

## ON A COLLECTION OF SCLERACTINIA FROM THE STRAIT OF MALACCA

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### SUMMARY

During the Second 'Xarifa' Expedition under the leadership of Dr. Hans Hass one of the authors (Scheer) made a representative collection of corals from Pulau Perak, Sembilan Islands and Pulau Jarak (between 4 and 6 deg. N and 98 and 102 deg. E) in the Strait of Malacca. All the specimens are preserved in Hessian State Museum, Darmstadt, West Germany and include 38 species divided among 20 genera of 12 families. A detailed taxonomic account of the various species is given and the known geographic distribution of many species is extended westward from the Pacific.

### I. INTRODUCTION

The first mention of corals from the Strait of Malacca seems to be that of the great French naturalists Milne Edwards and Haime, who reported the occurrence of three species in their classic work *Histoire naturelle des coralliaires* (1857, 1860). Later Gustav Schneider, of Basal, sent a collection of corals from the southern part of Malacca to F. Brüggemann and Th. Studer for a taxonomic treatment. Studer (1880) wrote "Die Korallen sind alle einem Riff entnommen, welches ziemlich entfernt von Singapore in der Strasse von Malakka liegt". He reported 49 species and Brüggemann (1878) mentioned 55 but described only three new species and five little known, thus leaving Studer (1880) to report on the other species. There is a very rich coral fauna at the south-eastern exit of the Strait of Malacca from where corals were described by both Dana (1846) and Verrill (1864). Studer (1880) listed 112 species from this area (much less according to the present species concept). But nothing is known of corals from the middle and north-western part of the Strait of Malacca. The recent works of Purchon (1956) and Searle (1956) record species from the vicinity of Singapore but nothing specific to the Strait of Malacca. Rosen (1971) has very recently summarised and tabulated the known data on the distribution of stony corals at the various coral reef areas of the Indian Ocean. In the eastern Indian area, he lists 36 genera from the Mergui Archipelago; 24 genera from the Andamans; and 53 from Singapore. Only three genera are listed from Nicobars, although Scheer and Pillai (1974) recorded 45 genera from the IInd "Xa-

rifa" Expedition collections from Nicobars. For the north coast of Sumatra, Rosen records 3 genera and none specifically to the Strait of Malacca. One of us (Scheer) collected the material forming the basis of the present paper as a member of the IInd "Xarifa" Expedition under the leadership of Dr. Hans Hass during 1957-58. Corals were collected by diving at different places and are housed in the Hessian State Museum at Darmstadt, West Germany under the custody of Scheer, who has briefly reported on the 20 genera collected (Scheer, 1971).

The classification of Scleractinia adopted in the systematic part of this work is that of Vaughan and Wells (1943) as revised by Wells (1956).

### II. COLLECTING PLACES WITH ECOLOGICAL NOTES

**Station 168.** Pulau Perak (Figs 1, 2); 5 deg. 41 min. 40 sec. N, 98 deg. 56 min. 26 sec. E; 22nd September, 1958.

The island is called "silver island" on account of the white droppings of sea swallows and boobies breeding there in great numbers. The conical island has a maximum width of 200m., is about 12m. high and is devoid of any plants. The steep slope continues under water to a depth of about 50m. then a less steep rubble slope begins.

The precipice of the rocky island forming an angle of 60 deg. with the horizontal, was overgrown under the sea level at many places with sea anemones, often head sized. At other spots extensive patches were covered with the red colonies of *Tubastraea aurea*. Between them gorgonians and

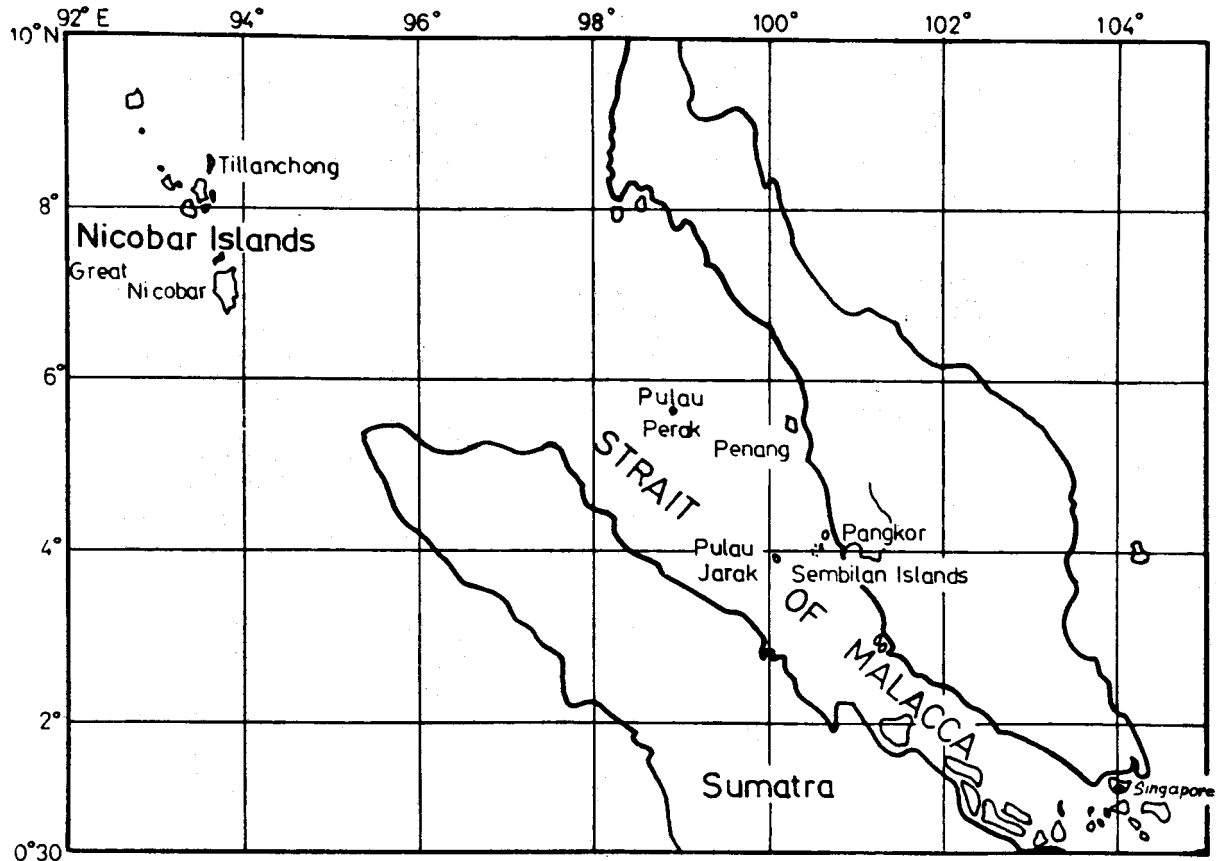


Figure 1: Map of Strait of Malacca showing localities of collections.

bivalves were present. Corals were found in dense patches on the steep rocks, a consolidated reef frame work being absent. The absence of *Acropora*, otherwise abundant everywhere, was striking. *Pocillopora* was common and was represented by four species. The yield of corals at this station was not very great, amounting to 14 species belonging to 10 genera. This small number of genera may really represent the common genera occurring there, though a few more might be obtained by future collectors. The 'bottomless' abyss, strong current and the presence of dangerous sharks restricted diving operations.

**Stations 172-174.** Sembilan Islands; 4 deg. 01 min. N and 100 deg. 32 min. 30 sec. E; 26th September to 3rd October.

This group of small islands and rocky cliffs jutting out of water, lie about 85 nautical miles south of the Island Penang, and about 16 nautical miles off the coast of the mouth of the Perak river. The water is very muddy, probably diluted by the fresh water from the Perak river, and the environment is not very congenial for a luxuriant growth of corals.

**Station 172:** Pulau Lalang consists of a northern and a southern island, bordered by a sandy shore. Only a very few corals are found here. In the channel connecting the two parts of the islands only *Porites tenuis* and *Platygyra lamellina* were found.

**Station 173:** Pulau Saga is west of Pulau Lalang, and divided into two parts. Big rocky boulders lie along the southwest coast of the northern part of the island. Seven species of corals divided among 6 genera, were collected here, *Porites* sp. being the dominant forms. *Acropora* was frequent. Consolidated reef is absent and corals are found in patches on rubble and sandy bottom, mixed with sea anemones.

**Station 174:** Pulau Rumbia lies north of Pulau Lalang and is the largest island of the Sembilan group. The island is wooded with steep slopes to the sea. At the western part there is a great bay with a sandy shore that is visited by turtles to deposit their eggs. The water in the bay looks muddy and there is a great degree of sedimentation which prevents many species of corals growing there. Corals are found in patches. Six species belonging

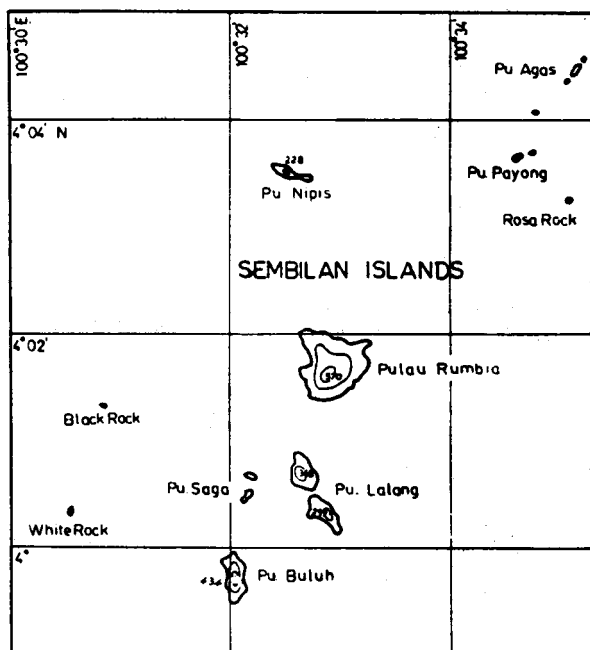


Figure 2: Enlarged map of Sembilan Islands.

to six genera were collected here. *Acropora* which is sensitive to silt was not found; the small polyped *Pocillopora* and *Porites* were noticed.

**Stations 175-178:** Pulau Jarak, 3 deg. 58 min. 30 sec. N, 100 deg. 05 min. 45 sec. E 9th and 11th October, 1958.

The island is situated 27 nautical miles west of the Sembilan Islands, in the midst of the Strait of Malacca, between Malaya and Sumatra. It is about 1 km long and 150 m high. The island is densely wooded, its slopes drop off steeply to the sea. Large granite boulders lie along the coast, a sandy shore does not exist. The water is clear with little sedimentation. This makes itself felt in the coral fauna. On some places of the island fringing reefs are developed.

