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New Records of Ahermatypic Corals (Scleractinia) from the Hawaiian and Line Islands

Stephen D. Cairns
Department of Invertebrate Zoology
Smithsonian Institution, Washington, D.C. 20560

ABSTRACT

A CRITICAL CHECKLIST of the 54 species of ahermatypic Scleractinia known from the Hawaiian Islands is given. Based on a collection of approximately 1,150 specimens from 186 stations, new records are documented for 42 of these species, including 19 new records for the Hawaiian Islands, 8 of these being new species. A synonymy, discussion, and distribution are given for each of the 42 species collected; those species new to the Hawaiian Islands are illustrated. This new checklist of species shows the Hawaiian deep-water Scleractinia to be an attenuated Indo-West Pacific fauna having a 48% endemic component, a 17% central-west Pacific component, a 15% Indo-West Pacific component, and a 17% cosmopolitan component. Deep-water Scleractinia from two stations from Christmas Island (in the Line Islands) and one station off Johnston Atoll are also reported.

INTRODUCTION

The ahermatypic Scleractinia[1] from the Hawaiian Islands have been studied only once in detail, by T. Wayland Vaughan (1907). Vaughan and Wells (1943) and Maragos (1977) have extracted information from Vaughan's original work but no new records of deep-water corals

[1] Ahermatypic Scleractinia are those species that do not have symbiotic zooxanthellae living in their tissue. It is a physiological condition that can be influenced by the environment, and thus not always a conservative systematic character. For instance, several species from Hawai'i, such as *Leptoseris hawaiiensis* and probably several of the *Cycloseris*, can be both hermatypic and ahermatypic, depending on the availability of light (i.e., depth, turbidity, etc.). Ahermatypes can and do occur in shallow water, but most species have depth ranges extending below 50 m; one Hawaiian species occurs at 2056 m. The deepest living scleractinian was dredged at 6300 m (Keller 1974). Most deep-water ahermatypic corals are solitary, but some are colonial; thus, the equation of ahermatypic corals to "deep-water" and/or "solitary corals" is, in general, correct but has many exceptions.

have been reported. Vaughan's (1907) monumental work on the Hawaiian Scleractinia, which included both the hermatypes and ahermatypes, discussed 32 species and 7 varieties of ahermatypic corals. All were collected on *Albatross* cruises.

This paper is based on a collection of greater size than that of Vaughan and provides distributional records of 42 ahermatypic species from the Hawaiian Islands, including 19 new records, 8 of which are new species. Four new combinations are created and 3 of Vaughan's species are synonymized. This brings the total number of ahermatypic species known from the Hawaiian Islands to 54, which includes 4 that may also be hermatypic (table 1). Maragos (1977, 162) listed 42 species of reef corals from Hawai'i, of which 2 are ahermatypes (*Balanophyllia* sp. and *Tubastraea coccinea*) and 3 (*Leptoseris hawaiiensis, Cycloseris fragilis,* and *C. hexagonis*) are sometimes ahermatypic. Thus, there are 50 exclusively ahermatypic, 37 exclusively hermatypic, and 4 facultative species of Scleractinia, or a total of 91 species, known from the Hawaiian Islands. A station list is on file with the author, in Bishop Museum Library, and the Smithsonian Institution Library (Department of Invertebrate Zoology).

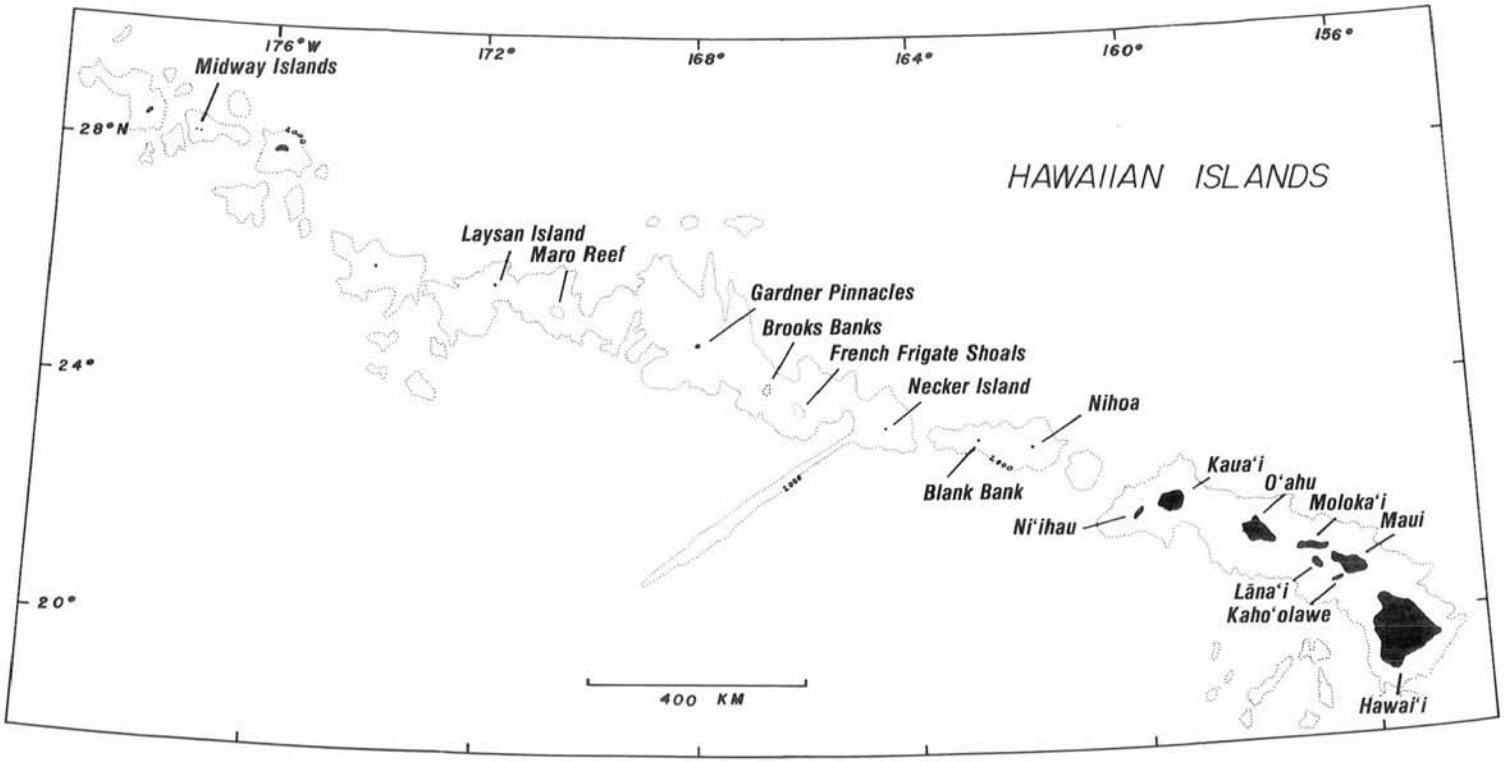
ZOOGEOGRAPHY

The zoogeography of Hawaiian Scleractinia has been discussed by Vaughan (1907, 47-48), Vaughan and Wells (1943, 88-89), and Maragos (1977, 161). In addition, Kay (1977) has discussed Hawaiian zoogeography in general. All agree that the Hawaiian fauna is an impoverished (attenuated) Indo-West Pacific fauna, with components of endemic and cosmopolitan species, and has virtually no connection with the eastern Pacific. The specimens reported in this paper support this hypothesis and serve only to refine the percentages alloted to each category. Vaughan and Wells (1943) calculated the endemic ahermatypic corals to constitute 70% (26/37) of the total Hawaiian ahermatypic scleractinian fauna. However, my study has shown that some of Vaughan's species are junior synonyms of other western Pacific species. Other cosmopolitan and widely distributed species are now known from the Hawaiian Islands as well, which lowers the endemic percentage to 48% (26/54), a number that will probably continue to fall as the Indo-West Pacific corals become better known.

Of the remaining species, 17% (9 species) occur in the central and western Pacific, 15% (8 species) occur throughout the Indo-West Pacific, and 17% (9 species) are cosmopolitan. One, *Caryophyllia atlantica,* is known from the eastern Atlantic and Hawai'i, and *Anomocora* sp., probably an Indo-West Pacific species, is not assigned to a category. Out of a total of approximately 12 species of cosmopolitan Scleractinia (species found in all oceans, some as far as the Antarctic continent), 9 have been collected from the Hawaiian Islands. It is likely that several more, such as *Lophelia prolifera, Solenosmilia variabilis,* and *Javania cailleti,* will be found. In waters deeper than 2000 m, *Fungiacyathus marenzelleri* and *Leptopenus discus* may also be found.

The only resemblance of the Hawaiian fauna to that of the eastern Pacific is through cosmopolitan species and *Endopachys grayi,* the latter of which, according to Umbgrove (1950), occurs in the Gulf of California.

That the Hawaiian coral fauna is an attenuated Indo-West Pacific fauna is undoubtedly the case but is difficult to quantify because of our poor knowledge of the approximately 350 species of ahermatypes found throughout the Indo-Pacific region (Vaughan and Wells 1943). The best known fauna is off Japan, which has about 100 ahermatypic species (Yabe and Eguchi 1941*a,b;* Eguchi 1968); over 150 species are known from the Malaysian region (Vaughan and Wells 1943), and 63 from off Queensland, Australia (Wells 1964). The Hawaiian Islands, with only 54 ahermatypes, is clearly an outpost of the greater Indo-West Pacific faunistic region.



Hawaiian Islands, listing islands and shoals near which corals were collected. Batymetric contours (dotted lines) equal 2000 fathoms.

MATERIAL AND METHODS

This study is based on approximately 1,150 previously unreported specimens collected from 186 stations (see map and station list on deposit) throughout the Hawaiian Islands, two stations off Christmas Island (Line Islands), and one specimen collected off Johnston Atoll. Specimens from 49 of these stations made by Tom and Beatrice Burch (1975–1982), which are abbreviated B, are deposited at the United States National Museum (USNM) and in the Bernice P. Bishop Museum (BPBM). Specimens from 45 stations from the University of Hawaii's SANGO and Midway projects (1970–1972) are also deposited at the USNM and BPBM. Specimens from 42 stations of the *Townsend Cromwell* expeditions of the Honolulu laboratory of the National Marine Fisheries Service (NMFS) (1964–1981), which are abbreviated TC, are deposited at the BPBM, USNM, and NMFS. Specimens from 26 stations made for the U.S. Army Corps of Engineers Deep Ocean Disposal Site Investigations in Hawai'i (1976–1978), which are abbreviated HON, are deposited at the BPBM and USNM. Specimens from 14 stations made by the U.S.F.C.S. *Albatross* (1902), apparently overlooked by Vaughan, are deposited at the USNM. Specimens from 5 stations of the Stanford Oceanographic Expedition, Cruise 23, leg 2 (1971), using the R/V *Proteus,* are deposited at the BPBM. Specimens from 4 stations of MacArthur Cruise 1 (1967), which are abbreviated MAC, are also deposited at the BPBM. In addition there were specimens from 4 miscellaneous stations. In all, this collection is significantly greater in size and diversity than the deep-water collection examined by Vaughan (1907), who included specimens from only 49 stations deeper than 100 m.

Synonymies are complete for most of the species discussed in the annotated checklist. The number of specimens collected at each station is enclosed in parentheses following the station number in the New Records sections. Following this is the abbreviation for the museum of deposition and catalog number. Only those species newly reported for the Hawaiian Islands or those showing unusual variations are illustrated. Otherwise, Vaughan (1907) should be consulted for illustrations.

