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SCLERACTINIA OF EASTERN AUSTRALIA

PART V

Family Acroporidae

by

J. E. N. Veron

and

Carden C. Wallace

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I
Introduction

Family Acroporidae is composed only of the 4 extant genera included in this volume. Two of those, *Anacropora* and *Astreopora*, are small with approximately 6 and 12 true Indo-Pacific species (respectively), while the other two, *Montipora* and *Acropora*, are the two largest genera of the Scleractinia.

The complexity of the taxonomic problems in *Montipora* and *Acropora*, combined with the overwhelming ecological importance of the latter, has necessitated almost as much field and laboratory work for *Scleractinia of Eastern Australia* as all other genera combined. This work was commenced before Part IV (Family Poritidae) of the present series and much of the field work for Parts IV and V was undertaken concurrently.

Laboratory work was initially undertaken on *Montipora* and *Acropora* collections made during field studies for Parts I-III of *Scleractinia of Eastern Australia.* Thereafter field and laboratory work was primarily directed towards unresolved taxonomic problems and rare species and also towards obtaining comprehensive collections from remote localities. Numbers of specimens listed in 'material studied' sections for each species may therefore not reflect the relative abundance of that species but rather its variability, geographic distribution and the taxonomic difficulties encountered with it.

Unless otherwise stated, all relevant type specimens were re-examined (see Wallace, 1978) by Veron, primarily in the British Museum (Natural History) (BMNH), the United States National Museum (USNM), the Yale Peabody Museum (YPM), the Museum of Comparative Zoology, Harvard (MCZ), the Muséum National d'Histoire Naturelle, Paris (MNHN) and the Museum für Naturkunde der Humboldt Universitat, Berlin (ZMB), which are the principal depositories of type specimens. Type specimens were also examined in the University Museum, Cambridge, the Zoology Department, University of Glasgow and the Zoology Department, University of the Philippines. Further type specimens were borrowed (as acknowledged below p. 472) and non-type specimens were studied in all the above institutions as well as the Western Australian, Queensland and Australian Museums. The above abbreviations are used throughout the following text, as type specimen numbers are given where these have not been published or where reference is made to a particular syntype.

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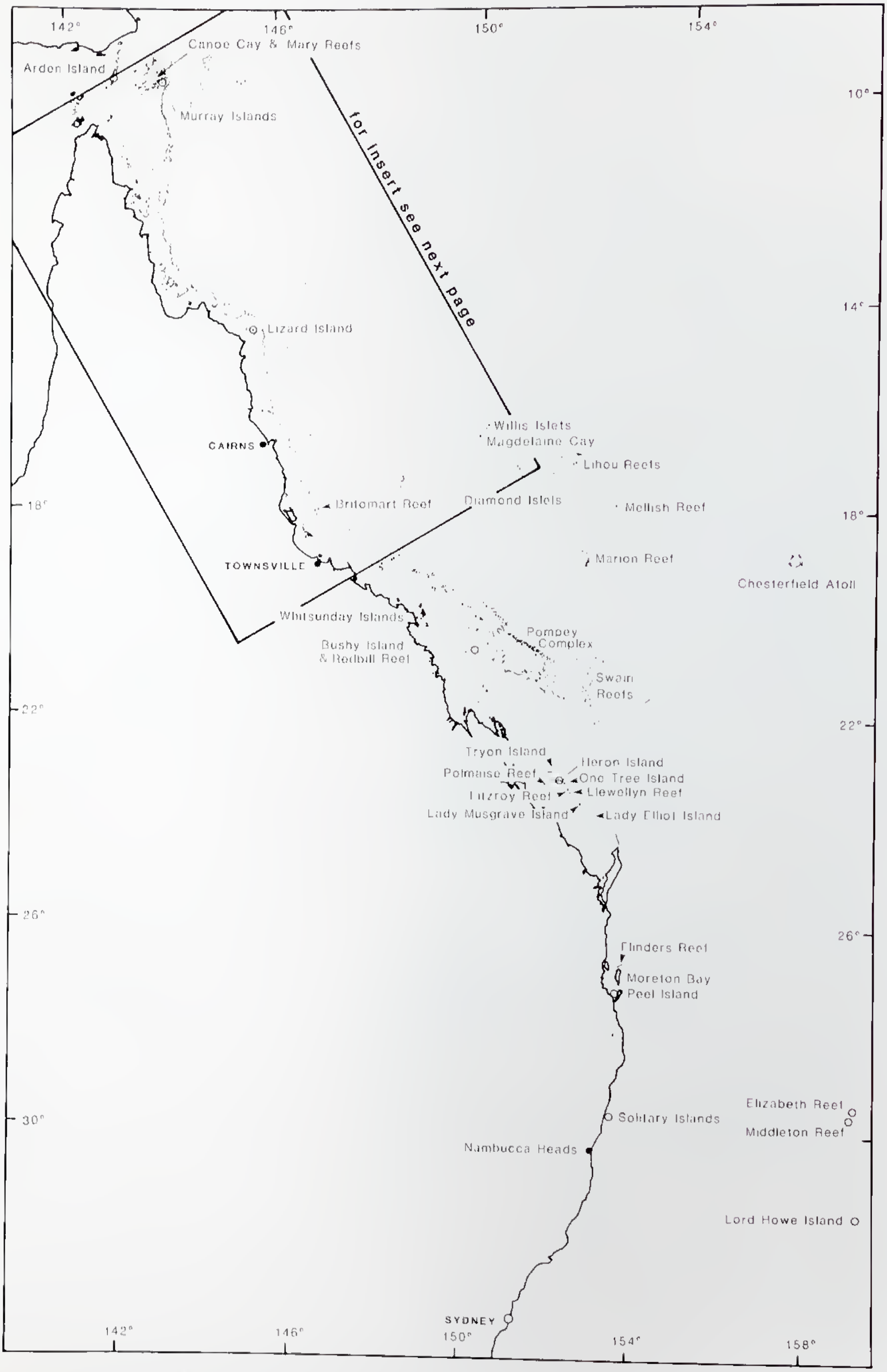
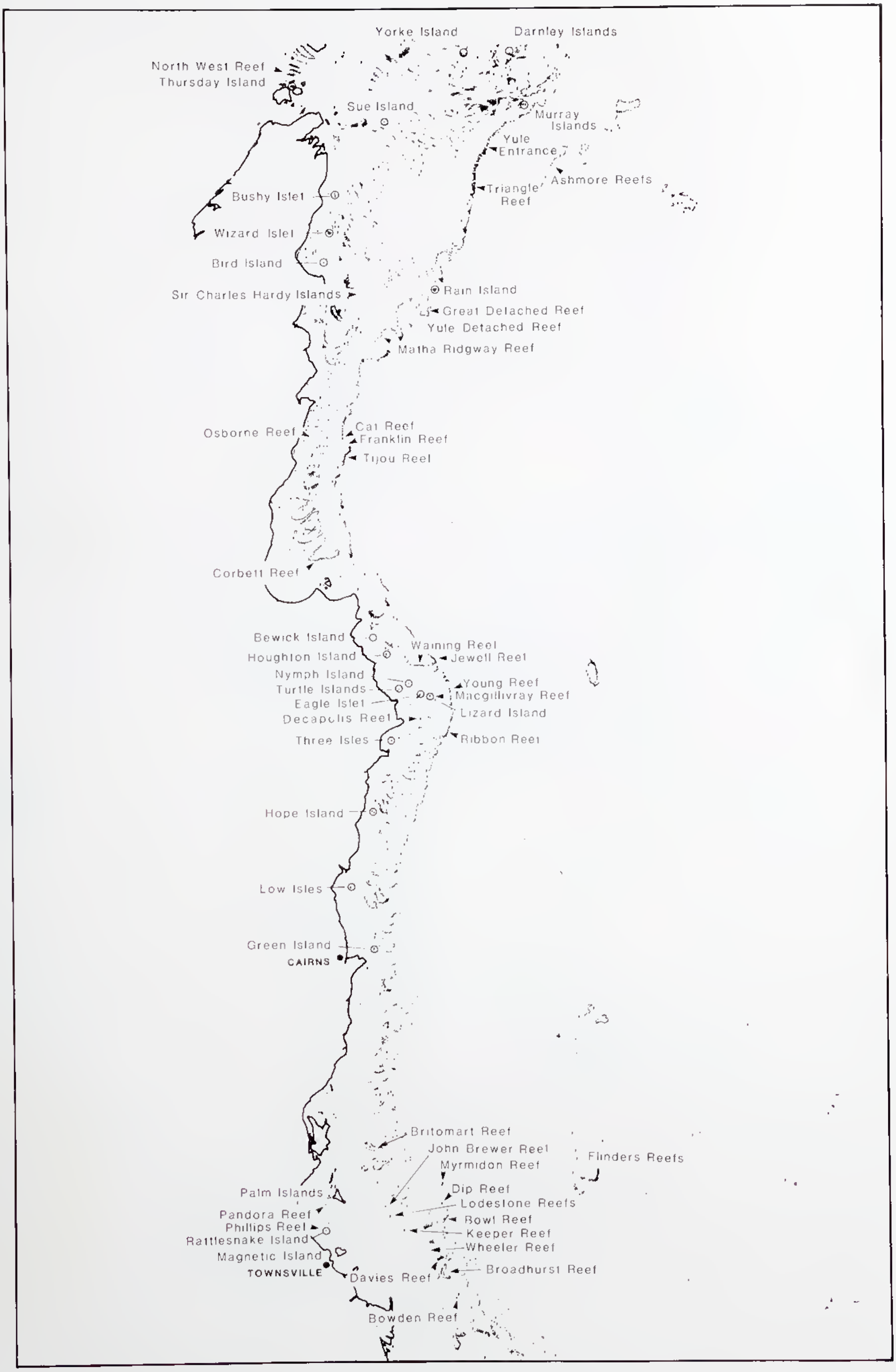


Fig. 1 East Australian place names cited in the text.


Yorke Island
Darnley Islands
North West Reef
Thursday Island
Sue Island
Murray Islands
Yule Entrance
Ashmore Reefs
Triangle Reef
Bushy Islet
Wizard Islet
Bird Island
Sir Charles Hardy Islands
Rain Island
Great Detached Reef
Yule Detached Reef
Matha Ridgway Reef
Cat Reef
Franklin Reef
Osborne Reef
Tijou Reef
Corbett Reef
Bewick Island
Waining Reef
Houghton Island
Jewell Reef
Nymph Island
Young Reef
Turtle Islands
Macgillivray Reef
Eagle Islet
Lizard Island
Decapolis Reef
Three Isles
Ribbon Reef
Hope Island
Low Isles
Green Island
CAIRNS
Britomart Reef
John Brewer Reef
Flinders Reefs
Myrmidon Reef
Palm Islands
Dip Reef
Lodestone Reefs
Pandora Reef
Bowl Reef
Phillips Reef
Keeper Reef
Rattlesnake Island
Wheeler Reef
Magnetic Island
Broadhurst Reef
TOWNSVILLE
Davies Reef
Bowden Reef

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REEFS, ISLANDS AND ATOLLS OF THE CORAL SEA

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199-202. (Willis Island, Magdelaine Cay and Lihou Reefs) see Part IV.

226. Flinders Reef (Coral Sea); series of collections from exposed and sheltered reefs, 1-25m.

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203-204. (Marion Reef) see Part IV.

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205-218. (Mellish Reef and Chesterfield Atoll) see Part IV.

SOUTH OF THE GREAT BARRIER REEF

There are four main areas south of the Great Barrier Reef where corals occur in abundance: Flinders Reef near Moreton Bay, Middleton and Elizabeth Reefs, Lord Howe Island and the Solitary Islands. Large collections have been made from each of these regions.

227. Flinders Reef near Moreton Bay; a rocky outcrop exposed to strong wave action; series of collections, 1-30m.

228. Myora, Moreton Bay; flat muddy substrate exposed to slight wave action; one collection, 3m.

142-147. (Lord Howe Island) see Part III.

229. North Solitary Island; a rocky outcrop exposed to strong wave action; one collection, 5-15m.

230. Middleton Reef, SW outer slope; substrate of consolidated rock exposed to strong wave action; two collections, 2-20m.

231. Middleton Reef, N side; substrate of rubble and sand, partly protected; 5 collections, 0-15m.

232. Middleton Reef, E side; substrate of undulating consolidated rock, exposed to strong wave action; one collection, 15-20m.

233. Middleton Reef, S outer slope; substrate of gently sloping consolidated rock, exposed to strong wave action; 3 collections, 10-30m.

234. Middleton Reef, lagoon, E side; rock sloping to sandy substrate; 2 collections, 0-4m.

235. Middleton Reef, reef flat; flat consolidated rock and shallow lagoons ponded to >1m above low water.

236. Elizabeth Reef, NE side; horizontal sea floor, consolidated rock and sand; 2 collections, 35-40 and 15-25m.

237. Elizabeth Reef, S outer slope; gently sloping consolidated rock; 2 collections, 5-15m.

238. *Elizabeth Reef, bar across lagoon entrance*; exposed to strong currents; 1 collection, 4m.

239. *Elizabeth Reef, lagoon*; rock sloping to sandy substrate; 2 collections, 0-10m.

240. *Elizabeth Reef, reef flat, N side*; flat consolidated rock and shallow lagoons ponded to >1m above low water.

III
Family Acroporidae Verrill, 1902

Three of the four extant genera of Acroporidae, *Montipora*, *Anacropora* and *Acropora*, all have similarly structured corallites primarily characterised by lack of columellae and dissepiments, by their small size, synapticulotheca, simple septa (with no pattern of fusion) and extratentacular budding. They also have a similar spinulose coenosteum when undifferentiated (termed reticulum in *Montipora* where it is often differentiated into other coenostial structures). The fourth genus, *Astreopora*, has fewer characters in common as corallites are relatively large and septa are relatively well-developed and may form a columella tangle. Superficially they resemble the corallites of *Turbinaria* (see p. 425) though the latter may show Pourtalès plan of fusion in common with other dendrophylliids. Columellae of *Turbinaria* are much better developed, primary and secondary septa are seldom clearly differentiated from each other and corallites are uniformly covered with coenosteum.

GENUS *MONTIPORA* DE BLAINVILLE, 1830

Generic synonymy

Montipora de Blainville, 1830; Quoy & Gaimard (1833); Bernard (1897)

Manopora Dana, 1846

Type species *Montipora verrucosa* (Lamarck) by subsequent designation Edwards & Haime (1850).

Characters of the genus (after Wells, 1956)

'Submassive, foliaceous, ramose or encrusting; no axial corallite. Corallite wall porous. Columella feeble or absent. Coenosteum reticular with strong vertical trabeculae, thin horizontal connections, surface spinulose or hirsute. No dissepiments.'

Taxonomic History and Introduction

Authorship of genus *Montipora* is attributable to de Blainville (1830), although his description is only a quotation from the manuscript of Quoy & Gaimard published in 1833. Bernard (1897, p. 3) gives the authorship to Quoy & Gaimard and discusses at length the confusion of identity of the type species, concluding that it 'has been here identified with the *M. obtusata* of Quelch'.

