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NEW SCLERACTINIA FROM JAPAN AND OTHER INDO-WEST PACIFIC COUNTRIES

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Abstract. Twenty-four species belonging to 16 genera of hermatypic Scleractinia are named, described and illustrated. Nineteen species have been found in Japan and 13 are known from more than one Indo-West Pacific country. Three species of the genus *Euphyllia* cannot be separated from each other or from *E. glabrescens* by skeletal characters alone, and these are described primarily from characteristics of soft parts.

INTRODUCTION

Species described in this publication are from Japan, the Philippines, Australia, the Cocos (Keeling) Is., Papua New Guinea, Vanuatu and/or Cook Is. (the latter collected by G. Paulay) and are species that the author and his colleagues have referred to in publications about the corals of those countries. They all relate, either geographically or systematically, to species of the Philippines-Japan island chain and are thus only a small proportion of the species that have remained unidentified during these studies. The remainder, which include many additional Japanese species, may be described at a later date, but most require further field study and/or collection, or require further study of type specimens.

Thirteen of the 24 species described have been found in more than one country. Most of these were not described in earlier regional studies of the author and his colleagues, because they were insufficiently well known. In general, the distribution range of most species described in this study is likely to be very incomplete.

This study includes a description of three species of *Euphyllia* which have skeletons indistinguishable form *E. glabrescens*. Two of these, *E. paradivisa* and *E. paraancora* have soft parts which, respectively, are very similar to, or identical with *E. divisa* and *E. ancora*, which, themselves, are not separable by skeletal characters alone.

Holotypes are lodged with the Queensland Museum, Townsville Branch, Australia; numbers given are registration numbers of that museum. Other specimens are held by the Australian Institute of Marine Science. Unless otherwise indicated, *in situ* colour photographs are by the author and specimens collected by the author for regional distribution and taxonomic studies.

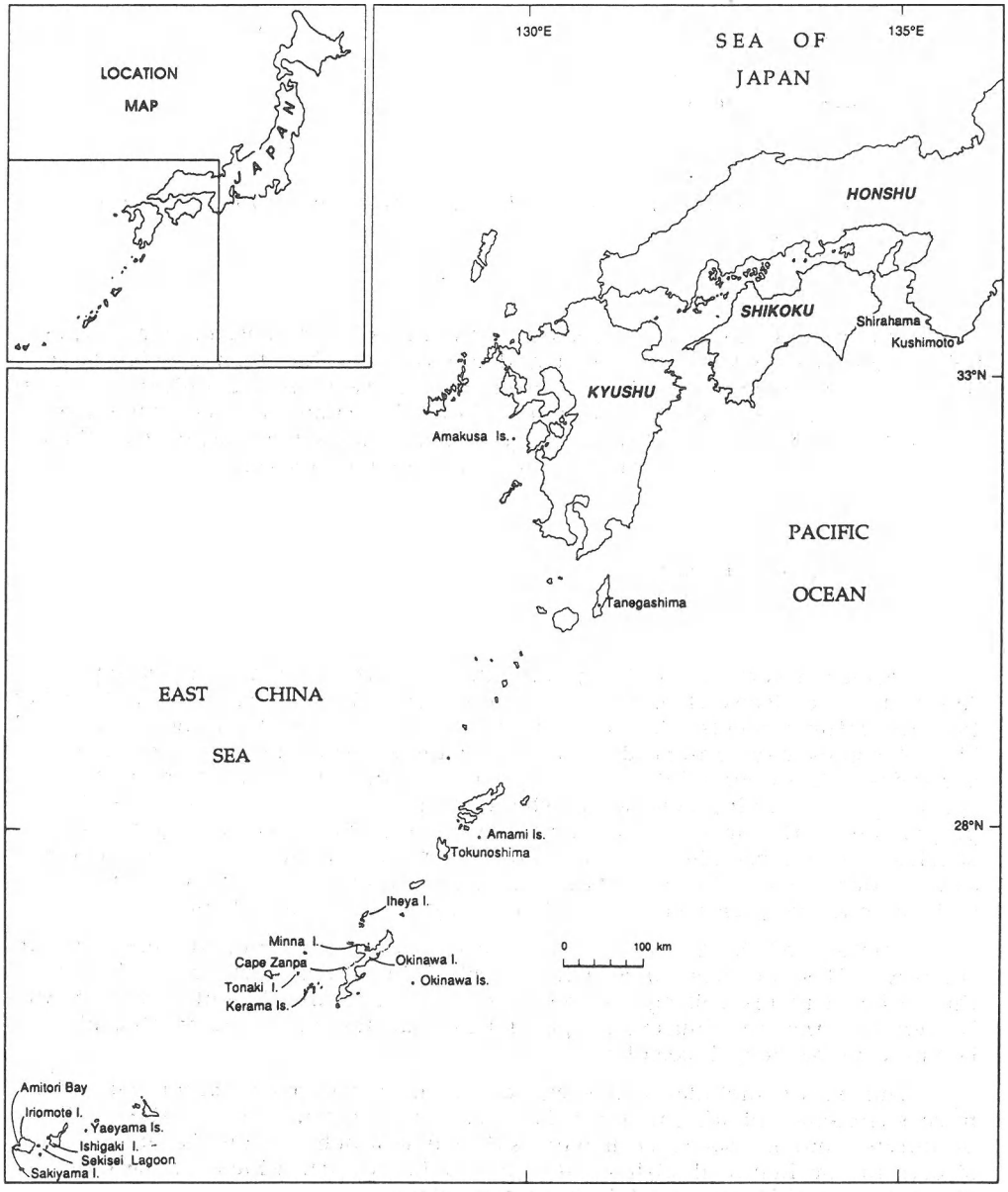

Fig. 1. Major place names of Japan cited in the text.

SYSTEMATICS

Family Astrocoeniidae Koby, 1890

Genus *Stylocoeniella* Yabe & Sugiyama, 1935a

Stylocoeniella cocosensis (Figs. 2 & 3)

Synonymy:

Stylocoeniella sp. Veron (1990)

Specimens

Cocos (Keeling) Is.: Direction I.
Japan: Sakiyama Bay, Iriomote I., Yaeyama Is., Ryukyus Is. (coll. M. Nishihira); Amitori Bay, Iriomote I., Yaeyama Is., Ryukyu Is. (2 specimens)

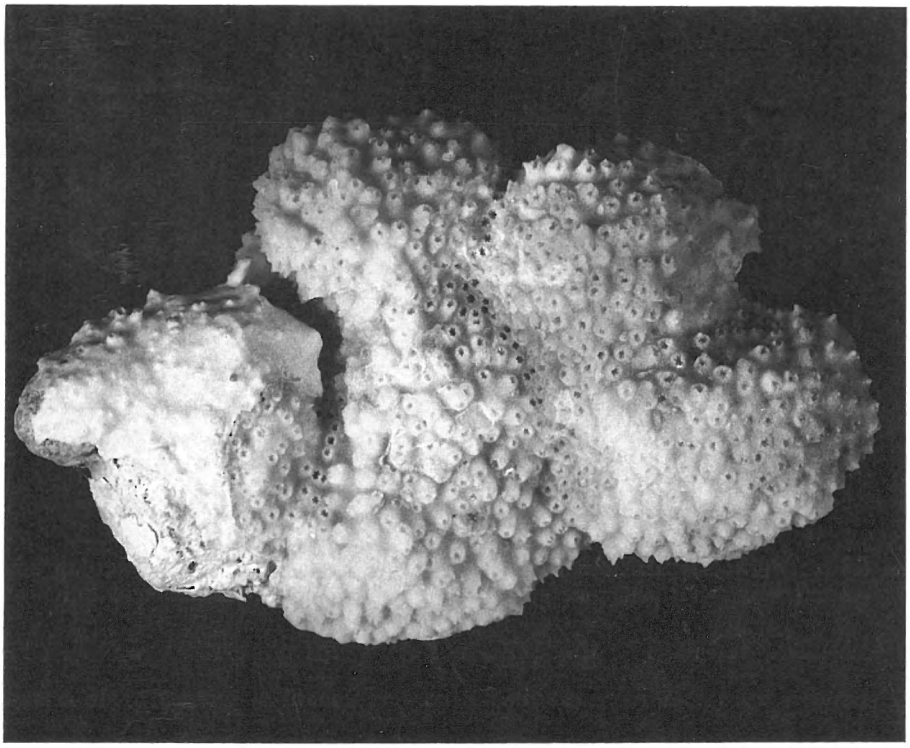

Fig. 2. Holotype of *Stylocoeniella cocosensis* (× 1.9).

Fig. 3. Holotype of *Stylocoeniella cocosensis* (× 8).

Description:

Coralla are encrusting and very cryptic. Corallites are irregular in size, shape and orientation are inclined on the corallum surface, 1.1-1.8 mm diameter, with calices 0.4-0.6 mm maximum diameter and are crowded, especially on convex surfaces. Calices are oval or crescent-shaped, depending on the degree of development of the associated style and degree of inclination on the corallum surface. The coenosteum is covered by spinules similar in size and appearance to those of other *Stylocoeniella*, except that their tips have *Palauastrea*-like elaborations. Most corallites on convex surfaces have style-like hoods. Septa are in two sub-equal cycles, <1/3 of the calice radius, slope steeply within the calice, and have highly granulated margins with rudimentary development of dentations (similar to septa of *S. armata* Ehrenberg, 1834). Psuedo-pali are weakly developed in some corallites. Columellae are weakly developed, highly granulated and are sometimes indistinct from the septal granules.

The only recorded colour is mottled cream and greenish-brown.

Etymology:

Named after Cocos (Keeling) Atoll where the species was first observed.

Holotype (G32473) (Figs. 2 & 3):

The holotype is 61.7 mm long by 38.8 mm wide, from Amitori Bay, Iriomote I., Yaeyama Is., Ryukyu Is. at approximately 15 m depth.

Distribution:

Known only from Cocos (Keeling) Atoll and the Yaeyama Is. of Japan.

Similar species:

There are four nominal *Stylocoeniella*: *guentheri* (Bassett-Smith, 1890), *armata*, *hanzawai* (Yabe & Sugiyama, 1933) and the present species. *Stylocoeniella hanzawai* is probably a junior synonym of *armata*. All three true species have very distinct skeletal characters making them readily identifiable and indicating that they are distantly related.

Family Acroporidae Verrill, 1902

Genus *Acropora* Oken, 1815

Acropora wallaceae (Figs. 4-6 & 71)

Synonymy:

Acropora (Acropora) sp.6 Veron & Wallace (1984)
Acropora sp.2 Veron & Hodgson (1988)

Specimens:

Great Barrier Reef: Britomart Reef and Rib Reef
Thailand: Ko Surin, Andaman Sea (3 specimens)
Philippines: Marine Science Institute, University of the Philippines
Japan: Kayama I., Sekisei Lagoon, Yaeyama Is., Ryukyu Is.;
Ginanotatejyan, Aka I., Kerama Is., Ryukyu Is.

Description:

Fully developed colonies are composed of upright branches which decrease in size in a regular pattern, each generation of sub-branches growing from the preceding generation in a regular manner and remaining distinct. Branches taper in a regular manner to small axial corallites. In Japan, colonies become sub-corymbose in shallow water.

'Radial corallites are immersed to 2.5 mm exsert, the latter being tubular, with rounded calices 0.9-1.0 mm diameter. Septa are irregular in size and shape, in two cycles up to 3/4 R (where R = the calice radius) and 1/4 R, the secondary cycle complete to absent. One or both directive septa are usually distinctive. Incipient axial corallites are usually proliferous. Axial corallites are <4.6 mm diameter, with calices 1.5 mm diameter. Septa are plate-like, sub-equal to 1/2 R and 1/4 R. Corallites are costate, separated by coarse coenosteum.' (Veron & Wallace, 1984, p.424).

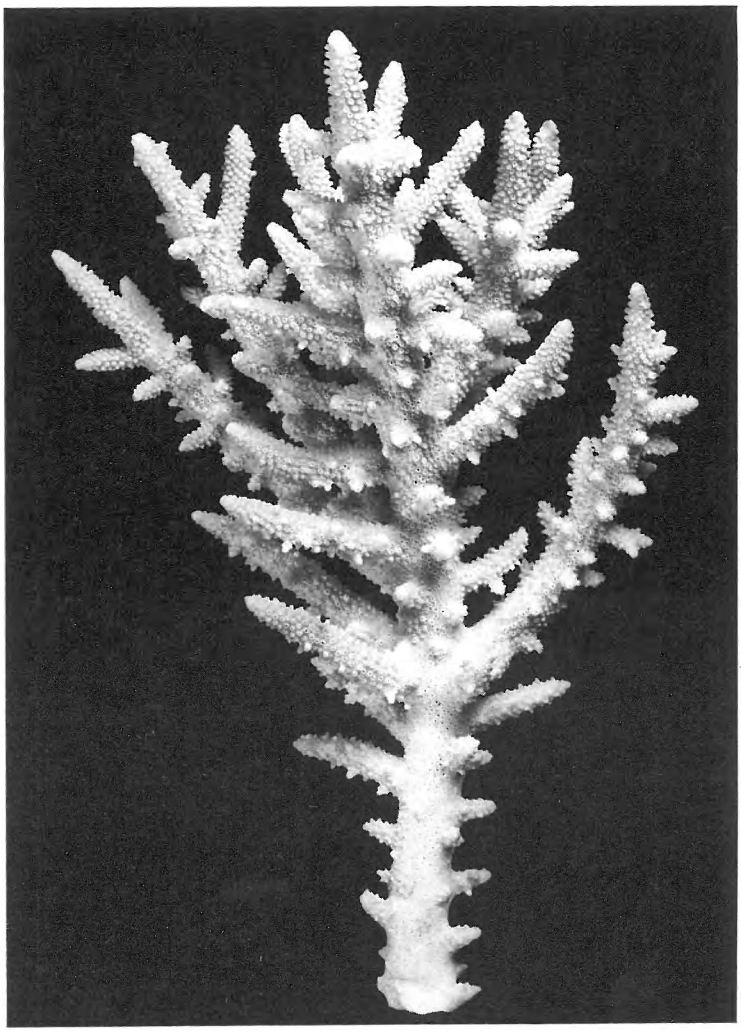

Fig. 4. Holotype of *Acropora wallaceae* (× 0.03).

The colour of living colonies in Japan is brown with yellowish radial corallites and cream, colonies are pale brown on the Great Barrier Reef.

Etymology:

Named after Carden Wallace, the authors's tutor in *Acropora* systematics.

Holotype (G32474) (Figs. 4 & 5):

Figured, Veron & Wallace (1984, p.423): and arborescent corallum 350 mm high with three generations of sub-branches from Rib Reef, Great-Barrier Reef at approximately 10 m depth.

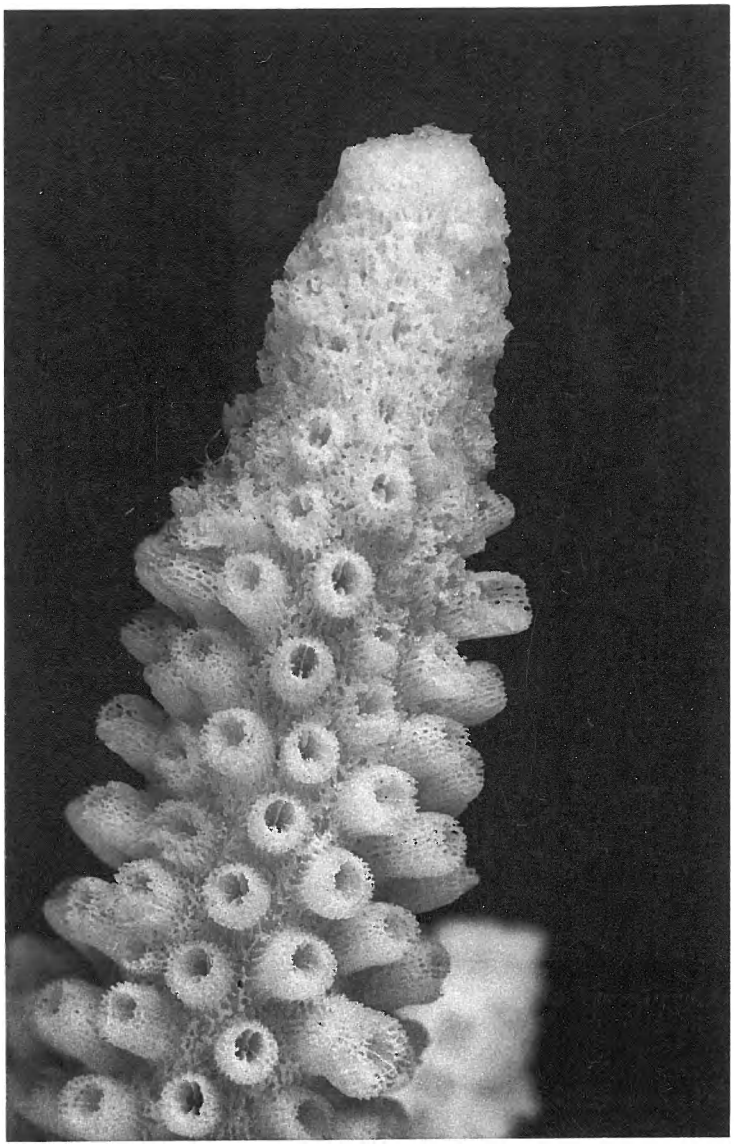

Fig. 5. Holotype of *Acropora wallaceae* (× 4).

Distribution:

Known from the Mergui Archipelago, Thailand (Fig. 6), the Great Barrier Reef, the Philippines and the Yaeyama and Okinawa Is. of Japan.

Similar species:

Affinities with *Acropora* are primarily with the '*florida* group' (Veron

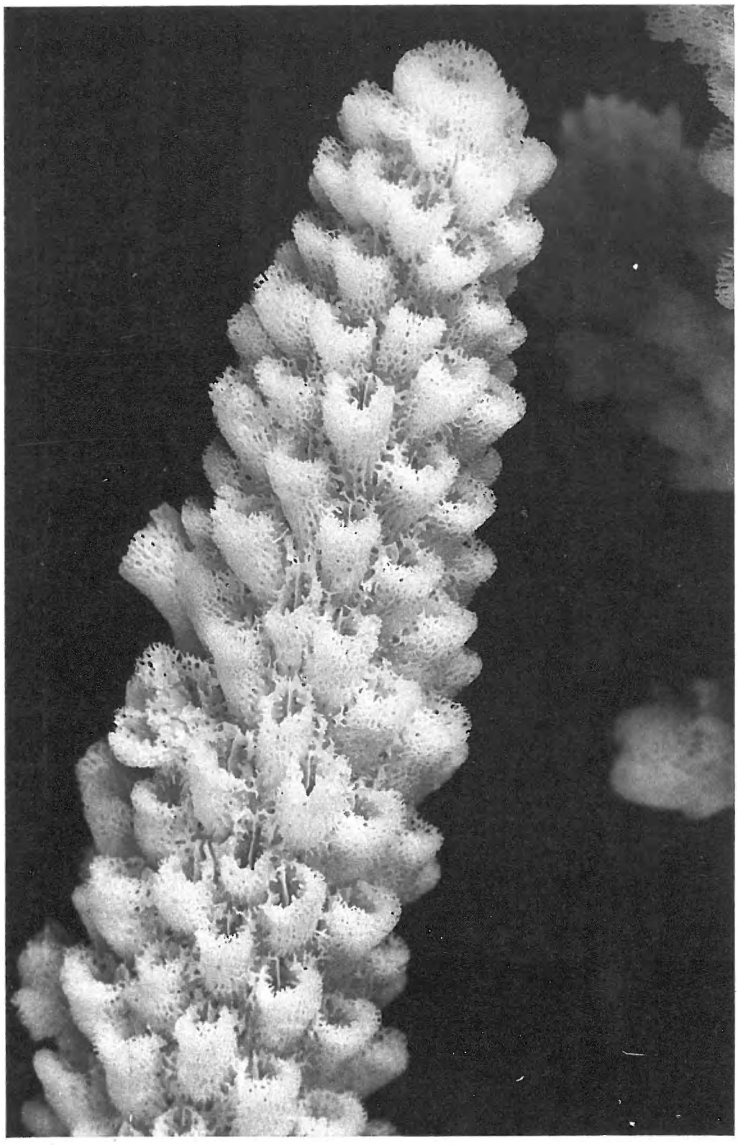

Fig. 6. *Acropora wallaceae* from the Mergui Arch., Thailand (× 4).

& Wallace, 1984), especially with *A. florida* (Dana, 1846) and *A. sarmentosa* (Brook, 1892).

Acropora akajimensis (Figs. 7-10)

Synonymy:

Not previously recorded.

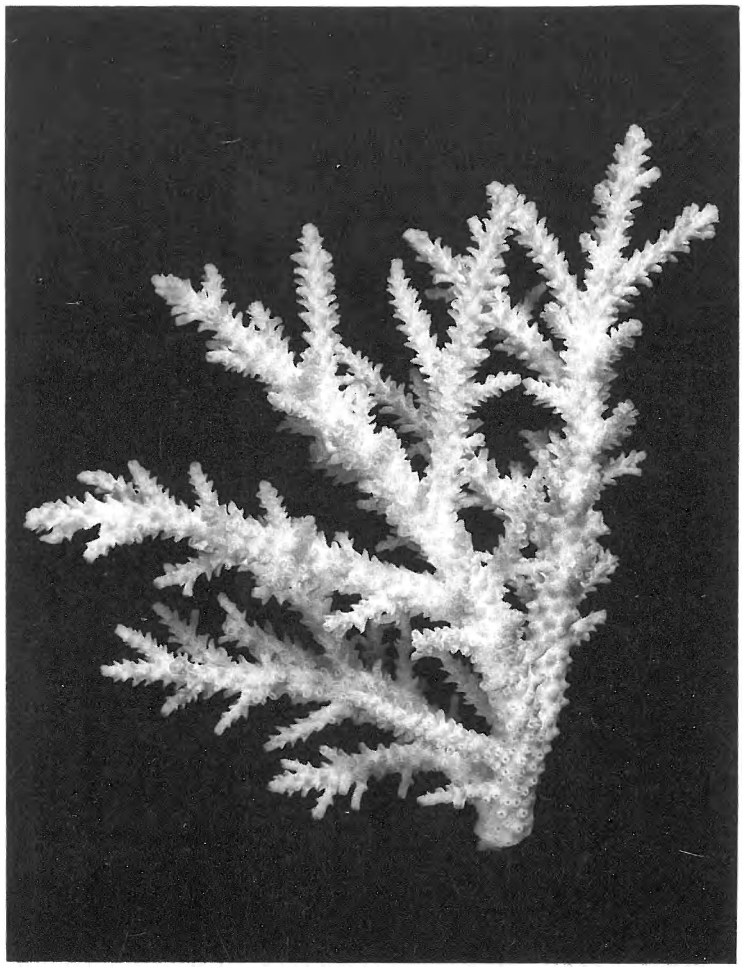

Fig. 7. Holotype of *Acropora akajimensis* (× 0.7).

Specimens:

Japan: Fukaji I., Kerama Is., Ryukyu Is.; Ginanotatejyan, Aka I., Kerama Is., Ryukyu Is.
Philippines: Danajou Bank, Cebu (2 specimens)

Description:

Colonies are irregularly arborescent with proliferous, occasionally anastomosing primarily horizontal branches giving a sprawling growth form. Axial corallites are 2.2-3.1 mm diameter, moderately exsert, with septa in two sub-equal cycles, with steeply plunging margins. Incipient axial corallites are abundant on the upper surface of horizontal branches. Radial corallites are exsert, tubular, fluted towards branch ends. On main

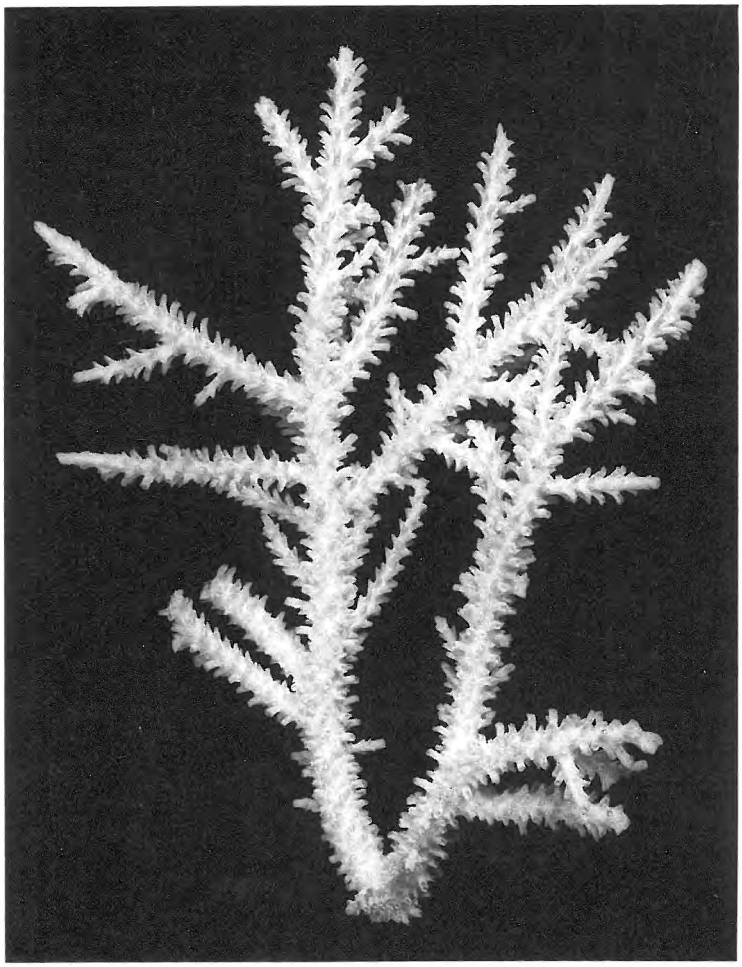

Fig. 8. *Acropora akajimensis* from Danajou Bank, Cebu, Philippines (× 0.7), same corallum as Fig. 10.

branches, corallites are of mixed sizes, almost immersed to appressed, with dimidiate openings. Primary setpa of older corallites almost reach the calice centre; secondary septa are usually less than 1/3 the calice radius. Corallites towards branch tips have progressively reduced development with no development of the second cycle in young fully formed corallites. The coenosteum is costate and coarse and the skeleton lightly calcified.

Probably uncommon or rare in the Philippines (not listed by Veron & Hodgson, 1988). Common on high diversity reef flats of the Kerama Is. of the Ryukyu Is.

Living colonies in Japan have a range of colours, predominantly blue and yellow.

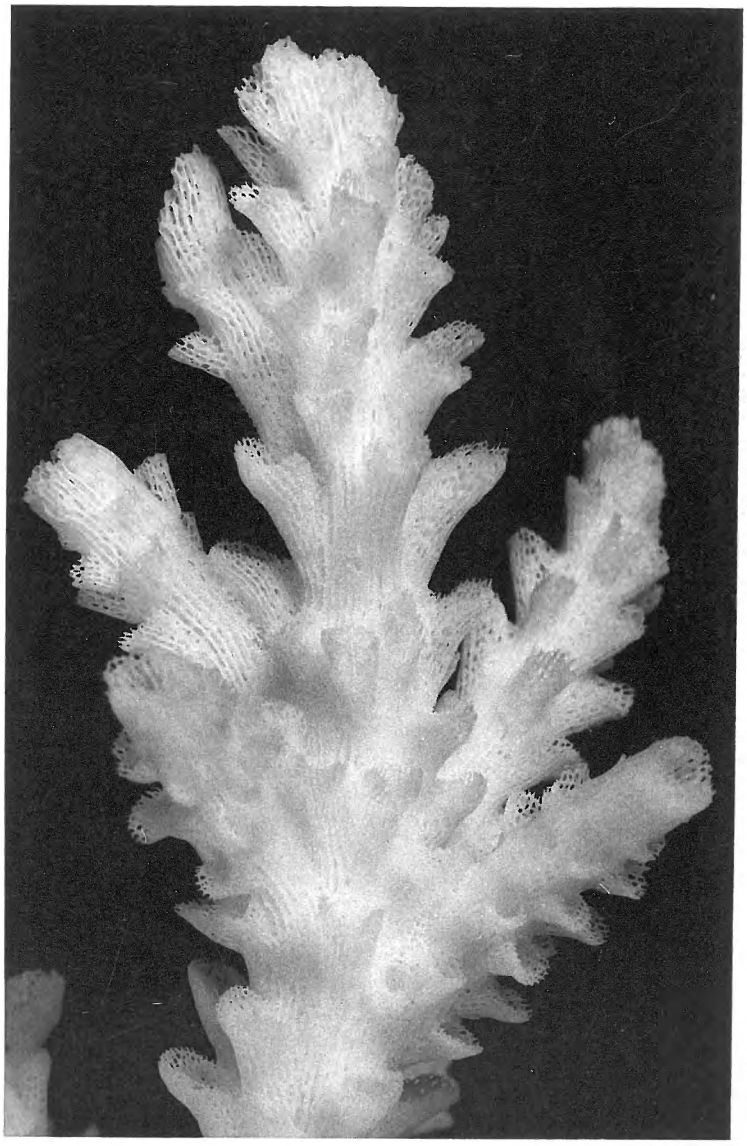

Fig. 9. Holotype of *Acropora akajimensis* (× 4).