**Station 175:** Fringing reef south east of the island, 3-6 m. The reef slope showed the richest coral growth at this depth. Mighty *Porites* coralla dominated, several *Acropora* species occurred. *Montipora* and *Pavona* along with *Pocillopora damicornis*, *Diploastrea heliopora* and *Platygyra lamellina* were not rare. Occasionally potato-sized knobs of *Porites tenuis* and *P. superfusa* were found lying free at the bottom. Altogether 22 species from 11 genera could be collected from Station 175.

**Station 176:** Fringing reef, south east of the island, 10 m. The coral growth on the reef slope at this depth was poor both in the number of species and number of individuals. Only some *Porites*,

*Montipora*, *Pocillopora* and *Platygyra* were seen. Small colonies of *Dendrophyllia arbuscula* were fairly common, along with *Tubastraea aurea*.

**Station 177:** Fringing reef south east of the island, 15 m. The reef slope passed into a debris slope. The bottom is covered with loose stones and dead coral pieces with calcareous algae. Only *Fungia fungites* was found.

**Station 178:** Fringing reef south west of the island. This fringing reef was essentially less developed and held by only few species. *Porites compressa* grew in columns along with the large specimens of *Pocillopora eydouxi*. *Pocillopora damicornis* was noticed frequently.

### III. REVIEW OF THE RESULTS

Table 1 shows the systematically arranged grouping of the various genera and species collected from different stations. Fourteen species divided among 10 genera and 8 families were collected from Pulau Perak, from a single station (168). Collections made at three stations (172, 173, 174) in the Sembilan Islands included 11 species of 9 genera and 5 families. Four stations (175, 176, 177, 178) in Pulau Jarak yielded 26 species belonging to 14 genera and 9 families. The entire collection contains 38 species of 20 genera and 12 families. Both Pulau Perak and Sembilan Islands harbour a comparatively poor coral fauna. Pulau Perak is situated far away from other coral reef formations, the Nicobar groups of islands themselves lying 350 nautical miles away. This isolated position may be a factor in restricting the number of species. Small polyped forms such as *Acropora* and *Montipora* (except *M. foliosa*), sensitive to sedimentation (Pillai, 1971c) are absent here. This again indicated that the ecological conditions do not favour a luxuriant growth of corals. Coral growth in the Sembilan Islands may be affected by the fresh water from the Perak River and a high degree of sedimentation, which would prevent the formation of reef frame work since the corals live only in patches.

Better conditions for coral growth appear to be present in the Pulau Jarak where the coral fauna is richer. The water is clear with very little suspended silt. Corals have grown to develop small fringing reefs, a condition not met with either in Pulau Perak or the Sembilan Islands. *Acropora* and *Montipora* are fairly well represented along with members of the families Poritidae and Faviidae. Here, too, it seems that better growth is seen between 3 to 6 metres depth, only dendrophylliids being represented to 10m. The difference in the number of species and their abundance on the southeast and southwest of Pulau Jarak, a small island only 1 km. in length, shows how colonisation of corals can be restricted even within a small territory.

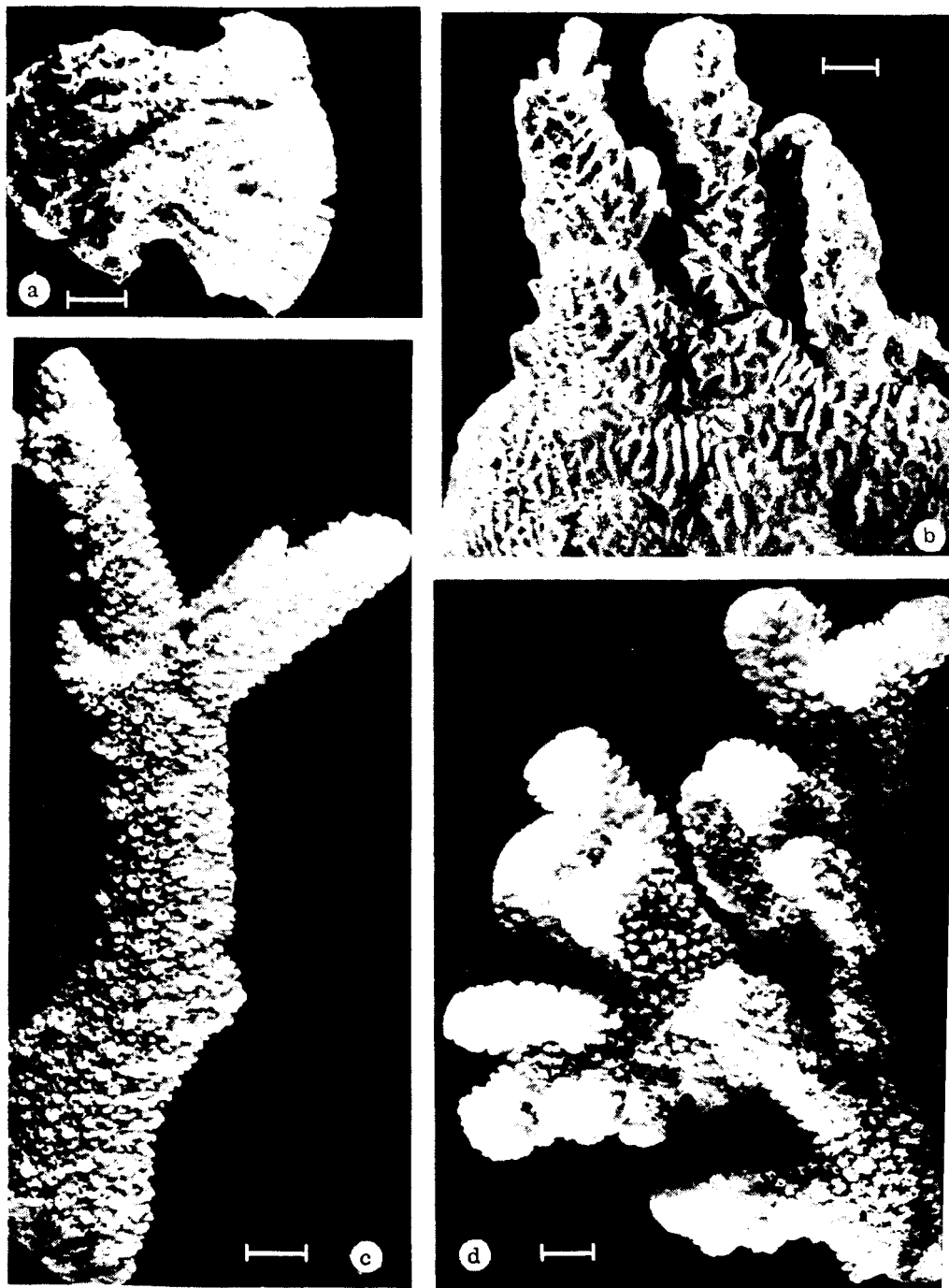


Figure 3: a *Pavona varians* (X2: 168-16) with encrusting base and expanding folia, from Pulau Perak  
 b *Pavona divaricata* (X2: 175-20), from Pulau Jarak  
 c *Acropora nobilis* (X2: 173-3), from Pulau Saga, Sembilan Islands  
 d *Pocillopora solida* (X2: 168-4), from Pulau Perak  
 (Scale: 1 cm)

Table I Corals from the Strait of Malacca collected during the Xarifa Expedition

NAME OF SPECIES	PULAU PERAK	SEMBILAN ISLANDS				PULAU JARAK Fringing reef at the SE coast.			SW Coast
		Channel between the two parts of Pulau Lalang	SW coast of the Pulau Saga.	Bay at the SW coast of Pulau Rumbia	3-6m	10m	15m		
	168	172	173	174	175	176	177	178	
Family Thamnasteriidae									
<i>Psammocora contigua</i>				x					
Family Pocilloporidae									
<i>Pocillopora damicornis</i>	x		x	x	x			x	
<i>P. brevicornis</i>	x								
<i>P. solida</i>	x								
<i>P. eydouxi</i>	x								
Family Acroporidae									
<i>Acropora formosa</i>					x				
<i>A. gravida</i>					x				
<i>A. nobilis</i>			x						
<i>A. tenuispicata</i>					x				
<i>Montipora venosa</i>					x				
<i>M. spumosa</i>					x				
<i>M. composita</i>					x				
<i>M. hispida</i>			x		x				
<i>M. foliosa</i>	x				x				
Family Agariciidae									
<i>Pavona lata</i>					x				
<i>P. divaricata</i>					x				
<i>P. duerdeni</i>	x								
<i>P. varians</i>	x				x				
Family Fungidae									
<i>Fungia fungites</i>	x						x		
Family Poritidae									
<i>Goniopora tenella</i>	x								
<i>Porites eridani</i>	x							x	
<i>P. compressa</i>			x		x				
<i>P. superfusa</i>					x				
<i>P. tenuis</i>			x		x				
<i>P. (Synaraea) iwayamaensis</i>			x		x				
Family Faviidae									
<i>Favites abdita</i>			x		x				
<i>Goniastrea retiformis</i>					x				
<i>G. pectinata</i>			x						
<i>Platygyra lamellina</i> var. <i>astraeiformis</i>		x			x				
<i>Hydnophora microconos</i>					x				
<i>Diploastrea heliopera</i>					x				
<i>Leptastrea transversa</i>					x				
Family Rhizangiidae									
<i>Culicia rubeola</i>					x				
Family Merulinidae									
<i>Merulina ampliata</i>	x								
Family Mussidae									
<i>Symphylia recta</i>					x				
Family Caryophyllidae									
<i>Pterogyra sinuosa</i>	x								
Family Dendrophylliidae									
<i>Dendrophyllia arbuscula</i>	x						x		
<i>Tubastraea aurea</i>	x						x		

While 25 species were found at the southeast of the Pulau Jarak only 3 are found at its southwest, two of them being common.

None of the species is new to science. All of them are common Indo-Pacific forms and the fauna is not much different from the known East Indian coral fauna. One of the species viz. *Pocillopora solida*, is of interest, since it was known previously only from Tahiti. The known distribution of *P. eridani*, *P. superfusa* and *P. tenuis* is extended westward up to the Strait of Malacca.

#### IV. SYSTEMATICS

Order SCLERACTINIA Bourne, 1900  
Suborder ASTROCOENIINA Vaughan and Wells, 1943  
Family THAMNASTERIIDAE Vaughan and Wells, 1943

Genus *Psammocora* Dana, 1846  
*Psammocora contigua* (Esper, 1797)

*Psammocora contigua*; Gardiner, 1905, p. 951 (synonymy). Horst, 1921, p. 32. Hoffmeister, 1925, p. 45, pl. 5, figs. 1a, 1b, 2a, 2b. Faustino, 1927, p. 211, pl. 70, figs. 1, 2. Yabe, Sugiyama and Eguchi, 1936, p. 59, pl. 44, figs. 5, 6, 8; pl. 45, figs. 2, 3, 6. Umbgrove, 1939, p. 51; 1940, p. 299. Nemenzo, 1955, p. 23, pl. 5, figs. 1, 3. Searle, 1956, p. 16, pl. 11, fig. B.

