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SCIENTIFIC RESULTS OF THE GALÁPAGOS-EXPEDITION
1953-54 OF THE INTERNATIONAL INSTITUTE FOR SUBMARINE
RESEARCH, VADUZ (LIECHTENSTEIN), LEADER DR. HANS HASS

CORALS FROM THE
GALÁPAGOS AND COCOS ISLANDS

by

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During 1953-1954 the Galápagos Expedition of the International Institute for Submarine Research, Vaduz (Liechtenstein), leader Dr. Hans Hass, on board the *Xarifa*, visited both Cocos Island and the Galápagos Islands in the tropical Eastern Pacific and made various collections. Dr. Georg Scheer, of the Hessisches Landesmuseum, Darmstadt, Germany, a member of the expedition, collected numerous corals by skin diving. Through his courtesy and patience I have had the opportunity of examining the corals and preparing this report. The major part of the collection is housed in the Hessisches Landesmuseum. Thanks to Dr. Scheer duplicate specimens of many

of the species have been deposited in the Museum of Paleontology, University of California, Berkeley, California, under accession no. 2070. The material at Berkeley includes representatives of *Balanophyllia scheeri*, new species; *Pavona clivosa* Verrill; *Pavona gigantea* Verrill; *Pavona varians* Verrill; *Pavona (Polyastra) ponderosa* (Gardiner); *Pocillopora damicornis* (Linnaeus); *Pocillopora damicornis cespitosa* Dana; *Pocillopora elegans* Dana; *Pocillopora meandrina* Dana; *Pocillopora verrucosa* (Ellis and Solander); *Porites excavata* Verrill; *Porites lobata* Dana (?); *Psammocora profundacella* Gardiner; *Psammocora (Stephanaria) stellata* (Verrill); and *Tubastrea tenuilamellosa* (Milne Edwards and Haime).

In identifying this collection of corals a broader species concept, in part following Squires (1959), than used previously (Durham, 1947; Durham and Barnard, 1952), has been employed in the potentially reef-building and taxonomically troublesome genera *Pavona*, *Pocillopora*, and *Porites*. As a result some of the previously employed names are hidden in the synonymies and the list of species in these genera has a marked Indo-Pacific aspect.

Durham and Barnard (1952) have summarized most of the available data on stony corals from Cocos Island and the Galápagos Islands, as well as other Eastern Pacific areas. Vaughan (1906) described 3 species from the Galápagos Islands that were not included in the paper by Durham and Barnard. Since then Squires (1959) has presented an extensive discussion of the corals of the Gulf of California, Durham and Allison (1960, pp. 70-76) have tabulated available distributional data on living and fossil corals of the Eastern Pacific at the generic level, and Hertlein and Emerson (1957, pp. 7-8) listed five corals previously unrecorded from Clipperton Island.

Cocos Island is situated a little over 500 kms. southwest of Costa Rica and about 700 kms. northeast of the Galápagos Islands. During most of the year it seems to be in the path of the Equatorial Counter Current. Durham and Barnard (1952) recorded 7 species (table 1) from this area.

The Galápagos Islands are about 1000 miles off the Ecuadorian Coast and are within the path of the westward flowing Peru current although a counter gyral from the Equatorial Counter current is directed toward this area for at least part of the year. Durham and Barnard (1952) recorded 21 species and Vaughan (1906), had described an additional 3 species, making a total of 24 species (table 1) previously known from these islands.

The corals collected by Dr. Scheer include representatives of at least 20 species and varieties, of which 4 have not been recorded from the Eastern Pacific previously. Three of these species (*Pavona (Polyastra) ponderosa* Gardiner, *Porites lobata* Dana (?), *Psammocora profundacella* Gardiner) are members of the Indo-Pacific coral reef fauna. All three, however, are members of genera that were previously known to occur in the Eastern Pacific and that are widespread throughout the warmer parts of the Indian and Pacific Oceans.

