar in color to *S. profundiporus* Broch, 1936 (from Japan), but has much smaller cyclosystems and a different coenosteal texture. Based on the literature, it is also similar to *S. pulcher* Quelch, 1884 (also known from off Japan), particularly in cyclosystem size, number of dactylopores per cyclosystem, and cyclosystem arrangement; but appears to differ in coenosteal color, its smaller ampullae, and in lacking large, randomly scattered coenosteal pores (?isolated dactylopores). Although similar to *S. divergens* in some characters (e.g., coenosteal texture, number of dactylopores per cyclosystem, cyclosystem size), *S. marenzelleri* is easily distinguished by its color, uniplanar corallum, papillose coenosteum, and smaller ampullae.

ETYMOLOGY.—This species is named in honor of Emil von Marenzeller.

MATERIAL EXAMINED.—Types.

TYPES.—Holotype: ALB-4642 (female colony) USNM 72096.

FIGURE 8.—*Stylaster marenzelleri* (A, holotype; B, C, F, male paratype; D, E, female paratype): A, holotype colony, × 1.3; B, branch coenosteum bearing several male ampullae, × 36, stereo pair; C, E, dactylostyles, × 225, × 210, respectively; D, cyclosystems and female ampullae with efferent tube, × 62, stereo pair; F, coenosteal papillae, × 100, stereo pair.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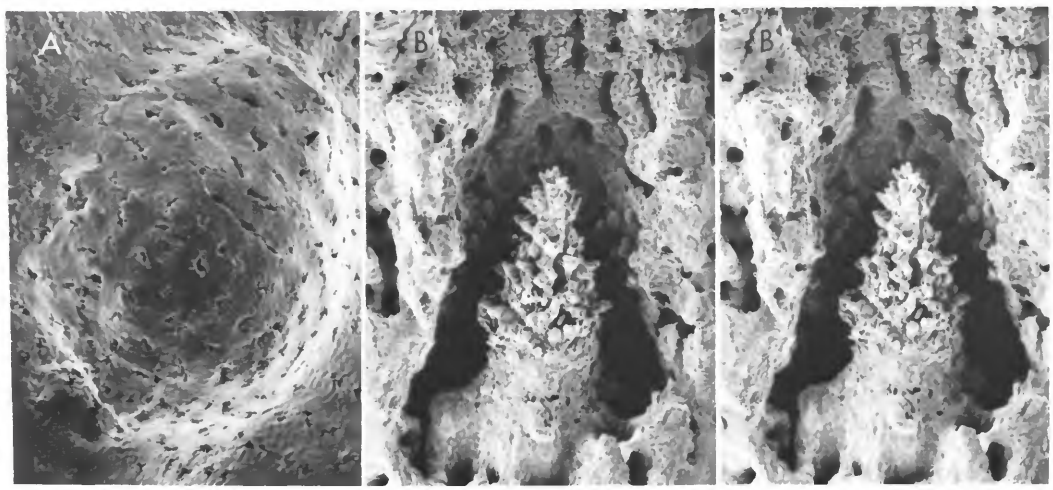


FIGURE 9.—*Stylaster marenzelleri* (A, female paratype; B, male paratype): A, female ampulla with two efferent tubes on opposite sides, × 94; B, gastrostyle, × 96, stereo pair.

Paratypes: ALB-4642 (4 colonies and one branch, female; 2 colonies and 1 branch, male; 4 colonies and 3 branches, sex indeterminate) USNM 72097; ALB-4642 (1 male and 1 female colony) BM 1984.9.28.3 and 2, respectively.

TYPE-LOCALITY.—1°30′30″S, 89°35′W (off southeastern Española), 549 m.

DISTRIBUTION.—Known only from the type-locality.

Stylaster galapagensis, new species

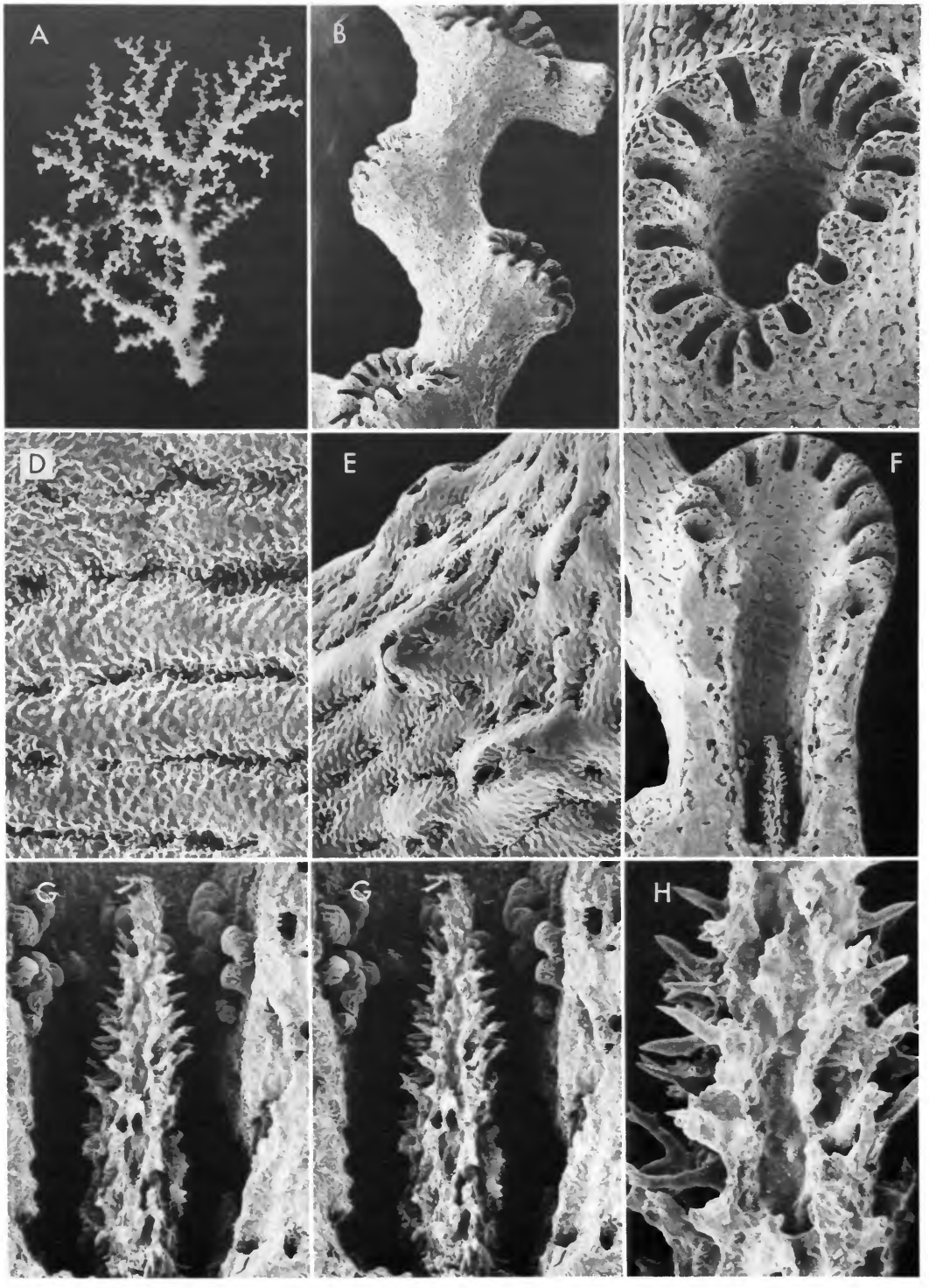
FIGURES 10A–H, 11A–C

DESCRIPTION.—Colonies tall, broad, and uniplanar. Tallest corallum 11.5 cm high, broadest 9.0 cm wide, and greatest basal branch diameter 7.5 mm. Branches long and slender, the distal branches being same diameter as a cyclosystem. Coenosteum white, composed of fine longitudinally arranged parallel strips 70–80 μm wide. Strips covered with low, smooth granules about 9 μm in diameter, giving the coenosteum a smooth texture. Coenosteal papillae common, the low apically perforate cones up to 70 μm tall with a pore diameter of about 25 μm.

Cyclosystems exclusively sympodially arranged on lateral branch edges, round to slightly irregular in shape (Figure 10C), and about 1.0 mm in diameter. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 10–19, average = 13.78 (σ = 1.94), and mode = 14.

Gastropore tube long and cylindrical, about 0.4 mm in diameter, and two to three times length of gastrostyle. Gastrostyles long and slender with a finely pointed tip. Illustrated style 0.61 mm tall and 0.12 mm in diameter (H : W = 5). Style vertically ridged, with tall slender spines up to 45 μm tall and 6 μm in diameter occurring on the ridges. Gastrostyle spines sometimes distally bifid. Ring palisade present at level of gastrostyle tip, the elements about 50 μm in diameter. Dactylopore slits about 75 μm wide; no diastemas. Pseudosepta 0.06–0.15 mm wide. Dactylostyles extremely rudimentary and very deeply placed; not visible in an undamaged cyclosystem.

FIGURE 10.—*Stylaster galapagensis* (A, holotype; B, E, female paratype from ALB-2818; C, D, F–H, male paratype from ALB-2818): A, holotype colony, × 0.67; B, branch segment showing sympodially arranged cyclosystems, × 14; C, cyclosystem, × 47; D, coenosteal texture, × 175; E, coenosteal papillae, × 115; F, longitudinal section of gastropore exposing gastrostyle, × 29; G, H, gastrostyle encircled by ring palisade, × 110, × 335, respectively (G is a stereo pair).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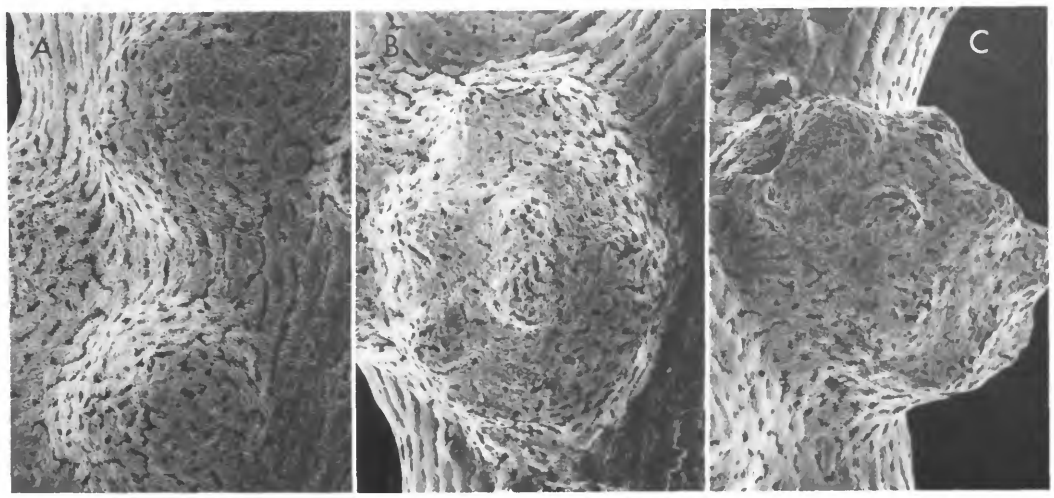


FIGURE 11.—*Stylaster galapagensis* (A, male paratype; B, C, female paratype): A, male ampulla, × 47; B, C, female ampulla with two efferent pores on opposite sides, × 47, × 44, respectively.

Female ampullae prominent and round to elliptical in outline, the elliptical ones sometimes with an efferent tube and pore on each of the vertices of ellipse. Elliptical ampullae about 1.0 × 0.75 mm in diameter; efferent pores about 0.20 mm in diameter. Female ampullae covered by five to eight wart-like protuberances, which sometimes unite into short carinae. Male ampullae smaller, 0.6–0.7 mm in diameter, and irregular in shape, resulting from the presence of one to four slightly conical efferent pores, each about 39 μm in diameter. Both types of ampullae occur on all branch surfaces of their respective sexes. Male ampullae usually clustered; female ampullae, although occasionally contiguous, are usually isolated, never clustered.

DISCUSSION.—*Stylaster galapagensis* clearly belongs to *Stylaster* (Group C) as defined by Cairns (1983b). Of the 27 species belonging to this group (Cairns, 1983b and 1986) I have examined representatives, usually the types, of all but five, concluding that *S. galapagensis* is most similar to *S. eximius* forma *altus* Hickson and England, 1905 (western Pacific), particularly in size, colony shape, and coenosteal color and texture. *Stylaster galapagensis* is distinguished by its lack of diastemas, distinctive ampullae, and larger cyclosystems. It is easily distinguished from the other Galápagan *Stylaster* by its exclusively lateral arrangement of cyclosystems and its significantly higher average number of dactylopores per cyclosystems. *Stylaster galapagensis* can be distinguished from most species by its relatively large complete cyclosystems with a high number of dactylopore per cyclosystem; its linear-granular, papillose white coenosteum; and its warty ampullae.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* ALB-2818 (female) USNM 72098.

Paratypes: ALB-2818 (1 colony, 9 branches, female; 3 colonies and 16 branches, male; 1 colony and 3 branches, sex indeterminate) USNM 72099; ALB-2818 (1 male and 1 female colony) BM 1984.9.28.5 and 4, respectively; ALB-4642 (3 colonies, 2 branches, male) USNM 72100.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (off Santa Cruz), 717 m.

