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NEW RECORDS OF STYLASTERIDAE (HYDROZOA: HYDROIDA) FROM THE GALÁPAGOS AND COCOS ISLANDS

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Abstract.—Based on the collections of the *Johnson-Sea-Link I* submersible, new records of 14 stylasterid species are reported from the Galápagos Islands, including one new species: *Lepidopora concatenata*. Five stylasterid species are reported from Cocos Island, including two new species: *Pliobothrus fistulosus* and *Stylaster cocosensis*. These are the first records of stylasterids from Cocos Island, three of the five species also shared with the Galápagos Islands. These specimens are also the first records of the genera *Lepidopora* and *Pliobothrus* in the eastern Pacific, from the Galápagos and Cocos Islands, respectively. Both the Galápagan and Cocos Island stylasterid faunae are considered to be derived from the western Pacific, having no affinity with the shelf and slope fauna of the American continents in the eastern Pacific.

A rich fauna of fourteen stylasterid species, all endemic to the Galápagos Islands and all based on only six *Albatross* stations made at the turn of the century, was reviewed by Cairns (1986b). Therefore, it was anticipated that a more intensive collecting effort (27 stations in the Galápagos and 8 off Cocos Island) using more efficient and selective collecting methods (a manned submersible) would certainly yield many more species. Although stylasterids were sighted on every submersible dive and collected at 21 of the 27 sites in the Galápagos, in which all 14 previously collected species were represented, only one specimen of one new species was collected. This surprising result might be explained by assuming that all of the Galápagan stylasterid species are uniformly and abundantly distributed throughout the archipelago, such that even a cursory sampling would have a high probability of collecting most of the resident species. This hypothesis would explain both the paucity of new species and the re-collection of all previously known species.

The history of our knowledge of the Galápagos stylasterid fauna was given by Cairns (1986b) and is not repeated here. One of the species previously reported, *Stenohelia robusta* Boschma, 1964a, is herein synonymized with *Stenohelia concinna* Boschma, 1964a, and one new species is described, which maintains the number of species known from the Galápagos at 14. The additional specimens collected by the *Johnson-Sea-Link I*, however, did: allow an extension of the geographic, bathymetric, and temperature ranges of all species; provide information on the range of variation of various morphological characters; and establish maximum colony sizes for half of the species.

Stylasterids were also abundant off Cocos Island, being collected from four of the eight stations. Since no stylasterids had previously been reported from Cocos Island, the five species reported herein are all new records for this island, including two new species.

Material and methods.—The new records on which this report is based originated primarily from collections of the *R/V Seward Johnson* and *Johnson-Sea-Link I* submersible expedition to the Galápagos and Cocos

Table 1.—List of *Johnson-Sea-Link I* (*JSL*) stations at which stylasterids were collected (Fig. 32).

Station	Latitude	Longitude (°W)	Depth (m)	Date	Bottom temperature (°C)
1911	0°32.7′S	90°07.0′	426–462	12 Nov 1986	8.3–10.3
1912	0°21.9′S	90°15.7′	713–806	14 Nov 1986	5.9–6.7
1913	1°32.7′S	90°25.8′	84–227	14 Nov 1986	13.5–14.5
1914	1°17.3′S	90°17.4′	166–172	15 Nov 1986	14.3–14.4
1915	1°17.2′S	89°48.7′	650–652	15 Nov 1986	7.4–10.8
1916	1°18.7′S	89°48.8′	545–562	16 Nov 1986	7.3–10.8
1920	1°46.6′S	89°30.8′	64–104	17 Nov 1986	
1921	0°17.0′N	89°59.8′	680–720	18 Nov 1986	6.0–6.7
1922	0°23.7′N	90°26.3′	475–578	19 Nov 1986	7.3–8.9
1923	0°23.7′N	90°32.3′	348–384	19 Nov 1986	9.9–10.0
1924	0°03.9′N	90°19.2′	373–430	20 Nov 1986	
1925	0°14.9′S	90°32.5′	415–447	20 Nov 1986	8.9–9.3
1927	0°10.5′S	90°53.3′	708–784	21 Nov 1986	5.6–6.5
1928	0°15.2′S	91°06.9′	720–813	22 Nov 1986	5.0–7.5
1929	0°14.7′N	91°36.5′	806	23 Nov 1986	5.7–9.3
1931	0°10.3′S	91°24.7′	441–525	24 Nov 1986	7.9–8.0
1932	0°15.1′S	91°27.7′	313–315	24 Nov 1986	10.4–12.2
1933	0°17.1′S	91°40.2′	663–788	25 Nov 1986	6.0–7.0
1935	0°15.2′S	91°27.9′	252–308	25 Nov 1986	7.8–9.0
1936	0°40.7′S	91°24.0′	182–224	26 Nov 1986	12.5–14.4
1937	0°59.8′S	91°27.1′	315–316	27 Nov 1986	11.2–12.6
1940	5°34.6′N	87°04.3′	546–631	1 Dec 1986	9.0
1942	5°34.6′N	87°04.3′	606–628	2 Dec 1986	6.7–7.1
1943	5°26.1′N	87°08.0′	303–333	2 Dec 1986	11.9
1944	5°28.1′N	87°08.0′	293–576	3 Dec 1986	7.7–8.3

Islands in November and December of 1986. Stylasterids were collected at 25 of the 35 submersible sites (Table 1). The use of a manned research submersible allowed selective collection of deep-water invertebrates and in situ observation and photography of living coral, and is highly recommended for the collection of deep-water benthic invertebrates in areas of rugged topography.

Definitions of the terms used in the descriptions are reviewed and illustrated by Cairns (1983b, 1986a). Synonymies are not always complete; where they are not, they include a reference to a complete synonymy. All type and most nontype specimens are deposited at the USNM; a synoptic collection is also deposited at the Charles Darwin Research Station. The scanning electron photomicrographs were done by the author on a Cambridge Stereo Scan 100.

The following abbreviations are used in the text:

CDRS	Charles Darwin Research Station, Santa Cruz, Galápagos
H:W	Height-to-width ratio of a gastrostyle
JSL	*Johnson-Sea-Link I*, a 4-man research submersible owned by the Harbor Branch Oceanographic Institution, Inc., Fort Pierce, Florida
USNM	Collections of the United States National Museum (now housed at the National Museum of Natural History), Smithsonian Institution, Washington, D.C.

Zoogeography.—Cairns (1986b) reported that all 14 stylasterid species known from the Galápagos were endemic. Furthermore, he stated that, at the generic level, the affinities of the Galápagos stylasterids were

with the western Pacific and less so with the western Atlantic, not at all with the eastern Pacific. The deep-water Equatorial Undercurrent was suggested as a possible dispersal mechanism for larvae. The collections of the *Johnson-Sea-Link I* expedition reinforce this interpretation. At the species level, three Galápagan species are now known from Cocos Island and one, *Crypthelia cymas,* is known from off New Zealand (Cairns 1991c). This observation, along with the discovery of *Lepidopora* in the Galápagos (a widespread genus but not known elsewhere in the eastern Pacific) reinforces the hypothesis of a western Pacific origin of the Galápagan stylasterid fauna.

Five stylasterid species are known from off Cocos Island, belonging to three genera: *Pliobothrus fistulosus, Errina macrogastra, Stylaster marenzelleri, S. galapagensis,* and *S. cocosensis.* At the species level, two of the five are known only from Cocos Island, the remaining three also occurring in the Galápagos Islands. All three genera have widespread distributions but do not occur in the eastern Pacific. Thus, although based on relatively few specimens, it would appear that the Cocos Island fauna is also primarily influenced from the western, not eastern, Pacific. This is contrary to the indication of Briggs (1974), based on shallow-water invertebrates and shore fish, and Cairns (1991a), based on ahermatypic Scleractinia, who both considered Cocos Island as an extension of the Panamanian Province. But it must be remembered that the Cocos stylasterid fauna is a predominantly deep water one (e.g., 300–800 m) and therefore probably not influenced by the shallow water currents from the Panamanian mainland.