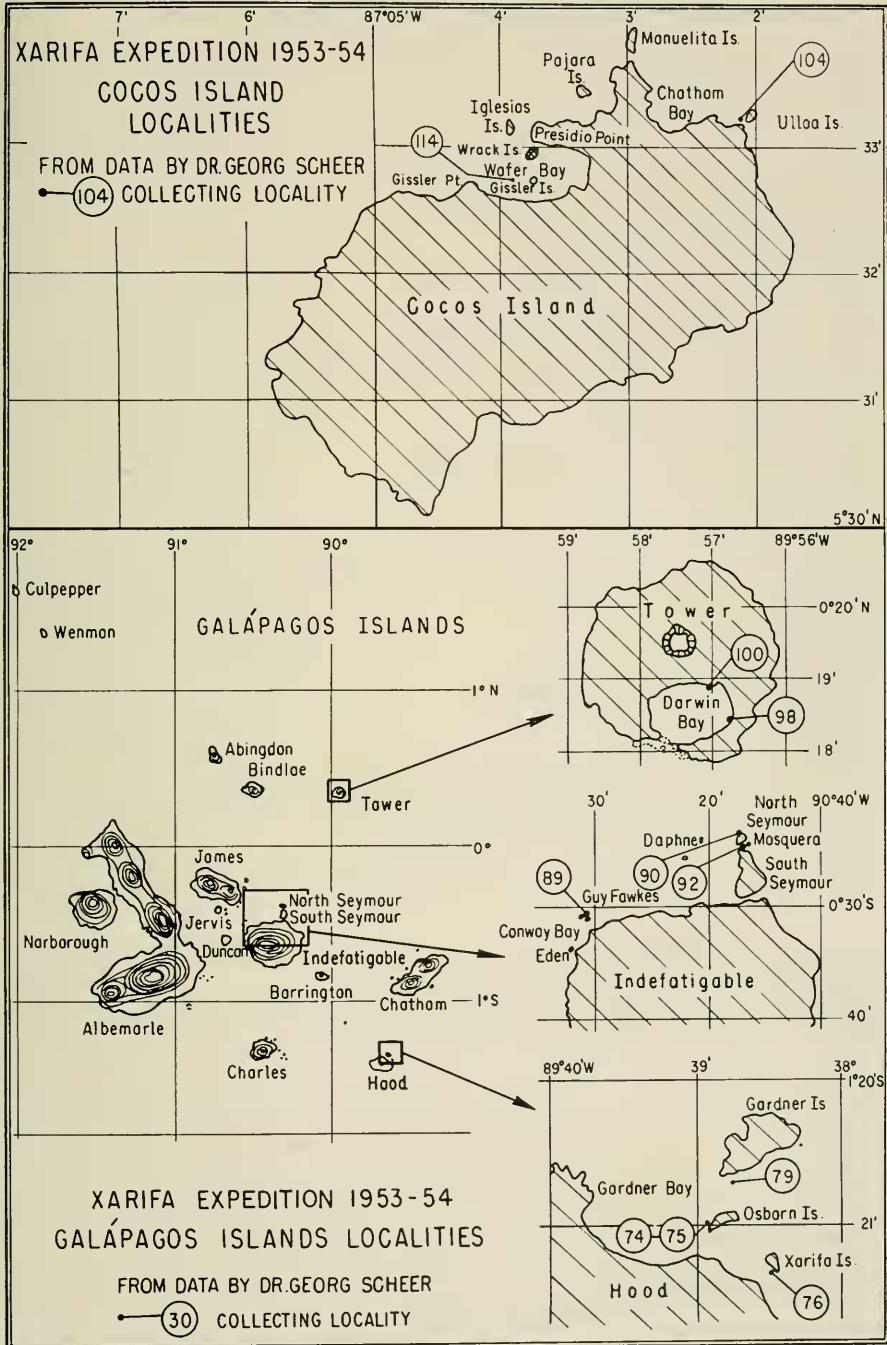


FIGURE 1. Collecting localities, Cocos and Galápagos islands.

TABLE 1. Corals previously reported from Galápagos Islands and Cocos Island (Vaughan, 1906; Durham and Barnard, 1952).

	Galápagos Island	Cocos Island
<i>Astrangia equatorialis</i> Durham and Barnard	x	
<i>Astrangia gardnerensis</i> Durham and Barnard	x	
<i>Astrangia hondaensis</i> Durham and Barnard (?)	x	x
<i>Balanophyllia galapagensis</i> Vaughan	x	
<i>Balanophyllia osburni</i> Durham and Barnard	x	
<i>Caryophyllia diomedae</i> Von Marenzeller	x	
<i>Cladocora debilis</i> Milne Edwards and Haime	x	x
<i>Cycloseris mexicana</i> Durham	x	x
<i>Desmophyllum galapagense</i> Vaughan	x	
<i>Endopachys vaughani</i> Durham	x	x
<i>Flabellum daphnense</i> Durham and Barnard	x	
<i>Kionotrochus</i> (?) <i>avis</i> Durham and Barnard	x	
<i>Kionotrochus</i> (?) <i>hoodensis</i> Durham and Barnard	x	
<i>Leptoseris digitata</i> Vaughan (?)		x
<i>Lophosmilia wellsii</i> Durham and Barnard	x	
<i>Madracis asperula</i> Milne Edwards and Haime	x	
<i>Madracis</i> sp.	x	
<i>Madrepora galapagensis</i> Vaughan	x	
* <i>Pavona clivosa</i> Verrill	x	
<i>Pavona</i> cf. <i>explanulata</i> (Lamarck)		x
<i>Pocillopora damicornis cespitosa</i> Dana	x	
<i>Pocillopora elegans</i> Dana	x	
<i>Psammocora</i> (<i>Stephanaria</i>) <i>stellata</i> (Verrill)	x	x
<i>Sphenotrochus hancocki</i> Durham and Barnard	x	
<i>Thecopanmia pourtalesi</i> Durham and Barnard	x	
<i>Tubastrca tenuilamellosa</i> (Milne Edwards and Haime)	x	
*Nomenclature corrected to agree with Squires (1959)	24	7

An important result of this expedition has been the addition of distributional data (see figure 1 for collecting localities) to the scanty store of information on corals of the tropical Eastern Pacific. The present collection (table 2) adds 11 taxa to the 7 previously recorded from Cocos Island and 7 to the 24 previously known from the Galápagos. The addition of 10 species to the coral fauna of these islands emphasizes how little systematic coral collecting has been done in the Eastern Pacific (see: Durham and Barnard, 1952, pp. 3-4; Squires, 1959, pp. 372-373).