Table 1 Checklist of Ahermatypic Scleractinia from the Hawaiian Islands

	Distribution[f]
Suborder Astrocoeniina	
Family Pocilloporidae	
**Madracis kauaiensis* Vaughan 1907	E
Suborder Fungiina	
Family Micrabaciidae	
**Letepsammia formosissima* Moseley 1876	CWP
Family Fungiidae	
[1]*Fungiacyathus fragilis* Sars 1872	C
***Fungiacyathus fissilis,* n. sp	E
†**Diaseris fragilis* (Alcock 1893)	IWP
†**Diaseris distorta* (Michelin 1843)	IWP
[2]†**Cycloseris tenuis* (Dana 1846)	CWP
Suborder Faviina	
Family Oculinidae	
**Madrepora kauaiensis* Vaughan 1907	E[a]
***Madrepora oculata* Linnaeus, 1758	C

Family Anthemiphylliidae	
**Anthemiphyllia pacifica* Vaughan 1907	E
***Anthemiphyllia dentata* (Alcock 1902)	IWP
Family Faviidae	
†*Leptoseris hawaiiensis* Vaughan 1907	CWP
Suborder Caryophylliina	
Family Caryophylliidae	
[3]*Caryophyllia atlantica* (Duncan 1873)	[b]
**Caryophyllia hawaiiensis* Vaughan 1907	E
**Caryophyllia octopali* Vaughan 1907	E
***Caryophyllia rugosa* Moseley 1881	CWP
***Caryophyllia marmorea*, n. sp.	E
***Caryophyllia* sp. cf. *C. ambrosia* Alcock 1898	C
***Premocyathus burchae*, n. sp.	E
***Conotrochus funicolumna* (Alcock 1902)	CWP
Ceratotrochus laxus Vaughan 1907	E
[4]***Cyathoceras rubescens* Moseley 1881	CWP
**Deltocyathus* sp. cf. *D. andamanicus* Alcock 1898	IWP[c]
***Deltocyathus stellulatus*, n. sp.	CWP
Desmophyllum cristagalli Milne-Edwards and Haime 1848	C
**Trochocyathus gardineri* (Vaughan 1907) n. comb.	E
Trochocyathus tenuicalyx (Vaughan 1907) n. comb.	E
**"Trochocyathus" oahensis* Vaughan 1907	E[d]
***Trochocyathus aithoseptatus*, n. sp.	E
Trochocyathus mauiensis (Vaughan 1907) n. comb.	E
[5]*"Paracyathus" molokensis* Vaughan 1907	E
***Anomocora* sp.	[e]
***Coenosmilia inordinata*, n. sp.	E
***Peponocyathus orientalis* (Duncan 1876)	IWP
Family Flabellidae	
[6]***Flabellum pavoninum* Lesson 1831	IWP
[7]**Flabellum vaughani*, n. sp.	E
[8]*Flabellum marcus* Keller 1974	CWP
***Javania lamprotichum* (Moseley 1880) n. comb.	E
***Javania insignis* Duncan 1876	IWP
**Gardineria hawaiiensis* Vaughan 1907	E
Placotrochus fuscus Vaughan 1907	E
Family Guyniidae	
***Guynia annulata* Duncan 1872	C
***Stenocyathus vermiformis* (Pourtalès 1868)	C
Suborder Dendrophylliina	
Family Dendrophylliidae	
**Dendrophyllia oahensis* Vaughan 1907	E
**Dendrophyllia serpentina* Vaughan 1907	E
***Dendrophyllia gaditana* (Duncan 1873)	C
[9]***Balanophyllia cornu* Moseley 1881	CWP
Balanophyllia laysanensis Vaughan 1907	E
**Balanophyllia desmophylloides* Vaughan 1907	E
**Balanophyllia diomedeae* Vaughan 1907	E

***Cladopsammia echinata,* n. sp.	E
[10]**Endopachys grayi* Milne-Edwards and Haime 1848	IWP
[11]**Enallopsammia rostrata* (Pourtalès 1878)	C
[12]*Tubastraea coccinea* Lesson 1831	C

ANNOTATED SYSTEMATIC CHECKLIST OF NEW RECORDS

Madracis kauaiensis Vaughan 1907

Madracis kauaiensis Vaughan 1907:83-84, pl. 9, figs. 1-4.

Not *Madracis* sp. cf. *M. kauaiensis:* Gardiner and Waugh 1939, 229.

New Records: Albatross 3991 (4 branches) USNM 60560; *Albatross* 4150 (1 branch) USNM 20779; TC 61-119 (1 colony) BPBM SC3086.

Remarks: Two *Albatross* records, apparently overlooked by Vaughan (1907), are included here. Gardiner and Waugh's (1939) doubtful record from off Pemba, east Africa is not considered to be the same species.

Distribution: The islands of Hawai'i, Maui, Moloka'i, and Kaua'i; 44-541 m.

Letepsammia formosissima (Moseley 1876)

Stephanophyllia formosissima Moseley 1876: 561-562; Moseley 1881, 201-204, pl. 4, fig. 11, pl. 13, figs. 6-7, pl. 16, figs. 8-9; Alcock 1902, 39-40; Vaughan 1907, 146-147, pl. 44, figs. 2, 2a; Wells 1958, 263, pl. 1, figs. 1-2.

?*Stephanophyllia formosissima:* van der Horst 1927, 7; Gardiner and Waugh 1939, 234.

Stephanophyllia (Letepsammia) formosissima: Yabe and Eguchi 1932*c*, 58, 61-63, pl. 8, figs. 7-8; Yabe and Eguchi 1941*b*, 138-139; Eguchi 1968; C16-17, pl. C6, figs. 7-11, pl. C25, figs. 10-13, pl. C27, figs. 2-3.

Letepsammia formosissima: Squires 1967, 505.

New Records: MAC3 (11) BPBM SC2494; MAC6 (24) BPBM SC2492; MAC 7 (8) BPBM SC2493; *Proteus* 97 (fragments) BPBM SC3090; B77049 (fragments) USNM 62475; B78001

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*New record(s) of this species reported in this paper.

**New record(s) for Hawaiian Islands.

†Species may be hermatypic in shallow water.

[1]*F. fragilis* was previously reported from Hawai'i as *F. hawaiiensis* by Vaughan (1907).

[2]*C. tenuis* was previously reported from Hawai'i as *C. hexagonis* by Maragos (1977).

[3]*C. atlantica* was previously reported from Hawai'i as *C. alcocki* by Vaughan (1907).

[4]*C. rubescens* was previously reported from Hawai'i as *C. diomedeae* by Vaughan (1907).

[5]Generic attribution probably wrong; see text.

[6]*F. pavoninum* includes those varieties reported as *distinctum* and *latum* by Vaughan (1907).

[7]*F. vaughani* was previously reported from Hawai'i as *F. pavoninum* variety *paripavoninum* by Vaughan (1907).

[8]*F. marcus* was previously reported from Hawai'i as *F. deludens* by Vaughan (1907).

[9]*B. cornu* was previously reported from Hawai'i as *B. hawaiiensis* by Vaughan (1907).

[10]*E. grayi* was previously reported from Hawai'i as *E. oahense* by Vaughan (1907).

[11]*E. rostrata* was previously reported from Hawai'i as *E. amphelioides* by Vaughan (1907).

[12]*T. coccinea* was previously reported from Hawai'i as *Dendrophyllia manni* by Vaughan (1907).

[a]Record from Great Barrier Reef (Wells 1964) questioned.

[b]Disjunct distribution; see text.

[c]Distribution subject to doubt.

[d]Record from Red Sea (Gardiner and Waugh 1938) doubtful.

[e]Probably IWP but not assigned to a category.

[f]E = Endemic to Hawaiian Islands; CWP = Central and West Pacific; IWP = Indo-West Pacific; C = Cosmopolitan.

(fragments) USNM 62468; B80070 (1) BPBM SC3091; TC 33-8 (8) BPBM SC3092; TC 35-1 (4) BPBM SC3093; TC 33-53 (8) BPBM SC3094; TC 40-73 (7) BPBM SC3095; TC 81-01-14 (1) NMFS; HON 7-4 (1) BPBM SC3095; HON 9B-3 (fragments) BPBM SC3149; HON 9B-4 (fragments) BPBM SC3098.

Remarks: Although the Hawaiian specimens are slightly smaller in calicular diameter than those from the Philippines, they are believed to be the same species.

Van der Horst's (1927) record from off South Africa and Gardiner and Waugh's (1939) record from off eastern Africa were not illustrated and have not been examined by the author. An undescribed species of *Stephanophyllia* (Squires, unpublished MS) occurs off eastern Africa, which may account for these records.

Distribution: The islands of Hawai'i to O'ahu and north of Nihoa; 109-470 m. Elsewhere—Indonesia, Tasmania, Philippines, and Japan; 128-828 m.

Fungiacyathus fraglis G. O. Sars 1872

Remarks: Cairns (1982) synonymized Vaughan's *Bathyactis hawaiiensis* with *F. fragilis*. In Hawai'i, *F. fragilis* is known from only one station between O'ahu and Kaua'i (Vaughan 1907) at 1762-2056 m.

Fungiacyathus fissilis, new species

Pl. 1, figs. A-B

Records: Holotype—HON 3-0, USNM 60514; Paratypes—B76076 (1) USNM 60750; HON 1A-0 (fragments) BPBM SC3099; HON 3A-6 (fragments) BPBM SC3100; HON 7-1 (fragments) BPBM SC3101; HON 7-3 (fragments) BPBM SC3102; HON 7A-6 (fragments) BPBM SC3103; HON 9-1 (fragments) BPBM SC3104; HON 9-2 (fragment) BPBM SC3105; HON 9-4 (fragments) BPBM SC3106; HON 9B-2 (fragments) BPBM SC3107; HON 9B-3 (fragments) BPBM SC3108; HON 9B-4 (fragments) USNM 62707.

Description: The corallum is known only from fragments, the largest (holotype) consisting of nine septa and measuring 4.9 mm in calicular radius. This fragment had begun to regenerate a complete calice, which is 4.1 mm in diameter. The base is flat and ridged with thin costae, and spiny granules occur on and between the costal ridges.

Because of the extreme fissaparity of this species the number of septal cycles could not be determined. Each of the smallest pairs of septa (S_4?) joins the next larger septa (S_3?) by several individual, digitiform processes; these junctions are not covered by canopies. The largest septa (S_1 and S_2) consist of a tall peripheral lobe composed of the outermost 10-12 trabecular spines; the middle part of each septum bears 3-4 tall, individualized trabecular spines that are slanted toward the columella; and the inner part of each septum also bears 3-4 small, individualized spines, which are indistinguishable from the columella. All trabecular spines have prominent ridges, which, in turn, bear spiny granules. Thus, the individual spines of the middle section are broader (parallel to calicular edge) than long (perpendicular to edge) because of these lateral ridges. Septa have straight margins and each of the larger septa is reinforced by 5 to 6 synapticular plates.

Remarks: Fungiacyathus fissilis is distinguished from *F. fragilis,* the only other *Fungiacyathus* reported from the Hawaiian Islands, by its smaller size, straight septal edges, lack of canopies, and different septal shape. It is extremely similar to *F. crispus* (Pourtalès 1871), which is known only from the Atlantic between 183-1010 m, particularly in size, tendency toward schizoparity, and in lacking canopies at septal junctions. *F. fissilis* differs only in its higher septal lobe and slightly less projecting trabecular spines.

Distribution: The islands of Hawai'i, Maui, and O'ahu; 212-503 m.

Diaseris fragilis Alcock 1893

Pl. 1, fig. C

Diaseris fragilis Alcock 1893: 148, pl. 5, fig. 11; Veron and Pichon 1979, 123-125, figs. 197-201.

Fungia fragilis: Vaughan 1907, 130-131, pl. 28, fig. 1; Boschma 1923, 138-142, pl. 10, figs. 17-23.

Not *Cycloseris fragilis:* Maragos 1977, 209-212, figs. 5, 84-85 (=*D. distorta).*

New Records: B76017 (1) USNM 62705; B78011 (1) USNM 62706; B79020 (11) BPBM SC3109; B79048 (1) BPBM SC3110; B79065 (3) BPBM SC3111; B80093 (4) BPBM SC3112; B81005 (4) BPBM SC3113.

Distribution: The islands of Lāna'i, Moloka'i, and O'ahu; 15-400 m. Elsewhere—widely distributed in Indo-West Pacific.

Diaseris distorta (Michelin 1843)

Pl. 1, fig. D

Cycloseris fragilis: Maragos 1977, 209-212, figs. 5, 84-85.

Diaseris distorta: Veron and Pichon 1979, 121-123, figs. 194-196.

New Records: Several thousand specimens collected at 74 locations in Māmala Bay, O'ahu; all lots at USNM.

Remarks: Diaseris distorta differs from *D. fragilis* because: 1) the lower-cycle septa (S_{1-3}) are significantly taller than the other septa, especially near the columella, at which each forms an exsert lobe up to 3 mm taller than adjacent higher-cycle septa, 2) the septa are thinner and their granules are smaller and less dense, producing the effect of more widely spaced septa, and 3) the septal granules are arranged in vertical rows, especially apparent on the tall septal lobes.

Distribution: Māmala Bay, O'ahu; 17-475 m. Elsewhere—widespread in Indo-West Pacific (Veron and Pichon 1979).

Cycloseris tenuis (Dana 1846)

Pl. 1, fig. E

Fungia tenuis Dana 1846: 290, pl. 18, fig. 1; Boschma 1923, 133-135, pl. 9, figs. 1-7, 12.

Fungia hexagonalis Milne-Edwards and Haime, 1848*a*: pl. 6, fig. 2; Reed 1971, 41, fig. 5.