The first substantial account of the genus is that of Dana (1846) under the name *Manopora*. He included 29 species in it, 16 of which were new. The genus was again revised by Edwards & Haime (1849, 1850) who restored the name *Montipora* but later confused species of other genera (especially *Porites*) with it. Subsequent authors, as described by Bernard, added new species names to the genus and discussed proposed affinities of the genus within what is now recognised as the Acroporidae and also with other genera, especially *Porites*, *Alveopora* and *Turbinaria*.

Bernard (1897) recognised 135 supposed species of *Montipora*, all of which are described or re-described in detail from the descriptions and collections of his predecessors and the collections of the British Museum. As with all Bernard's work, his 1897 monograph is more an ordered catalogue of described specimens than a study of *Montipora* systematics. Nevertheless, approximately 40% of all nominal species of *Montipora* are Bernard's and nearly $\frac{1}{4}$ of all nominal species (Table 1) were re-described by him.

Table 1 Nominal species of *Montipora* and their type localities

	Type locality
Madrepora foliosa Pallas, 1766	not recorded
Millepora compressa Linnaeus, 1767	? Red Sea
Madrepora monasteriata Forskål, 1775	Red Sea
Madrepora spongiosa Ellis & Solander, 1786	not recorded
?*Madrepora limitata* Ellis & Solander, 1786	not recorded
Madrepora patinaeformis Esper, 1795	Tranquebar (India)
?*Madrepora phrygiana* Esper, 1798	? East Indies
Porites spumosa Lamarck, 1816	not recorded
Porites complanata Lamarck, 1816	not recorded
Agaricia lima Lamarck, 1816	'southern seas'
Agaricia papillosa Lamarck, 1816	'southern seas'
Porites verrucosa Lamarck, 1816	not recorded
Porites tuberculosa Lamarck, 1816	not recorded
Porites rosacea Lamarck, 1816	not recorded
Porites angulata Lamarck, 1816	'eastern ocean'
?*Madrepora abrotanoides* Audouin, 1826	not recorded
Alveopora rubra Quoy & Gaimard, 1833	not recorded
Porites circumvallata Ehrenberg, 1834	not recorded
Porites cristagalli Ehrenberg, 1834	not recorded
Porites stilosa Ehrenberg, 1834	not recorded
Porites venosa Ehrenberg, 1834	not recorded
Porites meandrina Ehrenberg, 1834	not recorded
Montipora verrucosa de Blainville, 1834	?Fiji
Manopora lichen Dana, 1846	?Tahiti
Manopra caliculata Dana, 1846	Fiji
Manopora palmata Dana, 1846	Fiji
Manopora hispida Dana, 1846	Singapore
Manopora expansa, Dana, 1846	Singapore
Manopora grandifolia Dana, 1846	Singapore
Manopora effusa Dana, 1846	Tahiti
Manopora nodosa Dana, 1846	Fiji
Manopora scabricula Dana, 1846	Fiji
Manopora incrusta Dana, 1846	Fiji
Manopora erosa Dana, 1846	Fiji
Manopora capitata Dana, 1846	Hawaii
Manopora nudiceps Dana, 1846	not recorded
Manopora planiuscula Dana, 1846	Fiji
Manopora foveolata Dana, 1846	Fiji
Manopora digitata Dana, 1846	Fiji
Manopora tortuosa Dana, 1846	Singapore
Montipora multilobata Edwards & Haime, 1849	Red Sea, Seychelles
Montipora quoyi Edwards & Haime, 1851	Tonga
Montipora danae Edwards & Haime, 1851	Fiji
Porites phrygiana Edwards & Haime, 1851	'eastern ocean'
Montipora poritiformis Verrill, 1866	Ryukyu Is
Montipora rigida Verrill, 1866	Bonin Is
Montipora patula Verrill, 1869a	Hawaii
Montipora exesa Verrill, 1869a	Gaspar Straits
Montipora lichenoides Verrill, 1869a	Ryukyu Is
Montipora fragosa Verrill, 1869b	Gulf of California

Montipora ehrenbergii Verrill, 1872	Fiji
Montipora aspera Verrill, 1872	Singapore
Montipora monticulosa Studer, 1880	Singapore
Montipora incrustans Brüggeman, 1877	New Ireland
Montipora explanata Brüggemann, 1879	Mauritius
Montipora divaricata Brüggemann, 1879	Rodriguez
Montipora superficialis Brüggemann (unpublished)	'New Zealand' (*n.n.*)
Montipora prolifera Brüggemann, 1879	Ponape
Montipora porosa Bassett-Smith, 1890	Macclesfield Bank
Montipora scabriculoides Ortmann, 1888	Samoa
Montipora stalagmites Ortmann, 1888	Tahiti
Montipora villosa Klunzinger, 1879	Red Sea
Montipora tuberosa Klunzinger, 1879	Red Sea
Montipora gracilis Klunzinger, 1879	Red Sea
Montipora fragilis Quelch, 1886	Banda
Montipora levis Quelch, 1886	Banda
Montipora irregularis Quelch, 1886	Philippines
Montipora abtusata Quelch, 1886	Fiji
Montipora exserta Quelch, 1886	Torres Strait (GBR)
Montipora exigua Bernard, 1897	Billiton
Montipora subtilis Bernard, 1897	Mascarenes
Montipora granulosa Bernard, 1897	Macclesfield Bank
Montipora stratiformis Bernard, 1897	not recorded
Montipora tenuissima Bernard, 1897	Macclesfield Bank
Montipora reticulata Bernard, 1897	Macclesfield Bank
Montipora crassireticulata Bernard, 1897	Macclesfield Bank
Montipora pallida Bernard, 1897	Holothuria Bank
Montipora punctata Bernard, 1897	Albany Passage, GBR
Montipora auricularis Bernard, 1897	Thursday Is, GBR
Montipora glabra Bernard, 1897	Torres Strait, GBR
Montipora bolsii Bernard, 1897	Billiton
Montipora spongodes Bernard, 1897	type locality not designated
Montipora mollis Bernard, 1897	Palm Is and Torres Strait
Montipora alcicarnis Bernard, 1897	Tonga
Montipora fruticosa Bernard, 1897	Torres Strait, GBR
Montipora spicata Bernard, 1897	not recorded
Montipora nana Bernard, 1897	Port Molle, GBR
Montipora ramosa Bernard, 1897	Gulf of Manaar
Montipora rotunda Bernard, 1897	Palm Is, GBR
Montipora spatula Bernard, 1897	Torres Strait, GBR
Montipara marenzelleri Bernard, 1897	Solomon Is
Montipora libera Bernard, 1897	Torres Strait, GBR
Montipora turgescens Bernard, 1897	Green I, Capricorn I, GBR
Mantipora socialis Bernard, 1897	Capricorn Is, GBR
Montipora calcarea Bernard, 1897	Tonga
Montipora multiformis Bernard, 1897	Houtman Abrolhos Is
Montipora gaimardi Bernard, 1897	not recorded
Montipora indentata Bernard, 1897	GBR
Montipora aenigmatica Bernard, 1897	Tizard Bank, China Sea
Montipora brueggemanni Bernard, 1897	Fiji
Montipora lanuginosa Bernard, 1897	Mauritius
Montipora flammans Bernard, 1897	Darwin
Montipora lobulata Bernard, 1897	Diego Garcia
Montipora edwardsi Bernard, 1897	Red Sea

Montipora acanthella Bernard, 1897	not recorded
Montipora fungiformis Bernard, 1897	not recorded
Montipora bilaminata Bernard, 1897	Macclesfield Bank
Montipora guppyi Bernard, 1897	Solomon Is
Montipora tubifera Bernard, 1897	Macclesfield Bank
Montipora denticulata Bernard, 1897	Macclesfield Bank
Montipora pulcherrima Bernard, 1897	Macclesfield Bank
Montipora australiensis Bernard, 1897	Houtman Abrolhos Is
Montipora undata Bernard, 1897	Moluccas
Montipora viridis Bernard, 1897	Solomon Is
Montipora ambigua Bernard, 1897	Torres Strait
Montipora mammifera Bernard, 1897	Seychelles Is
Montipora sinensis Bernard, 1897	Tizard Bank, & Palm Is, GBR
Montipora perforata Bernard, 1897	Rodriguez
Montipora variabilis Bernard, 1897	Torres Strait
Montipora annularis Bernard, 1897	New Guinea
Montipora mammillata Bernard, 1897	Capricorn Is, GBR
Montipora cactus Bernard, 1897	not recorded
Montipora stellata Bernard, 1897	Rocky I, GBR
Montipora inconspicua Bernard, 1897	Billiton
Montipora challengeri Bernard, 1897	Zamboanga
Montipora listeri Bernard, 1897	Tonga
Montipora grisea Bernard, 1897	Tonga
Montipora minuta Bernard, 1897	Macclesfield Bank
Montipora scutata Bernard, 1897	Torres Strait, GBR
Montipora peltiformis Bernard, 1897	Amboyna
Montipora granulata Bernard, 1897	Torres Strait, GBR
Montipora aequituberculata Bernard, 1897	Albany Passage, GBR
Montipora incognita Bernard, 1897	not recorded
Montipora informis Bernard, 1897	Torres Strait, GBR
Montipora friabilis Bernard, 1897	not recorded
Montipora crassituberculata Bernard, 1897	Houtman Abrolhos Is
Montipora amplectens Bernard, 1897	South China Sea
Montipora frondens Bernard, 1897	Palm Is, GBR
Montipora trabeculata Bernard, 1897	Townsville, GBR
Montipora ellisi Bernard, 1897	not recorded
Montipora efflorescens Bernard, 1897	not recorded
Montipora fimbriata Bernard, 1897	Torres Strait, GBR
Montipora solanderi Bernard, 1897	not recorded
Montipora striata Bernard, 1897	Houtman Abrolhos Is
Montipora circinata Bernard, 1897	Palm Is, GBR
*Montipora crassifolia*Bernard, 1897	not recorded
Montipora plicata Bernard, 1897	Torres Strait, GBR
Montipora hirsuta Bernard, 1897	Tonga
Montipora bifrontalis Bernard, 1897	Palm Is, GBR
Montipora pilosa Bernard, 1897	Loyalty Is
Montipora profunda Bernard, 1897	Ellice Is
Montipora alveopora Bernard, 1897	Loyalty Is
Montipora saxea Bernard, 1897	Ellice Is
Montipora myriophthalma Bernard, 1897	Loyalty Is
Montipora granifera Bernard, 1897	Ellice Is
Montipora willeyi Bernard, 1897	Loyalty Is
Montipora spongilla Bernard, 1900	Christmas I
Montipora parasitica Bernard, 1900	Christmas I

Montipora dilatata Studer, 1901	Hawaii
Montipora flabellata Studer, 1901	Hawaii
Montipora densa von Marenzeller, 1907	Red Sea
Montipora erythraea von Marenzeller, 1907	Red Sea
Montipora verrilli Vaughan, 1907	Hawaii
Montipora tenuicaulis Vaughan, 1907	Hawaii
Montipora bernardi Vaughan, 1907	Hawaii
Montipora studeri Vaughan, 1907	Hawaii
Montipora elschneri Vaughan, 1918	Fanning I
Montipora cocosensis Vaughan, 1918	Cocos-Keeling Is
Montipora vaughani Hoffmeister, 1925	Samoa
Montipora berryi Hoffmeister, 1925	Samoa
Montipora millepora Crossland, 1952	Low Isles & vicinity, GBR
Montipora prominula Crossland, 1952	Low Isles & vicinity, GBR
Montipora fossae Crossland, 1952	Low Isles & vicinity, GBR
Montipora undans Crossland, 1952	Low Isles & vicinity, GBR
Montipora sulcata Crossland, 1952	Low Isles & vicinity, GBR
Montipora tertia Crossland, 1952	Low Isles & vicinity, GBR
Montipora composita Crossland, 1952	Low Isles & vicinity, GBR
Montipora angularis Crossland, 1952	Low Isles & vicinity, GBR
Montipora hoffmeisteri Wells, 1954	Marshall Is
Montipora conicula Wells, 1954	Marshall Is
Montipora colei Wells, 1954	Marshall Is
Montipora floweri Wells, 1954	Marshall Is
Montipora marshallensis Wells, 1954	Marshall Is
Montipora manauliensis Pillai, 1967	Gulf of Mannar
Montipora confusa Nemenzo, 1967	Philippines
Montipora altasepta Nemenzo, 1967	Philippines
Montipora inconstans Nemenzo, 1967	Philippines
Montipora coalita Nemenzo, 1967	Philippines
Montipora malampaya Nemenzo, 1967	Philippines
Montipora strigosa Nemenzo, 1967	Philippines
Montipora hirsuta Nemenzo, 1967	Philippines
Montipora plateformis Nemenzo, 1967	Philippines
Montipora carinata Nemenzo, 1967	Philippines
Montipora nodulosa Nemenzo, 1967	Philippines
Montipora samarensis Nemenzo, 1967	Philippines
Montipora prava Nemenzo, 1967	Philippines
Montipora conferta Nemenzo, 1967	Philippines
Montipora orientalis Nemenzo, 1967	Philippines
Montipora florida Nemenzo, 1967	Philippines
Montipora angusta Nemenzo, 1967	Philippines
Montipora reniformis Nemenzo, 1967	Philippines
Montipora cebuensis Nemenzo, 1976	Philippines
Montipora setosa Nemenzo, 1976	Philippines
Montipora sinuosa Pillai & Scheer, 1976	Maldives
Montipora suvadivae Pillai & Scheer, 1976	Maldives
Montipora maldivensis Pillai & Scheer, 1976	Maldives
Montipora mactanensis Nemenzo, 1979	Philippines
Montipora sumilonensis Nemenzo, 1979	Philippines
Montipora conspicua Nemenzo, 1980	Philippines
Montipora turtlensis Veron & Wallace	this study
Montipora corbettensis Veron & Wallace	this study

Since Bernard, Vaughan (1918), Crossland (1952), Wells (1954) and Nemenzo (1967) have undertaken partial revisions of *Montipora* and this has given stable nomenclature to a few of the more readily recognised species. However, *Montipora* has attracted less attention than might be expected of the second most species-rich genus of corals and most species descriptions are based on small numbers of specimens collected at random and without field study of their variability. Because of this, the majority of species have substantial problems of synonymy, usually involving questions of geographic variability as well as the usual problems of environmentally induced and genetic variation within a given region.

The present study involved re-examination of most type specimens, and synonymies have been independently determined from these studies. In the descriptions below, references are made as far as possible to individual specimens, as (with the exception of the BMNH) holotypes are frequently not designated, syntype series sometimes include more than one species and, especially in the USA, they are often distributed among different institutions.

Bernard (1897) divided *Montipora* into five major groups: glabrous, glabro-foveolate, foveolate, papillate and tuberculate, and three of these have further subdivisions. Subsequent authors have followed these major divisions with modifications, but they have not been adopted in the present account, firstly because many species can be included in more than one division and secondly, because there are no real distinctions between papillae and tuberculae. As noted below, these are homologous structures which differ in size only and this size difference is often a variable character without taxonomic significance.