New Records

Family Stylasteridae Gray, 1847

Lepidopora concatenata, new species

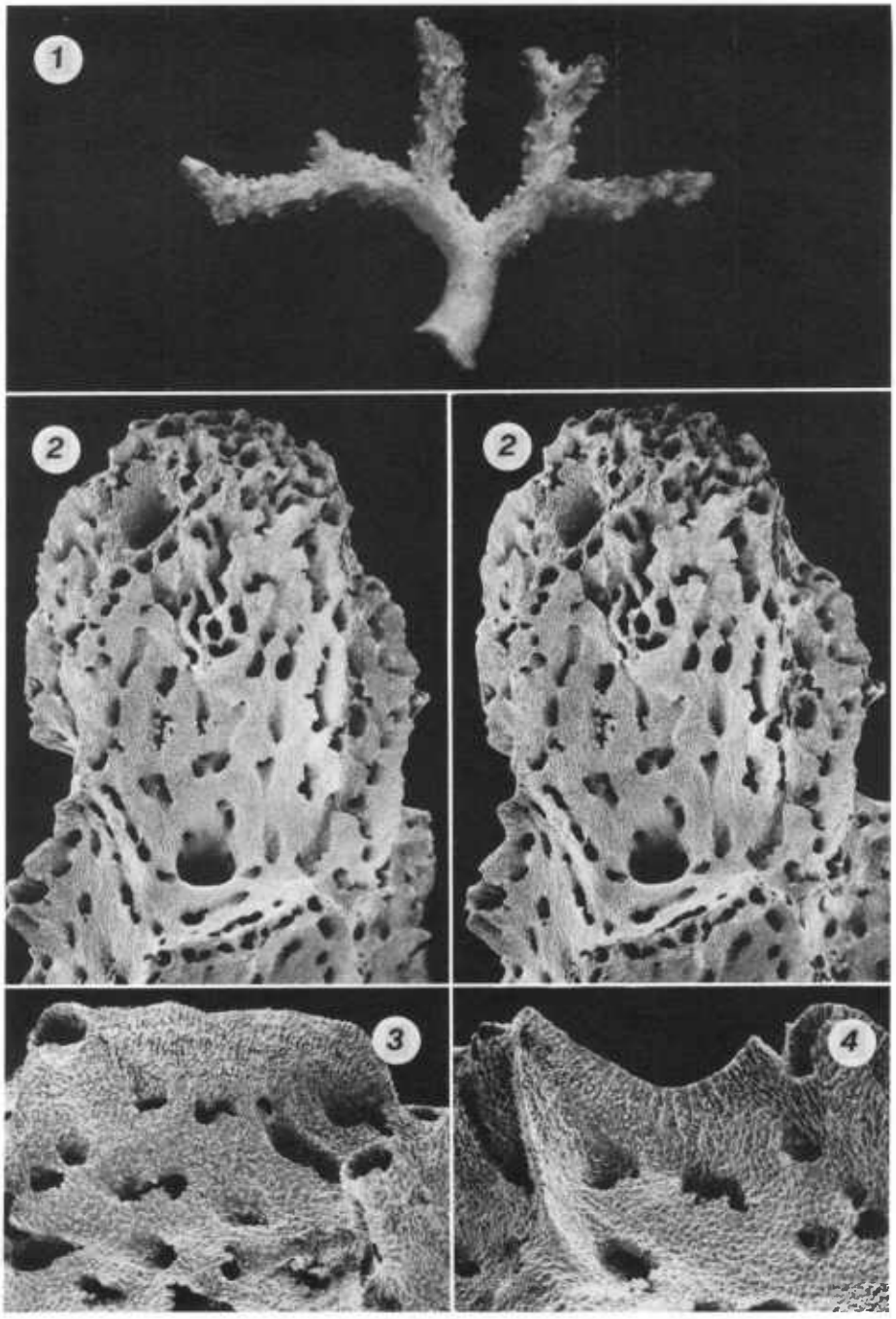
Figs. 1–7

Records.—Holotype: *JSL*-1921, 0°17′N, 89°59.8′W (southwest of Genovesa, Galápagos Islands), 680–720 m, 1 colony and SEM stub 698, USNM 84697.

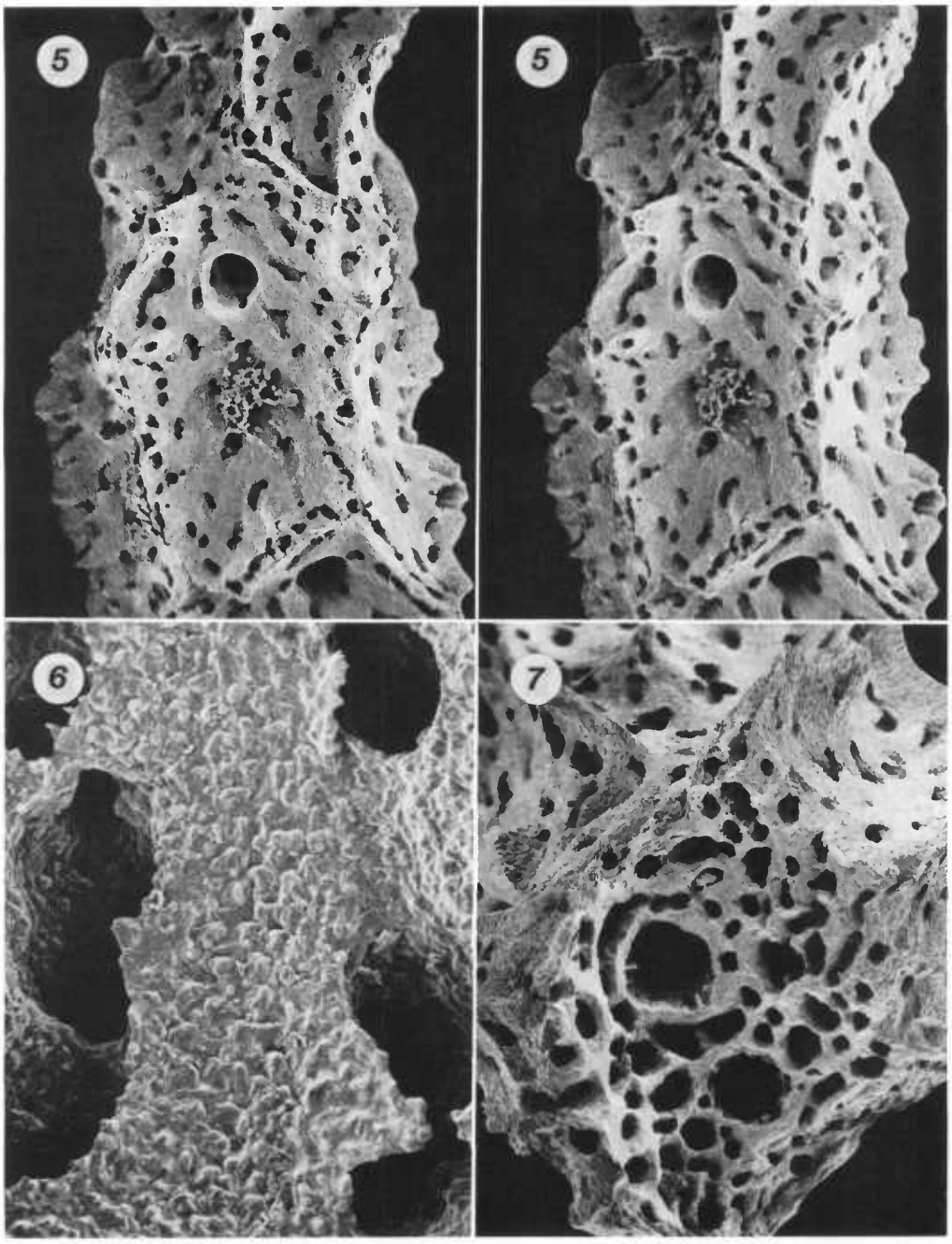
Description.—Colony uniplanar and relatively small, the holotype 20.4 mm tall and 30.2 mm broad, with a basal branch diameter of 3.2 mm. Branching sparse, dichotomous, and equal, resulting in a fairly symmetrical branching pattern. Branches circular in cross section, terminating in tips about 1.8 mm in diameter; no branch anastomosis. Coenosteum white and reticulate-imbricate in texture. Coenosteal strips broad but variable in width, ranging from 0.11 to 0.20 mm across and separated by a series of quite broad (about 66 μ wide), elliptical to elongate coenosteal pores and shallow grooves. Platelet structure poorly defined (Fig. 6), the platelets being only 18–35 μ wide.

Gastropores uniformly distributed on branch surfaces, circular in shape (0.31–0.33 mm in diameter), and flush with coenosteal surface (no gastropore lips). Gastropore tubes cylindrical and deep, each bearing a diffuse ring palisade composed of blunt, cylindrical elements up to 45 μ tall and 17 μ in diameter. Because only one specimen was available for study, a fragment was not sacrificed to examine and figure a gastrostyle; however, from gross external examination, gastrostyles appear to be elongate and slender, probably with a relatively high H:W ratio. Dactylopores arranged along sinuous, longitudinal or oblique ridges that occasionally anastomose into a reticulate pattern (Figs. 2, 5). Dactylopores circular to elliptical in shape: circular dactylopores about 85 μ in diameter, elliptical ones up to 118 μ in greater diameter. Ridges on which dactylopores occur quite tall (up to 0.5 mm) and thin (25–30 μ wide), dactylopore centers spaced every 0.5–0.8 mm along ridge. Dactylopores are the most prominent sections of a ridge, the ridge connecting adjacent pores sometimes slightly lower in height.

Colony sexually immature and therefore sex and characteristics of ampullae unknown.



Figs. 1–4. *Lepidopora concatenata,* holotype, USNM 84697: 1, Holotype colony, ×2.3; 2, Branch tip illustrating tall dactylopore ridges and one gastropore, ×25.5, stereo pair; 3, 4, Elongate ridges concatenating (linking) dactylopores, ×56, ×62, respectively.



Figs. 5–7. *Lepidopora concatenata*, holotype, USNM 84697: 5, Branch segment illustrating two gastropores and ridges linking dactylopores, ×21, stereo pair; 6, Weakly imbricate coenosteal texture, ×180; 7, Branch cross section revealing porous central core, two gastropores in cross section, and tall coenosteal ridges peripherally, ×38.