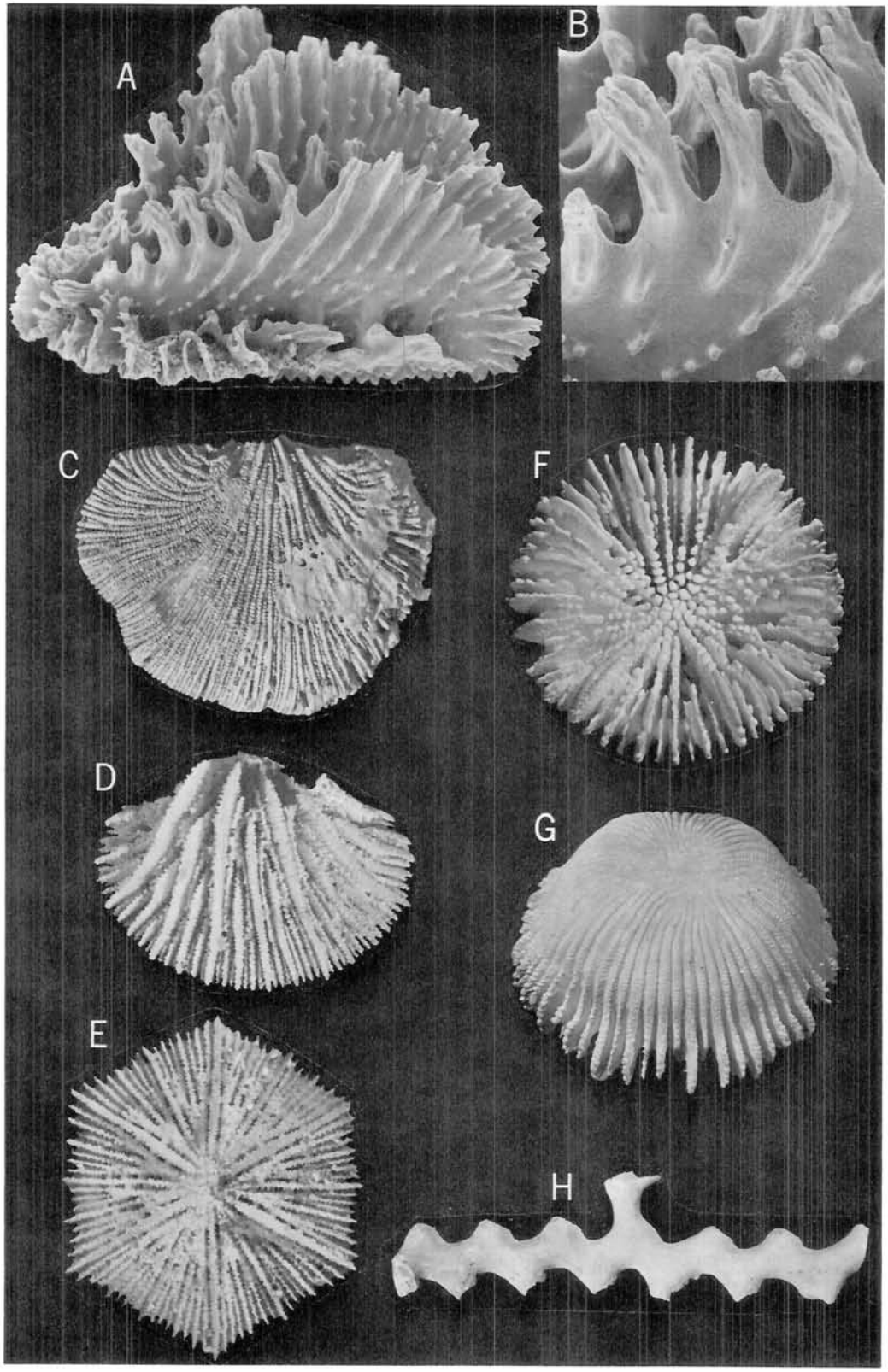
Cycloseris tenuis: Moseley 1881, 190, pl. 10, fig. 6.

Cycloseris hexagonalis: Maragos 1977, 212, figs. 3, 86-87.

New Records: Proteus 103 (1) BPBM SC3114; B75005 (4) USNM 60566; B75007 (2) USNM 60582; B75013 (16) USNM 60578; B75014 (10) USNM 60579; B75025 (4) USNM 60584; B77067 (3) USNM 60583; B77068 (1) USNM 60571; B77070 (1) USNM 60572; B77074 (6) USNM 60574; B77075 (3) USNM 60581; B77078 (12) USNM 60568; B78006 (5) USNM 60575; B78008 (2) USNM 60570; B78009 (3) USNM 60577; B78016 (17) USNM 60576; B78036 (1) USNM 60567; B78040 (1) USNM 60580; B79003 (1) USNM 60573; B79032 (2) USNM 60569; B79065 (2) BPBM SC3115; B81005 (1) BPBM SC3116.

Remarks: As with *L. formosissima,* all of the Hawaiian specimens of *C. tenuis* are smaller than those from the Indo-West Pacific. The largest specimen, 14.3 mm in calicular diameter, is still less than half the diameter of the holotype (USNM 114: 33.7×30.7 mm) and has an incomplete sixth cycle of septa. Most of the Hawaiian specimens preserve the hexameral outline characteristic of juvenile coralla.

Plate 1. A–B, *Fungiacyathus fissilis,* holotype (A, × 15; B, detail of trabecular spines, × 33); C, *Diaseris fragilis,* B76017, × 2.2; D, *Diaseris distorta,* B,79073, × 3.6; E, *Cycloseris tenuis,* B78008, × 4.1; F–G, *Anthemiphyllia dentata,* TC 81–01–14, × 3.1; H, *Madrepora oculata* Midway 13, × 1.15.


A
B
C
F
D
G
E
H

Another species of *Cycloseris, C. vaughani* Boschma 1923 (=*Fungia patella* Vaughan 1907), is also present off Hawai'i. However, its shallow depths of capture and its more robust growth form imply that it is a hermatypic species and it is therefore not included in this work.
Distribution: Islands of Hawai'i, Lāna'i, and O'ahu; 11-457 m. Elsewhere—throughout tropical western and central Pacific.

Madrepora kauaiensis Vaughan 1907

Madrepora kauaiensis Vaughan 1907: 81-83, pl. 8, figs. 1-2; ?Gardiner and Waugh 1939, 227; Crossland 1952, 121; ?Wells 1964, 109; Squires 1965, 503-505, figs. 1-2.
Mussa sp. Vaughan 1907, 106, pl. 8, fig. 3.
New Record: SANGO 14-1 (1 branch) USNM 60564.
Remarks: One of the twelve corallites of the SANGO specimen was abnormally enlarged (calicular diameter 6.7 mm), similar to the "neoplastic" growth anomalies reported by Squires (1965) for 3 of the 239 corallites of the type-colony. Vaughan (1907) considered these abnormal corallites as the settlement of a different, shallow-water species; Soule (1965) suggested that they were cyclostomatous bryozoans; White (1965) suggested that they were possibly the result of growth hormones released by an attached predator. After reexamination both of the types and the new record, I conclude that these abnormalities are definitely enlarged corallites of *M. kauaiensis*, but their etiology must await observation of the living animal.
Distribution: The islands of O'ahu and Kaua'i; 362-538 m. Elsewhere—Gardiner and Waugh's (1939) records from the Indian Ocean and Crossland's (1952) record from the Great Barrier Reef are both unillustrated. Until verified by examination these records are questioned.

Madrepora oculata Linneaus 1758
Pl. 1, fig. H

Madrepora oculata Linnaeus 1758: 798; Zibrowius 1974*a*, 762-766, pl. 2, figs. 2-5; Zibrowius 1980, 36-40, pl. 13, figs. A-P; Cairns 1979, 39-42, pl. 3, fig. 2, pl. 4, fig. 5, pl. 5, figs. 1-3; Cairns 1982, 15, pl. 3, figs. 4-6.
New Record: Midway 13 (15 branch fragments) USNM 60563.
Remarks: Madrepora oculata is distinguished from *M. kauaiensis* by its larger corallites (3.5-4.0 mm in calicular diameter), more robust corallum, less exsert septa, and less coenosteal sculpturing. Coincidentally, one corallite of *M. oculata* was abnormally enlarged (calicular diameter 11.3 mm), similar to those deformed corallites of *M. kauaiensis*.
Distribution: Gardner Pinnacles; 627-750 m. Elsewhere—cosmopolitan except for continental Antarctic; 80-1500 m.

Anthemiphyllia pacifica Vaughan 1907

Not *Discotrochus dentatus* Alcock 1902:27.
Anthemiphyllia pacifica Vaughan 1907: 79-80, pl. 7, fig. 5.
New Records: Proteus 97 (2) BPBM SC3117; TC 33-10 (2) BPBM SC3118; TC 33-26 (1) BPBM SC3119; TC 33-38 (1) BPBM SC3120; TC33-50 (1) NMFS; TC33-55 (1) BPBM SC3121; TC35-5 (2) BPBM SC3122; TC36-7 (1) BPBM SC3123; TC40-91 (2) BPBM SC3124; TC40-91 (2) USNM 60561.
Remarks: Yabe and Eguchi (1941*b*) implied, and Wells (1958) stated, that *A. pacifica* was simply the juvenile, 48-septa stage of the larger 96-septa adult, *A. dentatus* (Alcock 1902). However, the largest of the 19 specimens of *A. pacifica* known from the Hawaiian Islands has a calicular diameter of 9.5 mm and 50 septa and the other 18 specimens have 48 septa or less. Thus, four complete cycles seem to be the adult condition for *A. pacifica* and I do not consider it as a juvenile

of *A. dentata*. Other differences between *A. pacifica* and *A. dentata* are that *A. pacifica:* 1) is much smaller, with a maximum calicular diameter of about 9.5 mm; *A. dentata* ranges up to 22 mm, 2) has a smooth porcelaneous epithecate base; *A. dentata* has coarse, granular costae, 3) has thin septal teeth for the entire margin of the larger septa; *A. dentata* has a large lobe at the outer margin of the larger septa, 4) has $S_1=S_2$; *A. dentata* has $S_1>S_2$, and 5) has nonexsert septa; *A. dentata* has very exsert septa.

Several of the new specimens are characterized by being tall and trochoid in shape, perhaps in response to unfavorable environmental conditions. Also, several of the typical bowl-shaped specimens were basally attached.

Distribution: Islands of Maui, Lāna'i, and Moloka'i; 205-296 m.

Anthemiphyllia dentata (Alcock 1902)

Pl. 1, figs. F-G

Discotrochus dentatus Alcock 1902: 27, pl. 4, fig. 26; Gardiner and Waugh 1938, 194.

Anthemiphyllia dentata: Yabe and Eguchi 1941*b*, 128-129; Wells 1958, 264, pl. 1, figs. 8-11; Eguchi 1968, C29-30, pl. C6, figs. 12-21.

New Record: TC81-01-14 (3) BPBM SC3125; TC81-01-14 (1) USNM 60559.

Remarks: The illustrated specimen is 14 mm in calicular diameter and contains 60 septa, with one pair of S_5 in each system.

Distribution: Northeast of Nihoa; 369 m. Elsewhere—western Indian Ocean, Tasmania, Philippines, and Japan; 65-700 m.

Caryophyllia atlantica (Duncan 1873)

Bathycyathus atlanticus Duncan 1873: 318, pl. 48, figs. 1-2.

Caryophyllia laevicostata Moseley 1881: 134, pl. 1, fig. 1.

Caryophyllia alcocki Vaughan 1907: 73-74, pl. 5, fig. 1.

Caryophyllia atlantica: Zibrowius 1980, 56-57, pl. 20, figs. A-K.

Not *Caryophyllia* cf. *alcocki:* Yabe and Eguchi 1941*b*, 120, pl. 10, fig. 8.

Remarks: No new specimens of *C. atlantica* were found; however, the types of Vaughan's *C. alcocki* were compared to other species. They were found to be different from Yabe and Eguchi's (1941*b*) *C. alcocki* but identical to *C. atlantica,* a suspicion held by Zibrowius (1980). Because *C. atlantica* has nomenclatural priority, this name must be used for the Hawaiian specimens.

Distribution: Near Necker Island; 1602 m. Elsewhere—eastern Atlantic from the Mediterranean Sea to Ascension Island; 776-2165 m.

Caryophyllia hawaiiensis Vaughan 1907

Caryophyllia hawaiiensis Vaughan 1907: 76, pl. 5, fig. 4.

New Record: B80095 (1) BPBM SC3126.

Distribution: Islands of Hawai'i, Moloka'i, and O'ahu; 44-388 m.

Caryophyllia octopali Vaughan 1907

Caryophyllia octopali Vaughan 1907: 74-75, pl. 5, fig. 2.