The species is represented by three specimens in the collection. There is considerable coalascens of branches at the distal parts. The calices are superficial and are arranged in irregular longitudinal rows. Major septa only slightly thickened at the distal ends, but fundamentally they are club-shaped. Columella an upright style.

*Material examined*: X2: 174-2, X2: 174-6(1,2); Pulau Rumbia, Sembilan Islands.

*Distribution*: Madagascar; Seychelles; Maldives; Minicoy; Southeast India (Gravely, 1927); Andamans (Pillai, 1972); Strait of Malacca; Singapore; East Indies; Philippines; Palau Islands; Marshall Islands; Funafuti; Ellice Islands; Fiji; Samoa. Solomon Islands (Pillai and Stoddart, pers. comm.).

Family POCILLOPORIDAE Gray, 1842

Genus *Pocillopora* Lamarck, 1816  
*Pocillopora damicornis* (Linnaeus, 1758)

*Pocillopora damicornis*; Hoffmeister, 1925, p. 15, pl. 1, fig. 1 (synonymy). Wells, 1954, p. 412, pl. 99, fig. 2; 1972, p. 184. Stephenson and Wells, 1956, p. 11. Squires, 1959, p. 408, pl. 34, fig. 2. Nemenzo, 1964, p. 212, pl. 8, figs. 1, 2. Durham, 1962, p. 47, ?fig. 9.

*Pocillopora lacera* Verrill; Durham and Bernard, 1952, p. 20, pl. 1, fig. 4. (synonymy).

*Pocillopora favosa* (Ehrenberg); Klunzinger, 1879, pt. 2, p. 68, pl. 7, fig. 2; pl. 8, fig. 10 (synonymy). Rosi, 1954, p. 30.

There is a good suite of specimens of this common species in the collection. All the specimens seem to be referable to var. *bulbosa* as defined by Hoffmeister (1925). A comparative study of large number of specimens from the Red Sea and other parts of the Indian and Pacific Oceans has indicated that *Pocillopora favosa* is only a skeletal variant of *P. damicornis* (Scheer and Pillai, 1974).

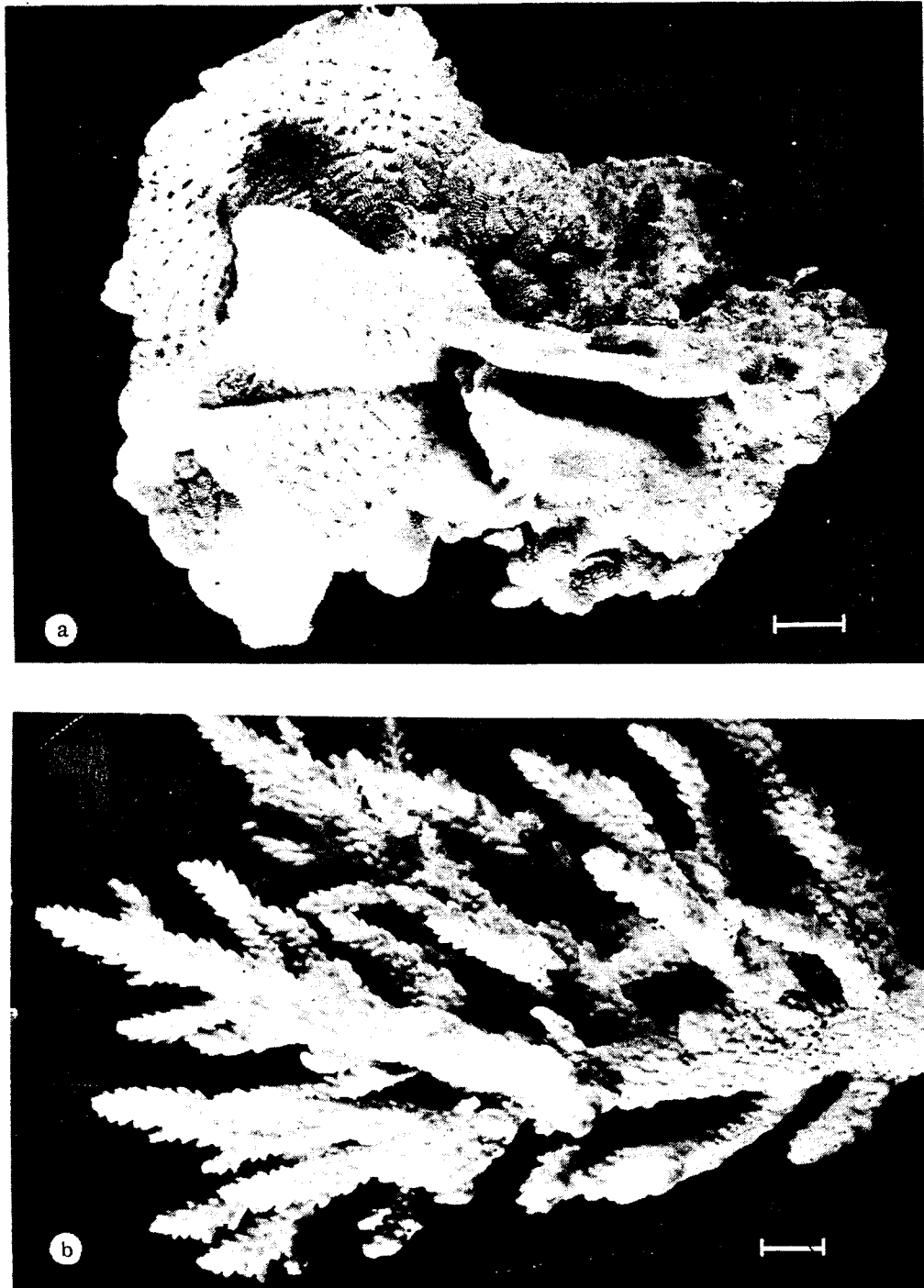


Figure 4: a *Pavona lata* (X2: 175-8) from Pulau Jarak  
b *Acropora tenuispicata* (X2: 175-5) from Pulau Jarak  
(Scale: 1 cm)

*Material examined:* X2:168-3 (1-4); Pulau Perak; X2:173-4, 173-5, Pulau Saga, Sembilan Islands; X:174-7, Pulau Rambia, Sembilan Islands; X:175-17, 175-18, Pulau Jarak; X2:178-4, Pulau Jarak, western side.

*Distribution:* Red Sea eastward to Gulf of California. A widely distributed and common Indo-Pacific species found in all reefs, often in abundance.

***Pocillopora brevicornis* Lamarck, 1816**

*Pocillopora brevicornis:* Dana, 1846, p. 526, pl. 49, fig. 8. Hoffmeister, 1925, p. 17, pl. 1, fig. 2. Wells, 1954, p. 413, pl. 98, figs. 1, 2. Nemenzo, 1964, p. 211, pl. 7, fig. 2.

One specimen is low, cespitose, even-topped as described by Hoffmeister (1925) and evidently belongs to this species. The branches are about 2.5 cm long, 2 to 3 cm broad at the top. Verrucae are present all over the branches, they are crowded, 2 to 3 mm thick and long, ascending. Septa and columella poorly represented.

*Material examined:* X2:168-7, Pulau Perak.

*Distribution:* Ceylon (Ortmann, 1889); Andamans (Pillai, 1972); Strait of Malacca; Philippines; East Indies; Fiji; Samoa; Hawaii.

***Pocillopora solida* Quelch, 1886**

(Figs. 3d, 7e)

*Pocillopora solida* Quelch, 1886, p. 67, pl. 1, figs. 4-4d.

Corallum subarborescent, branches much divided. Top-most branchlets 2-3 cm long; 1-1.5 cm broad; 10-12 mm thick. Apices generally devoid of verrucae. Verrucae at the sides of the branches close together or up to 4 mm apart. Majority of the verrucae are spreading, some at right angles to the branch surface. Calices on the verrucae rounded, 1-1.5 mm in diameter, moderately deep. At the basal parts of the branches the calices are smaller. At the underside of the branches where the verrucae are poorly developed the calices are very conspicuous and are about 1 mm deep. Generally 3 to 6 calices are present on an average sized verruca. Septa and columella poorly developed, mostly absent.

The coenenchymal ornamentation comprises of prominent spines. Just near the wall there is a row of spines, the base slightly invading the calicular fossa, simulating septal ridges. Between the two rows of spines of the adjacent calices there is usually another set so that the intercalicular area is supplied with three rows of spines.

*Material examined:* X2:168-4, Pulau Perak.

*Distribution:* Malacca Strait; Tahiti. This seems to be the first record of this species outside the type locality.

*Remarks:* One of us (Pillai) has examined the type of *P. solida* housed in the British Museum Natural History, London. The present specimen displays no noteworthy variation from the type. *Pocillopora molokensis* Vaughan, 1907 (Type locality, Hawaii) is very near to this species. The authors have recently examined specimens referable to *P. molokensis* from the Maldives and will discuss its relationship with *P. solida* in a subsequent publication. Both the species have a similar growth form except for the thicker and swollen apices of *P. solida*. The major difference between the two is the comparatively larger number of calices (8 to 12) per verruca in *P. molokensis*. In short *P. solida* has larger calices and more feebly developed septa than *P. molokensis*. More material is needed to accurately determine whether or not these two species represent growth forms of a single species.

***Pocillopora eydouxi* Milne Edwards and Haime, 1860**

*Pocillopora eydouxi* Milne Edwards and Haime, 1860, p.306, pl. F4, fig. 1a. Vaughan, 1918, p.79, pl.24, figs. 1, 2, 2a. Yabe, Sugiyama and Eguchi, 1936, p.13, pl.2, fig. 5; pl.4, fig.2; pl.6, figs. 4, 5; pl.7, figs.4-6. Umbgrove, 1939, p.22: 1940, p.273, pl.21, figs. 3, 4, 8. Crossland, 1952, p.112, pl.1, fig.2. Wells, 1954, p.414, pl.98, figs. 3, 4; pl.99, fig. 1. *Pocillopora madumanensis* Vaughan, 1907, p.93, pl.17, figs. 1, 1a. (Cited after Wells, 1954).

X2: 178-2 is an entire colony 17 cm in greater spread. The branches are meandering and are upto 13 cm broad. The thickness of the branches about 10 mm. The growing tips scarcely have any verruca. The verrucae at the sides of the branches are spreading and of uniform size.