Discussion.—Among the 25 valid species of *Lepidopora* (see Cairns 1991c), *L. concatenata* is most similar to *L. acrolophos* Cairns, 1983a, known only from the Scotia Ridge west of South Georgia (659–686 m). Both species have: similarly sized and shaped coralla and branching pattern; linked dactylopores; same sized gastro- and dactylopores; and the same bathymetric range. *Lepidopora acrolophos,* however, differs in having a very different coenosteal texture (reticulate-papillose), small abcauline gastropore lips, dactylopores that are sometimes not linked by ridges, and in lacking ring palisades.

Although less similar to *L. concatenata, L. polystichopora* Cairns, 1985 (north of New Zealand, 197–710 m) also sometimes has linked dactylopores as well as having equal branching and primarily imbricate coenosteal texture. But *L. polystichopora* differs in having its dactylopores arranged in four to seven discrete, longitudinal rows, the ridges uniting the dactylopores being quite low (about 0.12 mm); having small, abcauline gastropore lips; and in lacking ring palisades.

In addition to *L. concatenata,* only one other species of *Lepidopora* has ring palisades: *L. glabra* (Pourtalès, 1867), known only from the Straits of Florida at 267–1170 m (see Cairns 1986a). *L. glabra,* however, shares few other characters, differing in: coenosteal texture; arrangement of gastro- and dactylopores; having unlinked dactylopores; and in having quite large abcauline gastropore lips. The character of tall, slender ridges that consistently link its dactylopores is unique to *L. concatenata.*

Etymology.—The species name *concatenata* (Latin for "linked together") refers to the dactylopores of this species, which are linked together by tall, thin ridges.

Distribution.—Species known only from type locality. *Lepidopora* is a wide ranging genus known from throughout the Atlantic, Subantarctic, and South Pacific (New Zealand region) from depths of 60–1874 m (Cairns 1991b); thus, this is the first record of the genus for the eastern Pacific.

Pliobothrus fistulosus, new species
Figs. 8–14

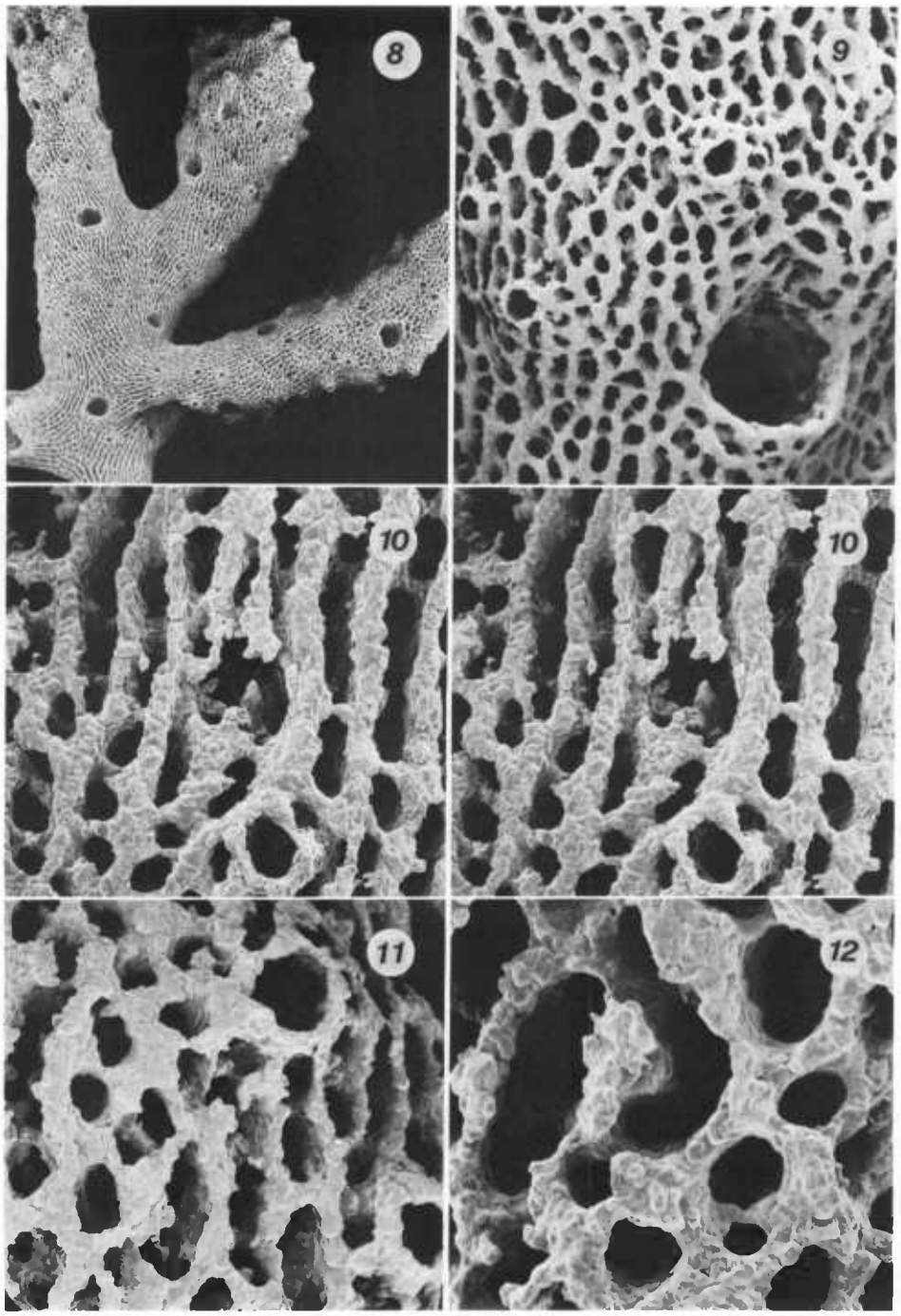
Records.—Holotype: *JSL*-1940, 5°34.6′N, 87°04.2′W (north coast of Cocos Island), 546–631 m, 9°C, 1 colony (ex SEM stub 699), USNM 84696.

Description.—Colony probably uniplanar, the only known specimen (the holotype) a colony fragment 11.0 mm tall and 10.5 mm broad, consisting of 3 terminal branches. Branching dichotomous and apparently equal; branches circular to slightly elliptical in cross section, having blunt to slightly clavate tips 1.8–2.2 mm in diameter. Coenosteum white and linear-imbricate in texture. Coenosteal strips quite thin (21–45 μ wide), bordered by deep, elongate slits that are often equal to or wider than strip width (e.g., up to 55 μ wide). Slits traversed by narrow (20–23 μ wide) coenosteal bridges (Fig. 10). Platelets very poorly defined but present in a unilinear series on each strip.

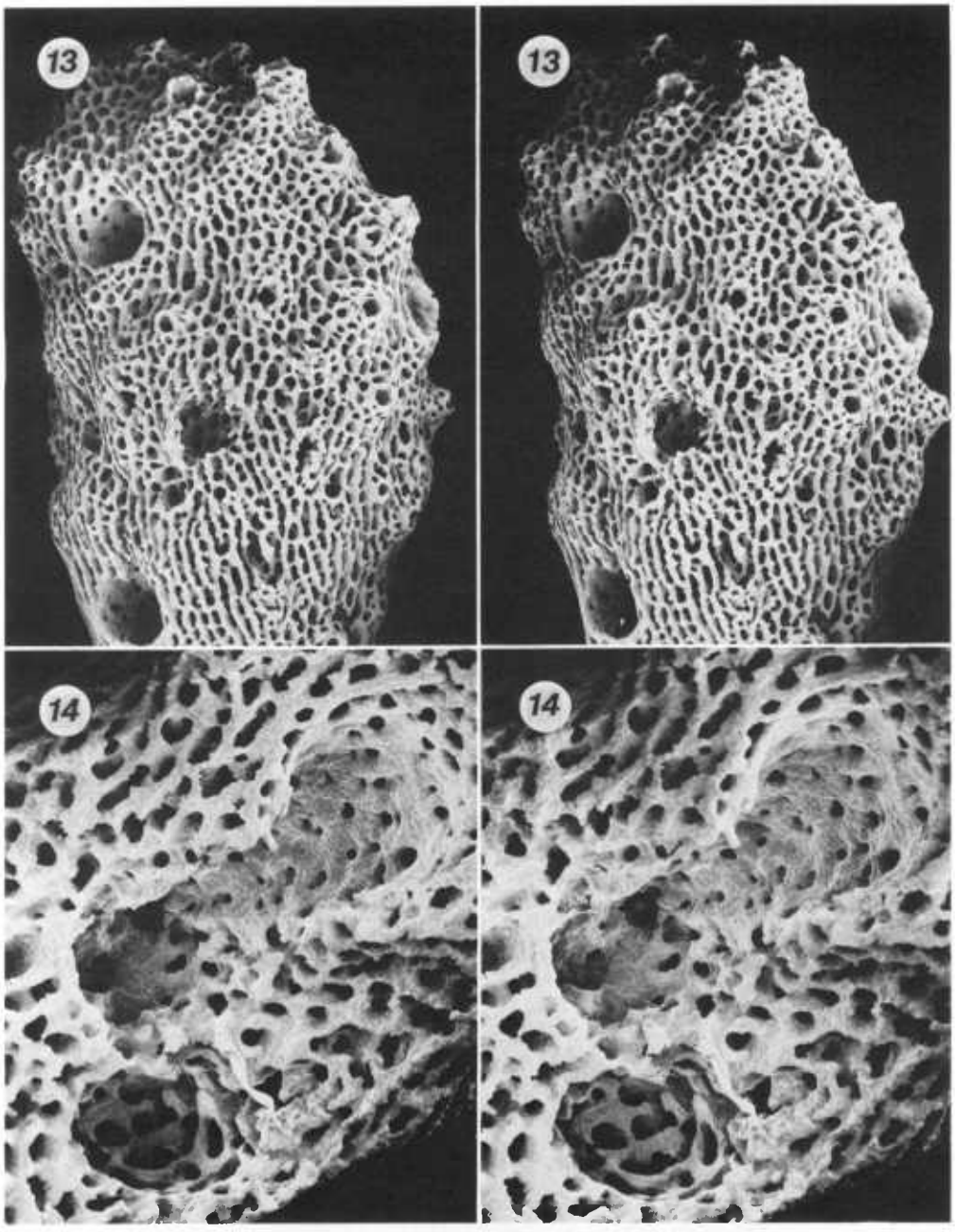
Gastropores uniformly distributed on all branch surfaces, circular in shape (0.37–0.39 mm in diameter), and flush with coenosteal surface. Gastropore tubes cylindrical with a slightly enlarged lower section, and bent about 90°, the lower section running parallel to branch axis. Total length of gastropore tube 0.9–1.0 mm. No ring palisades or tabulae present. Dactylopores also uniformly distributed on branch surfaces and circular in shape: 86–93 μ in diameter. Dactylopores elevated on cylindrical mounds as high as 0.2 mm, the thin walls of the mound 15–20 μ thick, resulting in a dactylopore mound diameter of 0.12–0.13 mm.