Etymology:

Named after Aka I., where the ETMER research station which supported the present study is located.

Holotype (G32475) (Figs. 7 & 9):

A branching corallum 152 mm long from Ginanotatejyan, Aka I., Kerama Is., Ryukyu Is. at 5 m depth.

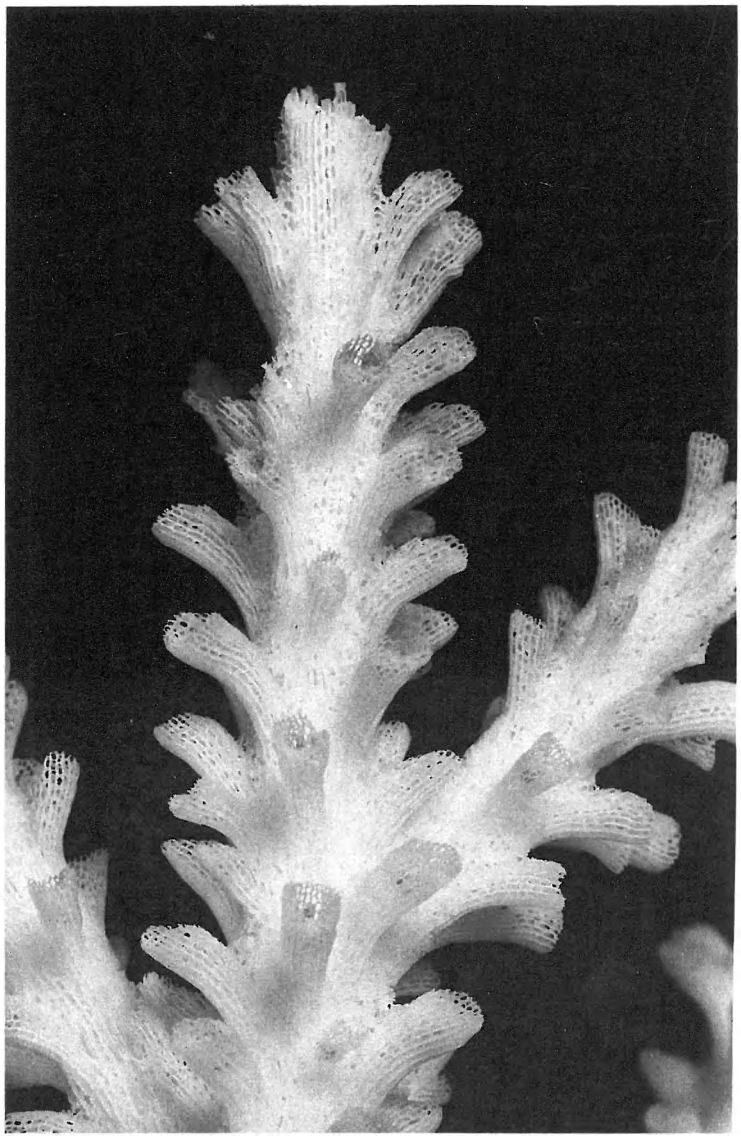

Fig. 10. *Acropora akajimensis* from Danajou Bank, Cebu, Philippines (× 4), same corallum as Fig. 8.

Distribution:

Known only from the Philippines and the Kerama Is. of Japan.

Similar species:

This species is closest to *A. exquisita* Nemenzo, 1971 which differs in having an upright growth form, non-anastomosed branches and more uniform radial corallites.

Acropora sekiseiensis (Figs. 11, 12 and 72)

Synonymy:

Not previously recorded.

Specimens:

Japan: Ishigaki I., Yaeyama Is., Ryukyu Is. (3 specimens); Sekisei Lagoon, Yaeyama Is., Ryukyu Is.; Iriomote I., Yaeyama Is., Ryukyu Is.; Sesoko I., Okinawa Is., Ryukyu Is. (2 specimens); Cape Zanpa, Okinawa I., Ryukyu Is.; Ago Bay, Zamami I., Kerama Is., Ryukyu Is.; Fukaji I., Kerama Is., Ryukyu Is.: Tokunoshima, Amami Is., Ryukyu Is.

Description:

Common over a wide range of environments of Sekisei Lagoon, Japan, including reef flats and lagoons. Colonies are composed of irregular branches, usually forming upright bushy, sometimes subcorymbose, thickets. Coralla are primarily charactrised by very irregular radial corallites, which readily from incipient axial corallites, and a very coarse coenosteum (visible *in situ*).

Radial corallites are immersed on main branches, becoming increasingly

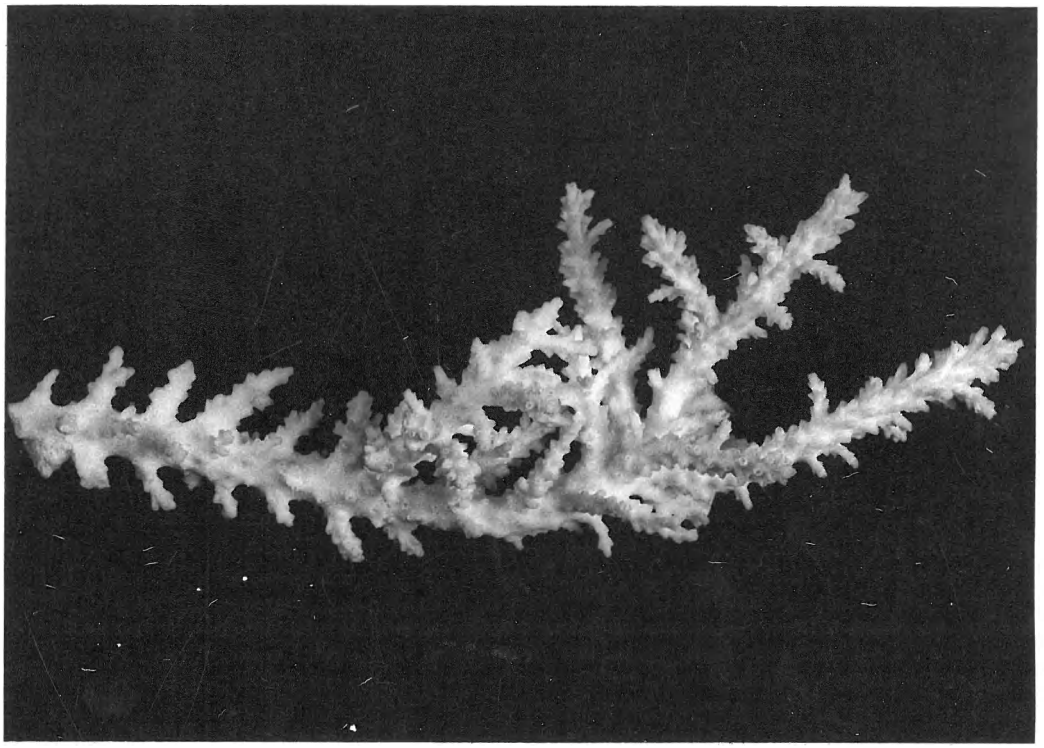

Fig. 11. Holotype of *Acropora sekiseiensis* (× 0.75).

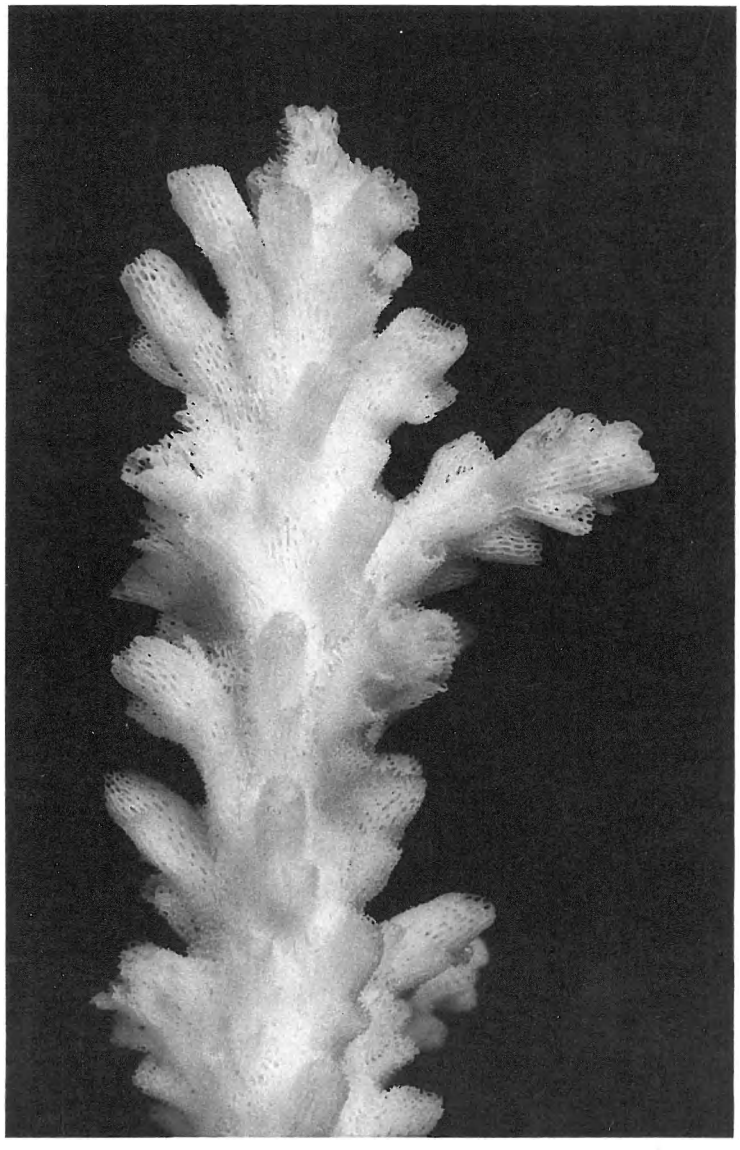

Fig. 12. Holotype of *Acropora sekiseiensis* (× 4).

exsert towards branch tips, where they vary greatly in length but are of uniform diameter, approximately 2 mm. Primary setpa almost reach the calice radius deep within the calice; directive septa are often distinguished in older corallites. Secondary septa are incomplete or absent in both radial and axial corallites. Corallites are weakly costate, the coenosteum between corallites is very coarse.

Colonies are brown in colour.

Etymology:

Named after Sekisei Lagoon, where the species was first studied.

Holotype (G32476) (Figs. 11 & 12):

An irregularly branching corallum 178 mm long from a fringing reef on the W side, Fukaji I., Kerama Is., Ryukyu Is. at 5 m depth.

Distribution:

Known only from Japan, where it occurs throughout the Ryukyu Is.

Similar species:

This species is like a diminutive *A. horrida* (Dana, 1846); it also has a superficial resemblance to *A. insignis* Nemenzo, 1967.

Acropora tanegashimensis (Figs. 13, 14 & 73)

Synonymy:

Not previously recorded.

Specimens:

Japan: Tanegashima (4 specimens).

Description:

Colonies are flat corymbose plates similar to those of *A. hyacinthus* (Dana, 1846). Branches are uniform in size, 9-11 m diameter and branchlets are short, terete, and also uniform. Axial and radial corallites are of similar size, the latter being uniformly crowded over the upper surface of the colony. They are labellate, approximately 1.9 mm diameter. Septa are similar in both axial and radial corallites, the first cycle being nearly the full calice diameter, the second cycle being short and abortive. Directive septa are sometimes distinguishable in radial corallites. Costae are well developed and strongly dentate. What little coenosteum there is between crallites is very coarse.

Living colonies are greenish-grey in colour.

Etymology:

Named after Tanegashima, the only known locality of the species.

Holotype (G32477) (Figs. 13 & 14):

A corallum 169 mm long, from a corymbose plate from Sumiyoshi, Tanegashima, Japan, at 5 m depth. The colony was attached to sandstone.

Distribution:

Known only from Tanegashima, Japan.

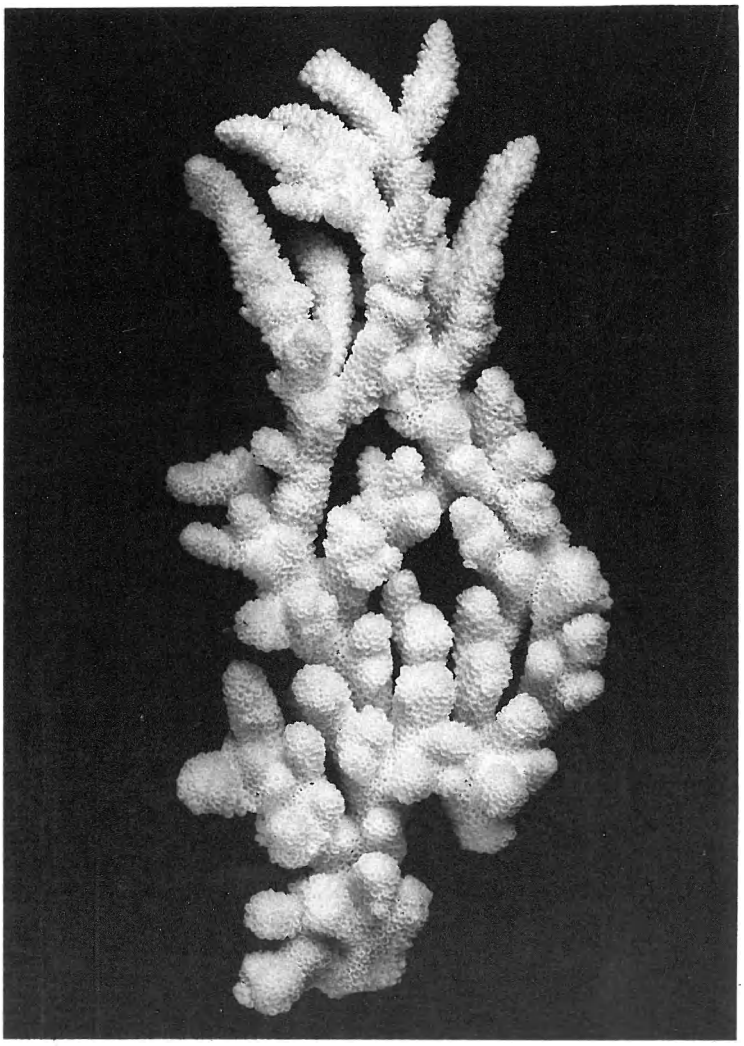

Fig. 13. Holotype of *Acropora tanegashimensis* (× 0.81).

Similar species:

This species is closest to *A. hyacinthus* which has a similar growth form and radial corallites of similar shape. It is readily distinguished from *A. hyacinthus* by having crowded radial corallites, indistinct axial corallites, and *in situ*, by colour.

Family Poritidae Gray, 1842

Genus *Porites* Link, 1807

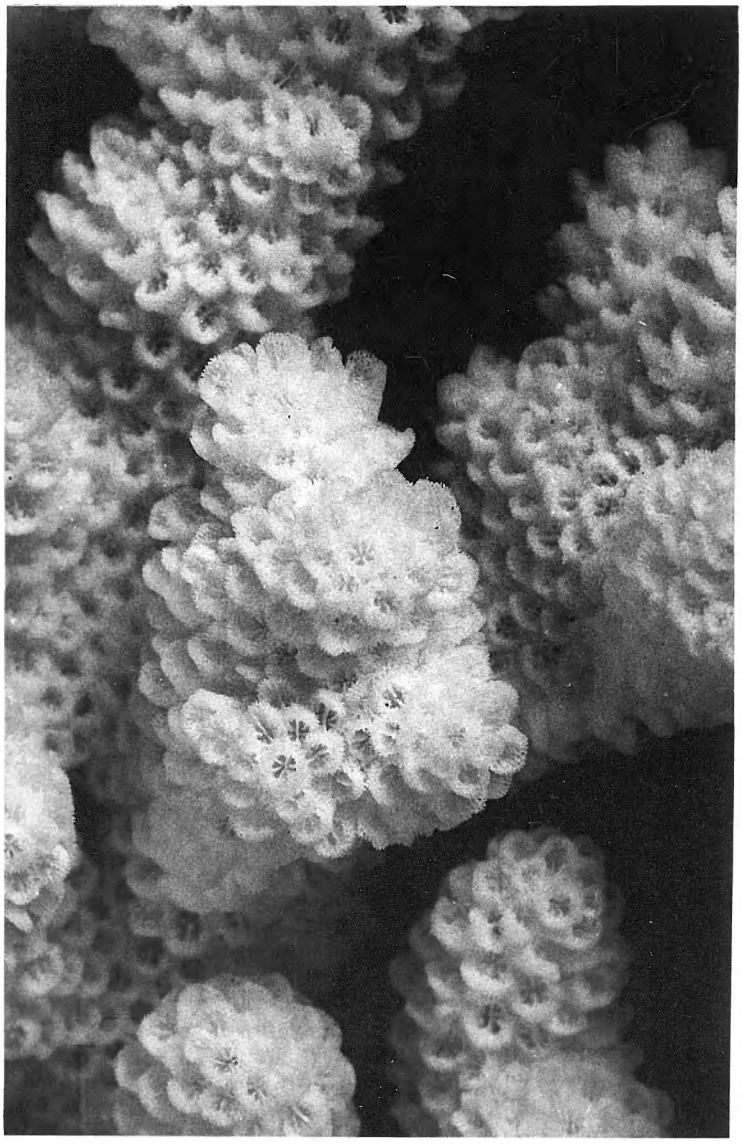

Fig. 14. Holotype of *Acropora tanegashimensis* (× 4).

Porites okinawensis (Figs. 15 & 16)

Synonymy:

Not previously recorded.

Specimens:

Japan: Okinawa Is., Ryukyu Is. (5 specimens) (coll. M. Nishihira)

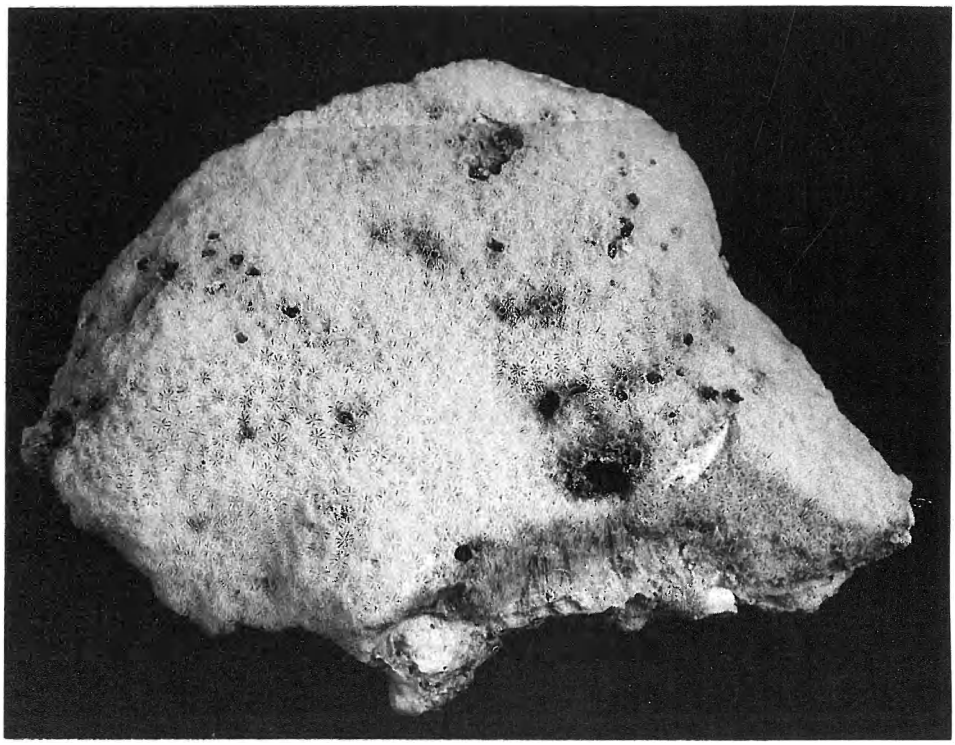

Fig. 15. Holotype of *Porites okinawensis* (× 0.45).

Description:

Colonies are massive or encrusting. Corallites are superficial, unevenly distributed up to 1.7 mm diameter. Wall thicknesses between adjacent corallites vary from less than the thickness of a septum, to over 2 mm. Septa vary in number according to the size of the corallite, both small and large corallites with below and above normal numbers of septa (respectively) are common. The *Porites* pattern of fusion is obscure in most corallites, due to a very high degree of fusion. The triplet is fused and frequently the directive septum is fused to one of the lateral pairs. The directive septum and the triplet are usually both fused to the columella. Septum often tend to bifurcate at the wall. Pali are weakly developed or absent. There are two weekly developed denticles per septum. Columellae are small or absent; highly fused radii link the septa to the corallite centre. The upper surface of the septal slope very little towards the centre. The surface of all calice structures are highly granulated.

Etymology:

Named after the Okinawa Is., the only region where this species has been found.

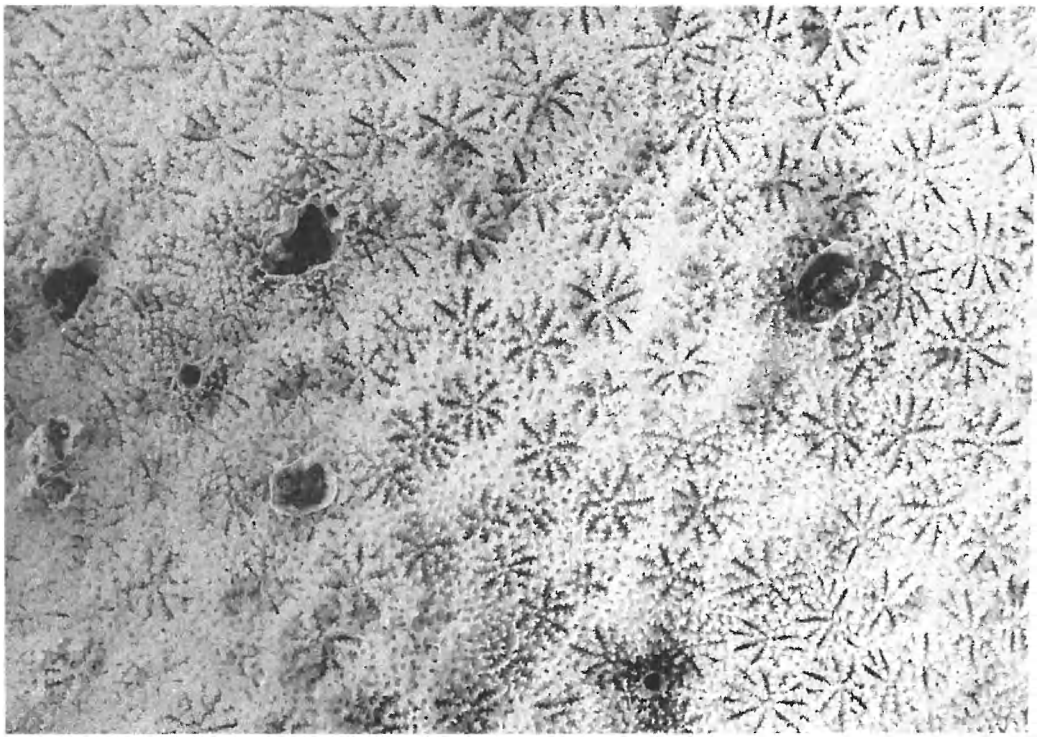

Fig. 16. Holotype of *Porites okinawensis* (× 8).

Holotype (G32495) (Figs. 15 & 16)

A corallum 55 mm long, from part of an encrusting colony from Kin Bay, Okinawa I., Ryukyus Is. at 4 m depth (coll. M. Nishihira).

Distribution:

Known only from the Okinawa Is. of Japan.

Similar species:

The septal configuration described above makes this species very distinctive, unlike any other *Porites* known to the author.

Porites negrosensis (Figs. 17-19 & 74)

Synonymy:

Porites sp. Veron & Hodgson, 1988

Specimens:

Japan: Iriomote I., Yaeyama Is., Ryukyu Is. (3 specimens); Ishigaki I., Yaeyama Is., Ryukyu Is.

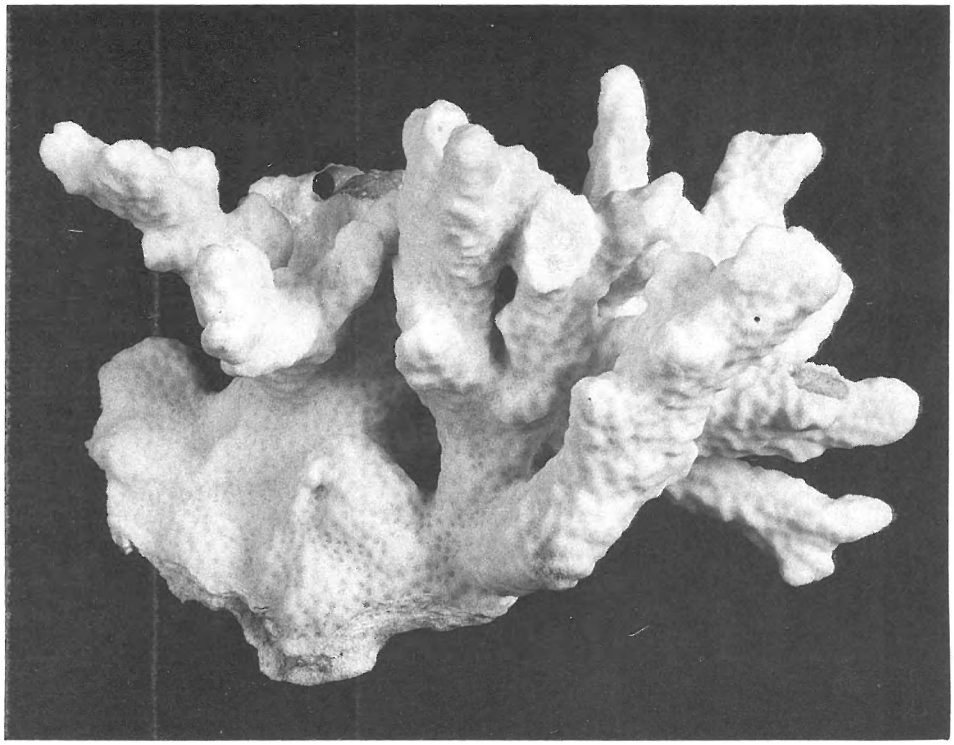

Fig. 17. Holotype of *Porites negrosensis* (× 1.24).

Philippines: Apo I., Negros

Description:

Rare. Colonies are irregularly arborescent with contorted anastomosing branches with flattened tips. Corallites are separated by approximately one corallite diameter; corallites on smaller branches may be aligned length-wise. Calices are 0.8-1.2 mm diameter. Septa are neatly and regularly spaced. The triplet is usually, but not always fused; the dorsal directive septum is relatively short. There are usually 6 pali, but may be 7 or 8 if the triplet has free margins. In the latter case, many corallites have fused or partly fused pali of the triplet and these are relatively small. All septa have a prominent denticle midway between the wall and palus and another denticle adjacent to the wall. The columella and inner synapticular ring are well-developed. Calicular structures and the coenosteum are uniformly covered with fine spinules. The coenosteum is coarse.

Colonies in Japan are usually pale brownish-grey; Philippines colonies were grey and white.

Etymology:

Named after the Negros I., Philippines, where the species was first recorded.

