Reef Corals from the Cocos-Keeling Atoll

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Plates Nos. 9–14 between pages 48 & 49.

Introductory Note

Corals have been known from the coral reefs of Cocos-Keeling Atoll since the time of Darwin's famous visit in 1836. The first important collection was made, however, by H. O. Forbes (1885) in 1879 during the course of a short visit, and the specimens were determined by Ridley and Quelch. Most of Forbes' specimens are in the British Museum (N.H.). In 1905–07, F. Wood-Jones spent fifteen months at Cocos-Keeling where he studied the natural history of reefs and lagoon. He particularly worked the ecology of the reef corals and made a small but choice collection which served as the basis for his classic paper *"On the growth-form and supposed species in corals"* (1907), and figures for his book *"Coral and Atolls"* (1910). Wood-Jones later sent his coral collection to the U.S. National Museum for study by Dr. T. Wayland Vaughan, and in Vaughan's well-known monograph *"Some shoal-water corals from Murray Island, Cocos-Keeling Islands, and Fanning Island"* (1918), we have the first extensive discussion and determination of the Cocos-Keeling reef-coral fauna. The Wood-Jones collection is in the U.S. National Museum.

In 1941, Dr. C. A. Gibson-Hill of the Raffles Museum made a new collection of corals at Cocos-Keeling, together with extensive notes on their occurrence. Duplicate specimens were sent to the U.S. National Museum for determination and the writer has had the pleasure of studying them, with results which are the subject of this paper. Dr. Gibson-Hill kindly sent his notes on the coral specimens, and these have been drawn on and quoted from in preparing the check list and discussion of the species.

Dr. Vaughan found 51 species and 21 genera in Wood-Jones' collection. In the Gibson-Hill collection there are 40 species representing 18 genera. In all, including forms listed by Ridley and Quelch and Bernard (1897) and 2 genera and 16 species (4 of them new) newly recorded in the present paper, we now have 24 genera represented by 74 species from Cocos-Keeling.

The isolated position of Cocos-Keeling probably accounts for the absence on its reefs of several of the common reef-coral genera of the Indo-Pacific such as *Stylophora, Euphyllia, Goniopora, Platygyra*[1], *Goniastrea, Merulina, Turbinaria, Galaxea, Synaraea,* and representatives of the Mussidae and Pectiniidae. The extensive observation and collecting by Wood-Jones and Gibson-Hill would surely have resulted in records of these forms if they were present.

1. Forbes (1885, p. 23) mentions "brain corals" in the lagoon.

The following check-list includes all genera and species now known from Cocos-Keeling, and Vaughan's analysis of their distribution has been augmented with data from the new collection.

Check-List of Cocos-Keeling Corals.

	Species	Forbes Collection (Ridley and Quelch)	Wood-Jones Collection (Vaughan)	Gibson-Hill Collection (This Paper)	Habitat		
					Lagoon	Barrier Pools and Flats	Exposed Barrier
1.	*Stylocoeniella armata* (Ehr.) ..			x			
2.	*Seriatopora angulata* (Klz.) ..		x	x	x		x
3.	*Pocillopora damicornis* (Esp.) ..		x	x	x	x	x
4.	,, *verrucosa* (E. & S.) ..		x	x			x
5.	,, *brevicornis* (Lmk.) ..	x				x	
6.	,, *elegans* Dana	?	x	x	x		x
7.	,, *eydouxi* M.E. & H. ..		x		x		
9.	,, *woodjonesi* Vaugh. ..		x	x		x	x
9.	*Acropora corymbosa* (Lmk.) ..		x		inlet		
10.	,, *formosa* (Dana)			x	x		
11.	,, *hebes* (Dana)			x	x		x
12.	,, *irregularis* (Brook) ..			x		x	
13.	,, *nana* (Studer)			x	x	x	x
14.	,, *ocellata* (Brook) ..		x	x		x	x
15.	,, *palifera* (Lamarck) ..		x		x		x
16.	,, *pharaonis* (M.E. & H.) (*scandens*)		x	x	x	x	
17.	*Acropora pinguis* n. sp.			x			x
18.	,, *pulchra* (Brook) (*orbipora*) ..		x		x		
19.	,, *scherzeriana* (Brueg.) ..		x				x
20.	,, *schmitti* n. sp.			x		x	
21.	,, *epicifera* (Dana) ..		x			x	
22.	,, *variabilis* (Klz.) ..		x	x		x	x
23.	*Astreopora myriophthalma* (Lmk.) ..		x	x		x	x
24.	*Montipora laevis* Quelch		x		x	x	
25.	,, *tortuosa* (Dana) ..		x		x		
26.	,, *ramosa* Bernard ..		x	x	x	x	

Check-List of Cocos-Keeling Corals—*continued*

					Habitat		

Check-List of Cocos-Keeling Corals—*continued*

Species	Forbes Collection (Ridley and Quelch)	Wood-Jones Collection (Vaughan)	Gibson-Hill Collection (This Paper)	Habitat		
				Lagoon	Barrier Pools and Flats	Exposed Barrier
27. *Montipora cocosensis* Vaugh. ..		x			x	
28. „ *spumosa* (Lmk.) ..		x	x	x		x
29. „ *sp.* Vaughan		x			x	
30. „ *informis* Bernard ..		x				x
31. „ *foliosa* (Pallas) ..		x	x	x		
32. „ *lobulata* Bernard ..			x	x		
33. „ *rubra* Studer						
34. „ *digitata* (Dana) ..	x				x	
35. „ *cf. expansa* (Dana) ..	x					
36. *Anacropora forbesi* Ridley ..	x			x		
37. *Pavona danai* (M.E. & H.) ..		x		x		
38. „ *maldivensis* (Gard.) ..		x			x	
39. „ *varians* Verrill		x			x	
40. „ *lata* (Dana)	x				x	
41. „ *decussata* (Dana)			x		channel	
42. „ *cactus* (Forsk.)			x	x	channel	
43. *Psammocora* (*Plesioseris*) *haimeana* (M.E. & H.)		x	x		x	x
44. *Psammocora* (*Stephanaria*) *togianensis* Umbgr.			x	x		
45. *Fungia fungites haimei* Doed. ..			x		x	
46. „ „ *confertifolia* Dana ..		x		x	x	
47. „ *scutaria* Lamarck ..		x	x		x	
48. *Herpolitha limax* (Esper)		(*crassa*)		x		
49. *Porites solida* (Forsk.)		x	x	x	x	x
50. „ *somaliensis* Gravier ..		x				x

Check-List of Cocos-Keeling Corals—*continued*

	Species	Forbes Collection (Ridley and Quelch)	Wood-Jones Collection (Vaughan)	Gibson-Hill Collection (This Paper)	Habitat: Lagoon	Habitat: Barrier Pools and Flats	Habitat: Exposed Barrier
51.	*Porites lichen* Dana		x				
52.	,, *nigrescens* Dana		x				x
53.	,, *laevis* Dana	x		x	x		?
54.	,, *cocosensis* n. sp.			x		x	
55.	,, *gibsonhilli* n. sp.			x	x		
56.	*Favia stelligera* (Dana)		x	x	x	x	x
57.	,, *speciosa* (Dana)		x				
58.	*Plesiastrea versipora* (Lmk.)		x				x
59.	*Favites abdita* (E. & S.)		x		x		
60.	,, *melicerum* (Ehr.)		x				
61.	*Leptoria phrygia* (E. & S.)		x	x	x	x	
62.	*Hydnophora exesa* (Pallas)		x				
63.	,, *microconos* (Lmk.)		x				
64.	*Leptastrea purpurea* (Dana)		x	x		x	x
65.	,, *bottae* (M.E. & H.)		x	x	x	x	x
66.	,, *immersa* Klz.		x			x	
67.	*Cyphastrea chalcidicum* (Forsk.)			x			x
68.	,, *microphthalma* (Lmk.)		x	x		x	
69.	*Echinopora lamellosa* (Esp.)	x	x	x	x		
70.	*Culicia cf. C. rubeola* (Q. & G.)			x			x
71.	*Dendrophyllia diaphana* Dana		x				x
72.	*Tubastrea willeyi* (Gardiner)	(*forskali verrucosa*)	x	x			x
73.	*Millepora platyphylla* H. & E.		x	x		x	x
74.	*Millepora tenella* Quelch		(*dichotoma*)	x		x	x

Systematic Descriptions

Class ANTHOZOA

Subclass Hexacorallia

Order SCLERACTINIA

Suborder ASTROCOENIIDA

Family ASTROCOENIIDAE

Subfamily Astrocoeniinae

Genus STYLOCOENIELLA Yabe & Eguchi 1935

Stylocoeniella armata (Ehrenberg) 1834.

Porites armata Ehrenberg 1834, Corallenth. roth. Meeres, p. 119.
Astrocoenia hanzawai Wells 1935, Ann. Mag. Nat. Hist. (10), xv, p. 343, pl. 15, figs. 1–3.
Stylocoeniella hanzawai Y. & S. 1935, Jap. Jour. Geol. Geogr., xii, p. 103, pl. 15, figs. 1–6.

A typical colony of this widespread but easily over-looked coral was found encrusting the dead basal part of a specimen of *Millepora tenella*.

Occurrence.—From outer (seaward) edge of the barrier (Specimen No. 3a[2]), U.S.N.M. No. 44350.

Distribution.—Red Sea eastward to Marshall Is., northward to Honshu.