Terminology

Terminology used in the following descriptions of *Montipora* is the same as that used for other genera in *Scleractinia of Eastern Australia*,* except for the coenosteum which forms a wide range of structures not found in other genera. The coenosteum consists of a basal *reticulum* as well as a series of structures collectively termed *papillae* and *tuberculae* (Fig. 2).

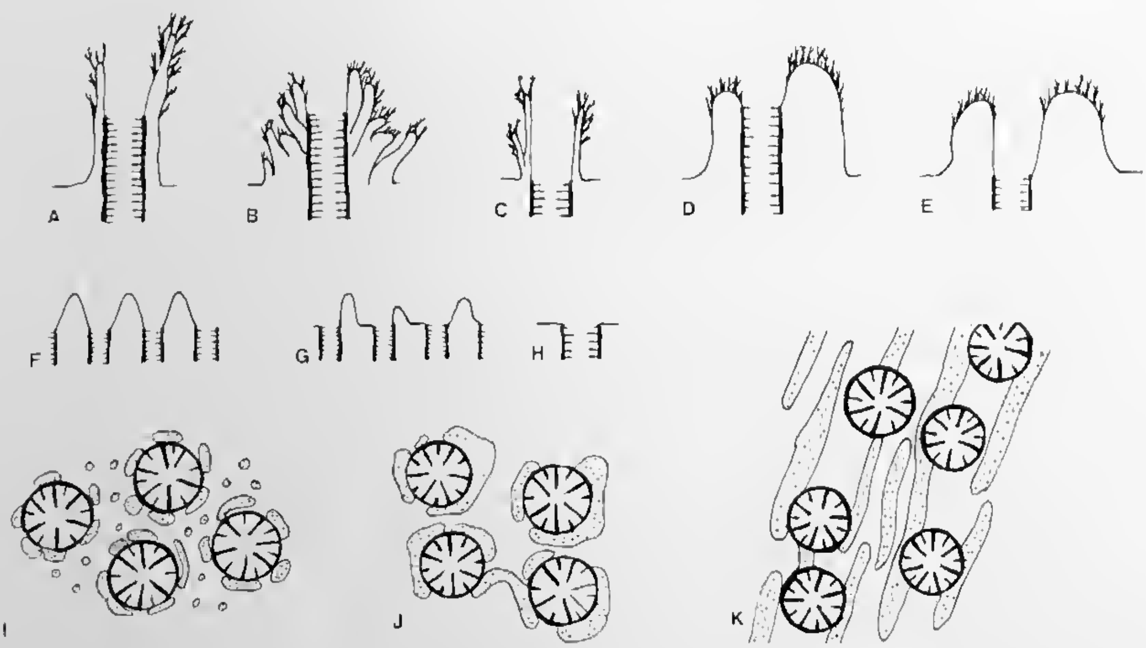


Fig. 2 Diagrammatic transverse (A-H) and surface (I-K) views of *Montipora* corallites and associated coenostial structures. (A) simple papillae with exsert corallite, (B) compound papillae with exsert corallite, (C) simple papillae with immersed corallite, (D) tuberculae with exsert corallite, (E) tuberculae with immersed corallite, (F-H) foveolate, tuberculate and glabrous corallites (respectively), (I) corallites with thecal and reticulum papillae, (J) corallites with thecal tuberculae, (K) corallites with reticulum tuberculae forming ridges.

* As in Part IV of *Scleractinia of Eastern Australia*, the length of septa is expressed as a fraction of the calice radius (R).

Papillae are finger-like projections of reticulum with a diameter equal to, or less than, that of the corallites. Papillae may encircle the corallites (*thecal papillae*) or may be scattered independently of the corallites (*reticulum papillae*). Papillae may be simple or compound.

Tuberculae are large papillae and may be many times the diameter of the corallites. They may be fused into *ridges* or may encircle corallites (*thecal tuberculae*) or be scattered independently of the corallites (*reticulum tuberculae*). When the latter are dome-shaped and uniform in size they are termed *verrucae*, but these verrucae are not homologous with the verrucae of *Pocillopora* which contain corallites.

Corallites of *Montipora* may be immersed or exsert, with or without thecal papillae or tuberculae (except that thecae are never exsert alone). Immersed corallites may be deeply imbedded in the reticulum so that the reticulum forms the upper (usually funnel-shaped) wall of the corallites and these corallites are termed *foveolate*. Coralla without any structures additional to the reticulum are termed *glabrous*.

All coenostial structures are composed of a basically spongy matrix, usually with a wide range of outward projecting trabecular components collectively called spinules. The latter usually have elaborated tips in common with the spinules of other Acroporidae. No costae (or dissepiments) are formed in *Montipora*.

Corallites of *Montipora* vary in size more than in other genera with small corallites. Ranges of calice diameters given below do not include extremes; they are the range of average diameters of mature calices.

Montipora monasteriata (Forskål, 1775)

Synonymy

Madrepora monasteriata Forskål, 1775.

?*Manopora capitata* Dana, 1846.

Montipora capitata (Dana); Verrill (1864); Quelch (1886); Ortmann (1888).

Montipora incrustans Brüggemann 1877a (*pars*); not Bernard (1897); not Ma (1959).

Montipora monasteriata (Forskål); Klunzinger (1879); ?Bernard (1897); von Marenzeller (1907); Gravier (1911); Crossland (1941); Boschma (1951); Ma (1959); Pillai (1967b).

Montipora tuberculosa (Lamarck); Klunzinger (1879); Hoffmeister (1925); Wells (1954); not Lamarck (1816).

Montipora verrucosa (Lamarck); Bernard (1897 *pars* (variety γ)); not Lamarck (1816).

Montipora lanuginosa Bernard, 1897; Yabe & Sugiyama (1935); Ma (1959).

Montipora sinensis Bernard, 1897; Yabe & Sugiyama (1935); Ma (1959); Zou (1975).

Montipora fungiformis Bernard, 1897; Studer (1901).

?*Montipora pilosa* Bernard, 1897; Nemenzo (1967).

Forskål's type series of *M. monasteriata* has the characteristics of the species well represented. It is described by Crossland (1941), who discusses the opinions of earlier authors (as does Boschma, 1951). *Manopora capitata* Dana (YPM 4211) is a probable synonym from Hawaii, characterised by a more branched growth form than normally found elsewhere. Brüggemann's *M. incrustans* includes specimens from Sri Lanka, New Ireland and Mauritius, only the first of which is this species.

Figs. 3,4 *Montipora monasteriata* (× 0.5)
Fig. 3 Plate-like corallum from Britomart Reef, collecting station 168, same corallum as Figs. 8, 11, 12.
Fig. 4 Massive corallum from Jewell Reef, same corallum as Fig. 7.

Fig. 3▲

Fig. 4▼

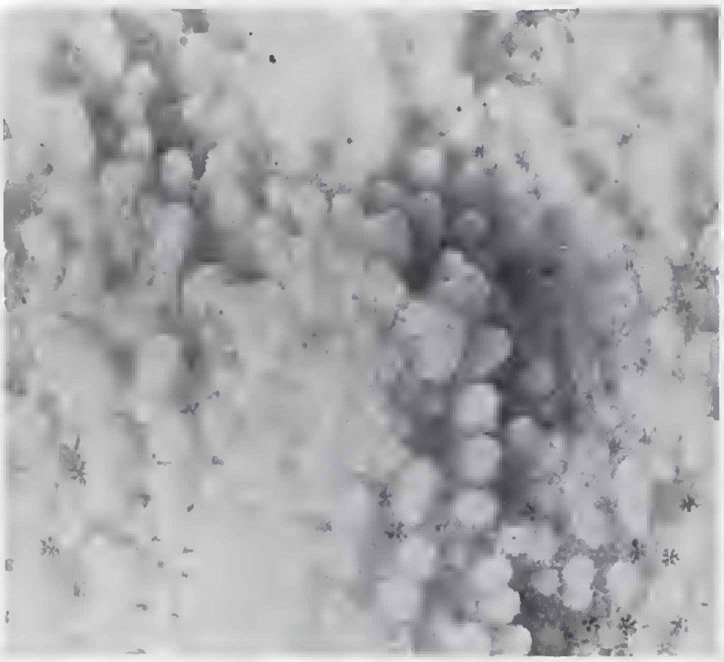


Fig. 5▲

Fig. 6▲

Fig. 7▼

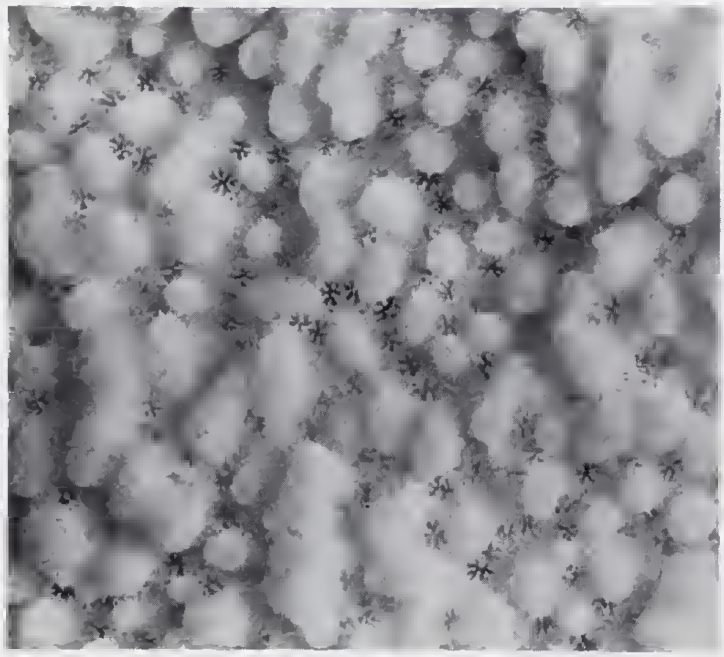


Fig. 8▼

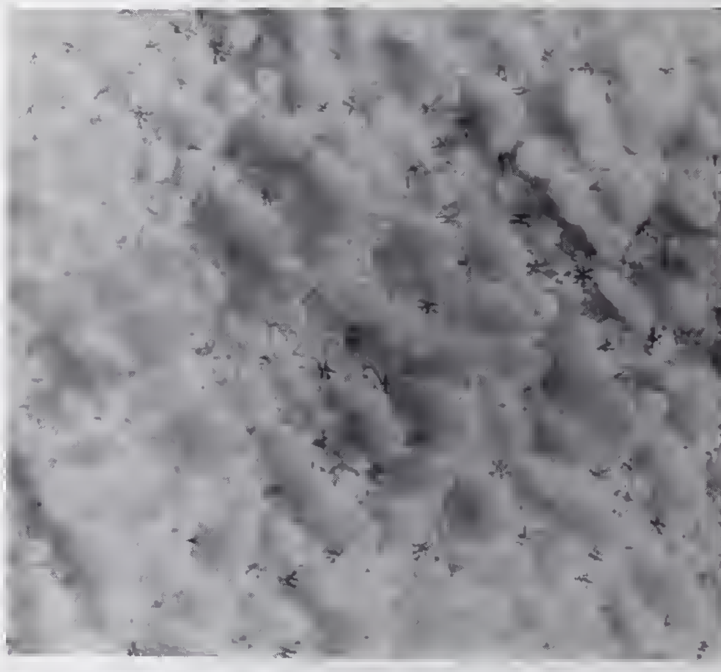


Fig. 9▼

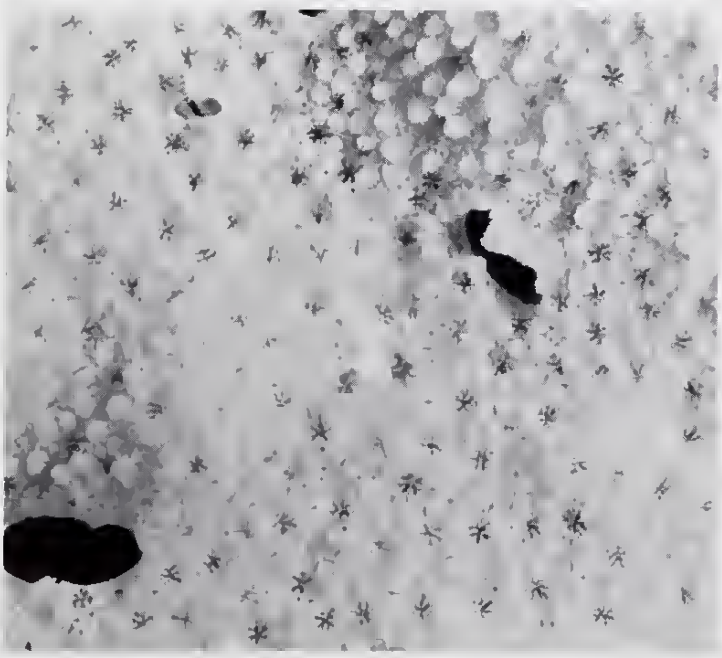
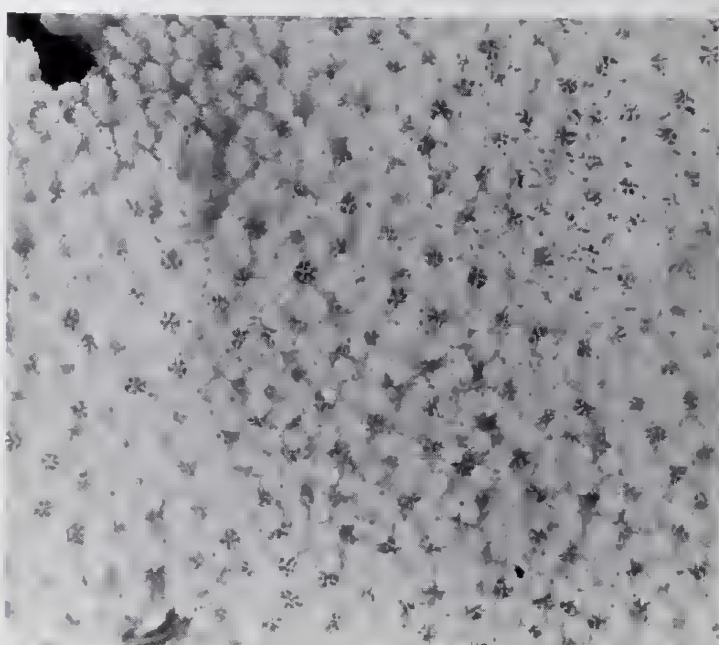


Fig. 10▼



Of the synonyms from Bernard, *M. lanuginosa* from Mauritius (syntype BMNH 1883-7-27-7) is a large corallum with all the characteristics of the species, *M. sinensis* from Tizard Bank (holotype BMNH 1889-9-24-126) and *M. fungiformis* from an unknown locality (holotype BMNH 1897-5-18-8) are both flat plates also with all characters developed, and *M. pilosa* from the Loyalty Islands (BMNH 1897-11-19-1) is a small encrusting corallum with few clear characters.