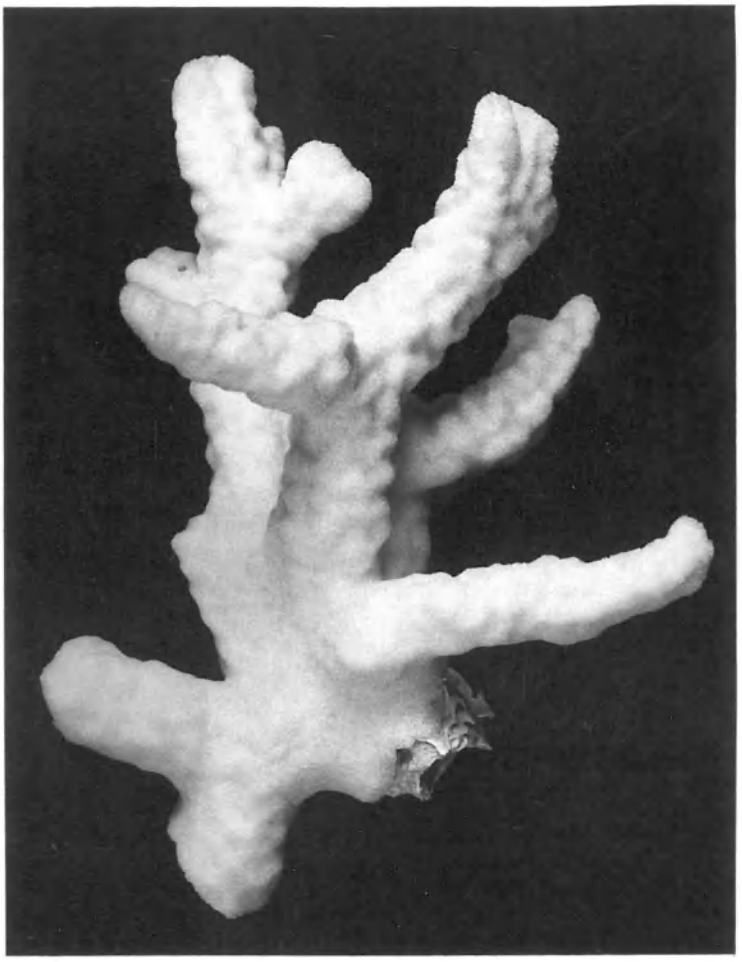

Fig. 18. *Porites negrosensis* from Iriomote I., Yaeyama Is., Ryukyu Is. (× 1.6).

Holotype (G32478) (Figs. 17-19):

A compact corallum of anastomosed branches 97 mm wide from Negros I., Philippines, at 12 m depth.

Distribution:

Known from the Philippines and the Yaeyama Is. of Japan.

Similar species:

There are several branching *Porites* with which this species can be confused, especially *in situ*. *Porites nigrescens* has superficially similar corallites but does not have contorted anastomosed branches, nor are coral-

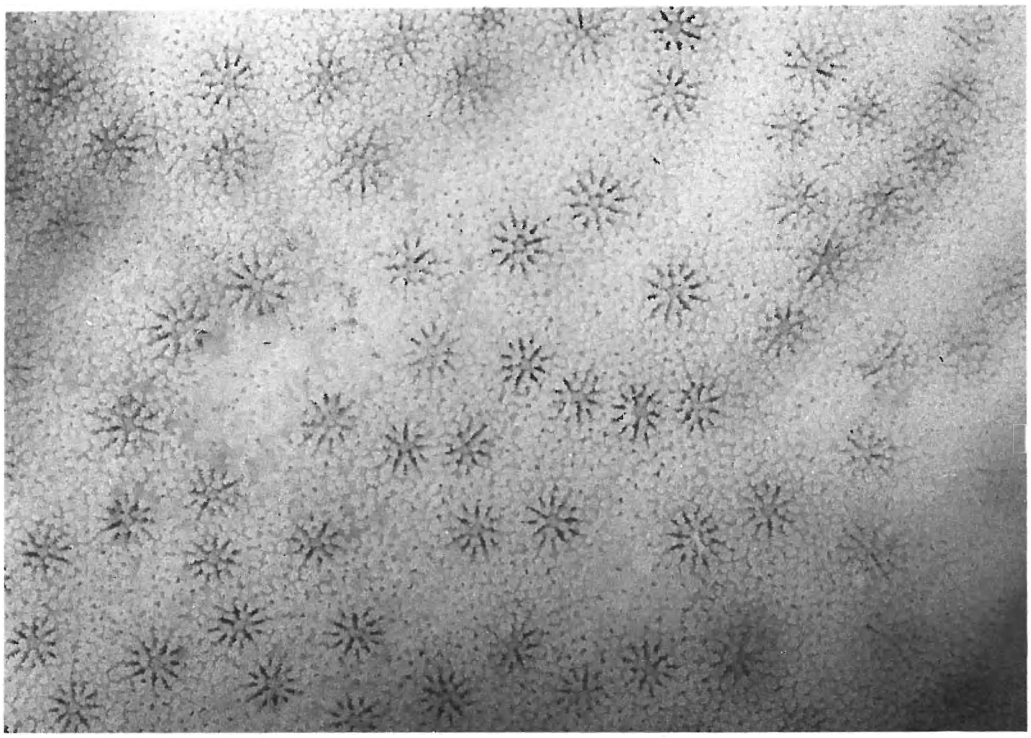

Fig. 19. Holotype of *Porites negrosensis* (× 8).

lites aligned lengthwise down branches. *Porites latistella* Quelch, 1886 is probably the closet species: the growth form may be similar, but corallites are substantially smaller and close together. *Porites sillimaniani* Nemenzo, 1976 has explanate bases, thinner, less anastomosed branches and substantially smaller corallites. *Porites deformis* Nemenzo, 1955 may have a similar growth form, but corallites are smaller, superficial and give the colony a smooth appearance.

Genus *Goniopora* de Blainville, 1830

Goniopora cellulosa (Figs. 20 & 21)

Synonymy:

Not previously recorded.

Specimens:

Japan: Tokunoshima, Amami Is., Ryukyu Is. (3 specimens); Tanegashima (5 specimens); Amakusa Is.

Description:

Colonies are massive. Mature corallites are six sided or rounded,

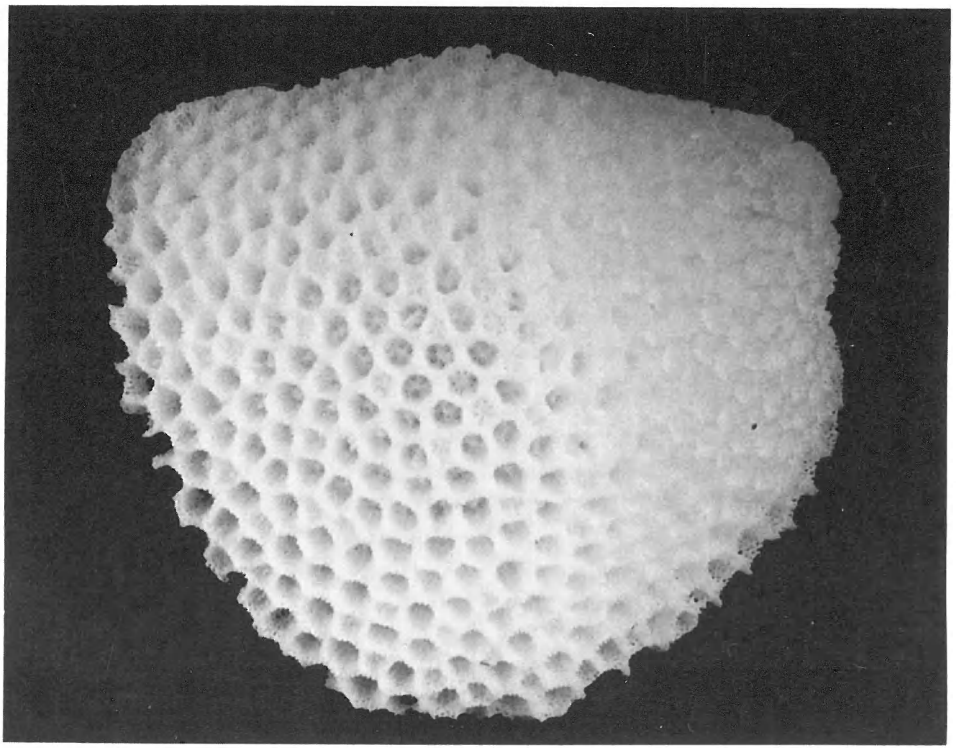

Fig. 20. Holotype of *Goniopora cellulosa* (× 1.84).

2.4-3.3 mm diameter. Walls are thin and highly perforated. Calices of some, especially those from Tanegashima, show very great variation in depth as well as septal development. The majority are deep, with irregularly developed, short, vertical septa, which may curve inwards at the floor of the corallite to form a columella tangle, or else simply extend to the floor of the corallite without forming any columella. Others are relatively shallow, with septa following the same pattern, but curving inwards at a lesser depth to form a columella. Deeper corallites are usually wider and older. The horizontal elements of most septa consist of irregular spines. In some corallites these are fused into a well-defined columella tangle, which may even form paliform deltas.

Etymology:

So called because of cellular appearance of the corallites.

Holotype (G32479) (Figs. 20 & 21):

A piece of a massive corallum 58 mm across from a protected rock outcrop just south of Ôjioya Port, Tanegashima, Japan at 4 m depth.

Distribution:

Known from the Amami Is., Tanegashima and the Amakusa Is. of Japan.

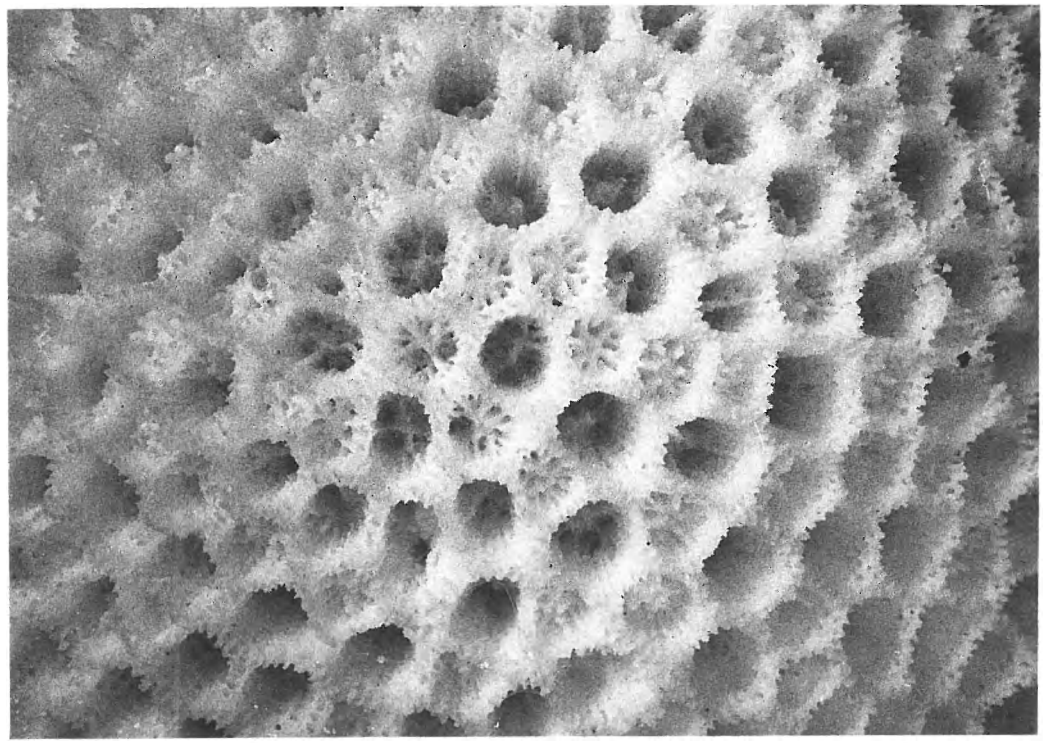

Fig. 21. Holotype of *Goniopora cellulosa* (× 4).

Similar species:

The cellular appearance of the corallites is unlike that of any other *Goniopora* known to the author. Corallites are larger than those of *G. minor* Crossland, 1952 and *G. burgosi* Nemenzo, 1955, but smaller than those of the other massive species except *G. tenuidens* Quelch, 1886. Of other nominal species, *G. pedunculata* Quoy & Gaimard, 1833 from New Guinea and *G. gracilis* (Edwards & Haime, 1860) from the Red Sea have corallites of similar size and wall structure, but the septation of the former consists of a neat pattern of primary septa, while the latter consists of small number of irregularly fused spines. Both are unlike the present species.

Family Agariciidae Gray, 1847

Genus *Pavona* Lamarck, 1801

There are several species of *Pavona* which are massive and have small corallites. These have a very similar appearance although they are readily separable. Species in this group include *P. minuta* Wells, 1954 (Fig. 22), *P. bipartita* Nemenzo, 1980 (Fig. 23) and *P. diminuta*, described below, and three further species: *Pavona* sp.2 of Veron (1990a) from Vanuatu (Fig. 24); *Pavona* sp. of Veron (1990b) from Cocos (Keeling) I. (Fig. 25) and *Pavona*

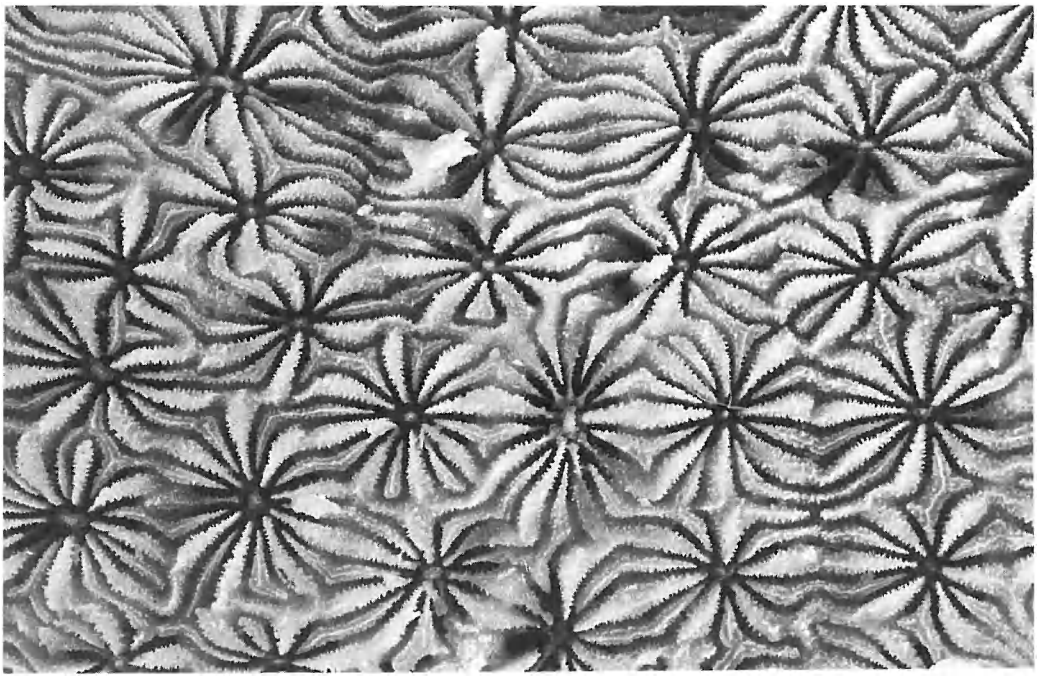

Fig. 22. *Pavona minuta* from Phuket, Thailand (× 8).

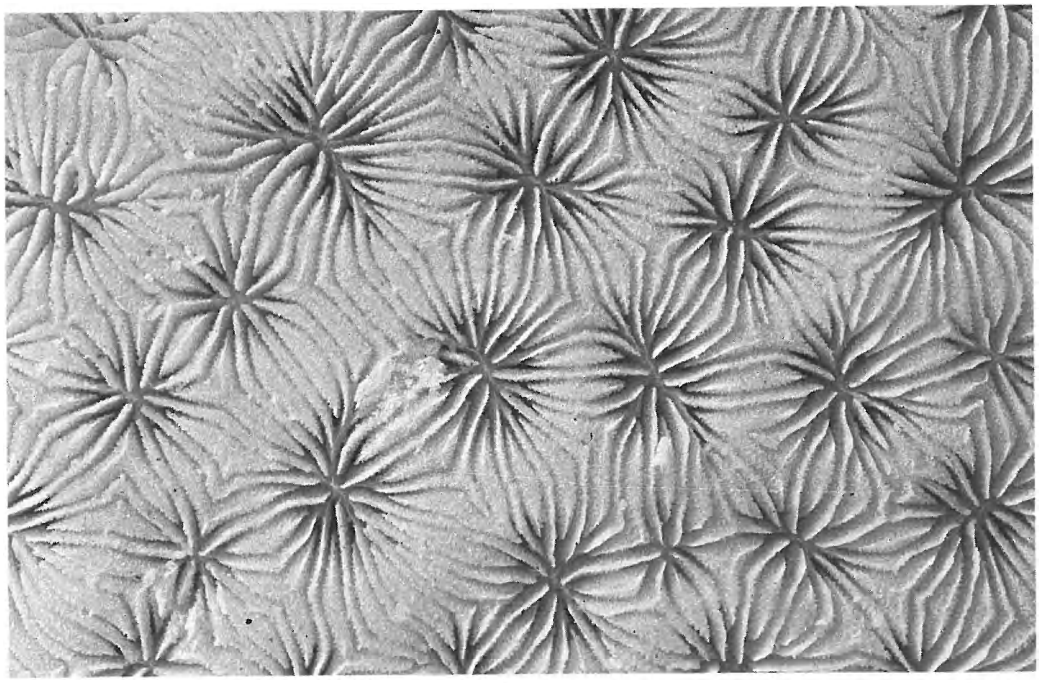

Fig. 23. *Pavona bipartita* from Phuket, Thailand (× 8).

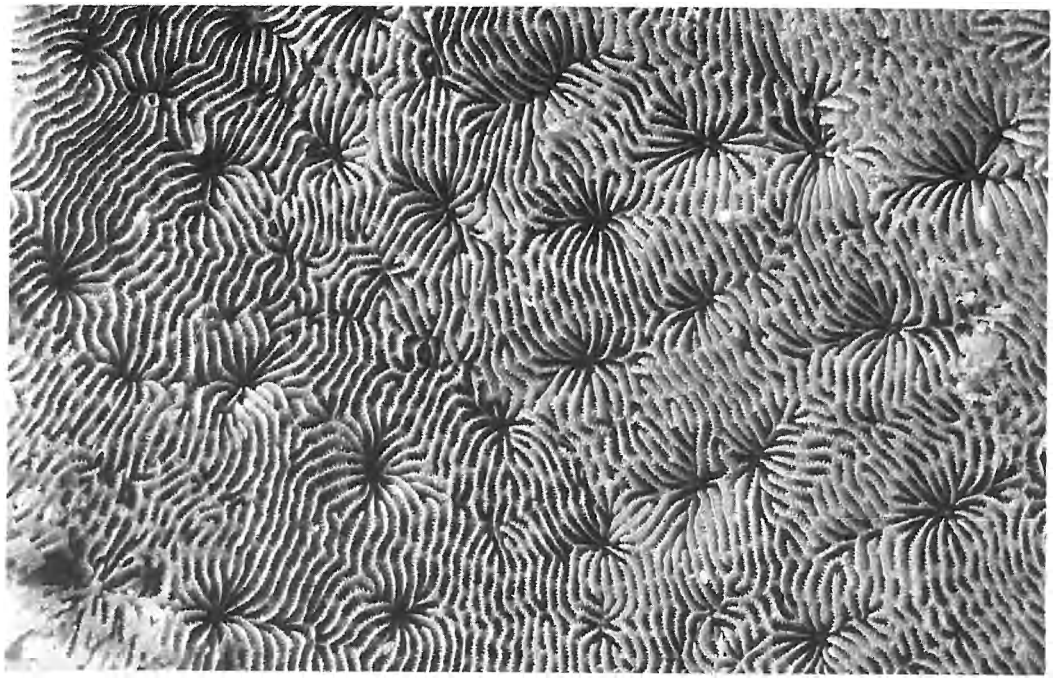

Fig. 24. *Pavona* sp.2 of Veron (1990a) from Vanuatu (× 8).

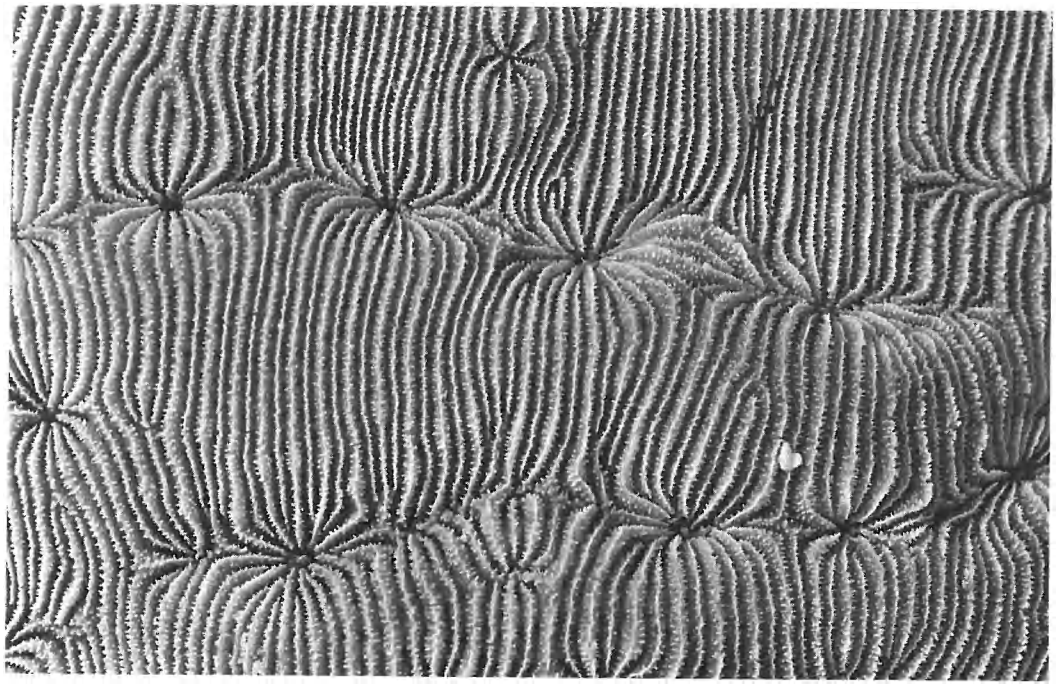

Fig. 25. *Pavona* sp. of Veron (1990b) from Cocos (Keeling) Is. (× 8).

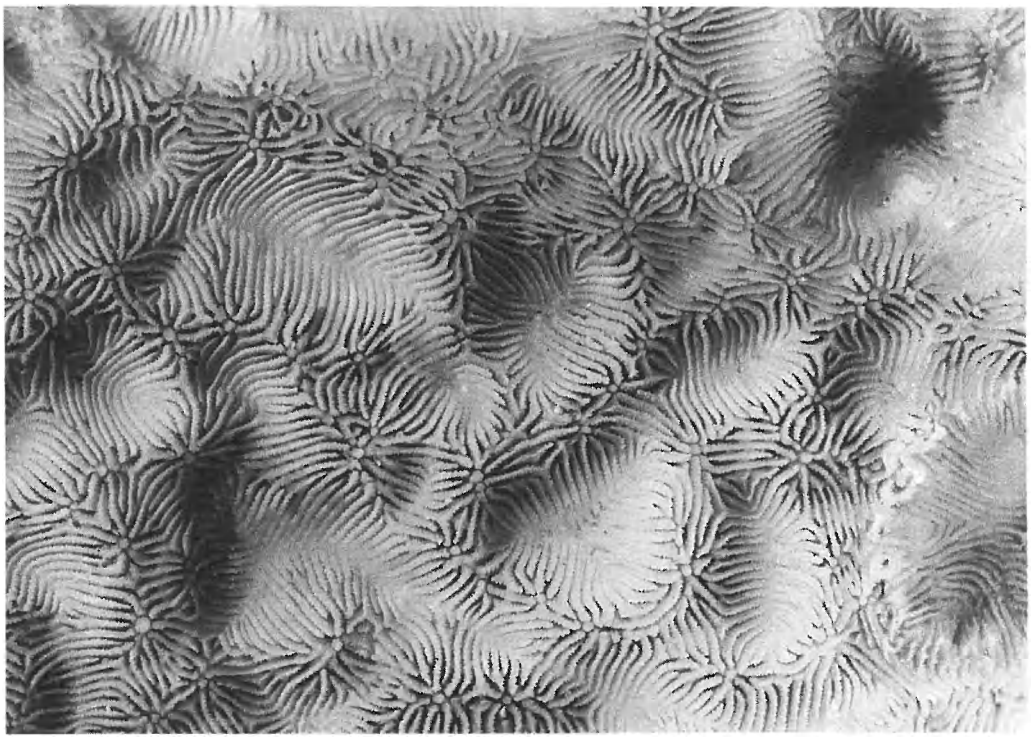

Fig. 26. *Pavona* sp.2 of Veron & Hodgson (1989) from Danajou Bank, Cebu, Philippines (× 8).

sp.2 of Veron & Hodgson (1988) from the Philippines (Fig. 26). Veron & Kelley (1988) record two further fossil species from the Pliocene of Papua New Guinea.

The massive *Pavona* species from a distinct group which is readily separable from the leafy *Pavona*. Skeletal detail of the genus as a whole, however, is sufficiently well defined to warrant the retention of the same generic name for both groups.

Pavona diminuta (Figs. 27, 28 & 75)

Synonymy:

Pavona sp.1 Veron & Marsh (1988)
Pavona sp.1 Veron & Kelley (1988)
Pavona sp.1 Veron & Hodgson (1988)
Pavona sp.1 Veron (1990a)

Specimens:

Western Australia: Ashmore Reef
Vanuatu: Tana I.
Papua New Guinea: Motupore

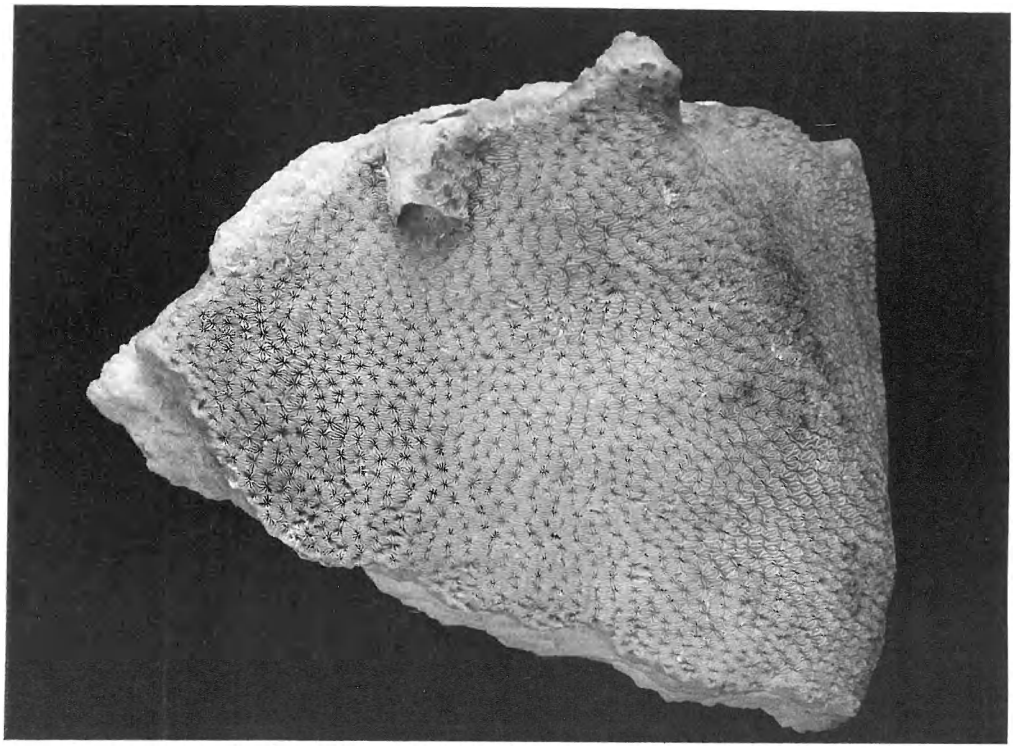

Fig. 27. Holotype of *Pavona diminuta* (× 0.8).

Philippines: Puerto Galera, Cebu, Negros
Thailand: Phuket
Cook Is.: Niue Is. (coll. G. Paulay)

Description:

Colonies may be over 1 m diameter, massive, with encrusting margins. They have smooth surfaces except where infested with boring organisms. Corallites are very small, 1.2-2.7 mm diameter. Calices are usually just the width of the columellae which are small, style-like or laterally compressed. Septo-costae strongly alternate except on strongly convex surfaces, where they become equal. There are up to twelve primary septa. Costae radiate neatly and uniformly except in encrusting parts of colonies where they may be more aligned in one direction, giving the corallum surface a striated appearance. The sides of septo-costae are strongly and neatly granulated, the granules infilling most of the gap between septo-costae.

There is substantial variation in skeletal detail between different coralla and within single coralla. Thus, concave surfaces typically have more strongly alternating septo-costae and the columellae may range from being prominent to absent. It is not known how this variation is correlated with environmental variation.

Colonies are usually dark green or dark brownish-green throughout the distribution range.