Septa and columella are seen in the older calices situated at the basal parts of the corallum. In X2: 168-9 the verrucae are somewhat ascending, 2 mm in length and width. The septa and columella in this specimen are well developed. A third specimen in the collection (X2: 178-3) is a branch 15 cm long and 12 cm broad. The verrucae are larger than in the other two and are up to 4 mm in length. Septa and columella very prominent, the latter looking like grains to the naked eye. In many instances the directive septa fuse with each other over the columella.

*Material examined:* X2: 168-9, Pulau Perak; X2: 178-, 178-3, Pulau Jarak.

*Distribution:* Aldabra (Rosen, 1971 in Barnes, et al); Maldives (Wells and Davies, 1966); Minicoy (Pillai, 1971); Gulf of Mannar (Pillai, 1971a);

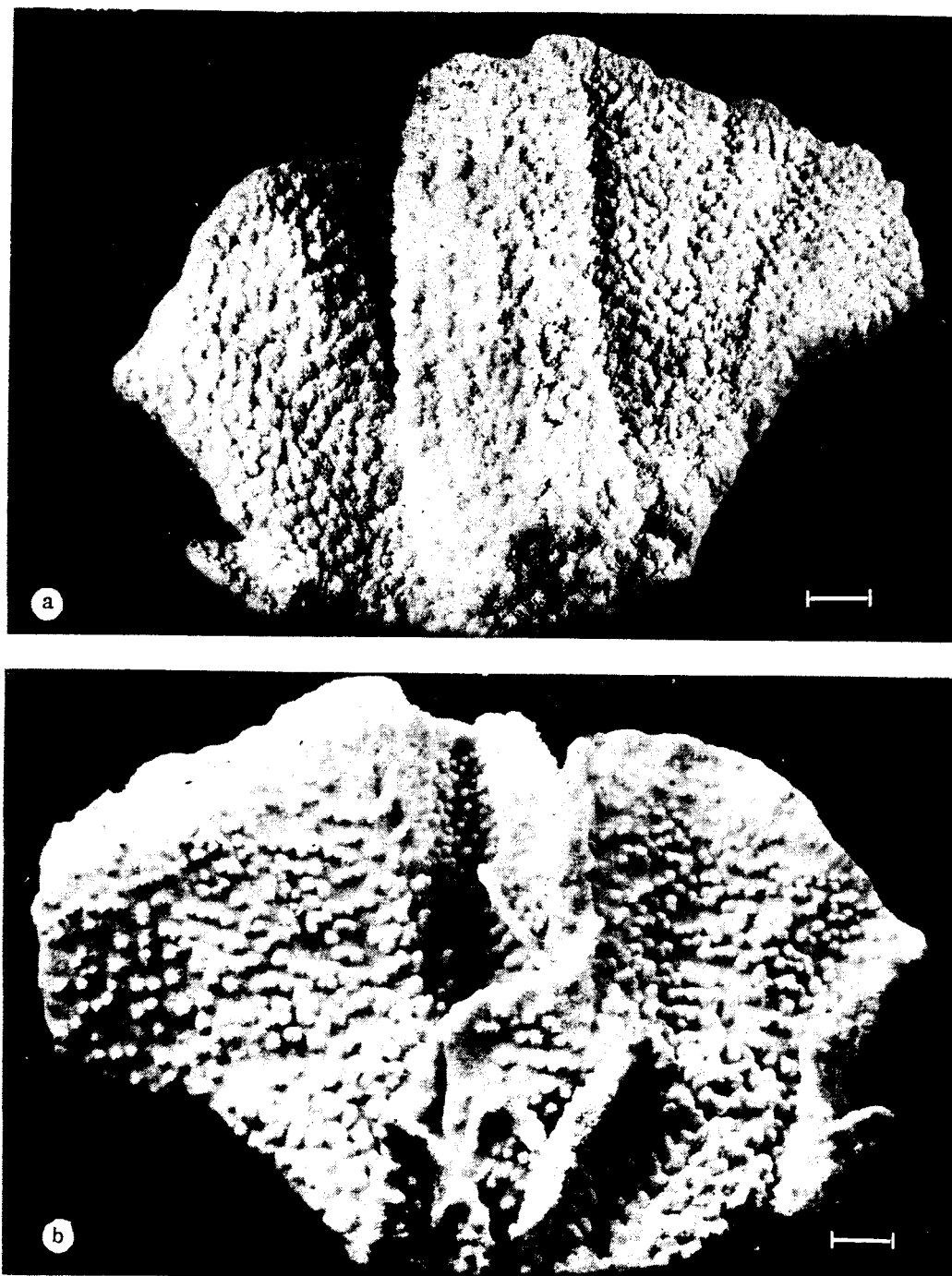


Figure 5: a *Montipora composita* (X2: 175-11) from Pulau Jarak, calicinal side  
b The same underside.

(Scale: 1 cm)



Nicobars (Scheer and Pillai, 1974); Strait of Malacca; Djakarta; Philippines; Great Barrier Reef; Togián Islands; Solomon Islands (Pillai and Stoddart, pers. comm); Marshall Islands; Cocos-Keeling Islands; Loyalty Islands; Funafuti; Rotuma; Samoa; Hawaii.

## Family ACROPORIDAE Verrill, 1902

### Genus *Acropora* Oken, 1815

Brook (1893) in his Catalogue of the Madreporaria (*Acropora*) reported the occurrence of six species of *Acropora*, viz. *A. hebes*, *A. polymorpha*, *A. rousseauii*, *A. tubulosa*, *A. cardus*, and *A. confraga* in the Strait of Malacca. None of the above mentioned species is represented in the present collection, but we have before us four species that are not previously known from this area. There are consequently 10 species now known from the Strait. One expects a large number of species from this area, in view of the several species of the genus occurring in the vicinity and it is probable that further collecting will increase the number recorded.

### *Acropora formosa* (Dana, 1846)

*Madrepora formosa* Dana, 1846, p.473, pl.31, fig.2; pl.38, fig.4. Brook, 1893, p.43.

*Acropora formosa*: Hoffmeister, 1925, p.55, pl.8, figs. 1, 2a, 2b, 3a (synonymy); 1929, p.363. Wells, 1950, p.35; 1954, p.415; pl.102, figs. 1-9; pl.103, figs. 1-5; pl.104, figs. 1, 2. Nemenzo, 1967, p.61, pl.21, fig. 3.

*Acropora nobilis*: Wells, 1954, p.416, pl.104, figs. 1, 2. (non Dana).

One arborescent clump (X2: 175-4) undoubtedly belongs to this species. The radial corallites are ascending, 1 to 1.5 mm in thickness, 4 to 4.5 mm in length. There are two other small fragments in the collection which probably belong to this species. The radial corallites in these specimens are about 2 mm in thickness and are spreading to nearly 80 deg.

**Material examined:** X2: 175-4, 175-36, 175-37. Pulau Jarak, southeastern side.

**Distribution:** East coast of Africa (Talbot, 1965); Madagascar (Pichon, 1964); Maldives; Minicoy (Pillai, 1971); Southeast India (Pillai, 1972); Andamans (Pillai, 1972); Nicobars (Scheer and Pillai, 1974); Strait of Malacca; Sumatra; Amboina; Singapore; Cocos-Keeling Islands; Philippines; Great Barrier Reef; Solomon Islands; Marshall Islands; Fiji; Samoa; Tahiti; Tuamotu Archipelago.

### *Acropora grávida* (Dana, 1846)

*Madrepora grávida* Dana, 1846, p. 470. Milne Edwards, 1860, p. 137. Studer, 1880, p. 18. Brook, 1893, p. 59.

*Acropora grávida*; Nemenzo, 1967, p. 107, pl. 31, fig. 3.

*Acropora vermiculata* Nemenzo, 1967, p. 104, pl. 31, fig. 4.

The two specimens available agree entirely with Brook's (1893) redescription of Dana's *Madrepora grávida*. Nemenzo (1967) described this species from the Philippine waters. Scheer and Pillai (1974) give details of specimens of this species collected at Nicobar Islands.

**Material examined:** X2: 175-6, 175-12, Pulau Jarak.

**Distribution:** Nicobar Islands; Strait of Malacca; Singapore; Celebes; (Umbgrove, 1940); Philippines.

**Remarks:** *Acropora affinis* (Brook) is very similar to this species. It seems that in *A. affinis* the ramificuli are found all over the stems, while in *A. grávida* the undersides of the branches are devoid of ramificuli and supplied with only nariform corallites. Further, in *A. affinis* the radial corallites are said to be shorter, stouter and more spreading than in *A. grávida* (In the present specimens of *grávida* they are at 45 deg.). In *A. affinis* according to Brook's statements the septa are poorly developed while in *A. grávida* a star of 12 well developed septa is present. But Crossland (1952) remarks that his specimens of *A. affinis* have well developed septa. It is likely that *A. grávida*, *A. affinis* and *A. brachyclados* are all one and the same. They all occur in the mid Indo-Pacific. Reasons for merging *A. vermiculata* Nemenzo with *A. grávida* are given elsewhere (Scheer and Pillai, 1974).

### *Acropora nobilis* (Dana, 1846)

(Fig. 3c)

*Madrepora nobilis* Dana, 1846, p. 481, pl. 40, fig. 3. Brook, 1893, p. 135.

*Acropora nobilis*: Hoffmeister, 1925, p. 59, pl. 11, figs. 1, 2. Nemenzo, 1967, p. 62, pl. 21, fig. 5.

*Madrepora secunda* Brook, 1893, p. 30 (synonymy).