Sex of holotype probably female. Ampullae internal, 0.3–0.4 mm in diameter, and communicate to coenosteal surface through an inconspicuous, spongy efferent pore about 0.10 mm in diameter.

Discussion.—Four Recent species of *Pliobothrus* are known: *P. tubulatus* (Pour-



Figs. 8–12. *Pliobothrus fistulosus,* holotype, USNM 84696: 8, Holotype colony, ×7.0; 9, Branch segment illustrating one gastropore and two smaller dactylopores, ×44; 10, Porous coenosteal texture with irregularly-shaped efferent pore in center, ×92, stereo pair; 11, Porous coenosteal texture (dactylopore in upper right), ×110; 12, Enlargement of coenosteal texture, ×170.



Figs. 13, 14. *Pliobothrus fistulosus*, holotype, USNM 84696: 13, Branch tip bearing a concave, ruptured ampulla (left center), ×20.5, stereo pair; 14, Longitudinal section of a gastropore tube (above) and internal ampulla (below), ×46, stereo pair.

talès, 1867) (Antilles, 419–718 m); *P. symmetricus* Pourtalès, 1868 (North Atlantic, 80–1600 m); *P. spinosus* (Hickson & England, 1905) (Indonesia, 1089 m); and *P. echinatus* Cairns, 1986a (Lesser Antilles, 164–708 m). *Pliobothrus fistulosus* differs from all of these species in having extremely narrow coenosteal strips and much smaller ampullae. Its dactylopore mounds are about the same height as those of *P. symmetricus* (0.2 mm), but considerably shorter than those of *P. spinosus* (1.2 mm), *P. tubulatus* (0.8 mm), and *P. echinatus* (0.4 mm). It is further differentiated from *P. symmetricus* by having less robust branches.

Etymology.—The species name *fistulosus* (Latin for "forming a pipe," "hollow," or "porous") could be interpreted in any of three ways: forming a pipe, alluding to its long axial gastro- and dactylopores, which give the branch a very porous cross section; hollow, referring to the numerous axial gastro- and dactylopores and the numerous rather large coenosteal pores that penetrate the coenosteum; and "porous," as a general designation for the highly permeable nature of the coenosteum.

Distribution.—Known only from the type locality. Species of *Pliobothrus* are known from the North Atlantic and Indonesian region from depths of 80–1600 m (Cairns 1991b); therefore, this is the first record of the genus from the eastern Pacific.

Lepidotheca macropora Cairns, 1986
Fig. 15

Lepidotheca macropora Cairns, 1986b:4–6, figs. 1A–G, 2A–C.

New records.—*JSL* Stations 1914, 16 colonies, USNM 84698; 1924, 3 colonies, USNM 84699; 1929, 5 colonies and branches, USNM 84700; 1932, 3 colonies and branches, USNM 84701; 1933, 1 branch, USNM 84702; 1937, 1 colony, USNM 84703.

Discussion.—Previously known from only two localities in the Galápagos, 29 additional colonies of *L. macropora* are herein reported from six more localities, extending its range into the western islands of the Galápagos. Considerably larger specimens were collected during the *JSL* expedition, the largest (*JSL*-1914) a uniplanar colony 7.7 cm tall and 9.1 cm broad, with a basal branch diameter of 7.5 mm (Fig. 15). The tissue is a characteristic light brown; the corallum is white. Branches are elliptical to flattened in cross section; the distal, small-diameter branches being flattened in the plane of the colony. Although abcauline dactylopore spines are clearly present on most branches, dactylopore spines are often quite small and low, and have very short, obscure dactylotomes, thus sometimes superficially resembling species of *Lepidopora*.

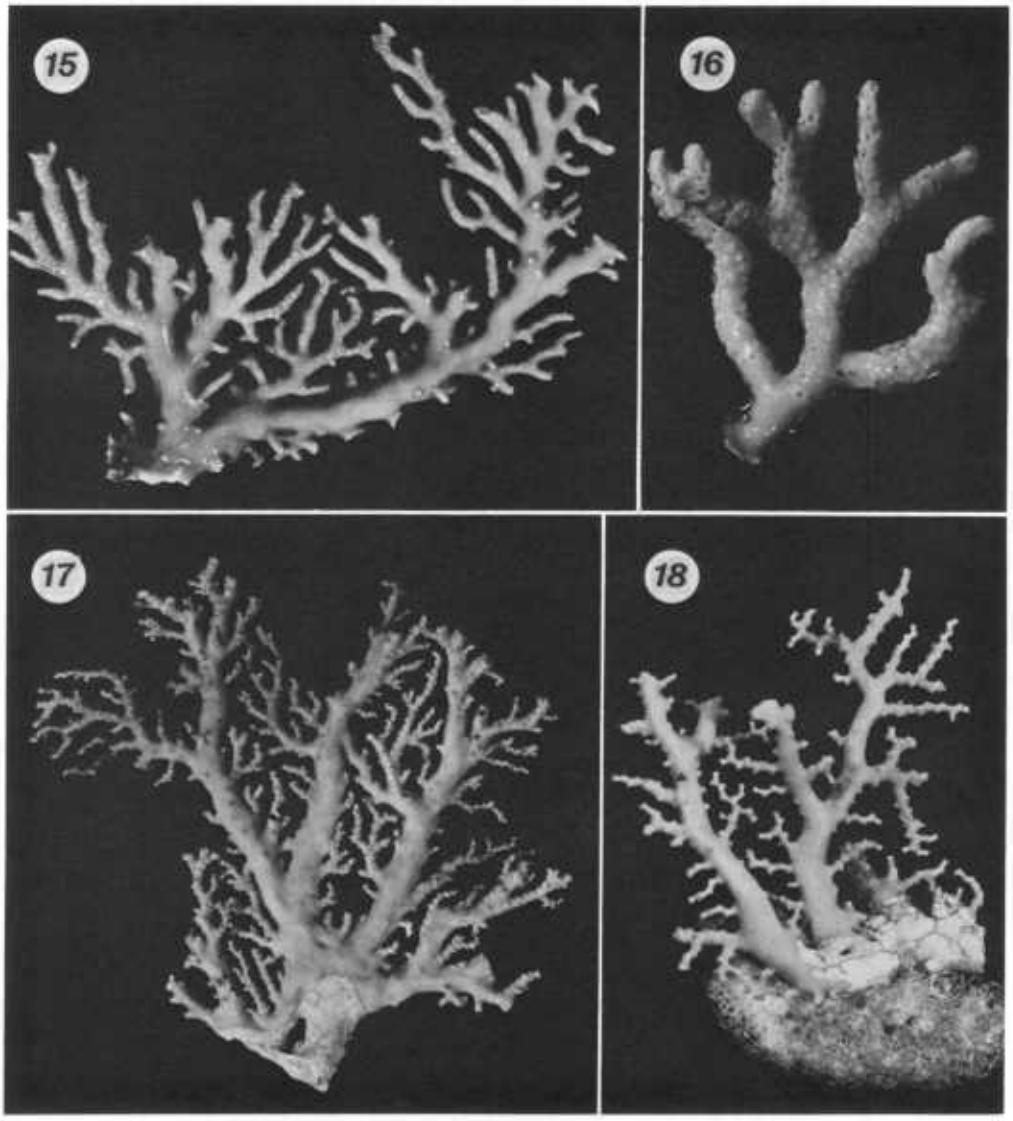
Distribution.—Widespread throughout Galápagos, including off: Fernandina, Isabela, south of Marchena, northeast of Santa Cruz, Española, and Floreana; 166–806 m; 5.7°–14.4°C.