Material studied

Darnley Island (6 specimens), **Arden Island, Raine Island** (10 specimens), **Great Detaehed Reef** (2 specimens), **Martha Ridgeway Reef, Tijou Reef** (3 specimens), **Corbett Reef** (4 specimens), **Houghton Island** (3 specimens), **Lizard Island** (2 specimens), **Low Isles, Lihou Reefs, Britomart Reef, Davies Reef, Palm Islands** (4 specimens), **Broadhurst Reef** (3 specimens), **Parker Reef, Middleton Reef.**

These localities include collecting stations 8, 16, 31, 40, 60, 151, 152, 153, 159, 164, 168, 177, 183, 187, 202, 231.

Charaeters

Coralla are massive or are thick plates which may be bifacial or have epitheca extending to the margin. Corallites are evenly distributed and are of uniform size with calices 0.6-0.7mm diameter. Primary septa are complete, $\frac{2}{3}$-$\frac{3}{4}$R and consist of dentated plates or rows of spines which may be irregular. Secondary septa are $<\frac{1}{3}$R, are seldom complete and may be absent. They always consist of irregular spines. The reticulum is coarse and is uniformly covered with papillae and/or tuberculae, 0.4-1.5mm diameter. These may fuse on flat surfaces (usually plate-like coralla) to form short ridges perpendicular to the corallum margin. They are not concentrated around corallites but if sufficiently fused, corallites may become sub-foveolate. They may be absent on concave surfaces, leaving corallites separated only by coarse spongy reticulum. All papillae and tuberculae are composed of fine reticulum with elaborated spinules.

Coralla from environments protected from strong wave action have small papillae, and corallites have a relatively well-developed septation. Those exposed to strong wave action have tuberculae rather than papillae, which are broad and highly fused. Secondary septa are usually reduced or absent and the spines of some primary septa are fused into dentate plates.

Living colonies are usually pale brown or pink in colour, with pink or white margins.

Affinities

Differences between *M. monasteriata* and *M. incrassata* are noted on p. 65. *Montipora monasteriata* may be close to *M. tuberculosa.* The latter has smaller corallites and smaller tuberculae/papillae which are fused into thecal tubes.

Distribution

Widely distributed from the Red Sea probably east as far as Hawaii.

Figs. 5-10 *Montipora monasteriata* (× 5)

Figs. 5, 6 Same corallum from between Orpheus and Fantome Islands, Palm Islands, collecting station 60.
Fig. 7 From Jewell Reef, same corallum as Fig. 4.
Fig. 8 From Britomart Reef, same corallum as Figs. 3, 11, 12.
Figs. 9, 10 From Corbett Reef, collecting station 164.

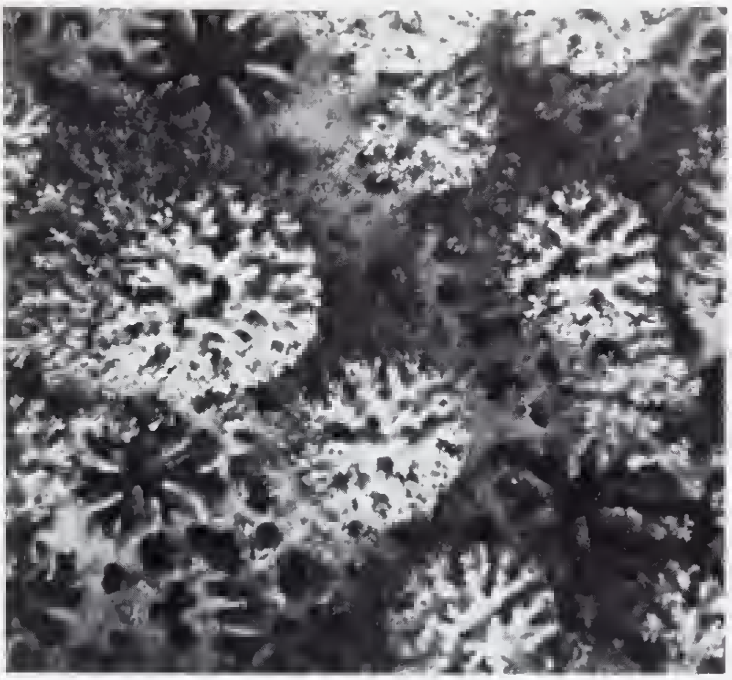


Fig 11▲

Fig. 12▲

Figs. 11, 12 *Montipora monasteriata* from Britomart Reef, same corallum as Figs. 3 and 8 (× 20 and 40 respectively).

Fig 13▼

Fig. 13 *Montipora tuberculosa* from Flinders Reef (Moreton Bay), collecting station 227 (× 0.75).

Montipora tuberculosa (Lamarck, 1816)

Synonymy

Porites tuberculosa Lamarck, 1816.

Montipora tuberculosa (Lamarck); Bernard (1897, *pars*); not Klunzinger (1879); Hoffmeister (1925); Wells (1954).

Montipora mammifera Bernard, 1897.

Bernard (1897, p. 112) gives a description of Lamarck's two type specimens in the Paris Museum, which correspond well with the present series. The name *M. tuberculosa* has been used frequently in the literature where it probably refers to *M. monasteriata* (see p. 14), as in Klunzinger (1879), Hoffmeister (1925) and Wells (1954).

Syntype BMNH 1882-10-17-162 of *M. mammifera* is a fragment from the Seychelles Islands with fine, widely spaced corallites.

Material studied

Little Mary Reef, Thursday Island, Raine Island (5 specimens), **Great Detached Reef, Martha Ridgeway Reef** (2 specimens), **Tijou Reef** (2 specimens), **Corbett Reef, Lizard Island** (3 specimens), **Britomart Reef** (3 specimens), **Rib Reef** (9 specimens), **Palm Islands** (14 specimens), **Broadhurst Reef** (9 specimens), **Magnetic Island, Lady Musgrave Reef, Flinders Reef (Moreton Bay)**.

These localities include collecting stations 5, 33, 37, 41, 42, 43, 45, 51, 54, 60, 89, 151, 152, 154, 155, 159, 164, 167, 168, 174, 177, 186, 195, 222, 227.

Characters

Coralla are submassive, encrusting or plate-like, with a surface usually raised into irregular mounds. Corallites are evenly distributed with calices 0.4-0.7mm diameter. All coralla have immersed corallites which intergrade with others that are exsert and surrounded by thecal papillae. In some coralla most of the corallites are only partly surrounded by papillae which are conical or are fused into incomplete circles. Reticulum papillae also occur, but are relatively uncommon. All papillae are covered by projecting spinules which are usually highly elaborated. Primary septa are complete, $<\frac{3}{4}R$, and are

Figs. 14, 15 *Montipora tuberculosa* (× 5)

Fig. 14 From Magdelaine Cay, same corallum as Figs. 18, 19.

Fig. 15 From Falcon Island, Palm Islands, same corallum as Figs. 20, 21.

Fig 14▾

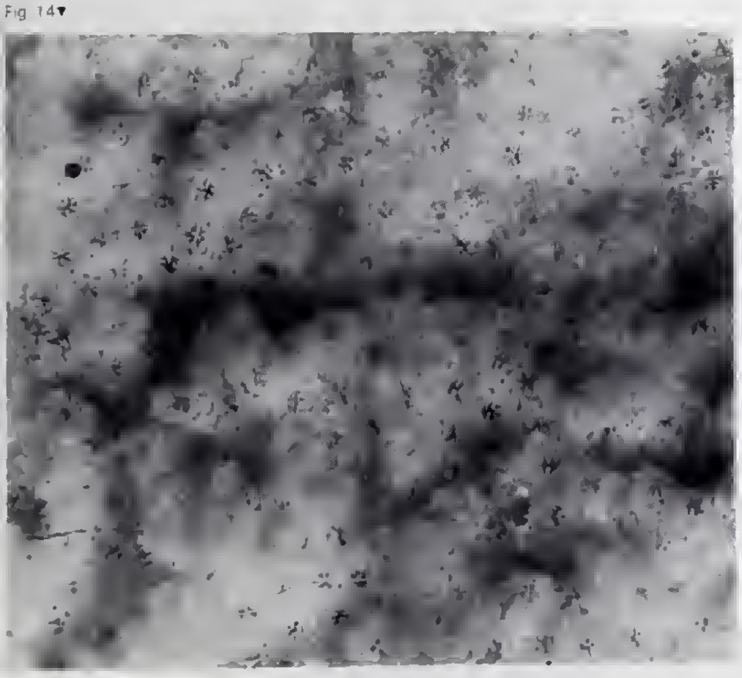
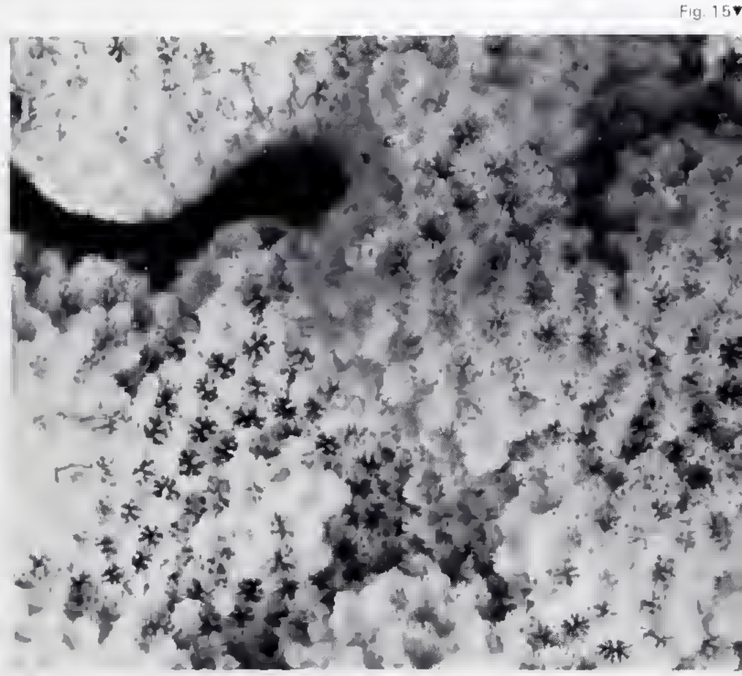