An arborescent clump is placed under this species. It has a total height of 15 cm. The main branch is 2.8 cm at the broken end. The tip of branchlets are obtuse. Axial corallites, 4 mm in diameter, thick-walled with 12 septa. Radial corallites, halftubular, lamellate and subimmersed, all mixed together. At the distal parts of the branches the radials are ascending, lower down spreading. Larger halftubular radials 1.5 to 1.75 mm in

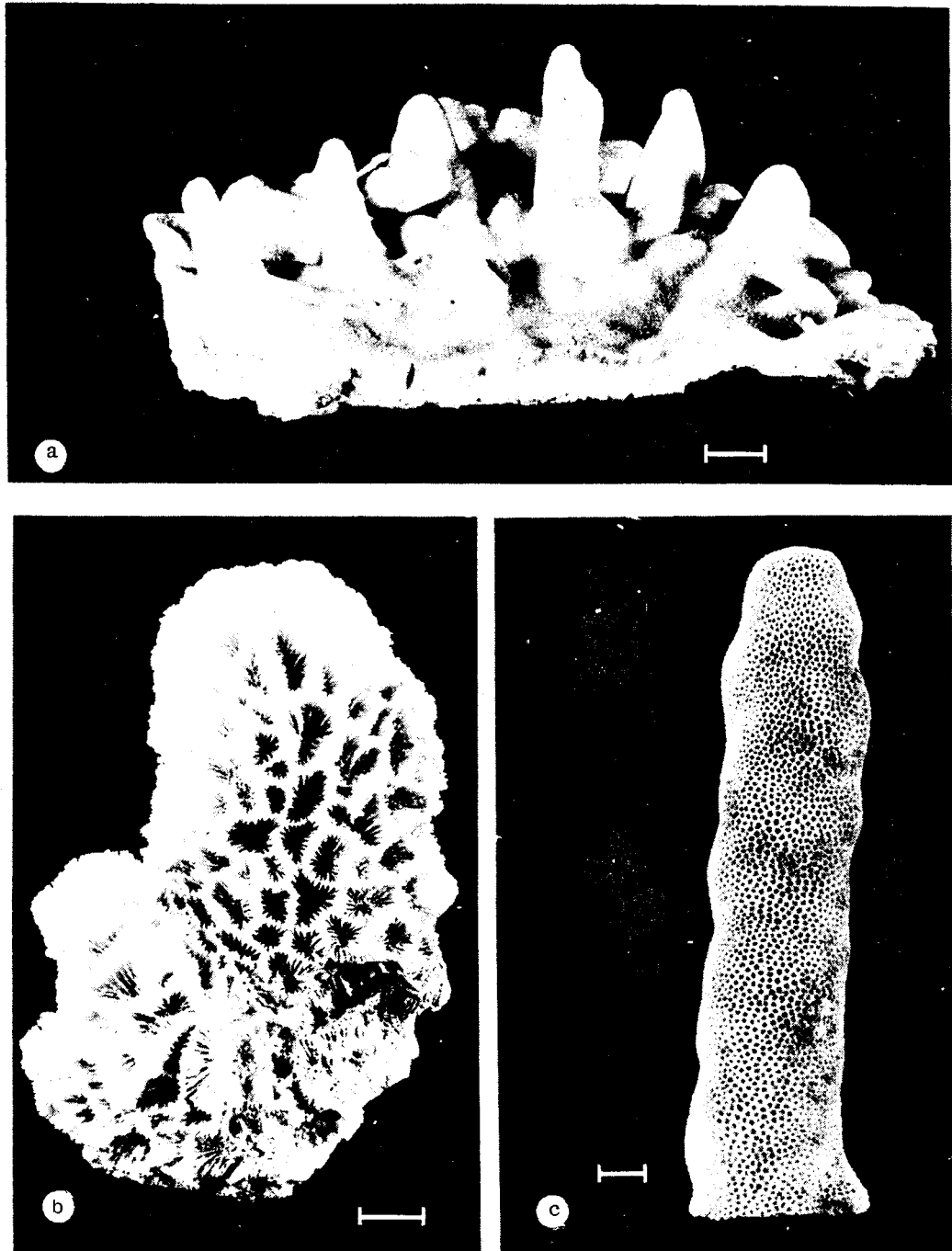


Figure 6: a *Porites eridani* (X2: 168-1) from Pulau Perak  
b *Platygyra lamellina* var. *astraeformis* (X2: 175-22) from Pulau Jarak  
c *Porites compressa* (X2: 178-1) from Pulau Jarak  
(Scale: 1 cm)

diameter, 2 to 3 mm long. A few of them have buds. Mostly the radials have 12 well developed septa.

*Material examined:* X2: 173-3, Pulau Saga, Sembilan Islands.

*Distribution:* Ceylon; Gulf of Mannar (Pillai, 1971a); Andamans (Pillai, 1972); Strait of Malacca; Singapore; China Sea; Philippines; Great Barrier Reef; Samoa.

#### *Acropora tenuispicata* (Studer, 1880)

(Fig. 4b)

*Madrepora tenuispicata* Studer, 1880, p.20, figs. 1a, 1b. Brook, 1893, p. 96

The only published figures of this species are those of Studer's woodcuts, which according to Brook (1893) do not give a good idea of the species. However, the present specimens are nearer to *A. tenuispicata* (Studer) than to any other known. The following are the details of the present specimens.

Corallum corymbose with a narrow pedicel. Main branches prostrate with occasional coalescens. Underside of the main branches with small branchlets. The space between the branchlets is supplied with subimmersed and verruciform corallites. Branchlets on the upperside, 4 to 6 cm long, their apices with proliferations. Tips slightly tapering. Axial corallites 1.5 to 2 mm in diameter, upto 2 mm exsert; opening rounded or oval; wall thin. Septa 12. Radial corallites ascending, tubular, innerwall less developed than the outer; 1.5 mm thick, 3 to 4 mm long, wall thin, outer wall a little curved up. Opening oval, oblique. Towards the basal parts of the branches the radials are appressed and verruciform. A few larger radials are proliferous. Primary cycle of septa well developed, the directives being the largest. Second cycle of septa of varying numbers, the cycle is rarely complete. Wall striated with serial, minute echinulation. Surface coenenchyme, echinulate, echinulations in the form of small plates. Corallum dense in section.

*Material examined:* X2: 175-3, 175-5, Pulau Jarak, southeastern side.

*Distribution:* Strait of Malacca; Singapore.

*Remarks:* The arrangements of the radial corallites in the present specimens have some similarity to those of certain thin stemmed forms of *A. variabilis* from the Red Sea. The nature of echinulation is also the same. But the axial corallites are thicker in *A. variabilis*. Further, the radial corallites are more appressed in the present than in *A.*

*variabilis*. Some very robust specimens of *Acropora hyacinthus* forma *cytherea* exhibit a similar facies to the present specimens and their relationship needs further investigation.

#### Genus *Montipora* Quoy and Gaimard, 1830

##### Papillate species

#### *Montipora venosa* (Ehrenberg, 1834)

*Montipora venosa:* Bernard, 1897, p. 69, pl. 32, fig. 15 (synonymy). Vaughan, 1918, p. 153, pl. 63, fig. 3. Hoffmeister, 1925, p. 50, pl. 6, figs. 2a, 2b. Crossland, 1952, p. 188, pl. 26, fig. 5; pl. 27, fig. 5; pl. 28, fig. 7. Wells, 1954, p. 436. Stephenson and Wells, 1956, p. 23. Pillai, 1969, p. 419.

This species is present in the collection in the form of a small chip broken off from a larger corallum. The calices are conspicuous with 12 septa and a rudimentary columella. The papillae in size and nature agree to Bernard's description.

*Material examined:* X2: 175-39, Pulau Jarak, southern side.

*Distribution:* Red Sea; Gulf of Mannar; Strait of Malacca; Amboina; Great Barrier Reef; Marshall Islands; Fiji, Samoa.

#### *Montipora spumosa* (Lamarck, 1816)

*Montipora spumosa:* Bernard, 1897, p. 71, pl. 8, fig. 1; pl. 11; pl. 32, fig. 16. Bedot, 1907, p. 277, pl. 48, figs. 267-270. Vaughan, 1918, p. 154, pl. 63, figs. 2, 2a. Wells, 1950, p. 41. Pillai, 1969, p. 419.

Corallum encrusting with the upperside rising into several small gibbositities. Papillae more or less 1 mm in height and thickness. They are more prominent on gibbositities than on the level parts of the corallum. The intercorallite areas on the base are mostly devoid of papillae. The calices are 0.75 mm diameter, a diameter apart. Primary septa thick, almost reaching the centre of the axial fossa. Second cycle of septa smaller.

*Material examined:* X2: 175-15, Pulau Jarak.

*Distribution:* Southeast India; Strait of Malacca; Cocos-Keeling Island; Great Barrier Reef; Tongatabu.

##### Tuberculate species

#### *Montipora composita* Crossland, 1952

(Fig. 5a, b)

*Montipora composita* Crossland, 1952, p.195, pl.28, figs. 1, 5; pl.29, figs. 1, 3, 4. Wells, 1954, p.439, pl.148, figs. 4, 5; pl.150, figs. 1-3. Pillai, 1969, p.421.

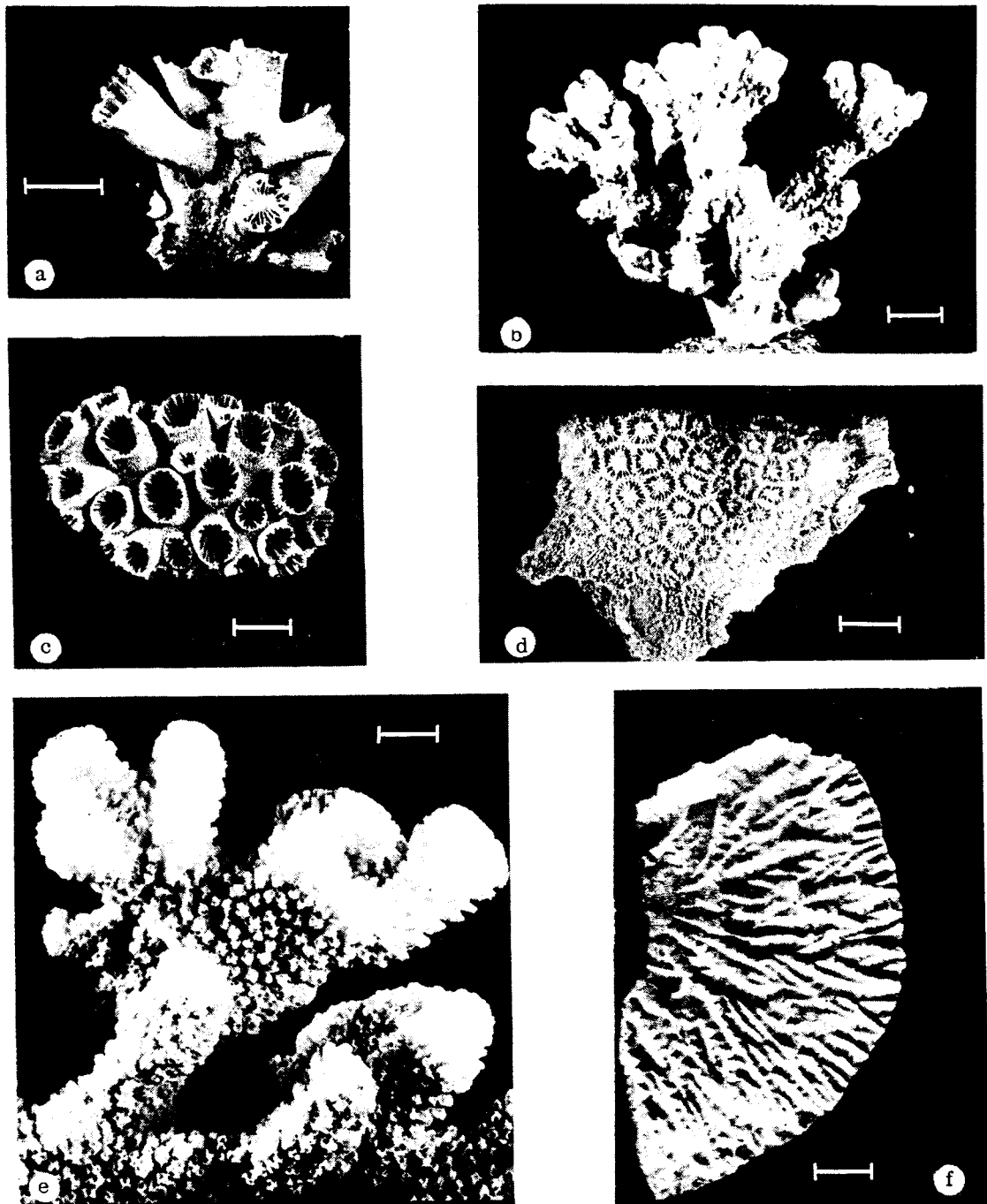


Figure 7: a *Dendrophyllia arbuscula* (X2: 176-4) from Pulau Jarak  
 b *Porites* (*Synaraea*) *iwayamaensis* (X2: 175-23) from Pulau Jarak  
 c *Tubastraea aurea* (X2: 168-8(2)) from Pulau Perak  
 d *Goniopora tenella* (X2: 168-12) from Pulau Perak  
 e *Pocillopora solida*, part of the specimen in Plate I, fig. 4  
 f *Pavona varians* (X2: 168-15) from Pulau Perak  
 (Scale: 1 cm)