The recorded fauna of the Galápagos Islands (table 3) now totals 30 species, of which only 13 belong to the hermatypic group. Eighteen species, including 14 hermatypic types are now known from Cocos Island. Thirty-eight species, of which 20 are hermatypic, are now recorded from these two island areas. It seems probable that all of the hermatypic species may eventually be found in both areas. Fourteen of the 20 hermatypic species

TABLE 2. Corals collected by the Galápagos-Expedition 1953-54.

	Galápagos Islands										Cocos Island		
	Localities												
	74	75	76	79	80	89	90	92	98	100	104	107	114
<i>Astrangia dentata</i> Verrill													X
<i>Astrangia equatorialis</i> Durham and Barnard										X			
<i>Astrangia gardnerensis</i> Durham and Barnard		X											
<i>Balanophyllia osburni</i> Durham and Barnard	X												
* <i>Balanophyllia scheeri</i> , new species													X
<i>Cycloseris elegans</i> (Verrill)					X								
<i>Pavona clivosa</i> Verrill			X				X						
<i>Pavona gigantea</i> Verrill				X			X						
<i>Pavona varians</i> Verrill													X
* <i>Pavona (Polyastra) ponderosa</i> Gardiner													X
<i>Pocillopora damicornis</i> (Linnaeus)	X		X								X	X	
<i>Pocillopora damicornis cespitosa</i> Dana	X					X							
<i>Pocillopora elegans</i> Dana	X		?								X	X	
<i>Pocillopora meandrina</i> Dana													X
<i>Pocillopora verrucosa</i> (Ellis and Solander)							X		X		X		
<i>Porites excavata</i> Verrill													X
* <i>Porites lobata</i> Dana (?)			X	X				X					
* <i>Psammocora profundacella</i> Gardiner								X					X
<i>Psammocora (Stephanaria) stellata</i> (Verrill)	X												
<i>Tubastrea tenuilamellosa</i> (Milne Edwards and Haime)	X					X					X	X	X

*Not previously reported in Eastern Pacific.

are also known from the coast of the Americas. In addition, the hermatypic species *Agaricia* sp., *Leptoseris panamensis* Durham and Barnard, *Porites panamensis* Verrill, *Psammocora brighami* (Vaughan), and *Solenastrea ecuadoriana* Durham and Barnard have been recorded (Durham and Barnard, 1952) from the adjacent mainland coast. It seems probable that most or all of these species may eventually be found in the offshore island areas. Despite the increased distributional data afforded by the present collection it is notable that no additional genera of hermatypic corals were added to the known fauna. Genera such as *Acropora*, *Montipora*, *Favia*, *Cyphastrea*, and *Plesiastrea* continue to be unrecorded on the American side of the East Pacific Barrier (see Durham and Allison, 1960, pp. 69, 70-76). Likewise the disappearance from the region of many of the hermatypic genera recorded as fossils (Durham and Allison, 1960, pp. 71-73) from the Pacific shores of the Americas is still enigmatic. For example Durham and Allison list 30

extant genera of hermatypic corals that are known to occur in the fossil record of this region. Although many of these genera are still present in the Indo-Pacific region, only 10 are now living in the Eastern Pacific.

TABLE 3. *Summary of Corals recorded from Galápagos Islands and Cocos Island.*

	Galápagos Islands	Cocos Island	Pacific Coast	Indo- Pacific
<i>Astrangia dentata</i> Verrill		X	X	
<i>Astrangia equatorialis</i> Durham and Barnard	X			
<i>Astrangia gardnerensis</i> Durham and Barnard	X			
<i>Astrangia honduensis</i> Durham and Barnard (?)	X	X		
<i>Balanophyllia galapagensis</i> Vaughan	X			
<i>Balanophyllia osburni</i> Durham and Barnard	X			
<i>Balanophyllia scheeri</i> , new species		X		
<i>Caryophyllia diomedae</i> Von Marenzeller	X		X	
<i>Cladocora debilis</i> Milne Edwards and Haime	X	X		
<i>Cycloseris elegans</i> (Verrill)	X		X	
<i>Cycloseris mexicana</i> Durham	X	X	X	
<i>Desmophyllum galapagense</i> Vaughan	X			
<i>Endopuchys raughani</i> Durham	X	X	X	
<i>Flabellum daphnense</i> Durham and Barnard	X			
<i>Kionotrochus</i> (?) <i>aris</i> Durham and Barnard	X			
<i>Kionotrochus</i> (?) <i>hoodensis</i> Durham and Barnard	X			
<i>Leptoseris digitata</i> Vaughan (?)		X	X	X
<i>Lophosmilia wellsii</i> Durham and Barnard	X			
<i>Madracis asperula</i> Milne Edwards and Haime	X			
<i>Madracis</i> sp.	X		X	
<i>Madrepora galapagensis</i> Vaughan	X			
<i>Parona clivosa</i> Verrill	X		X	
<i>Parona gigantea</i> Verrill	X		X	
<i>Parona varians</i> Verrill		X	X	X
<i>Parona</i> cf. <i>cyplanulata</i> (Lamarck)		X		X
<i>Parona</i> (<i>Polyastra</i>) <i>ponderosa</i> (Gardiner)		X		X
<i>Pocillopora damicornis</i> (Linnaeus)	X	X	X	X
<i>Pocillopora damicornis cespitosa</i> Dana	X		X	X
<i>Pocillopora elegans</i> Dana	X	X	X	X
<i>Pocillopora meandrina</i> Dana		X	X	X
<i>Pocillopora verrucosa</i> (Ellis and Solander)	X	X	X	X
<i>Porites excurvata</i> Verrill		X	X	
<i>Porites lobata</i> Dana (?)	X			X
<i>Psammocora profundacella</i> Gardiner	X	X		X
<i>Psammocora</i> (<i>Stephanaria</i>) <i>stellata</i> (Verrill)	X	X	X	X
<i>Sphenotrochus hancocki</i> Durham and Barnard	X		X	
<i>Thecopsammia pourtalesi</i> Durham and Barnard	X			
<i>Tubastrea tenuitrancllosa</i> (Milne Edwards and Haime)	X	X	X	
Total	30	18	19	12