Fig. 15▾



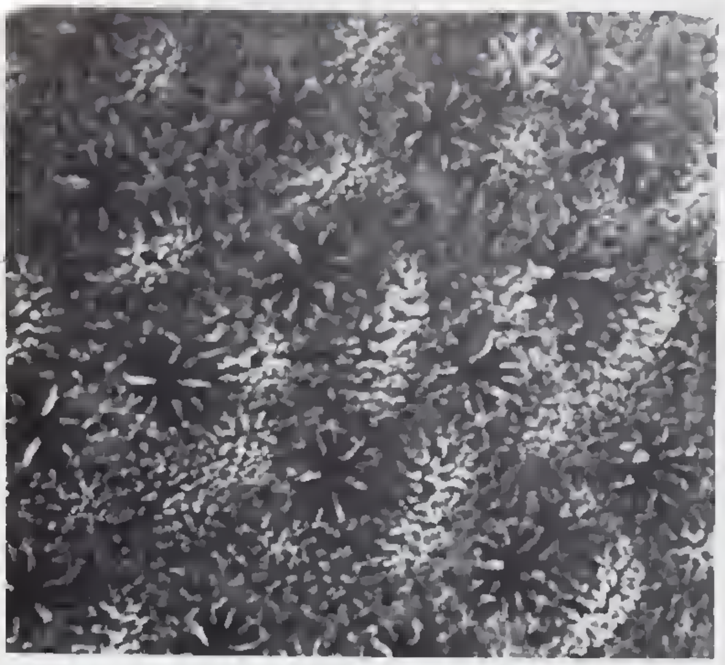


Fig 16▲

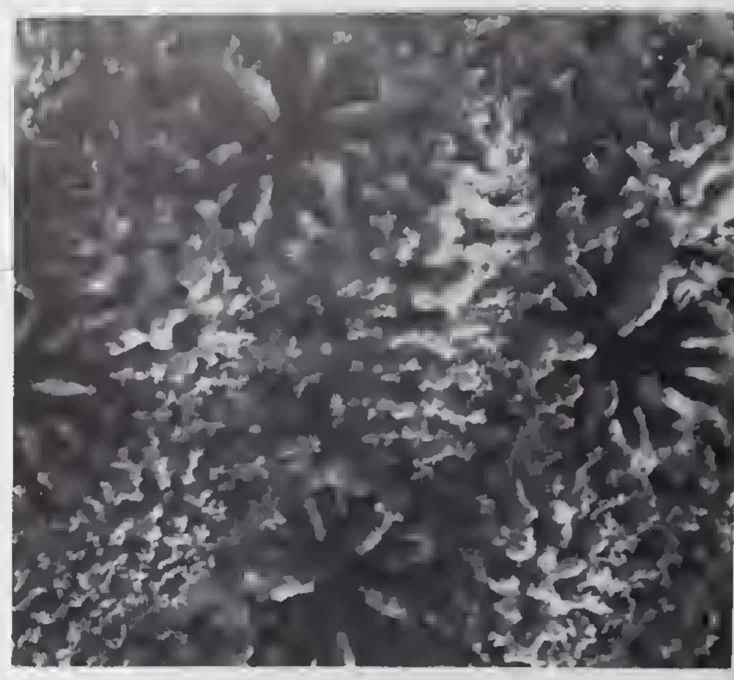


Fig 17▲

Fig 18▼

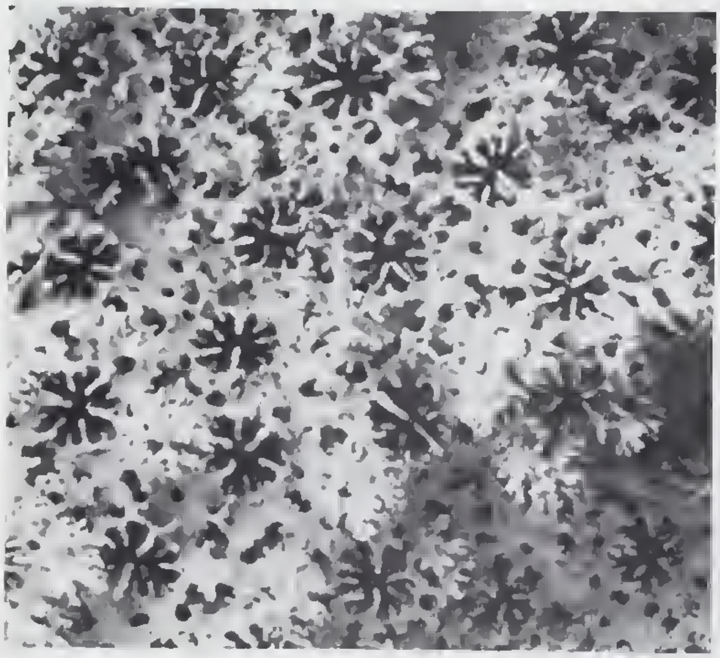


Fig 19▼

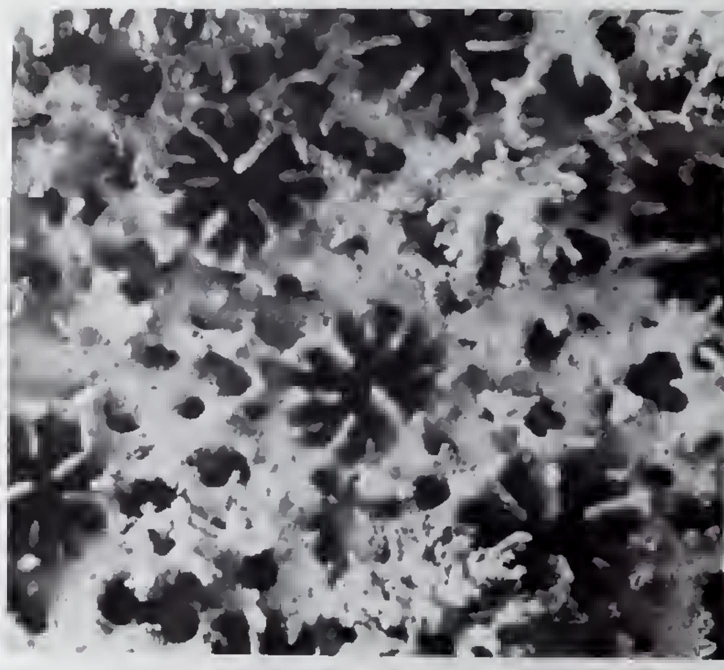


Fig 20▼

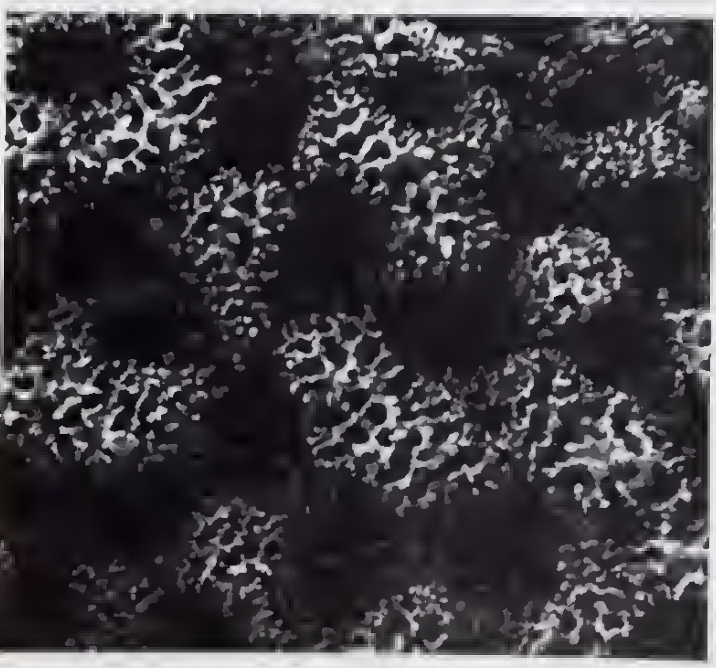


Fig 21▼

composed of rows of spines which may be partly fused and may also be slightly exsert. One or both directive septa may be distinguished. Secondary septa are usually complete but are sometimes very reduced. They are $<\frac{1}{3}R$ and are usually composed of smaller spines than the primary septa. Coralla from environments exposed to strong wave action have regular septa composed of thick spines which may be granulated. In coralla from deep water, all septa are of irregular lengths. The reticulum is always spongy and coarse.

Montipora tuberculosa occurs over a wide environmental range. It may be brightly coloured (usually blue) in shallow water but is usually a dull brown or green.

Figs. 16-21 *Montipora tuberculosa*
Figs. 16, 17 From Chesterfield Atoll, collecting station 210 (× 20 and 40 respectively).
Figs. 18, 19 From Magdelaine Cay, collecting station 200, same corallum as Fig. 14 (× 20 and 40 respectively).
Figs. 20, 21 From Falcon Island, Palm Islands, collecting station 174 (× 20 and 40 respectively).

Affinities

Differences between *M. tuberculosa* and *M. monasteriata* are noted on p. 17. *Montipora tuberculosa* may resemble *M. corbettensis* which has more compacted papillae and which are uniform in shape and size and do not fuse around the corallites (i.e. are not differentiated into thecal and reticulum papillae).

Distribution

Widespread in the tropical Indo-Pacific, although most records are obscured by taxonomic problems.

Fig 22 ▾

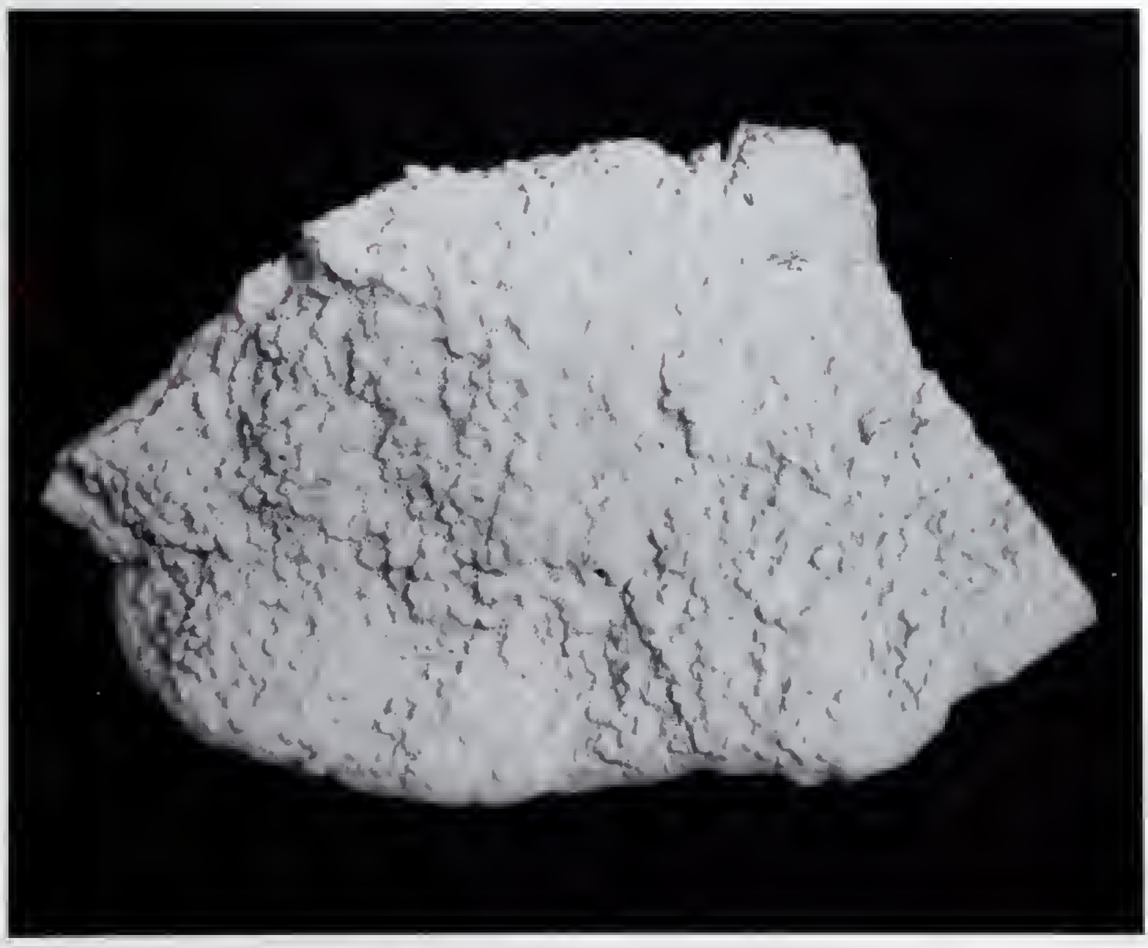


Fig. 22 *Montipora hoffmeisteri* from Martha Ridgeway Reef, collecting station 154, same corallum as Figs. 23-25 (× 0.75).

Fig 23▲

Fig 25▼

Fig 27▼

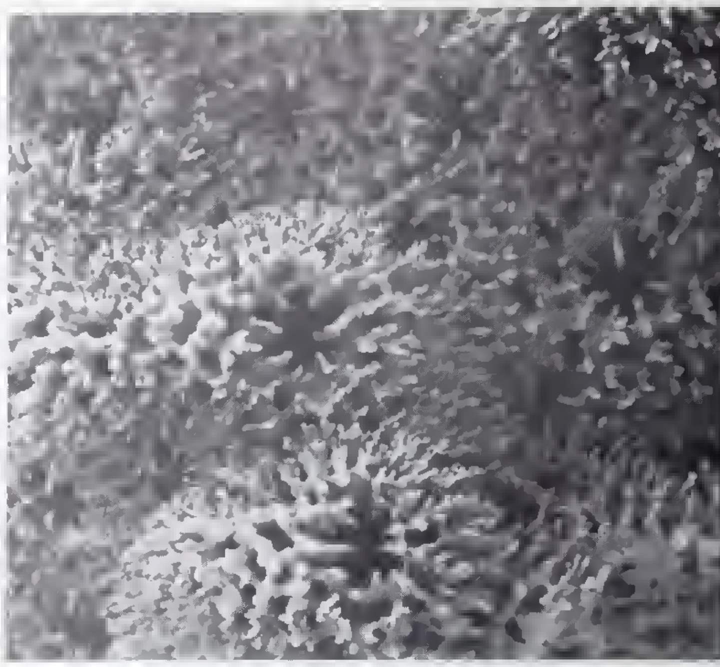


Fig. 24▲

Fig 26▼

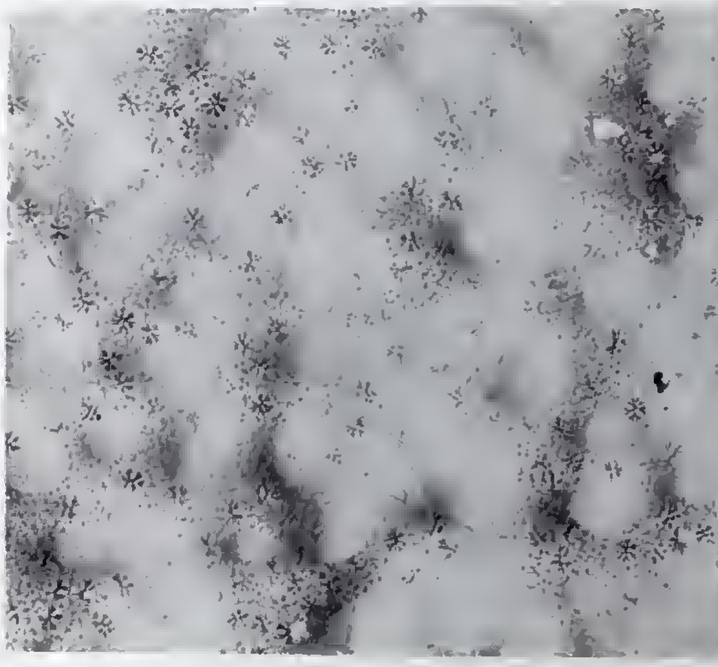


Fig. 28▼

Montipora hoffmeisteri Wells, 1954

Synonymy

Montipora hoffmeisteri Wells, 1954.

Material studied

Raine Island (7 specimens), **Great Detached Reef** (2 specimens), **Martha Ridgeway Reef, Franklin Reef, Tijou Reef, Magdelaine Cay, Flinders Reef (Coral Sea), Rib Reef** (7 specimens), **Broadhurst Reef, Chesterfield Reefs** (2 specimens), **Fitzroy Reef** (3 specimens).

These localities include collecting stations 1, 149, 152, 154, 155, 189, 191, 200, 210, 215, 222, 226.

Characters

Coralla of the present series are thick, submassive plates, backed with epitheca. Their surface is covered with conical tuberculae, 2-4mm diameter, which become irregularly fused. Corallites are primarily concentrated on flat surfaces between tuberculae but there is usually a single corallite on the summit of each tuberculum and sometimes one or more on the side. Corallites are immersed with calices 0.7-0.9mm diameter. Thecae are hardly distinguishable. Primary septa are up to $\frac{2}{3}$R, complete, and consist of rows of non-tapered spines. Secondary septa are composed of rows of smaller spines up to $\frac{1}{3}$R and are usually incomplete, sometimes absent. The reticulum is uniform, moderately coarse, partly spongy and is covered with elaborated spinules.

Affinities

Montipora hoffmeisteri is closest to *M. floweri* and is distinguished by having slightly larger calices and corallites on the top of most tuberculae. Calicular and coenostial characters of these species are similar, except that *M. floweri* has more elaborated spinules.

Distribution

Previously recorded only from the Marshall Islands, but occurs on the east and west coasts of Australia.

Figs. 23-28 *Montipora hoffmeisteri*

Figs. 23-25 Same corallum from Martha Ridgeway Reef and same corallum as Fig. 22 (× 5, 20 and 40 respectively).

Figs. 26-28 Same corallum from Chesterfield Atoll, collecting station 210 (× 5, 20 and 40 respectively).

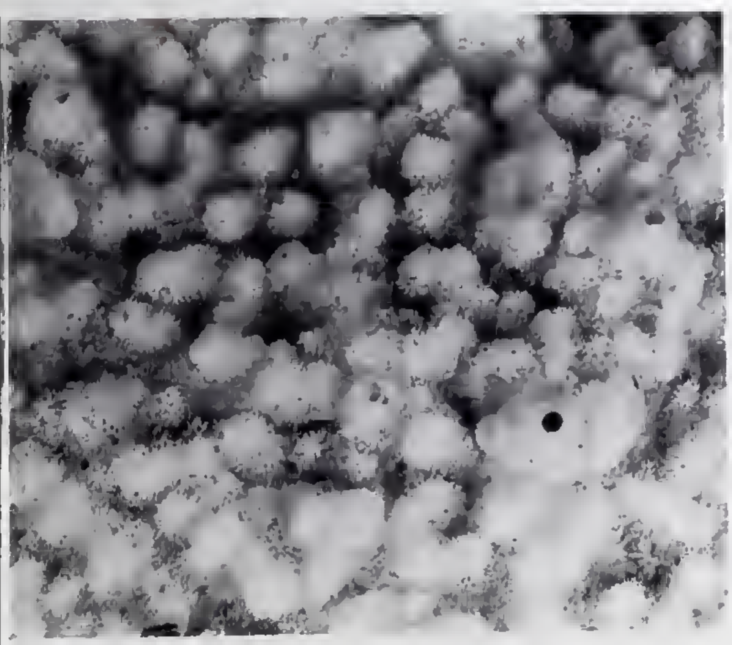


Fig 29▲

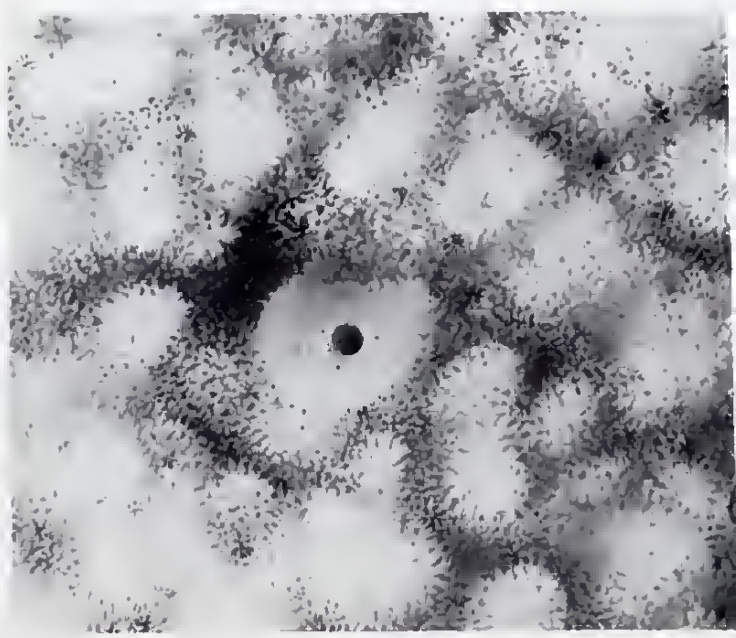


Fig. 30▲

Figs. 29, 30 *Montipora floweri* from Magdelaine Cay collecting station 200, same corallum as Figs. 31, 32 (× 2 and 5 respectively).