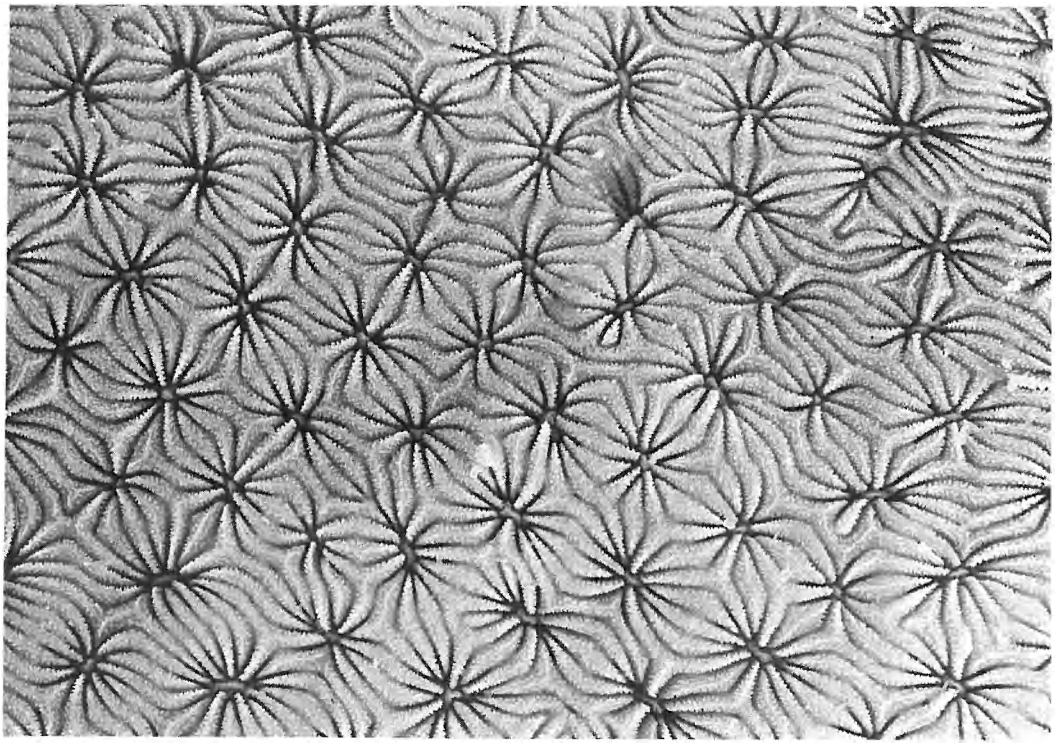

Fig. 28. Holotype of *Pavona diminuta*. (× 8).

Etymology:

So named because of the very small size of the corallites.

Holotype (G32480) (Figs. 27 & 28):

A wedge-shaped corallum, 834 mm long, 635 mm wide from the edge of a large colony, has corallites on both the upper and lower surfaces, from a protected biotope at Phuket, Thailand at 5 m depth. The corallum is central to the range of variation of the species.

Distribution:

From western Thailand in the west to the Cook Is. in the east and north to the Philippines.

Similar species:

Pavona minuta and *P. bipartita* are both similar species. The former has larger corallites, coarser and more strongly alternating septo-costae (a recognisable character *in situ*) and, usually, more prominent columellae. The latter has corallites of similar size, but these are more open, with only weak alternation of septo-costae and weakly developed columellae.

Of the undescribed species noted above, that from Vanuatu (known from a single specimen) has thin, equal, mostly parallel septo-costae; that from the Cocos (Keeling) Is. (three specimens) has much larger, more widely spaced corallites with sub-equal septo-costate, and that from the Philippines (a single specimen) has small corallites arranged in valleys and separated by collines and a distinct septal pattern of septal fusion.

These six species are compared in Figs. 22-26 and 28.

Genus *Leptoseris* Edwards & Haime, 1849

Leptoseris amitoriensis (Figs. 29, 30 & 76)

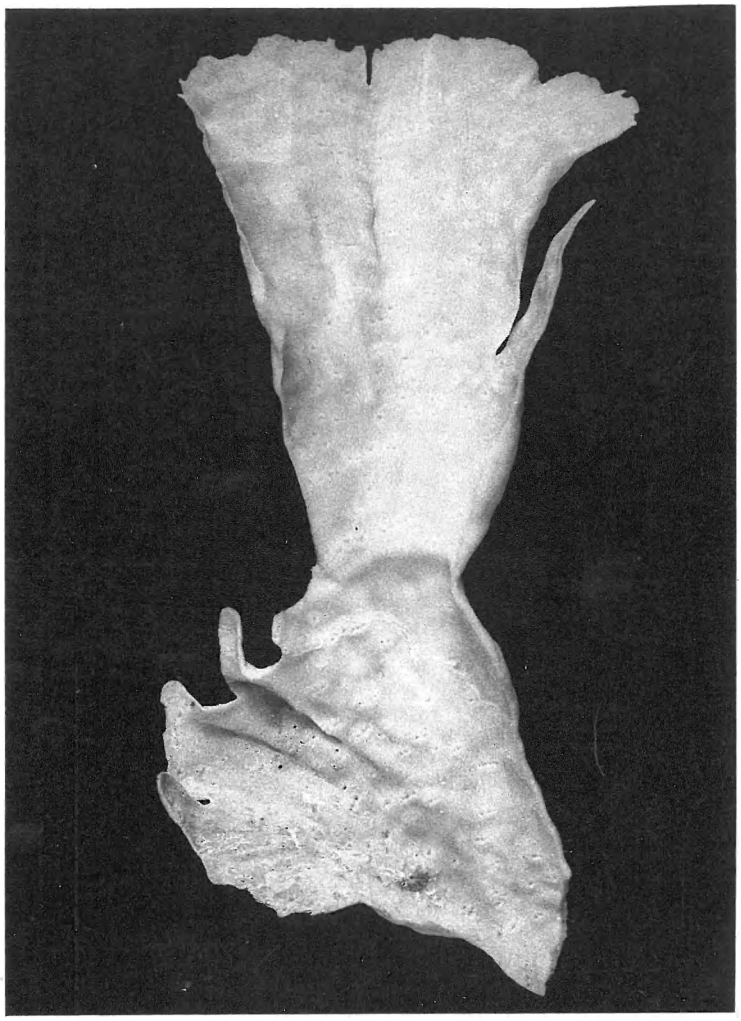

Fig. 29. Holotype of *Leptoseris amitoriensis* (× 0.88).

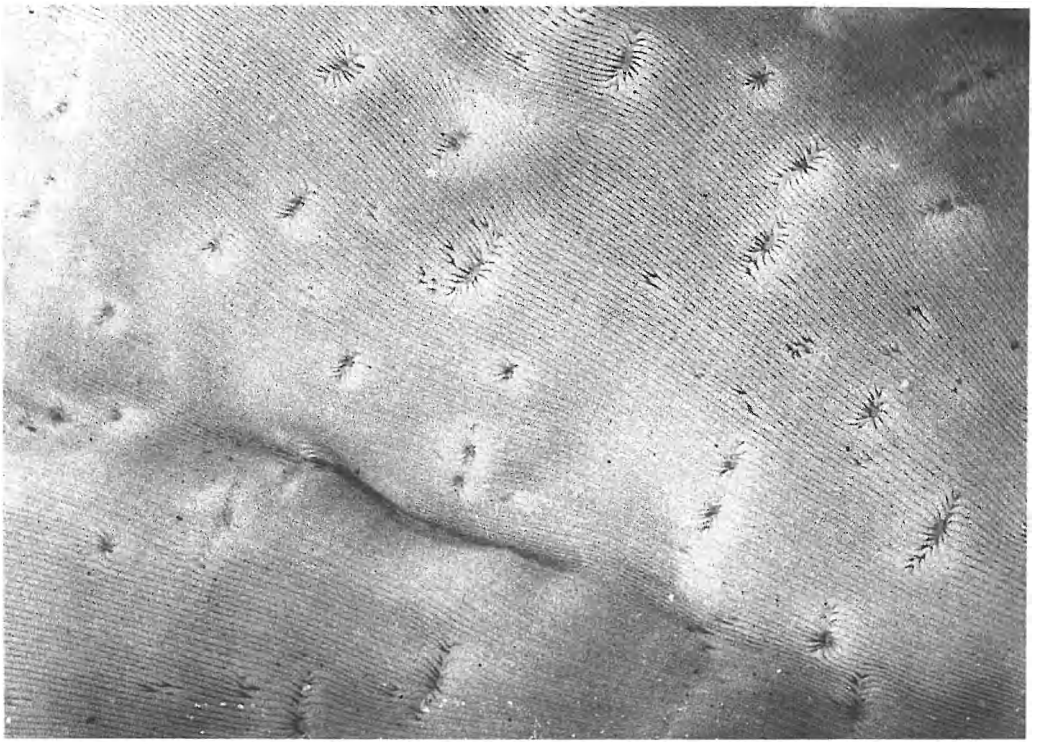

Fig. 30. Holotype of *Leptoseris amitoriensis* (× 4).

Synonymy:

Not previously recorded.

Specimens:

Japan: Amitori Bay, Iriomote I., Yaeyama Is., Ryukyu Is. (5 specimens, coll. H. Yokochi).

Description:

Colonies form extensive stands *in situ* in Amitori Bay, Iriomote I., Japan, at a depth of approximately 50 m (Yokochi, pers. comm.), where it is intermixed with *L. gardineri* van der Horst, 1921. Coralla are very thin and delicate, foliose, unifacial laminae, with subentire to irregularly bifurcated margins and upward curving sides. Laminae vary in width; those of collected specimens are up to 67 mm wide but *in situ* photographs show that they may be several times this width. Septo-costae are in neat, straight rows; they may alternate very slightly and have slightly granulated sides. Corallites are very superficial, elongate, >2.4 mm across; calices are >0.8 mm diameter, becoming smaller towards the corallum margins. They are distributed irregularly except that two or more are frequently laterally adjoined to form a short series. Walls are hardly distinguishable. Columellae are style-like and conspicuous in proximal corallites.

As this species is very conspicuous, yet has only been found in deep water at Amitori Bay, it is likely that it is restricted to deep water elsewhere. Both *L. papyracea* (Dana, 1846) and *L. gardineri* occur with *L. amitoriensis*.

Living colonies are brown in colour, becoming pale towards the margins, which have whitish borders.

Etymology:

Named after Amitori Bay, Iriomote I., the only known location for the species.

Holotype (G32481) (Figs. 29 & 30):

A very thin unifacial plate 149 mm diameter long and 69 mm wide at the outer margin, from Amitori Bay, Iriomote Is., Ryukyu Is. at approximately 50 m depth.

Distribution:

Known only from Iriomote I., Japan.

Similar species:

Only *L. papyracea* has corallites as small as *L. amitoriensis*. The growth form is most similar to *L. gardineri*. All three species occur together at Amitori Bay. There are no species with which *L. amitoriensis* can be confused.

Genus *Pachyseris* Edwards & Haime, 1849

Pachyseris foliosa (Figs. 31, 32 & 77)

Synonymy:

Pachyseris sp. Veron & Hodgson (1988)
Pachyseris involuta Studer; Nemenzo (1976)(*pars*); Ross & Hodgson (1982); not Studer (1877)

Specimens:

Philippines: Puerto Galera (2 specimens); Olango I.

Description:

Colonies consist of multiple flattened, foliose, unifacial plates with deeply divided margins giving a leafy appearance. Plates are thin and delicate and their leafy margins are sometimes anastomosed. Valleys are in approximately concentric rows, parallel to the corallum margins, and are uniform 4-5 mm apart. The distal surfaces of carinae are infolded steeply. Backs of fronds are neatly costate and costae form fine serrations on their sides and suture-like structures where they bifurcate. On upper surfaces, costae have fine, neat, dentations and are linked with fine synapticulae at regular intervals. There is little or no development of columellae; centres are indistinguishable. Living colonies are pale brown in colour.

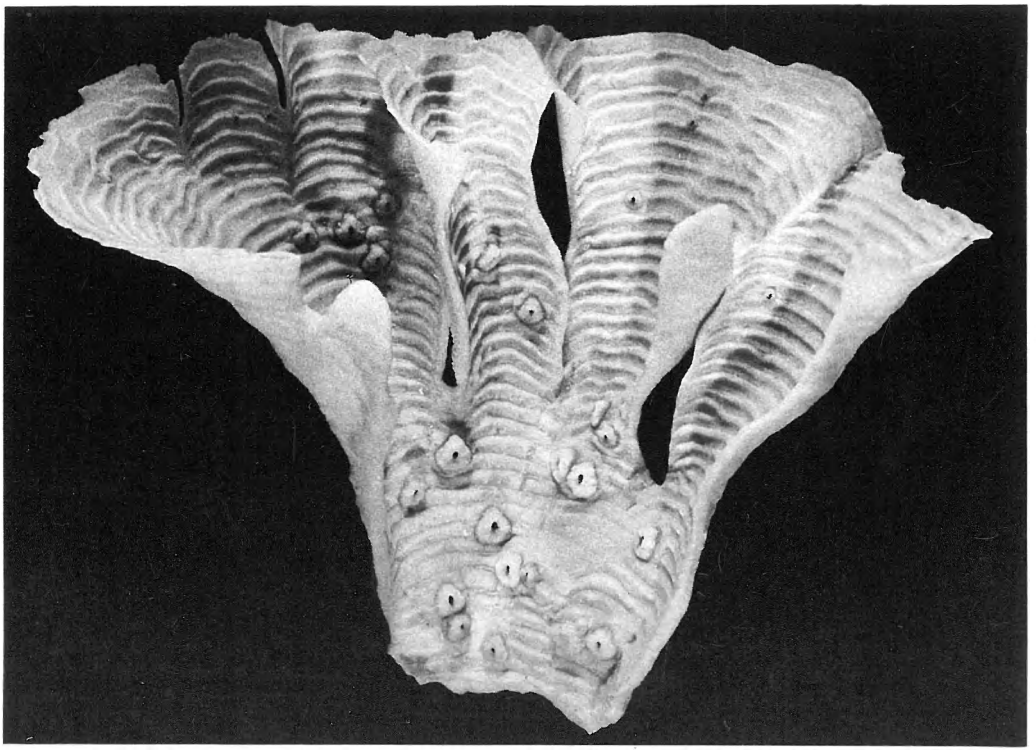

Fig. 31. Holotype of *Pachyseris foliosa* (× 1.65).

Etymology:

So named because the species has a foliose growth form.

Holotype (G33228) (Figs. 31 & 32):

A foliose corallum 210 mm wide and 162 mm high from Puerto Galera, Philippines from a protected biotope at a depth of 8 m.

Distribution:

Known only from the Philippines: Puerto Galera, Cebu, Bolinao and Negros.

Similar species:

This is very distinct species *in situ* with a growth form unlike that of any other *Pachyseris*. Skeletal fine structures are very similar to those of *P. speciosa*, especially as the columella is very little developed.

This species is not *P. involuta* as proposed by Nemenzo (1976) and Ross & Hodgson (1982) and considered a valid species by Hoffmeister (1925) (although he did not record it from Samoa or Fiji) and by Horst (1921) from Borneo (a single fragment dredged from 34 m depth). The holotype of *invo-*

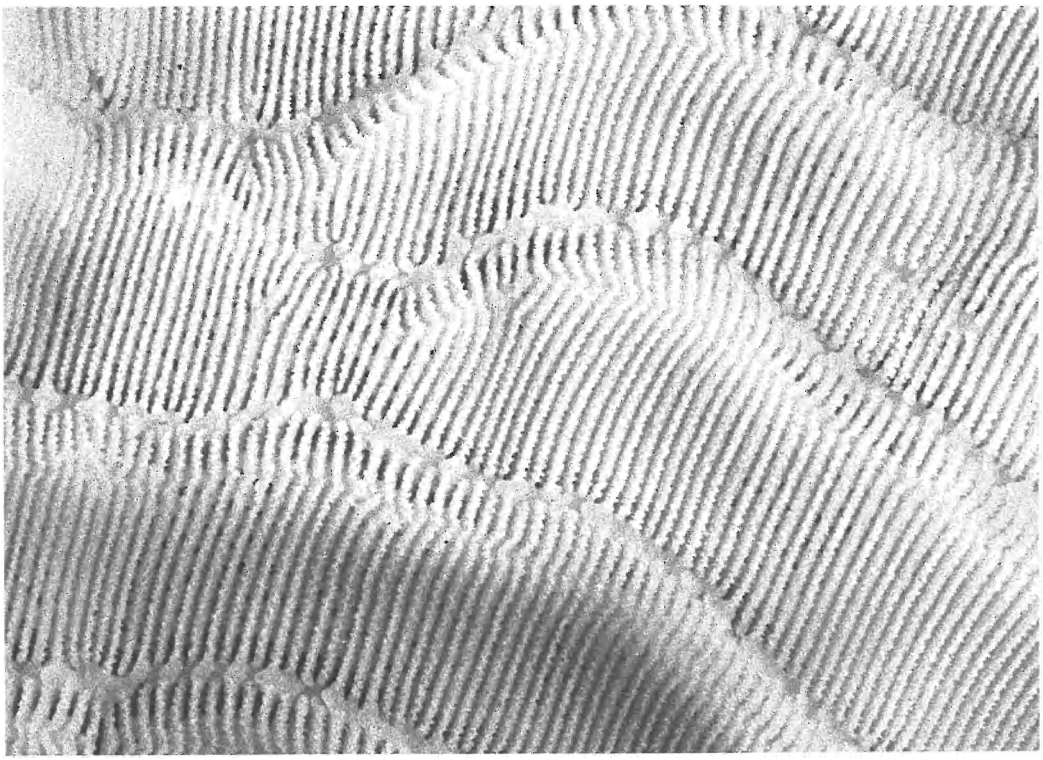

Fig. 32. Holotype of *Pachyseris foliosa* (× 8).

luta has not been re-examined during the present study, but the description and illustrations of Studer are clearly of another species, probably *P. speciosa*, of which the holotype appears to be a convoluted frond.

Family Fungiidae Dana, 1846

Genus *Podabacia* Edwards & Haime, 1849

Podabacia motuporensis (Figs. 33, 34 & 78)

Synonymy:

Podabacia sp. Veron & Kelley (1988)
Podabacia sp. Veron & Hodgson (1988)
Podabacia sp. Veron (1990a)

Specimens:

Papua New Guinea: Horseshoe Reef near Motupore I.
Vanuatu: Efate, Tana and Aneityum Is. (3 specimens)
Philippines: Apo I., Negros (2 specimens)

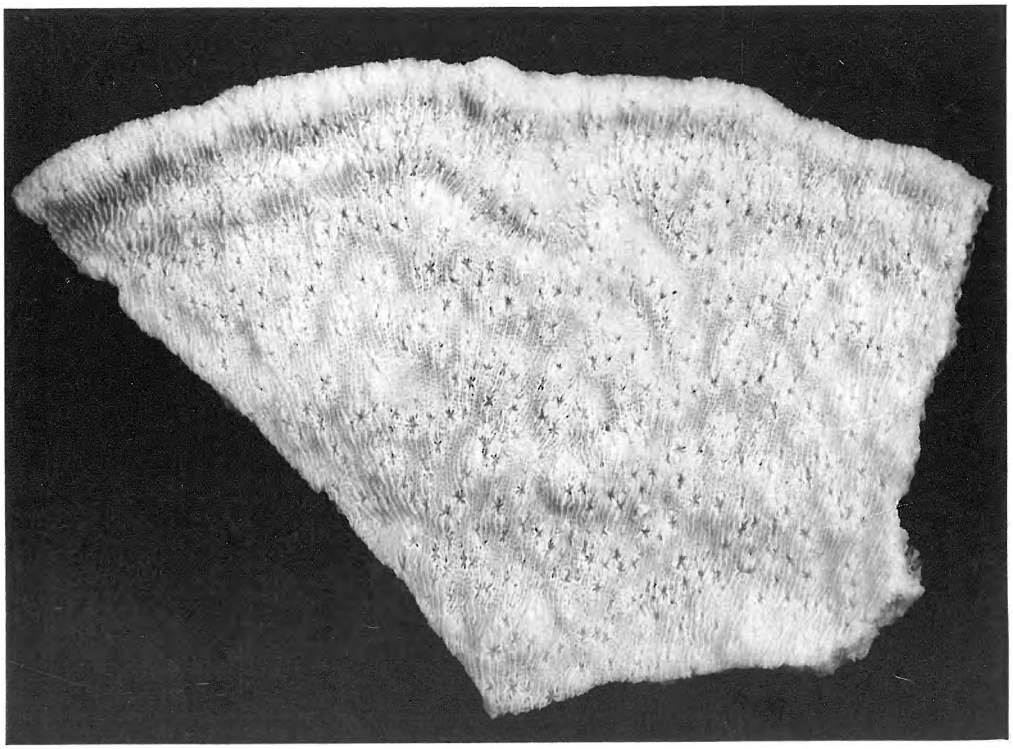

Fig. 33. Holotype of *Podabacia motuporensis* (× 0.87).

Description:

Colonies are thin, unifacial plates up to approximately 1 m diameter, attached at or near one edge. Plates are sometimes upturned or convoluted. Corallites are irregularly but equi-distantly arranged; there is no central corallite. Mature corallites are less than 5 mm diameter; calices are less than 2.5 mm. Septo-costae are neat, parallel, radiating to the corallum edge; they alternate in height and width and are beaded, the beads being elaborated with spinules. Within the corallite the two cycles each consist of 4-6 (rarely more) septa. Petallolid septa are rare. Septa may have one or more dentations visible from above and may also have weakly developed paliform lobes.

Recorded in Japan from a single corallum. Uncommon elsewhere except Vanuatu where it is more abundant than *P. crustacea* (Pallas, 1766).

Pale brown in colour.

Etymology:

Named after Motupore I. region where the species was first observed.

Holotype (G32482) (Figs. 33 & 34):

A unifacial plate 153 mm across (at the corallum margin) from Apo I., Negros, Philippines at 5 m depth.

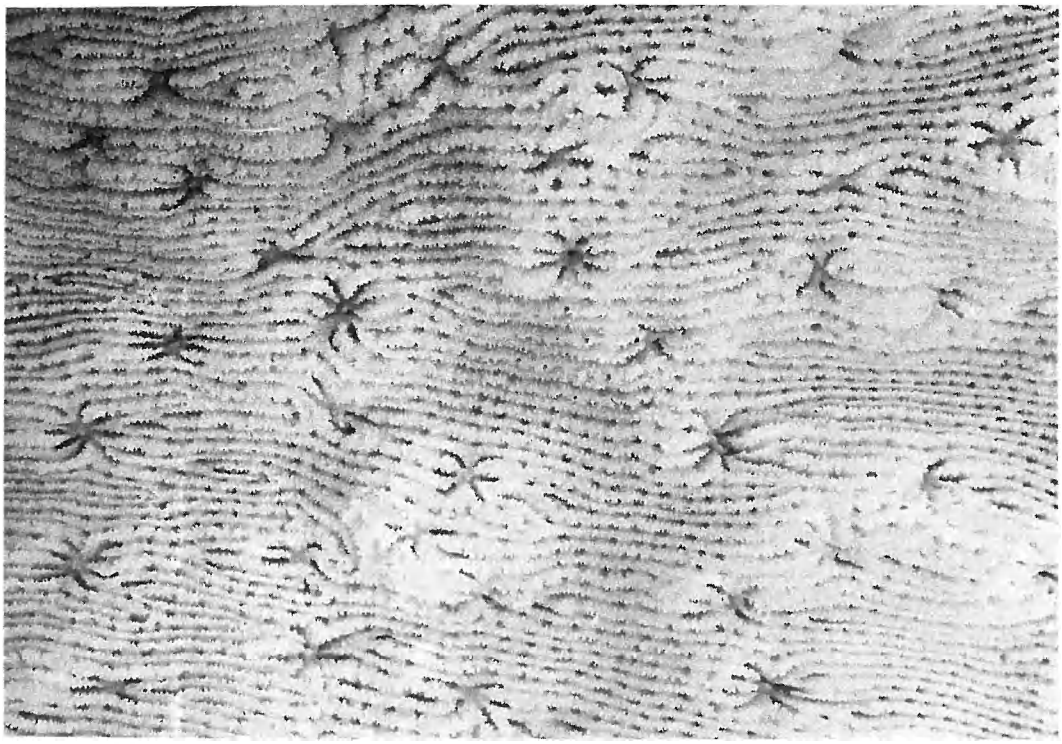

Fig. 34. Holotype of *Podabacia motuporensis* (× 4).

Distribution:

Known from Papua New Guinea, Vanuatu, the Philippines and the Yaeyama Is. of Japan.

Similar species:

This species is similar to *P. crustacea*, but is much finer, and is readily distinguished *in situ*. There are no other known species of *Podabacia*. *Coscinarae wellsi* Veron & Pichon, 1980 has a similar growth form and corallites of similar size and might be confused with this species *in situ*.

Family Pectiniidae Vaughan & Wells, 1943

Genus *Echinophyllia* Klunzinger, 1879

Echinophyllia nishihirai (Figs. 35-37 & 79)

Synonymy:

Not previously recorded.

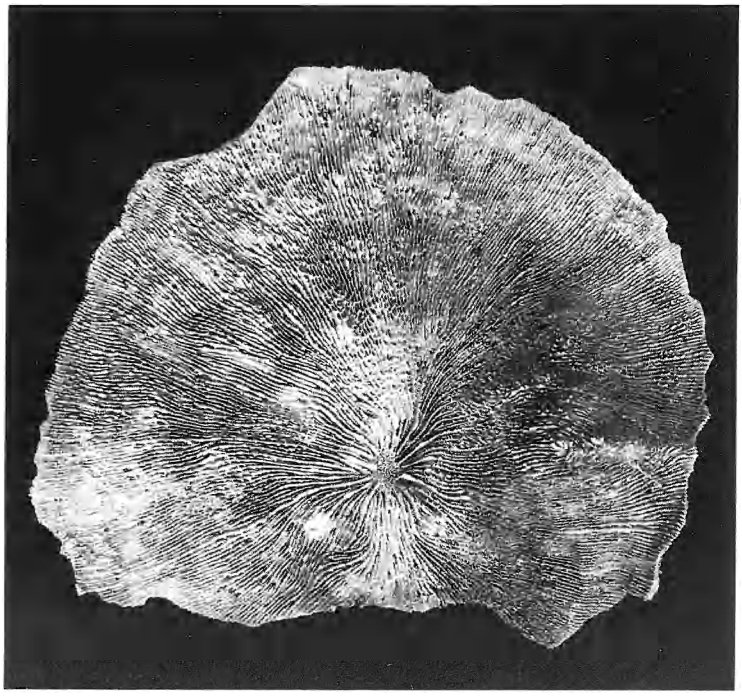

Fig. 35. Holotype of *Echinophyllia nishihirai* (× 0.5).

Specimens:

Japan: Okinawa I., Ryukyu Is. (2 specimens) (coll. M. Nishihira); Aka I., Kerama Is., Ryukyu Is. (2 specimens); Tokunoshima, Amami Is., Ryukyu Is.

Description:

Rare, but very conspicuous. Coralla have a very large central corallite with a compact, circular or elongate columella up to 20 mm diameter. In one specimen the central corallite is divided into two, due to a contortion rather than normal growth. Septo-costae radiate from the central corallite to the corallum perimeter. There are no secondary corallites except in one corallum, where there is one secondary corallite. Paliform lobes may be distinguished around the columella and dentations on septo-costae may be relatively high and rounded in the vicinity of the corallite wall, where they form several indistinct orders. Elsewhere, the septo-costae are equal and have fine, acute dentations. Alveoli occur at points of insertion of septo-costae.

Colonies are dark, usually mottled, greens and browns.

Etymology:

Named after Prof. Moritaka Nishihira of the Department of Biology, University of the Ryukyus.

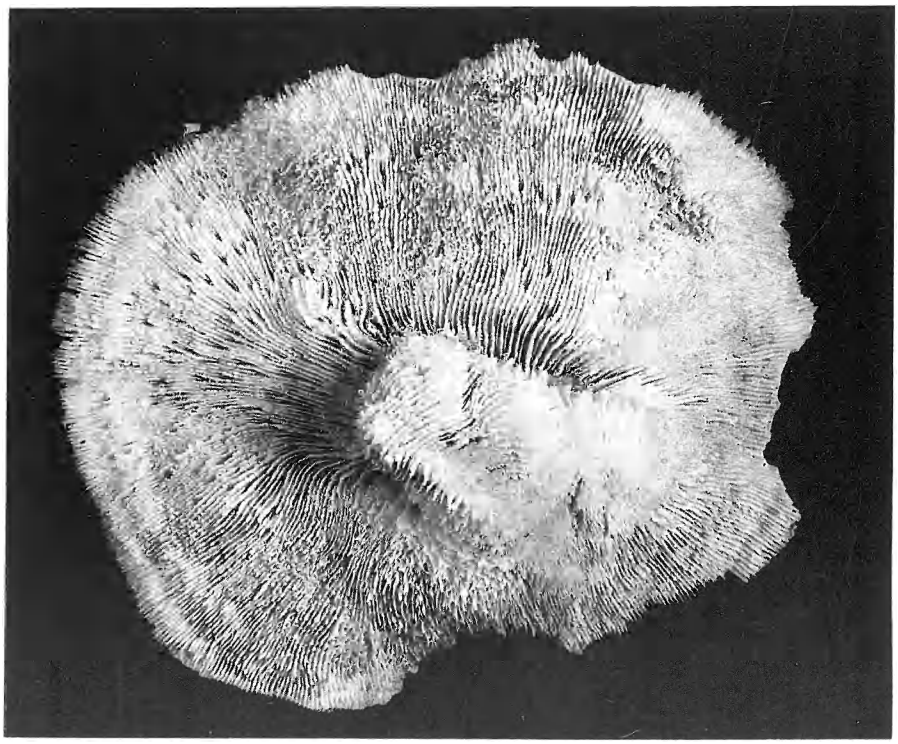

Fig. 36. *Echinophyllia nishihirai*, second specimen from Okinawa I., Ryukyu Is. (× 0.65).