Family SERIATOPORIDAE

Genus SERIATOPORA Lamarck 1816

Seriatopora angulata Klunzinger 1879.

Seriatopora angulata Y. S. & E. 1936, Sci. Rep. Tôhoku Imp. Univ. (2), Spec. Vol. i, p. 11, pl. 2, figs. 1, 2. (Synonymy).

Two specimens represent both the slender and stouter-branched forms mentioned by Wood-Jones and Vaughan. None, however, shows any perceptible development of the angular stem cross-section reputedly characteristic of this species. They agree well, however, with several of the specimens figured by von Marenzeller (1907, pl. 29, figs. 109a, 110a) from the Red Sea. Calicular hoods are scarcely developed on most branches, quite absent on others.

Occurrence.—"Large beds in shallow, sandy, slightly weedy water inside the lagoon to the south of Pulo Selma. When alive

2. These are the numbers used by Dr. Gibson-Hill. In several cases the same number included more than one species. Specimens in the U.S. National Museum have been assigned catalogue numbers as indicated.

it is a delicate mauve-pink". (Specimens No. 13), U.S.N.M. No. 44307.

Distribution.—Red Sea; Indian Ocean; Palau, Caroline, and Marshall Islands.

Genus POCILLOPORA Lamarck 1816

This genus is "plentiful in the pools on the outer, and outer half of the middle, sections of the barrier and along its seaward edge".

Pocillopora damicornis (Linnaeus) 1758.

Pocillopora damicornis Hoffmeister 1925, Carnegie Inst. Wash., Pub. 343, p. 15, pl. 1, fig. 1. (Synonymy).

A typical specimen of *P. damicornis*, as revised by Hoffmeister,- thick, straggly, with branches coarsely divided at the tips. A second specimen, a small, stunted, compact colony, also probably is the typical form.

Two other specimens, one of them corresponding very closely to Hoffmeister's figure of Dana's specimen of *P. bulbosa*, the other to Vaughan's figured specimen (1918, pl. 21, figs. 3, 3a) from Cocos-Keeling, represent this growth-form of *P. damicornis*. "When alive it may be a pale, permanganate-pink".

Occurrence.—Outer edge of the barrier between Pulo Tikus and Pulo Gangsa (Specimens Nos. 6a, *typica*), U.S.N.M. No. 44308; vicinity of Pulo Gangsa (Specimens Nos. 5a, *bulbosa*), U.S.N.M. No. 44309.

Distribution.—Eastern Indian Ocean eastward to Marshall and Hawaiian Is .

Pocillopora verrucosa (Ellis & Solander) 1786 (?).

Plate 9, fig. 2.

Pocillopora verrucosa Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 77, pl. 23, figs. 1, 2, 2a. (Synonymy).

This is an interesting specimen, combining the characters of *P. damicornis, danae*, and *verrucosa*. Young branchlets on the under side of the subspherical corallum are *P. damicornis;* the verrucae on the main branches are slender, erect, scattered, as in *P. danae;* while the main branches are flabellate with summit verrucae as in *P. verrucosa*. The verrucae are more erect and less closely spaced than in *P. verrucosa*. The aspect is wholly that of *P. danae* except for the flabellate form of the branches. It has been pointed out by Vaughan, Hoffmeister and Umbgrove that the species group from *P. damicornis* to *P. elegans* forms a graded series which may well represent a single species.

Occurrence.—From the outer edge of the barrier between Pulo Tikus and Pulo Gangsa. (Specimen No. 6), U.S.N.M. No. 44310.

Distribution.—Eastern Indian Ocean eastward to Hawaiian Is.

Pocillopora elegans Dana 1846.

Pocillopora elegans Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 78, pl. 23, fig. 3, 4, 4a.

One typical specimen.

Occurrence.—Outer edge of the barrier between Pulo Tikus and Pulo Gangsa. (Specimen No. 6), U.S.N.M. No. 44311.

Distribution.—Cocos-Keeling eastward to Fiji Is. and Samoa; northward to Ryukyu Is.

Pocillopora woodjonesi Vaughan 1918.

Plate 9, fig. 1.

Pocillopora woodjonesi Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 80, pl. 22, fig. 3; pl. 24, fig. 3.

A good specimen of this species, which was well described by Vaughan on the basis of a single flabellate branch. A more complete figure is included here.

Vaughan's description may be modified to point out that the typical development of septa, columella and granulations are found only down on the branches; near the tips they are obsolete.

Occurrence.—From outer edge of the barrier between Pulo Tikus and Pulo Gangsa. (Specimen No. 6), U.S.N.M. No. 44312.

Distribution.—Known only from Cocos-Keeling.

Family ACROPORIDAE

Genus **ACROPORA** Oken 1815

Acropora formosa (Dana) 1846.

Acropora formosa Hoffmeister 1925, Carnegie Inst. Wash., Pub. 213, p. 55, pl. 8, figs. 1–3. (Synonymy).

One specimen is a small bushy colony with short, finger-thick, upright main branches with clusters of secondary branchlets near the tops. The axial corallites are 2·5—3 mm. in diameter, which is slightly larger than is usual in the genus, otherwise the specimen is very close to Dana's original material.

Occurrence.—"This seems very similar to [*A. pharaonis*], but it grows alongside straggly "long-legged" forms of the latter in thick, compact masses in the blocks of mixed corals, in the vicinity of shafts of deeper water towards the south end of the

lagoon. It is plentiful". (Specimen No. 27), U.S.N.M. No. 44313.

Distribution.—Tropical Pacific westward to East Indies and Cocos-Keeling.

Acropora pharaonis Milne Edwards & Haime 1860.

Acropora pharaonis Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 166, pl. 69, figs. 1–5; pl. 70, figs. 1, 2, 2a.

One specimen corresponds to Specimen No. 5 described and figured by Vaughan from Cocos-Keeling.

Occurrence.—"Taken by and large, this is probably the most abundant of all the corals found on Cocos. It occurs mostly inside the atoll and forms great banks, which are rapidly filling portions of the lagoon, particularly in the neighbourhood of the Pulo Selma".

"In shallow, fairly still water, in the neighbourhood of the exposed portions of the barrier, they are shortened and thickened, and not distorted". (Specimen No. 4b), U.S.N.M. No. 44314.

Distribution.—Red Sea and Indian Ocean.

Acropora hebes (Dana) 1846.

Acropora hebes Hoffmeister 1925, Carnegie Inst. Wash., Pub. 343, p. 57, pl. 9, figs. 3a, 3b.

Fragments from a large bushy colony agree well with the specimen from Samoa figured by Hoffmeister, and show the tendency marked by him "for numerous branchlets to form, especially at the branch-tips".

Not previously reported from west of the Great Barrier Reef.

Occurrence.—"On fairly exposed portions of the seaward fringe of the barrier, where it occasionally occurs, the limbs are stunted, twisted, and thickened". (Specimen No. 4a), U.S.N.M. No. 44315.

Distribution.—Fiji Is.; Samoa; Great Barrier Reef; Marshall Is.

Acropora irregularis (Brook) 1892.

Plate 10, figs. 1, 2.

Madrepora irregularis Brook 1893, Cat. Madrep. Brit. Mus., i, p. 50, pl. 14, figs. E, F. (Synonymy).

One specimen is referable to this species. It has an expanded base encrusting on older subpalmate corallum. Above the base rise several thick branches to form a sub-caespitose colony about 16 cm. in height. The branches are proliferous near their tips, bearing short branchlets up to 5 cm. long and

about 1 cm. thick. Radial corallites on the branchlets 4–8 mm. long, tubo-labellate, 1–1·5 mm. in diameter, interspersed among subimmersed labellate ones, often with one or two labellate radials at their bases, or with labellate buds between base and aperture. Farther down the branchlets the long radials become shorter and more nariform and the number of immersed ones increases. Axial corallites about 2 mm. in diameter, exsert 2–3 mm., with thick, costulate walls.

Brook's figures of this species are not very good, but his description is excellent. Comparison of the Cocos specimen with his types from Rodriguez (B.M. Nos. 76. 5. 5. 89–90) shows that they are the same in every detail.

Occurrence.—"A single specimen found in a pool on the outer section of the barrier behind Pulo Gangsa. When alive it was a light fawn, with the tips of the buds purplish". (Specimen No. 26), U.S.N.M. No. 44316.

Distribution.—Rodriguez; China Sea (Macclesfield Bank, 7–8 fms.).

Acropora pinguis n.sp.

Plate 11, figs. 1, 2.

Corallum large and heavy, forming thick horizontal brackets from the upper surface of which arise thick, tapering, blunt, erect and straight branches which may divide once or twice. Other thick stubby branches expand horizontally. Thickness of basal portion: 75 mm.; dimensions of a single erect branch: height, 120 mm.; basal thickness, 35 mm.; thickness 10 mm. from tip, 15 mm. Axial corallites 2–3 mm. in diameter, with apertures 0·75–1 mm., thick-walled, rounded, very slightly exsert, with 6 well-developed first cycle septa and slightly developed secondaries. Radial corallites spreading, closely crowded together, especially towards tips of branchesm averaging 1 mm. in diameter, strongly labellate with weakly developed or no inner wall; roughly striato-echinulate, incurved outer wall. Septa of the first cycle rudimentary, the upper directive often long and prominent. Toward the basal part of the corallum, as is common in *Acropora*, the primaries are well-developed and prominent. Many immersed corallites. Surface of coenenchyme mostly coarsely porous or spongy with simple echinulations, or subvermiculate with rows of plate-like echinulae in places.