Montipora floweri Wells, 1954

Synonymy

Montipora floweri Wells, 1954.

Material studied

Magdelaine Cay (3 specimens), **Flinders Reef (Coral Sea), Davis Reef, Palm Islands** (2 specimens), **Chesterfield Reefs, Musgrave Reef** (2 specimens).

These localities include collecting stations 36, 194, 200, 210, 226.

Characters

The present small series consists of sub-massive coralla which have their surfaces covered with irregularly fused tuberculae, 2.2-3.8mm diameter. Corallites are distributed

Figs. 31-34 *Montipora floweri*
Figs. 31, 32 From Magdelaine Cay, same corallum as Figs. 29, 30 (× 20 and 40 respectively).
Figs. 33, 34 From Chesterfield Atoll, collecting station 210 (× 20 and 40 respectively).

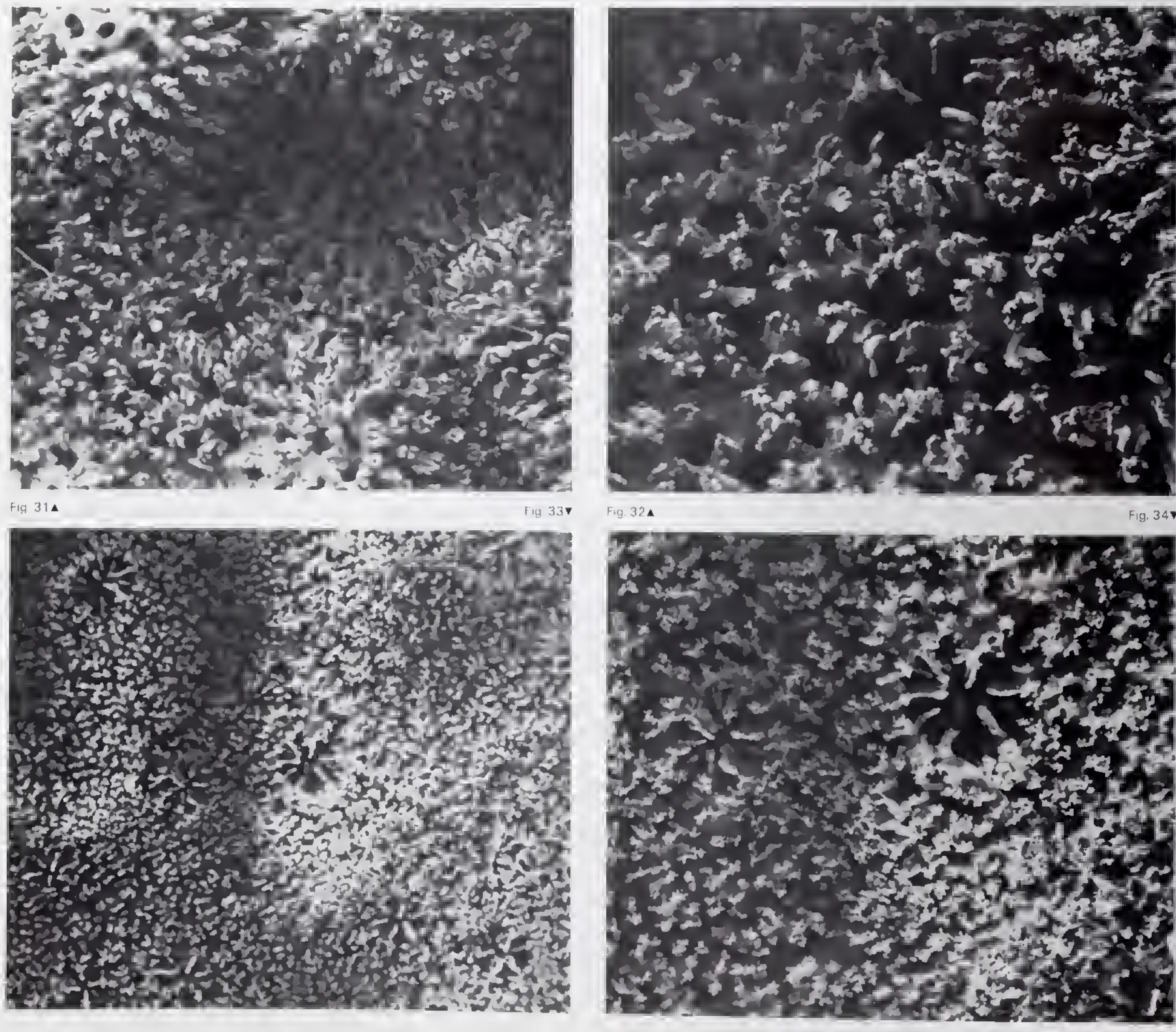


Fig 31▲ Fig 33▼ Fig. 32▲ Fig. 34▼

independently of the tuberculae. They are immersed, with calices 0.6-0.7mm diameter and have a clearly distinguishable theca. Septa are in two complete cycles of non-tapered spines, up to $\frac{3}{4}$R and $\frac{1}{2}$R. Primary septa may become thickened in some corallites and there is some tendency for some spines to be fused and slightly exsert. The reticulum is medium-coarse and is covered with spinules which may be highly elaborated, giving a frosted appearance.

Affinities

Montipora floweri is close to *M. millepora* which has smaller corallites almost always absent from the tips of tuberculae, and having incomplete to absent secondary septa. *Montipora floweri* is also close to *M. hoffmeisteri* (see p. 23), with calices intermediate in size between *M. hoffmeisteri* and *M. millepora*.

Distribution

Previously recorded only from the Marshall Islands.

Montipora millepora Crossland, 1952

Synonymy

Montipora millepora Crossland, 1952.

?*Montipora pallida* Bernard, 1897; ?Wells (1954); Ma (1959).

?*Montipora reticulata* Bernard, 1897; Ma (1959).

?*Montipora subtilis* Bernard, 1897; ?Wells (1954).

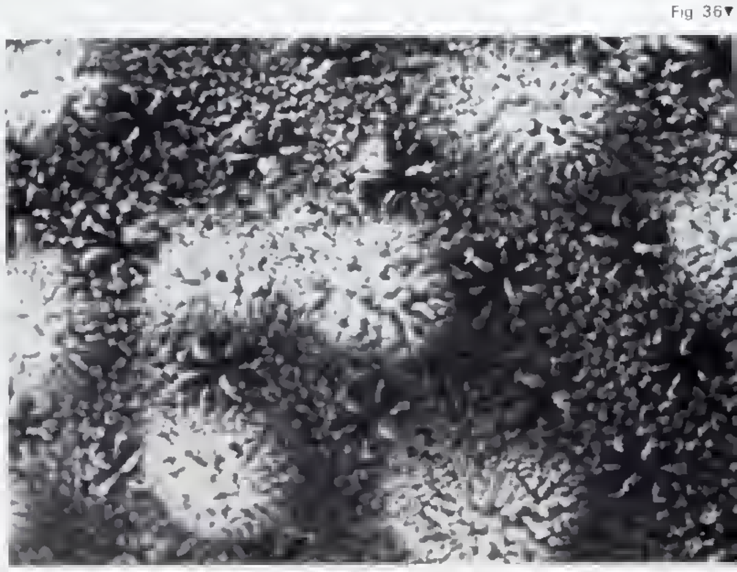
Bernard's holotype of *M. pallida* (BMNH 1892-1-16-2) is a small thin plate dredged from Holothuria Bank, with no tuberculae and a smooth reticulum. Corallites are the same as Fig. 35 but with the lack of clear characters, the identity of *M. pallida* cannot be confirmed. The holotype of *M. reticulata* (BMNH 1893-9-1-81), dredged from Macclesfield Bank at a depth of 60m, has even less well-defined characters but is possibly this species. The holotype of *M. subtilis* (BMNH 1882-10-17-188), also from Macclesfield Bank, is only a small fragment and is similar to Crossland's type of *M. millepora* but may be a

Figs. 35-42 *Montipora millepora*

Figs. 35, 36 Same corallum from Willis Island, collecting station 199 (× 5 and 20 respectively).
Figs. 37, 38 Same corallum from Magdelaine Cay, collecting station 200 (× 5 and 20 respectively).
Figs. 39, 40 Same corallum from Davies Reef (× 5 and 40 respectively).
Figs. 41, 42 Same corallum from Rib Reef (× 5 and 40 respectively).

Fig 35▼

Fig 36▼



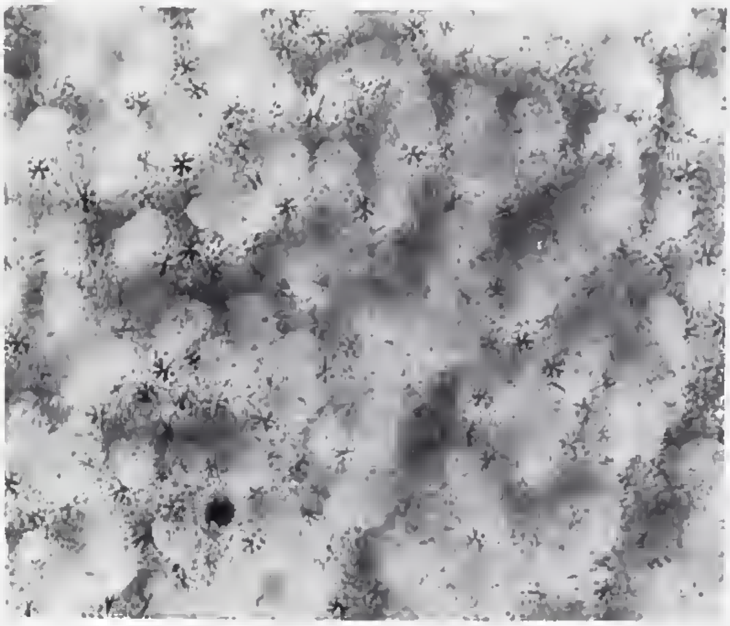


Fig. 37▲

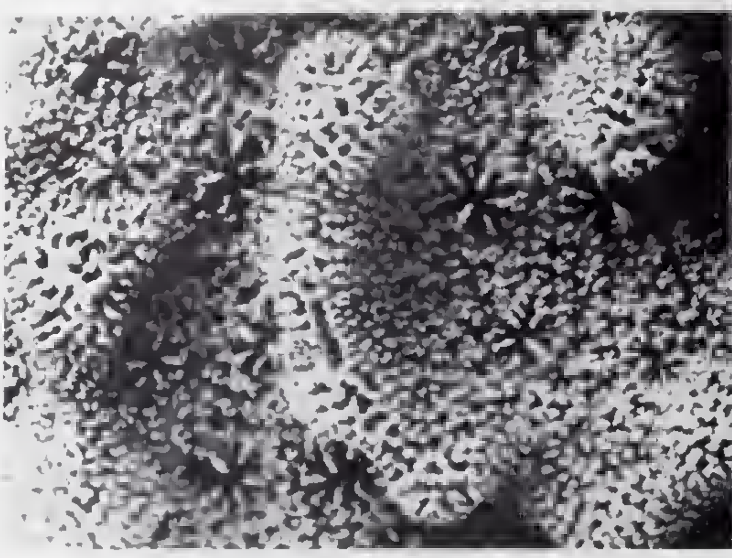


Fig. 38▲

Fig. 39▼

Fig. 40▼

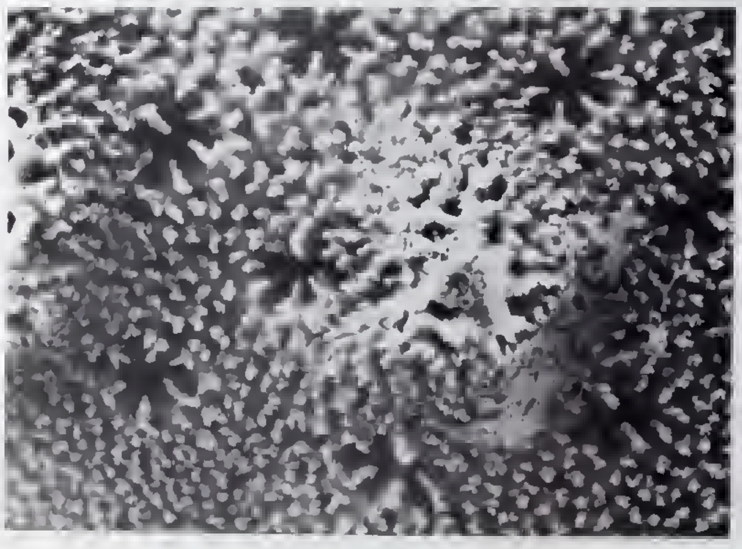


Fig. 41▼

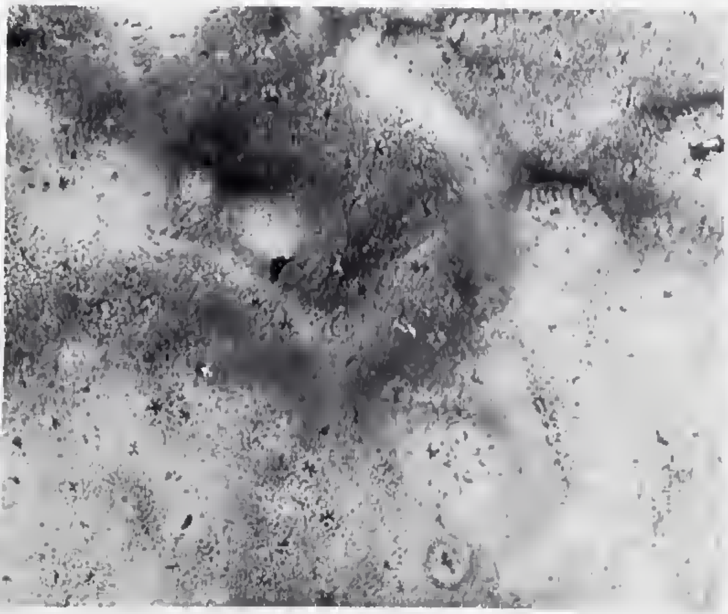
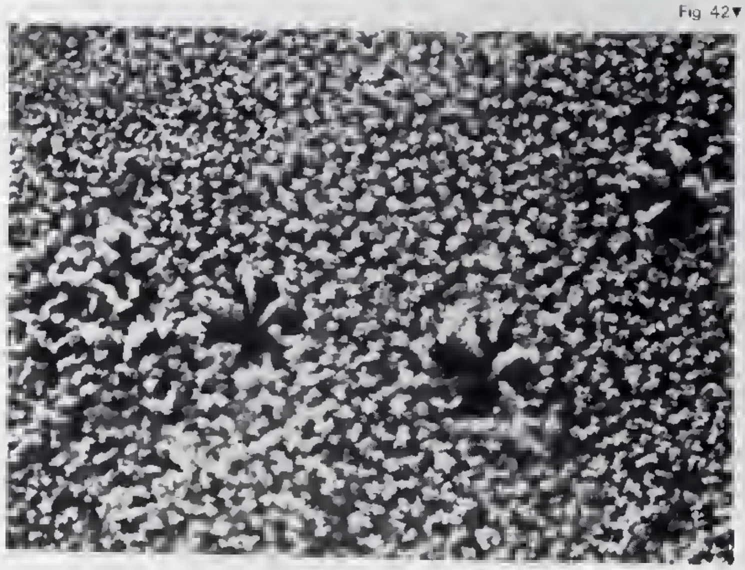


Fig. 42▼



deep water ecomorph of another species. Wells's *M. subtilis* differs from Crossland's type in several characters, especially in the development of a second septal cycle.