Holotype (G32483) (Figs. 35 & 37):

A thin explanate plate 176 mm diameter containing a single corallite, from Okinawa I., Ryukyu Is. (coll. M. Nishihira).

Distribution:

Occurs throughout the Ryukyu Is. of Japan.

Similar species:

The affinities of this species are unclear. The closest species is *E. echinata* (Saville-Kent, 1871), which is readily distinguished by having secondary corallites and much more irregular septo-costae with higher dentations. There are also distinct affiliations with the Mussidae.

Family Mussidae Ortmann, 1890

Genus *Acanthastrea* Edwards & Haime, 1848

Acanthastrea ishigakiensis (Figs. 38-41, 80 & 81)

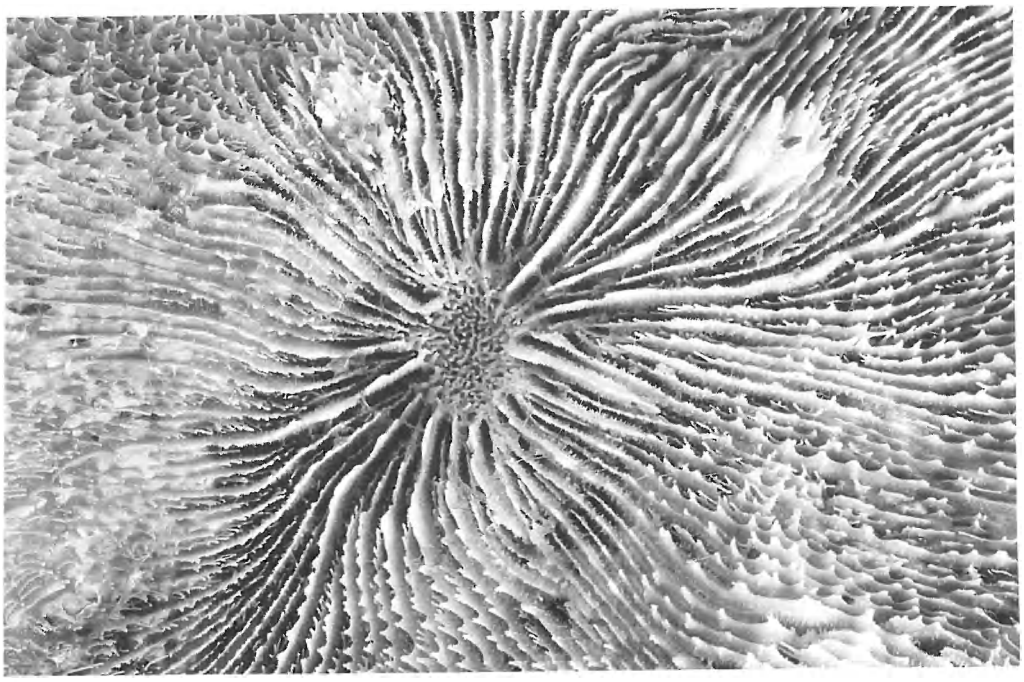

Fig. 37. Holotype of *Echinophyllia nishihirai* (× 1.8)

Synonymy:

Acanthastrea sp. Veron & Hodgson (1988)
Acanthastrea sp.1 Veron (1990a)

Specimens:

Japan: Ishigaki I., Yaeyama Is., Ryukyu Is. (3 specimens); Tonaki I., Ryukyu Is.
Philippines: Bolinao (2 specimens)
Vanuatu: Efate and Shepherd Is. (2 specimens)
Cook Is.: Niue (6 specimens, coll. G. Paulay)

Description:

Colonies massive, usually hemispherical, often >300 mm diameter. Corallites are cerioid, becoming plocoid on the colony sides, with angular calices up to 24 mm diameter. Columellae are spongy, up to 6.5 mm diameter. Septa are uniform in size, or very slightly alternate, and have up to six large dentations. Budding is intratentacular and two or more columellae in budding corallites is common. There are substantial environment-related variations among coralla which were clearly observed *in situ*. The most notable of these is a tendency for colonies from relatively deep or turbid water to become subplocoid and colonies from shallow exposed biotopes to have thickened setpa.

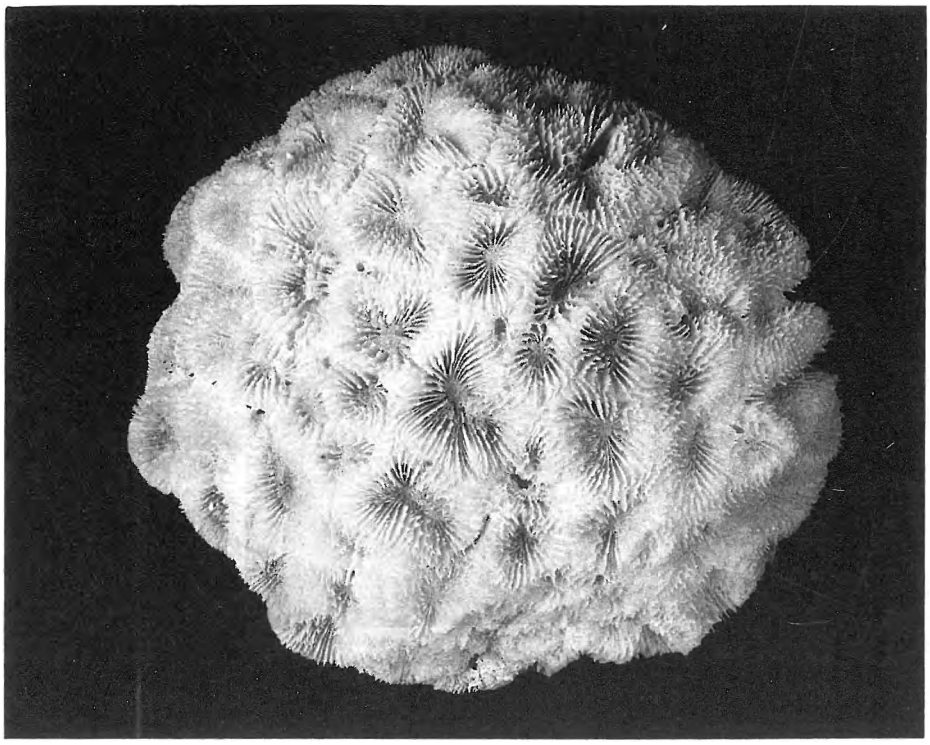

Fig. 38. Holotype of *Acanthastrea ishigakiensis* (× 0.59).

Uncommon to rare throughout the recorded range, but always very conspicuous.

Colonies are usually a uniform blue-grey in colour in Japan, grey or brown in the Philippines, dark brown with cream calices in Vanuatu. Colonies from the Cook Is. were brown with grey calices, green and brown with brown calices, and brown with green calices and brown mouths (pers. comm., G. Paulay).

Etymology:

Named after Ishigaki I., Japan, where this species is relatively common.

Holotype (G32484) (Figs. 38 & 39):

An entire hemispherical corallum 168 mm diameter from the entrance to Kabira Bay, Ishigaki I., Japan at 10 m depth.

Geographic variation:

There are clear geographic variations in both colour and skeletal detail. Colour variations recorded above have a very definite geographic basis. Coralla from Vanuatu and the Cook Is. have more widely spaced, more

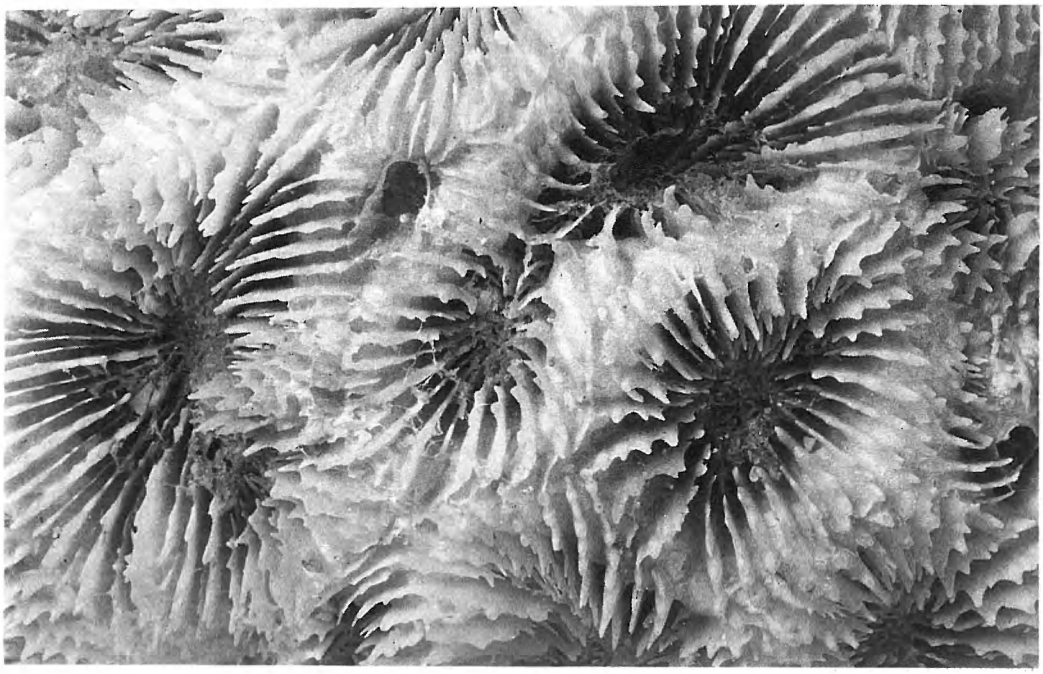

Fig. 39. Holotype of *Acanthastrea ishigakiensis* (× 2).

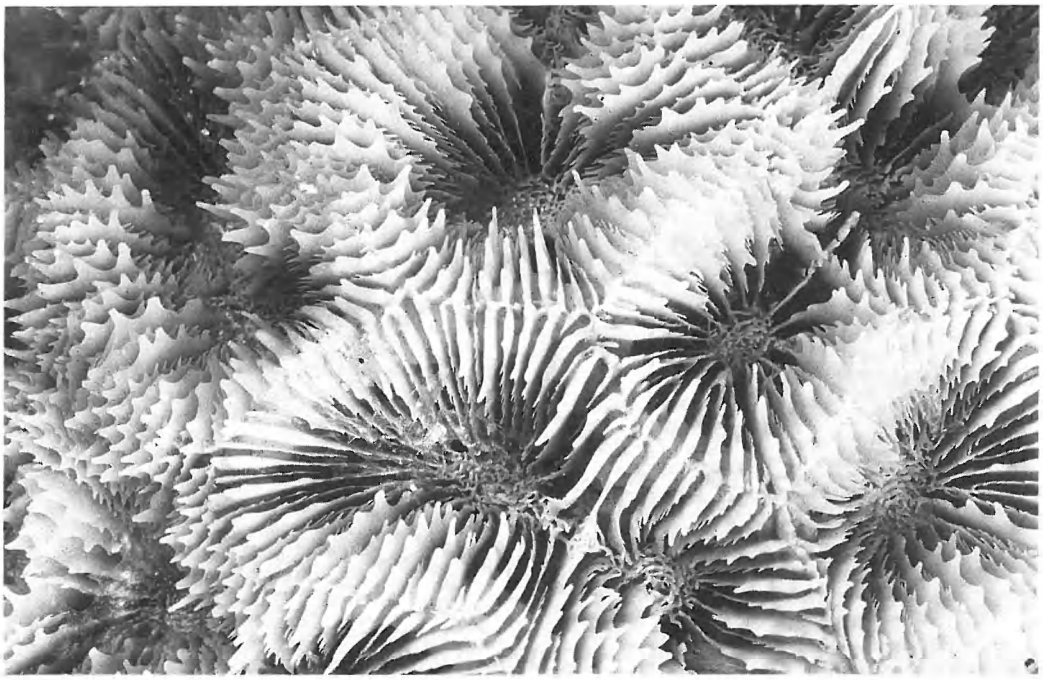

Fig. 40. *Acanthastrea ishigakiensis* from Bolinao, Philippines (× 2).

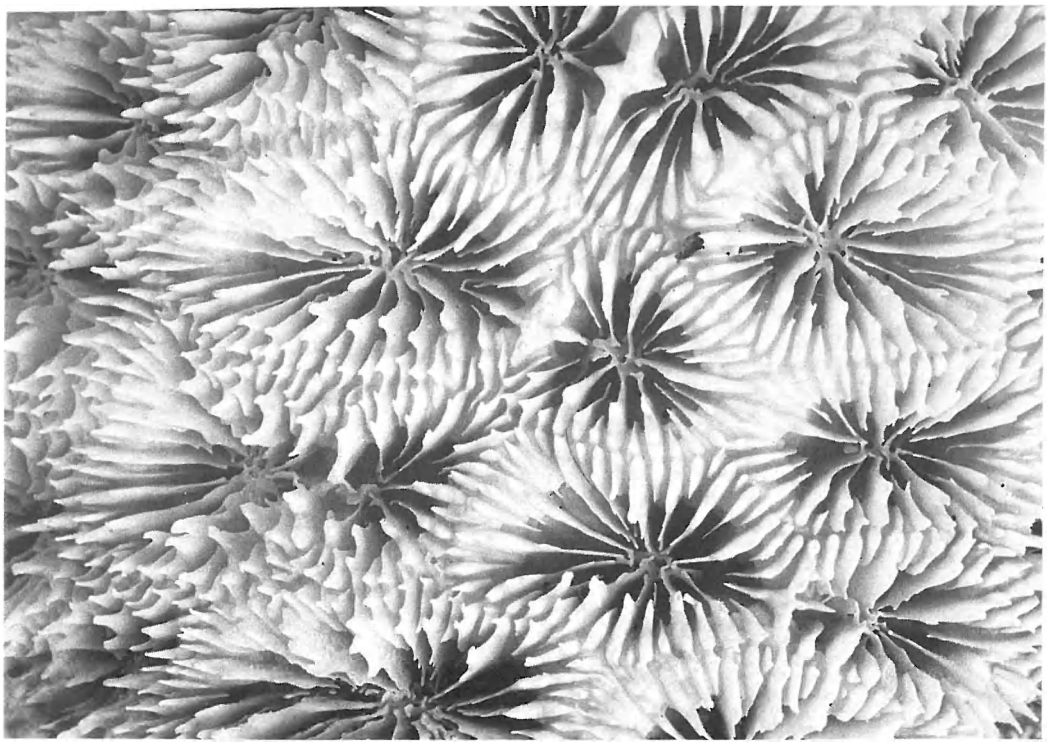

Fig. 41. *Acanthastrea ishigakiensis* from Niue, Cook Is. (× 2).

strongly dentate septa. Both coralla from Vanuatu and one from the Cook Is. have well developed ambulacral grooves between corallites and some septa are greatly thickened towards the corallite walls. Both coralla from the Philippines have fine ambulacral ridges between corallites and Philippines coralla (especially) have more numerous septa and finer dentations. There are clear geographic, as distinct from environment-related variations.

Distribution:

Known from the Philippines, the Ryukyu Is. of Japan, Vanuatu and The Cook Is.

Similar species:

Acanthastrea (Mareastrea) grandiflora Chevalier, 1968 from the Holocene of New Caledonia is described from a single specimen containing three corallites. It cannot be determined if this is the same species as the present one, but as it is plocoid, with smaller corallites, this is unlikely. *Acanthastrea maxima* Sheppard from Muscat, has much larger corallites than *ishigakiensis*, with substantially different septal structures, extratentacluar budding, and polyps which are 'large flesh cups which are crowded together but which are not attached to each other above the calice height'.

Acanthastrea amakusensis (Figs. 42-44 & 82)

A single corallum from Sesoko I., Okinawa, Japan may be another undescribed *Acanthastrea*, with corallites smaller than those of *amakusensis*.

Synonymy:

Acanthastrea minuta Moll & Borel Best, 1984; Veron & Kelley (1988)
Acanthaster sp.2 Veron (1990a)

Specimens:

Japan: Tanegashima (3 specimens); Amakusa Is.; Kushimoto; Shirahama
Thailand: Mergui Arch.
Vanuatu: Tana I.

Description:

Colonies are cereoid, with neat, angular corallites with calices up to 7.5 mm diameter. Columellae are up to 3.5 mm diameter. Septa are subequal with granulated sides and margins and usually have 1-3 large dentations. 'Groove and tubercle' structures are present in two specimens. Colonies are fleshy, brightly coloured, green or red (rarely), white.

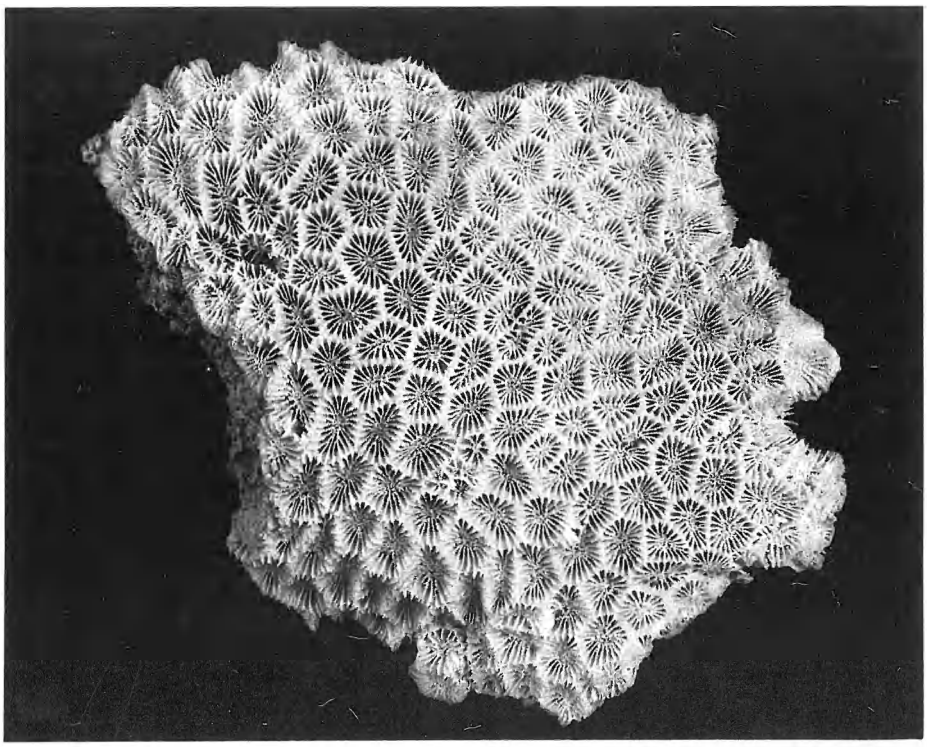

Fig. 42. Holotype of *Acanthastrea amakusensis* (× 1.1).

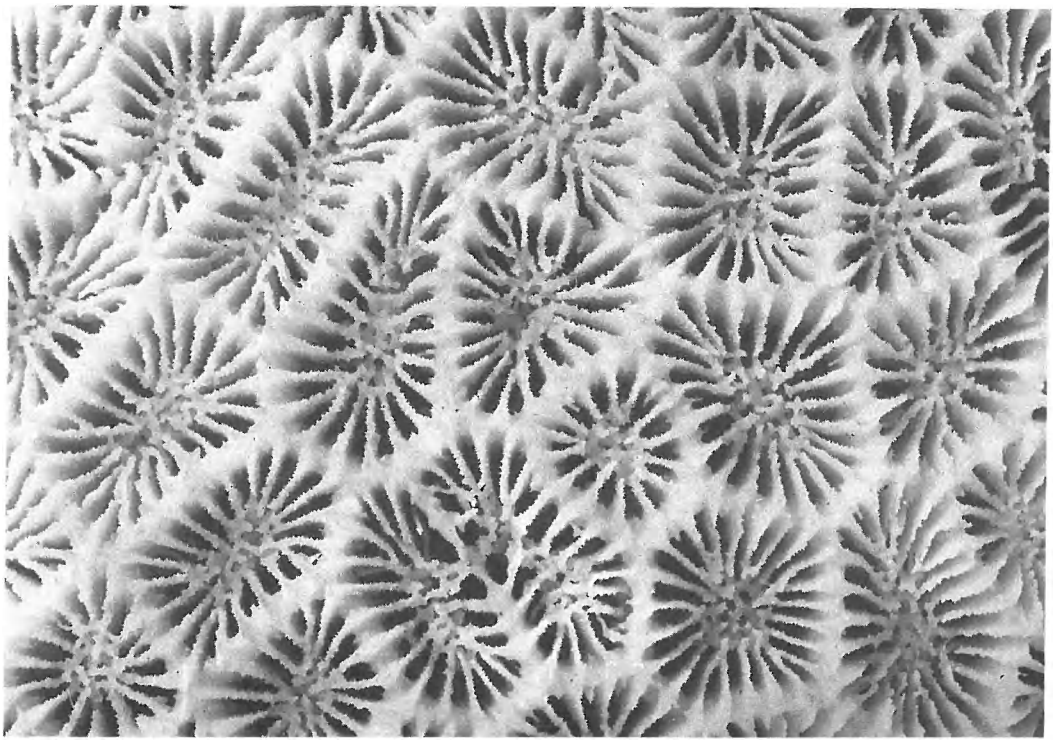

Fig. 43. Holotype of *Acanthastrea amakusensis* (× 4).

This species appears to be rare throughout the know distribution range.

Etymology:

Named after the Amakusa Is., Japan, the type locality.

Distribution:

Known from western Thailand, Tanegashima and mainland Japan (Amakusa Is., Kushimoto and Shirahama) and Vanuatu.

Holotype (G32485) (Figs. 42 & 43):

Part of an encrusting colony 94 × 80 mm from O-gase, an exposed rock outcrop at the Amakusa Is., Japan at approximately 10 m depth.

Similar species:

This species has corallites of similar size as the holotype and only specimen of *A. minuta* Moll & Borel-Best, 1984. There closely resemble peripheral encrusting corallites of *A. rotundaflora* Chevalier, 1968 which typically are sub-plocoid and have widely spaced septa. The nearest species structurally (and with a similar *in situ* appearance) is *A. lordhowensis*

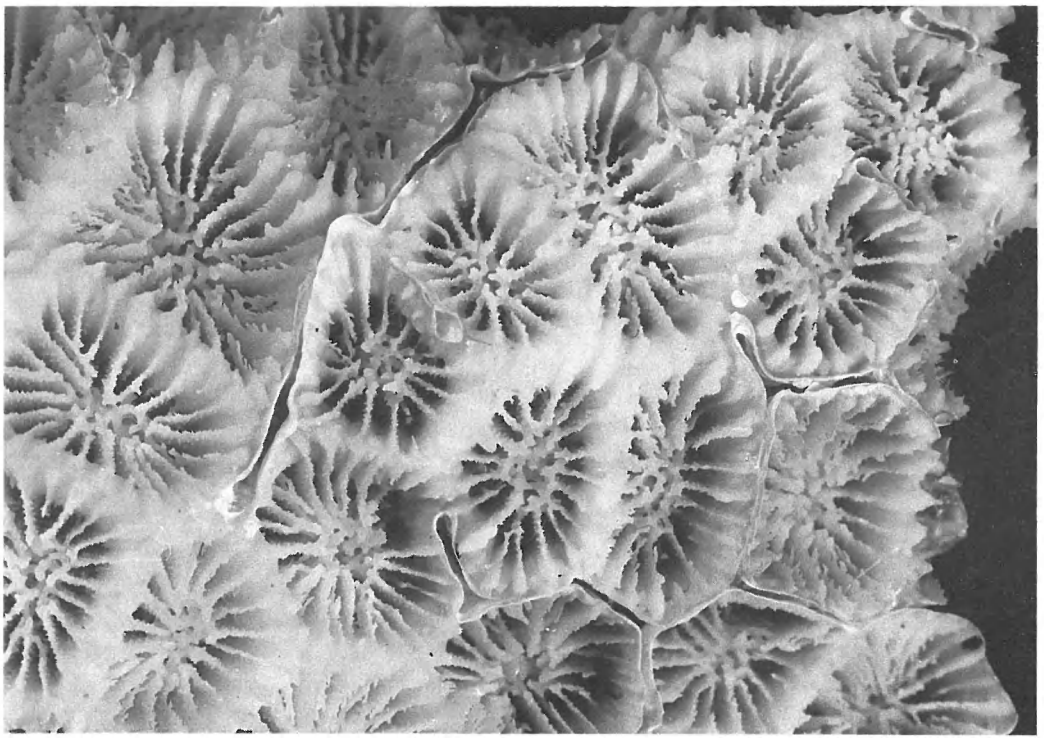

Fig. 44. *Acanthastrea amakusensis* from Tanegashima, Japan (× 4).

Veron & Pichon, 1980 (Fig. 45) which has larger, less regular corallites and more septa. These species were readily distinguished *in situ* at Tanegashima and the Amakusa Is.

Family Merulinidae Verrill, 1866

Genus *Hydnophora* Fischer de Waldheim, 1807

Hydnophora bonsai (Figs. 46 & 47)

Synonymy:

Not previously recorded.

Specimens:

Japan: Tanegashima (2 specimens); Amakusa Is. (1 specimen); Kushimoto (3 specimens)

Description:

Uncommon. Colonies are encrusting, plate-like, with short irregular

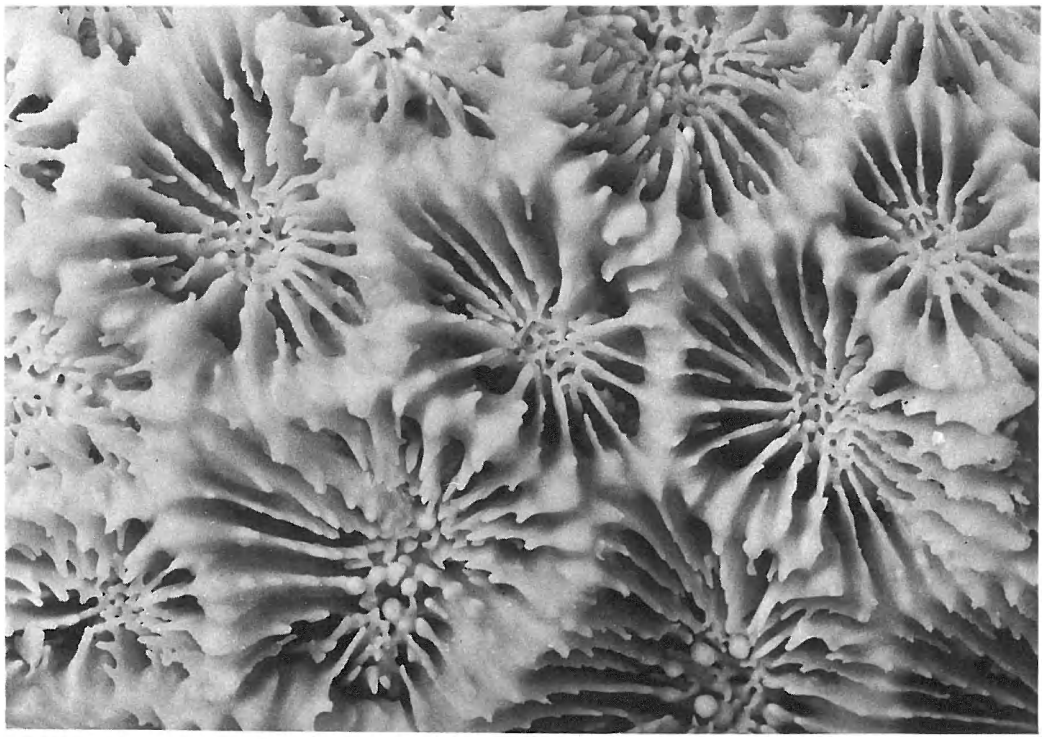

Fig. 45. *Acanthastrea lordhowensis* from Tanegashima, Japan (× 4).

branch-like upgrowths. Monticules are conical on upgrowths but form short radiating collines on the perimeter of encrusting plates. They are mostly <2 mm wide and may be up to 5 mm high but most are <3 mm. Septa are correspondingly fine. They strongly alternate and are strongly dentate, with very elaborated tips. Setpa are thin on the monticules, becoming wide and coarser in the valleys. Columellae are irregularly developed and usually consist of a few twisted trabeculae.