At first glance this seems to be very similar to *A. cuspidata* (Dana) which has thick, erect branches, but with radial corallites which are more often subtubular than sublabellate, relatively fewer which than the immersed ones, giving a strongly "mixed" effect rather than the even distribution in the present form. The closest relationship is probably with *A. conigera*

(Dana), a less extreme form with only short, conical protuberances on the upper surafce which bear sublabellate corallites similar to and arranged like those of the Cocos coral, but with smaller axial (1·5 mm.) corallites.

Occurrence.—"This coral occurs in two large masses, each about three feet across, on the outer edge of the barrier behind Pulo Tikus. I was unable to find any other examples elsewhere on the atoll". (Specimen No. 23), U.S.N.M. No. 44317 (holotype).

Acropora ocellata (Klunzinger) 1879.

Acropora ocellata var. Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 177, pl. 76, figs. 3, 3a, 3b. (Synonymy).

This specimen is a fine head of this species, with stout, blunt, short branches. The axial corallites are large, 4–6 mm. in diameter, hemispherical, with 1 mm. apertures. The radial corallites of the branches average 2 mm. in diameter and vary from occasional long tubular through abundant spreading nariform to small and immersed. The outer lip is thick and rounded, the inner less developed and thinner so that the aperture is usually oval and oblique. The coenenchyme is spongy-reticulate, echinulate; wall not striate.

Vaughan described and figured a stunted facies of this species from Cocos. The present specimen is more typical.

Occurrence.—"This coral, which grows in large masses up to two and a half to three feet in diameter, is found on the outer edge and seaward section of the barrier. It is not very plentiful. When alive it is a brownish fawn color". (Specimen No. 24, from near Pulo Beras), U.S.N.M. No. 44318.

Distribution.—Red Sea; Ceylon; Cocos-Keeling.

Acropora variabilis (Klunzinger) 1879.

Acropora variabilis Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 181, pl. 80, figs. 2, 3, 3a, 3b. (Synonymy).

Two specimens of this species are identical with the thicker-branched specimen (a single branchlet) figured by Vaughan. The growth-form is like that of Vaughan's second specimen (1918, pl. 80, fig. 3). A third specimen has the slender branchlets corresponding to the variant described by Vaughan.

Occurrence.—East side of atoll, with *A. nana,* on outer edge of exposed reef behind Pulo Gangsa, P. Tikus, and P. Siput (Specimen No. 5,- slender-branched form), U.S.N.M. No. 44351. And in shallow pools on inner border of small lagoon on northwest corner of Pulo Tikus, colour dirty-white, with faint lavender-blue tips. (Specimen No. 21), U.S.N.M. No. 44319.

Distribution.—Red Sea; Ceylon; Cocos-Keeling; Great Barrier Reef; Samoa; Tongatabu; Marshall Is.

Acropora schmitti n.sp.

Plate 12, figs. 1, 2.

Corallum spreading-corymbose, main branches 12 to 18 mm. thick, upright branchlets 10 to 12 mm. thick, 40 to 50 mm. high, tapering obtusely. Axial corallites 2–2·5 mm. in diameter, 1·5 mm. exsert, thick-walled with apertures 0·75–1 mm., with two well-developed cycles of septa. Radial corallites short, spreading, with very thick, rounded, outer lip and very thin inner wall, with aperture, 0·75–1 mm. opening upward, 2–2·5 mm. in diameter, 1–2 mm. long, close-set, rarely proliferant, with very small interspersed immersed calices. Two septal cycles well-developed in radials. Coenenchyme dense, walls of corallites and interspaces densely echinulate, non-striate.

The distinctive character of this species is the extraordinary thickness of the outer lip of the radial corallites, which gives them the appearance of hemispherical bowls attached to the branch by one side or by a very short, thick handle. No other described *Acropora*, so far as the writer knows, consistently has such extreme radial corallites of this type. It is probably closely related to *A. variabilis*. One of the two specimens of this latter from Cocos-Keeling bearing the number 21 shows a few similar radials low on some branchlets. But *A. variabilis* regularly has more appressed, less tumid radials, proportionally larger axial corallites, and slenderer, more closely-set branchlets.

Occurrence.—"This coral, which is rather similar to the preceding [*A. variabilis*] in both colour and form, occurs in shallow pools on the middle section of the barrier, and on parts of its seaward edge. It is not very plentiful, but it seems to be most numerous at the back of Pulo Tikus, where these specimens (five) were taken". (Specimen No. 22), U.S.N.M. No. 44320 (holotype).

Acropora nana (Studer) 1879.

Plate 10, figs. 3, 4.

Madrepora nana Studer 1879, K. preuss. Ak. Wiss., M.B.f. 1878, p. 533, pl. 2, fig. 6.

Madrepora nana Brook 1893, Cat. Madrep. Brit. Mus., i, p. 82.

Acropora syringodes Hoffmeister (*non* Brook) 1925, Carnegie Inst. Wash., Pub. 343, p. 65, pl. 15, figs. 2, 2a; (ibid., Pub. 340, pl. 15, fig. 51).

Description of specimens from Cocos-Keeling.—Corallum caespitose, forming small, neat, even-topped, rounded, tufts 10–15 cm. or more across, 5–7 cm. high from a broad base, and composed of close-set, short, slender branchlets 2–3 cm. long,

divided once or twice. Branchlets 5 mm. thick basally, slightly tapering to 2·5–3 mm. apically, with tips about 5 mm. apart. Axial corallites 1·5 mm. in diameter, cylindrical, exsert 1–2 mm., thick-walled with apertures 0·5 mm. in diameter and with 6 well-developed first cycle septa and weakly-developed septa of the second cycle. Radial corallites appressed tubulo-nariform, 2–3 mm. long, 1 mm. in diameter, with inner wall weak, outer lip convex so that the oval aperture slopes inward. Septa of the first cycle developed, the directives prominent. Coenenchyme compact, surface evenly echinulate and non-striate towards bases of branchlets, to striato-echinulate or even costulate near tips.

The neatly tufted and slender branching of this species is very striking and unlike other *Acroporae*, except *A. aculeus* (Dana) from Fiji (holotype, U.S.N.M. No. 257), which has larger radials with costulate lacy walls, and a taller growth-form with much longer branchlets. *A. syringodes* is a closely-related species, having similar but larger axial and radial corallites and a laxer, more proliferant growth-form.

In addition to the specimen from Matuku, Fiji, figured by Studer, which is a young colony with axials smaller than those of the present material, there is another specimen of *A. nana* in the U.S. National Museum collected at Suva, Fiji, in 1928 by J. E. Hoffmeister and H. S. Ladd. Hoffmeister's *A. syringodes* from Samoa, also in the U.S. National Museum, clearly belongs to this species as well.

Occurrence.—Outer edge of the barrier on the east side of atoll, with *A. variabilis*, behind Pulo Gangsa, Pulo Tikus, and Pulo Siput (Specimen No. 5) U.S.N.M. No. 44321; "shallow, sandy water immediately internal to Pulo Gangsa" (Specimen No. 29); U.S.N.M. No. 44322.

Distribution.—Cocos-Keeling; Fiji Is.; Samoa.

Genus **ASTREOPORA** de Blainville 1830

Astreopora myriophthalma (Lamarck) 1816.

Astreopora myriophthalma Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 146, pl. 60, figs. 5, 5a. (Synonymy).

One large pulvinate specimen, 16 cm. long, 10 cm. high, represents this well-known species. It presents no important variation from the one described from Cocos by Vaughan, except that the spinules of the coenenchyme are more often fimbriate than not.

Occurrence.—"On the exposed stretch of the barrier between Pulo Tikus and Pulo Běras". (Specimen No. 12c), U.S.N.M. No. 44323.

Distribution.—Red Sea generally eastward to Fanning I.

Genus MONTIPORA de Blainville 1830

Montipora laevis Quelch 1886.

Montipora laevis Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 150, pl. 61, figs. 1, 1a. (Synonymy).

Two typical specimens of this ramose, glabrous species.

Occurrence.—"This coral, which is very fragile both alive and dead, occurs occasionally in patches several feet across, on the inner section of the barrier and in the zone immediately behind its seaward edge. It is not very plentiful". (Specimens No. 14, from Pulo Tikus), U.S.N.M. No. 44324.

Distribution.—Cocos Keeling; Banda; Fiji; Ryukyu Island.

Montipora ramosa Bernard 1897.

Montipora ramosa Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 150, pl. 62, figs. 1, 1a, 2, 3.

Montipora ramosa Umbgrove 1939, Zool. Meded., xxii, p. 55. (Synonymy).

According to Vaughan, the branches of the specimens from Murray Island were slender, from 5 to 7·5 mm. in diameter. Bernard does not indicate the thickness of the branches in his types, other than short and thick, or tall and slender. Later writers have given no dimensions for their specimens, except Vaughan.

The specimen from Cocos is a stout, branching tuft from a small base, with short, thick, sub-clavate branches, averaging nearly 15 mm. in diameter. This appears to be more stoutly-branched than is usual, but there are no other differences.

Occurrence.—With *M. lobulata* "in shallow, sandy water immediately internal to Pulo Gangsa". (Specimen No. 28), U.S.N.M. No. 44325.

Distribution.—Eastern Indian Ocean and Malaysia.

Montipora spumosa (Lamarck) 1816.