DISTRIBUTION.—Known only from the Galápagos east of Santa Cruz and southeast of Española; 549–717 m.

Stenohelia Kent, 1870

DIAGNOSIS.—Gastro- and dactylopores arranged in cyclosystems which occur exclusively on anterior branch faces. Cyclosystems without lips or lids. Coenosteum white, either linear-imbricate or reticulate-granular in texture. Gastropores long and usually curved; gastrostyles present, usually encircled by a robust ring palisade. Dactylostyles rudimentary. Ampullae superficial, often clustered around base of cyclosystem. Ampullar efferent pores of both sexes usually well distinguished.

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

Stenohelia robusta Boschma, 1964

FIGURES 12A–G, 13A–C, 27A,B,D

Stenohelia profunda.—Marenzeller, 1904a:86, pl. 2: fig. 2; 1904b:91.

Stenohelia robusta Boschma, 1964a:69–72, fig. 2, pl. 1: figs. 7–9; 1968:437.—Vervoort and Zibrowius, 1981:28.—Cairns, 1983b:431.

DESCRIPTION.—Colonies small and uniplanar, the largest corallum (holotype) 2.7 cm tall and 2.7 cm broad, with a basal branch diameter of 4.3 mm. Seven to ten mm above corallum base, there is a spherical cavity caused by the symbiosis with a polynoid polychaete, much like the cavity found in *Errina macrogastra*. From this deformation radiate up to nine independent branches, usually diverging in a plane in the upper 180° of arc above the worm tube; however, sometimes branches diverge slightly out of the plane, producing a fuller colony. Branches robust, cylindrical, and straight; tapering gradually to branch tips. Branching axils greatly thickened and sometimes branching is trichotomous, giving a heavy or massive aspect to the colony. Coenosteum linear-imbricate in texture. Strips 80–90 μm wide, covered by broad but irregularly shaped platelets (Figure 12F,G). Coenosteum smooth, not ridged; however, numerous short papillae usually occur on coenosteum that forms worm tube.

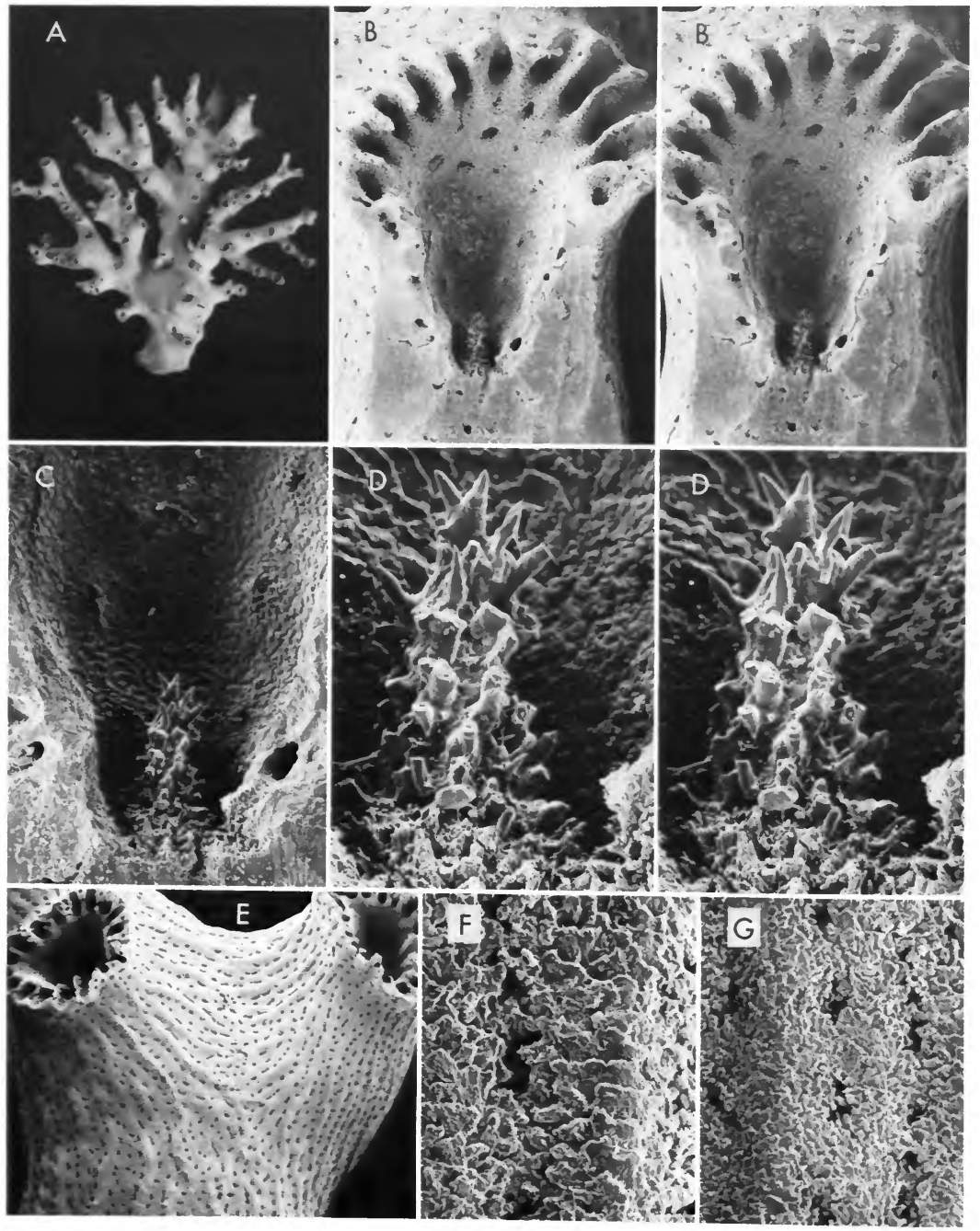
Cyclosystems occur unilinearly on anterior face and also occasionally on posterior side on coenosteum that forms worm tube. Cyclosystems round, elliptical, and irregular in shape, e.g., 0.8 mm in diameter if round, 1.3 × 0.8 mm if elliptical. Greater axis of elliptical cyclosystems transverse to branch axis. Based on 60 cyclosystems, the range of dactylopores per cyclosystem is 12–19, average = 15.40 (σ = 1.92), and mode = 16.

Lower gastropore tube cylindrical and narrow, about 0.20 mm in diameter. Just above gastrostyle tip the tube greatly expands up to 0.50 mm in diameter (Figure 12B). Illustrated gastrostyle conical, 0.216 mm tall and 0.084 mm in basal diameter (H : W = 2.57). A gastrostyle figured by Boschma (1964a, fig. 2b) measured 0.35 mm tall and 0.15 mm in diameter (H : W = 2.33). Style pointed, the tip easily seen in an undamaged cyclosystem. Style unridged and covered with large pointed spines up to 35 μm long and 11 μm in diameter. Spines not arranged in rows. Dactylopore slits about 77 μm wide; dactylostyles rudimentary.

Female ampullae prominent hemispheres and round to elliptical in shape, e.g., 0.70 × 0.57 mm in diameter. Female ampullae smooth, with an efferent pore about 0.19 mm in diameter. Male ampullae also hemispherical and about same size (0.60–0.70 mm in diameter) but knobby, having one to six efferent pores, some of them raised up to 0.13 mm. Efferent pores about 32 μm in diameter. Both male and female ampullae occur sparingly on anterior faces of their respective colonies and shallow concavities appear in the coenosteum of both sexes following release of their gametes.

Nematocysts of dactylozooids 5.0–5.5 × 2.8–3.0 μm.

REMARKS.—The skeletal deformation caused by the polychaete tubes, which occurs on every colony examined, is very similar in size, shape, and position to those of *Errina macrogastra*, making a tight spiral of 1½–2 revolutions, resulting in a spherical cavity. The deformations are also caused by the same species of polynoid polychaete: *Harmothoe irritans* (Marenzeller, 1904b). One non-type colony also had a small aplacophoran mollusc about 2.0 mm long and 0.4 mm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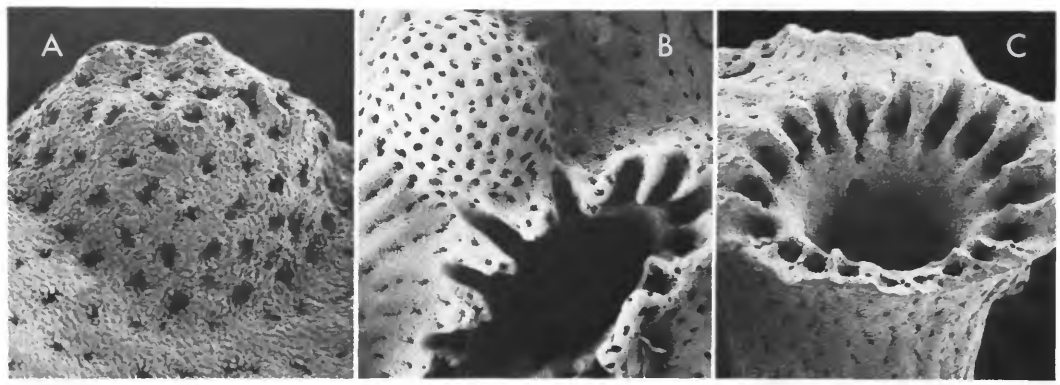


FIGURE 13.—*Stenohelia robusta* (A, C, male colony from ALB-3404; B, female colony from ALB-3404): A, male ampulla with three efferent pores, × 76; B, cyclosystem and contiguous female ampulla, × 39; C, cyclosystem, × 37.

in diameter lightly curled around a branch.

DISCUSSION.—As Boschma (1964a:72) noted, *S. robusta* differs from the other species in the genus by its distinctively robust growth form with its characteristically thickened branch axils.

In Boschma's (1964a) original description of *S. robusta*, he stated that elliptical cyclosystems were rare and that the holotype was a male. Based on additional specimens, it is now clear that elliptical cyclosystems are very common. Of the 73 colonies examined, 49 were male, 7 female, and 17 of indeterminate sex, the largest specimen, the holotype, being a female, as Marenzeller (1904a) suggested.

MATERIAL EXAMINED.—ALB-3404 (28 males, 2 females, 6 sex indeterminate, 4 histological slides) USNM 21283; ALB-3404 (21 male, 4 female, 10 sex indeterminate) MCZ. Types.

TYPES.—*Holotype:* ALB-3404 (female) USNM 21282.

Paratype: ALB-3404 (1 colony, sex indeterminate) USNM 21282.

TYPE-LOCALITY.—1°03′S, 89°28′W (south of San Cristóbal), 704 m.

FIGURE 12.—*Stenohelia robusta* (A, holotype; B–D, F, G, male colony from ALB-3404; E, female colony from ALB-3404): A, holotype, × 1.8; B–D, longitudinal section of cyclosystem exposing gastrostyle, × 39, × 115, × 270, respectively (B and D are stereo pairs); E, branching axil and two cyclosystems, × 18; F, G, imbricate coenosteal texture, × 280, × 145, respectively.

DISTRIBUTION.—Known only from the type-locality.