DESCRIPTION OF COLLECTING LOCALITIES (*see* figure 1) OF THE GALÁPAGOS-EXPEDITION 1953-54 ("XARIFA-EXPEDITION")

GALÁPAGOS ISLANDS

- Locality 74. Osborn Island, near Hood Island. About 30 m. offshore on northwest coast. Depth 3 m.
- Locality 75. From depth of 2 m. along steep shore of northwest coast of Osborn Island.
- Locality 76. From west shore of Xarifa Island, near Hood Island.
- Locality 79. About 30 m. from beach, south side of southwest point of Gardner Island. Depth between 5 and 6 meters.
- Locality 80. From southeast side of Gardner Island.
- Locality 89. Guy Fawkes Islands, near Indefatigable Island. From between the two islets, depth 5 m., on steep rocks.
- Locality 90. North shore of North Seymour Island, from depth of 6 m. on steep shore.
- Locality 92. Mosquera Island, between North Seymour and South Seymour Island. Along west side, about 50 m. offshore. Depth 5 m.
- Locality 98. East side of Darwin Bay, Tower Island, steep shore.
- Locality 100. Near small inlet on north shore of Darwin Bay, Tower Island.

COCOS ISLAND

- Locality 104. From northeast side near Ulloa Island, depth 5 m.
- Locality 107. From shore of Wrack Islet, Wafer Bay, northwest side of Cocos Island. Depth 8 m.
- Locality 114. From depth of 7 to 10 meters, Wafer Bay, northwest side of Cocos Island.

SYSTEMATICS

Family POCILLOPORIDAE Gray, 1842

Genus *Pocillopora* Lamarek, 1816Type species *Pocillopora acuta* Lamarek.***Pocillopora damicornis*** (Linnaeus).*Millepora damicornis* LINNAEUS, 1758, Systema Natura, Ed. 10, p. 791.*Pocillopora lacera* VERRILL, 1869, Proc. Essex Inst., Vol. 6, p. 100; DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 20-21, 26, pl. 1, fig. 4.

Pocillopora damicornis (Linnaeus), WELLS, 1954, U.S. Geol. Surv. Prof. Pap. 260, p. 412, pl. 99, fig. 2; SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, pp. 408-409, pl. 34, fig. 2.

OCURRENCE. *Xarifa* localities 74, 79 (?), 107, 114. Cocos and Galápagos islands. Recorded from Panama to Indian Ocean. The illustrated specimen (fig. 9) is referred to this species with some doubt because of its extreme "roughness."

***Pocillopora damicornis* var. *cespitosa* Dana.**

Pocillopora cespitosa DANA, U.S. Expl. Exped., Zooph., p. 525, pl. 49, figs. 5, 5a.

Pocillopora damicornis var. *cespitosa* Dana, HOFFMEISTER, 1925, Carnegie Inst., Wash., Publ. Dept. Mar. Biol., vol. 22, pp. 16-17; DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 20, pl. 1, figs. 3a-3c.

OCURRENCE. *Xarifa* localities 74, 89 (?). Galápagos Islands. Recorded from Panama and widely through the Indo-Pacific.

***Pocillopora elegans* Dana.**

Pocillopora elegans DANA, 1846, U.S. Explor. Exped., Zooph., p. 532, pl. 51, figs. 1, 1a; WELLS, 1954, U.S. Geol. Surv., Prof. Pap. 260, p. 413, pl. 95, fig. 2; SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, pp. 409-410, pl. 34, fig. 5.

Pocillopora capitata VERRILL, 1864, Bull. Mus. Comp. Zool. Harvard Coll., vol. 1, p. 60. *Pocillopora capitata* var. *robusta* VERRILL, 1870, Trans. Conn. Acad. Arts Sci., vol. 1, pp. 521-522.

Pocillopora robusta Verrill, DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 26-28, pl. 1, figs. 5a-5b, 6.

OCURRENCE. *Xarifa* localities 74, 76 (?), 107, 114. Cocos and Galápagos islands. Recorded from the Gulf of California to the Indo-Pacific.