Distichopora laevigranulosa Cairns, 1986
Fig. 16

Distichopora laevigranulosa Cairns, 1986b: 6–8, figs. 3A–I.

New records.—*JSL* Stations 1911, 1 female colony, USNM 84704; 1914, 2 female colonies, USNM 84705; 1916, 1 female colony, USNM 84706; 1929, 2 female colonies, USNM 84707.

Discussion.—*Distichopora laevigranulosa* was previously known from only one branch fragment (the holotype); six additional specimens from four more localities are recorded herein. The largest, and complete, colony is 31.0 mm tall and 3.95 mm broad, with a basal branch diameter of 5.2 × 6.2 mm (*JSL*-1929). It has equal, sparse branching, resulting in only 10 branch tips (Fig. 16). Tissue light brown; corallum white. The holotype has several gastropores on its anterior face; however, the colony from *JSL*-1916 has numerous gastropores on its anterior face in addition to those constituting the lateral edge pore row. Another point of



Figs. 15–18. 15, *Lepidotheca macropora*, *JSL*-1914, USNM 84698, ×0.81; 16, *Distichopora laevigranulosa*, *JSL*-1929, USNM 84707, female colony, ×1.2; 17, *Stylaster marenzelleri*, *JSL*-1923, USNM 84730, male colony, ×0.8; 18, *Stylaster cocosensis*, holotype, USNM 84734, ×1.3.

variation is that one of the dactylopore rows of the specimen from *JSL*-1911 has almost completely degenerated, the opposite row appearing to be the only functional dactylopores. The holotype, as well as all six specimens reported here, are mature female colonies, thus male ampullae remain unknown.

Distribution.—Off Roca Redonda, Santa Cruz, Española, and Floreana; 166–806 m; 5.7°–14.4°C. Species of *Distichopora* are common in the Indo-West Pacific (Boschma 1959) and western Atlantic (Cairns 1983a), but are conspicuously absent from the Antarctic-Subantarctic region and eastern Atlantic. *Distichopora laevigranulosa* is

the only record of the genus from the eastern Pacific.

Errina macrogastra Marenzeller, 1904

Errina macrogastra Marenzeller, 1904:81–83, pl. 2, fig. 1, pl. 3, fig. 1.—Cairns, 1986b: 8–9, figs. 4A–G, 5A–C (synonymy).

New records.—*JSL* Stations 1916, 2 female, 4 male, and 1 immature colonies, USNM 84708; 1942, 1 male and 1 immature colonies, USNM 84709.

Discussion.—Previously known from between Española and San Cristóbal (Cairns 1986b), *E. macrogastra* is herein reported from two additional stations: one also from near Española, the other north of Cocos Island. The Galápagan specimen is typical of previously collected specimens, but the Cocos Island specimens are more delicate in construction, having elongate, slender branch tips as small as 0.5 mm in diameter.

Distribution.—Off San Cristóbal and Española, Galápagos; north of Cocos Island; 545–704 m; 6.2°–10.8°C.

Stylaster divergens Marenzeller, 1904

Stylaster divergens Marenzeller, 1904:83–86, pl. 2, fig. 3, pl. 3, fig. 2.—Cairns, 1986b: 11–14, figs. 6A–G, 7A–C (synonymy).

New records.—*JSL* Stations 1914, 4 colonies, USNM 84721; 1920, 4 colonies, USNM 84722; 1936, 1 female colony, USNM 84723; off Daphne Minor, 55 m, coll. Hydes and Summerhays, June 1974, 1 male colony, USNM 84724.

Discussion.—Colonies from four additional Galápagos localities are reported herein, including one large specimen 7 cm tall (*JSL*-1914). Although most colonies have a white corallum, several from *JSL*-1920 have a rich purple-violet corallum, both white and pigmented corolla co-occurring. A bright red foraminiferan is often found encrusting the base of colonies, *S. divergens* being the shallowest occurring stylasterid in the Galápagos.

Distribution.—Off southwestern Isabela, Daphne Minor, San Cristóbal, and Floreana; 55–224 m; 12.5°–23.4°C.

Stylaster marenzelleri Cairns, 1986
Fig. 17

Stylaster marenzelleri Cairns, 1986b:14–16, figs. 8A–F, 9A, B.

New records.—*JSL* Stations 1911, 2 colonies, USNM 84727; 1913, 1 branch, USNM 84728; 1914, 6 branches, USNM 84729; 1923, 4 colonies, USNM 84730; 1924, 7 colonies, USNM 84731; 1937, 2 colonies, USNM 84732; 1940, 1 branch, USNM 84733.

Discussion.—Previously known from only the type locality off Española, *S. marenzelleri* is herein reported from seven additional localities, including off Cocos Island. Several large specimens were collected, one (*JSL*-1923) 7.8 cm tall and 8.7 cm broad, with a basal branch diameter 6.5 mm in lesser diameter (Fig. 17). Some branch anastomosis occurs in this specimen. All coralla are light pink; however, some have white branch tips and basal encrustations. All medium- to large-sized specimens live in association with a eunicid polychaete, which live in tubes 0.6–0.8 mm in diameter along the axis of larger branches. In some branches, two closely adjacent tubes are present. The tube penetrates the coenosteal surface periodically near the branch tips. *S. marenzelleri* is the only Galápagos stylasterid to have axial polychaete tubes; however, *S. cocosensis* from Cocos Island has a similar commensalism.

Distribution.—Known from throughout the Galápagos, including off: Isabela, Marchena, Santa Cruz, Española, and Floreana; north of Cocos Island; 84–631 m; 8.3°–14.5°C.

Stylaster galapagensis Cairns, 1986

Stylaster galapagensis Cairns, 1986b:16–18, figs. 10A–H, 11A–C.

New records.—*JSL* Stations 1911, 4 colonies, USNM 84710; 1921, 2 colonies, USNM 84711; 1922, 2 colonies, USNM 84712; 1924, 9 colonies, USNM 84713; 1925, 4 branches, USNM 84714; 1927, 1 colony, USNM 84715; 1929, 14 colonies, USNM 84716; 1931, 2 colonies, USNM 84717; 1935, 1 colony, USNM 84718; 1938, 5 colonies, USNM 84719; 1944, 2 colonies, USNM 84720.

Distribution.—Previously known from only two stations in the western Galápagos Islands, 11 additional records of *S. galapagensis* are reported herein, showing it to be widespread throughout the Galápagos, as well as off Cocos Island, including: off Fernandina, Isabela, Roca Redonda, Marchena, Genovesa, Española, Santa Cruz, and Santiago; 252–806 m; 5.8°–10.3°C.

Stylaster cocosensis, new species
Figs. 18–25

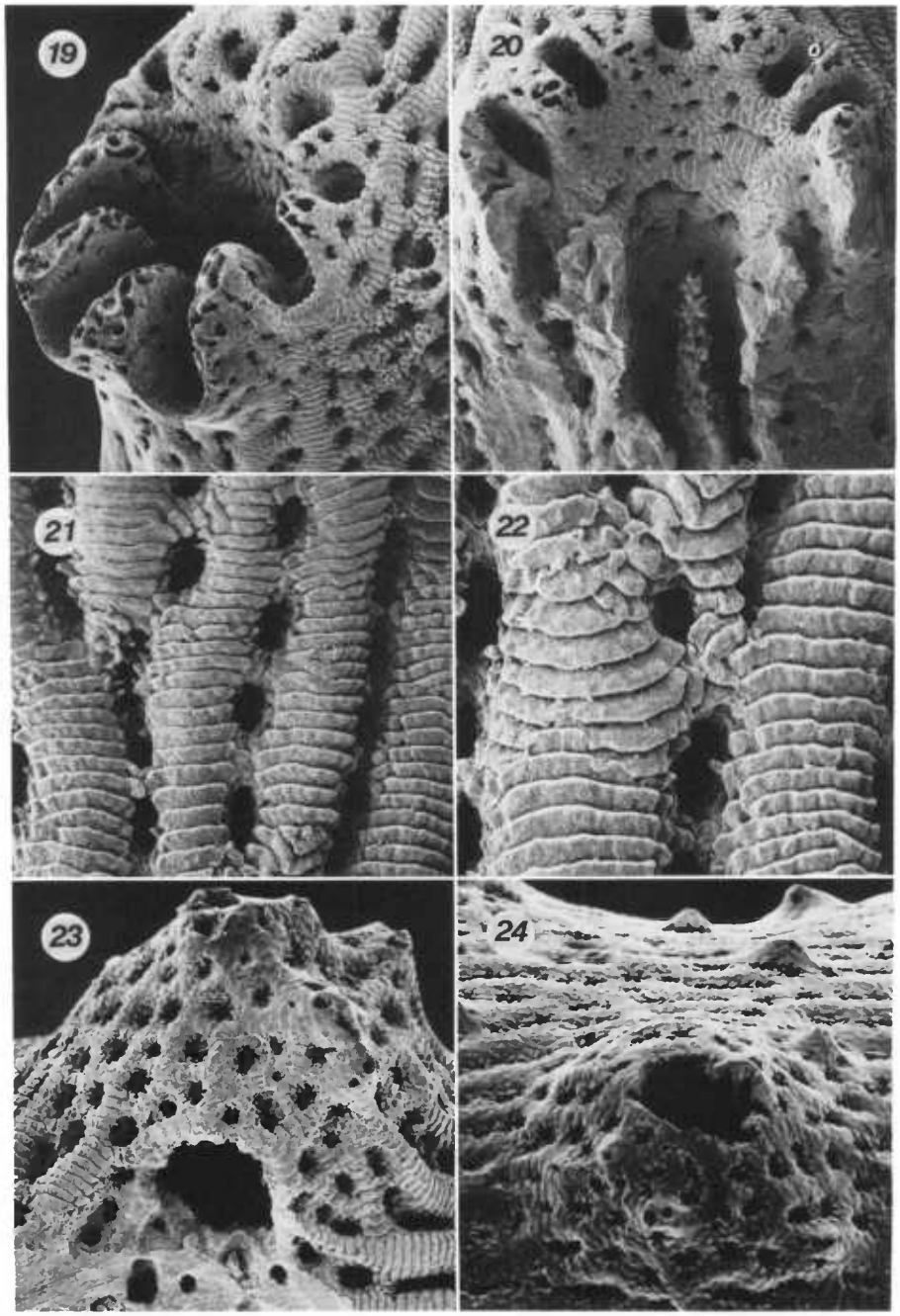
Records.—Holotype: *JSL*-1944, 5°28.1′N, 87°08′W (southwest coast of Cocos Island), 293–576 m, 1 male colony and SEM stub 704, USNM 84734.—Paratypes: *JSL* Stations 1943, 2 male colonies and branches, USNM 84735; 1944, 4 female colonies, branches, and SEM stub 703, USNM 84736.