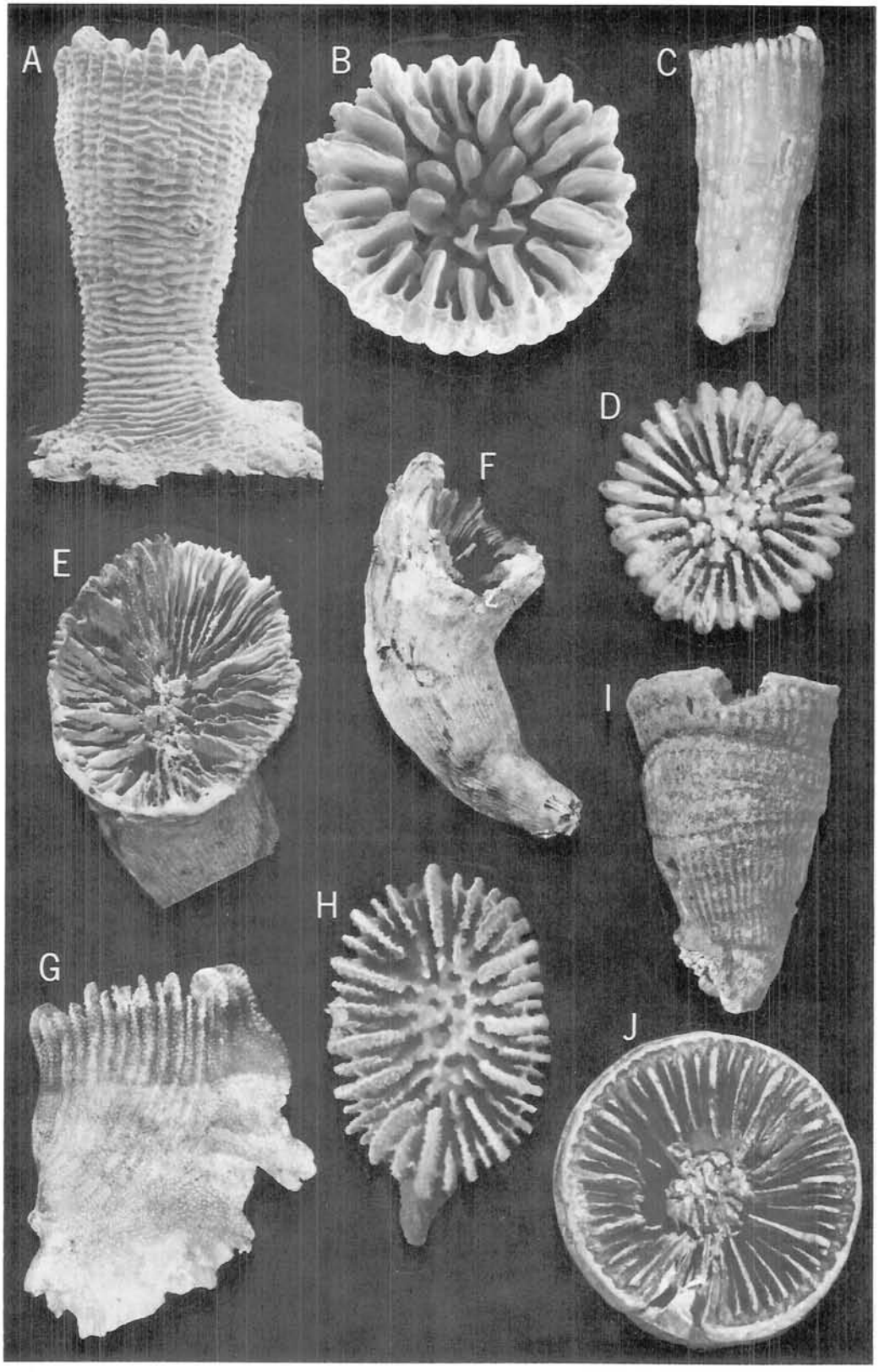
New Records: Midway 13 (1) USNM 60562; *Proteus* 103 (4) BPBM SC3127.

Distribution: Islands of Hawai'i, Moloka'i, and the Gardiner Pinnacles; 457-627 m.

Caryophyllia rugosa Moseley 1881

Pl. 2, figs. A-B; Pl. 4, fig. I

Caryophyllia rugosa Moseley 1881: 141-143, pl. 1, fig. 8; Koch 1889, 10-20, 7 figs.; Wells 1954, 469, pl. 177, figs. 5-6.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Caryophyllia paraoctopali Yabe and Eguchi 1941b: 150, pl. 10, fig. 12.
New Records: Albatross 4135 (2) USNM 60553; MAC3 (1) BPBM SC3128; SANGO 13-13 (4) USNM 60554; SANGO 13-15 (2) USNM 60552; B77049 (1) USNM 62477; B80095 (1) BPBM SC3129; TC33-26 (5) BPBM SC3130; TC33-27 (3) BPBM SC3131; TC33-42 (1) NMFS; HON 9-3 (1) BPBM SC3132.
Distribution: Islands of Hawai'i, Lāna'i, O'ahu, Kaua'i, and Brooks Banks; 137-439 m. Elsewhere—Philippines, Ceram Sea, Formosa, Japan, and Bikini Atoll; 71-230 m.

Caryophyllia marmorea, new species
Pl. 2, figs. C-D

Records: Holotype—HON 9-3, USNM 60515; Paratypes—HON 9-3 (4 fragments) BPBM SC3133; HON 9-4 (1) BPBM SC3134; HON 9-6 (1) BPBM SC3135.
Description: The corallum is solitary, ceratoid, and attached. The holotype is 8.6 mm tall and 3.7 mm in calicular diameter. The theca is light brown and porcelaneous, without indication of granules. C_1 and C_2 are slightly raised; C_3 are flat. The septa are octamerally arranged: 8 S_1, 8 S_2, and 16 S_3. S_1 are the largest and most exsert septa, S_2 and S_3 are progressively smaller; however, the S_3 extend an equal distance to the columella as the S_2. The inner edges of the S_2 are sinuous, those of S_1 less so, and those of S_3 are relatively straight. Eight highly granulated, thin pali occur before the S_2. The columella is composed of 1-3 twisted ribbons extending to just below the upper edges of pali. The fossa is shallow.
Remarks: Four other species belong to the octamerally symmetrical *Caryophyllia: C. rugosa* Moseley 1881, *C. octopali* Vaughan 1907, *C. mabahithi* Gardiner and Waugh 1938 (Indian Ocean), and *C. barbadensis* Cairns 1979 (Caribbean). *C. rugosa* and *C. octopali* both occur off Hawai'i. *C. marmorea* is most easily distinguished from *C. rugosa* by its different costal ornamentation and less sinuous septa, and from *C. octopali* by its smaller size, different costal ornamentation, and more exsert septa.
Distribution: Off Hilo, Hawai'i; 331-337 m.

Caryophyllia sp. cf. *C. ambrosia* Alcock 1898
Pl. 2, figs. E-F

Records: B81033 (4) BPBM SC3136; B82004 (2) USNM 60550; TC61-119 (1) BPBM SC3137.
Diagnosis: The best-preserved specimen (Pl. 2, figs. E-F) is 53 m long and 27 × 23 m in calicular diameter. The corallum is curved 90° from its original pedicel orientation and is unattached. The costae are prominent thin ridges. The preservation of the specimen does not allow an accurate determination of the number of septa, but there appear to be almost five cycles of septa arranged in 21-22 groups of four. Pali are present before the penultimate cycle of septa.
Remarks: This species, which can be briefly diagnosed as a recumbent *Caryophyllia* with five cycles of septa, is unlike any *Caryophyllia* thus far reported from the Hawaiian Islands or the western Pacific. It is similar to *C. ambrosia* Alcock 1898, known from the Indian and Atlantic Oceans between 183-2670 m; however, the preservation of the seven specimens at hand does not allow an accurate species identification.
Distribution: Off Maui and O'ahu; 56-206 m.

Plate 2. A–B, *Caryophyllia rugosa,* SANGO 13–13 (A, rugose theca, × 9.1; B, calice, × 12); C–D, *Caryophyllia marmorea,* holotype (C, theca, × 5.4; D, calice, × 9.8); E–F, *Caryophyllia* sp. cf. *C. ambrosia,* B82004 (E, damaged calice, × 1.5; F, side view of corallum, × 1.15); G–H, *Premocyathus burchae,* holotype (G, side view, × 6.1; H, calice, × 8.5); I–J, *Conotrochus funicolumna,* SANGO 3–4 (I, side view, × 2; J, calice, × 3.2).

Premocyathus burchae, new species
Pl. 2, figs. G-H

Records: Holotype—B79065, USNM 60512; Paratypes—B79065 (6) BPBM SC3138; B79065 (10) USNM 60513.

Description: The corallum is solitary, trochoid, highly compressed, and curved about 90° from its original pedicel attachment. The base of the corallum is invariably broken, revealing a circular scar about 1.3 mm in diameter exposing the original septa. The outer convex edge of the corallum bears a prominent, thin crest extending from the basal scar to the calice. The crest is rarely continuous or of consistent height. In smaller specimens, a smaller and shorter crest is also present on the inner concave thecal margin. The largest specimen (holotype) is 9.8 mm tall and 5.7×3.6 mm in calicular diameter. Its lateral crest is 2.3 mm high, and its costae are well developed, especially deeply incised near the calicular edge, and covered by low rounded granules. The upper corallum is light brown to reddish brown, but the lower half is white; there is a distinct line of demarcation between the two areas, as though the lower half had been submerged in a soft substrate.

The septa are hexamerally arranged in four incomplete cycles. For instance, the holotype is missing four pairs of S_4 making a total of 40 septa. The S_1 and S_2 are of equal size, except for the two S_1 that are aligned with the greater calicular axis (those that correspond to the crests), which are slightly larger. The S_3 and S_4 are progressively smaller and less exsert; however, all septa are moderately exsert. The axis of divergence of septal trabeculae is well inside the theca; the septa bear low granulated ridges along the lines of the trabeculae. Thin pali are present before the S_3. Smaller paliform lobes are sometimes present before the S_1 and S_2. The columella consists of several irregular papillae similar in shape to the paliform lobes. The pali, paliform lobes, and columellar papillae are all interconnected.

Remarks: Premocyathus burchae differs from the only other species in the genus, *P. compressus* Yabe and Eguchi 1941; it is smaller, reddish brown in corallum color, has more prominent costae and crests, and sometimes has a small secondary crest on its concave thecal side. According to Yabe and Eguchi (1941*b*) *P. compressus* has decamerally arranged septa, which would be another difference, but specimens collected from the Philippines (*Albatross* 5156 and 5164) are hexameral with an incomplete fourth cycle, as is *P. burchae*. *P. compressus* is only known from the Philippines (33 m) and off Japan (type-locality, 115-658 m).

Distribution: Kealai Kahiki Channel, southeast of Lāna'i; 64 m.

Conotrochus funicolumna (Alcock 1902)
Pl. 2, figs. I-J

Ceratotrochus (Conotrochus) funicolumna Alcock 1902: 11-12, pl. 1, fig. 6; Yabe and Eguchi 1941*b*, 117, pl. 9, fig. 11; Eguchi 1968, C38-39.

New Records: SANGO 3-4 (1) USNM 60558; *Proteus* 103 (11) BPBM SC3139; *Proteus* 103 (2) USNM 60557.

Remarks: Alcock's (1902) types and Yabe and Eguchi's (1941*b*) specimens were compared with the Hawaiian specimens. Those from the Hawaiian Islands are among the largest thus far reported, one being 14.7 mm in calicular diameter and 23.5 mm tall. One characteristic found in all specimens was a basal reinforcement composed of a thickening of the pedicel along the lower one-third to one-quarter of one side of the corallum. A similar reinforcement formed by adventitious roots is found in *Monomyces;* however, it is unknown if the basal structure of *C. funicolumna* originates in the same manner.

Distribution: Islands of Hawai'i and O'ahu; 457-470 m. Elsewhere—Sulu Sea and off Japan; 165-600 m.

Cyathoceras rubescens Moseley 1881

Cyathoceras rubescens Moseley 1881: 157, pl. 2, fig. 8; Yabe and Eguchi 1941*b*, 117.

Cyathoceras diomedeae Vaughan 1907: 77-78, pl. 7, figs. 1-2; Yabe and Eguchi 1941*b*, 116-117, pl. 9, fig. 8.

New Records: Albatross 3810 (1) USNM 60585; SANGO 4-2 (1) USNM 60591; SANGO 13-1B (2) USNM 60589; SANGO 13-1C (1) USNM 60588; SANGO 13-2 (3) USNM 60592; SANGO 13-5A (2) USNM 60593; SANGO 13-8 (2) USNM 60594; SANGO 13-13 (1) USNM 60590; SANGO 13-15 (3) USNM 60587; *Proteus* 94 (2) BPBM SC3140; *Proteus* 95 (1) BPBM SC684; B76077 (1) USNM 62484; B76078 (2) USNM 62480; TC33-4 (1) BPBM SC3142; TC33-36 (1) BPBM SC3143; TC35-4 (2) BPBM SC3144; TC62-72 (1) BPBM SC3145; TC81-01-44 (2) BPBM SC3146.