***Pocillopora meandrina* Dana.**

Pocillopora meandrina DANA, 1846, U.S. Explor. Exped., Zooph., p. 529, pl. 50, figs. 3, 3a; VAUGHAN, 1918, Carnegie Inst., Wash., Pap. Dept. Mar. Biol., vol. 9, p. 78; SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, pp. 410-411, pl. 34, fig. 4.

OCURRENCE. *Xarifa* locality 114, Cocos Island. Recorded from Gulf of California to the Indo-Pacific.

***Pocillopora verrucosa* (Ellis and Solander).**

Mudrepora verrucosa ELLIS and SOLANDER, 1786, Nat. Hist. Zooph., p. 172.

Pocillopora capitata var. *porosa* VERRILL, 1869, Proc. Essex Inst., vol. 6, p. 99.

Pocillopora porosa Verrill, DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 26.

Pocillopora verrucosa (Ellis and Solander), WELLS, 1954, U.S. Geol. Surv. Prof. Pap. 260, p. 413, pl. 98, figs. 5-6; DURHAM, in Hertlein and Emerson, 1957, Amer. Mus. Novitates, no. 1859, p. 7; SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, p. 410.

OCCURRENCE. *Xarifa* localities 90, 100, 107. Cocos and Galápagos islands. Recorded from Gulf of California, Clipperton Island, and westward to Indian Ocean.

Family THAMNASTERIIDAE Vaughan and Wells, 1943

Genus **Psammocora** Dana, 1846

Type species *Pavona obtusangula* Lamarek.

Psammocora (Psammocora) profundacella Gardiner.
(Figure 6.)

Psammocora profundacella GARDINER, 1898, Proc. Zool. Soc. London for 1898, p. 537, pl. 45, fig. 3; VAUGHAN, 1918, Carnegie Inst. Wash., Pap. Dept. Biol., vol. 9, p. 78.

HYPOTYPE, Univ. Calif. Mus. Paleo., no. 30725, *Xarifa* locality 114.

OCCURRENCE. *Xarifa* localities 92 and 114. Cocos and Galápagos islands. Previously recorded from Funafuti and Fanning Island.

Subgenus **Stephanaria** Verrill, 1867.

Type species *Stephanocora stellata* Verrill.

Psammocora (Stephanaria) stellata (Verrill).

Stephanocora stellata VERRILL, 1866, Proc. Boston Soc. Nat. Hist., vol. 10, p. 330.

Stephanaria stellata VERRILL, 1870, Trans. Conn. Acad. Arts Sci., vol. 1, pp. 545-546, pl. 9, figs. 4, 4a.

Psammocora (Stephanaria) stellata (Verrill), DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 29-30, pl. 2, fig. 8.

OCCURRENCE. *Xarifa* locality 74, Galápagos Islands. Previously recorded from the Galápagos Islands, Cocos Island, Hawaiian Islands, and Panama to the Gulf of California.

Family AGARICIDAE Gray, 1847

Genus **Pavona** Lamarek, 1801

Type species *Pavona cristata* Lamarek.

Pavona (Pavona) clivosa Verrill.

Pavonia clivosa VERRILL, 1869, Proc. Boston Soc. Nat. Hist., vol. 12, pp. 395-396.

Pavona (Pavona) clivosa Verrill, DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 37, 42, pl. 2, fig. 12.

Pavona (Pseudocolumnastrea) galapagensis DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 44-45, pl. 3, figs. 16a-16b.

Pavona clivosa Verrill, SQUIRES 1959, Bull. Mus. Nat. Hist., vol. 118, pp. 412-413, pl. 32, fig. 1.

OCCURRENCE. *Xarifa* localities 76 and 92, Galápagos Islands. Previously reported from Ecuador, the Galápagos Islands, Panama and the Gulf of California.

Pavona (Pavona) gigantea Verrill.

Pavonia gigantea VERRILL, 1869, Proc. Boston Soc. Nat. Hist., vol. 12, pp. 394-395.

Pavona (Pavona) gigantea Verrill, DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 43, pl. 3, fig. 14.

Parona gigantea Verrill, SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, pp. 413-414, pl. 32, fig. 2.

OCCURRENCE. *Xarifa* localities 79 and 92, Galápagos Islands. Previously recorded from Clipperton Island, and Panama to Gulf of California.

Pavona (Pavona) varians Verrill.

(Figure 3.)

Pavonia varians VERRILL, 1864, Bull. Mus. Comp. Zool., vol. 1, no. 3, p. 55.

Pavona varians Verrill, VAUGHAN, 1907, U.S. Nat. Mus. Bull. 59, p. 135, pl. 38, figs. 1, 1a; WELLS, 1954, U.S. Geol. Surv. Prof. Pap. 260, p. 442, pl. 152, figs. 3-4.

Parona (Pavona) cf. varians Verrill, DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 43, pl. 3, fig. 15.

HYPOTYPE, Univ. Calif. Mus. Paleo., no. 30721, *Xarifa* locality 114.

OCCURRENCE. *Xarifa* locality 114, Cocos Island. A widespread species, ranging from the Red Sea and Great Barrier Reef to the Hawaiian Islands and Colombia.

Subgenus **Polyastra** Ehrenberg, 1834

Type species *Polyastra venosa* Ehrenberg.

Pavona (Polyastrea) ponderosa (Gardiner).