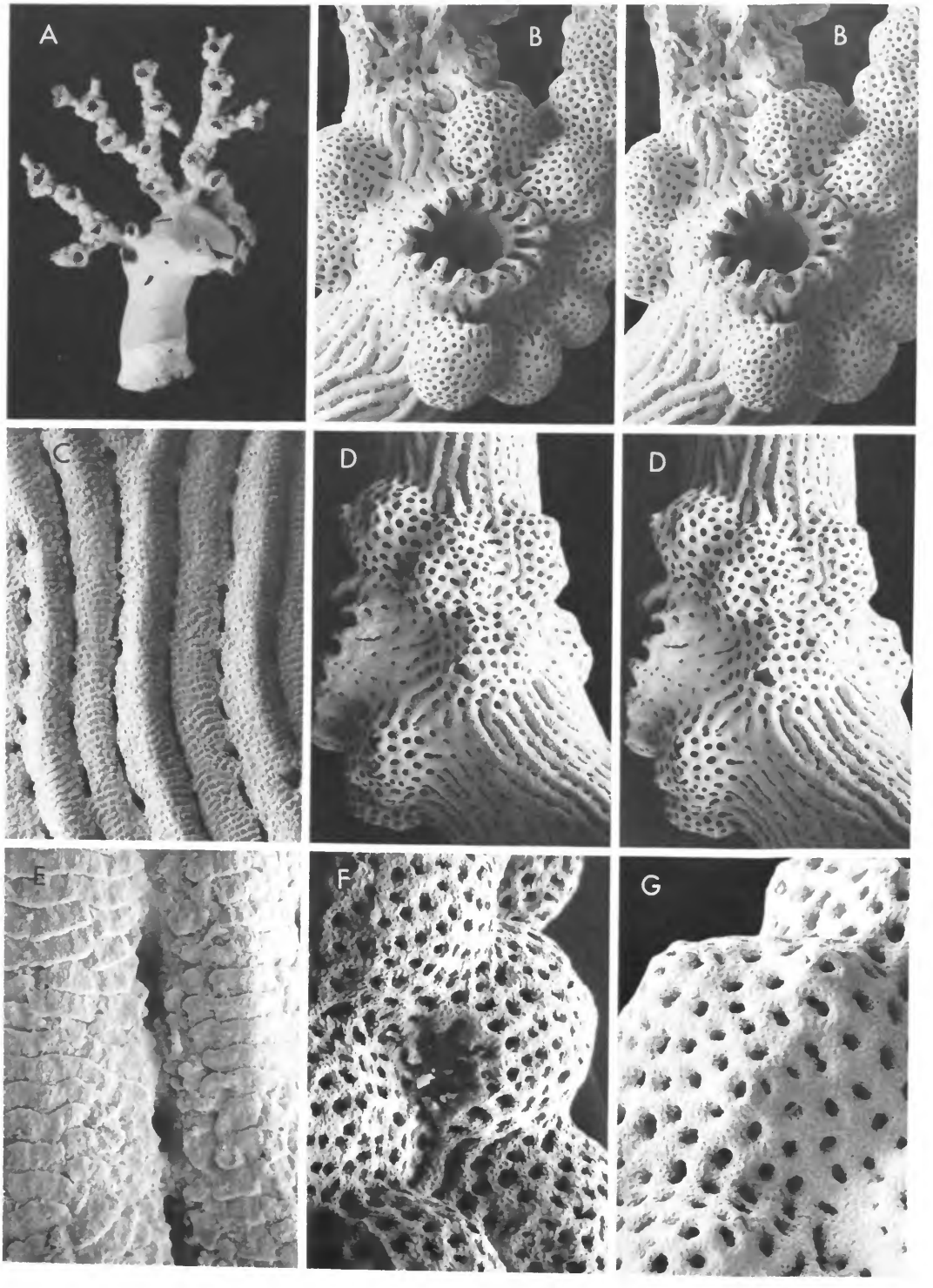
Stenohelia concinna Boschma, 1964

FIGURES 14A–G, 15A,B, 27E

Stenohelia concinna Boschma, 1964a:69, 70, pl. 1: figs. 1–6; 1964b:74–77, fig. 1, pls 1, 2; 1968:437.—Vervoort and Zibrowius, 1981:28, 29.—Cairns, 1983b:431.

DESCRIPTION.—Colonies small and uniplanar, the largest corallum 2.6 cm tall and 1.6 cm broad; largest basal branch diameter 6.5 mm. Every colony has a spherical deformation caused by a polynoid polychaete, the worm tube being identical to that described for *S. robusta* and caused by same species of polychaete. Branches cylindrical and slender, the last two or three cyclosystems on a branch usually greater in diameter than branch supporting them. Coenosteal texture linear-imbricate. Coenosteal strips convex, 0.91–1.0 mm wide, and covered by broad, flat platelets. Coenosteal slits consistently 12–13 μm wide and bridged periodically by coenosteal extensions about 45 μm wide (Figure 14C, E). Low, broad papillae about 0.15 mm in diameter very common on basal branch and coenosteum overlying worm tube. Apical pores of papillae often elongate, e.g., 0.11 mm long and 0.015 mm wide.

Cyclosystems occur unilinearly on anterior face. Cyclosystems round, elliptical, and irregular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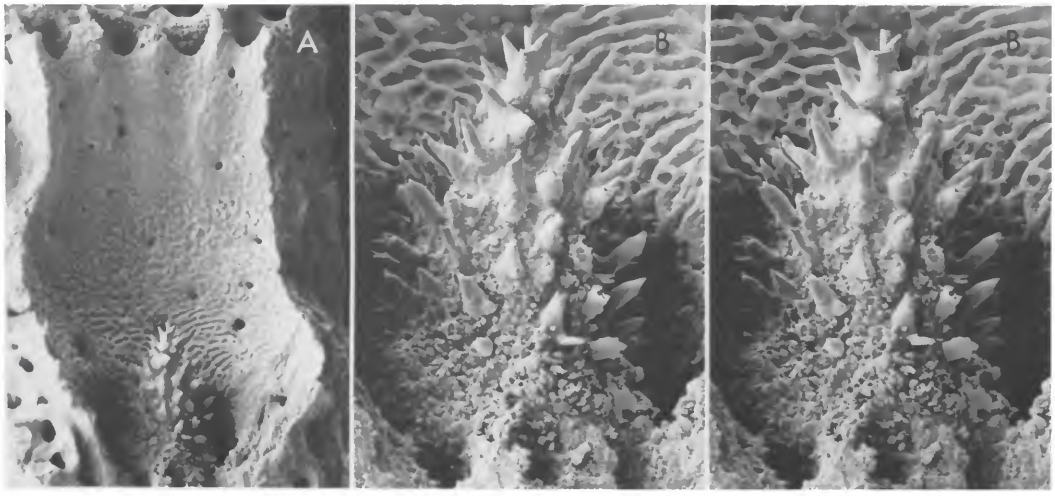

15.—*Stenohelia concinna* (A, B, female colony from ALB-3404): A, B, longitudinal section of cyclosystem revealing gastrostyle, × 66, × 180, respectively (B is a stereo pair).

in shape; an elliptical cyclosystem often 1.0 × 0.75 mm in diameter. Greater axis of elliptical cyclosystem transverse to branch axis. Based on 50 cyclosystems, the range of dactylopores per cyclosystem is 12–19, average = 15.54 (σ = 1.62), and mode = 15.

Gastropore tube a narrow cylinder basally, about 0.25 mm in diameter, which flares into a spacious spherical cavity about 0.60 mm in diameter. The spherical cavity narrows to a cylindrical upper part about 0.45 mm in diameter (Figure 15A). Gastrostyle occupies lower third of gastropore chamber, filling lowermost cylinder and extending into spherical chamber. Gastrostyle conical and pointed, the illustrated style 0.35 mm tall and 0.16 mm in basal diameter (H : W = 2.2). A gastrostyle figured by Boschma (1964c, fig. 1b) measured 0.25 mm tall and 0.09 mm in diameter (H : W = 2.7). Gastrostyle covered by large, smooth, pointed spines up to 43 μm tall and 15 μm in basal diameter; spines not aligned. Dactylopore slits about 75 μm wide. Dactylostyles rudimentary: composed of one row of cylindrical elements about 24 μm tall and 10 μm in diameter.

Female ampullae hemispherical, 0.60–0.65 mm in diameter, and penetrated by numerous round coenosteal pores 25–35 μm in diameter. Efferent pore about 0.18 mm in diameter. Male ampullae roughly hemispherical, 0.55–0.60 mm in diameter, each with two or three apical efferent pores, each pore on a short conical mound about 50 μm tall; efferent pores about 27 μm in diameter. Male ampullae also extremely porous, penetrated by numerous large coenosteal pores. Both male and female ampullae clustered on all branch surfaces, especially on posterior face and around cyclosystems.

Gastro- and dactylozooid nematocysts not well preserved, but nematocysts 8–9 × 3–4 μm in size were found throughout the coenenchyme.

REMARKS.—As in *S. robusta*, two paratype colonies of *S. concinna* each had an aplacophoran mollusk curled around its branches: one 6 mm long and 0.73 mm in diameter, the other 2.5 mm long and 0.40 mm in diameter. The smaller one had caused the branch coenosteum to begin

FIGURE 14.—*Stenohelia concinna* (A, holotype; B, C, F, female colony from ALB-4642; D, E, G, male colony from ALB-4642): A, holotype, × 2.5; B, cyclosystem surrounded by porous female ampullae, each with an efferent pore, × 24, stereo pair; C, E, imbricate coenosteal texture, × 76, × 250, respectively; D, side view of cyclosystem surrounded by porous male ampullae, each with two or three apical efferent pores, × 27, stereo pair; F, female ampulla with efferent pore, × 46; G, male ampulla with three efferent pores, × 76.

to form a tube around it. This is the first report of an association between a stylasterid and an aplacophoran.

DISCUSSION.—*Stenohelia concinna* is distinguished from the other species in the genus by its very porous ampullae (Boschma, 1964b); however, it is very similar to *S. robusta*, particularly in regard to its growth form, size, gastrostyle, coenosteal texture and papillae, and number of dactylopores per cyclosystem. It can be distinguished primarily by its more slender branches, which are not thickened at branch axils, and by its very porous ampullae, which are smaller than those of *S. robusta* and not confined to the anterior face.

MATERIAL EXAMINED.—ALB-4642 (7 colonies preserved in alcohol and 2 histological slides) USNM 62716. Types.

TYPES.—*Holotype:* ALB-4642 (male) USNM 60201.

Paratypes: ALB-4642 (4 male colonies, 1 female colony) USNM 60202.

TYPE-LOCALITY.—1°30′30″S, 89°35′W (southeast of Española), 549 m.

DISTRIBUTION.—Known only from the type-locality.

Crypthelia Milne-Edwards and Haime, 1849

DIAGNOSIS.—Gastro- and dactylopores arranged in cyclosystems, which occur exclusively on anterior branch faces. Cyclosystems covered partially or entirely by one or more fixed lids. Coenosteum linear-imbricate and often spinose as well. Nematopores common, especially on cyclosystem lids, pseudosepta, and ampullae. Gastropore double chambered; no gastro- or dactylostyles. Ampullae usually superficial and large, occurring in a variety of positions and with a variety of efferent pore locations. Female ampullae usually occur singly within cyclosystem lid and proximal cyclosystem wall; male ampullae usually clustered, often in compartmentalized rings around cyclosystems or in cyclosystem lid and proximal cyclosystem wall.

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

DISCUSSION.—In order to better characterize and distinguish the new species of *Crypthelia* described in this paper, the characteristics of all 25 valid species were tabulated. Some of the better diagnostic characters are: size and placement of nematopores; cyclosystem size; average number of dactylopores per cyclosystem; and lid shape and size; however, the best single set of characters is that pertaining to the location of the ampullae and their efferent pores. Although data were completely lacking for four of the 25 species and for one sex of five other species, a total of three types of female and eight types of male ampullae/efferent pore arrangements were found (see accompanying tabulation). Only twelve of the 24 possible combinations of male-female arrangements have thus far been discovered.

Ampullar and Efferent Pore Arrangements of *Crypthelia*

Female[1]

A. Ampulla primarily on lid; efferent pore beneath lid: *C. clausa, C. pudica, C. trophostega, C. lacunosa, C. gigantea, C. insolita, C. papillosa, C. tenuiseptata.*

B. Ampulla primarily in proximal cyclosystem wall; when known, efferent pore opens beneath lid: *C. balia, C. cryptotrema, C. vetusta, C. eueides, C. glebulenta, C. cymas, C. dactylopoma, C. peircei, C. glossopoma, C. floridana, C. formosa, C. fragilis, C. affinis* (*C. dactylopoma* and *C. eueides* may also have another ampulla on distal cyclosystem wall with an efferent pore opening into an adjacent pseudoseptum).

C. Ampullae internal, scattered randomly on branch; efferent pore apical: *C. japonica.*

Male[2]

A Ampullae in lid.

1. Efferent pores apical: *C. clausa, C. ramosa, C. lacunosa, C. insolita* (*C. insolita* has a curved apical projection obscuring the efferent pore).
2. Efferent pores open beneath lid: *C. pudica, C. trophostega.*

B. Ampullae primarily in proximal cyclosystem wall; efferent pores apical: *C. peircei, C. fragilis, C. crypto-*

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[1] Data missing for *C. ramosa, C. platypoma,* and *C. stenopoma.*

[2] Data missing for *C. balia, C. platypoma, C. stenopoma, C. papillosa,* and *C. vetusta.*

trema (*C. cryptotrema* has a straight apical projection near the efferent pore).

C. Ampullae form a ring around cyclosystem and sometimes also occur in proximal lid region.

1. Efferent pores apical: *C. eueides, C. glebulenta, C. dactylopoma, C. formosa, C. affinis.*
2. Efferent pores open on upper outer pseudosepta: *C. floridana.*
3. Efferent pores open on outer upper pseudosepta: *C. cymas.*
4. Efferent pores open into dactylotomes within cyclosystem: *C. gigantea, C. glossopoma, C. tenuiseptata.*

D. Ampullae internal, scattered randomly on branch; efferent pores apical: *C. japonica.*

Crypthelia eueides, new species

FIGURES 16A–J, 17A–C, 27 F, I

DESCRIPTION.—Colonies up to 8 cm tall, with a basal branch diameter up to 10.5 mm. Terminal branches cylindrical, about 1.2 mm in diameter. Coenosteum smooth and dense, composed of fine linear-imbricate strips about 80 μm wide. Strips covered by broad platelets, each platelet with up to 10 longitudinal ridges. Nematopores 45–50 μm in diameter and usually raised on conical mounds up to 70–80 μm tall. Nematopores common on lid, pseudoseptal edges (Figure 16H), cyclosystem wall region, and on both male and female ampullae; rare on branch coenosteum.