Montipora spumosa Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 154, pl. 63, figs. 2, 2a.

Two fine colonies, one typical, with encrusting or explanate base with spumose, branching columns or lobes, the other seemingly branching and lobate from an early stage with a very small encrusting basal area. The first specimen, dried, is a brown to light yellow-brown; the second is wholly pale yellow-brown.

Occurrence.—With *M. foliosa* towards south end of lagoon; more plentiful than *M. foliosa,* and when alive it is a dull yellow-buff colour. (Specimens No. 17), U.S.N.M. No. 44326.

Distribution.—N. W. Australia; Great Barrier Reef; Cocos-Keeling; Tongatabu.

Montipora lobulata Bernard 1897.

Plate 11, fig. 3; pl. 4, fig. 3.

Montipora lobulata Bernard 1897, Cat. Madrep. Brit. Mus., iii, p. 76, pl. 14; pl. 16, fig. 1; pl. 33, fig. 1.

One specimen, consisting of several branching-lobulate pieces broken from a large corallum, agrees closely with the specimen from Mauritius figured by Bernard (1897, pl. 16, fig. 1). The branches or lobes originate as knob-like papillae bearing a few calices, rising as "short finger-shaped processes which grow out in all directions and fuse irregularly", and as Bernard pointed out the "resulting stock.....is in great contrast with the compact lobed mass" of the type specimen.

Occurrence.—"In shallow, sandy water immediately internal to Pulo Gangsa", with *Acropora nana* and *Pocillopora damicornis.* (Specimen No. 28), U.S.N.M. No. 44327.

Distribution.—Diego Garcia (type); Mauritius.

Montipora foliosa (Pallas) 1766.

Montipora foliosa Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 159, pl. 65, figs. 2, 2a, 2b. (References).

Two specimens, both typical for this species, in which there is very great variation from one part of a colony to another.

Occurrence.—With *Pocillopora damicornis, Acropora hebes, A. formosa, Montipora spumosa,* and *Porites nigrescens* "....in the vicinity of the shafts of deeper water towards the south end of the lagoon". (Specimens No. 16), U.S.N.M. No. 44328.

Distribution.—Indian Ocean eastward to New Hebrides.

Suborder FUNGIIDA

Superfamily Agaricioidae

Family AGARICIIDAE

Genus PAVONA Lamarck 1801

Pavona decussata (Dana) 1846.

Pavona decussata Hoffmeister 1925, Carnegie Inst. Wash., Pub. 343, p. 40, pl. 4, fig. 1. (Synonymy).

Pavona decussata Y. S. & E. 1936, Tôhoku Imp. Univ., Sci. Rep. (2), Spec. Vol. i, p. 56, pl. 39, figs. 4, 5, 6.

Two specimens are close to the typical form of the species as described by Hoffmeister. The fronds are narrow, usually less than 15 mm., rarely as much as 20 mm., with no carinae and little or no fusion of adjacent lobes or fronds.

Occurrence.—With *P. cactus* in channel between south end of Pulo Selma and Pulo Kechil. (Specimens 8b), U.S.N.M. No. 44329.

Distribution.—Red Sea eastward to Fiji and northward to Honshu.

Pavona cactus (Forskal) 1775.

Pavona cactus Y. S. & E. 1936, Tôhoku Imp. Univ., Sci. Rep. (2), Spec. Vol. i, p. 56, pl. 41, figs. 1–3. Synonymy).

Three specimens represent this species, which has a habit similar to *P. decussata* but the structures are finer and the fronds thinner with more crispate summits. It was not reported from Cocos by Vaughan.

Occurrence.—"Small, fairly compact masses up to a width of about 15 inches. It is most plentiful in the shallow water immediately internal to the channel between the south end of Pulo Selma and Pulo Kechil, where these specimens were taken". (Specimens No. 8b), U.S.N.M. No. 44330.

Distribution.—Red Sea eastward to Tahiti.

Family THAMNASTERIIDAE

Genus **PSAMMOCORA** Dana 1846

Subgenus **Plesioseris** Duncan 1884

Psammocora (Plesioseris) haimeana M.E. & H. 1853.

Psammocora haimeana Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 141, pl. 59, figs. 2, 2a. (Synonymy).

Two specimens, both loose nodules, alive over the whole surface, correspond precisely with Vaughan's specimen from Cocos. There is little or no difference between these and Vaughan's specimen of *P. profundacella* from Fanning Island.

Occurrence.—"This coral, which grows in the form of small, rounded knobs three to six inches in diameter, occurs in the pools over the inner and middle portion of the barrier. It is not plentiful. When alive it is a pearl-grey colour. These specimens (eight) were on the barrier between Pulo Tikus and Pulo Beras". (Specimens No. 18), U.S.N.M. No. 44331.

Distribution.—Red Sea; Indian Ocean; Funafuti.

Subgenus **Stephanaria** Verrill 1867

Psammocora (Stephanaria) togianensis Umbgrove 1940.

Psammocora togianensis Umbgrove 1940, Zool. Meded., xxii, p. 299, pl. 29, fig. 3; pl. 30, fig. 1, pl. 31, figs. 3, 4.

One handsome colony, 19 × 26 cm., 15·5 cm. high, composed of subflabellate, short, branching columns about 2 × 5·5 cm. in

cross-section, corresponds very closely to Umbgrove's type from the Togian Islands, and to specimens from Jaluit Atoll, Marshall Islands.

Occurrence.—"In sandy water of a depth of three to six feet towards the south-east corner of the lagoon". (Specimen No. 15), U.S.N.M. No. 44332.

Distribution.—Togian Is. North Celebes; Borodino Is. (?); Jaluit Atoll, Marshall Islands.

Superfamily **Fungioidae**

Family FUNGIIDAE

Genus **FUNGIA** Lamarck 1801

Fungia scutaria Lamarck 1801.

Fungia scutaria, Thiel 1932, Mém. Mus. R. Hist. Nat. Belg., (Hors Sér.), ii, p. 63, pl. 8, fig. 3. (Synonymy).

One specimen, with moderately developed tentacular lobes, is typical of this wide-spread species.

Occurrence.—With *F. fungites* in vicinity of Pulo Běras and Pulo Siput. (Specimen No. 11), U.S.N.M. No. 44333.

Distribution.—Widespread and common in the Indo-Pacific from the Red Sea eastward to Ogasawara, Hawaiian and Paumotu Islands.

Fungia fungites (Linnaeus) 1758.

Fungia fungites haimei Doederlein 1902, Abh. Senckenb. Naturf. Ges., xxvii, p. 149, pl. 20, figs. 4, 5a.

Fungia fungites Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 127.

Four specimens, three of them alive when collected, measure 100 × 120 mm.; 115 × 125 mm., and 155 × 165 mm. They all represent *var. haimei* Verrill, as analysed by Doederlein. Vaughan's specimens from Cocos in the U.S. National Museum are *var. confertifolia.*

Occurrence.—"...shallow pools on the middle and inner portions of the barrier, and occasionally in the lagoon immediately behind it". (Specimens No. 11 from vicinity of Pulo Běras and Pulo Siput, U.S.N.M. No. 44334; Specimen No. 11a from coral rubble near center of Pulo Luar and Pulo Tikus, U.S.N.M. No. 44335).

Distribution.—(*var. haimei*) Red Sea; Zanzibar; Celebes; Marshall Is.

Superfamily Poritoidae

Family PORITIDAE

Genus PORITES Link 1807

Porites solida (Forskaal) 1775.

Porites solida Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 191, pl. 84, figs. 3, 3a. (Synonymy).

Two specimens, both irregularly rounded loose heads, alive on all surfaces, correspond precisely with Vaughan's description and figures.

Occurrence.—Commonest coral in pools on middle and inner parts of the barrier and in shallow water behind it. Forms small rounded knobs to irregular dome-shaped patches several feet across, and microatolls "like flat Gloucester cheeses". Also in large rock-like masses in one to three fathoms in northern half of the lagoon. Lavender or lavender-brown when alive. Specimens from between Pulo Tikus and Pulo Bĕras. (Specimens No. 2), U.S.N.M. No. 44336.

Distribution.—Red Sea; Cocos-Keeling.

Porites gibsonhilli n.sp.

Plate 13, figs. 1, 2.

Ramose, the corallum composed of closely anastomosed clavate branches, free for about 2 cm. distally, their tips swollen and terminating in 2 to 5 knobs which are the beginnings of new branchlets. The branches tend to divide in the same plane and some appear palmate. Average thickness of an undivided branch, 10 mm. Surface of colony eventopped, the distance between branchlets being from 2 to 10 mm. Calicular surface even, the superficial calices lacking defined mural ridges. Diameter of calices, measuring from center to center, about 1 mm. The principal elements in the corallites are the 6 to 8 palar trabeculae, which form with their synapticulae a sharply defined ring around the small, deep fossette in which a columellar tangle or columellar papilla is often lacking. Hence the fossette often appears as a dark hole, easily seen by the naked eye. Almost as prominent is the ring of 12 vertical septal trabecular elements with connecting synapticulae. This is some distance from the palar ring. The septa are thin and poorly developed and the septal formula is indistinct. The mural trabeculae are small, distant, and irregular, often absent, never close or forming a definite calicular boundary. In many places the septa of adjacent calices are directly united with no intervening mural tubercles. Peripherally in most calices there is some thickening of the horizontal elements between the septal trabecular ring of

one calice and that of another adjoining one, similar to that in *P. nigrescens* but less heavy and shelf-like.