A frond represents this species. It measures 14 cm in width at the growing edge. The underside of the corallum possesses several verruciform or conical elevations about 2 mm thick and 2 to 4 mm in height. The tip of the projections have small calices with degenerate septa. The tubercles on the upperside unite to form warts typical of the species. Individual tubercles round-topped or flattened. The calicular and septal characters agree to Crossland's (1952) original description. Large calices about 1 mm in diameter with two cycles of septa, the primaries being larger.

*Material examined:* X2: 175-11, Pulau Jarak.

*Distribution:* Southeast India; Strait of Malacca; Great Barrier Reef; Marshall Islands. Red Sea (Wells in Loya and Slobodkin, 1971).

#### *Montipora hispida* (Dana, 1846)

*Montipora hispida*; Bernard, 1897, p.134, pl.26; Pl.34, fig. 4 (synonymy). Nemenzo, 1967, p.25.

The identity of the small specimens available is in doubt. They are all pieces from encrusting corallum or coralla. The usual upward branch like growth has not taken place probably due to the young condition of the coral at the time of collection.

As pointed by Vaughan (1918, p.157), the three tuberculate species, *M. hispida*, *M. informis* and *M. stellata* are very close to each other. *M. stellata* according to Vaughan (1918) is probably based on the basal encrustation of *M. informis*. One of us (Pillai) has examined the type of *M. informis* and certain specimens identified by Bernard as belonging to *M. hispida*. These two superficially differ, the ridges formed by the fusion of tubercles of *M. hispida* being very prominent. According to Bernard (1897) the tubercles of *M. hispida* stand a little away from the corallite wall, while in *M. informis* they are almost over the wall. In the present specimens, in some cases the tubercles are found a little away from the wall or they are almost touching the wall. It is hard to believe that this suite of specimens is a mixture of two species. The calices are 0.75 mm in diameter, the primary cycle of septa is very well developed, the directives often meeting each other. The septal condition is almost similar to Vaughan's (1918) specimens of *M. informis*. Bernard (1897) recorded *M. hispida* from the Strait of Malacca and it is probable that the present specimens are the same species. It is only a possibility that *M. informis* is a synonymy of *M. hispida*.

*Material examined:* X2: 173-7 (a-c); Pulau Saga, Sembilan Islands. X2: 175-13 (a-c), Pulau Jarak.

*Distribution:* Strait of Malacca; Singapore; Philippines.

#### *Montipora foliosa* (Pallas, 1766)

*Montipora foliosa*; Bernard, 1897, p. 158, pl. 30; pl. 34, fig. 13 (synonymy). Vaughan, 1918, p. 159, pl. 65, figs. 2, 2a, 2b. Faustino, 1927, p. 254, pl. 82 figs. 1-3. Thiel, 1932, p. 115, pl. 20, fig. 3. Umbgrove, 1939, p. 55. Wells, 1950, p. 42. Crossland, 1952, p. 194. Nemenzo, 1967, p. 42.

A few species of a foliaceous corallum or coralla represents this species.

*Material examined:* X2: 168-10 (a,b), Pulau Perak; X2: 175-7, Pulau Jarak.

*Distribution:* Western Indian Ocean eastward to New Hebrides.

Suborder FUNGIINA Verrill, 1865  
Superfamily AGARICIICAE Gray, 1847  
Family AGARICIIDAE Gray, 1847

Genus *Pavona* Lamarck, 1801  
*Pavona lata* Dana, 1846

(Fig. 4a)

*Pavona lata* Dana, 1846, p.330, pl. 23, fig. 1. Horst, 1921, p. 22. Matthai, 1924, p. 54, pl. 7, fig. 6; pl. 8, fig. 1. Nemenzo, 1955, pl.5.

Corallum frondose, bifacial. Fronds up to 8 cm broad, 5 mm thick at the growing tips; adjacent ones undergo fusion at the top. Carina absent. Calices in irregular rows. Larger calices elongated, 3 to 5 mm long and 2 mm broad. Smaller calices rounded. Ambulacra flat, distance between adjacent rows of calices about 3 mm. Septocostae alternating in thickness and elevation; edges serrated. Columella moderately developed, elongated in the longitudinal axis of the corallites.

*Material examined:* X2: 175-8, Pulau Jarak.

*Distribution:* Rodriguez; Andamans; Mergui Archipelago; Strait of Malacca; Philippines; Fiji.

*Remarks:* *P. decussata* and *P. lata* have almost similar growth forms and calicular characters. In *lata* carina is absent, while in *P. decussata* it might be moderately developed. It is yet to be ascertained whether this distinction is of real specific value.

*Pavona divaricata* (Lamarck, 1816)

(Fig. 3b)

*Pavona divaricata*; Matthai, 1924, p. 55 (synonymy). Hoffmeister, 1925, p. 38, pl. 2, figs. 3a-3b. Yabe, Sugiyama and Eguchi, 1936, p. 56, pl. 40, fig. 4.

*Lophoseris divaricata*; Ortmann, 1889, p. 513.  
*Tichoseris angulosa* Ortmann, 1889, p. 515, pl. 14, fig. 1.

One of the specimens (X2: 175-20) has an encrusting base from which branches (3 to 4 cm long and 2 cm broad) arise. Calices are in short series in between valleys of collines. X2: 175-40 is a frond 5.5 cm long and 4 cm broad.

**Material examined:** X2: 175-20, 175-40, Pulau Jerak.

**Distribution:** Gulf of Mannar (Pillai, 1971a); Ceylon; Strait of Malacca; Singapore; Australia; Marshall Islands; Wakaya; Rotuma; Fiji; Tongatabu, Samoa.

#### ***Pavona duerdeni* Vaughan, 1907**

*Pavona duerdeni* Vaughan, 1907, p. 135, pl. 38, figs. 2, 2a, 3. Crossland, 1952, p. 163.  
*Pavona clavus*; Horst, 1922, p. 420, pl. 31, fig. 7. Wells, 1954, p. 441, pl. 152, figs. 1, 2. Scheer, 1964, p. 458. (non Dana).  
*Pavona maldivensis*; Yabe, Sugiyama and Eguchi, 1936, p. 57, pl. 58, figs. 4, 5. (non Gardiner).

The reason for the above synonymy is discussed elsewhere (Scheer and Pillai, 1974). The synonymy of *P. clavus* Dana and *P. maldivensis* (Gardiner) with *P. duerdeni* Vaughan (Horst, 1922) is not considered valid by the present authors. One specimen before us is a massive corallum. The calices are rounded, about 1.5 mm in diameter with 12 to 18 septa. The distinction between major and minor septa is very slight.

**Material examined:** X2: 168-6, Pulau Perak.

**Distribution:** Abd-el-Kuri; Seychelles; Maldives; Minicoy; Nicobars; Strait of Malacca; Great Barrier Reef; Daito Island; Caroline Islands; Palau Islands; Marshall Islands; Hawaii.

#### ***Pavona varians* Verrill, 1864**

(Figs. 3d, 7f)

*Pavona varians* Verrill, 1864, p. 55. Horst, 1921, p. 25. Yabe, Sugiyama and Eguchi, 1936, p. 57, pl. 58, fig. 6. Crossland, 1952, p. 162, pl. 14, fig. 4. Wells, 1954, p. 442, pl. 152, figs. 3, 4. Stephenson and Wells, 1956, p. 24.

One of the present specimens is a foliaceous growth (Fig. 7f) the underside with ridges and furrows similar to some specimens of *Merulina ampliata*. The specimen is more or less similar to the one figured by Matthai (1948) in his plate 12, fig. 46.

**Material examined:** X2: 168-16 and 168-16, Pulau Perak; X2: 175-29, Pulau Jarak.

**Distribution:** Red Sea, throughout Indo-Pacific up to Columbia.

Superfamily FUNGIICAE Dana, 1846  
 Family FUNGIIDAE Dana, 1846

#### ***Fungia* (Fungia) fungites (Linnaeus, 1758)**

*Fungia fungites*: Döderlein, 1902, p. 136, pls. 20-25 (synonymy). Vaughan, 1918, p. 127. Boschma, 1925, p. 220, pl. 7, fig. 73. Hoffmeister, 1925, p. 33. Faustino, 1927, p. 183, pl. 58, fig. 1; pl. 59, figs. 1-4. Thiel, 1932, p. 69. Umbgrove, 1939, p. 44; 1940, p. 294. Yabe and Sugiyama, 1941, p. 80, pl. 77, figs. 2-3b; pl. 78. Crossland, 1952, p. 153. Wells, 1954, p. 448, pls. 158-160.

**Material examined:** X2: 168-11, Pulau Perak, X2: 177-1, 177-2, 177-3 and 177-4, Pulau Jarak.

**Distribution:** Red Sea eastward to Samoa, but does not seem to occur on the shallow fringing reefs of Palk Bay and Gulf of Mannar along the eastern coast of India.

Superfamily PORITICAE Gray, 1842  
 Family PORITIDAE Gray, 1842

Genus *Goniopora* de Blainville, 1830  
*Goniopora tenella* (Quelch, 1886)

(Fig. 7d)

*Tichopora tenella* Quelch, 1886, p. 189, pl. 11, figs. 1, 1a.  
*Goniopora tenella*: Faustino, 1927, p. 283, pl. 95, figs. 1, 2. Nemenzo, 1955, p. 50, pl. 9, fig. 5.  
*Goniopora* "philippines(4)" Bernard, 1903, p. 67, pl. 4, fig. 9.  
 The present specimen is only part of a corallum. It is explanate with a convex upperside and is about 1 cm in thickness. It is highly porous. Corallites polygonal, calices oval or circular as clearly illustrated by Quelch (1886). Wall 0.5 mm in thickness. Diameter of the calices 5-6 mm, very shallow. Septa 24, subequal, tertiaries join to the secondaries. Septa begin a little below the submit of the wall, edges with 2 to 3 teeth. Six pali are seen around or above the columella. Columella very prominent, conical, projecting to the level of the wall, 3 to 3.5 mm in diameter.