(Figure 5.)

Agaricia ponderosa GARDINER, 1905, Fauna and Geogr. Maldive and Laccadive Arch., vol. 2, suppl. 1, p. 937, pl. 89, figs. 1-2; VAUGHAN, 1918, Carnegie Inst. Wash., Pap. Dept. Mar. Biol., vol. 9, p. 140; YABE, SUGIYAMA, and EGUCHI, 1936, Sci. Repts. Tohoku Imp. Univ., Ser. 2, (Geol.), Spec. vol. 1, p. 55, pl. 27, fig. 5, pl. 38, fig. 1, pl. 52, fig. 1.

HYPOTYPE, Univ. Calif. Mus. Paleo., no. 30724, *Xarifa* locality 114.

OCCURRENCE. *Xarifa* locality 114, Cocos Island. This species is known from the Maldives to the Bonin Islands.

Family PORITIDAE Gray, 1842

Genus **Porites** Link, 1807

Type species *Madrepora porites* Pallas.

Porites californica Verrill.

Porites californica VERRILL, 1870, Trans. Conn. Acad. Arts Sci., vol. 1, p. 504;
DURHAM and EARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 46, pl.
3, figs. 17a-17b; SQUIRES, 1959 (in part), Bull. Amer. Mus. Nat. Hist., vol. 118,
pp. 420-422, pl. 32, figs. 3-6, pl. 33, figs. 3-4 (only).

Porites porosa VERRILL, 1870, Trans. Conn. Acad. Arts Sci., vol. 1, p. 504.

Porites nodulosa VERRILL, 1870, Trans. Conn. Acad. Arts Sci., vol. 1, pp. 505-506;
DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 46-
47, pl. 3, fig. 18.

OCCURRENCE. *Xarifa* locality 107, Cocos Island. Previously recorded from Panama to Magdalena Bay and to the head of the Gulf of California.

Porites excavata Verrill.

Porites excavata VERRILL, 1870, Trans. Conn. Acad. Arts and Sci., vol. 1, pp. 504-505;
SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, pl. 33, figs. 1-2.

OCCURRENCE. *Xarifa* locality 107, Cocos Island. Recorded previously from Panama. The calices on one specimen are smaller than those on the type as figured by Squires. Squires suggests that his *P. baueri*, described from the Tres Marias Islands, is closely related.

Porites lobata Dana (?)

(Figure 8.)

Porites lobata DANA, 1846, U.S. Expl. Exped., Zooph., p. 562, pl. 55, fig. 1; VAUGHAN,
1907, U.S. Nat. Mus. Bull. 59, pp. 196-198, pl. 81, figs. 1-1a, 1b; VAUGHAN, 1918,
Carnegie Inst. Wash., Pap. Dept. Mar. Biol., vol. 9, p. 192.

HYPOTYPE, Univ. Calif. Mus. Paleo., no 30726, *Xarifa* locality 98.

OCCURRENCE. *Xarifa* localities 76, 79, and 98, Galápagos Islands. The specimens have deeper calices and the top of the wall more fused than in typical *P. lobata*. They also resemble *P. paschalensis* Vaughan, described from Easter Island, but the calices average smaller in size and the columella is more compressed. *P. lobata* is widespread in the Central Pacific.

Family FUNGIDAE

Genus **Cycloseris** Milne Edwards and Haime, 1849.

Type species *Fungia cyclolites* Lamarek.

Cycloseris elegans (Verrill).

Fungia elegans VERRILL, 1870, Am. Jour. Sci., ser. 2, vol. 49, p. 100.

Cycloseris elegans (Verrill), DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 52, pl. 4, figs. 20a-20b; SQUIRES, 1959, Bull. Amer. Mus. Nat. Hist., vol. 118, p. 414.

OCCURRENCE. *Xarifa* locality 80, Galápagos Islands. Previously recorded from La Paz to Panama.

Family RHIZANGIIDAE d'Orbigny

Genus **Astrangia** Milne Edwards and Haime, 1848

Type species *Astrangia michelinii* Milne Edwards and Haime.

Astrangia dentata Verrill.

Astrangia dentata VERRILL, 1866, Proc. Boston Soc. Nat. Hist., vol. 10, p. 332; DURHAM, 1947, Geol. Soc. Amer. Mem. 20, p. 28, pl. 5, fig. 6.

OCCURRENCE. *Xarifa* locality 107, Cocos Island. Previously reported from La Paz to Panama.

Astrangia equatorialis Durham and Barnard.

Astrangia equatorialis DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 69, pl. 6, figs. 29a-29b.

OCCURRENCE. *Xarifa* locality 98, Galápagos Islands. Previously reported from the Galápagos Islands.

Astrangia gardnerensis Durham and Barnard.

Astrangia gardnerensis DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, p. 70, pl. 5, fig. 27.

OCCURRENCE. *Xarifa* locality 75, Galápagos Islands. Originally described from the same bay.

Family DENDROPHYLLIIDAE Gray, 1847

Genus **Balanophyllia** Searles Wood

Type species *Balanophyllia calyculus* Searles Wood.

Balanophyllia osburni Durham and Barnard.

(Figure 2a, d.)

Balanophyllia osburni DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 100-101, pl. 15, figs. 63a-63d.