Colour of dried corallum, deep black.

Although this species is evidently related to *P. nigreseens* and *P. eridani*, it is distinguished from both by its growth-form and lighter skeletal structures. The deep columellar fossa is like that in *P. eridani*, but the columella is more often developed and the calices less excavated than in that species, and in both *nigrescens* and *eridani* the horizontal elements are coarser and more highly developed. *P. cocosensis* is readily differentiated by its well-defined wall and less defined columellar fossa.

None of the *Porites* described by Bernard seems to be the same as this, which may be the other species (*"clavaria"*) referred to by Darwin and Guppy.

Occurrence.—"Large, thickly-massed blocks in the vicinity of the shafts of deeper water towards the south end of the lagoon. Here it grows in company with [*Acropora formosa, A. pharaonis, A. hebes, Pocillopora damicornis, Montipora foliosa*, and *M. spumosa*]. When alive,. . . .a bright olive-yellow, but it dries black on exposure. . . ." (Specimens No. 7a), U.S.N.M. No. 44337 (holotype).

Porites nigrescens Dana 1846.

Porites nigrescens Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 205, pl. 91, figs. 3, 3a; pl. 92, figs. 1, 1a, 1b, 2, 2a.

A typical specimen with more or less anastomosing, gently tapering, slightly flattened branches about 7 mm. in thickness, terminating abruptly. Calicular structures as in the type described by Vaughan. Horizontal elements greatly thickened.

This species seems to be one of the two species of *Porites* mentioned by Darwin as occurring in Keeling lagoon, with cylindrical branches, one of which forms circular clumps with only the exterior branches alive:

> "This Porites has somewhat the habit of *P. clavaria*, but the branches are not knobbed at their ends. When alive it is of a yellow colour, but after having been washed in fresh water and placed to dry, a jet-black slimy substance exuded from the entire surface, so that the specimen now appears as if it had been dipped in ink". (Struct. & Dist. Coral Reefs, p. 29).

Guppy, (1889, p. 570) also refers to this species as *P. palmata:*

> "The two most frequent of the branching species of *Porites* are *P. palmata* (?) [yellow when alive, forming clumps 12 to 15 feet in diameter], which turns black on removal from the water, and *P. clavaria*, which in a similar manner assumes a dark brown hue".

Occurrence.—"In the form of isolated, rounded colonies one to three feet across, in sandy water of depth three to six feet, towards the south-east corner of the lagoon". Alive it is bright olive-yellow, but dries black, like *P. gibsonhilli*. (Specimen No. 7b), U.S.N.M. No. 44338.

Distribution.—Cocos-Keeling eastward to Fiji Islands.

Porites cocosensis n.sp.

Plate 13, figs. 3, 4.

Porites Singapore 5 Bernard 1905, Cat. Madrep. Brit. Mus., v, p. 186, pl. 28, figs. 5a, 5b; pl. 29, fig. 4.

Porites Amirantes 3 Bernard 1905, Cat. Madrep. Brit. Mus., v, p. 225, pl. 33, fig. 3; pl. 35, fig. 26.

Corallum ramose, composed of short clavate anastomosing branchlets, secondarily thickened below by moniliform swellings and sometimes forming irregular plates. Near the tips the branches are about 7 mm. thick, swelling downwards to as much as 15 mm. Calices nearly superficial, 1–1·5 mm. in diameter, mostly about 1·25 mm., polygonal, bounded by a nearly continuous thin wall ridge of twisted flakes. Septa greatly thickened near the wall and forming, with the synapticulae of the single septal elements, a more or less solid shelf with the wall. Around the inner edge of the shelf the septal elements form a well-defined ring. Palar ring consisting of six pali, usually more prominent than the septal trabecular ring pillars. The pali before the lateral pairs and the dorsal triplet are larger than the small palus on the ventral directive. The laterals of the triplet lack pali and are fused to the directive in the trident pattern. Fossette not sharply defined, usually with a small columellar tubercle but occasionally filled only by a tangle of processes.

Colour of dried corallum a pale ash-brown.

One of the two specimens is an attached colony with expanding base; the other (holotype) is an oval mass 17·5 cm. long and 12 cm. in diameter, with branches in all directions, the tips being within 10 mm. of each other, and which evidently lay loose on the bottom. Centrally this latter specimen is a mass of closely anastomosed thick stems.

The growth-form is quite distinct from *P. nigrescens* and *P. gibsonhilli*, which also occur at Cocos-Keeling, and the calicular characters are also distinct. This species is distinct from the other named ramose forms of *Porites*, although the specimens from Singapore and Amirante described by Bernard and referred to above are evidently the same. *P. andrewsi*, *P. cylindrica*, *P. capricornis*, and *P. compressa*, normally have two trabecular elements between wall and pali, and *P. eridani* groups with *P. nigrescens*.

Occurrence.—"In beds, several feet in diameter, widely scattered over the middle section of the barrier. It is fairly plentiful". (Specimens Nos. 25), U.S.N.M. Nos. 44339 (holotype), 44340 (paratype).

Distribution.—Singapore; Marie Louise I. (17 fms.), Amirante Islands; Cocos-Keeling.

Suborder **FAVIIDA**

Family FAVIIDAE

Subfamily Faviinae

Genus **FAVIA** Oken 1815

Favia stelligera (Dana) 1846.

Favia stelligera Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 101, pl. 34, figs. 2, 3; pl. 35, figs. 1–4. (Synonymy).

A typical specimen of this species, well-described and figured by Vaughan.

Occurrence.—Barrier between Pulo Tikus and Pulo Bĕras. (Specimen No. 12), U.S.N.M. No. 44341.

Distribution.—Red Sea generally eastward to Paumotu Is., and northwards to Borodino Is.

Genus **LEPTORIA** M.E. & H. 1848

Leptoria phrygia (Ellis & Solander) 1786.

Leptoria phrygia Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 117, pl. 45, figs. 4, 5; pl. 46, figs. 1, 2, 3.

Leptoria phrygia Y. S. & E. 1936, Tôhoku Imp. Univ., Sci. Rep. (2), Spec. Vol. i, p. 38, pl. 57, fig. 1. (Synonymy).

A large, convex, slightly lobate mass, 15 cm. high, 20 cm. broad, is typical of this species, except that the columella is only weakly developed. The interserial wall is thin and the entire corallum is very light in weight.

Occurrence.—"In the form of rounded knobs like the top of a skull, up to about 10 inches in diameter,. . . .towards the northeast corner of the atoll, but it is not very plentiful. These specimens (four) were all taken between Pulo Tikus and Pulo Bĕras". (Specimens No. 1), U.S.N.M. No. 44342.

Distribution.—Ceylon; Cocos-Keeling; Philippines; Palau; Caroline, Marshall, Ogasawara, and Ryukyu Islands.

Subfamily Montastreinae

Genus **LEPTASTREA** M.E. & H. 1848

Leptastrea purpurea (Dana) 1846.

Leptastrea purpurea Y. S. & E. 1936, Sci. Rep. Tôhoku Imp. Univ. (2), Spec. Vol. i, p. 26, pl. 48, figs. 5–7. (Synonymy).

Two specimens are loose, potato-like nodules, living over the whole surface, and are typical of this species.

Occurrence.—Barrier between Pulo Tikus and Pulo Běras. (Specimens No. 12), U.S.N.M. No. 44343.

Distribution.—Red Sea eastward to Fanning I., and Hawaiian Islands; northward to Honshu.

Leptastrea bottae (M.E. & H.) 1849.

Leptastrea bottae Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 94, pl. 31, figs. 3, 4. (Synonymy).

Three specimens, loose nodules, are similar to Vaughan's specimens from Cocos-Keeling.

Occurrence.—Barrier between Pulo Tikus and Pulo Běras. (Specimens Nos. 12 and 12c), U.S.N.M. No. 44344.

Distribution.—Red Sea, eastward to Philippines, Marshall and Hawaiian Islands.

Genus CYPHASTREA M.E. & H. 1848

Cyphastrea chalcidicum (Forskaal) 1775.

Cyphastrea chalcidicum Matthai 1914, Trans. Linn. Soc. (2), Zool., xvii, p. 41, pl. 7, figs. 1, 5; pl. 12, figs. 1–3; pl. 14, fig. 1.

Cyphastrea chalcidicum Y. S. & E. 1936, Tôhoku Imp. Univ., Sci. Rep. (2), Spec. Vol. i, p. 24, pl. 18, fig. 1; pl. 49, fig. 5. (Synonymy).

One specimen, an irregular nodule, nearly free, with all calices immersed or non-exsert, separated by spined peritheca. Septa of first two cycles thin and equal, often somewhat exsert. Costae scarcely developed.

Occurrence.—On the barrier between Pulo Tikus and Pulo Běras, with *Porites solida, Leptastrea purpurea, L. bottae, Favia stelligera,* and *Astreopora myriophthalma.* (Specimen No. 12b), U.S.N.M. No. 44345.

Distribution.—Red Sea eastward to Marshall Islands; northward to Honshu.

Genus ECHINOPORA Lamarck 1816

Echinopora lamellosa (Esper) 1787.

Echinopora lamellosa Y. S. & E. 1936, Tôhoku Imp. Univ., Sci. Rep. (2), Spec. Vol. i, p. 48, pl. 58, fig. 1. (Synonymy).