Crossland's type (BMNH 1934-5-14-410) has the characters of the species clearly exhibited, although the stratified layering of the coenosteum he described is not diagnostic of, or peculiar to, this species.

Material studied

Magdelaine Cay (4 specimens), **Flinders Reef (Coral Sea), Rib Reef** (6 specimens), **Palm Islands** (2 specimens), **Chesterfield Reefs** (3 specimens), **Bushy Island-Redbill Reef, Polmaise Reef, Musgrave Reef**.

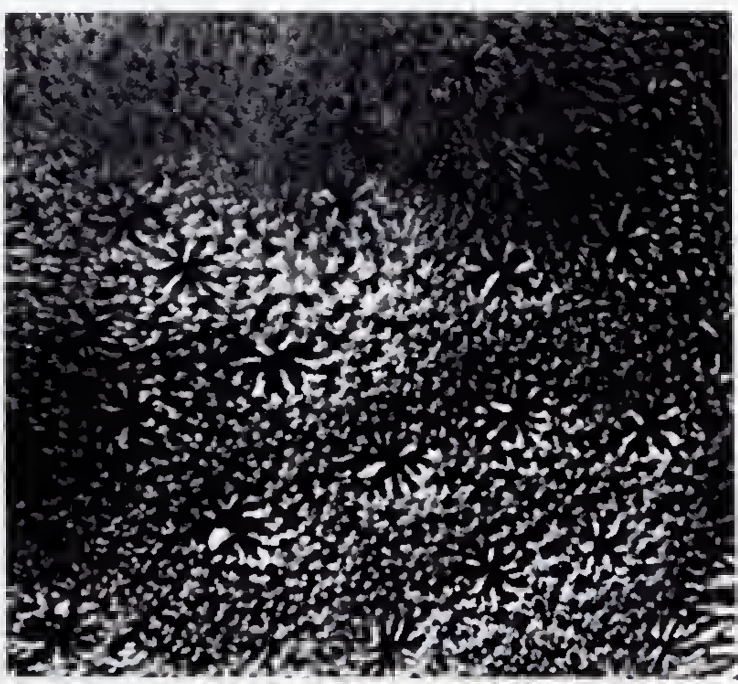
These localities include collecting stations 73, 90, 193, 198, 199, 200, 215, 216, 222, 226.

Figs. 43-45 Same corallum of *Montipora* sp. 1 from Magnetic Island (× 0.5 and 20 respectively).

Fig. 43▼

Fig. 44▼

Fig. 45▼



Characters

Colonies are massive to encrusting, massive colonies usually having flattened encrusting margins. Coralla are covered with low encrusting tuberculae with corallites evenly distributed between and on the sides of tuberculae. Corallites are immersed and occasionally have a well-defined thecal rim, with calices 0.4-0.6mm diameter. Very small corallites occur on the corallum perimeter. Primary septa are complete and are composed of rows of thick spines which may be fused into dentate plates which may be slightly exsert. Secondary septa are $<\frac{1}{2}$R and are incomplete or, commonly, absent. The reticulum is medium-fine and spongy, that of the tuberculae sometimes being slightly finer, with elaborated spinules. There is very little variation between any of the coralla of the present series.

Montipora millepora is an uncommon species which has only been found under ledges and in crevices. It is usually dark green or dark red and closely resembles *Stylocoeniella in situ.*

Affinities

Montipora millepora resembles only *M. floweri* (see p. 25).

Distribution

Occurs on the east and west coasts of Australia but identification difficulties make the wider distribution of this species uncertain.

Montipora sp. 1

Material studied

Magnetic Island.

Characters

This species is known from a single corallum from Magnetic Island (Fig. 43) which consists of a mass of fused nodular columns.

Corallites are immersed, with a distinguishable theca. Calices are approximately 0.6mm diameter. Primary septa consist of strongly dentate plates up to $\frac{3}{4}$R. Secondary septa are weakly developed spines, incomplete, $<\frac{1}{3}$R to absent. The reticulum is medium-fine with moderately elaborated, well-developed spinules.

Affinities

Corallites are similar to those of *M. millepora.* However, with its distinctive growth form, this corallum does not resemble any other in the present collections, nor any described species.

Montipora mollis Bernard, 1897

Synonymy

Montipora mollis Bernard, 1897.

Montipora saxea Bernard, 1897.

Montipora turgescens Bernard; Vaughan (1918).

Montipora tertia Crossland, 1952.

Montipora cristagalli Ehrenberg; Bernard (1897).

Bernard's specimen of *M. cristagalli* Ehrenberg from the Persian Gulf is certainly the present species, but the species cannot be traced to Ehrenberg.

Figs. 46-48 *Montipora mollis* (× 0.5)

Fig. 46 From Lizard Island, same corallum as Fig. 49.
Fig. 47 From Broadhurst Reef, collecting station 223, same corallum as Figs. 50, 53, 54.
Fig. 48 From Broadhurst Reef, collecting station 223, same corallum as Figs. 51, 55, 56.

Fig. 46▲

Fig. 47▲

Fig. 48▲

There is little difference between Bernard's types of *M. mollis* from the Palm Islands (syntype BMNH 1892-12-1-4) and *M. saxea* from the Ellice Islands (? type BMNH 1897-11-19-5). Both have corallites close to those of Fig. 49, with relatively poorly developed primary septa normally associated with coralla from turbid environments. The holotype of *M. tertia* (BMNH 1934-5-14-455) has corallites near the opposite end of the species range.

Figs. 49-52 *Montipora mollis* (× 5)

Fig. 49 From Lizard Island, same corallum as Fig. 46.
Fig. 50 From Broadhurst Reef, same corallum as Figs. 47, 53, 54.
Fig. 51 From Broadhurst Reef, same corallum as Figs. 48, 55, 56.
Fig. 52 From Broadhurst Reef, same corallum as Figs. 57, 58.

Figs. 53-58 *Montipora mollis* from Broadhurst Reef

Figs. 53-54 Same corallum as Figs. 47, 50 (× 20 and 40 respectively).
Figs. 55, 56 Same corallum as Figs. 48, 51 (× 20 and 40 respectively).
Figs. 57, 58 Same corallum as Fig. 52 (× 20 and 40 respectively).

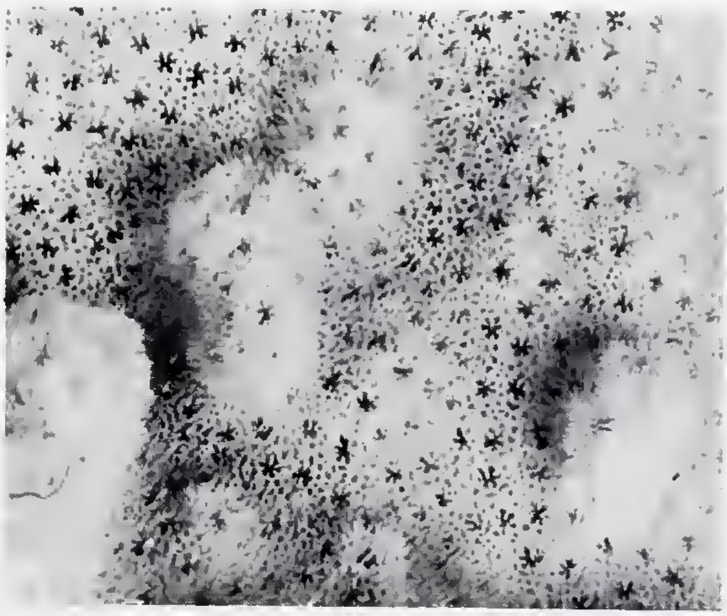
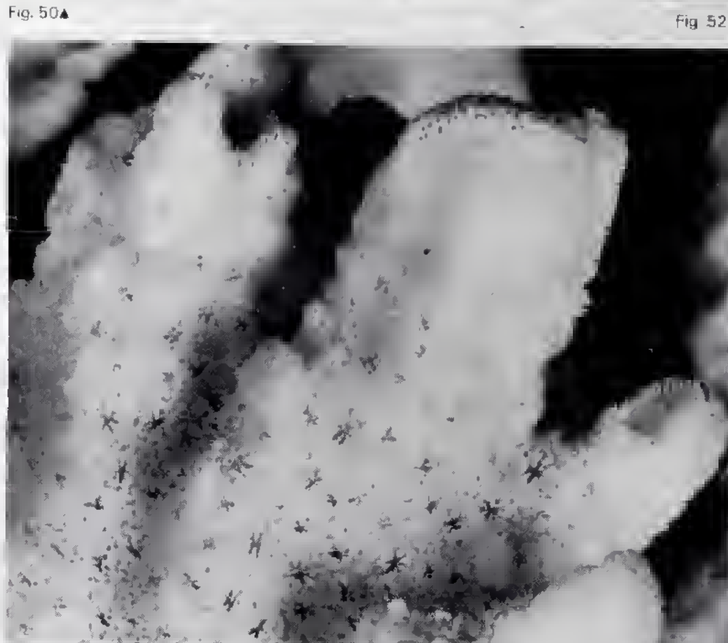