Although most individual coralla are polymorphic (like those of *H. exesa*, (Pallas, 1766)) this appears to be product of the relative age of different parts of the colony rather environment-related variation. Thus, central areas of large colonies have upgrowths, while peripheral areas are explanate or encrusting, with outwardly inclined monticules forming radiating collines.

Colonies are mostly pale colours; tentacles are sometimes extended during the day.

Etymology:

So named because colonies have a stunted appearance.

Holotype (G32486) (Figs. 46 & 47):

Part of an encrusting corallum 121 mm long and 100 mm wide, including a stunted branch, from Kushimoto, Japan at 4 m depth.

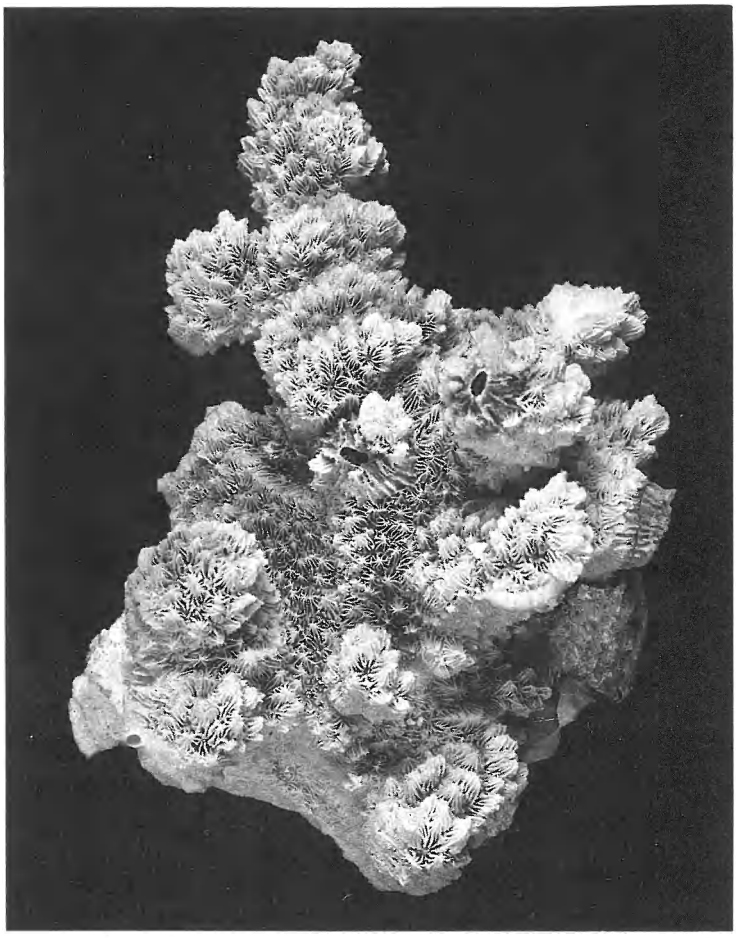

Fig. 46. Holotype of *Hydnophora bonsai* (× 0.93).

Distribution:

Known only from the mainland of Japan (Amakusa Is., Kushimoto and Shirahama).

Similar species:

This species is apparently a high-latitude Japanese endemic. The growth form is similar to *H. exesa* but is finer, with relatively stunted branches. It might have been considered a geographic subspecies of *H. exesa* had not these two species been found together.

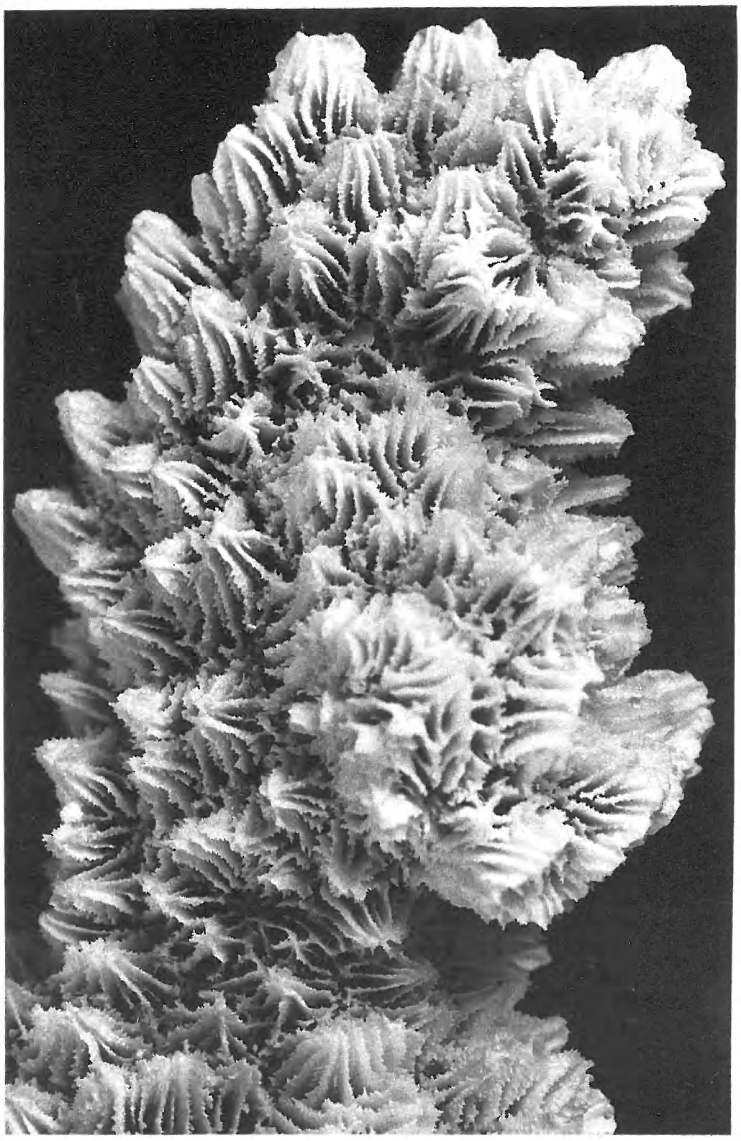

Fig. 47. Holotype of *Hydnophora bonsai* (× 4).

Family Faviidae Gregory, 1900

Genus *Goniastrea* Edwards & Haime, 1848

Goniastrea deformis (Figs. 48-50 & 83)

Synonymy:

Not previously recorded.

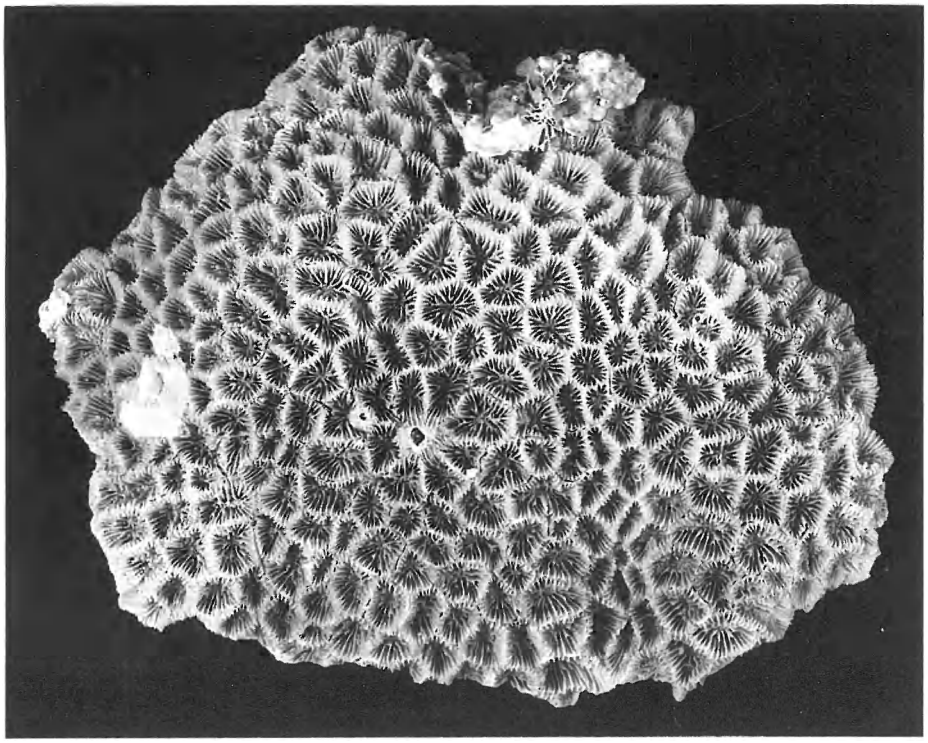

Fig. 48. Holotype of *Goniastrea deformis* (× 0.93).

Specimens:

Japan: Tanegashima (4 specimens): Amakusa Is.; Kushimoto (6 specimens)

Description:

Coralla are massive, cerioid, with angular to irregular corallites up to 8.8 mm diameter. Septa are equal or slightly alternate and usually have strong, almost *Acanthastrea*-like dentations and granulated sides. Most coralla have a high degree of septal fusion. Paliform lobes are usually well developed, but this, as with other *Goniastrea* species, is variable and some coralla, especially those from Kushimoto, have only weakly formed paliform lobes and hence a *Favites*-like appearance. Some coralla from Kushimoto have some development of a 'groove and tubercle' formation.

Colonies are usually dark colours, usually deep red.

Uncommon and may be restricted to high latitude localities of Japan.

Etymology:

So named because skeletal elements are less even or regular than in other *Goniastrea* species.

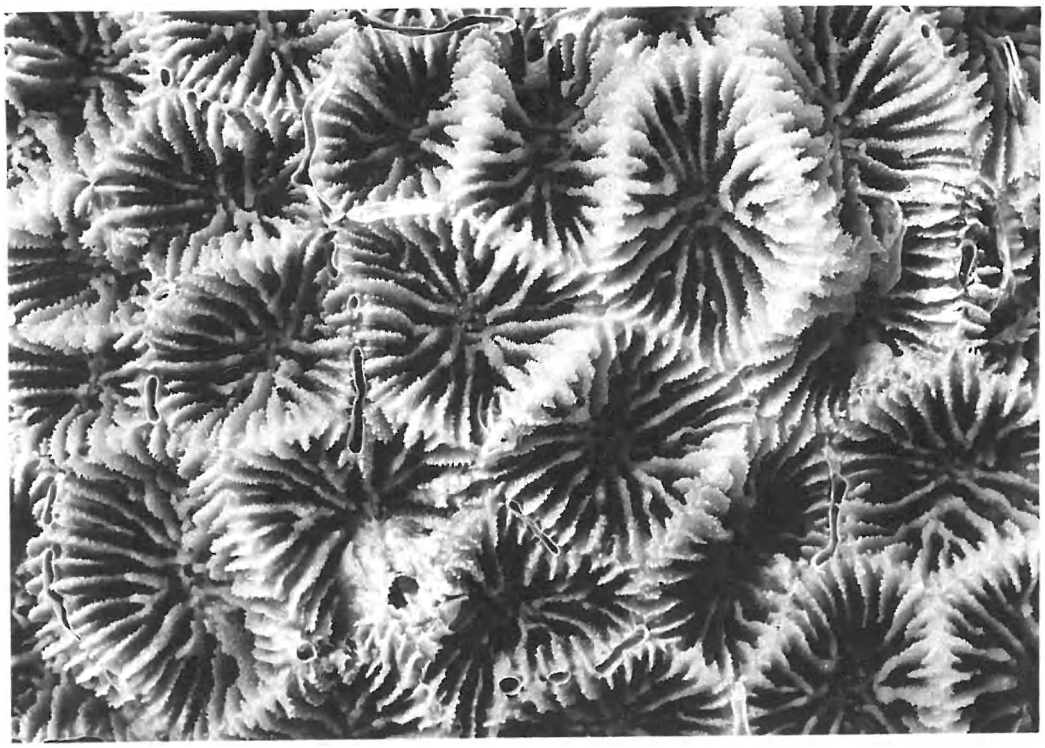

Fig. 49. Holotype of *Goniastrea deformis* (× 4).

Holotype (G32487) (Figs. 48 & 49):

An oval-shaped encrusting corallum 122 mm maximum dimension, from Kushimoto, Japan at 4 m depth. A groove and tubercle formation is weakly developed.

Distribution:

Known from Tanegashima and mainland Japan (Amakusa Is., Kushimoto, Shirahama), but may occur in tropical localities.

Similar species:

It is likely that this species is more widespread than indicated above. It is not easy to recognise *in situ* because it has no clearly distinctive characters and coralla have characters in common with *Favites*, *Platygyra* as well as *Goniastrea* species.

It is closest to *G. aspera* (Verrill, 1865), and was originally considered to be a possible high latitude geographic subspecies of *aspera*. However, both species co-occur at Tanegashima. They are distinguished by *aspera* having more regular corallites with less granulated, equally spaced septa, a neat paliform crown (if present), and little tendency towards fusion of the septa.

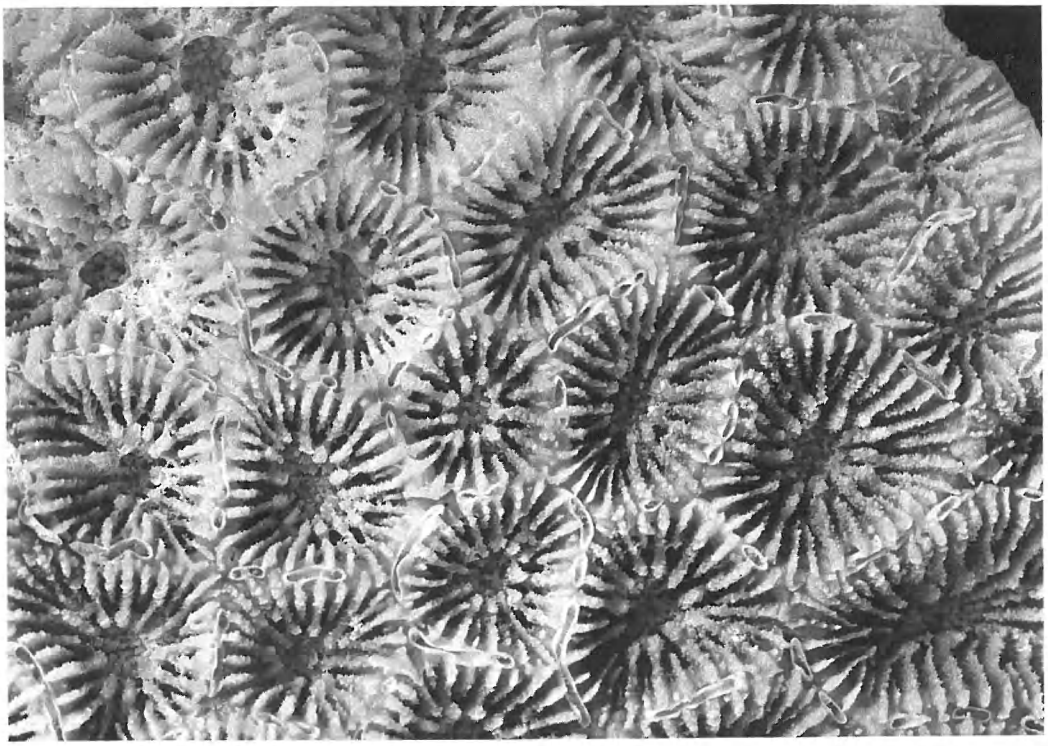

Fig. 50. *Goniastrea deformis* from Kushimoto, Japan (× 4).

Genus *Platygyra* Ehrenberg, 1834

Platygyra contorta (Figs. 51, 52 & 84)

Synonymy:

Platygyra sp. Veron & Hodgson (1988)
Platygyra sp. Veron (1990a)

This species was originally attributed to *Boniastrea boniensis* Yabe & Sugiyama, 1935 by Veron (1986) and Nishihira (1988) as the holotype was believed lost and no colonies or coralla clearly attributable to this species had been found in the Ryukyu Is. or mainland Japan.

Specimens:

Japan: Iriomote I. and Ishigaki I., Yaeyama Is., Ryukyu Is.; Minna I., Okinawa Is., Ryukyu Is.; Tanegashima; Kushimoto (6 specimens)
Philippines: Puerto Galera
Papua New Guinea: Motupore I.
Vanuatu: Tana and Aneityum Is.

Description:

Colonies are massive or encrusting, usually with explanate margins,

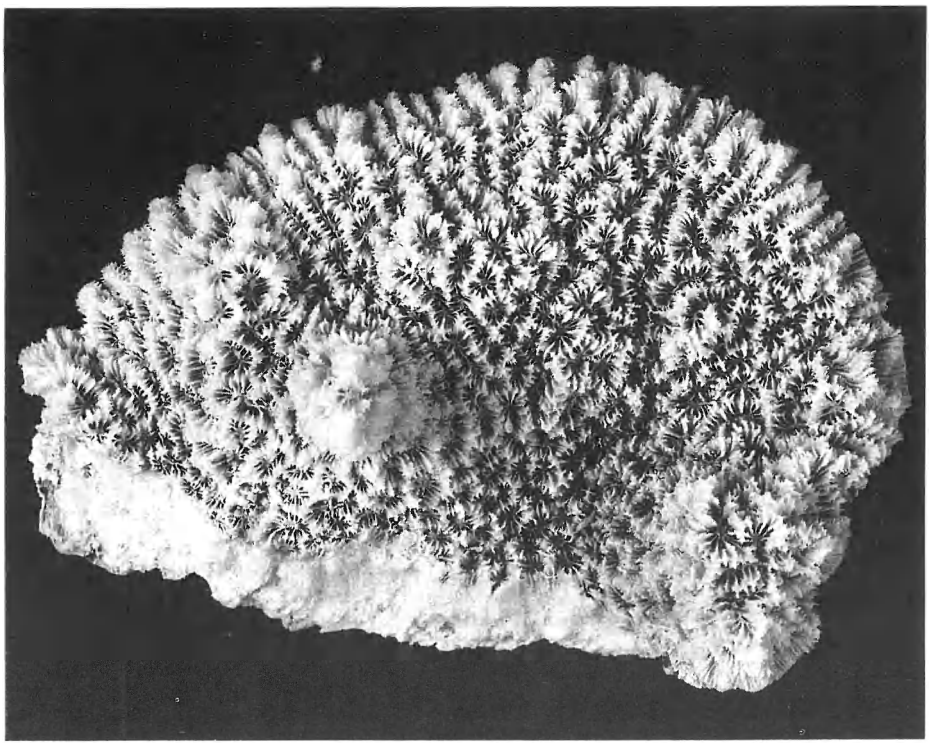

Fig. 51. Holotype of *Platygyra contorta* (× 0.93).

rarely with contorted upgrowths. Large colonies may develop tall, distinctive columns. Valleys are 3.5-5 mm wide, usually long and relatively straight and radiating on the margins, becoming short and/or sinuous and contorted towards the colony centre. Walls are thin and acute. Septa are irregular in all respects giving walls a ragged appearance similar to those of *P. daedalea* (Ellis & Solander, 1786). Columella structures are variable. Columellae may consist of a continuous wall of loosely twisted septal dentations without any tendence to form centres, or may have ill-defined centres and associated weakly-formed paliform lobes. This range is similar in *P. pini* Chevalier, 1975.

The species is generally uncommon in the Ryukyu Is., becoming common in mainland Japan. It may be common in some biotopes of the countries listed above and also occurs in Indonesia. No geographic variation has been determined, all variation in the species being environment-related or, more particularly, related to position on the colony.

Colonies have a fleshy appearance. Colours are uniform, commonly red, grey, pale yellow or green.

Etymology:

So named because of the contorted appearance of the walls and valleys.

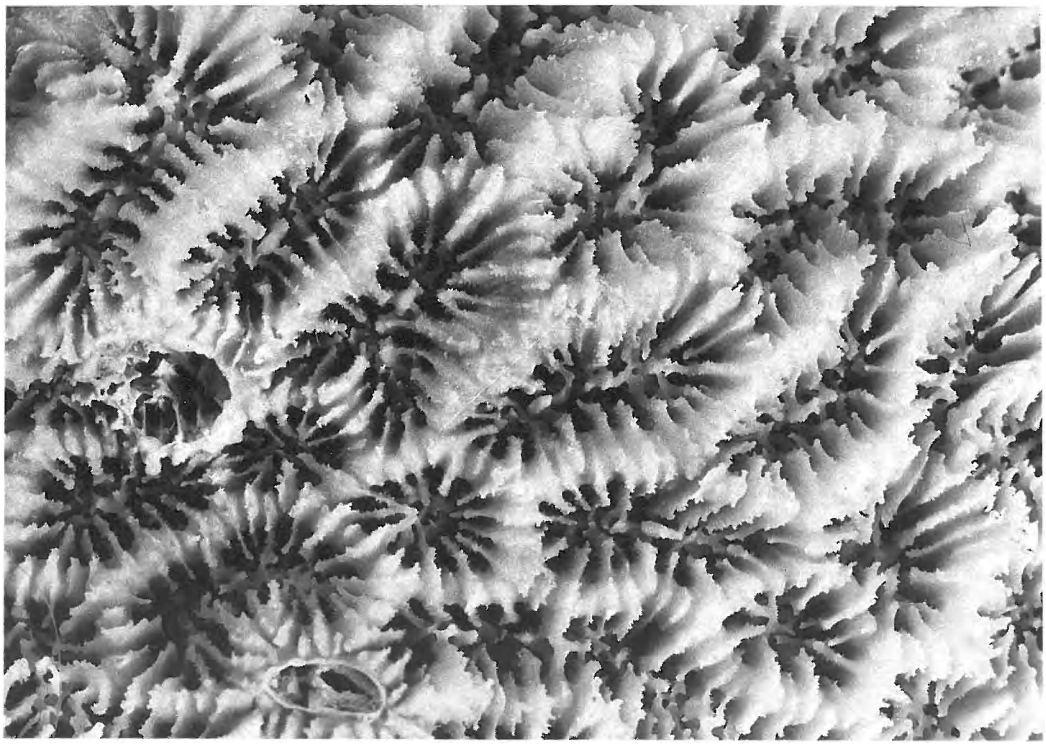

Fig. 52. Holotype of *Platygyra contorta* (× 4).

Holotype (G32488) (Figs. 51 & 52):

A corallum from the edge of plate-like colony, 128 mm across, with a single small columnar upgrowth, from Puerto Galera, Philippines at 15 m depth.

Distribution:

Widely distributed throughout SE Asia north to the south coast of Honshu, Japan (Yaeyama, Okinawa and Amami Is., Tanegashima, Amakusa Is., Kushimoto, Shirahama) and south to Papua New Guinea and Vanuatu.

Similar species:

Considering the distinct appearance of both coralla and living colonies of this species, and its wide distribution, it would seem likely that it would have been previously described. It clearly has the characters of *Platygyra*, and is closest to *P. daedalea*. It remains, however, one of the most distinct of the *Platygyra* species.

Genus *Leptoria* Edwards & Haime, 1848

Leptoria irregularis (Figs. 53, 54 & 85).

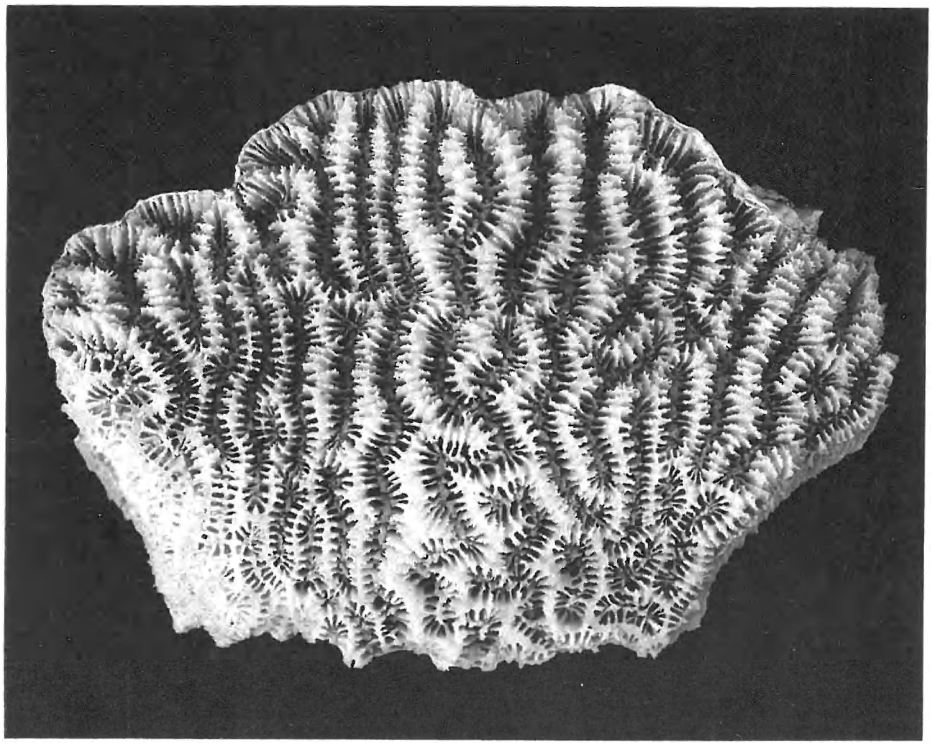

Fig. 53. Holotype of *Leptoria irregularis* (× 1.47).

Synonymy:

Not previously recorded.

Specimens:

Japan: Sekisei Lagoon, Yaeyama Is., Ryukyu Is.; Iheya I., Ryukyu Is.

Description:

Colonies are submassive or plate-like, up to 1.5 m diameter. Large colonies may have surface irregularities developing into mounds or, rarely, into low columns. Valleys are 2.8-3.9 mm wide, mostly straight and parallel at the corallum margins with strong dentations, the dentations ornamented with very fine spinules. Columellae do not form centres. They consist of irregularly fused trabeculae and are not plate-like.

The present series of specimens shows little variation. Walls and valleys are broader in coralla exposed to strong wave action than those from deeper or more protected biotopes. The species is uncommon and probably restricted to exposed habitats.

Living colonies are pale blue-grey.

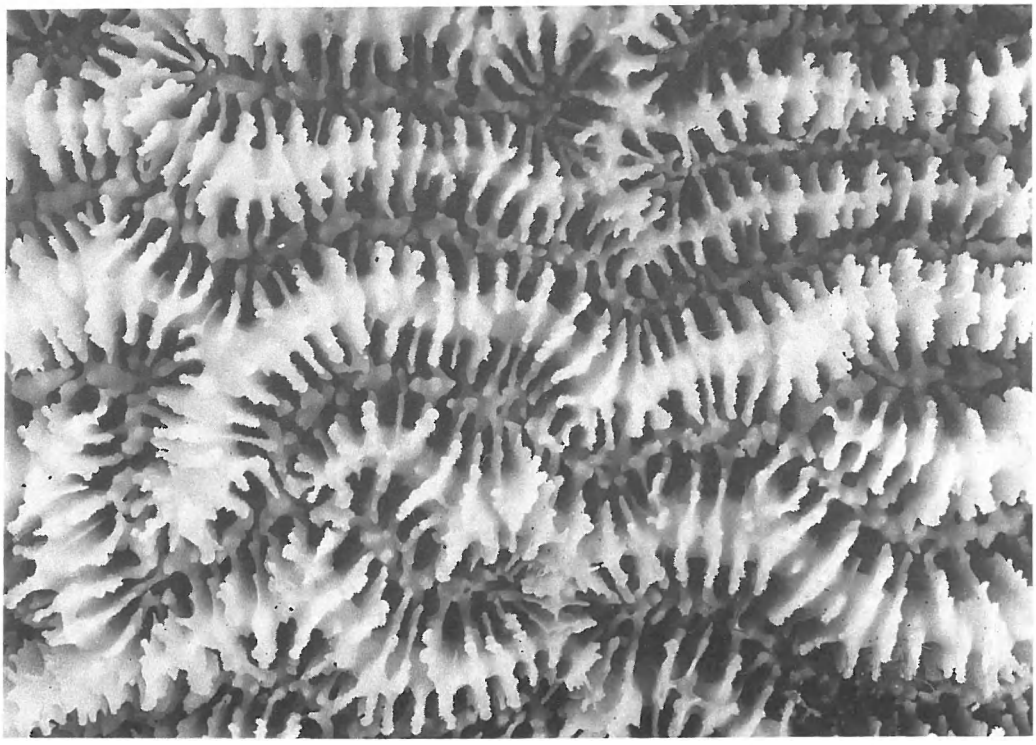

Fig. 54. Holotype of *Leptoria irregularis* (× 4).