Specimens similar to that described by Vaughan from this atoll. Some folia appear to be bifacial, due to the adherence of one plate-like expansion to another by their undersurfaces and simultaneously growing upwards.

Occurrence.—"This coral, which may reach a width of over two feet across the flat sheets, is plentiful in still, sheltered water

inside the lagoon, [and] at a depth of one to three fathoms in the vicinity of the rock masses internal to the reefs in the neighbourhood of Pulo Luar. It also occurs in shallower water, in company with [*Acropora pharaonis* and *A. hebes*] in the lee of Pulo Selma; and....the edge of the sudden shafts of deeper water towards the south end of the lagoon. These specimens (No. 8a) were all taken in the neighbourhood of Pulo Selma". U.S.N.M. No. 44346.

Distribution.—Western Indian ocean eastward to Fiji Is. and northward to Ryukyu Islands.

Family ASTRANGIIDAE

Genus CULICIA Dana 1846

Culicia *sp. cf.* **C. rubeola** (Q. & G.) 1833.

Dendrophyllia rubeola Quoy & Gaimard 1833, Voy. Astrolabe, Zooph., p. 97, pl. 15, figs. 12–15.

Culicia rubeola M. E. & H. 1857, Hist. Nat. Corall., ii, p. 607.

Two pieces, one with 24, the other with 6 corallites up to 6 mm. tall, cylindrical, with maximum diameter of 3 mm. Calices shallow, filled with stout septa, 24–32 in number. Those of the first cycle may be exsert with a non-dentate lobe, the second cycle slightly shorter and dentate. Columella well-developed, papillary.

These specimens group with *C. rubeola, C. tenella, C. verreauxi,* and *C. stellata,* all of which may pertain to one species. They approach *C. verreauxi* in the large number of septa and shallow calices. The calices, however, are not so superficial as in *C. truncata* Dana. The writer has discussed these species in another manuscript, and they will not be further dealt with here.

Occurrence.—"In the same habitat as [*Tubastrea willeyi*], but it is much less plentiful". When alive it is a very light fawn. Specimens (No. 20) from Pulo Bĕras, U.S.N.M. No. 44347.

Distribution.—New Zealand; Australia; Marshall Is; Gulf of Manaar.

Suborder **DENDROPHYLLIIDA**

Family DENDROPHYLLIDAE

Genus **TUBASTRAEA** Lesson 1834

Tubastraea willeyi (Gardiner) 1899.

Dendrophyllia willeyi Vaughan 1918, Carnegie Inst. Wash., Pub. 213, p. 143, pl. 60, figs. 4, 4a. (Synonymy).

Four typical specimens. Few of the mature calices attain a diameter of 10 mm., the average long diameter being between 8 and 9 mm.

Occurrence.—"On the under surface of boulders on the outer portion of the barrier. When alive this species is a bright orange-red, with the polyps green". Specimens No. 19, U.S.N.M. No. 44348.

Distribution.—Lifu, Loyalty Is.; Fanning Island; Cocos-Keeling.

Class HYDROZOA

Order MILLEPORINA

Genus MILLEPORA Linnaeus 1758

Millepora platyphylla Hemprich & Ehrenberg 1834.

Millepora platyphylla Boschma 1948, Zool. Verh., No. 1, p. 35, pl. 2, figs. 1, 2; pl. 4, fig. 2; pl. 5, figs. 2, 3; pl. 15, figs. 4, 5; textfigs. 4, 5, 11, 19. (Synonymy).

Typical specimens identical with that figured by Vaughan.

Occurrence.—"Abundant on the two exposed sides of the atoll—the east and the south—and also occurs, though less plentifully, on the sheltered sides. Its normal habitat seems to be the outer edge of the barrier, where it forms a rampart along the low tide line". Also occurs in larger pools on the middle section of the barrier. Specimens (Nos. 3b) from between Pulo Tikus and Pulo Bĕras, U.S.N.M. No. 44349.

Distribution.—Red Sea generally eastward to Paumotu Is; northward to Ryukyu Is.

Millepora tenella Ortmann 1892.

Millepora tenella Boschma 1948, Zool. Verh., No. 1, p. 41, pls. 12, 13; pl. 14, figs. 1, 2; pl. 10, fig. 2; textfigs. 3, 4, 5, 12, 13. (Synonymy).

One large typical specimen.

Occurrence.—In same habitat as *M. platyphylla.* Specimens from between Pulo Tikus and Pulo Bĕras (No. 3a), U.S.N.M. No. 44350.

Distribution.—Western Indian Ocean eastward to Fiji Is.; Johnston I. northward to Ryukyu and Borodino Is.

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Plate 9

1. *Pocillopora woodjonesi* Vaughan, × 0·6.
2. *Pocillopora verrucosa* Ellis & Solander, × 0·6

Plate 10

1, 2. *Acropora irregularis* (Brook), × 0·5, × 5
3, 4. *Acropora nana* (Studer), × 0·7, × 5

Plate 11

1, 2. *Acropora pinguis* n.sp., holotype, × 0·5, × 5
3. *Montipora lobulata* Bernard, × 5

Plate 12

1, 2. *Acropora schmitti* n.sp., holotype, × 0·7, × 5
3. *Montipora lobulata* Bernard, × 0·6

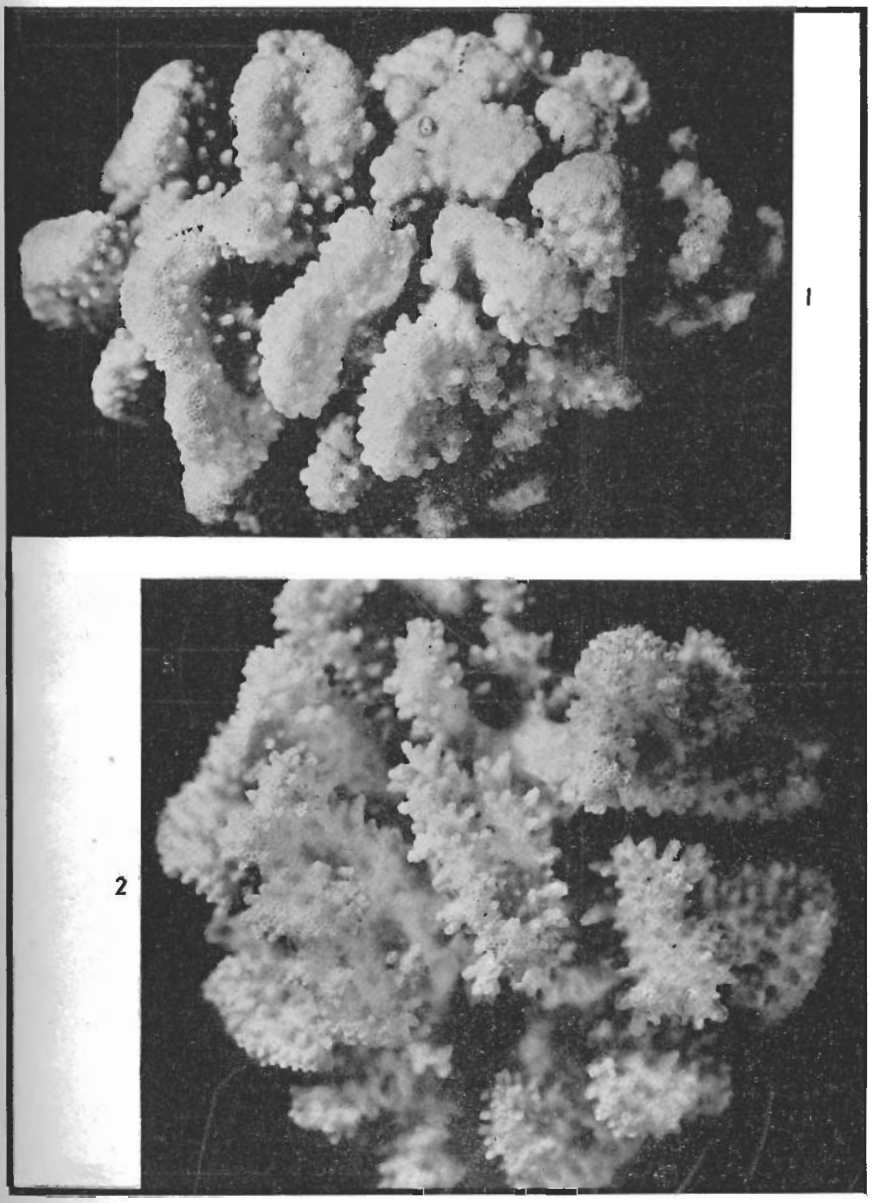
Plate 13

1, 2. *Porites gibsonhilli* n.sp., holotype, × 0·9, × 5
(Fig. 1: unbleached corallum; fig. 2: portion of bleached branch).
3, 4. *Porites cocosensis* n.sp., holotype, × 0·7, × 5