Remarks: In his original description of *C. diomedeae*, Vaughan (1907) noted its close resemblance to *C. rubescens*, differentiating it primarily on its lack of a glistening theca. The additional specimens collected from the Hawaiian Islands have both glistening and granular costae; this difference is not considered to be a species-level characteristic. Unfortunately the holotype of *C. rubescens* is lost (pers. comm., P. F. S. Cornelius, BMNH), precluding a direct comparison, but Moseley's (1881) description and figures are adequate to synonymize the two species. Furthermore, a specimen collected from *Albatross* 5519 (Sulu Sea off Negros) is considered to be the same as Vaughan's species. This specimen, although not topotypic of *C. rubescens* (type-locality: Ki Islands, Ceram Sea), was collected in a location much closer to the Ki Islands than to the Hawaiian Islands and supports the premise that *C. rubescens* is a single widespread species extending from the Ceram Sea to the Hawaiian Islands.

Distribution: Islands of Maui, Moloka'i, O'ahu, and Kaua'i, and Nihoa, Blank, and Brooks Banks; Laysan; 197-634 m. Elsewhere—Ceram Sea, Sulu Sea, Japan, and Christmas Island; 183-366 m.

Deltocyathus sp. cf. *D. andamanicus* Alcock 1898

Pl. 3, figs. A-B

Deltocyathus andamanicus: Vaughan 1907, 71-72, pl. 6, fig. 4.

New Records: B80064 (1) USNM 60565; TC33-38 (1) BPBM SC3147.

Remarks: The type-locality of *D. andamanicus* is the Andaman Sea (314-556 m); it was subsequently reported by Gardiner and Waugh (1938) from the western Indian Ocean (238-1463 m). The four Hawaiian specimens, including Vaughan's, are all considerably smaller than those from the Indian Ocean, the largest only 10.7 mm in calicular diameter (exclusive of exsert septa); however, they all have three to four pairs of S_5. Because of the smaller size of the Hawaiian specimens, and because I have not examined Alcock's type, I hesitate to assign the Hawaiian specimens to this species.

Distribution: Islands of Hawai'i, Moloka'i, and O'ahu; 274-518 m.

Deltocyathus stellulatus, new species

Pl. 3, figs. C-D

Records: Holotype—HON 9-3, USNM 60516; Paratypes—*Proteus* 97 (1) BPBM SC3148; HON 9-3 (13) BPBM SC3149; HON 9-3 (2) USNM 60517; HON 9-4 (4) BPBM SC3150; HON 9-6 (1) BPBM SC3151; HON 9B-0 (2) BPBM SC3152; HON 9B-1 (6) BPBM SC3153. Nontype—New Hebrides, Espíritu Santo, 166°51.04′E, 15°36.08′S, 16000-23000 years BP (2) U.S. Geological Survey, Smithsonian Institution.

Description: The corallum is solitary, free, and discoidal, with a flat to slightly concave base, the concavity caused by a massive scar of former attachment. Surrounding the scar is a porcelaneous

base which is reflected upward and inward (towards the columella) as a theca. Because of this inward growth, the calicular diameter is usually smaller than the basal diameter. For instance, the holotype is 4.5 mm in basal diameter, 3.7 mm in calicular diameter, and has a basal scar 2.8 mm in diameter. The theca is up to 2.3 mm high with poorly defined costae, each costa bearing a row of fine pointed granules. Associated with each of the six S_1 is a blunt spine, up to 2 mm long, projecting outward and slightly downward from the lower thecal margin.

The septa are hexamerally arranged in four incomplete cycles. The holotype has 36 septa, each system lacking a pair of S_4. The incomplete nature of every system of every specimen is consistent so as to suggest that this might be the adult condition for this species. The septa are not very exsert and decrease in size with increasing cycle number. Small pali are present before the S_1 and slightly larger ones before the S_2 and S_3. Pali are also present before those S_3 that are flanked by S_4. Thus each system has one P_1, one P_2, and one P_3 (instead of two P_3), for a total of 18 pali for each calice. The septa and pali are highly spinose, especially the pali. The fossa is shallow.

Remarks: Only two other species of *Deltocyathus* have spines projecting from their coralla: *D. calcar* Pourtalès 1874 with six spines and endemic to the western Atlantic, and *D. ornatus* Gardiner 1899 with 12 spines and known only from the Loyalty Islands. *D. stellulatus* is clearly different from *D. calcar,* the other six-spined species, because of its smaller size, large basal scar and differently shaped corallum.

Distribution: Islands of Hawai'i and Lāna'i; 274-336 m. Elsewhere—New Hebrides (Late Pleistocene).

Trochocyathus gardineri (Vaughan 1907), n. comb.

Paracyathus gardineri Vaughan 1907: 68-69, pl. 4, fig. 4; Not Gardiner and Waugh 1938, 183-184, pl. 3, fig. 5.

New Records: MAC7 (2) BPBM SC3154; *Proteus* 103 (12) BPBM SC3155; TC33-36 (37) BPBM SC3156; TC33-38 (55) BPBM SC3157; TC33-38 (10) USNM 60556; TC40-91 (5) NMFS; TC81-01-14 (4) BPBM SC3158; TC81-01-14 (2) USNM 60555.

Distribution: Vaughan's (1907) original description, which was the only record of this species, was not accompanied by distributional data. These records therefore represent the first such data available. Known only from off Hawai'i, Maui, Moloka'i, and north of Nihoa; 274-470 m.

"Trochocyathus" oahensis Vaughan 1907

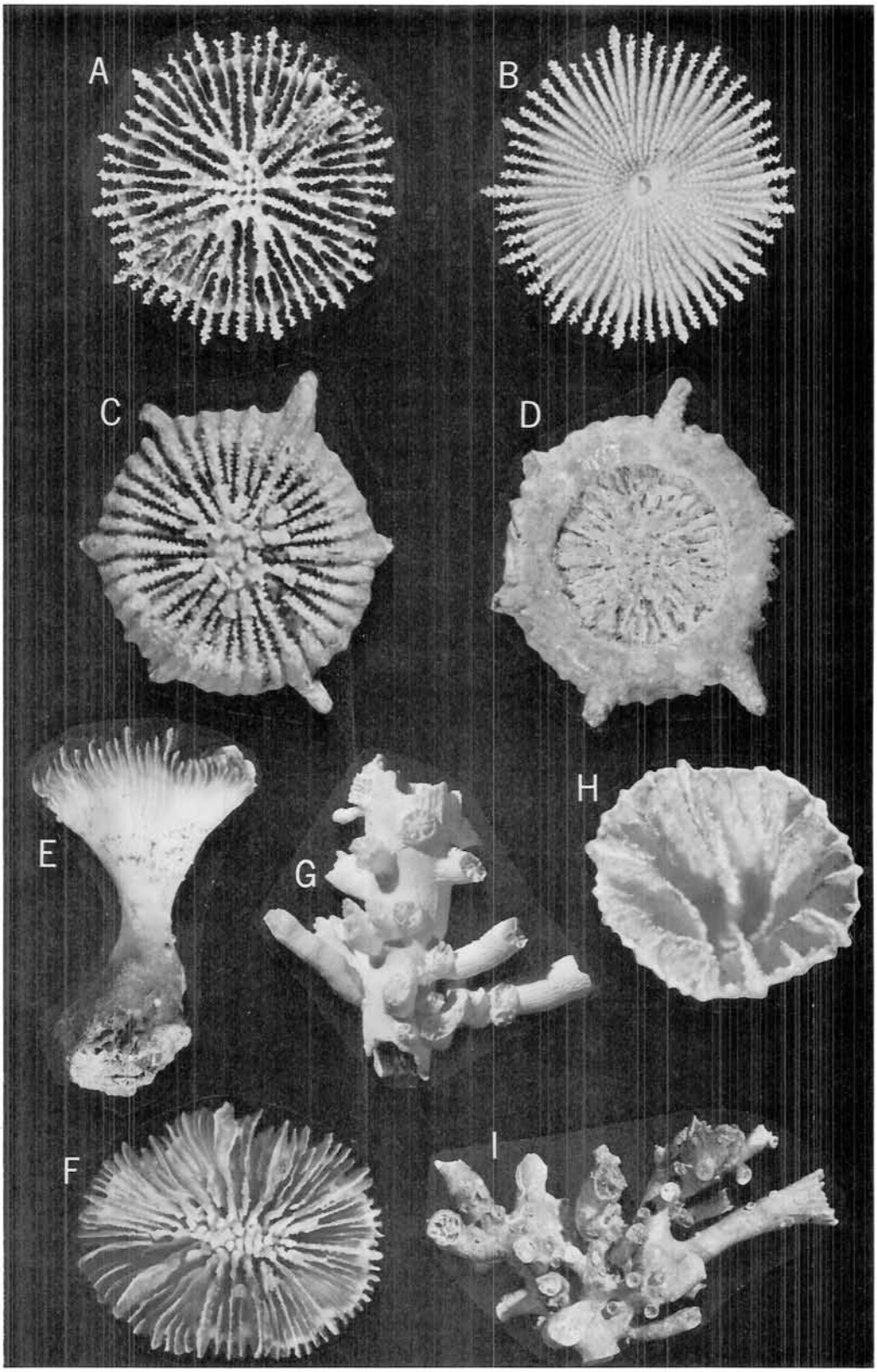
Trochocyathus oahensis Vaughan 1907: 72-73, pl. 6, figs. 5-6; ?Gardiner and Waugh 1938, 188.

New Record: HON 3A-6 (4 fragments) BPBM SC3159.

Remarks: This is a very atypical *Trochocyathus,* characterized by a low discoidal corallum and apparent asexual budding. Analysis of more specimens may relocate this species in a different genus.

Distribution: The islands of Hawai'i, O'ahu, and Kaua'i; 75-571 m. Its presence in the Red Sea (Gardiner and Waugh 1938) is doubtful.

Plate 3. A–B, *Deltocyathus* sp. cf. *D. andamanicus,* TC 33–38, × 4.2; C–D, *Deltocyathus stellulatus,* holotype, × 9.9; E–F, *Trochocyathus aithoseptatus,* holotype (E, side view, × 1.5; F, calice, × 2.3); G, *Anomocora* sp., *Albatross* 3937, × 1.8; H–I, *Coenosmilia inordinata,* holotype (H, calice of one of the corallites, × 7.2; I, colony, × 1.7).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Trochocyathus aithoseptatus, new species
Pl. 3, figs. E-F

Records: Holotype—SANGO 16-8, USNM 60529; Paratypes—SANGO 16-1 (1) USNM 60532; SANGO 16-3 (fragments) USNM 60531; SANGO 16-5 (41) USNM 60530; SANGO 16-5 (2) BPBM SC3160.

Description: The corallum is trochoid and attached by a slender pedicel, which expands into a flared, elliptical calice. The largest specimen (holotype) is 19.7 × 14.4 mm in calicular diameter, 21.4 mm tall, and 4.7 mm in pedicel diameter. The costae are equal, low, and rounded (never ridged), set apart by shallow grooves. Small rounded granules cover the costae; near the calice they occur in an irregular arrangement, two to three across a costa. The corallum is white except for the upper one-tenth to one-third of the theca, including the upper septal faces and palar tips, which are all reddish brown. Small specimens are sometimes entirely white.

Septa are hexamerally arranged in five cycles, but the fifth cycle is never complete; the holotype has only 74 septa. S_1 and S_2 are equal in size and exsertness, with the higher-cycle septa becoming progressively smaller and less exsert. However, even S_5 project above the calicular edge. Additional pairs of S_5 occur irregularly within the half-systems. The septa have straight inner edges and bear coarse granules up to 0.4 mm in diameter.

Narrow pali are present on the first four cycles of septa, with the P_1 and P_2 forming the innermost and most deep-seated crown. The P_3 form another crown and the P_4 form the outermost and most exsert crown. The two P_4 and one P_3 of each half-system usually form a chevron. The inner edges of some pali have a small lobe which is indistinguishable from the columellar elements. The columella is composed of 7-12 slender pillars, which are loosely united among themselves and to the inner edges of the pali.

Remarks: Trochocyathus caryophylloides Alcock 1902, is the only Indo-West Pacific species similar to *T. aithoseptatus*. The latter is differentiated from *T. caryophylloides* by its greater number of septa at a corresponding size, uniformly sized pali, and unique reddish brown pigment pattern of the corallum.

Distribution: Kaua'i; 371-454 m.

"Paracyathus" molokensis Vaughan 1907

Paracyathus molokensis Vaughan 1907: 71, pl. 6, fig. 3.

Remarks: The small specimen described by Vaughan as *P. molokensis* does not belong to *Paracyathus;* its small size and early development does not allow a confident generic identification. Vaughan himself was uncertain as to what genus this specimen belonged.

Anomocora sp.
Pl. 3, fig. G

Records: Albatross 3937 (1 branch) USNM 20796; TC33-8 (1) BPBM SC3161; TC35-1 (1) USNM 60597. First records of this genus for Hawaiian Islands.