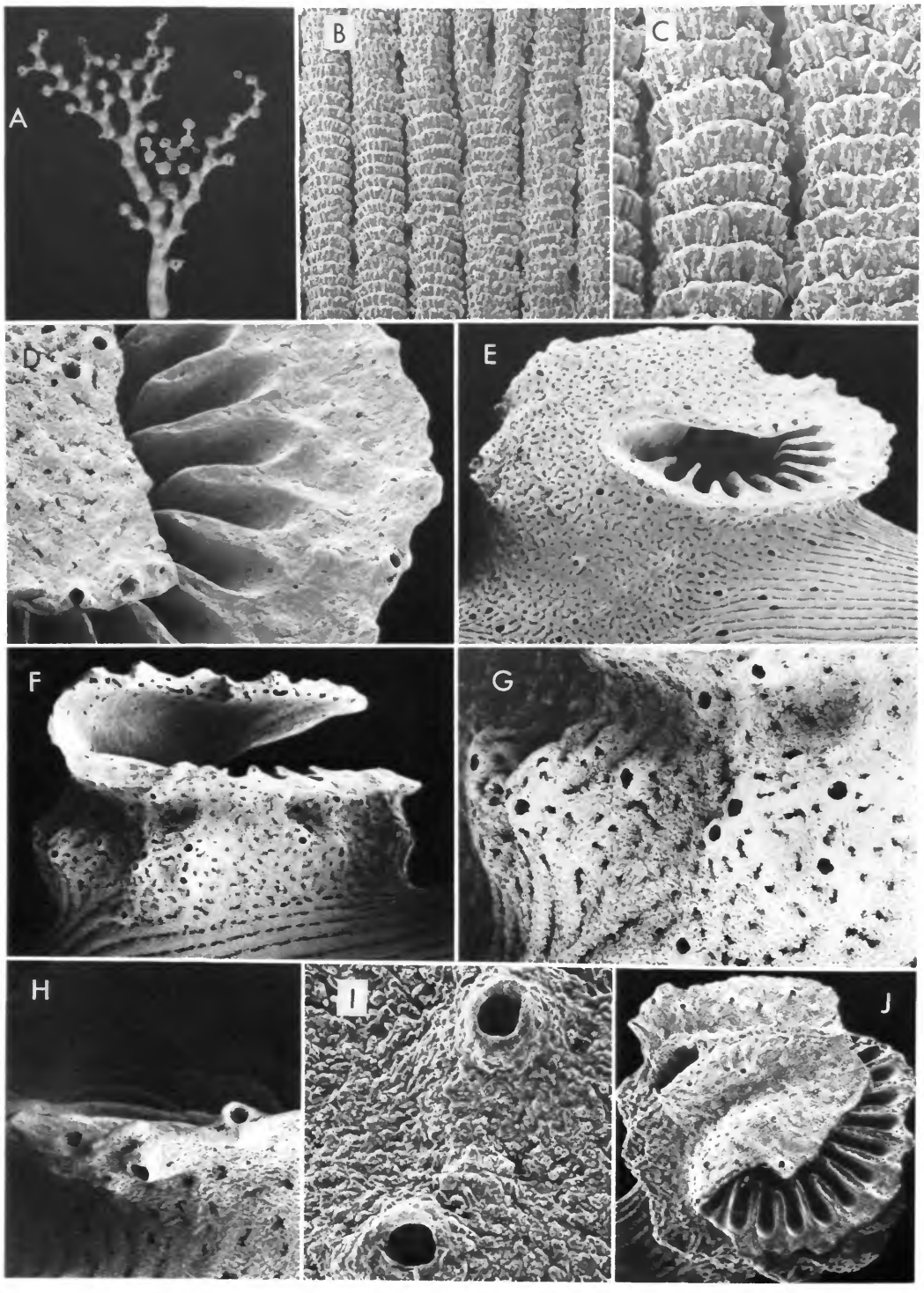
Cyclosystems elliptical, the greater axis of ellipse transverse to branch axis, about 3.2 × 2.5 mm in diameter. Cyclosystems greatly flared, having broad, very thin edges that sometime increase cyclosystem diameters to 3.5–3.7 mm. Because the edges are so thin and delicate, they are usually broken. Cyclosystems on larger diameter branches sunken into coenosteum and thus flush with coenosteal surface, without functional ampullae. Even older cyclosystems are completely covered with stereome. Based on 55 cyclosystems, the range of dactylopores per cyclosystem is 21–25, average = 22.93 (σ = 1.09), and mode = 23.

Upper, spherical gastropore chamber about 0.90 mm in diameter; aperture to lower chamber about 0.50 mm; lower, flattened chamber about 1.1 mm in diameter. Cyclosystem lid horizontal and very thin, its edges invariably broken away during collection. A fully intact and fully developed lid covers about 90% of cyclosystem when viewed from above. Lid not very high above pseudosepta, allowing a passage of only about 0.40 mm width between pseudosepta and lid. In some cyclosystems the lid appears to be formed from two adjacent pseudosepta that have incompletely fused, leaving an elongate pore along center of lid (Figure 16J). Dactylopore slits about 0.12 mm wide; pseudosepta thin, about 80 μm wide at outer edge, and slightly concave above.

Female ampullae massive hemispheres up to 1.6 mm in diameter located in proximal cyclosystem wall and occasionally also on distal cyclosystem wall. Each proximally placed ampulla has an efferent pore about 0.25 mm in diameter, opening on the lower edge of the pseudoseptum that produces the lid. The efferent pore of a distally positioned female ampulla opens into one or two adjacent dactylotomes on distal cyclosystem edge, usually at the expense of the intervening pseudoseptum. Each male cyclosystem has 10–12 individual ampullae which form a continuous ring around the cyclosystem just beneath flared cyclosystem edge. Each ampulla roughly hemispherical, about 0.60 mm in diameter, having an apical efferent pore about 60 μm in diameter, which, in turn, is in the center of a shallow concavity about 0.15 mm in diameter. Prominent nematopores often give male ampullae an irregular, knobby aspect. Both male and female ampullae only rarely found on cyclosystem lid.

Nematocysts of nematophores about 27 × 4.5 μm; those of dactylozooids about 8.0 × 2.5 μm. Each nematophore contains about 60 closely packed nematocysts.

DISCUSSION.—The arrangement of female and male ampullae and efferent pores of *C. eueides* (B, C1) is shared with *C. glebulenta*, *C. dactylopoma*, and *C. formosa* Cairns, 1983a, being the most common combination of ampullar arrangements in the genus. *Crypthelia eueides* is easily distinguished from *C. glebulenta* by its greater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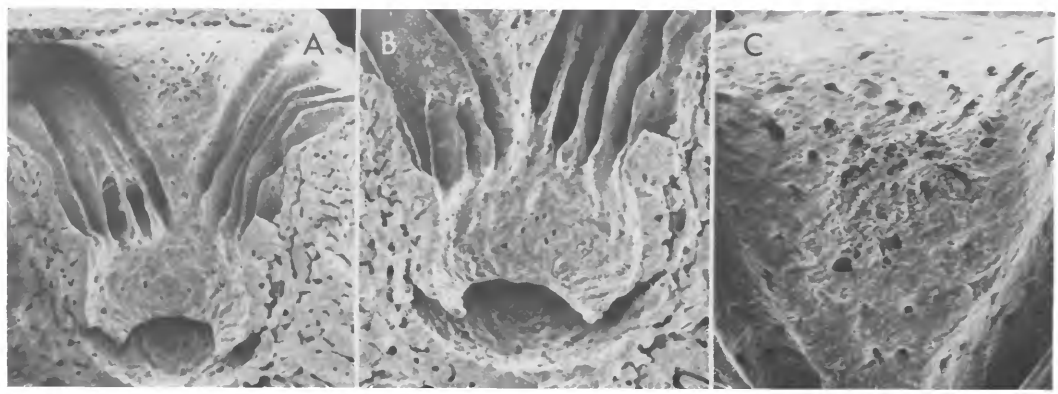


FIGURE 17.—*Crypthelia eueides* (A–C, female paratype): A, B, longitudinal section through cyclosystem showing double chamber, × 25, × 32, respectively; C, presumptive efferent pore beneath cyclosystem lid, also as seen in A, × 73.

cyclosystem size, greater cyclosystem flare, smaller male efferent pores, and much broader coenosteal platelets (Table 2); from *C. dactylopoma* by its greater cyclosystem flare, much larger lid, and smaller raised nematopores (Table 2); and from *C. formosa*, known only from the Scotia Ridge, by its larger cyclosystem, greater cyclosystem flare, and broader platelets.

ETYMOLOGY.—The specific name is from the Greek *eueides* ("beautiful").

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* ALB-2818 (male) USNM 72101.

Paratypes: ALB-2818 (2 colonies, 22 branches, 6 histological slides, female; 1 colony, 11 branches, male) USNM 72102; ALB-2818 (1 female colony, 1 male branch) BM 1984.9.28.6 and 7, respectively.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (northeast of Santa Cruz), 717 m.

FIGURE 16.—*Crypthelia eueides* (A, holotype; B–E, H, female paratype; F, G, I, J, male paratype): A, holotype × 0.73; B, C, coenosteal texture, × 105, × 265, respectively; D, lid and outer cyclosystem lip, × 49; E, female cyclosystem covered by numerous nematopores, × 21; F, cyclosystem encircled by several male ampullae, each ampulla with several conical nematopores and one recessed efferent pore, × 26; G, enlargement of male ampullae in F, × 60; H, I, nematopores on outer cyclosystem lip and cyclosystem lid, respectively, × 68, × 170, respectively; J, cyclosystem with a double lid, the lids fusing along midline, × 20.

DISTRIBUTION.—Known only from the type-locality.

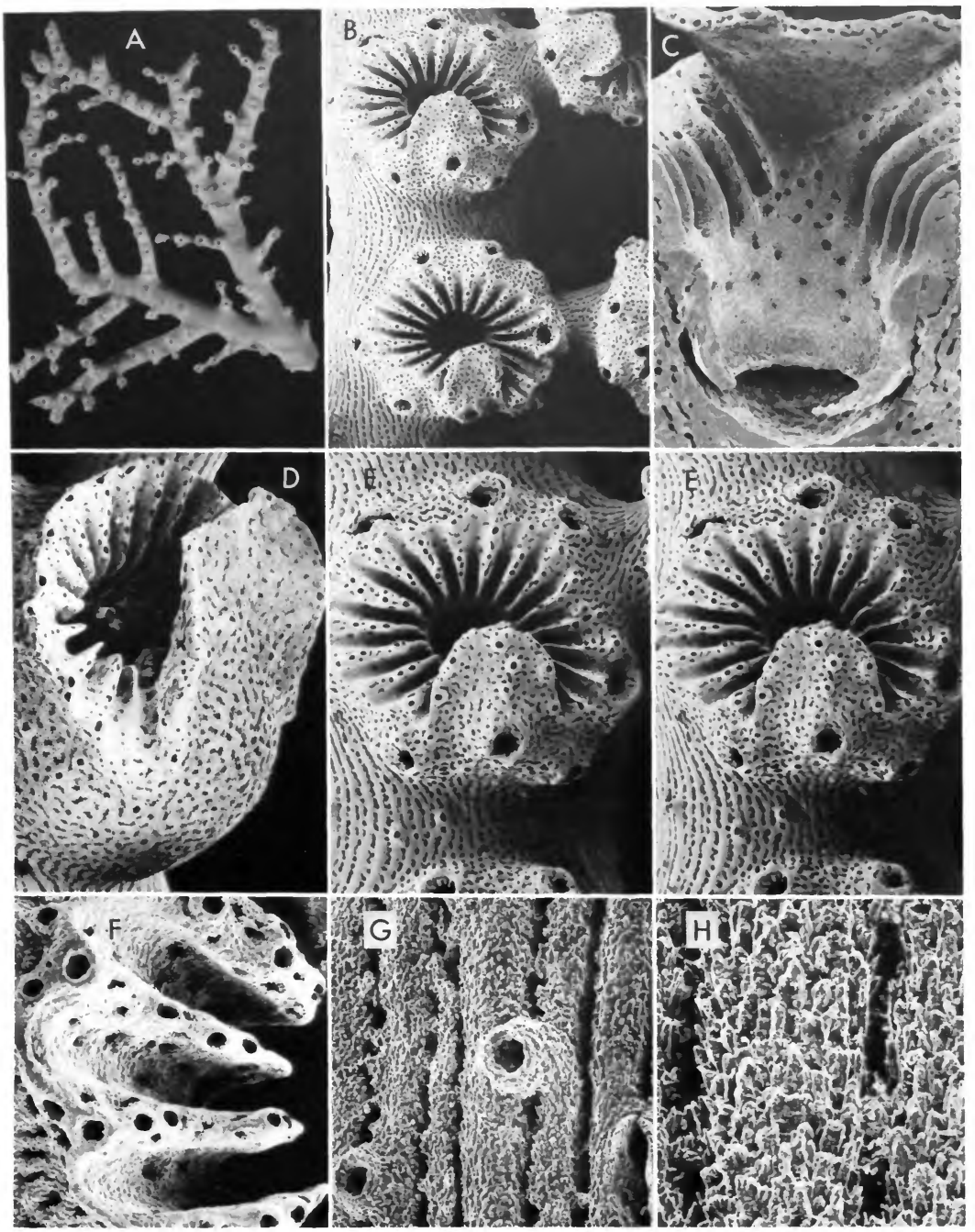
Crypthelia glebulenta, new species

FIGURES 18A–H, 19A,B

Crypthelia stenopoma.—Boschma, 1957:38[part: specimens from ALB-2818].