**Material examined:** X2: 168-12, Pulau Perak.

**Distribution:** Red Sea (Wells, in Loya and Slobodkin, 1971); Strait of Malacca; Philippines.

**Remarks:** The type locality of this species is Philippines. Faustino (1927) recorded it and reproduced Quelch's original figures. Nemenzo (1955) describes additional material from the Philippines waters, but his specimens have smaller calices and a different look than those of the type.

**Genus Porites Link, 1807**  
**Porites eridani Umbgrove, 1940**

(Fig. 6c)

*Porites* "North West Australia 8" Bernard, 1905, p.157, pl.23, fig.9; pl.35, fig.5.

*Porites eridani* Umbgrove, 1940, p.306, pl.33, fig.4; pl.35, fig.2.

The present specimen agrees to Umbgrove's (1940) analysis of the characters of this species in: (1) growth shape: explanate and encrusting with thin sharp edges; (2) small mammillate processes and branches rising from the undulate uppersurface; (3) small calices with very deep fossa; (4) short and thick septa; (5) a conspicuous ring of five principal frosted pali; (6) central columella tubercle absent; (7) the concentrically striated lower surface of the corallum" (Umbgrove, 1940, p.306).

The present specimen has a greater diameter of 14 cm. Thickness of the base about 9 mm. The upperside has 8 branches. Branches curved, tapering to the tip or blunt; length up to 3 cm, thickness 10 to 12 mm. Diameter of the calices about 1 mm.

*Material examined:* X2: 168-1, Pulau Perak.

*Distribution:* Strait of Malacca; Northwest Australia; Celebes.

**Porites compressa Dana, 1846**

(Fig. 6c)

*Porites compressa* Dana, 1846, p.553, pl.53, figs. 5, 5a Vaughan, 1907, p.174 (several figures). Nemenzo, 1955, p.31. Pillai, 1967, pl.1, fig.3.

Two thick, cylindrical branches, one with a slightly flattened tip and two broken tips are available. One branch has a total height of 16 cm with a basal diameter of 3.5 cm. The other is 5 cm high. Calices polygonal, septa begin a little below the top of the wall. Five pali dominant. The species is highly variable.

*Material examined:* X2: 173-8, Pulau Saga; Sembilan Islands; X2: 175-32 and 175-35, Pulau Jarak; X2: 178-1, Pulau Jarak.

*Distribution:* Gulf of Mannar; Strait of Malacca; Philippines; Palau Islands (Eguchi, 1938); Hawaii.

**Porites ?superfusa Gardiner, 1898**

*Porites superfusa*; Wells, 1954, p.454, pl.169, figs. 1-4 (synonymy).

*Porites* "Ellice Islands 2" Bernard, 1905, p.64, pl.5, fig.3; pl.13, fig.15.

There are two small nodular specimens of *Porites* in the collection which agree to Wells' figures and description of the present species. The up-

persurface of both the coralla rises into small rounded gibbosities, 1 to 1.5 cm in height and thickness. The calices are rounded, deep.

*Material examined:* X2: 175-31, 175-33, Pulau Jarak.

*Distribution:* Strait of Malacca; Marshall Islands; Ellice Islands.

**Porites tenuis Verrill, 1866**

*Porites tenuis*; Vaughan, 1907, p.212, pl.90, figs. 1-1a (synonymy). Faustino, 1927, p.297, pl.99, figs. 1-2. Eguchi, 1938, p.386. Nemenzo, 1955, p.41.

There is a good suite of massive *Porites* in the present collection. The specimens agree to Vaughan's analysis of Verrill's species. A recent good description of this species is given by Nemenzo (1955).

*Material examined:* X2: 172-1, Pulau Lalong, Sembilan Islands; X2: 173-6, Pulau Saga, Sembilan Islands; X2: 174-5(1,2), Pulau Rumbia, Sembilan Islands; X2: 175-25, 175-26, 175-27 and 175-38, Pulau Jarak.

*Distribution:* Strait of Malacca; Philippines; Ryukyu Islands; China Sea; Palau Islands; Hawaii.

**Subgenus Synaraea Verrill, 1864**

**Porites (Synaraea) iwayamaensis Eguchi, 1938**

(Fig. 7b)

*Porites iwayamaensis* Eguchi, 1938, p.385. Wells, 1954, p.455, pl.170, figs. 3-5 (synonymy).

*Porites* "Caroline Islands (4) 3" Bernard, 1905, p.94, pl.9, fig.5; pl.12, figs. 1, 2, 3.

Corallum branching, branches undergoing fusion. Tips of branches flattened or rounded, lower parts dead. Calices 0.5 mm in diameter. Five to six prominent pali present. Surface looks echinulate under the lens.

Some specimens of branching *Synaraea*, probably *S. convexa* from the Maldives have a similar appearance to the present species. It is possible that *S. convexa*, *S. iwayamaensis* and *S. irregularis* are all ecological variants of one and the same species.

*Material examined:* X2: 175-10(a, b); 175-21, 175-23, Pulau Jarak.

*Distribution:* Aldabra (Rosen in Barnes *et al.*, 1971); Strait of Malacca; Caroline Islands; Palau Islands; Marshall Islands.

Suborder FAVIINA Vaughan and Wells, 1943  
 Superfamily FAVIICAE Gregory, 1900  
 Family FAVIINAE Gregory, 1900

Genus *Favites* Link, 1807  
*Favites abdita* (Ellis and Solander, 1786)

*Favia abdita*: Matthai, 1914, p.91, pl.9, fig.5; pl.29, figs. 1-4; pl.35, fig. 2 (synonymy).

*Favites abdita*: Yabe, Sugiyama and Eguchi, 1936, p. 31, pl.22, figs. 3, 4 (synonymy). Stephenson and Wells, 1956, p.31. Nemenzo, 1959, p.94, pl.7, fig.1.

**Material examined:** X2:173-1, 173-2, Pulau Saga, Sembilan Islands; X2:174-4 (1, 2), Pulau Rumbia, Sembilan Islands.

**Distribution:** Red Sea eastward to Samoa and Cook Islands (Stoddart and Pillai, 1973).

Genus *Goniastrea* Milne Edwards and Haime, 1848  
*Goniastrea retiformis* (Lamarck, 1816)

*Goniastrea retiformis*: Matthai, 1914, p.118, pl.31, figs. 1-5; pl.33, fig.3; pl.38, figs. 2,4 (synonymy). Hoffmeister, 1925, p.26. Crossland, 1952, p.133. Wells, 1954, p.461.

*Goniastrea solida* Matthai, 1914, p. 117, pl.28, figs. 3,4; pl.31, fig.6; pl.33, fig.4; pl.38, fig.3 (synonymy). Nemenzo, 1959, p.98.

*Goniastrea parvistella* Vaughan, 1918, p.114, pl.44, figs. 2, 2a. The present specimen is typical as described by Matthai (1914). The polygonal corallites are 3 mm in length. Wall about 0.5 mm in thickness. 8-11 septa are larger than the others and bear well developed paliform lobes.

**Material examined:** X2:174-3, Pulau Rumbia, Sembilan Islands.

**Distribution:** Red Sea and then eastward to Samoa.

*Goniastrea pectinata* (Ehrenberg, 1834)

*Astrea pectinata* Ehrenberg, 1834, p.96.

*Goniastrea pectinata*: Matthai, 1914, p.120, pl.28, fig.6; pl.37, fig.1 (synonymy). Chevalier, 1971, p.246, pl.27, figs. 3, 4; pl.30; pl.31, fig.6; pl.32, figs. 1, 2. Wijsman Best, 1972, p.41, pl.9, figs. 1, 2, 3.

*Goniastrea planulata* Matthai, 1914, p.121, pl.28, fig.5; pl.31, figs. 7, 8 (synonymy).

*Goniastrea mantoniae* Crossland, 1952, p.136, pl.7, figs. 1, 2. Nemenzo, 1959, p. 101, pl. 9, fig. 2.

*Goniastrea equisepta* Nemenzo, 1959, p.101, pl.10, fig.1.

Corallum encrusting, greater diameter 11 cm. Corallites, either single or sometimes meandering. Single corallites about 5 mm in length and 4 mm in width. Wall less than 0.5 mm in thickness.

**Material examined:** X2: 173-9, Pulau Saga, Sembilan Islands.

**Distribution:** Red Sea, throughout Indo-Pacific as far east as Samoa. Recently Stoddart and Pillai (1973) have recorded this species from the Cook Islands.

Genus *Platygyra* Ehrenberg, 1834  
*Platygyra lamellina* (Ehrenberg, 1834)

(Fig. 6 b)

*Meandra (Platygyra) lamellina* Ehrenberg, 1834, p.323

*Platygyra lamellina*: Stephenson and Wells, 1956 (synonymy).

*Favia astriformis* Matthai, 1928, p.276, pl.44, figs. 2a, 2b; pl.45, fig.1.

There are three specimens in the present collection. The growth form is massive with hillocks. X2: 175-34 and X2: 175-22 are columnar growths broken off from a corallum. X2:172-2 is a massive compressed column, again part of a corallum. In all the specimens the corallites are mostly monostomodaeal, 8-10 mm. long and 6-7 mm broad and 7-8 mm deep. A few distomodaeal corallites are up to 15 mm. long. The present specimens are referable to var. *astraeformis*.

**Material examined:** X2: 172-2, Pulau Lalong, Sembilan Islands; X2:175-22, 175-34, Pulau Jarak.

**Distribution:** A widely distributed species from Red Sea to Tuamotu Archipelago (Chevalier, et al, 1968).

Genus *Hydnophora* Fischer de Waldheim, 1807  
*Hydnophora microconos* (Lamarck, 1816)

*Hydnophora microconos*: Matthai, 1928, p.144, pl.2, figs. 8, 9; pl. 16, figs. 5-9; pl.17, figs. 1, 2, 4-6; pl.49, fig. 5 (synonymy). Yabe, Sugiyama and Eguchi, 1936, p.40, pl.32, fig. 5. Umbgrove, 1939, p. 34; 1940, p.284. Crossland, 1952, p.151. Wells 1954, p.462. Nemenzo, 1959, p.104, pl.11, fig. 2. Scheer, 1964a, p.461.

One of the specimens (X2:174-1) is typical. The monticules are 2 to 3 mm. in height and thickness with rounded top. In a second specimen (X2: 175-14) the monticules are conical with pointed tips. They are 2-3 mm. thick at the base and are up to 4 mm. in height. Occasionally the monticules run together, especially at the periphery of the base, thus grading towards *H. exesa*. Columella well developed in both the specimens.