OCCURRENCE. *Xarifa* locality 74, Galápagos Islands. Described from the Galápagos.

Balanophyllia scheeri Durham, new species.

(Figures 2b, 2c, 4, 7.)

Corallum elongate, tall; attachment base broken but apparently broad; calice round to slightly oval; calicular fossa deep; columella oval in outline, rising slightly above base of fossa, parietal, moderately compact; septa apparently in five incomplete cycles (fig. 2c); first cycle septa broadly rounded at top (fig. 2b) inner edge smooth, nearly vertical, fused to columella at depth; second cycle septa narrow at top, usually smooth, descending obliquely to columella; third cycle septa narrow, inner edge dentate; fourth cycle septa more prominent than third cycle, dentate, fused to one another about midway to columella and in turn fused to columella at higher point than first and second cycle septa; fifth cycle septa narrow, fused to include fourth cycle, developed only in outer part of each system; septa considerably thinner than adjacent interspaces, laterally finely granulate; wall porous, with epitheca of varying thickness for one-half to two-thirds height of corallum; costae corresponding to all septae, covered by a row of fine granules; first cycle septa slightly more prominent than others.

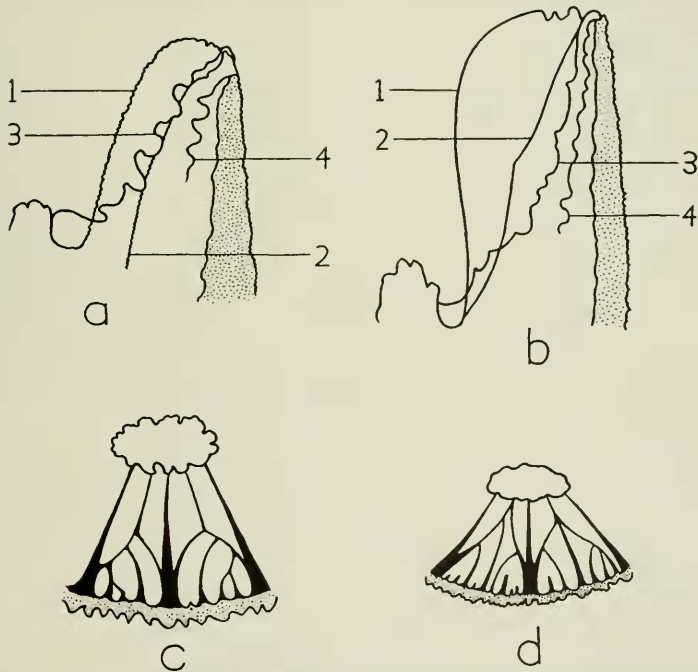


FIGURE 2. a, d. *Balanophyllia osburni* Durham and Barnard. After hypotype in Hessisches Landesmuseum, no. X 1:74-7. a. Lateral profile of 4 cycles of septa; d. Plan view of part of calice. b, c. *Balanophyllia scheeri*, n. sp. After holotype, Univ. Calif. Mus. Paleo. no. 30722. b. Lateral profile of 4 cycles of septa; c. Plan view of part of calice.

DIMENSIONS OF HOLOTYPE. Height (incomplete) 22.4 mm., maximum diameter 9.0 mm., depth of fossa to top of columella 3.6 mm.

HOLOTYPE: Univ. Calif. Mus. Paleo., no. 30722. PARATYPES: Univ. Calif. Mus. Paleo., no. 30723 and Hessisches Landesmuseum nos. XI:114-9e, XI:114-9d; all from *Xarifa* locality 114.

OCCURRENCE. *Xarifa* locality 114, Wafer Bay, Cocos Island. This species resembles single corallites of *Dendrophyllia fistula* (Alcock) but differs by the presence of the fifth cycle septa, and the slightly prominent first cycle costae. *Balanophyllia galapagensis* Vaughan has a shallower fossa, lacks the fifth cycle septa, and has a heavier epitheca.

Genus *Tubastrea* Lesson, 1834.

Type species *Tubastrca coccinea* Lesson.

Tubastrea tenuilamellosa (Milne Edwards and Haime).

Coenopsammia tenuilamellosa MILNE EDWARDS and HAIME, 1848, Ann. Sci. Nat., ser. 3, vol. 10, p. 110, pl. 1, fig. 11.

Astropsammia pedersenii VERRILL, 1869, Proc. Boston Soc. Nat. Hist., vol. 12, p. 392.

Tubastrea tenuilamellosa (Milne Edwards and Haime), DURHAM and BARNARD, 1952, Allan Hancock Pac. Exped., vol. 16, no. 1, pp. 105-106, pl. 12, fig. 50d.

Tubastrea aurca SQUIRES, 1959, Bull. Am. Mus. Nat. Hist., vol. 118, pp. 427-428 (*pro parte, non* Quoy and Gaimard, 1833).

OCCURRENCE. *Xarifa* localities 74, 89, 104, 107, and 114. Galápagos and Cocos islands. Previously recorded from San Marcos Island, Gulf of California to the Galápagos. One specimen from locality 114 closely resembles Verrill's *Astropsammia pedersenii*.