Remarks: Several specimens of *Anomocora,* one apparently overlooked by Vaughan in the *Albatross* collection, are reported from the Hawaiian Islands. Other records of *Anomocora* from the Indo-West Pacific include: *Parasmilia fecunda* sensu Gardiner and Waugh 1938 (Red Sea, 366 m); *Parasmilia fecunda* sensu Marenzeller 1904 (off Sumatra, 380 m); and *Anomocora fecunda* sensu Eguchi 1968 (off Japan, 50-100 m). As Zibrowius (1980, 133) indicated, none of these is the true *Anomocora fecunda* (Pourtalès 1871), known only from the Atlantic from 73-567 m (Cairns 1979). The Hawaiian specimens most closely resemble Marenzeller's colonies from off Sumatra, not those of Eguchi from Japan. Eventually, a review of all Indo-West Pacific specimens should be made to properly identify these specimens.

Distribution: Maui and Laysan; 201-271 m.

Coenosmilia inordinata, new species
Pl. 3, figs. H-I

Records: Holotype—SANGO 13-13 (1 colony) USNM 60527; Paratypes—SANGO 13-13 (8 colonies, 4 branches) USNM 60528; SANGO 13-13 (1 colony) BPBM SC3162. First record of genus for Hawaiian Islands.

Description: The colonies are small and phaceloid; corallites originate in an irregular manner from both the sides of other corallites and from the common encrusting basal coenosteum. The branching is dense but corallite anastomosis is rare. The corallites are ceratoid to cylindrical. Although the longest corallite is 26.5 mm long, the best-preserved corallite is 14.3 mm long, with a calicular diameter of 5.3×4.6 mm and a pedicel diameter of 3.0 mm. Costae are not well differentiated, distinguished only by lines of granules.

Septa are hexamerally arranged in three cycles. S_1 are larger and more exsert than the S_2; S_3 are not exsert and usually rudimentary, quickly degenerating into a row of spines lower in the fossa. The inner septal edges are straight, except for the lower edges of the S_1, which are slightly sinuous and fuse with one another forming a very rudimentary columella. No pali or paliform lobes are present. The lack of pali and the rudimentary columella produce a deep fossa which is usually truncated by a thin, horizontal dissepiment. Dissepiments occur frequently in the corallites, producing a lightweight corallum.

Remarks: The only other species in the genus *Coenosmilia* is *C. arbuscula* Pourtalès 1874, known from the Atlantic at 109-622 m (Cairns 1979). *C. inordinata* differs from the type-species by having smaller and thinner corallites; less septa per corallite; a much more rudimentary columella; and budding from a common coenosteum.

Distribution: Brooks Banks; 244-322 m.

Peponocyathus orientalis (Duncan 1876)
Pl. 4, fig. A

Deltocyathus orientalis Duncan 1876: 431, pl. 38, figs. 4-7.

Deltocyathus lens Alcock 1902: 19-20, pl. 2, fig. 6; Umbgrove 1925, 4, pl. 1, figs. 8-10; Gardiner and Waugh 1938, 198, text-fig. 4.

Not *Peponocyathus orientalis:* Yabe and Eguchi 1932*a*, 444-446.

Deltocyathus (Paradeltocyathus) orientalis: Yabe and Eguchi 1937, 131-135, pl. 20, figs. 1-10; ?Squires 1958, 55.

Peponocyathus orientalis: Zibrowius 1980, 112.

New Records: B76063 (9) USNM 52485; B76076 (12) USNM 62483; B77049 (8) USNM 62476; B80008 (16) BPBM SC3163; HON 1A-0 (6) BPBM SC3164; HON 1A-3 (1) BPBM SC3165; HON 3-0 (2) BPBM SC3166; HON 3-1 (3) BPBM SC3167; HON 3-2 (5) BPBM SC3168; HON 3-3 (25) BPBM SC3169; HON 4-3 (1) BPBM SC3170; HON 3A-7 (10) BPBM SC3171; HON 3A-8 (10) BPBM SC3172; HON 7-1 (1) BPBM SC3173; HON 7-3 (1) BPBM SC3174; HON 9-1 (1) BPBM SC3175; HON 9B-1 (2) BPBM SC3176. First records of this genus for Hawaiian Islands.

Remarks: The Hawaiian specimens are all relatively small (3-4 mm in calicular diameter), most having recently regenerated from a parent fragment. None of them have a complete crown of well-developed pali. In view of the great variation in palar development and the size of the closely related Atlantic species *P. stimpsonii* (Pourtalès 1871) (see Cairns 1979, 116), the Hawaiian specimens are identified as the widely distributed Indo-West Pacific species, *P. orientalis.*

Peponocyathus orientalis occurs in two growth forms in Hawaiian waters: the typical shallow bowl-shaped corallum (figured) and a taller conical form. It is not known what influences the development of these forms.

Distribution: Māmala Bay, O'ahu; 439-494 m. Elsewhere—western Indian Ocean, Indonesia, Philippines, and Japan; 75-522 m.

Flabellum pavoninum Lesson 1831

Flabellum pavoninum Lesson 1831: pl. 14; Milne-Edwards and Haime 1857, 80; ?Gardiner 1902, 123-125; Vaughan 1907, 52-55, pl. 1, figs. 2, 3; Faustino 1927, 44-45, pl. 1, figs. 1-9; Yabe and Eguchi 1941*a*, 90-91, pl. 5, fig. 2, pl. 6, figs. 1-2; Yabe and Eguchi 1941*b*, 129, pl. 11, fig. 7; ?Wells 1964, 114, pl. 1, figs. 13-14.

Not *Flabellum patens* Moseley 1881: 172.

Not *Flabellum australe* Moseley 1881: 173-174.

Not *Flabellum chunii* Marenzeller 1904: 274.

Flabellum pavoninum var. *latum:* Vaughan 1907, 55-56, pl. 2, fig. 2.

Flabellum pavoninum var. *distinctum:* Vaughan 1907, 56-59, pl. 2, fig. 5.

New Records: Albatross 3858 (1) USNM 20723; TC35-2 (2) BPBM SC3177; TC33-8 (3) BPBM SC3178; TC33-10 (1) NMFS; TC33-12 (1) BPBM SC3179; TC33-54 (11) BPBM SC3180; TC35-2 (5) BPBM SC3181; TC35-3 (1) BPBM SC3181; TC35-5 (4) BPBM SC3183; TC36-7 (3) BPBM SC3184; TC40-53 (2) SC3185; TC40-59 (6) BPBM SC3186; TC40-77 (3) BPBM SC3187; TC52-90 (2) BPBM SC3188; TC52-94 (17) BPBM SC3189; H 80-29 (1) BPBM SC3190.

Remarks: Whereas Vaughan's (1907) specimens of *F. pavoninum* var. *distinctum* and var. *latum* are merely variants of typical *F. pavoninum,* other species (*i.e., F. patens, F. australe,* and *F. chunii*) that have been synonymized with *F. pavoninum* are distinct species. Records of *F. pavoninum* off South Africa and off Queensland are queried; the Queensland specimens are probably *F. australe*. The entire *F. pavoninum* species complex is in need of worldwide revision.

Distribution: The islands of Hawai'i (type-locality), Maui, Moloka'i, and French Frigate Shoals; 183-517 m. Elsewhere—Queensland, Philippines, China Sea, Japan, and ?South Africa; 78-949m.

Flabellum vaughani, new species

Pl. 4, figs. B-C

Not *Flabellum paripavoninum* Alcock 1894: 187; Alcock 1898, 21, pl. 2, fig. 3; Faustino 1927, 46-47, pl. 2, figs. 1-4.

Flabellum pavoninum var. *paripavoninum:* Vaughan 1907, 59-62, pl. 3, figs. 1-4 (in part: not *Albatross* 3856 or 3857).

Not *Flabellum pavoninum paripavoninum:* Yabe and Eguchi 1941*a*, 91-93, pl. 1, figs. 7-8.

Records: Holotype-*Albatross* 4115, USNM 20721 (Vaughan 1907, pl. 3, fig. 4, specimen #77); Paratypes-*Albatross* 3835 (1) USNM 20717; *Albatross* 4079 (10) USNM 20799; *Albatross* 4080 (51) USNM 20713, 20715, and 20720 (including specimen #24 of Vaughan); *Albatross* 4081 (1) USNM 20716; MAC3 (11) BPBM SC3231; MAC4 (1) BPBM SC689; TC33-10 (4) BPBM SC3192; TC33-36 (87) BPBM SC3193; TC33-38 (1) NMFS; TC33-39 (11) BPBM SC3194; TC52-94 (4) BPBM SC3195.

Description: The two lateral faces of the corallum are flabellate, straight to slightly convex, sometimes flared near the calice, which produces a slightly concave region toward the center of each face. The angle of the lateral edges ranges from 85°-125°, the mean being 107°; the angle of lateral faces ranges from 38°-53°, the mean being 45° (Vaughan 1907, 61). The upper calicular edge is smooth and crescent-shaped; the lateral edges are sharp near the pedicel but rounded near the calice. There are rarely lateral crests. The pedicel is only 1.2-1.4 mm in diameter and usually worn to a point, never attached. The holotype, which is the largest and most perfect specimen, is 54.4 × 42.2 mm in calicular diameter and 47.0 mm tall. Inconspicuous costal striae correspond to all septa. The theca is uniformly gray to light brown.

The holotype contains 202 septa, arranged in 49 groups of four plus three pairs of additional septa. The 49 primary septa—probably 48 in a typical adult specimen—represent the first four

cycles. They are of equal size, not exsert, very thin, and not dentate at the calicular edge. The S_5 and S_6 are progressively smaller, the S_6 extending only halfway down the fossa. Pairs of S_7 are rare but usually occur in the quartets closest to the lateral edges. Septal edges are straight to very slightly sinuous; those of the S_{1-4} thicken deep in the fossa and fuse, forming a rudimentary columella.

Remarks: F. vaughani was well described and illustrated by Vaughan (1907) as *F. pavoninum* var. *paripavoninum*. The major difference between the two is that the latter has a truncated base resulting from transverse fission, which places it in a group of *Flabellum* designated by Zibrowius (1974*b*) as the "second group." *F. vaughani* clearly belongs in Zibrowius' (1974*b*) first group, characterized by a smooth calicular edge and lack of transverse fission. Vaughan (1907) ignored the basal fracture of Alcock's *F. paripavoninum,* assuming it was a damaged corallum and therefore of no importance. However, Alcock (1898) stated that the type of *F. paripavoninum* has a "sessile scar" and his illustration indicates what appears to be a natural fission. Furthermore, Gardiner (1929) confirmed that the basal scar was natural, not an accidental break. These two species therefore belong to different "groups" (subgenera ?) sensu Zibrowius (1974*b*) within *Flabellum*.

The species most similar to *F. vaughani* is *F. atlanticum* Cairns, 1979, known only in the western Atlantic at 357-618 m. Cairns (1979, 151) discusses their similarities and differences.

F. vaughani is distinguished from *F. pavoninum* by the lesser angle of its lateral edges and its straighter septa.

Distribution: Maui and O'ahu; 232-369 m.

Flabellum marcus Keller 1974

Not *Flabellum deludens* Marenzeller 1904: 269, pl. 17, fig. 10.

Flabellum deludens: Vaughan 1907, 63-65, pl. 3, fig. 5.

Flabellum marcus Keller 1974: 208-209, pl. 1, fig. 5, pl. 3, fig. 5, pl. 5, fig. 8.

Remarks: Although the type-specimens of *F. marcus* were not examined, there is little doubt from Keller's figures that Vaughan's *F. deludens* is the same species. Furthermore, both Keller's and Vaughan's records are from the central Pacific at similar depths.

In Keller's original description of *F. marcus,* she undoubtedly meant to say "*12* septa of the third cycle . . ." (not 24) and "*22-23* very short septa of the fourth cycle" (not 44-46). The full complement of septa for a mature individual appears to be four cycles (48 septa), sometimes with additional pairs of S_5 in the four lateral half-systems (56 septa), not 80-82 as suggested by Keller.

Distribution: The island of Hawai'i and Necker Island Shoal; 1261-1602 m. Elsewhere—Marcus-Necker Ridge northwest of Wake Island; 1350 m.

Javania lamprotichum (Moseley 1880), n. comb.