Description.—Colonies uniplanar, the largest colony (holotype) 38.0 mm tall and 32.2 mm broad, with a basal branch diameter of 4.5 mm. Branching dichotomous and unequal, densely branched but lacking branch anastomosis. Branches circular in cross section, the distal branches slender and fragile. Symbiotic polychaetes usually present but do not significantly alter colony shape (see Remarks). Coenosteum white, with well-developed, linear-imbricate coenosteum. Coenosteal strips 40–80 μ wide, separated by relatively wide and deep slits 15–20 μ wide. Slits periodically traversed by thick coenosteal bridges, which reduce the coenosteal slits to a series of elongate, elliptical pores (Figs. 21, 22). Platelets well developed, usually continuous across a strip, and slightly corrugated; alternating platelet polarity not unusual (Fig. 22). Older or worn coenosteum appears to be linear-granular or linear-smooth in texture, the imbricate platelets being worn or secondarily covered. Nematopores uniformly and abundantly distributed on branch coenosteum. Basal diameter of nematopore mounds 50–70 μ, apical pit 13–16 μ in diameter, and height of mounds up to 15 μ.

Cyclosystems exclusively sympodially arranged on branch edges. Cyclosystems small (0.4–0.6 mm in diameter) and circular to slightly elliptical in shape. Based on 50 cyclosystems, the range of dactylopores per cyclosystem was 5–12, average 8.41 (σ = 1.45), and mode 9.

Gastropore tubes consist of two sections: a broad, upper, chaliciform section about 0.35 mm in diameter and 0.3–0.4 mm deep, and a lower, cylindrical section about half this diameter and about 0.5 mm deep, which the gastrostyle occupies. Ring palisades absent. Upper section linear-imbricate in texture, 3 or 4 coenosteal strips encircling the tube; lower tube porous, not textured. Gastrostyle elongate-conical to needle-shaped: illustrated style (Fig. 20) 0.39 mm tall and 50 μ in diameter (H:W ratio 7.2), its tip rising almost to junction between upper and lower gastropore sections. Upper three-quarters of gastrostyle covered with smooth, sharp spines up to 20 μ long. Dactylotomes 55–75 μ wide but extend only a short distance down gastropore tube. Pseudosepta wedge-shaped, about 0.13 mm wide at their outer edges, and consistently well developed on terminal cyclosystems. Cyclosystems on older branches, however, often develop diastemas of variable width by the atrophy of adcauline (distal) dactylopores. Dactylostyles consist of a unilinear row of small, cylindrical elements.

Female ampullae (Fig. 23) prominent hemispheres 0.35–0.45 mm in diameter, occurring on anterior and posterior branch faces. Coenosteum of female ampullae porous, each ampulla bearing 5–8 short, apical



Figs. 19–24. *Stylaster cocosensis, JSL*-1924, paratypes, USNM 84735: 19, Cyclosystem, ×98; 20, Longitudinal section of a gastropore tube revealing the gastrostyle, ×86; 21, 22, Linear-imbricate coenosteal texture, ×200, ×300, respectively; 23, Female ampulla with efferent pore, ×125; 24, Male ampulla with apical efferent pore, ×110.

(about 50 μ tall) spines. Female efferent pore lateral: 0.10–0.12 mm in diameter. Spent female ampullae often distintegrate, resulting in coenosteal cavities. Male ampullae (Fig. 24) superficial mounds 0.25–0.40 mm in diameter, each with a single apical efferent pore about 40 μ in diameter.

Remarks.—Most specimens examined lived in association with a cunicid polychaete that formed a pair of tubes along the branch axis. The worm tubes are circular in cross section, 0.30–0.57 mm in diameter, and visible only in branch cross section or at infrequent escape pores along the branch coenosteum. Only a thin septum separates one axial tube from the other.

Polychaete commensalism among species of *Stylaster* (Group C) is rare, known only in *S. amphelioides* Kent, 1871 and *S. spatula* Cairns, 1986a, the latter having inconspicuous, internal, axial tubes like those of *S. cocosensis*. *Stylaster marenzelleri* Cairns, 1986b, known from the Galápagos and Cocos Island but a member of *Stylaster* (Group B), also has internal, axial cunicid polychaete tubes that are similar to those of *S. cocosensis*.

Discussion.—Roughly one-third of all stylasterid species belong to the genus *Stylaster* (80/224, Cairns 1991b), and they are badly in need of revision, which makes the description of yet another new species a difficult matter. In order to facilitate comparison, I (Cairns 1983b) divided *Stylaster* into three "groups" (referred to as Groups A–C) of species based primarily on the location of their cyclosystems. *Stylaster cocosensis* falls into Group C, along with 35 other Recent species that have exclusively sympodially arranged cyclosystems and rudimentary dactylostyles. *Stylaster cocosensis* was directly compared to 33 of the 35 species in its group: the types or type fragments of 27 of these species are deposited at the USNM and another six species are represented as nontype specimens. Only specimens of *S. ramosus* Broch, 1947 and *S. microstriatus* Broch, 1936 were lacking. *Stylaster cocosensis* was found to be most similar to *S. duchassaingi* Pourtalès, 1867 (Caribbean, 42–692 m), particularly in: corallum size and shape; coenosteal color and texture; having well-developed nematopores; having papillose female ampullae; and in gastrostyle shape. *S. cocosensis* differs in having smaller cyclosystems, fewer dactylopores per cyclosystem, and in having a polychaete commensal.

Only one other *Stylaster* (Group C) is known from the Galápagos and Cocos Islands, *S. galapagensis* Cairns, 1986b. *Stylaster cocosensis* differs from this species in having linear-imbricate coenosteal texture, smaller cyclosystems, fewer dactylopores per cyclosystem, and porous ampullae. In general, *S. cocosensis* can be distinguished by its linear-imbricate coenosteal texture (although many other species have this texture); small cyclosystems; porous, papillose female ampullae; and inconspicuous polychaete symbiosis.

Etymology.—Named for the island from which it was collected.

Distribution.—Known only from off Cocos Island, 293–576 m.

Stenohelia concinna Boschma, 1964
Figs. 26, 27

Stenohelia concinna Boschma, 1964a:69, 70, pl. 1, figs. 1–6.—Boschma, 1964b:74–77, pls. 1, 2.—Cairns, 1986b:21–24, figs. 14A–G, 15A, B, 27E (synonymy).

Stenohelia robusta Boschma, 1964a:69–72, pl. 1, figs. 7–9.—Cairns, 1986b:19–21, figs. 12A–G, 13A–C, 27A, B, D (synonymy).

New records.—*JSL* Stations 1911, 11 colonies, USNM 84739; 1914, 5 colonies, USNM 84740; 1915, 1 colony, USNM 84741; 1916, 7 colonies, USNM 84742; 1922, 3 colonies, USNM 84743; 1923, 1 colony, USNM 84744; 1924, 12 colonies, USNM 84745; 1927, 1 colony, USNM 84746; 1929, 10 colonies, USNM 84747; 1931, 1 colony, USNM 84748; 1932, 4 colonies, USNM 84749; 1937, 5 colonies,

USNM 84750; *Albatross*-2818, 8 colonies, USNM 52243.