FIGURE 3. *Pavona varians* Verrill ($\times 0.83$). Hypotype, Univ. Calif. Mus. Paleo., no. 30721, *Xarifa* locality 114, Cocos Island.

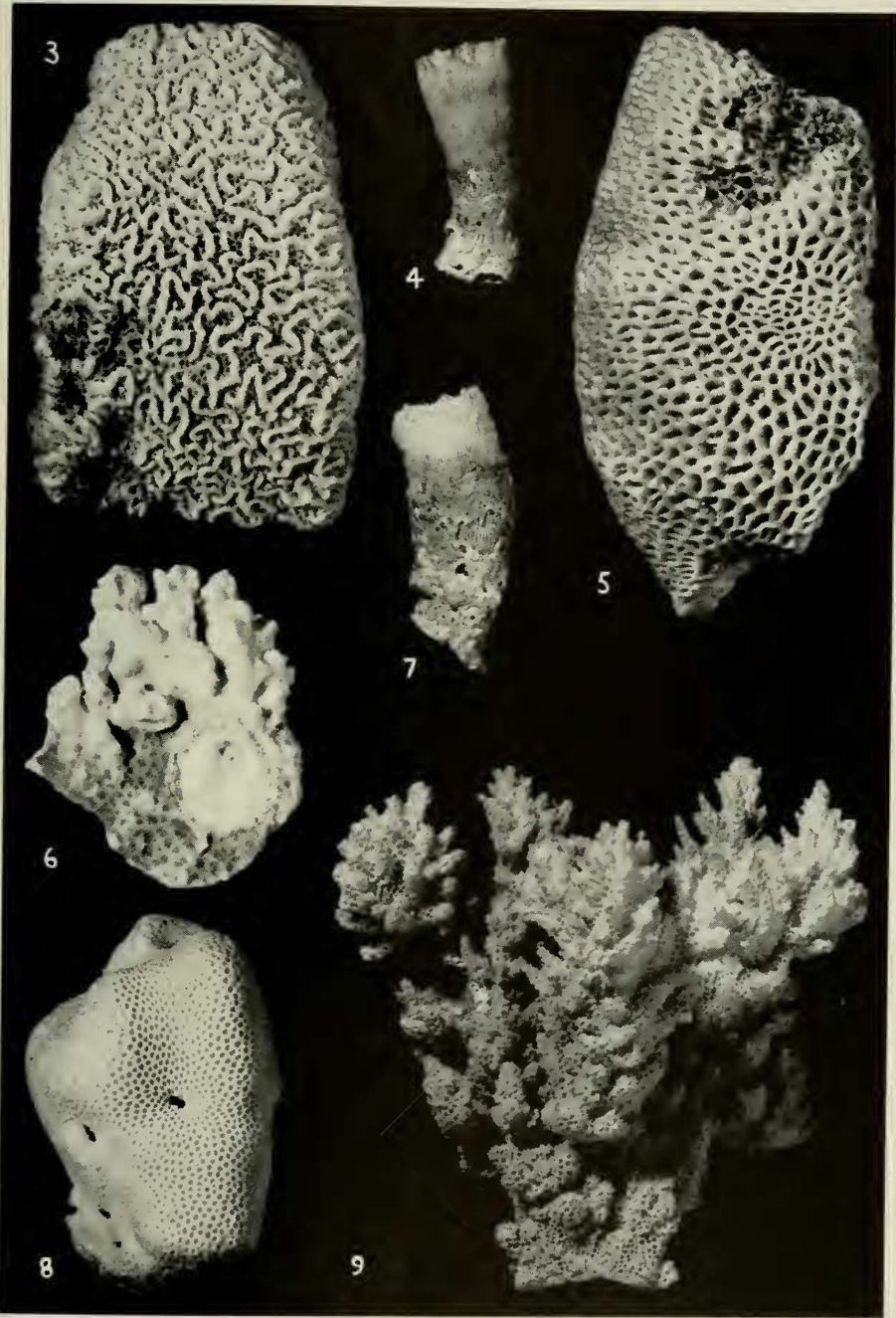
FIGURES 4, 7. *Balanophyllia scheeri*, new species ($\times 1.66$). 2, holotype, Univ. Calif. Mus. Paleo., no. 30722; 5, paratype, Univ. Calif. Mus. Paleo., no. 30723. Both from *Xarifa* locality 114, Cocos Island.

FIGURE 5. *Pavona ponderosa* (Gardiner) ($\times 0.83$). Hypotype, Univ. Calif. Mus. Paleo., no. 30724, *Xarifa* locality 114, Cocos Island.

FIGURE 6. *Psammocora profundacella* Gardiner ($\times 0.83$). Hypotype, Univ. Calif. Mus. Paleo., no. 30725, *Xarifa* locality 114, Cocos Island.

FIGURE 8. *Porites lobata* Dana (?) ($\times 0.83$). Hypotype, Univ. Calif. Mus. Paleo., no. 30726, *Xarifa* locality 98, Darwin Bay, Tower Island, Galápagos Island.

FIGURE 9. *Pocillopora damicornis* (Linnaeus) (?) ($\times 0.83$). Hypotype, Univ. Calif. Mus. Paleo., no. 30727, *Xarifa* locality 79, Gardner Island, Galápagos Islands.



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