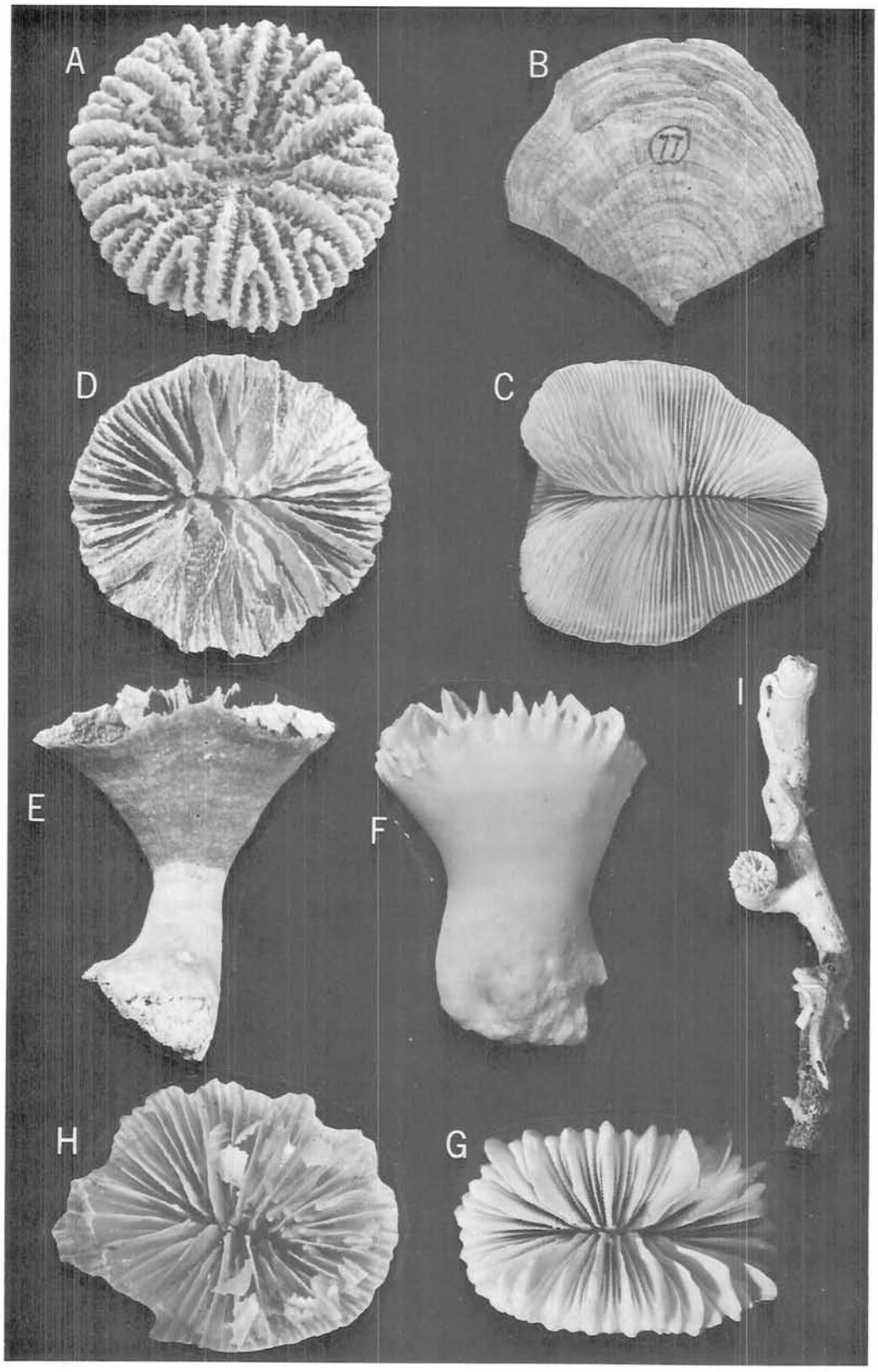
Pl. 4, figs. D-E

Desmophyllum lamprotichum Moseley 1880:41-42, figs. 1-2.

New Records: SANGO 13-13 (2) USNM 60551; *Proteus* 94 (1) BPBM SC3196; HURL—206 (1) BPBM SC3294. First documented records of this species.

Remarks: Zibrowius (1974*b*) reviewed the genus *Javania* but overlooked the somewhat obscure record of *J. lamprotichum*. Examination of the type at the British Museum confirms that it is a *Javania* and that it is identical to the Hawaiian specimens.

Distribution: Of the holotype (the only previously known specimen of *J. lamprotichum)* Moseley (1880) writes: "The single specimen on which the species is founded was purchased from a dealer, Mr. Cutter; and its locality is unknown." The Hawaiian specimens, therefore, represent the first known localities for this species: off Brooks Banks, south of Moloka'i, and Johnston Atoll; 244-322 m.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Javania insignis Duncan 1876

Pl. 4, figs. F-H

Javania insignis Duncan 1876: 435, pl. 39, figs. 11-13; Marenzeller 1907, 23; Zibrowius 1974*b*, 8-9, pl. 1, figs. 1-6.

Desmophyllum cf. *insigne:* Yabe and Eguchi 1941*b*, 115, pl. 9, figs. 5-6.

Desmophyllum insignis: Eguchi 1968, C41-42, pl. C9, figs. 4-9.

New Records: Proteus 95 (1) BPBM SC3197; TC62-72 (1) BPBM SC3198; TC62-73 (1) BPBM SC3199.

Remarks: The Hawaiian specimen (*Proteus* 95) is 28.5 × 22.0 mm in calicular diameter and 37.4 mm tall. It was alive when collected and still has its tissue. It most closely resembles the specimen collected off Madagascar and illustrated by Zibrowius (1974*b*, pl. 1, figs. 5-6).

Distribution: South of Moloka'i; 302 m. Elsewhere—Madagascar, Red Sea, Japan, and Christmas Island (Line Islands); 52-825 m.

Gardineria hawaiiensis Vaughan 1907

Gardineria hawaiiensis Vaughan 1907: 65-66, pl. 4., fig. 1.

New Records: Proteus 103 (2) BPBM SC3200; TC81-01-44 (1) BPBM SC3201.

Remarks: These represent the only records of this species since its original description.

Distribution: North of the island of Hawai'i, Kaua'i, and north of Nihoa; 369-541 m.

Guynia annulata Duncan 1872

Pl. 5, figs. A-B

Guynia annulata Duncan 1872: 32, pl. 1, figs. 1-8; Cairns 1979, 164-165, pl. 32, figs. 1-3; Zibrowius 1980, 161-163, pl. 83, figs. A-Q.

Pyrophyllia inflata Hickson 1910: 1-7, figs. 1-4.

New Records: Proteus 118 (2) BPBM SC3202; B76066 (1) USNM 62481; B76067 (1) USNM 60595; B78028 (4) USNM 62469; B79030 (1) BPBM SC3203; B79065 (1) BPBM SC3204; B79077 (1) USNM 62487; B80068 (2) BPBM SC3205; B80093 (5) BPBM SC3206; B81020 (1) BPBM SC3207; HON 2A-3 (1) BPBM SC3208; HON 7-2 (6) BPBM SC3209. First record for Pacific.

Remarks: G. annulata is one of the smallest scleractinian corals known, rarely exceeding 1 mm in calicular diameter and 7-10 mm in length. The Hawaiian specimens were weakly attached basally and/or laterally to a variety of substrates, such as small bivalves, dead *Cycloseris tenuis*, bryozoans, and pebbles. Sand grains and small calcareous debris were also cemented to the theca.

Of the specimens collected from Hawai'i, most have octameral symmetry (16 septa); only one is hexameral (12 septa).

Distribution: The islands of Maui, Lāna'i, O'ahu, and Kaua'i; 64-384 m. Elsewhere—Atlantic Ocean, and Persian Gulf; 28-653 m.

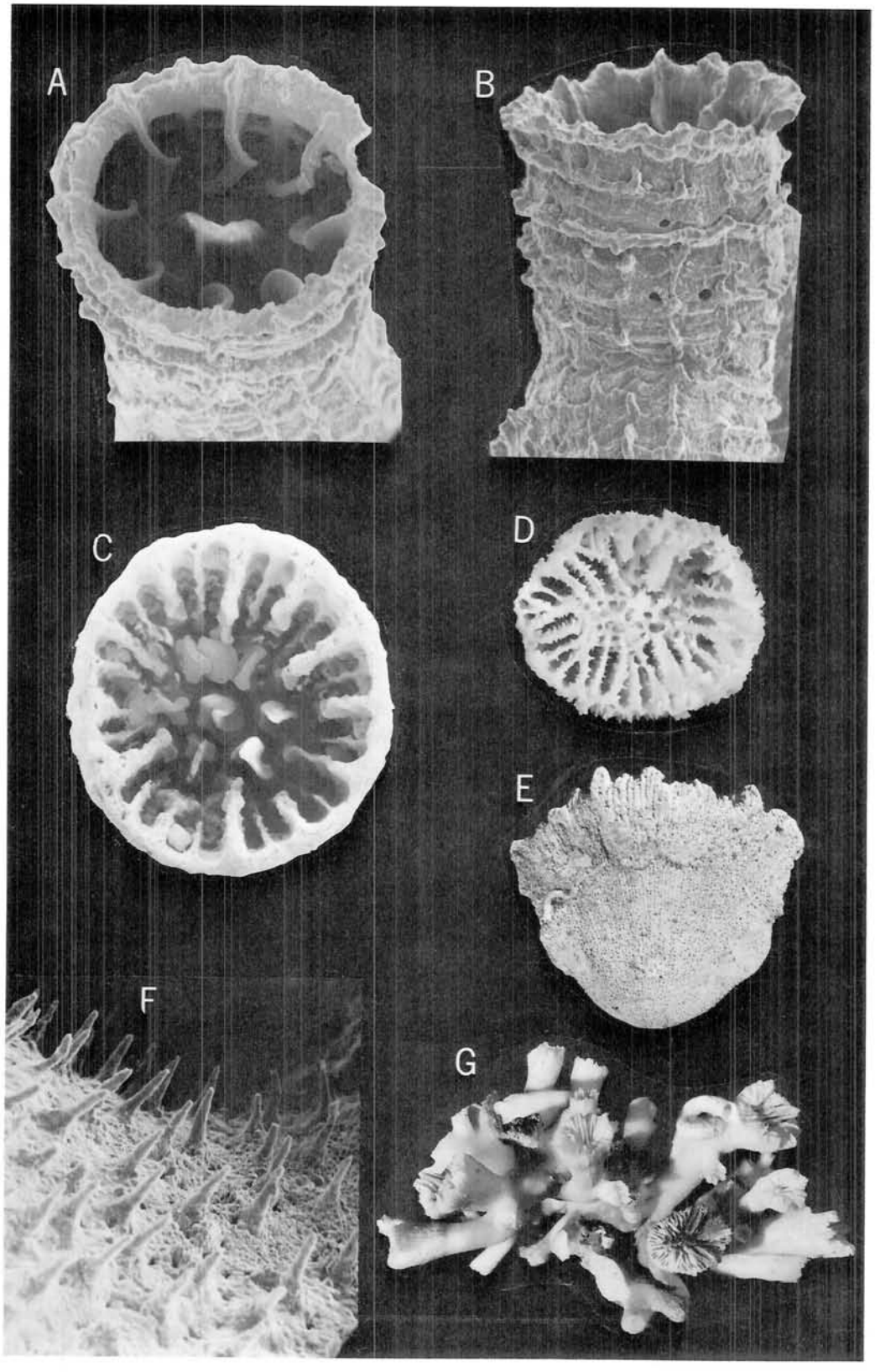
Stenocyathus vermiformis (Pourtalès 1868)

Pl. 5, fig. C

Coenocyathus vermiformis Pourtalès 1868: 133-134.

Stenocyathus vermiformis: Marenzeller 1904, 298-300, pl. 18, fig. 16; Cairns 1979, 168-170, pl. 32, figs. 8-10, pl. 33, figs. 1-2; Zibrowius 1980, 163-165, pl. 84, figs. A-Q; Cairns 1982, 52, pl. 16, figs. 8-11.

Plate 4. A, *Peponocyathus orientalis*, B77049, × 17.3; B–C, *Flabellum vaughani*, holotype (B, side view, × 0.9; C, oblique view of calice, × 1); D–E, *Javania lamprotichum*, SANGO 13–13 (D, calice, × 1.15; E, side view, × 1.3); F–G, *Javania insignis*, TC 62–72 (Christmas Island) (F, side view, × 1; G, calice, × 1.15); H, *Javania insignis*, *Proteus* 95, calice with tissue, × 1.9; I, *Dendrophyllia gaditana* with *Caryophyllia rugosa* attached midway on corallum, MAC3, × 1.7.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Stenocyathus decamera Ralph and Squires 1962: 11-12, pl. 4, figs. 2-6.
New Record: B77049 (1) USNM 62474. First record from North Pacific.
Remarks: Like the previous species, *S. vermiformis* is very small and cylindrical. The single specimen reported here measures 2.1 mm in calicular diameter and 5.5 mm long. It is easily distinguished from *G. annulata* by its hexameral symmetry (24 septa) and ring of pali before the second cycle of septa.
Distribution: Māmala Bay, O'ahu; 439 m. Elsewhere—Atlantic Ocean; St. Paul and Amsterdam Islands, Indian Ocean; New Zealand; Antipodes Islands; seamounts in South Pacific (see Cairns 1982); 80-1229 m.

Dendrophyllia oahensis Vaughan 1907

Dendrophyllia oahensis Vaughan 1907: 154-155, pl. 46, fig. 1.
New Records: SANGO 4-1 (2) USNM 60536; SANGO 4-2 (16) USNM 60538; SANGO 4-4 (1) USNM 60537; SANGO 12-1 (2) USNM 60534; SANGO 13-1B (15) USNM 60535; SANGO 13-8 (14) USNM 60539; TC81-01-14 (4) BPBM SC3210; TC81-01-44 (24) BPBM SC3211; TC81-01-44 (2) USNM 60544; TC81-01-44 (5) NMFS.
Remarks: Previously known only from the holotype, *D. oahensis* is now known to have a columella of variable structure ranging from spongy (like the holotype) to a maze of short, interconnected lamellae, similar to that of *Labyrinthocyathus* Cairns 1979.
Distribution: O'ahu, Nihoa, Blank Bank, and Brooks Banks; 357-485 m.