Etymology:

So named because this species lacks the neat, regular arrangement of septa which characterises *L. phrygia* (Ellis & Solander, 1786).

Holotype (G32489) (Figs. 53 & 54):

A corallum from the edge of a plate-like colony, 76 mm across from N side of Kayama I., Sekisei Lagoon, Ryukyu Is. at 15 m depth.

Distribution:

Observed by the author in the Philippines (but not recorded by Veron & Hodgson, 1988), and occurs throughout the Ryukyu Is.

Similar species:

This species is similar to *L. phrygia*, although the two can be readily distinguished *in situ*. Valleys of *L. phrygia* are slightly smaller and are more sinuous and septo-costae are notably more regular. Coralla are readily distinguished by these characters and, more reliably, by the columellae, which are plate-like in *L. phrygia*. This species has greater similarity with *Platygyra* spp. than has *L. phrygia*. Apart from *L. phrygia*, it is closest to *P. ryukyuensis* Yabe & Sugiyama, 1935, from which it is distin-

guished by having thicker walls and much longer valleys.

Many previous authors have divided *L. phrygia* into three species: *L. phrygia*, *L. gracilis* (Dana) and *L. tenuis* (Dana) (references in Veron *et al.*, 1977). The conclusion of the latter four studies, that these are synonyms, is again supported by the present study, which involved re-examination of the holotype *L. gracilis*.

Genus *Echinopora* Lamarck, 1816

Echinopora pacificus (Figs. 55-57 & 86)

Synonymy:

Echinopora lamellosa (pars) Veron *et al.* (1977), p. 184, Fig. 367
Echinopora sp. Veron (1988)

Specimens:

Japan: Ishigaki I., Yaeyama Is., Ryukyu Is. (7 specimens); Minna I., Okinawa Is., Ryukyu Is.; Aka I., Kerama Is., Ryukyu Is.; Tokunoshima, Amami Is., Ryukyu Is.
Vanuatu: Efate I.
Great Barrier Reef: Bowl Reef

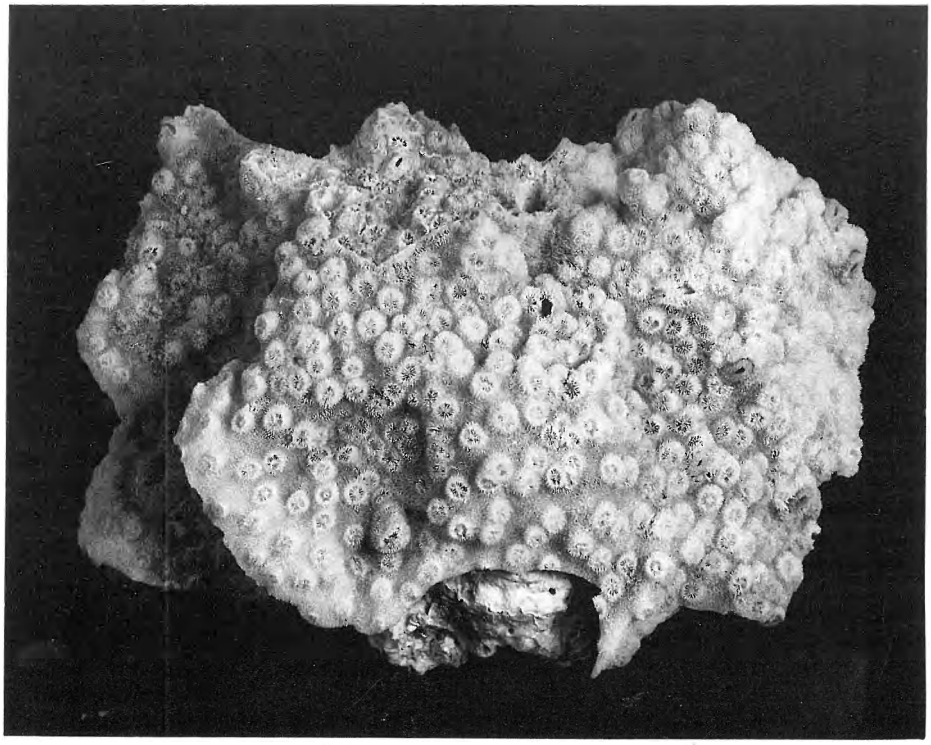

Fig. 55. Holotype of *Echinopora pacificus* (× 0.67).

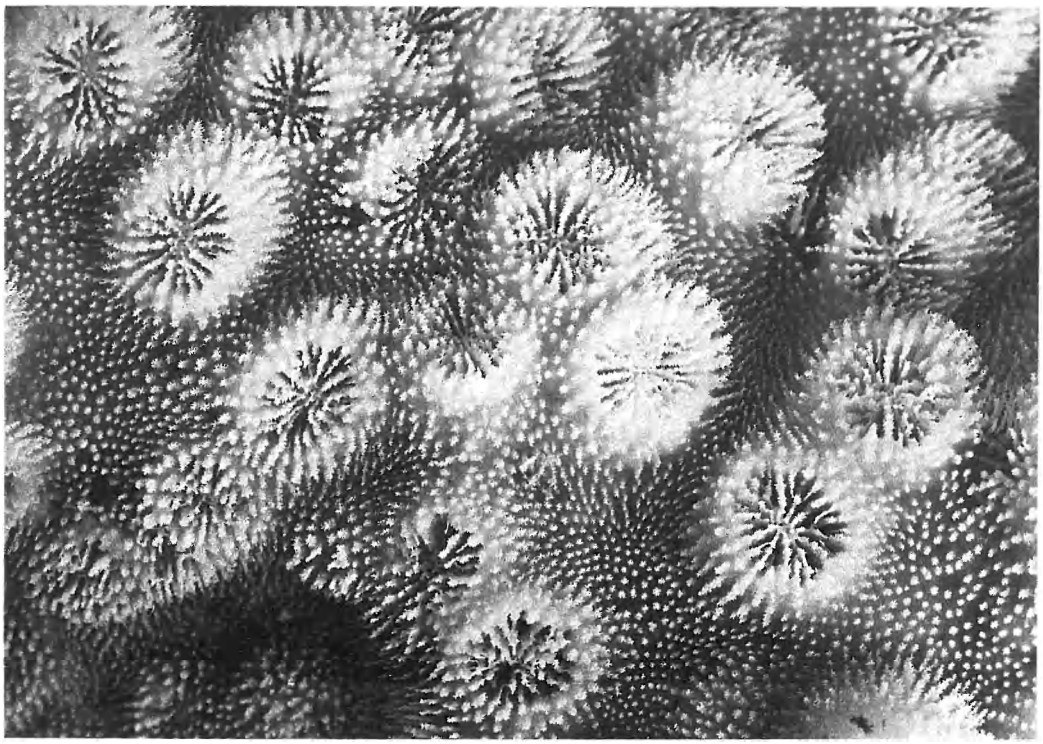

Fig. 56. Holotype of *Echinopora pacificus* (× 4).

Description:

Colonies are unifacial (rarely bifacial) plates, usually with free margins and thick, encrusting or attached, centres. Corallites are similar to those of *E. lamellosa* (Esper, 1795), but are much larger, with calices up to 9.8 mm diameter. Septo-costae are in two orders, the second seldom forming well-developed septa. Septal dentations are well developed, usually tall and spinulose. Costae are beaded, the beads integrating with the coenosteum spinules which are very numerous and equi-distant, giving both coralla and living colonies a velvet-like appearance.

The present series of specimens shows considerable variation in the size of corallites and the distance between them. Parts of thin plates tend to have relatively small, fine corallites, while corallites on thick, encrusting colonies, or those on convex surfaces, are larger and have thicker walls.

Colonies are green to grey-brown in colour.

Etymology:

So named because the species has a wide Pacific distribution.

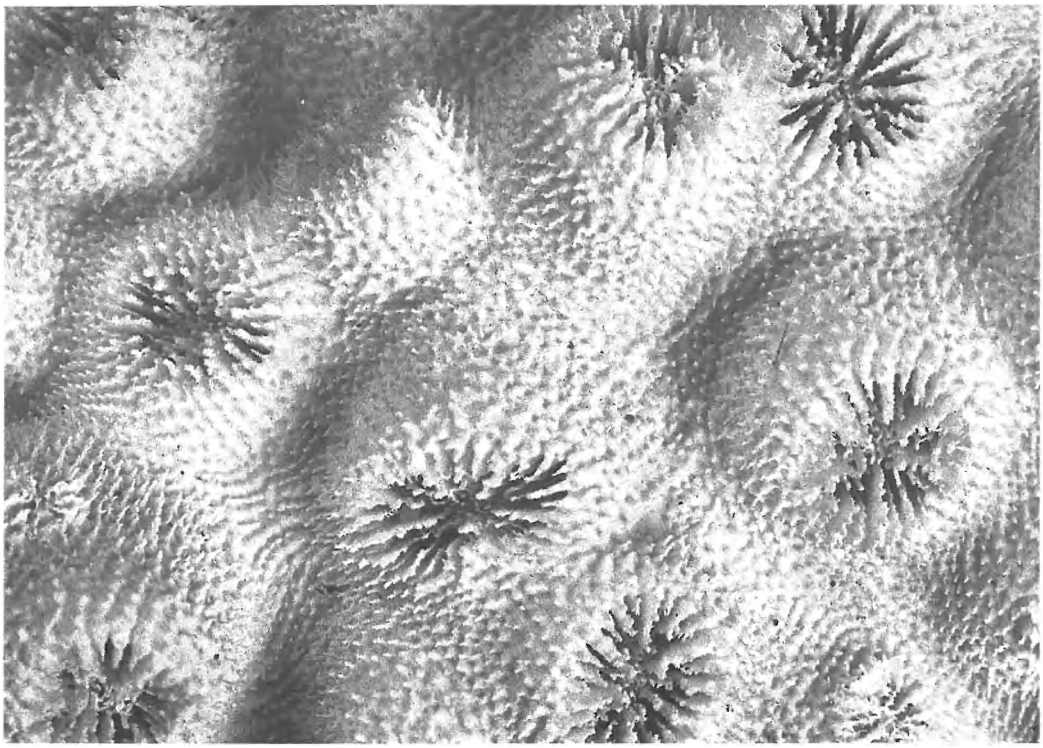

Fig. 57. *Echinopora pacificus* from Vanuatu (× 4).

Holotype (G32490) (Figs. 55 & 56):

Part of an encrusting plate-like colony with a partly free margin, 163 mm across, from the entrance to Kabira Bay, Ishigaki I., Ryukyu Is. at approximately 15 m depth.

Distribution:

The great Barrier Reef, Vanuatu, Indonesia, the Philippines and the Ryukyu Is. of Japan.

Similar species:

The closest species is *E. lamellosa*, as noted above.

Echinopora ashmorensis (Figs. 58-62, 87 & 88)

Synonymy:

Echinopora lamellosa (pars) Veron (1986), p. 528, Fig. 2
Echinopora sp. Veron & Marsh (1988)
Echinopora sp. Veron & Hodgson (1988)

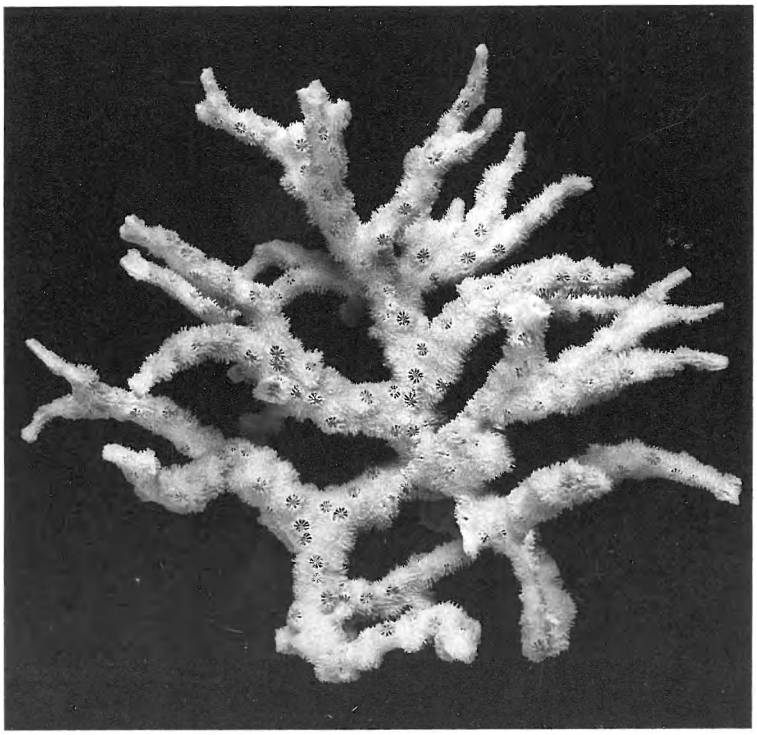

Fig. 58. Holotype of *Echinopora ashmorensis* (× 0.6).

Specimens:

Australia: Ashmore Reef (4 specimens)
Philippines: Puerto Galera (two collecting station) (4 specimens)

Description:

Colonies are composed of irregular tubes with hollow centres, (rarely) solid cylindrical branches, flattened contorted branches and/or irregular flattened anastomosed irregular upright plates. Colonies may be very large: over 2 m diameter at Ashmore Reef. Corallites have a similar wide variation in structure, which partly correlated with growth from. When fully developed, corallites are conical and have three full septal cycles. The first two cycles reach the columella, the second being thinner than the first. The third cycle is short. The columella is well formed. Septa are irregularly dentate, the inner dentation forming a paliform lobe. All septal structures are heavily granulated. Calices are 2.3-3.6 mm diameter. The coenosteum is covered with tall spinules, and at branch ends, especially, is strongly costate. In some coralla, corallites are mostly immersed and all septal structures are much reduced: only two cycles are discernible and these may be very irregular. The columella is reduced and there is also substantial variation in the development of coenosteum spinules.

Colonies are a uniform brown in colour and dark blue-grey at Ashmore Reef.

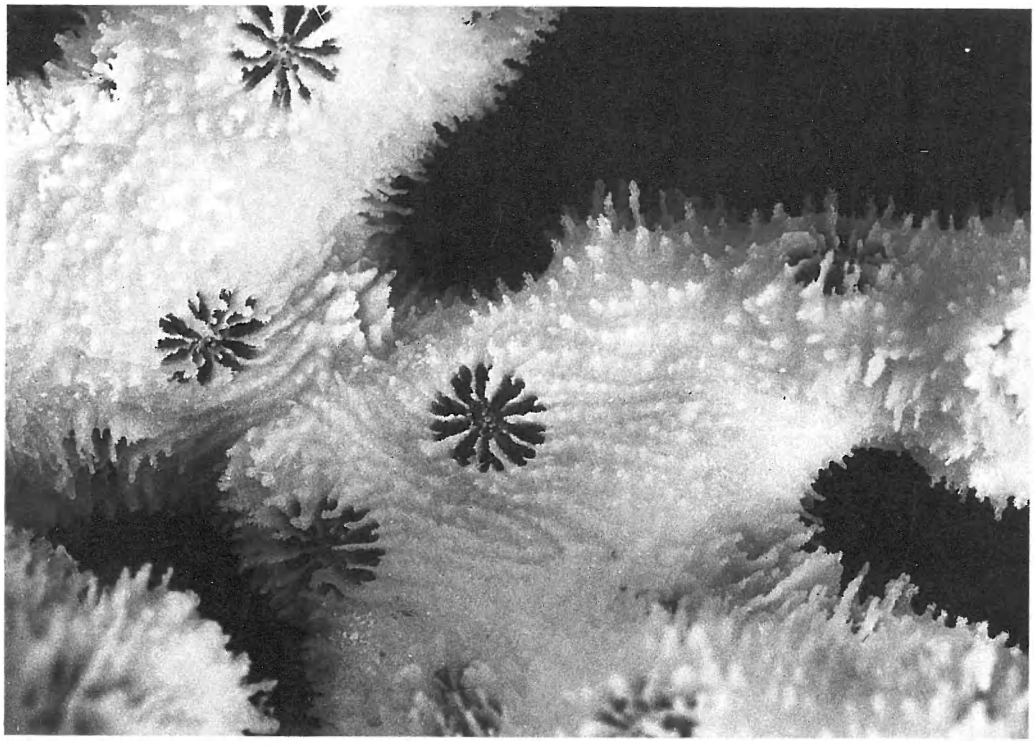

Fig. 59. Holotype of *Echinopora ashmorensis* (× 4).

Etymology:

Named after Ashmore Reef where this species was first observed.

Holotype (G32491) (Figs. 58 & 59):

A compact arborescent corallum 111 mm high and 141 mm wide from Ashmore Reef, NW Australia at 2 m depth.

Geographic and environmental variation:

Coralla from Ashmore Reef (Figs. 58, 59 & 62) and those from two different locations at Puerto Galera in the Philippines (Figs. 60 & 61) show very substantial variation in both growth form and corallite structure. Coralla from Ashmore Reef are basically tubular, occasionally forming solid branches. Corallites are conical and have a well developed septation. Coralla from the Philippines consist of flattened branches or (in a different biotope), flattened anastomosing plates. They have relatively immersed corallites, with weakly developed columella and weakly developed coenosteum spinules.

Much of this variation is clearly environment-related, both localities at the Philippines being protected, with partly turbid water and abundant

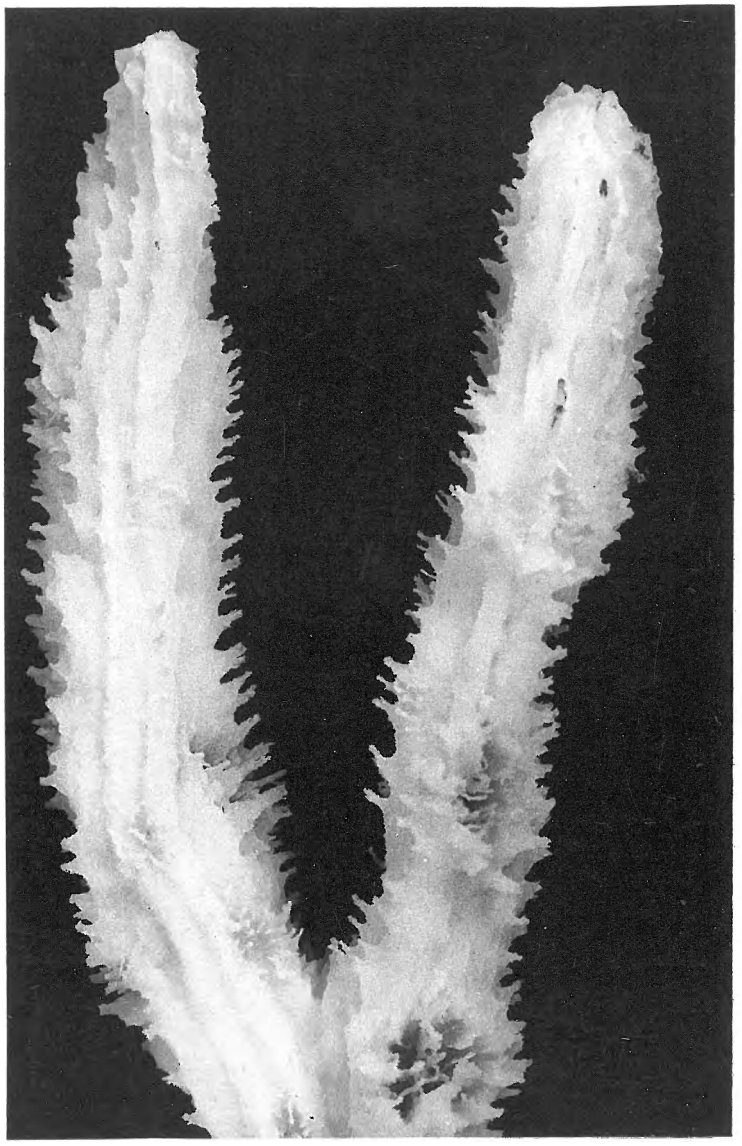

Fig. 60. *Echinopora ashmorensis* from Puerto Galera, Philippines (× 4).

terrigenous sediment. The flattening of branches appears to be directly related to environment. Coralla from Ashmore Reef are from shallow clear water on a reef flat devoid of terrigenous sediment. The holotype has sufficient variation in corallite structure to include much of this range. The essential conclusion of this study is that the present collection includes two geographic subspecies of a single polymorphic species.

Distribution:

Known only from Ashmore Reef and Pilbra coast of W Australia, and Puerto Galera of the Philippines.

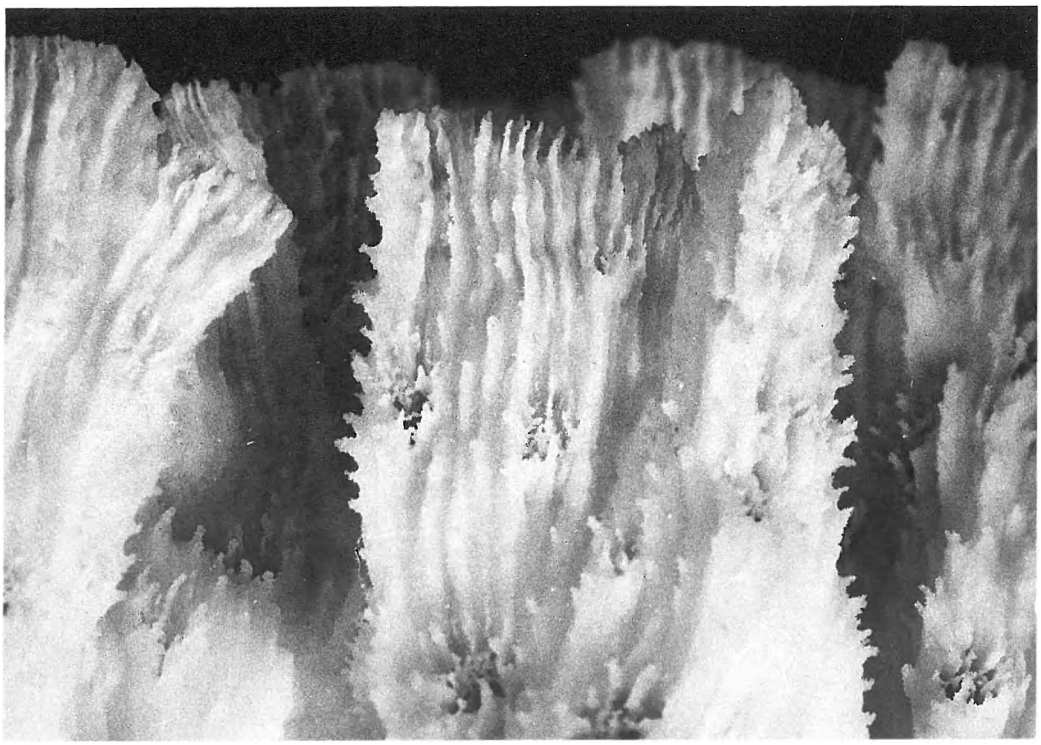

Fig. 61. Second corallum of *Echinopora ashmorensis* from Puerto Galera, Philippines (× 4).

Similar species:

Corallites are very similar to those of *E. lamellosa* which may have tubular upgrowths of 'chimneys' similar to those of *E. ashmorensis*. The latter, however, develops solid branches with or without tubular ends. As far as is know, *E. ashmorensis* never forms flat, explanate sheets, while *E. lamellosa* always does, chimneys being very unusual. Both species occur together at Puerto Galera where they are very distinct.

Family Caryophylliidae Gray, 1847

The following descriptions are of three new species which cannot be distinguished from *E. glabrescens* (Chamisso & Eysenhardt, 1821) (Fig. 70) by their skeletal characters. Two of these, *E. paradivisa* and *E. paraancora* have tentacles very similar to those of *E. divisa* Veron & Pichon, 1980 and *E. ancora* Veron & Pichon, 1980 (respectively). The third species, *E. paraglabrescens* has short, bubble-shaped tentacles, superficially resembling the vesicles of *Plerogyra* spp.

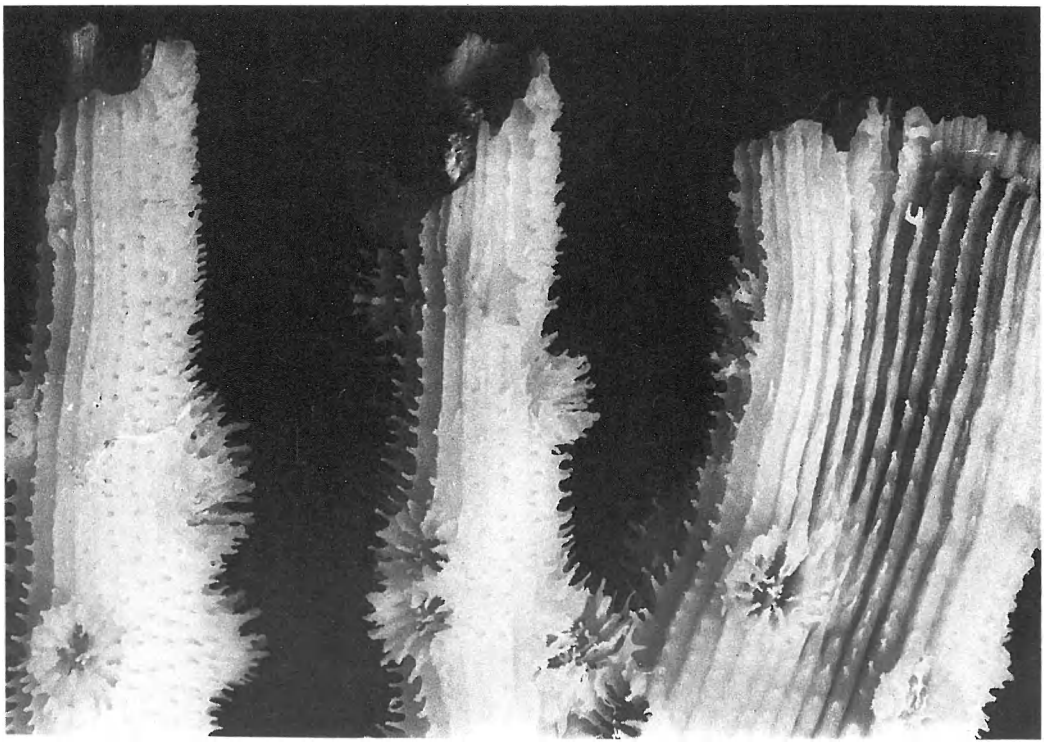

Fig. 62. Second specimen of *Echinopora ashmorensis* from Ashmore Reef, NW Australia (× 4).

Genus *Euphyllia* Dana, 1846

Euphyllia paradivisa (Figs. 63, 64 & 89)

Synonymy:

Euphyllia sp.1 Veron & Hodgson (1988)

Specimens:

Philippines: Bolinao (two specimens)

Description:

Although only two specimens of this species have been collected, several were observed *in situ* at Bolinao, Philippines. The two specimens are representative of the variation of the species at Bolinao. Coralla are phaceloid, branches being 20-30 mm diameter near the calices. Branches are costate, without epithecae. Four orders of septa are distinguishable although these do not have a precise cyclical arrangement. First and second order septa are slightly exsert and extend inwards for most of the calice radius before plunging steeply. Their inner margins may be twisted

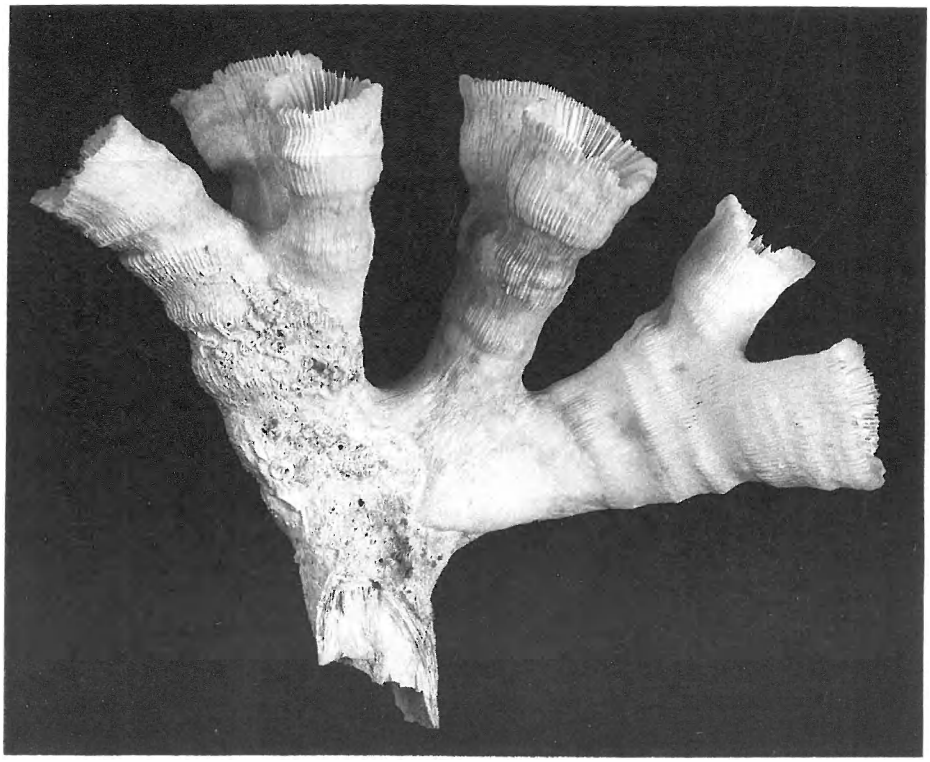

Fig. 63. Holotype of *Euphyllia paradivisa* (× 0.65).

towards the calice centre or thickened on their inner margin. There are no other columella structures.