DESCRIPTION.—Largest colony examined (holotype) 5.8 cm tall and 6.1 cm broad; greatest basal branch diameter 8.3 mm. Terminal branches about 0.70 mm in diameter. Coenosteum composed of fine, linear-imbricate strips 60–100 μm wide. Strips covered by very narrow platelets about 9 μm wide arranged six or seven across width of a strip in a very irregular manner (Figure 18H). Nematopores 45–55 μm in diameter and often raised on conical mounds up to 70 μm high. One nematopore on upper, outer edge of each pseudoseptum, and several usually occur on the narrow upper surface of each pseudoseptum. Nematopores also on male ampullae, upper lid edge, and sometimes on female ampullae and branch coenosteum.

Cyclosystems round to elliptical, about 1.9 × 1.7 mm in diameter, the greater axis of ellipse transverse to branch axis. Cyclosystems slightly flared, most noticeable on female cyclosystems because on male cyclosystems the position of ampullae obscures flare. Based on 50 cyclosystems, the range of dactylopores per cyclosystem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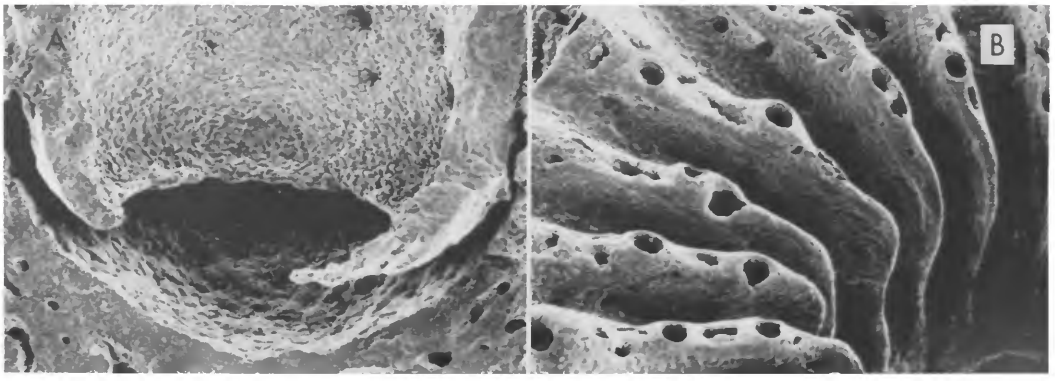


FIGURE 19.—*Crypthelia glebulenta* (A, male paratype; B, female paratype): A, gastropore ring constriction between upper and lower gastropore chambers, × 76; B, upper pseudoseptal edges and nematopores, × 86.

is 16–21, average = 18.84 (σ = 1.49), and mode = 19.

Upper, spherical gastropore chamber about 0.65 mm in diameter; aperture to lower chamber about 0.50 mm in diameter; flattened lower chamber about 1.0 mm in diameter (Figures 18C and 19A). Cyclosystem lid variable in size, ranging from 10–50% coverage of cyclosystem, usually covering about 30%. Lid roughly rectangular in shape, about 0.8 mm wide, with rounded distal edges; point of attachment to cyclosystem usually slightly greater in width than remainder of lid. Dactylopore slits about 0.12 mm wide; pseudosepta thin, about 0.11 mm wide at outer edge, narrowing to 30 μm width at inner edge.

Female ampullae massive hemispheres up to 1.8 mm in diameter located within proximal cyclosystem wall, sometimes extending into lid. A large efferent pore, up to 0.27 mm in diameter, opens beneath lid. Each mature male cyclosystem has six to nine individual ampullae encircling the cyclosystem just beneath upper outer edges of pseudosepta. Often a continuous ring is formed by these hemispherical ampullae, each ampulla about 0.60 mm in diameter. Apical efferent pores large, about 0.20 mm in diameter.

DISCUSSION.—*Crypthelia glebulenta* has been compared to *C. eueides* in the previous account and to the other species in the genus in Table 2. Particularly distinctive characters of *C. glebulenta* are its very large male efferent pores and its high density of nematopores, especially on the upper pseudoseptal edges.

ETYMOLOGY.—The specific name is from the Latin *glebulenta* ("lumpy") in reference to the lumpy aspect of the male ampullae.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* ALB-2818 (male) USNM 72103.

Paratypes: ALB-2818 (7 colonies, 20 branches, female; 3 colonies, 24 branches, male) USNM 72104; ALB-2818 (1 male and 1 female colony) BM 1984.9.28.9 and 8, respectively.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (northeast of Santa Cruz), 717 m.

DISTRIBUTION.—Known only from the type-locality.

FIGURE 18.—*Crypthelia glebulenta* (A, holotype; B, E–G, male paratype; C, D, H, female paratype): A, holotype, × 1.15; B, E, male cyclosystems illustrating ampullae with large efferent pores, × 13, × 22, respectively (E is a stereo pair); C, longitudinal section of a cyclosystem revealing female efferent pore beneath lid, × 38; D, female cyclosystem with ampulla in proximal cyclosystem wall, × 31; F, outer and upper pseudoseptal edges and nematopores, × 79; G, H, coenosteal texture, × 105, × 315, respectively.

TABLE 2.—Comparisons of Galápagos *Crypthelia* (Characters that distinguish a species from other Galápagos congeners are italicized. For data on location and arrangement of ampullae and efferent pores, see tabulation on page 24. Abbreviations: amp = ampullae, cs = cyclosystem, ps = pseudosepta.)

Characters	*C. eueides*	*C. glebulenta*	*C. lacunosa*	*C. cymas*	*C. dactylopoma*	*C. gigantea*
Coenosteum: width and relief of strips; width of platelets	80 μm, slightly convex; platelets broad, *ridged*	60–100 μm, slightly convex; platelets narrow and irregular	60–65 μm, flat; platelets narrow and irregular	70–80 μm, flat; platelets narrow	75–90 μm, flat; platelets broad	*110–150 μm, alternating ridges;* platelets broad
Nematopores: size; elevation; and location	45–50 μm; raised; lid, outer ps edges, amp (rare on coenosteum)	45–55 μm; raised; lid edge, *upper* and outer *ps*, amp, branch coenosteum	45–50 μm; usually raised; upper, outer ps, amp, and branch coenosteum	50–60 μm; flush; lid, upper, outer ps edges	*70 μm*; flush; *upper, outer ps only*	*Absent*
Cyclosystems: average size (mm) and shape; flare	3.2 × 2.5 (elliptical); *greatly flared*	1.9 × 1.7 (round to elliptical); slightly flared	1.40 × 1.75 (*round*); not flared	2.4 × 2.0 (elliptical); slightly flared	2.8 (round to irregular); not flared	*4.0 × 3.7* (elliptical); slightly flared
Range and average number of dactylopores/cyclosystem	21–25, 23.93	16–21, 18.84	12–21, 16.75	15–25, 20.38	19–25, 21.60	*21–28, 24.10*
Lid: shape; % cover of cyclosystem; orientation	Circular; 90%; horizontal and *low over gastropore*	Tongue-shaped to rectangular; 10–50%; horizontal	Circular; *over 100%*; inclined upward 45°–80°	Tongue-shaped; 50–70%; horizontal	*Digitiform; 0–20%;* inclined upward 45–60°	Round; 100%; horizontal, massive
Location and arrangement of female and male ampullae and efferent pores (p. 24)	B, C1	B, C1	A, A1	B, C3	B, C1	A, C4
Other characters	*Lid sometimes with medial fusion line;* additional female amp sometimes present on distal cs wall	*Male efferent pores quite large* (e.g., 0.2 mm in diameter)	*Lower gastropore chamber spiny; Ampullae usually covered by reticulate ridges*	*Male ampullar ring smooth and continuous; Gastropore ring constriction well developed and easily visible because of low, sloping ps*	*Coenosteal slits broad and deep; ps sometimes of unequal lengths; gastropore ring constriction often porous;* additional female amp sometimes present on distal cs wall	*Gastropore ring constriction a thin ridge; lower gastropore chamber large; ps very low, extending into lower gastropore chamber*

Crypthelia lacunosa, new species

FIGURES 20A–G, 21A–C, 27C,G

Crypthelia pachypoma.—Boschma, 1957:36 [part: specimens from ALB-2818].

DESCRIPTION.—Tallest colony 9 cm, broadest (holotype) 8.1 cm wide; greatest basal branch diameter 9.0 mm. Terminal branches about 0.7 mm in diameter. Coenosteum composed of fine linear-imbricate strips 60–65 μm wide covered by slender platelets about 10 μm wide. Platelets irregularly arranged four or five across a strip. Nematopores common on branch coenosteum and ampullae; one nematopore also on upper, outer edge of each pseudoseptum but not on tops of pseudosepta. Nematopores 45–50 μm in diameter and flush with coenosteal surface on pseudosepta but raised on conical mounds on branches and ampullae.

Cyclosystems round, 1.40–1.75 mm in diameter, with a very short vertical wall region. Based on 55 cyclosystems, there is a range of 12–21 dactylopores per cyclosystem, average = 16.78 (σ = 1.79), and mode = 17. Because the female cyclosystem lids are slightly broader at the point of attachment to the cyclosystem wall, there is less room available for dactylopores and therefore fewer dactylopores per cyclosystem on female cyclosystems. Female cyclosystems average 16.00 dactylopores per cyclosystem (N = 28); males, 17.41 (N = 27).

Upper gastropore chamber small (about 0.58 mm in diameter) and compressed, caused by the low encircling wall of the cyclosystem. Aperture to lower chamber large, about 0.43 mm in diameter, and serrate. Lower chamber small, about 0.58 mm in diameter. Gastropore ring constriction porous. Many irregularly shaped cylindrical pillars up to 34 μm tall and only 5 μm in diameter carpet bottom of lower chamber (Figures 20F and 21B). Cyclosystem lid large, its thin edges extending far beyond perimeter of underlying cyclosystem. Lid obliquely oriented 45°–80° above the cyclosystem. Attachment of lid to cyclosystem quite broad, consuming about one-third of cyclosystem perimeter in males, almost one-half in females. Cyclosystem lids often lacking on larger diameter branches. Dactylopore slits about 0.12 mm wide; pseudosepta about 0.09 mm wide at outer edge, narrowing to 21 μm width at inner edge. Pseudosepta slightly concave and porous above.

Female ampullae massive hemispheres up to 1.7 mm in diameter, confined to cyclosystem lid and sometimes to proximal cyclosystem wall. A large efferent pore about 0.26 mm in diameter opens beneath lid. Every female ampulla has very tall, apically perforate nematopores up to 0.25 mm tall. In older cyclosystems these nematopore mounds are linked by ridges forming a reticulate pattern, which enclose polygonal concavities (Figure 21C–E). Each male cyclosystem has one to nine hemispherical ampullae about 0.7 mm in diameter arranged in an irregular mass on cyclosystem lid. Each ampulla has an apical depression about 0.23 mm in diameter into which the efferent pore opens, the pore about 71 μm in diameter. A system of reticulate ridges and nematopores is also present on male ampullae.

Nematophore nematocysts 17 × 2.8–3.0 μm; those of dactylozooid, 6.5–7.0 × 3.0 μm.

REMARKS.—In most species of *Crypthelia* there is one large ampulla per cyclosystem or one in the proximal and one in the distal cyclosystem wall regions. However, one female specimen of *C. lacunosa* had two cyclosystems with two ampullae apiece, both in the lid region and each having an efferent pore beneath the lid.