Dendrophyllia serpentina Vaughan 1907
Pl. 5, fig. D

Dendrophyllia serpentina Vaughan 1907: 155-156, pl. 46, figs. 2-5.
Not *Balanophyllia serpentina:* Gardiner and Waugh 1939, 240, pl. 1, fig. 2.
New Records: MAC3 (1) BPBM SC686; TC33-43 (1) BPBM SC3213; H 80-29 (3) BPBM SC3191; H 80-29 (2) USNM 60545.
Distribution: The islands of Hawai'i, Maui, Lāna'i, and French Frigate Shoals; 200-362 m.

Dendrophyllia gaditana (Duncan 1873)
Pl. 4, fig. I

Balanophyllia gaditana Duncan: 1873, 333.
Balanophyllia fistula: Horst 1922, 59 (in part: *Siboga* 310).
Balanophyllia praecipua Gardiner and Waugh 1939: 240, pl. 1, fig. 2.
Dendrophyllia praecipua: Wells 1964, 116, pl. 2, figs. 6-7.
Dendrophyllia gaditana: Cairns 1979, 181-182, pl. 36, figs. 5-10; Zibrowius 1980, 176-178, pl. 89, figs. A-N.
New Records: SANGO 13-13 (4) USNM 60543; MAC3 (1) BPBM SC3214; *Proteus* 97 (1) BPBM SC3215; B80008 (1) BPBM SC3216; TC33-18 (2) BPBM SC3217; TC33-36 (1) BPBM SC3218; TC81-01-14 (4) BPBM SC3219; TC81-01-14 (2) NMFS.
Remarks: D. gaditana is distinguished from the other Hawaiian *Dendrophyllia* by its long, slender corallites, rarely exceeding 5 mm in diameter.
Distribution: Maui, Lāna'i, O'ahu, Nihoa, and Brooks Banks; 244-470 m. Elsewhere—Atlantic and Indian Oceans, Java Sea, and Queensland; 73-505 m.

Plate 5. A–B, *Guynia annulata,* B79077 (A, calice, × 42; B, side view of theca, × 40); C, *Stenocyathus vermiformis,* B77049, worn calice, × 26; D, *Dendrophyllia serpentina,* MAC3, × 11; E, *Endopachys grayi,* TC 35-33, × 1.2; F–G, *Cladopsammia echinata,* holotype colony (F, coenosteal spines, × 70; G, colony, × 1.15).

Balanophyllia cornu Moseley 1881

Balanophyllia cornu Moseley 1881: 192-193, pl. 12, figs. 11-15.
Balanophyllia hawaiiensis Vaughan 1907: 148-149, pl. 44, figs. 4-5.
?Balanophyllia cf. *hawaiiensis:* Yabe and Eguchi, 1941*b*, 142, pl. 12, fig. 20.
New Records: SANGO 3-4 (7) USNM 60540; SANGO 16-6 (6) USNM 60541; MAC7 (1) BPBM SC688; Proteus 103 (2) BPBM SC3221.
Remarks: As Vaughan (1907, 149) suspected, his *B. hawaiiensis* is within the range of variation of *B. cornu*. The columellas of the syntypes of *B. hawaiiensis* are poorly developed, but those of other specimens from the Hawaiian Islands are more robust, similar to those of typical *B. cornu*. The syntypes of *B. cornu* were directly compared with those of *B. hawaiiensis*.

Balanophyllia cornu is characterized by independent settlement of its planulae on dead specimens of the same species, which often produce a quasicolonial clump of coralla that could easily be interpreted as a *Dendrophyllia*.
Distribution: The islands of Hawai'i, Moloka'i, O'ahu, and Kaua'i; 280-470 m. Elsewhere—Ceram Sea, and ?Japan; 223-236 m.

Balanophyllia desmophylloides Vaughan 1907

Balanophyllia desmophylloides Vaughan 1907: 149-150, pl. 45, fig. 1.
?Balanophyllia sp. Maragos 1977, 162, 197, figs. 1, 69.
New Records: Albatross 4135 (1) USNM 60547; Midway 8 (4) USNM 60548; SANGO 13-5B (6) USNM 60549; SANGO 13-11 (2) USNM 60546; *Proteus* 118 (1) BPBM SC3234; B76017 (2) USNM 62470; B76066 (2) USNM 62482; B78001 (1) USNM 62486; B78028 (2) USNM 62472; B79035 (44) USNM 62478; B79037 (2) USNM 62479; B80095 (2) BPBM SC3235.
Remarks: The largest specimen measures 18.6×10.7 mm in calicular diameter and is 32.6 mm tall.
Distribution: Widespread and common throughout Hawaiian Islands, including the islands of Hawai'i, Maui, Moloka'i, O'ahu, Nihoa, and Brooks Banks, and Laysan.

Balanophyllia diomedeae Vaughan 1907

Balanophyllia diomedeae Vaughan 1907: 151-153, pl. 45, figs. 3-5.
Balanophyllia diomedeae var. *mauiensis* Vaughan 1907: 153, pl. 45, fig. 6.
Not *Balanophyllia diomedeae:* Gardiner and Waugh 1939, 240; Yabe and Eguchi 1941*b*, 142.
New Records: SANGO 13-15 (2) USNM 60542; MAC6 (1) BPBM SC687; Osprey (3) BPBM SC345; TC33-8 (1) BPBM SC3223; TC33-15 (15) BPBM SC3224; TC33-18 (3) BPBM SC3225; TC33-50 (3) BPBM SC3226; TC35-2 (1) BPBM SC3227; TC35-33 (1) NMFS; TC36-26 (1) BPBM SC3228; TC40-59 (2) BPBM SC3229.
Remarks: Gardiner and Waugh (1939) and Yabe and Eguchi's (1941*b*) specimens were examined and found not to be the same species. *B. diomedeae* most closely resembles *B. rediviva* Moseley 1881 (from the Ki Islands, 238 m), differing in its nonexsert septa and less conspicuous costae.

The specimen from SANGO 13-15 is much longer than specimens previously reported, measuring 11.3×9.9 mm in calicular diameter and 8.4 cm long.
Distribution: The islands of Maui, Moloka'i, Kaua'i, and Brooks Banks; 110-307 m.

Cladopsammia echinata, new species

Pl. 5, figs. F-G

Records: Holotype-SANGO 2-4, USNM 60518; Paratypes-SANGO 2-6 (5 fragments) USNM 60524; SANGO 13-1C (2 fragments) USNM 60520; SANGO 13-4A (1 colony) USNM 60526; SANGO 14-2B (4 fragments) USNM 60519; SANGO 16-1 (1 fragment) USNM 60525; SANGO 16-3 (2 fragments) USNM 60521; SANGO 16-5 (1 colony) USNM 60522; SANGO 16-8 (7

fragments) USNM 60523; TC81-01-14 (1 colony) BPBM SC3230.

Description: The colony forms irregular phaceloid clumps, with individual corallites originating both from the common encrusting base and from the sides of other corallites. The largest colony (SANGO 14-2) measures 8×6×2.5 cm and has about 80 corallites. A typical founder corallite measures 10.0×7.5 mm in calicular diameter, 16.4 mm tall, 4.9 mm in pedicel diameter, and has a thin encrusting base covering approximately 15 square mm. Founder corallites and colonies often attach themselves to dead colonies of the same species. The corallites are ceratoid and slightly flared distally.

C_1 and C_2 are ridged, the former extending about halfway to the base, the latter extending only one-half that distance. Higher cycle costae are not expressed; instead, this area is covered with irregular pores, which often penetrate the theca. There is no epi- or holotheca; the theca and encrusting base are densely covered by tiny spines, measuring about 0.15 mm tall and 0.025 mm in diameter at their midpoints (pl. 5, fig. F).

Septa are hexamerally arranged in four cycles. S_1 are highly exsert and larger than S_2. The S_3 and S_4 are arranged in a Pourtalès Plan, the rudimentary S_3 being smaller and dentate. The S_4 adjacent to S_1 are highly exsert, larger than the S_2, and fuse with the S_1 at the level of the calice. The inner septal edges are straight and vertical, bordering a deep, narrow fossa. The columella is small, elongate, and spongy. There are no paliform lobes.

Discussion: The only other species in the genus *Cladopsammia* is *C. rolandi* Lacaze-Duthiers 1897, known only from the western Mediterranean at 20-50 m (Zibrowius 1980). *C. echinata* differs from the type-species by not having an epitheca (instead, its theca is covered with spines). Also, *C. echinata* has nonuniform, ridged costae, highly exsert S_1, and ceratoid, flared corallites (those of *C. rolandi* are cylindrical).

Distribution: Kaho'olawe, Kaua'i, Ni'ihau, Nihoa, and Brooks Banks; 295-470 m.

Endopachys grayi Milne-Edwards and Haime 1848

Pl. 5, fig. E

Endopachys grayi Milne-Edwards and Haime 1848*b:* 82-83, pl. 1, fig. 2; Umbgrove 1950, 648-650, pl. 82, figs. 1-10, pl. 83, fig. 7, text-fig. 2 (discussion); Wells 1975, 173 (distribution).

Endopachys oahense Vaughan 1907: 147-148, pl. 44, fig. 3.

Endopachys japonicum Yabe and Eguchi 1932*b:* 11-17, pl. 2, figs. 1-6.

Endopachys vaughani Durham 1947: 39-40, pl. 11, figs. 6-8, 10-11.

New Records: B79037 (2) USNM 62473; B80068 (1) BPBM SC3222; B81029 (2) BPBM SC3212; TC35-33 (2) BPBM SC3220.

Remarks: Umbgrove (1950) synonymized all Recent species of *Endopachys* as *E. grayi* based on the range of variation he observed in 44 specimens from Java. The lateral crests of the worn holotype and only known specimen of *E. oahense* are very poorly developed but, according to Umbgrove, within the range of variation for *E. grayi*. The specimens reported herein, two of which were collected very close to the type-locality of *E. oahense*, all have the typically prominent lateral crests, which supports Umbgrove's thesis that *E. oahense* is just an unusual specimen of *E. grayi* with reduced lateral crests.

Distribution: O'ahu 91-386 m. Elsewhere—Mauritius, Indonesia (Recent and Neogene), Philippines, Japan, and Gulf of California; 37-274 m.

Enallopsammia rostrata (Pourtalès 1878)

Amphihelia rostrata Pourtalès 1878: 204, pl. 1, figs. 4-5.

Dendrophyllia (Coenopsammia) amphelioides Alcock 1902: 42-43, pl. 5, fig. 37.

Anisopsammia amphelioides: Vaughan 1907, 156-157, pl. 47, figs. 1-2.

Dendrophyllia (sic) *amphelioides* var. *cucullata* Vaughan 1907: 157, pl. 47, fig. 3, pl. 48, figs. 1-4.

Enallopsammia rostrata: Zibrowius 1973, 44-45, pl. 2, figs. 14-15; Cairns 1979, 186-188, pl. 37, figs. 2-3, 6; Zibrowius 1980, 201-203, pl. 105, figs. A-K, pl. 106, figs. A-C; Cairns 1982, 57, pl. 18, figs. 1-4 (discussion).

New Records: Albatross 3827, USNM 60600; *Albatross* 3838, USNM 20785; SANGO 2-1, USNM 60611; SANGO 2-2, USNM 60613; SANGO 2-6, USNM 60614; SANGO 3-1, USNM 60605; SANGO 3-2A, USNM 60598; SANGO 3-2B, USNM 60616; SANGO 3-3A, USNM 60604; SANGO 3-3B, USNM 60620; SANGO 3-4, USNM 60615; SANGO 3-5A, USNM 60618; SANGO 3-5B, USNM 60599; SANGO 3-7, USNM 60619; SANGO 4-2, USNM 60608; SANGO 4-4, USNM 60617; SANGO 12-2, USNM 60612; SANGO 13-1A, USNM 60609; SANGO 13-1C, USNM 60607; SANGO 13-3, USNM 60623; SANGO 13-4B, USNM 60621; SANGO 14-1, USNM 60610; SANGO 14-2B, USNM 60603; SANGO 14-3, USNM 60624; SANGO 14-4, USNM 60602; SANGO 16-9, USNM 60601; Midway 4, USNM 60622.

Distribution: Kaho'olawe, Maui, Moloka'i, O'ahu, Kaua'i, Ka'ula Rocks, Brooks Banks, and off Ladd Seamount (Midway); 362-583 m. Elsewhere—Atlantic and Indian Oceans, Tasmanian Ridge, Macquarie Ridge, Kermadec Ridge, Japan, and Tuamotus Islands; 229-2165 m.

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