There is substantial difference between the two specimens collected. The holotype has thicker branches and is relatively well calcified with relatively numerous septa.

Polyps are extended during the day and have branching tentacles identical in appearance to those of *E. divisa* (Veron, 1986, pp. 548 & 549). Tentacles are green in colour with white tips.

Etymology:

So named because polyp tentacles are identical to those of *E. divisa*.

Holotype (G32492) (Figs. 63 & 64)

A phaceloid corallum 180 mm wide and 140 mm high, comprised of seven corallites from Bolinao, Philippines at approximately 8 m depth.

Distribution:

Known only from Bolinao, northern Philippines.

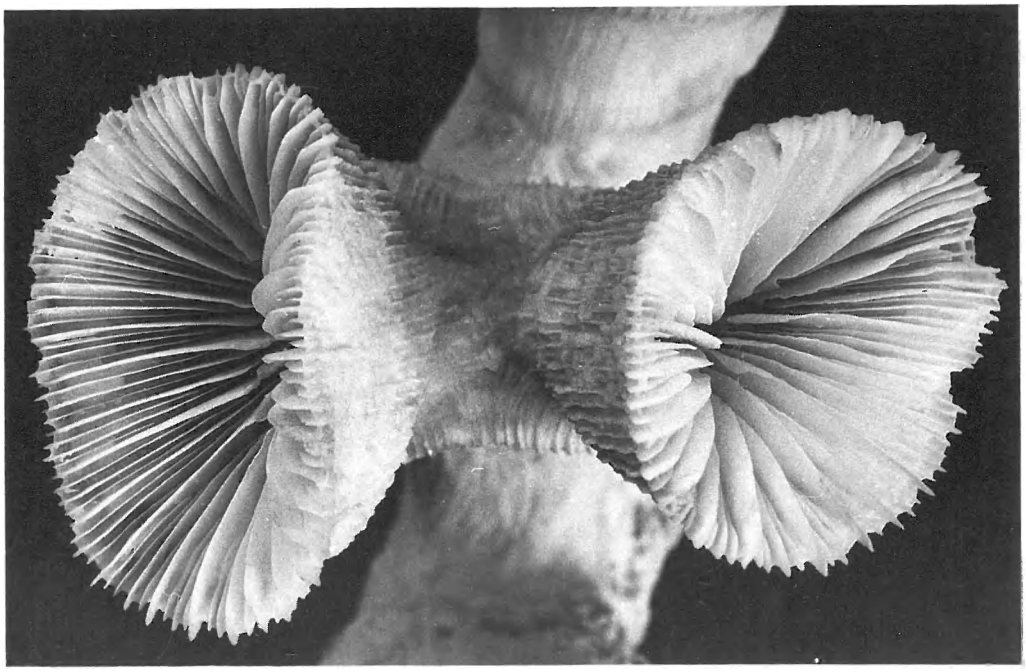

Fig. 64. Holotype of *Euphyllia paradivisa* (× 3.6).

Similar species:

There are no skeletal characters to distinguish this species from *E. glabrescens*, *E. paraancora* or *E. paraglabrescens*.

Euphyllia paraancora (Figs. 65-67 & 90)

Synonymy:

Euphyllia sp.2 Veron & Hodgson (1988)
Euphyllia sp. Veron & Kelley (1988)

Specimens:

Philippines: Bolinao (two specimens)
Papua New Guinea: Motupore region

Description:

Coralla are phaceloid, branches being 18-43 mm diameter near the calices. Branches are costate, without epithecae. Four orders of septa are distinguishable although these do not have a precise cyclical arrangement. First and second order septa are slightly exsert and extend inwards for most of the calice radius before plunging steeply. Their inner margins may be twisted towards the calice centre or thickened on their inner margin. There are no other columella structures.

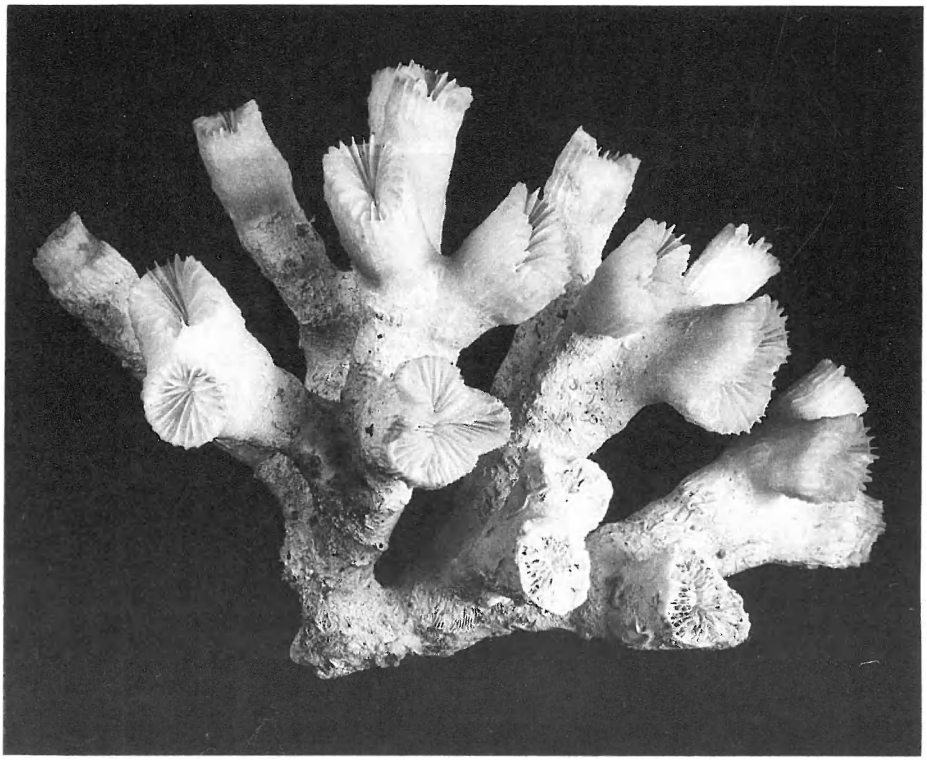

Fig. 65. Holotype of *Euphyllia paraancora* (× 0.65).

Specimens collected do not reveal any environment-correlated variation.

Polyps are extended during the day and have anchor-shaped tentacle ends identical in appearance to those of *E. ancora* (Veron, 1986, p. 547). As with *E. ancora*, some tentacles branch, but they do not integrate with those of *E. paradivisa*. Tentacles are pale greenish-brown in colour.

Etymology:

So named because polyp tentacles are identical to those of *E. ancora*.

Holotype (G32493) (Figs. 65 & 66):

A phaceloid corallum 185 mm wide and 120 mm high, comprised of 16 corallites that were alive at the time of collection, three that were not alive, from Bolinao, Philippines at approximately 6 m depth.

Geographic variation:

The corallum from Papua New Guinea (Fig. 67) has corallites of similar size to those of the holotype. It has less exsert septa. These are minor differences that are likely to be environment-related rather than geographic differences.

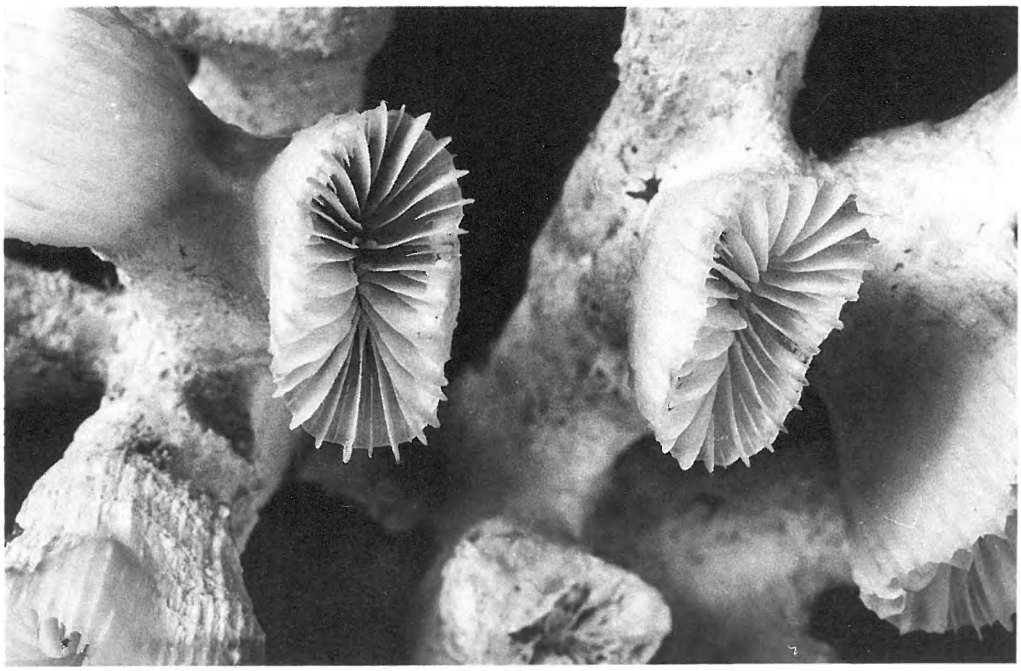

Fig. 66. Holotype of *Euphyllia paraancora* (× 3.6).

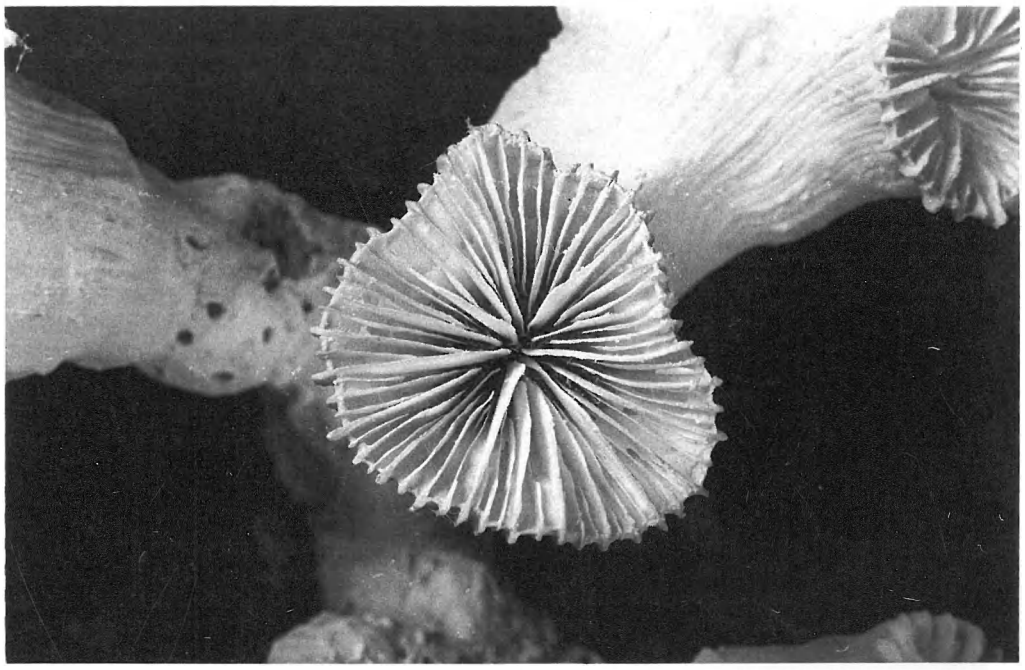

Fig. 67. *Euphyllia paraancora* from near Motupore I., Papua New Guinea (× 3.6).

Distribution:

Known from S Papua New Guinea and Bolinao, northern Philippines.

Similar species:

There are no skeletal characters to distinguish this species from *E. glabrescens*, *E. paradivisa* or *E. paraglabrescens*.

Euphyllia paraglabrescens (Figs. 68, 69, 91 & 92)

Synonymy:

Not previously recorded.

Specimens:

Japan: Ôjioya Port, Tanegashima

Description:

Coralla are phaceloid, branches being 30-37 mm diameter near the calices. Branches are costate, without epithecae. Four orders of septa

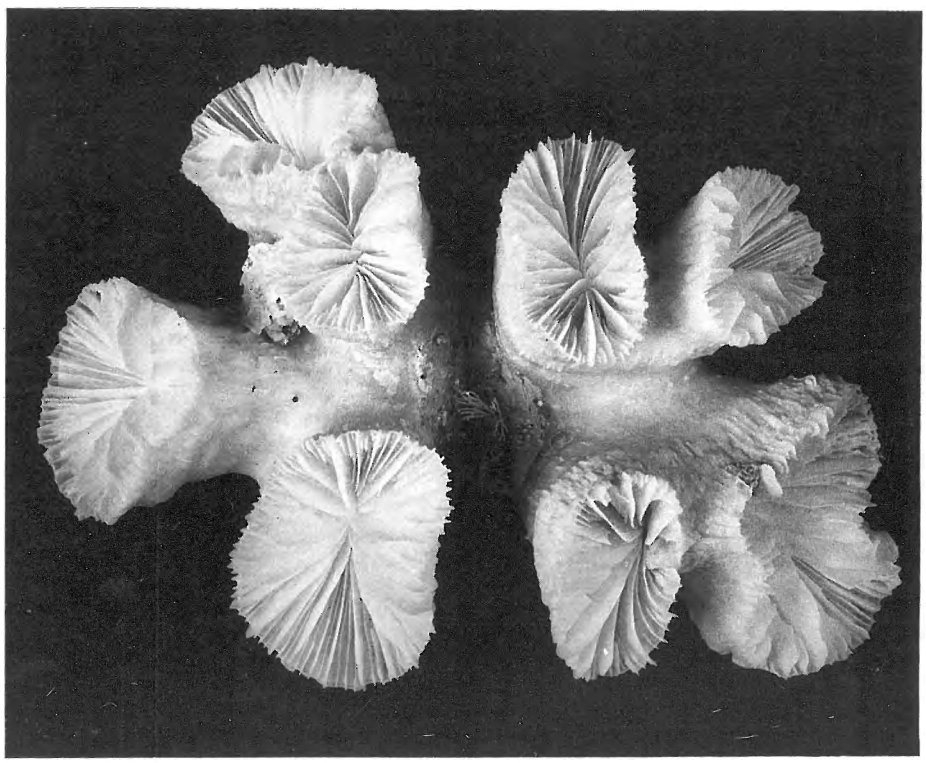

Fig. 68. Holotype of *Euphyllia paraglabrescens* (× 0.85).

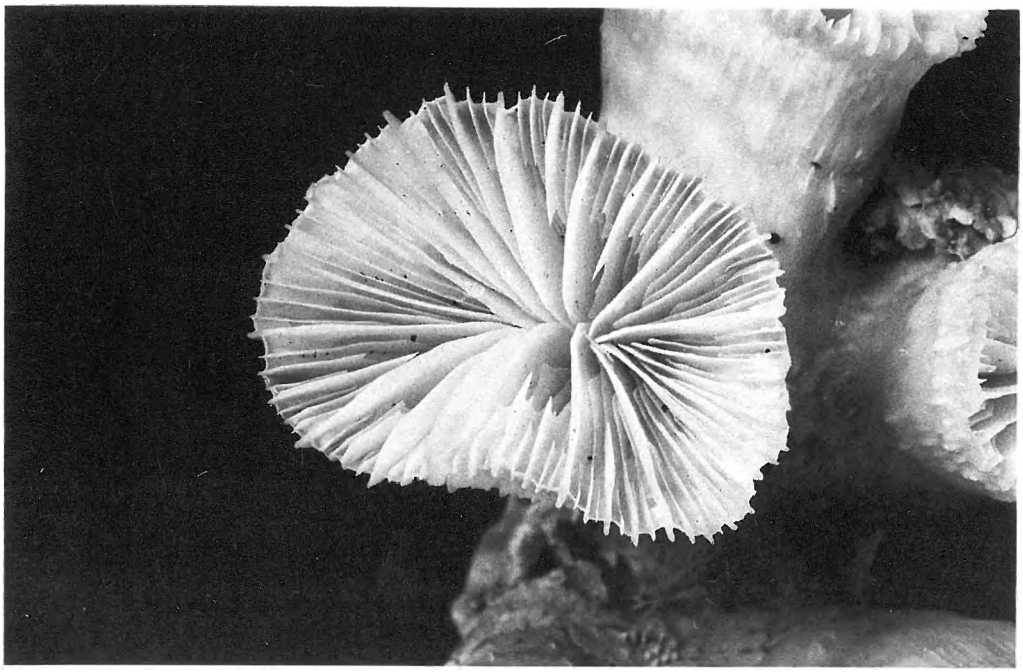

Fig. 69. Holotype of *Euphyllia paraglabrescens* (× 3.6).

are distinguishable although these do not have a precise cyclical arrangement. First and second order septa are slightly exsert and extend inwards for most of the calice radius before plunging steeply. Their inner margins may be twisted towards the calice centre or thickened on their inner margin. There are no other columella structures.

Tentacles are short and bubble-like and are extended day and night, retracting only if disturbed. They are uniform grey, or varied greens, or combinations of both grey and green. In general appearance they resemble the vesicles of *Plerogyra* and thus colonies look much like *Plerogyra simplex* Rehberg, 1892 *in situ*.

Etymology:

So named because coralla are identical to those of *E. glabrescens*.

Holotype (G32494) (Figs. 68 & 69)

A phaceloid corallum 123 mm wide and 80 mm high, comprised of 8 corallites from Ôjioya Port, Tanegashima, Japan at 2 m depth.

Distribution:

Known only from Ôjioya Port, Tanegashima, Japan where this is one of the dominant species. The diversity of this area is low. Corals are attached to sandstone as Tanegashima is north of the northern-most coral reefs of the Ryukyu Is. chain.

Fig. 70. *Euphyllia paraglabrescens* from the northern Great Barrier Reef (×3.6).

Specimens collected are from the same biotope and thus environment-correlated variation is unknown.

Similar species:

The corallum is indistinguishable from large, phaceloid, *Euphyllia glabrescens*. Living colonies resemble only *Plerogyra simplex*. Rehberg's description and figure of *P. simplex*, as well as specimens of this species in the author's collections, have very exsert setpa, are very costate, and clearly belong to *Plerogyra*. *Plerogyra taisnei* Chevalier, 1971 is a synonym of *simplex*, as suggested by Chevalier.

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Fig. 71. *Acropora wallaceae* at Kayama I., Sekisei Lagoon, Yaeyama Is., Ryukyu Is. in a very protected lagoon at 1-2 m depth.

Fig. 72. *Acropora sekiseiensis* at Amitori Bay, Iriomote I., Yaeyama Is., Ryukyu Is. at 10 m depth (photograph: M. Nishihira).

Fig. 73. *Acropora tanegashimensis* at Ôjioya Port, Tanegashima on exposed rugged rock at 5 m depth.

Fig. 74. *Porites negrosensis* at Danajou Bank, Cebu, Philippines, ón a protected fringing reef at 4 m depth.

Fig. 75. *Pavona diminuta* (left) adjacent to *Pavona bipartita* (right) at Danajou Bank, Cebu, Philippines, on a partly exposed fringing reef at 10 m depth.

Fig. 76. *Leptoseris amitoriensis* at Amitori Bay, Iriomote I., Yaeyama Is., Ryukyu Is. at approximately 50 m depth (photograph: H. Yokochi).

Fig. 77. *Pachyseris foliosa* at Danajou Bank, Cebu, Philippines at 10 m depth.

Fig. 78. *Podabacia motuporensis* at Horseshoe Reef near Motupore I., S Papua New Guinea at 12 m depth.

Fig. 71. *Acropora wallaceae.*

Fig. 72. *Acropora sekiseiensis.*

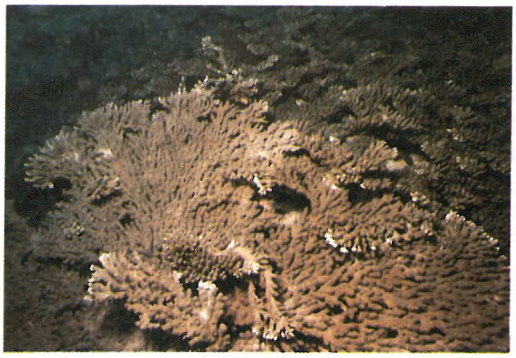

Fig. 73. *Acropora tanegashimensis.*

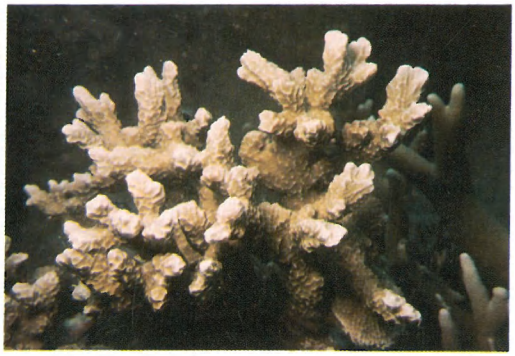

Fig. 74. *Porites negrosensis.*

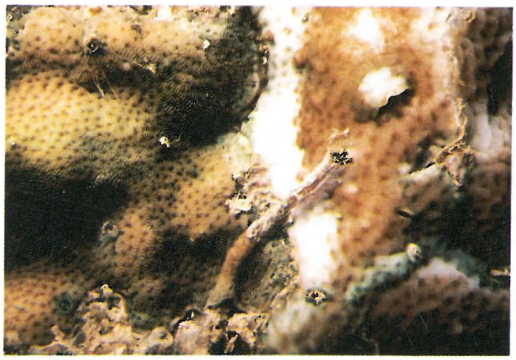

Fig. 75. *Pavona diminuta* (left) and *Pavona bipartita* (right).

Fig. 76. *Leptoseris amitoriensis.*

Fig. 77. *Pachyseris foliosa.*

Fig. 78. *Podabacia motuporensis.*

Fig. 79. *Echinophyllia nishihirai* at Amitori Bay, Iriomote I., Yaeyama Is., Ryukyu Is. (photograph: M. Nishihira).

Fig. 80. *Acanthastrea ishigakiensis* at Kayama I., Sekisei Lagoon, Yaeyama Is., Ryukyu Is. on an exposed outer slope, at approximately 15 m depth.

Fig. 81. *Acanthastrea ishigakiensis* at Kaminomine, Tokunoshima, Amami Is., Ryukyu Is. on an outer reef slope at approximately 20 m depth.

Fig. 82. *Acanthastrea amakusensis* near the Sabiura Marine Park Research Station, on exposed rock at approximately 4 m depth.

Fig. 83. *Goniastrea deformis* near the Seto Marine Biological Laboratory, Honshu, at approximately 5 m depth.

Fig. 84. *Platygyra contorta* near the Seto Marine Biological Laboratory, Honshu, at approximately 5 m depth.

Fig. 85. *Leptoria irregularis* at Kayama I., Sekisei Lagoon, Yaeyama Is., Ryukyu Is. on an exposed reef slope at approximately 10 m depth.

Fig. 86. *Echinopora pacificus* at Puerto Galera, Philippines, on a protected reef slope at 10 m depth.

Fig. 79. *Echinophyllia nishihirai.*

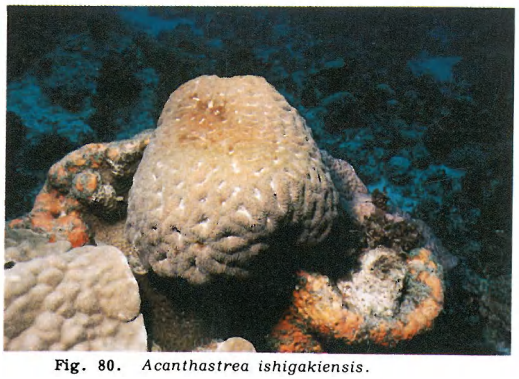

Fig. 80. *Acanthastrea ishigakiensis.*

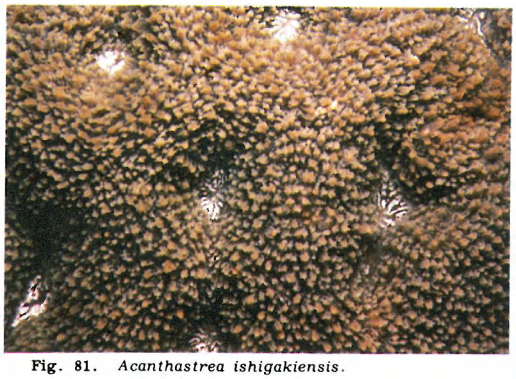

Fig. 81. *Acanthastrea ishigakiensis.*

Fig. 82. *Acanthastrea amakusensis.*

Fig. 83. *Goniastrea deformis.*

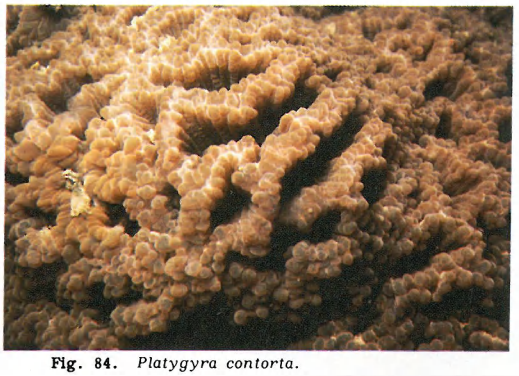

Fig. 84. *Platygyra contorta.*

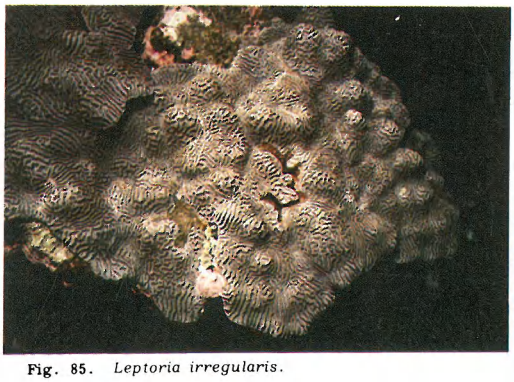

Fig. 85. *Leptoria irregularis.*

Fig. 86. *Echinopora pacificus.*

Fig. 87. *Echinopora ashmorensis* at Ashmore Reef, NW Australia in a protected reef lagoon at 2 m depth.

Fig. 88. *Echinopora ashmorensis* at Olango I., Cebu, Philippines, on an outer slope at 12 m depth.

Fig. 89. *Euphyllia paradivisa* at Bolinao, Philippines, in a sheltered lagoon at 5 m depth, with tentacles mostly retracted.

Fig. 90. *Euphyllia paraancora* at Bolinao, Philippines,in a sheltered lagoon at 5 m depth.

Fig. 91. *Euphyllia paraglabrescens* at Ôjioya Port, Tanegashima, Japan, on exposed rugged rock, at approximately 3 m depth (photograph: M. Nishihira).

Fig. 92. *Euphyllia paraglabrescens* at Ôjioya Port, Tanegashima, Japan, on exposed rugged rock, at approximately 3 m depth with tentacles retracted (photograph: M. Nishihira).

Fig. 87. *Echinopora ashmorensis.*

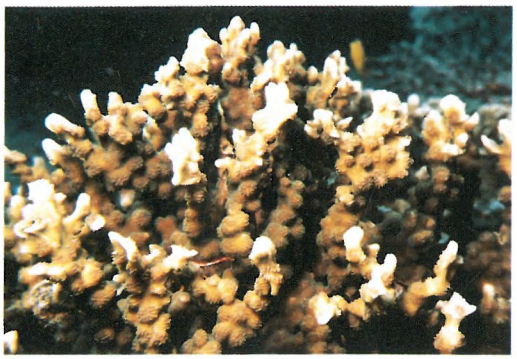

Fig. 88. *Echinopora ashmorensis.*

Fig. 89. *Euphyllia paradivisa.*

Fig. 90. *Euphyllia paraancora.*

Fig. 91. *Euphyllia paraglabrescens.*

Fig. 92. *Euphyllia paraglabrescens.*