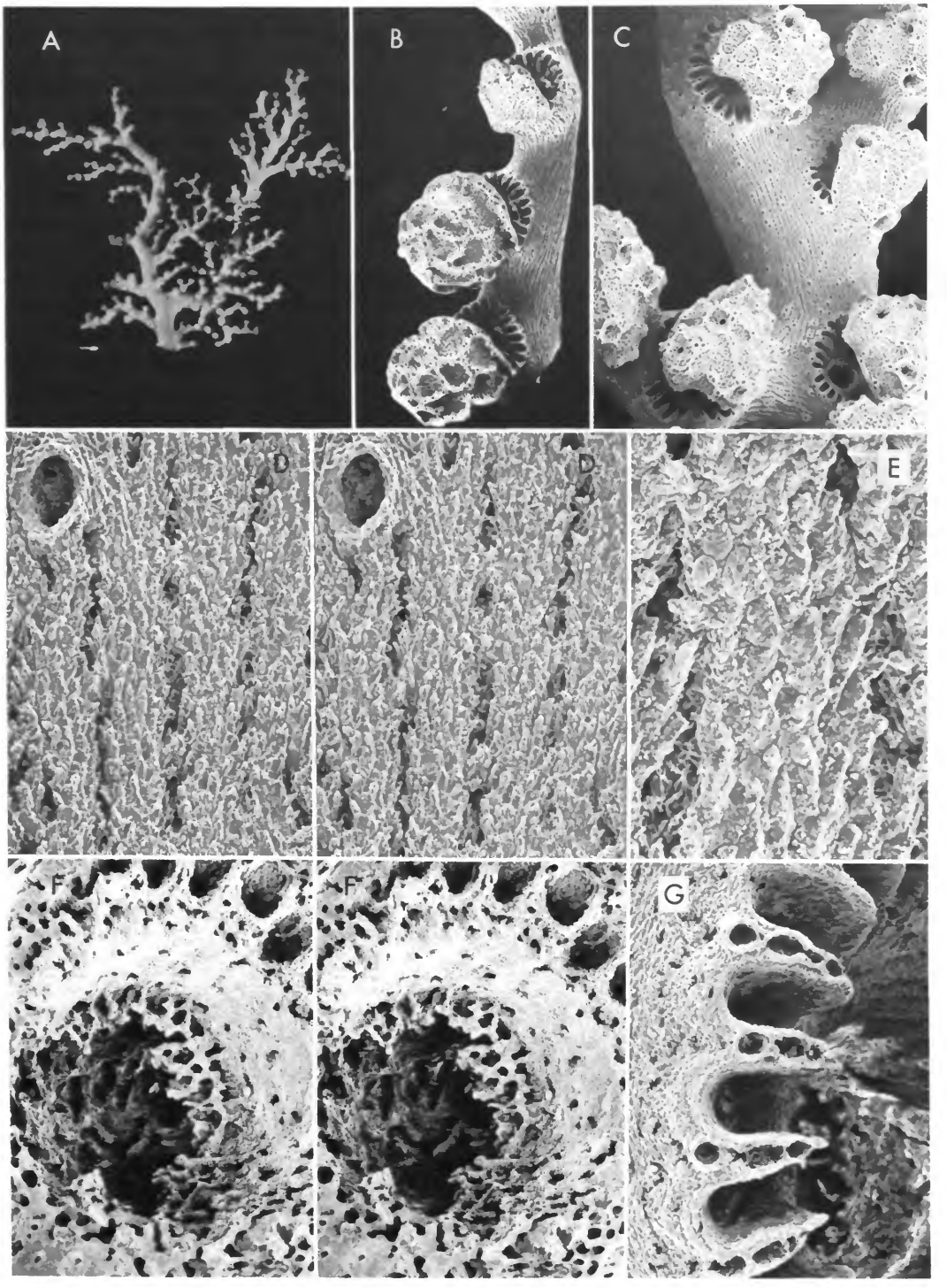
DISCUSSION.—*Crypthelia lacunosa* is distinguished from all other species by its uniquely sculptured ampullae. Only one other species has the same combination of ampullae types (A, A1), *C. clausa* Broch, 1947 (Indian Ocean), but there are many differences that separate the two. Among the species from the Galápagos, *C. lacunosa* has the smallest cyclosystems, largest lids (in relation to cyclosystem diameter), and a distinctively spiny lower gastropore chamber (Table 2).

ETYMOLOGY.—The specific name is from the Latin *lacunosa* ("having hollows") in reference to the concavities found on the ampullae.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* ALB-2818 (female) USNM 72105.

Paratypes: ALB-2818 (8 colonies, 34 branches, 3 histological slides, female; 13 colonies, 28 branches, 6 histological slide, male)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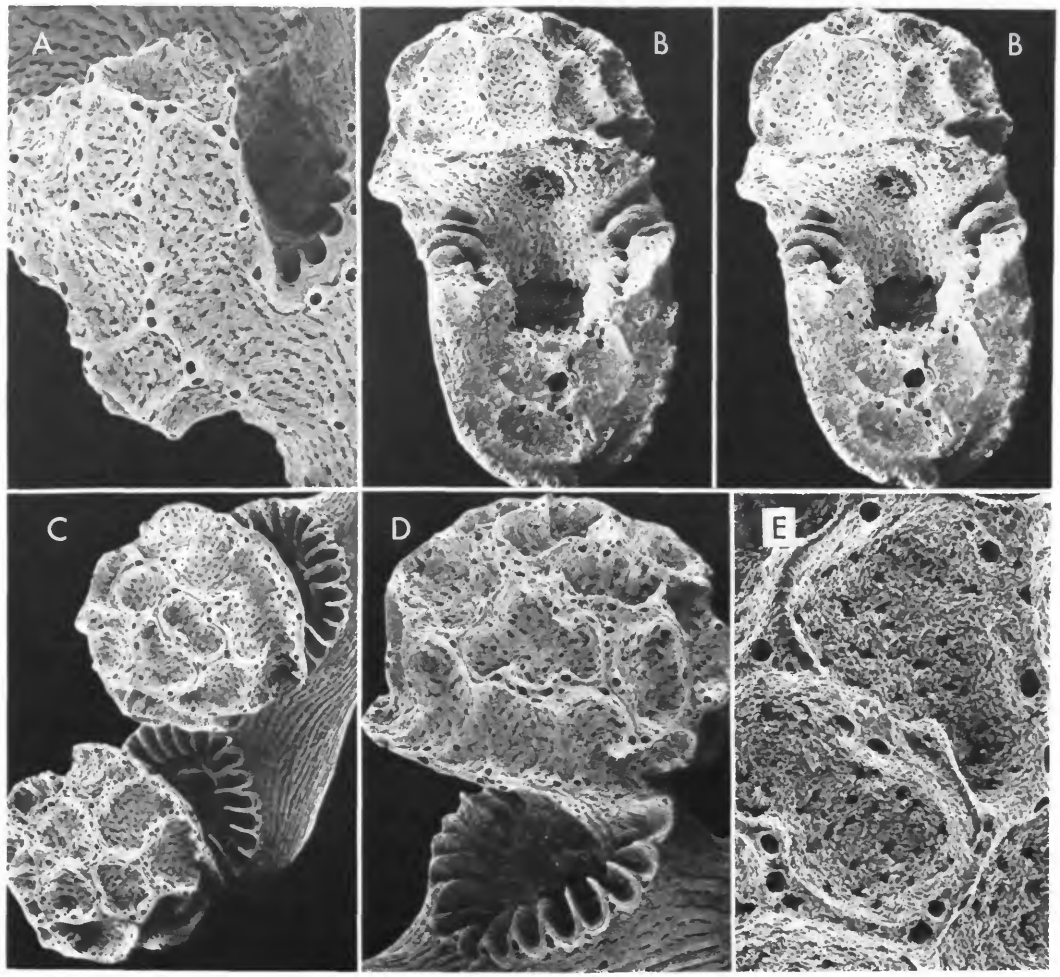


FIGURE 21.—*Crypthelia lacunosa* (A, male paratype; B–E, female paratype): A, male ampullae on cyclosystem lid, × 38; B, longitudinal section of female cyclosystem, × 22, stereo pair; C–E female ampullae, × 18, × 28, × 70, respectively.

USNM 45684; ALB-2818 (1 male and 1 female colony) BM 1984.9.28. 12 and 11, respectively.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (northeast of Santa Cruz), 717 m.

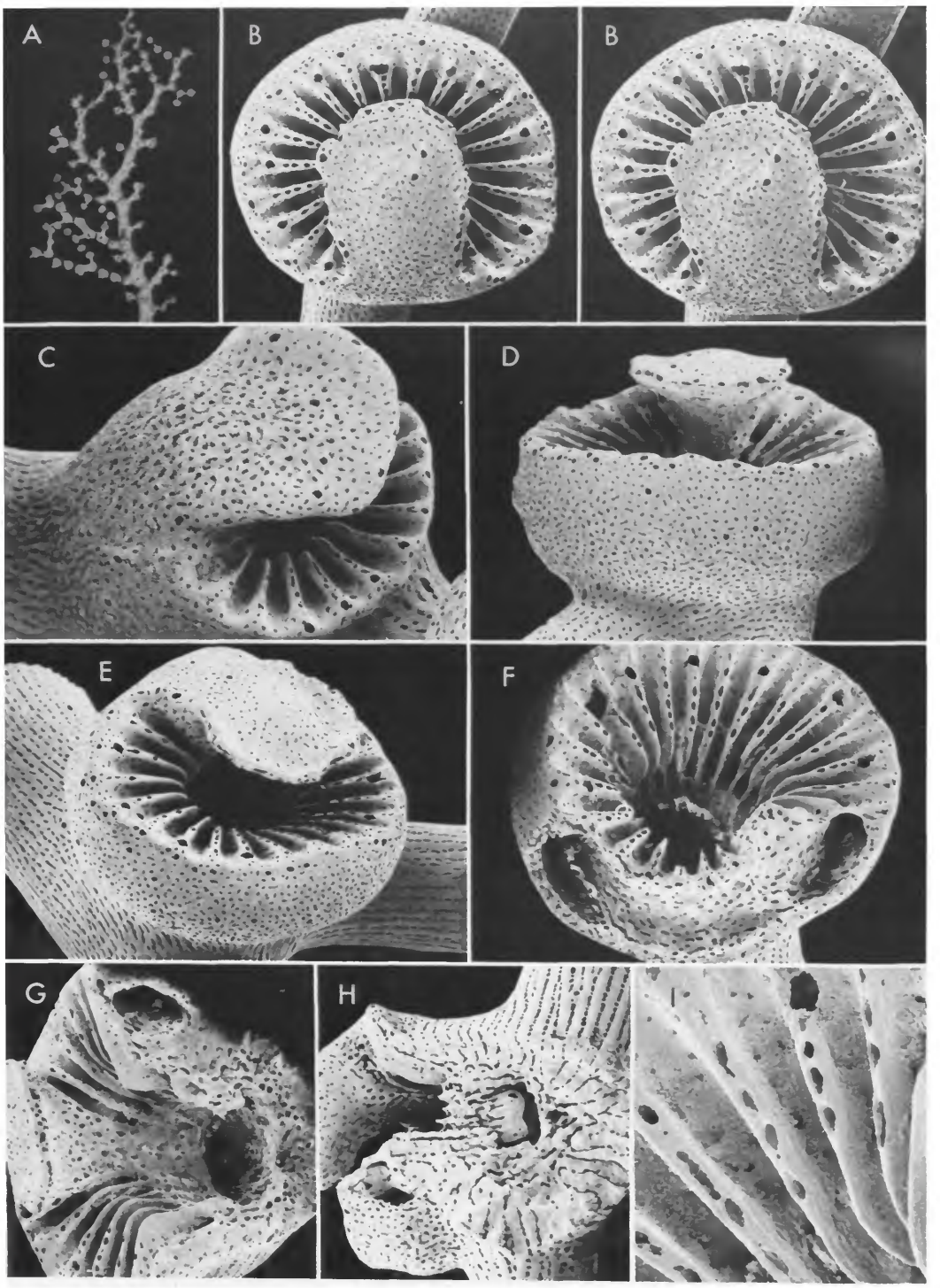
DISTRIBUTION.—Known only from the type-locality.

FIGURE 20.—*Crypthelia lacunosa* (A, holotype; B, female paratype; C–G, male paratype): A, holotype, × 0.70; B, female branch with mature ampullae, × 10; C, male branch, × 12; D, E, imbricate coenosteal texture, × 190, × 515, respectively (D is a stereo pair); F, view from above into gastropore chamber revealing porous gastropore ring constriction, × 60, stereo pair; G, upper outer edges of pseudosepta with nematopores, × 84.

Crypthelia cymas, new species

FIGURES 22A–I, 23A–C, 27H

DESCRIPTION.—Largest colony (holotype) 11 cm tall and 4.5 cm broad; greatest basal branch diameter 8.5 mm. Terminal branches about 0.7 mm in diameter. Coenosteum composed of fine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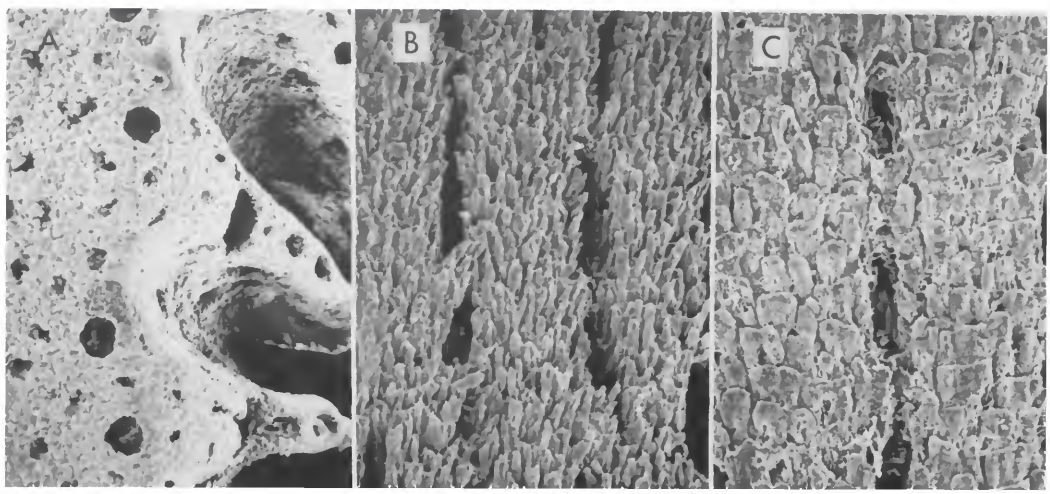


FIGURE 23.—*Crypthelia cymas* (A, C, male paratype; B, female paratype): A, nematopores on upper outer edges of pseudosepta, × 120; B, C, imbricate coenosteal texture, × 210, × 310, respectively.

linear-imbricate strips 70–80 μm wide covered by narrow platelets 8–20 μm wide. Wider platelets (Figure 23C) rectangular; more slender platelets have rounded or pointed tips (Figure 22B). Nematopores 50–60 μm in diameter and flush with coenosteum. One, sometimes two, nematopores occur on upper, outer edge of each pseudoseptum and several occur on lid. Nematopores rare on coenosteum and ampullae.