**Material examined:** X2: 174-1, Pulau Rumbia, Sembilan Islands; X2:175-14, Pulau Jarak.

**Distribution:** Red Sea; Madagascar (Pichon, 1964); Maldives; Laccadives; Chagos; Gulf of



Mannar and Palk Bay along the Indian coast; Nicobars; Mergui Archipelago; Strait of Malacca; East Indies; Celebes; Philippines; Great Barrier Reef; Palau Islands; Caroline Islands; Marshall Islands; Solomon Islands; Ellice Islands; Fiji, Samoa; Cook Islands (Stoddart and Pillai, 1973).

Subfamily MONTASTREINAE Vaughan and Wells, 1943

Genus *Diploastrea* Matthai, 1914  
*Diploastrea helipora* (Lamarck, 1816)

*Diploastrea helipora*; Matthai, 1914, p.72, pl.20, figs. 7, 8; pl.34, fig. 9 (synonymy). Vaughan, 1918, p.143, pl.59, figs. 5, 5a, Yabe, Sugiyama and Eguchi, 1936, p.54, pl.11, figs. 5, 6. Crossland, 1952, p.166. Wells, 1954, p.464 Scheer, 1964b, p.618, fig. 10.

There are three specimens of this easily identifiable species.

*Material examined*: X2: 175-1, 175-2 and 175-16, Pulau Jarak.

*Distribution*: Red Sea to Samoa but does not occur in Southeast India though abundant in Laccadives (Minicoy).

Genus *Leptastrea* Milne Edwards and Haime, 1848

*Leptastrea transversa* Klunzinger, 1879

*Leptastrea transversa* Klunzinger, 1879 pt. 3, p. 46, pl. 6, figure 6. Vaughan, 1918, p. 94, pl. 31, figs. 1, 1a. Crossland, 1952, p. 115, pl. 54, fig. 1-3. Stephenson and Wells, 1956, p. 39 Scheer, 1964a, p. 461.

*Leptastrea transversa* Klunzinger, 1879 pt. 3, p. 46, pl. 6, fig. 1-3; pl. 17, fig. 4; pl. 18, fig. 1, 2; pl. 37 fig. 3 (synonymy).

*Material examined*: X2: 175-28, Pulau Jarak.

*Distribution*: Red Sea; Chagos; Maldives; Minicoy; Ceylon; Southeast coast of India; Nicobars (Scheer and Pillai, 1974); Mergui Archipelago; Strait of Malacca; Great Barrier Reef; Cook Islands (Stoddart and Pillai, 1974); Fanning Islands.

Family RHIZANGIIDAE d'Orbigny  
Genus *Culicia* Dana, 1846  
*Culicia rubeola* (Quoy and Gaimard, 1833)

*Culicia rubeola*; Milne Edwards and Haime, 1857, p. 607. Gravely, 1927, p. 46.

*Culicia rubeola*; Wells, 1950, p. 50; 1954, p. 464, pl. 185, figs. 3-6. Chevalier, 1971, p. 93, pl. 3, fig. 6. Pillai, 1972, p. 208.

This species is present in the collection in the form of two corallites attached to the underside of

a colony of *Symphyllia recta*. Both the corallites are 4.5 mm, in diameter and about 1 mm, in height. An epitheca reaches to the thecal rim. There are 28 septa each, the first cycle being very broad with entire edges; those of the higher cycles of septa being dentate. Septal sides granular. First and second cycle of septa reach the columella. Primary septa slightly exsert.

*Material examined*: Two corallites attached to X2: 175-9, Pulau Jarak.

*Distribution*: Red Sea (Klunzinger, 1879 as *C. cuticulata*); Gulf of Mannar; Strait of Malacca; Singapore; New Zealand; New Caledonia; Japan; Tuamotu Archipelago; Marshall Islands.

Family MERULINIDAE Verrill, 1866

Genus *Merulina* Ehrenberg, 1834

*Merulina ampliata* (Ellis and Solander, 1786)

*Madrepora ampliata* Ellis and Solander, 1786, p. 157, pl. 41, figs. 1, 2.

*Merulina ampliata*; Matthai, 1928, p. 127, pl. 1, figs. 4-6; pl. 13, figs. 1-8; pl. 59, figs. 3,4; pl. 67, fig. 3 (synonymy).

For further literature on this species, see Stephenson and Wells, 1956, p. 41. Part of a foliaceous corallum is placed under this species. The collines often rise into small protuberances. Underside of the folia with ridges and furrows and porous.

*Material examined*: X2: 168-2, Pulau Perak.

*Distribution*: Red Sea; Madagascar; Seychelles; Maldives; Minicoy; Gulf of Mannar; Singapore; Mergui Archipelago; Strait of Malacca; Java; Amboina; Great Barrier Reef; Philippines; Pulau Islands; Japan; Solomon Islands; Marshall Islands; Samoa.

Family MUSSIDAE Ortmann, 1890

Genus *Symphyllia* Milne Edwards and Haime, 1848

*Symphyllia recta* Dana, 1846

*Symphyllia recta*; Matthai, 1928, p. 227, pl. 30, figs. 1-6; pl. 31, figs. 1-2; pl. 48, figs. 4-6; pl. 57, figs. 1a-1b (synonymy). Yabe, Sugiyama and Eguchi, 1936, p. 46, pl. 31, fig. 4. Umbgrove, 1939, p. 37; 1940 p. 288. Crossland, 1952, p. 144, pl. 11, figs. 2, 3. Nemenzo, 1959, p. 132.

*Symphyllia nobilis* Wells, 1954, p. 466 (synonymy).

The present specimen is an overgrowth on a dead corallum of the same species. The living part is 20 cm long and 9 cm broad. The valleys are 20-22 mm broad and 12 mm deep. Collines about 7 mm thick with a faint middle groove. Length of

uninterrupted valleys up to 7 cm. Septa 12 to 13 per cm length of colline. Major septa nearly 1 mm in thickness at the top. Septal edges with 6 to 8 teeth.

*Material examined:* X2: 175-9, Pulau Jerak.

*Distribution:* Western Indian Ocean eastward to Samoa.

*Remarks:* In the details of the valleys and thinness of the septa the present specimen is very near to *S. valenciennesii* and *S. agaricia*. But in both *S. valenciennesii* and *S. agaricia* there is occasional presence of a second row of columella centres in a valley. As already pointed out by Umbgrove (1940) the four species of *Symphyllia* recognised by Matthai (1928) in his monograph may be only skeletal variation of a single species, or growth forms.

Suborder CARYOPHYLLIINA Vaughan and Wells, 1943

Superfamily CARYOPHYLLIICAE Gray, 1847

Family CARYOPHYLLIIDAE Gray, 1847

Subfamily EUSMILIINAE Milne Edwards and Haime, 1857

Genus *Plerogyra* Milne Edwards and Haime, 1848

*Plerogyra sinuosa* (Dana, 1846)

*Euphyllia sinuosa* Dana, 1846, p. 168.

*Plerogyra sinuosa*: Matthai, 1928, p. 184, pl. 40, fig. 3; pl. 41, fig. 3; pl. 42, fig. 6; pl. 47, fig. 5; pl. 48, fig. 8. Yabe, Sugiyama and Eguchi, 1936, p. 18, pl. 9, figs. 5, 6; pl. 11, fig. 4. Scheer, 1967, p. 433, fig. 13. Chevalier, 1971, p. 44, pl. 1, figs. 1, 5; pl. 11, fig. 2; pl. 37, figs. 3, 6.

*Plerogyra eurysepta* Nemenzo, 1960, p.212, pl. 2, fig. 2.

A single monostomodaeal corallite belongs to this species. The major septa are upto 8 mm exsert as in the variety *cultrifera* (Matthai, 1928). We have (Scheer and Pillai, 1974) discussed elsewhere our reasons for merging *P. eurysepta* with *P. sinuosa*.

*Material examined:* X2: 168-14, Pulau Perak.

*Distribution:* Red Sea; Madagascar; Chagos; Maldives; Nicobars (Scheer and Pillai, 1974); Strait of Malacca; Northwest Australia; Philippines; New Caledonia; Pulau Islands.

Suborder DENDROPHYLLIINA Vaughan and Wells, 1943

Family DENDROPHYLLIIDAE Gray, 1847

Genus *Dendrophyllia* de Blainville, 1830

*Dendrophyllia arbuscula* Horst, 1922

(Fig. 7a)

*Dendrophyllia arbuscula* Horst, 1922, p.53, pl. 8, fig. 6. Eguchi, 1968, p.C.55, pl. 21, figs. 5, 13.

There are seven specimens in the present collection that we refer to this species. They are all dendroid in growthform. The fully grown corallites are 8 to 9 mm in diameter at the top. The septal and other characters show not much variation from those given by Horst. A detailed description of this species, based on material from Nicobar Islands is given elsewhere. (Scheer and Pillai, 1974).

*Material examined:* X2: 168-13(1,2), Pulau Perak; X2: 176-2(1,2), 176-3, 176,4, 176-6, 176-8(1, 2), 176-9, Pulau Jarak.

*Distribution:* Nicobars; Strait of Malacca; Banda Sea; Japan.

Genus *Tubastraea* Lesson, 1834

*Tubastraea aurea* (Quoy and Gaimard, 1833)

(Fig. 7c)

*Dendrophyllia aurea*: Horst, 1926, p.46, pl. 2, figs. 1,2,3,4,8,9 (synonymy).

*Tubastraea aurea*: Boschma, 1953, pp.100-119, pl. 9, figs. 5,6; pl. 10, figs. 2, 6; pl. 11, figs. 2, 4, 5, 6. Eguchi, 1968, p. C.16, pl. C.16, figs. 5, 6; pl. 17, fig. 17; pl. C.26, figs. 2, 3.

Seven specimens are identified with this species. They are plocoid. The adult corallites are 7 to 8 mm in diameter and 8 to 10 mm in height. The primary cycle of septa are slightly exsert with entire edges. There are four cycles of septa of which the first two join the columella. Columella trabecular, poorly developed. The higher cycles of septa undergo the typical dendrophylliid fusion. For relationship of this species to other members of the genus reference may be made to Boschma (1953).

*Material examined:* X2: 168-8(1,2); Pulau Perak; X2: 176-1, 176-5, 176-10, and 176-11, Pulau Jarak.

*Distribution:* Chagos; Maldives; Southeast India (Pillai, 1972); Strait of Malacca; Singapore; East Indies; Great Barrier Reef; Loyalty Islands; Japan; Fanning Islands; Hawaii; Galapagos; Gulf of California; Panama. Also Atlantic in Jamaica; Curacao; Puerto-Rico (as *T. tenuilamellosa*).

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