Plate 14

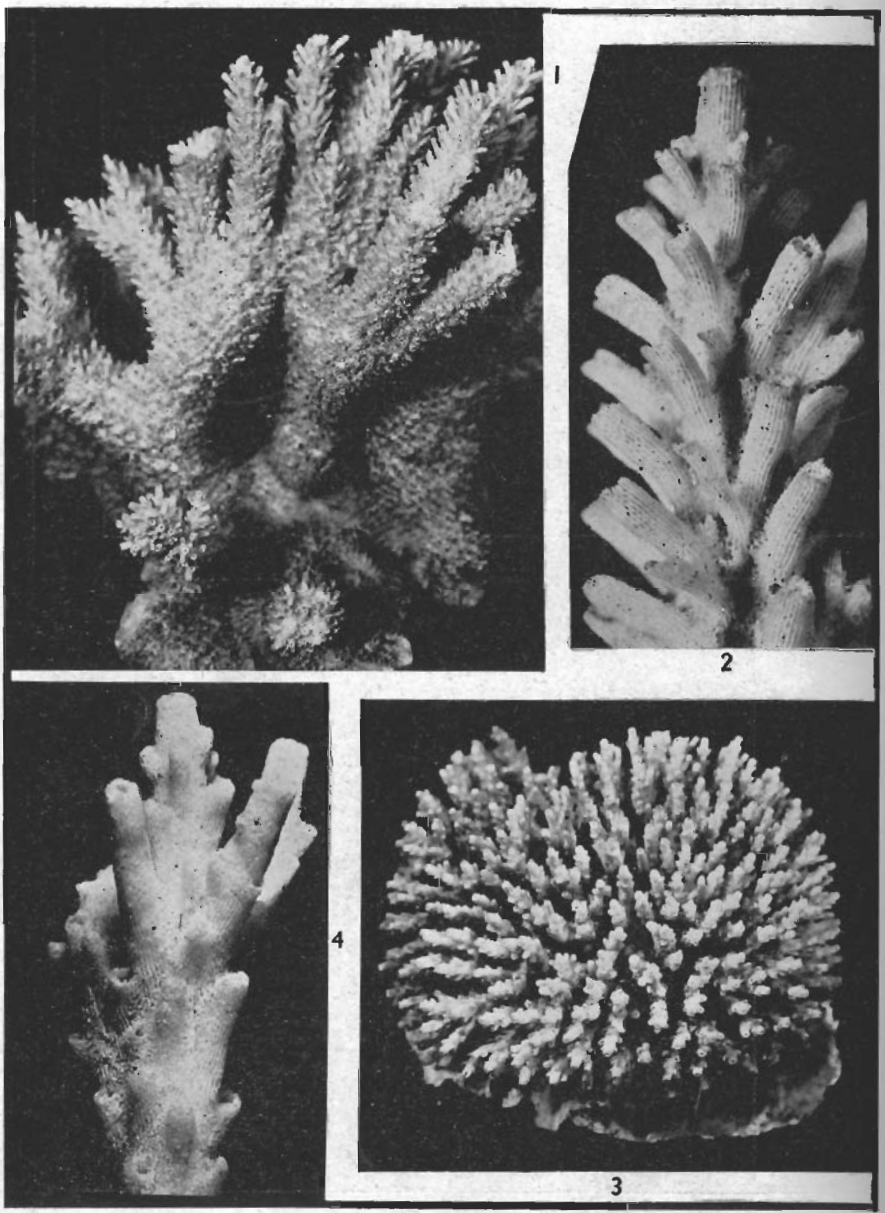
Upper. A view of the outer edge of the barrier between Pulo Gangsa and Pulo Tikus at low tide.

Lower. Encrusting forms of a species of *Porites* growing in a pool near the outer portion of the barrier between Pulo Gangsa and Pulo Tikus.



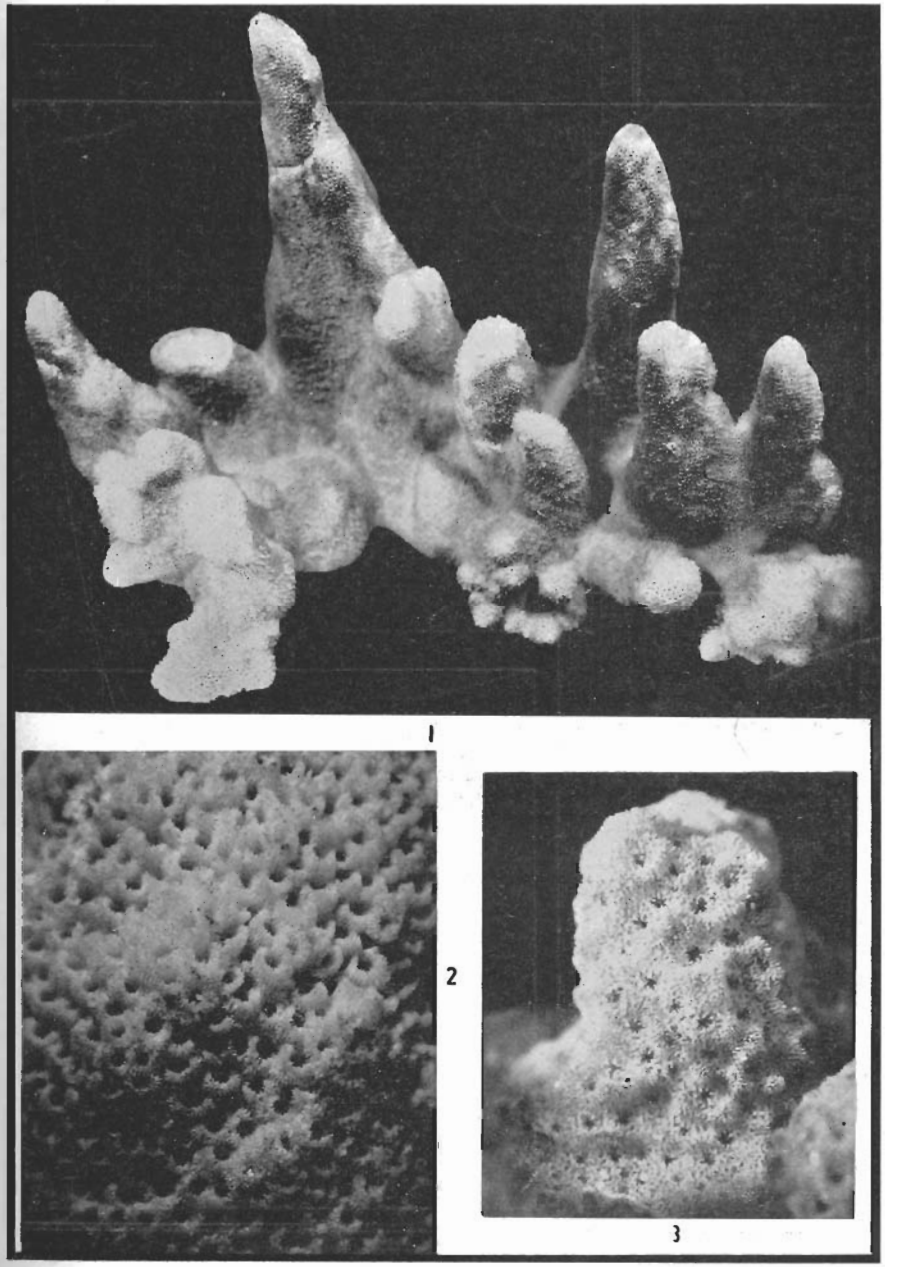
Reef Corals from the Cocos-Keeling Atoll (John W. Wells).

1. *Pocillopora woodjonesi* Vaughan, × 0.6.
2. *Pocillopora verrucosa* Ellis & Solander, × 0.6.



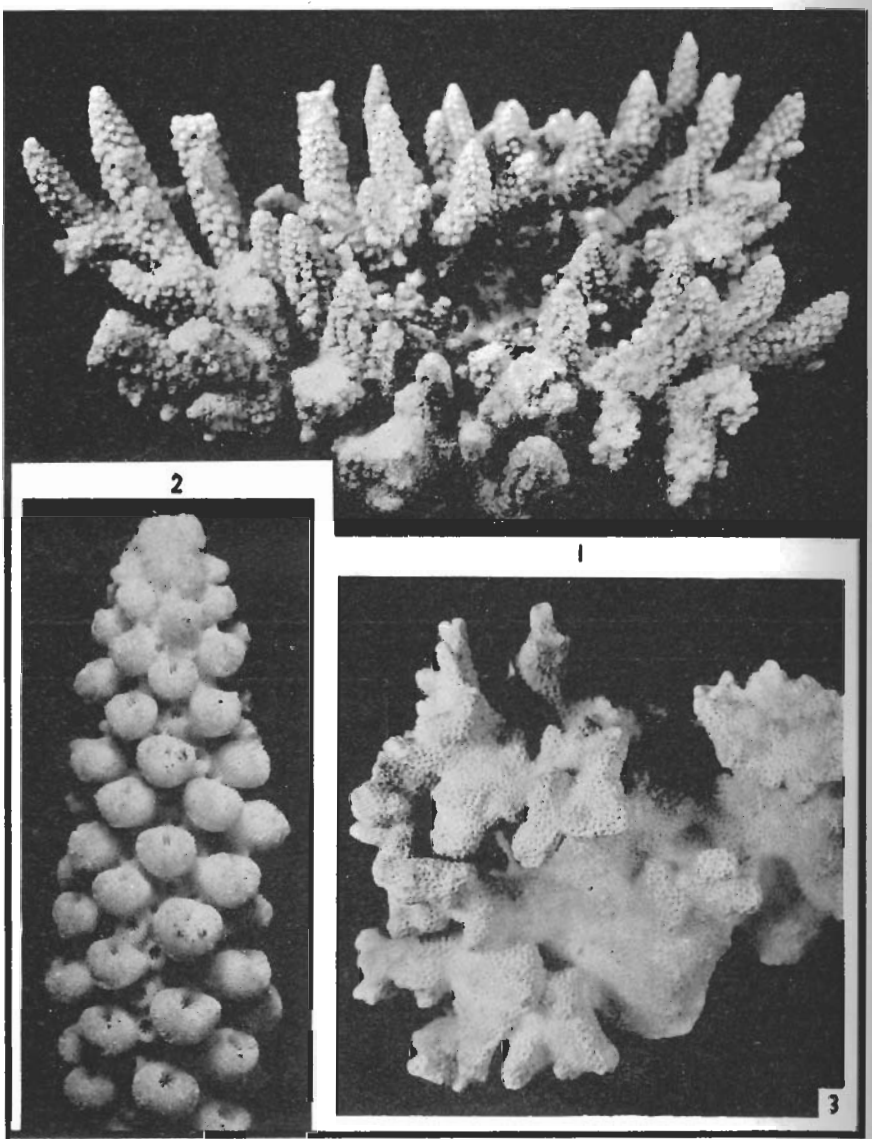
Reef Corals from the Cocos-Keeling Atoll (John W. Wells).