Cyclosystems elliptical, about 2.4 × 2.0 mm in diameter, the greater axis transverse to branch axis. Cyclosystems slightly flared, most noticeable on all females and those male cyclosystems prior to development of ampullae. Based on 50 cyclosystems, there is a wide range of 15–25 dactylopores per cyclosystem, average = 20.38 (σ = 2.61), and a dual mode of 19 and 23. Sexual dimorphism evident regarding number of dactylopores per cyclosystem probably because female lids more broadly attached to the cyclosystem perimeter allowing less area for dactylopores. Female cyclosystems have an average of 17.28 dactylopores per cyclosystem (N = 14, mode = 17) and males, 22.20 (N = 36, mode = 23).

Upper gastropore chamber cylindrical and slightly flared, about 0.80 mm in diameter; aperture to lower chamber about 0.57 mm in diameter; lower chamber about 0.80 mm in diameter. Gastropore ring constriction very well developed and easily visible in an undamaged cyclosystem. Cyclosystem lid tongue shaped to rectangular, with rounded distal edges. Lid about 1 mm wide, covering only about 50–70% of cyclosystem. Dactylopore slits about 0.10 mm wide; pseudosepta about 0.12 mm wide at outer edge, narrowing to about 40 μm at gastropore. Pseudosepta strongly inclined downward toward gastropore at about a 45° angle and thus not very exsert. Pseudosepta porous above but lacking nematopores.

Female ampulla a massive swelling in proximal cyclosystem wall up to 2.0 mm in diameter. Large

FIGURE 22.—*Crypthelia cymas* (A, holotype, B, D–J, male paratype; C, female paratype): A, holotype, × 0.55; B, D, E, male cyclosystems showing placement of efferent pores on outer upper pseudoseptal edges, × 24, × 25, × 23, respectively (B is a stereo pair); C, female cyclosystem with mature ampulla in proximal cyclosystem wall, × 30; F, damaged male cyclosystem revealing continuous ring of ampullae, × 26; G, longitudinal section of cyclosystem, × 25; H, damaged cyclosystem revealing exterior of gastropore ring constriction and several dactylopores, × 20; I, upper surface of pseudosepta and one efferent pore, × 55.

efferent pore, about 0.2 mm in diameter, opens beneath lid. Individual male ampullae about 0.80 mm in diameter; however, with maturity, 10–12 contiguous ampullae join to form a continuous ring around cyclosystem wall, obscuring cyclosystem flare and producing a characteristic turgid appearance. Exterior surface of ampullae and ring quite smooth. Each ampulla has an irregularly shaped efferent pore 65–75 μm in diameter opening on outer upper edge of an adjacent pseudoseptum. In fully developed male cyclosystems there are efferent pores on almost every other pseudoseptum (Figure 22B,F). Both male and female ampullae extend slightly into cyclosystem lid, giving lid a swollen appearance.

Nematocysts of nematopores about 23 × 4 μm; those of dactylozooids, 7.5–8.0 × 2.5–2.8 μm.

DISCUSSION.—*Crypthelia cymas* is unique among the species of the genus in having its efferent pores open into the outer upper pseudosepta. It is also distinctive in having strongly inclined, low pseudosepta, which produce a very open fossa, revealing a well-developed gastropore ring constriction.

ETYMOLOGY.—The specific name is from the Greek *cymas* ("pregnant women") in reference to the swollen, turgid aspect of both the female and male ampullae.

MATERIAL EXAMINED.—Types.

TYPES.—*Holotype:* ALB-2818 (male) USNM 72106).

Paratypes: ALB-2818 (17 colonies, 37 branches, 3 histological slides, male; 2 colonies, 1 branch, female) USNM 72107; ALB-2818 (1 male colony) BM 1984.9.28.10.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (northeast of Santa Cruz), 717 m.

DISTRIBUTION.—Known only from the type-locality.

Crypthelia dactylopoma, new species

FIGURES 24A–H, 25A,B

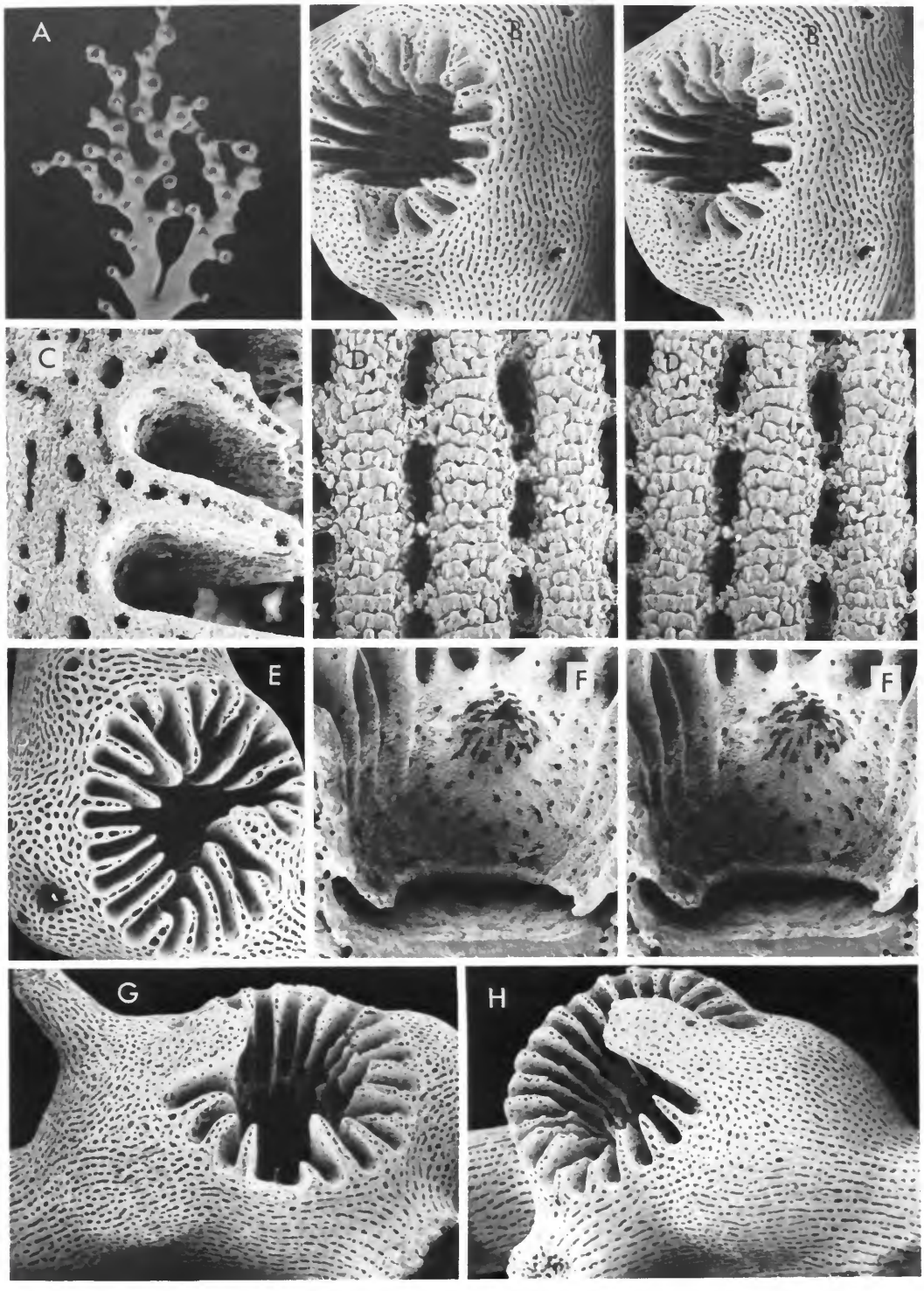
DESCRIPTION.—Holotype colony 6.3 cm tall and 3.7 cm broad; tallest colony 8.5 cm in height, greatest basal branch diameter, 9.5 mm. Terminal branches about 1.0 mm in diameter. Coenosteum composed on linear-imbricate strips 75–90 μm wide, separated by deep, broad slits about 25 μm wide. Slits bridged periodically by coenosteal extensions about 40 μm thick (Figure 24D). Platelets broad and flat, usually extending across entire width of strip. One nematopore on upper edge of each pseudoseptum; rare or absent elsewhere on corallum. Nematopores about 70 μm in diameter and flush with coenosteum.

Cyclosystems round to slightly irregular in shape, about 2.8 mm in diameter. Cyclosystems not flared. Based on 50 cyclosystems, there is a range of 19–25 dactylopores per cyclosystem, average = 21.60 (σ = 1.48), and mode = 22.

Upper gastropore chamber cylindrical, about 1.2 mm in diameter; lower chamber about 1.4 mm in diameter and 0.10 mm high. Aperture to lower chamber about 0.80 mm in diameter, encircled by a very delicate, porous gastropore ring constriction in young cyclosystems, which progressively becomes solid and then robust with greater age of cyclosystem. Cyclosystem lid slender, short, and digitiform, rarely more than 0.7 mm wide; sometimes lacking. Lid usually obliquely oriented up to 45°–60° above plane of cyclosystem, the lid covering only a small portion of the cyclosystem. Dactylopore slits about 0.16 mm wide; pseudosepta about 0.15 mm wide at outer edge and 65 μm at inner edge. Pseudosepta of unequal lengths in some cyclosystems (Figure 24E), the order of lengths seeming to be random.

Female ampulla a large hemisperical bulge, up to 2.8 mm in diameter, in proximal cyclosystem wall. An additional female ampulla sometimes present opposite the first on distal cyclosystem wall. The proximal ampulla has a large efferent pore about 0.32 mm in diameter near base of

FIGURE 24.—*Crypthelia dactylopoma* (A, holotype; B, D, E, male paratype; C, F–H, female paratype): A, holotype, × 1.05; B, male cyclosystem showing several efferent pores, × 15, stereo pair; C, nematopores on upper outer edges of pseudosepta, × 75; D, imbricate coenosteal texture, × 125, stereo pair; E, male cyclosystem with pseudosepta of unequal lengths, × 17; F, longitudinal fracture through gastropore chambers revealing female efferent pore, × 33, stereo pair; G, H, female cyclosystems with mature ampullae, both × 17.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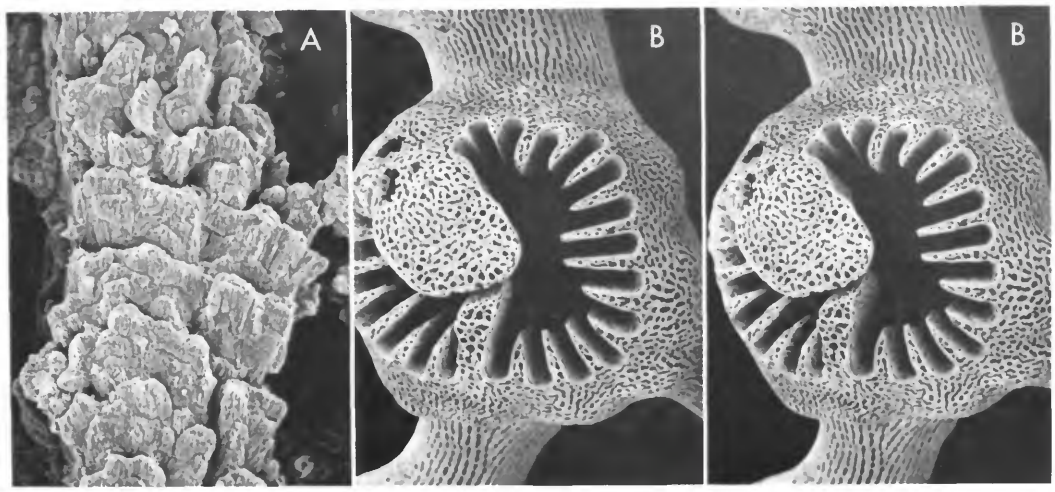


25.—*Crypthelia dactylopoma* (A, B, nontype male colony from ALB-4642, USNM 72110): A, imbricate coenosteal texture, × 470; B, cyclosystem with auxiliary lid, × 16, stereo pair.

lid, often in upper gastropore chamber. The distal ampulla, when present, has a smaller pore opening into lower part of an adjacent pseudoseptum; this pseudoseptum sometimes enlarged, approximating a lid. Male ampullae consist of up to 12 low bulges, each about 1.0 mm in diameter, which encircle cyclosystem wall. Unlike *C. cymas*, these ampullae do not lose their individuality in a smooth ring structure but retain their hemispherical shape. Each ampulla has an apical efferent pore about 0.15 mm in diameter.

REMARKS.—In addition to the typical arrangement of male ampullae described above, two branches from *Albatross* station 2818 also had numerous male ampullae scattered over the posterior face.