Discussion.—*Stenohelia concinna* and *S. robusta* were previously known only from their type-localities: two *Albatross* stations in the Galápagos. The *Johnson-Sea-Link* expedition provided 70 additional colonies from 13 localities throughout the Galápagos, showing it to be a widespread species and more variable than previously thought. For instance, one large, bushy colony from *JSL*-1929 (Fig. 27) is 14 cm tall and 14 cm broad, with a basal branch diameter of 1.5 cm, which is considerably larger than previously known specimens. Large colonies have numerous, globular, polychaete galls (Fig. 26), one often occurring at each major branch axil. It was also noted that the porosity and size of ampullae is variable within the species, the female ampullae varying from 0.45 to 0.65 mm in diameter and not always as highly porous as those of the type specimens.

Stenohelia robusta was originally (Boschma 1964a) and subsequently (Cairns 1986b) distinguished from *S. concinna* by its more robust branches (thicker axils) and more porous ampullae. Otherwise, the species were considered to be very similar, having the same: coenosteal texture, gastrostyle and gastropore tube shape, ampullar sexual dimorphism, number of dactylopores per cyclosystem, and the same species of polychaete symbiont (Cairns 1986b). All but one of the newly examined 70 specimens pertain to typical *S. concinna,* only one specimen from *JSL*-1915 to *S. robusta,* the latter specimen collected with typical *S. concinna.* As stated above, range of size and porosity of the female ampullae of *S. concinna* is variable, which leaves only the robust growth form to distinguish *S. robusta.* Because of the many other similarities between the two species, *S. robusta* is herein considered as simply the robust growth form of typical *S. concinna.*

Distribution.—Widespread throughout the Galápagos, including off: Fernandina, Isabela, Roca Redonda, Marchena, Santiago, Santa Cruz, San Cristóbal, Española, and Floreana; 166–806 m; 5.6°–14.4°C.

Crypthelia eueides Cairns, 1986
Figs. 28, 29

Crypthelia eueides Cairns, 1986b:25–27, figs. 16A–J, 17A–C, 27F, I.

New records.—*JSL* Stations 1922, 1 male colony, USNM 84758; 1928, 2 female colonies, USNM 84759.

Discussion.—The only variation noted in the *JSL* specimens was that each male ampulla of the colony from *JSL*-1921 has a porous apical projection up to 0.3 mm tall and 0.2 mm in diameter (Figs. 28, 29). These circumferential, spiniform processes result in a coarse appearance of the cyclosystems and corallum.

Distribution.—Off eastern Isabela, Marchena, and southeast of Santa Cruz; 475–813 m; 5.0°–8.9°C.

Crypthelia glebulenta Cairns, 1986
Figs. 30, 31

Crypthelia glebulenta Cairns, 1986b:27–29, figs. 18A–H, 19A, B.

New records.—*JSL* Stations 1914, 7 female colonies, USNM 84762; 1929, 8 male colonies, USNM 84763; 1937, 2 female colonies, USNM 84764.

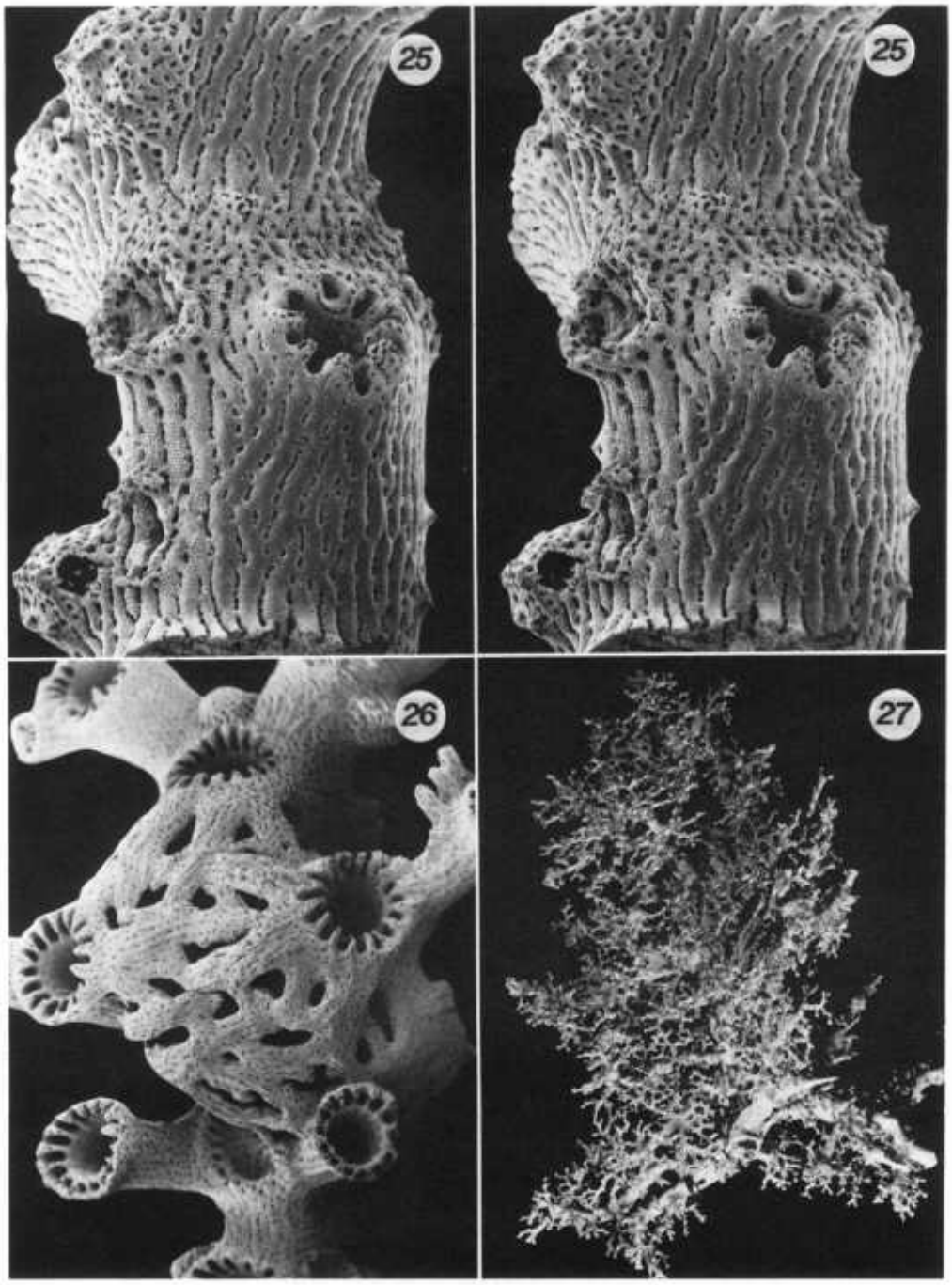
Distribution.—Previously known only from the type locality off Santa Cruz, three more localities are reported herein, from: off southwestern Isabela, Roca Redonda, and Floreana; 166–806 m; 5.7°–14.4°C.

Crypthelia lacunosa Cairns, 1986

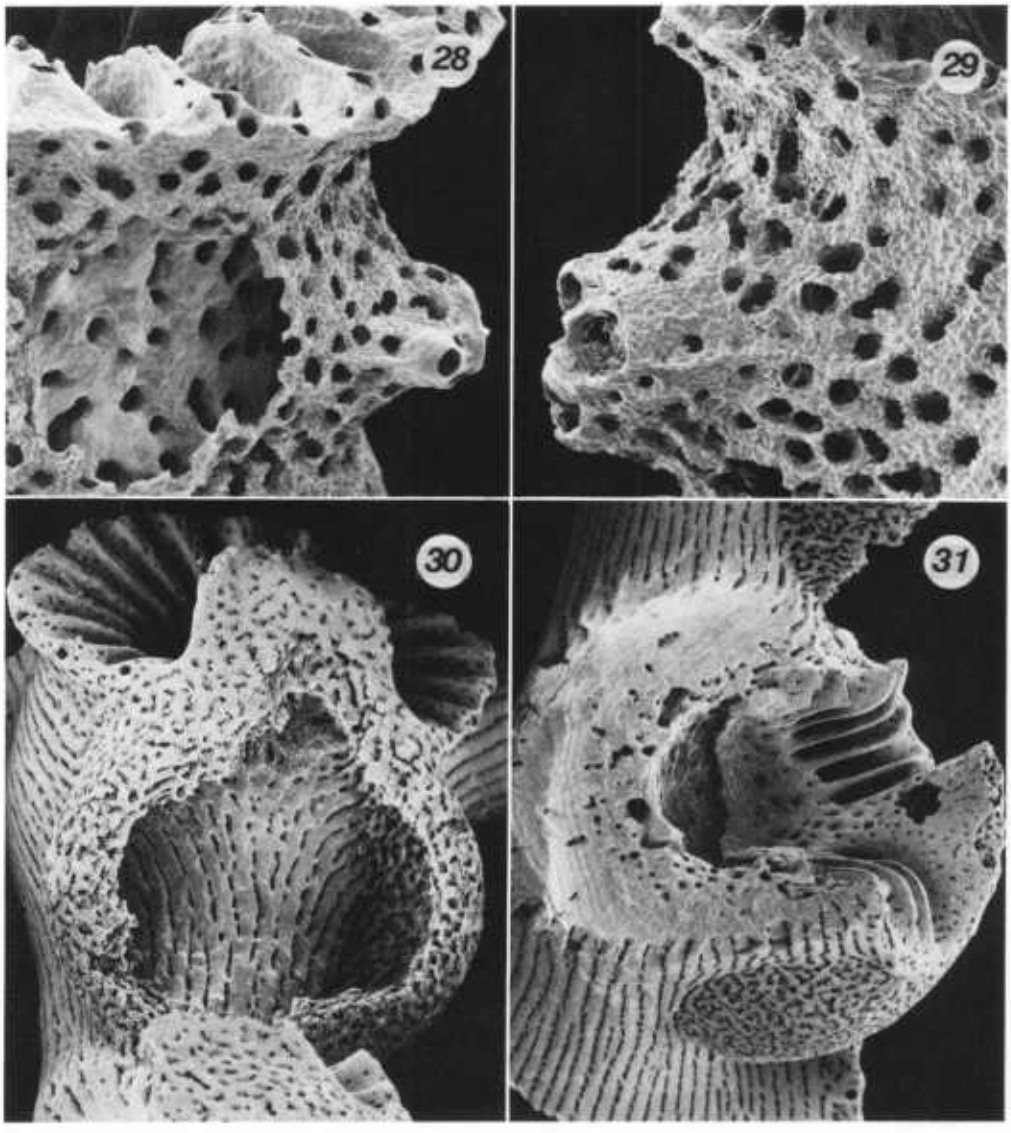
Crypthelia lacunosa Cairns, 1986b:31–33, figs. 20A–G, 21A–C, 27C, G.