1, 2. *Acropora irregularis* (Brook), × 0.5, × 5
3, 4. *Acropora nana* (Studer), × 0.7, × 5.



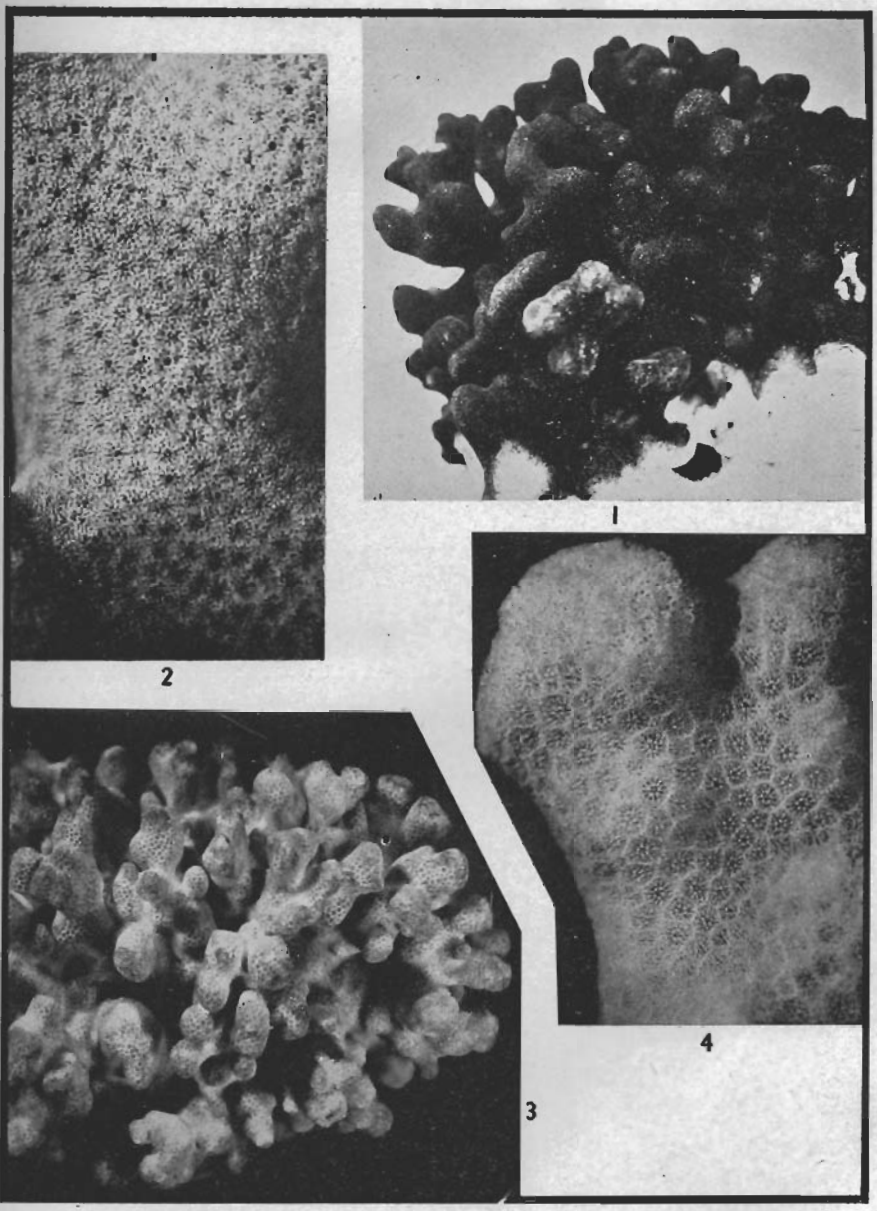
Reef Corals from the Cocos-Keeling Atoll (John W. Wells).

1, 2. *Acropora pinguis* n.sp., holotype, × 0.5, × 5
3. *Montipora lobulata* Bernard, × 5.



Reef Corals from the Cocos-Keeling Atoli (John W. Wells).

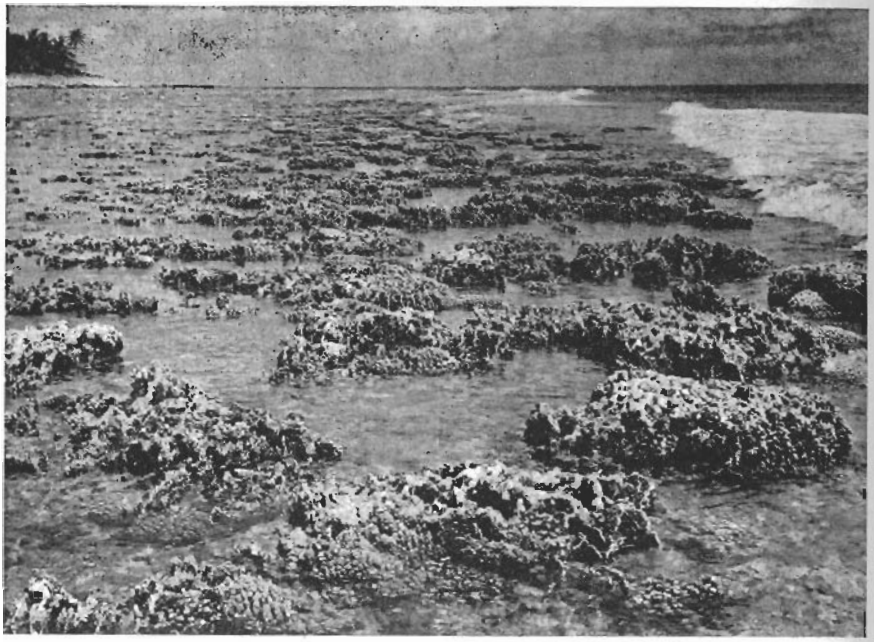
1, 2. *Acropora schmitti* n.sp., holotype, × 0.7, × 5
3. *Montipora lobulata* Bernard, × 0.6.



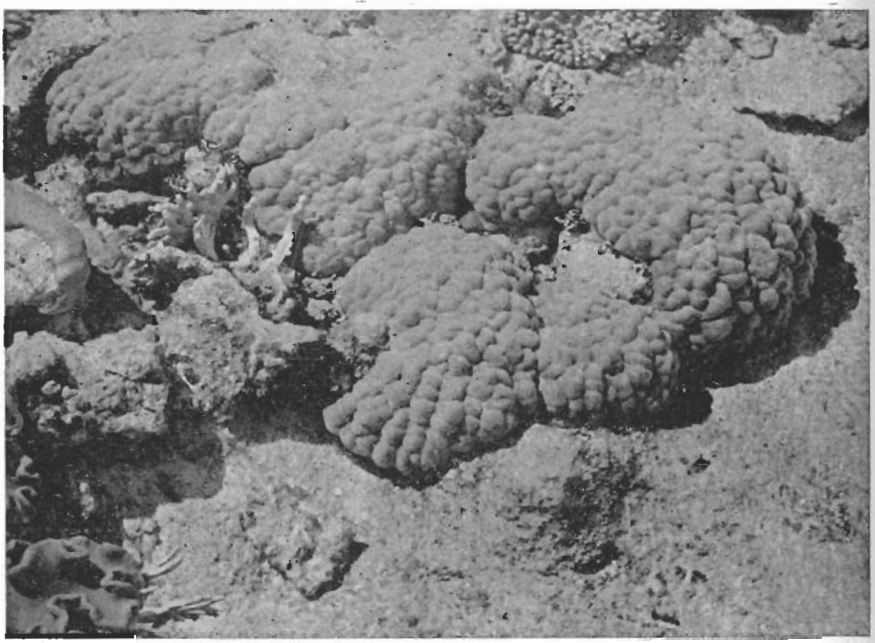
Reef Corals from the Cocos-Keeling Atoll (John W. Wells).

1, 2. *Porites gibsonhilli* n.sp., holotype, × 0.9, × 5.
(Fig. 1: unbleached corallum; fig. 2: portion of bleached branch).

3, 4. *Porites cocosensis* n.sp., holotype, × 0.7, × 5.



A view of the outer edge of the barrier between Pulo Gangsa and Pulo Tikus, on the Cocos atoll, at low tide.



Encrusting forms of a species of *Porites* growing in a pool near the outer portion of the barrier flat between Pulo Gangsa and Pulo Tikus, on the Cocos atoll.