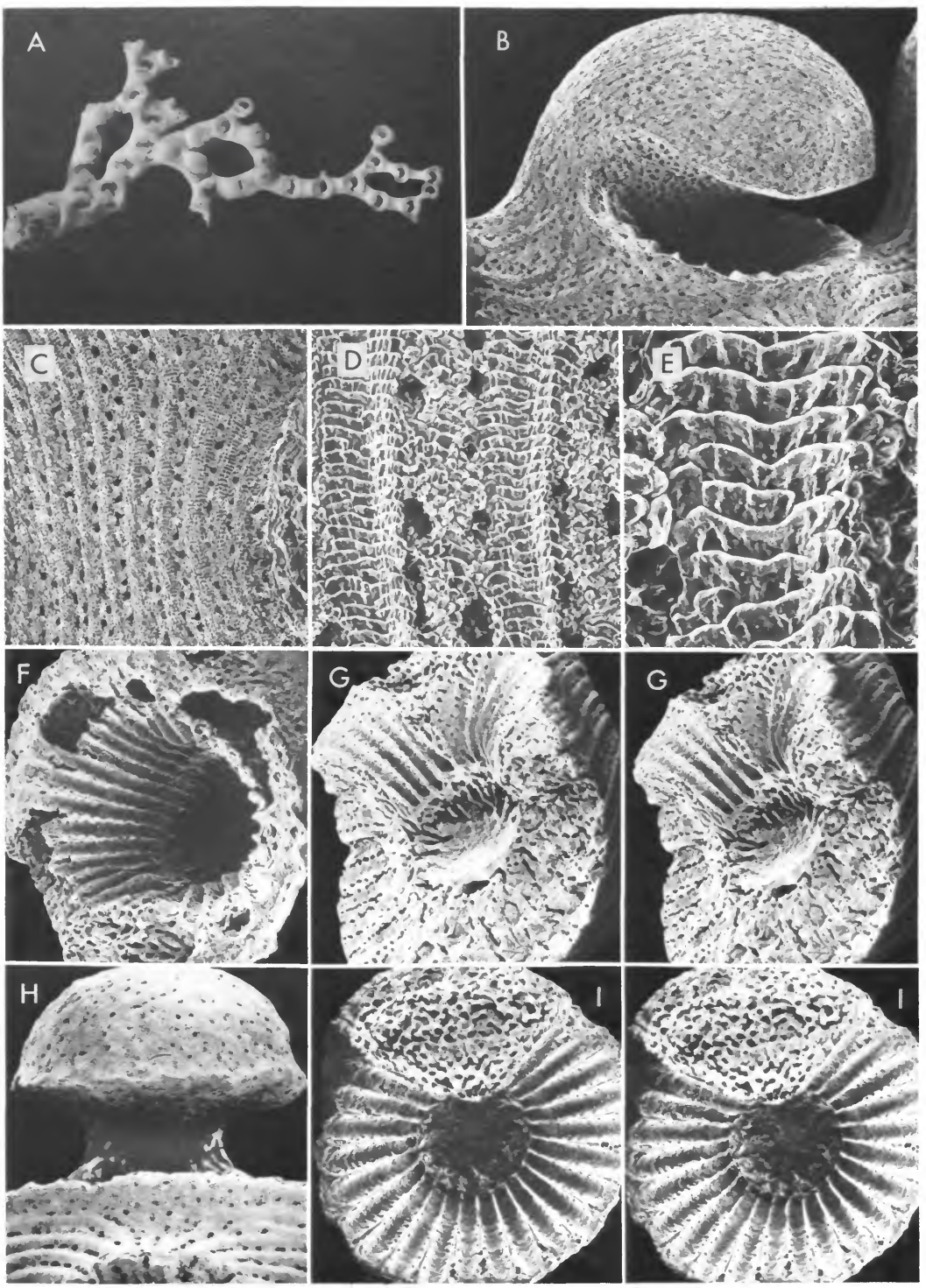
One male colony from *Albatross* station 4642 (Figure 25A, B) and two male branches from *Albatross* station 2818 are identical to *C. dactylopoma* except for various aspects of the cyclosystem lid. In these specimens the lid is larger (up to 1 mm wide), tongue-shaped, and often occurs two or three per cyclosystem, sometimes fusing over the gastropore. I hesitate to describe a new species based on this one difference and on so little material.

DISCUSSION.—The ampullae and efferent pore placement of *C. dactylopoma* (B, C1) is common to several other *Crypthelia* from the Galápagos (Table 2). It is most easily distinguished from these by its very narrow, obliquely oriented lid; porous gastropore ring constriction; and large nematopores. Furthermore, many female cyclosystems have an additional ampulla on the distal cyclosystem wall and often the pseudosepta are of unequal lengths.

ETYMOLOGY.—The specific name is from a combination of the Greek *dactylos* ("finger") plus *poma* ("lid") in reference to the narrow, digitiform cyclosystem lids.

MATERIAL EXAMINED.—ALB-4642 (1 male colony) USNM 72110. Types.

FIGURE 26.—*Crypthelia gigantea* (A–E, G–I, female syntype; F, male syntype): A, previously figured (Fisher, 1938) female syntype colony, × 0.95; B, female cyclosystem with mature ampulla, × 15; C–E, imbricate coenosteal texture, × 23, × 84, × 250, respectively; F, damaged male cyclosystem revealing ring like ampullar cavity, × 14; G, damaged cyclosystem revealing lower gastropore chamber and ridge-like gastropore ring constriction, × 12, stereo pair; H, female cyclosystem and lid viewed from anterior, × 17; I, damaged female cyclosystem revealing lower chamber, × 14, stereo pair.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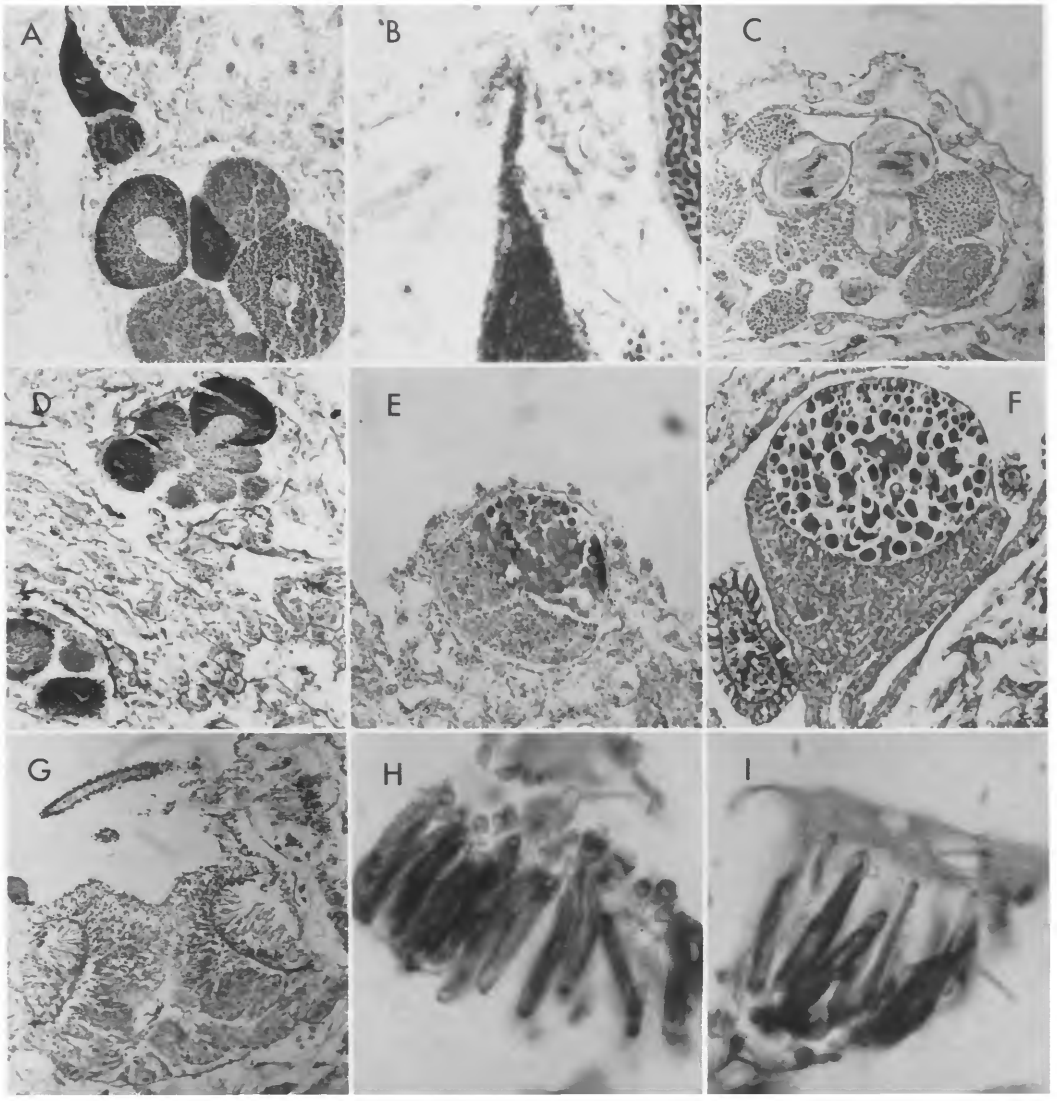

FIGURE 27.—Histological sections of various species (A, B, D, *Stenohelia robusta* from ALB-3404, USNM 21283, male; C, G, *Crypthelia lacunosa* from ALB-2818, USNM 45684, male; E, *Stenohelia concinna* from ALB-4642, USNM 62716, female; F, I, *Crypthelia eueides* from ALB-2818, USNM 72101, female; H, *Crypthelia cymas* from ALB-2818, USNM 72107, male): A, male ampulla containing several gonophores, × 90; B, enlargement of seminal duct of one gonophore containing mature sperm, × 300; C, cluster of male gonophores within cyclosystem lid, × 100; D, cluster of young male gonophores attached to spadix, × 90; E, young female gonophore, × 120; F, well-developed female gonophore showing attachment to spadix, × 90; G, longitudinal section of gastrozooid and one dactylozooid above, × 90; H, I, nematophores, both × 950.

TYPES.—*Holotype:* ALB-2818 (male) USNM 72108.

Paratypes: ALB-2818 (8 colonies, 37 branches, female; 2 colonies, 17 branches, male) USNM 72109; ALB-2818 (1 female colony and 1 male colony) BM 1984.9.28.13 and 14, respectively.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (northeast of Santa Cruz), 717 m.

DISTRIBUTION.—Known only from the type-locality and possibly southeast of Española (specimen from ALB-4642); (549)–717 m.

Crypthelia gigantea Fisher, 1938

FIGURE 26A–I

Crytohelia gigantea Fisher, 1938:535, 536, pl. 64: fig. 5.
Crypthelia gigantea.—Boschma, 1953:166; 1957:35.—Cairns, 1983b:431.

DESCRIPTION.—Largest syntype fragment 7.4 cm tall and 7.6 mm in basal diameter. Terminal branches about 1.3 mm in diameter. Coenosteum composed of linear-imbricate strips alternating in width and prominence. Highly convex strips 0.12–0.15 mm wide and composed of broad ridged platelets alternate with flat, narrower strips about 0.11 mm wide, the latter covered by irregularly shaped platelets (Figure 26C–E). No nematopores.

Cyclosystems elliptical, about 4.0–4.1 × 3.5–3.7 mm in diameter, the greater axis transverse to branch axis. Upper pseudoseptal edges somewhat flared, the cyclosystems being exsert on distal branches but sunken below coenosteal level on larger diameter branches. Based on 50 cyclosystems (all available specimens), the range of dactylopores per cyclosystem is 21–28, average = 24.10 (σ = 1.66), and mode = 24.

Upper gastropore chamber infundibuliform, tapering from an upper diameter of about 2.25 mm to a lower constriction diameter of about 1.2 mm. Gastropore ring constriction poorly defined, marked by a thin circular ridge about 80 μm high. Lower chamber ellipsoidal, about 1.4 mm in horizontal diameter and about 0.83 mm high. Female cyclosystem lid large and quite swollen, covering entire cyclosystem; male lids unknown. Dactylopore slits quite broad, about 0.25 mm wide, separated by slender pseudosepta about 0.16 mm wide at their outer edges and 45 μm at their inner edges. Pseudosepta low in relief (only about 0.14 mm high), closely following the sloping inner wall of upper gastropore chamber and usually continuing as rudimentary ridges into lower chamber.

Female ampullae quite massive, swelling cyclosystem lid to great size (Figure 26B,H). Efferent pore about 0.45 mm in diameter, opening beneath lid over gastropore. Male ampullae form a continuous ring around the cyclosystem, each having an efferent pore 0.13–0.17 mm in diameter opening into an adjacent dactylotome within upper part of upper gastropore chamber.

REMARKS.—*Crypthelia gigantea* has the largest cyclosystems and the greatest number of dactylopores per cyclosystem of any known stylasterid.

DISCUSSION.—In addition to it distinctively large size and high number of dactylopores per cyclosystem, *C. gigantea* is also characterized by its large lower gastropore chamber, unique pattern of coenosteal texture, pseudosepta extending into lower chamber, and complete absence of nematopores. Its combination of ampullae and efferent pore placements (A, C4) is also unique.

MATERIAL EXAMINED.—Syntypes.

TYPES.—Three syntypes (1 colony, 1 branch, female; 1 branch, male), including Fisher's (1938, pl. 64: fig. 5) illustrated type are deposited at the USNM (43273). Three more syntype branches are also deposited at the California Academy of Sciences (29129). All syntypes were collected at ALB-2818.

TYPE-LOCALITY.—00°29′S, 89°54′30″W (northeast of Santa Cruz), 717 m.

DISTRIBUTION.—Known only from the type-locality.

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