New records.—*JSL* Stations 1912, 1 female colony, USNM 84760; 1935, 1 colony, USNM 84761.

Discussion.—Little can be added to the original description, other than that the fe-



Figs. 25–27. 25, *Stylaster cocosensis, JSL*-1944, paratype, USNM 84736: branch segment illustrating female ampullae, cyclosystem, and transition from linear-imbricate to linear-smooth coenosteal texture, ×40, stereo pair; 26, 27, *Stenohelia concinna, JSL*-1929, female colony, USNM 84747: 26, Coenosteal deformation caused by commensal polychaete, ×14.5; 27, Large colony with dozens of polychaete galls, ×0.43.



Figs. 28–31. 28, 29, *Crypthelia eueides, JSL*-1922, USNM 84758: circumferential male ampullae and spiniform processes supporting the efferent pores, ×50, ×64, respectively; 30, 31, *Crypthelia glebulenta, Albatross* 2818, USNM 72104: partially fractured cyclosystem illustrating interior of a female ampulla and an efferent pore on lower side of lid, ×35, ×27.5, respectively.

male colony from *JSL*-1912 is slightly larger than any of the types, measuring up to 8 cm tall and 11 cm broad, with a basal branch diameter of 8.5 mm. The two new records also extend the known bathymetric and geographic distribution of the species.

Distribution.—Off Fernandina, north of Baltra, and southeast of Santa Cruz; 252–806 m; 5.9°–9.0°C.

Crypthelia cymas Cairns, 1986

Crypthelia cymas Cairns, 1986b:33–36, figs. 22A–I, 23A–C, 27H.

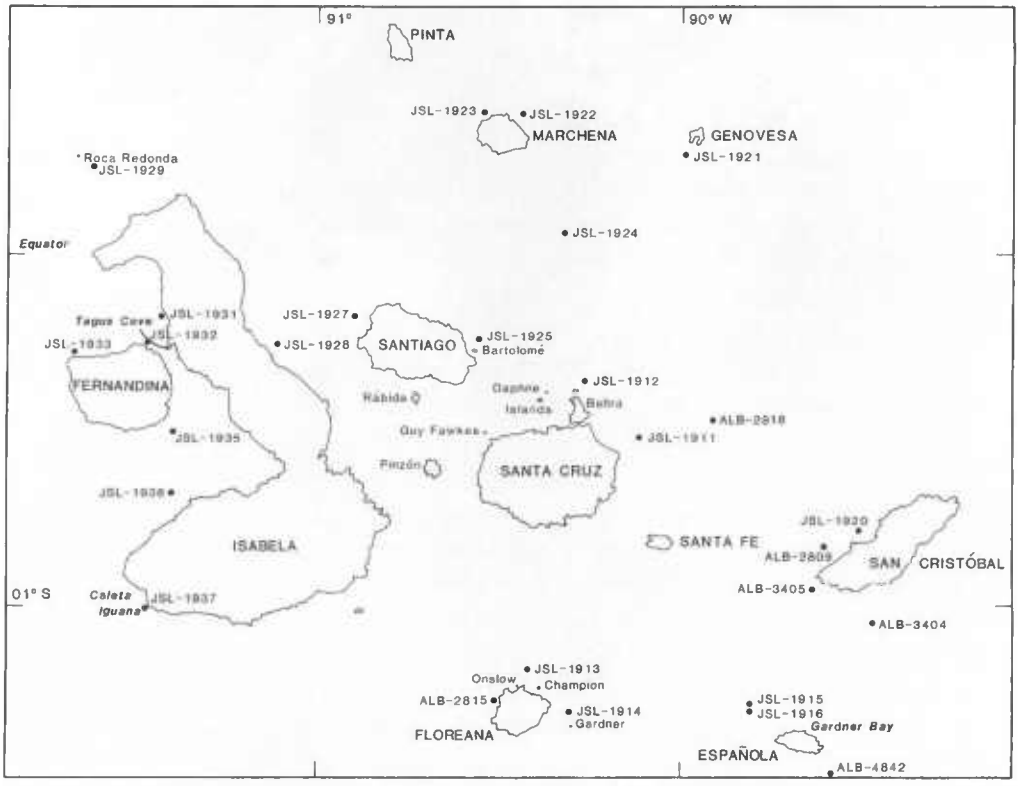


Fig. 32. The Galápagos Islands (excluding the northern-most islands), showing all stations at which stylasterids have been collected.

New records.—*JSL* Stations 1911, female branches, USNM 84765; 1914, 5 female colonies, USNM 84766; 1921, 1 female colony, USNM 84767; 1922, 2 male colonies, USNM 84768; 1923, 4 male colonies, USNM 84769; 1924, 5 male colonies, USNM 84770; 1929, 5 female colonies, USNM 85071; 1937, 1 female colony, USNM 85072.

Discussion.—Identification of male colonies of *Crypthelia* species is customarily easier than that of female colonies, due to the male's more distinctive ampullar morphology. Unfortunately, the females of four of the six Galápagos *Crypthelia* species have the rather nondescript arrangement of "B" (as defined by Cairns 1986b): i.e., ampullae restricted to the proximal cyclosystem wall, which forces reliance on other characters to identify the female colonies. For instance, females of *C. cymas* are very similar to those of *C. glebulenta* in morphology but can be distinguished by having smaller cyclosystems; fewer dactylopores per cyclosystem; and larger, horizontal lids.

Distribution.—Widespread throughout the Galápagos, including off southwest Isabela, Roca Redonda, Marchena, Genovesa, Santa Cruz, and Floreana; off New Zealand (Cairns 1991c); 166–806 m; 5.7°–14.4°C.

Crypthelia dactylopoma Cairns, 1986

Crypthelia dactylopoma Cairns, 1986b:36–41, figs. 24A–H, 25A, B.

New records.—*JSL* Stations 1923, 1 female colony, USNM 85754; 1928, 1 female branch, USNM 84755; 1929, 1 female col-

ony, USNM 84756; 1933, 2 female colonies, USNM 84757.

Discussion.—The small branch fragment from *JSL*-1928 is a typical female specimen, consistent with the original description; however, the colonies from the other three stations differ in having cyclosystems only about half the typical diameter (e.g., about 1.4 mm). Except for the character of cyclosystem size and associated delicacy of the corallum, these specimens are similar to the types.

Distribution.—Off Fernandina, Roca Redonda, Marchena, eastern Isabela, northeast of Santa Cruz, and Española; 348–813 m; 5.0°–10.0°C.

Crypthelia gigantea Fisher, 1938

Cryptohelia [sic] *gigantea* Fisher, 1938:535, pl. 64, fig. 5.

Crypthelia gigantea: Cairns, 1986b:41, figs. 26A–I (synonymy).

New records.—*JSL* Stations 1921, 1 branch, USNM 84751; 1922, 2 female colonies, USNM 84752; 1927, 1 colony, USNM 84753.

Discussion.—Previously known only from the type locality (*Albatross* 2818), *C. gigantea* is herein reported from three additional stations, making possible observations on corallum variation. Branch anastomosis appears to be common, resulting in uniplanar, reticulate flabella. None of the *JSL* specimens were quite as large as the syntypes in cyclosystem diameter (which have the largest cyclosystems of any stylasterid—4.0–4.1 mm in greater diameter [Cairns 1986b]); cyclosystems of the *JSL* specimens ranged from only 2.5 to 3.4 mm in greater diameter. Male cyclosystem lids and nongravid female cyclosystem lids are slightly concave, horizontal, and tongue-shaped, covering 50–70% of the cyclosystem.

Distribution.—Known only from the eastern Galápagos Islands: off Santiago, Marchena, Genovesa, and northeast of Santa Cruz; 475–784 m; 5.6°–8.9°C.

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