Fig. 49▲

Fig. 50▲

Fig 51▼

Fig 52▼



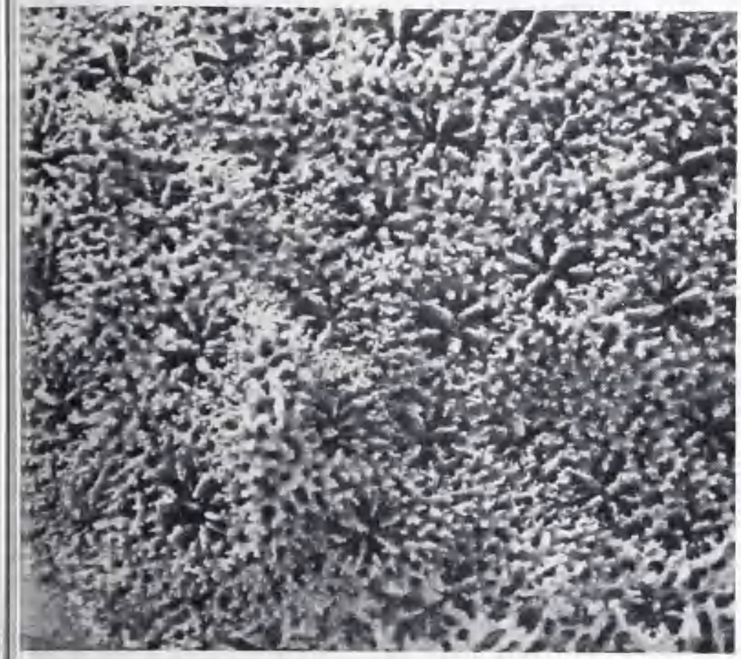


Fig. 53▲

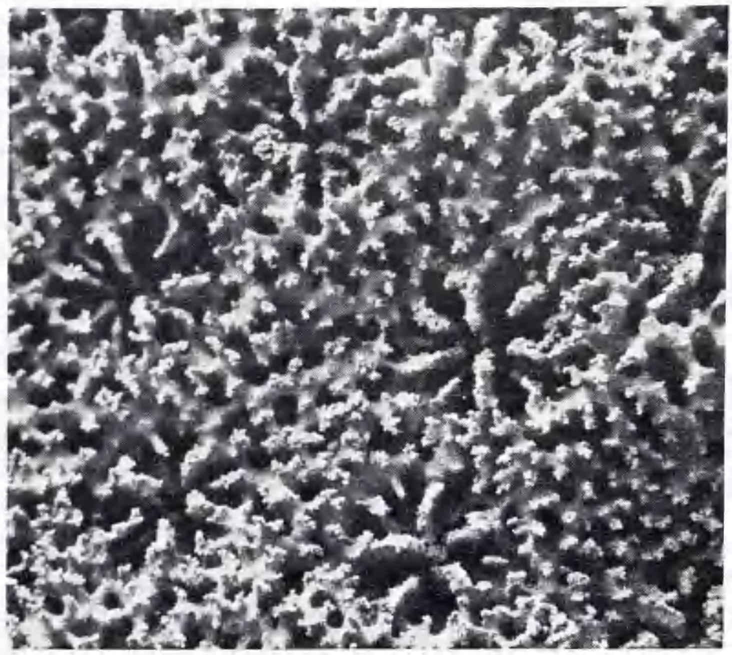


Fig. 54▲

Fig. 55▼

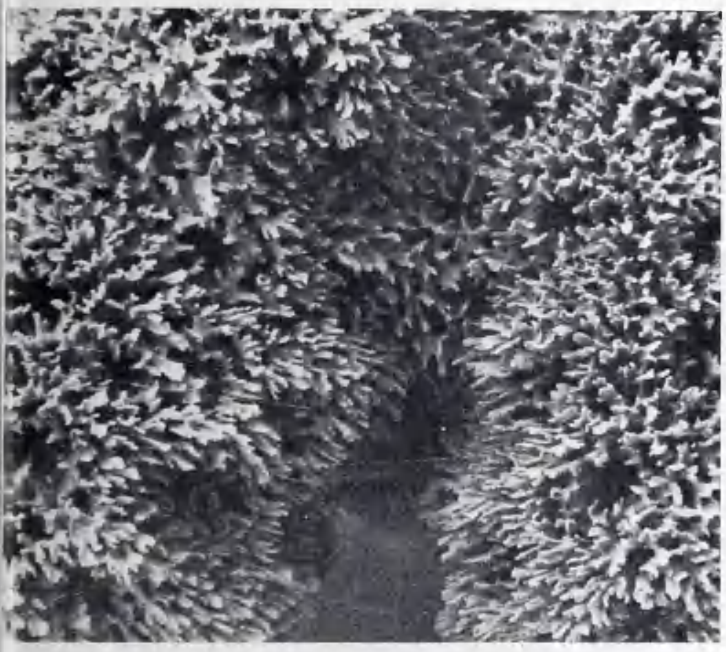


Fig. 56▼

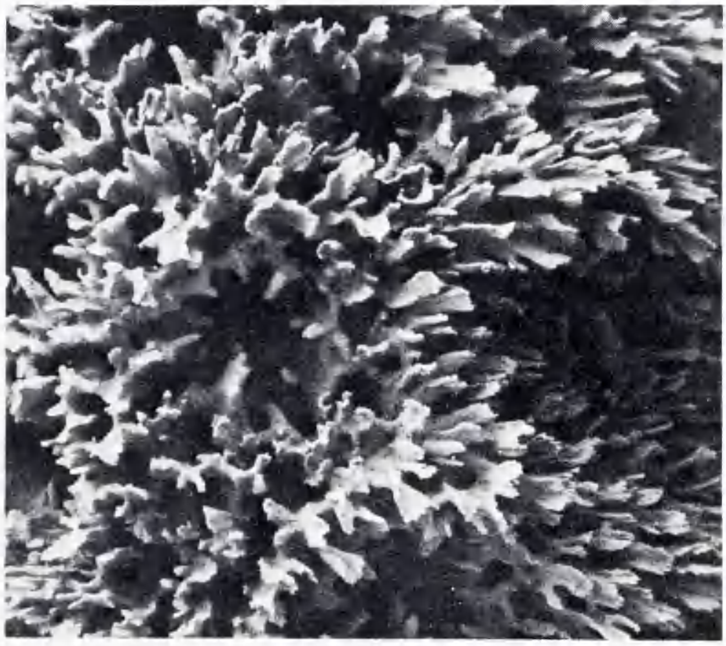


Fig. 57▼

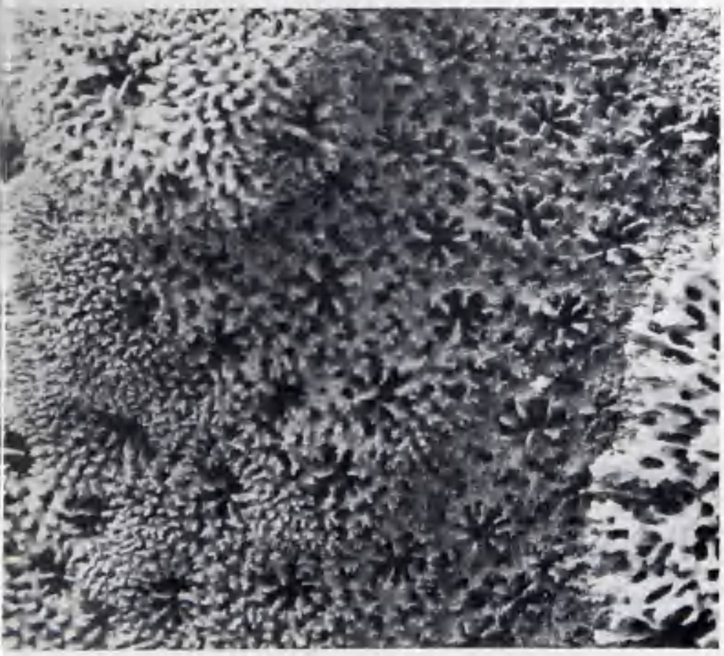
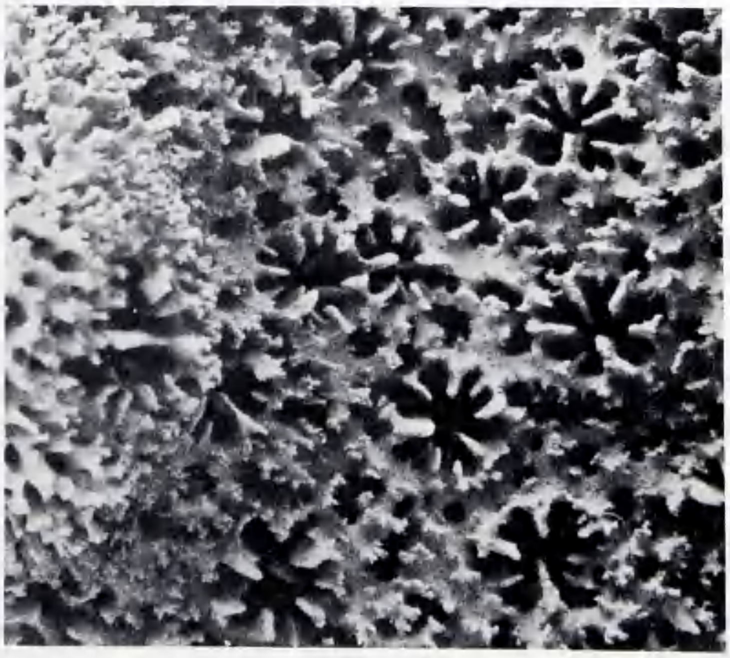


Fig. 58▼



Bernard's syntypes of *M. multiformis* from Houtman Abrolhos Islands (BMNH 1895-10-9-57) may also be a synonym of *M. mollis*, although some calicular characters are outside the range of the present series.

Material studied

Turtle Backed Island, Ashmore Reef, Great Detached Reef (3 specimens), **Corbett Reef, Lizard Island** (4 specimens), **Willis Islet** (11 specimens), **Magdelaine Cay** (18 specimens), **Lihou Reefs** (3 specimens), **Mellish Reef** (6 specimens), **Palm Islands** (3 specimens), **Keeper Reef** (2 specimens), **Magnetic Island** (16 specimens), **Marion Reef** (2 specimens), **Chesterfield Reefs** (56 specimens), **Bushy Island-Redbill Reef, Swain Reefs, Flinders Reef (Moreton Bay)** (3 specimens), **Lord Howe Island**.

These localities include collecting stations 1, 43, 73, 81, 89, 90, 99, 106, 138, 145, 164, 174, 199, 200, 202, 203, 205, 206, 207, 209, 210, 211, 212, 213, 215, 216, 225, 227.

Characters

Colonies are composed of bifacial or encrusting plates and short, fused, irregularly dividing clumps of tapering columns. Individual columns are <50mm long and <4.5mm thick.

Corallites have well-developed thecae and calices 0.5-0.7mm diameter. Primary septa are usually well developed and slightly exsert. They are usually thickened dentate plates or rows of spines up to approximately $\frac{3}{4}$R. One or both directive septa may be distinguishable. Secondary septa are composed of smaller spines, $<\frac{1}{2}$R, incomplete to absent.

Some coralla have all corallites immersed. Other coralla, especially those with columns, have some corallites with *Acropora*-like lower lips which may become cucullate or have corallites uniformly surrounded by a tubercular tube. Plate-like coralla may also have low conical reticulum tuberculae. All coralla have a uniform, medium-sized spongy reticulum which becomes slightly finer on tuberculae and covered with simple spinules.

Montipora mollis occurs primarily on subtidal flats where it usually has a uniform brown colour.

Affinities

Montipora mollis is closest to *M. turtlensis*. It is distinguished by its columnar rather than globular branches, less compacted corallites, lack of papillae with elaborated spinules and greater differentiation between septal cycles. It may also resemble *M. turgescens* (see p. 42).

Distribution

Distributed along the east and west coasts of Australia. Also recorded from the Persian Gulf (*M. cristagalli* of Bernard).

Montipora turtlensis n.sp.

Material studied

Darnley Island, Triangle Reef (2 specimens), **Raine Island** (7 specimens), **Wye Reef, Turtle Islands** (6 specimens), **Lizard Island, Rib Reef** (3 specimens), **Broadhurst Reef** (5 specimens), **Magnetic Island** (3 specimens), **Chesterfield Reefs** (3 specimens), **Fitzroy Reef** (5 specimens), **Middleton Reef** (19 specimens), **Elizabeth Reef** (3 specimens), **Lord Howe Island**.

These localities include collecting stations 31, 89, 147, 151, 152, 157, 163, 165, 189, 190, 191, 210, 222, 223, 230, 231, 233, 236, 238.

Figs. 59-61 *Montipora turtlensis* (× 0.75)

Figs. 59, 60 From the Turtle Islands, collecting station 165; Fig. 59, holotype, same corallum as Fig. 68; Fig. 60, same corallum as Fig. 69.

Fig. 61 From Chesterfield Atoll, collecting station 310.

Fig. 59▲

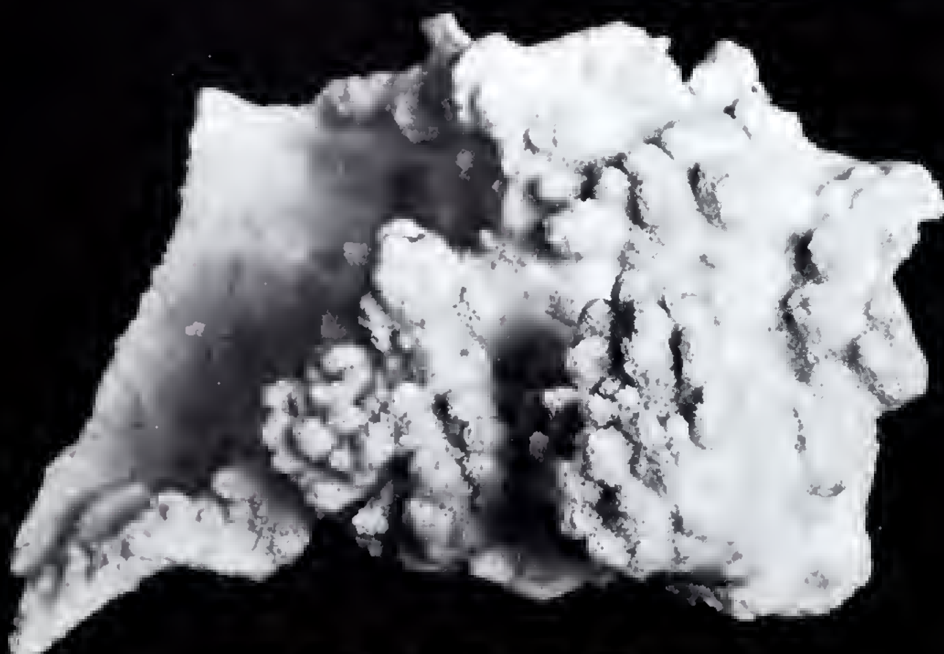


Fig. 60▲

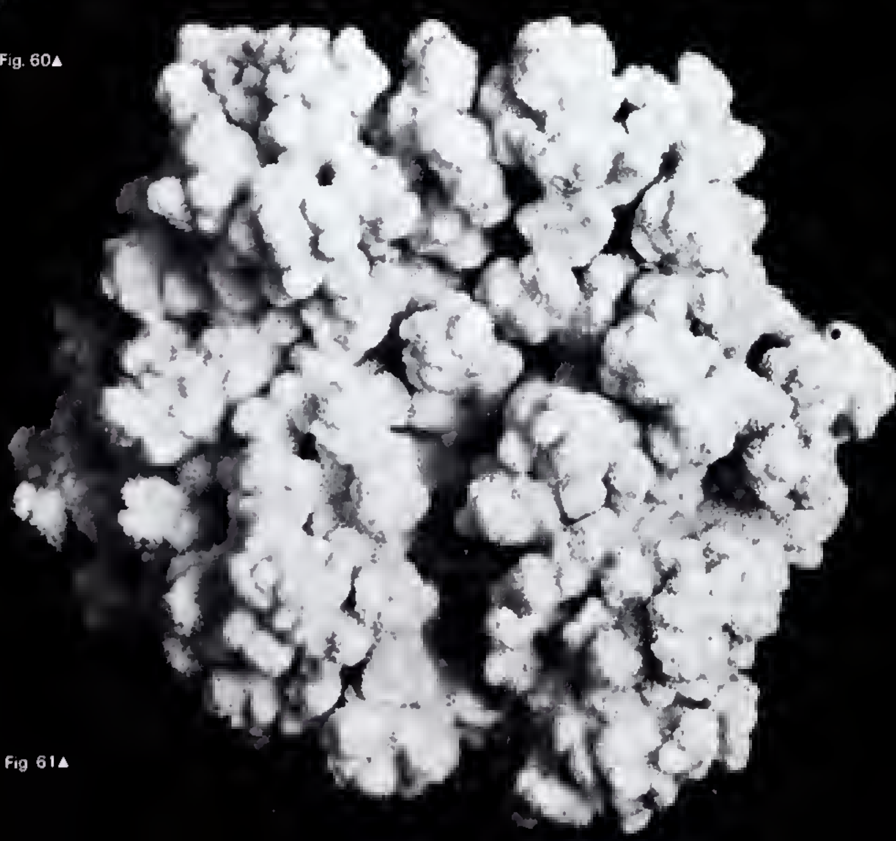


Fig 61▲

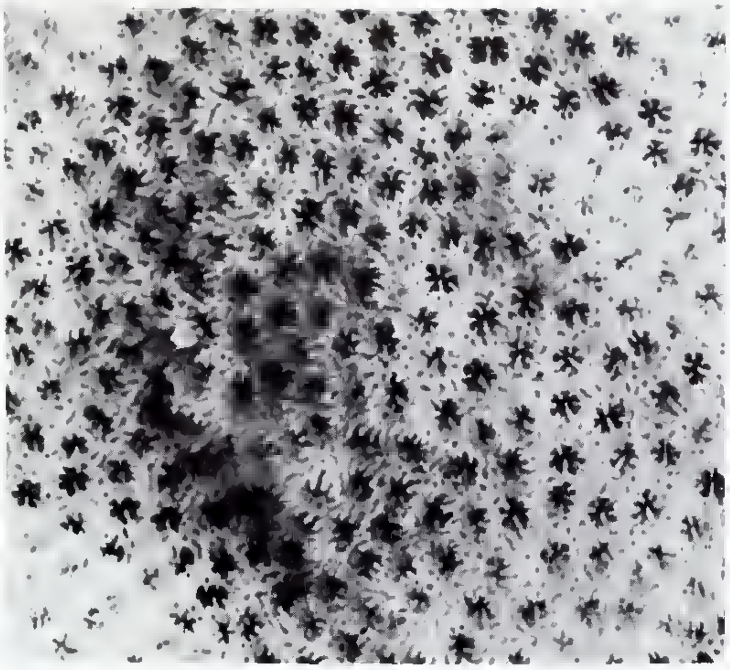


Fig. 62▲

Fig. 63▲

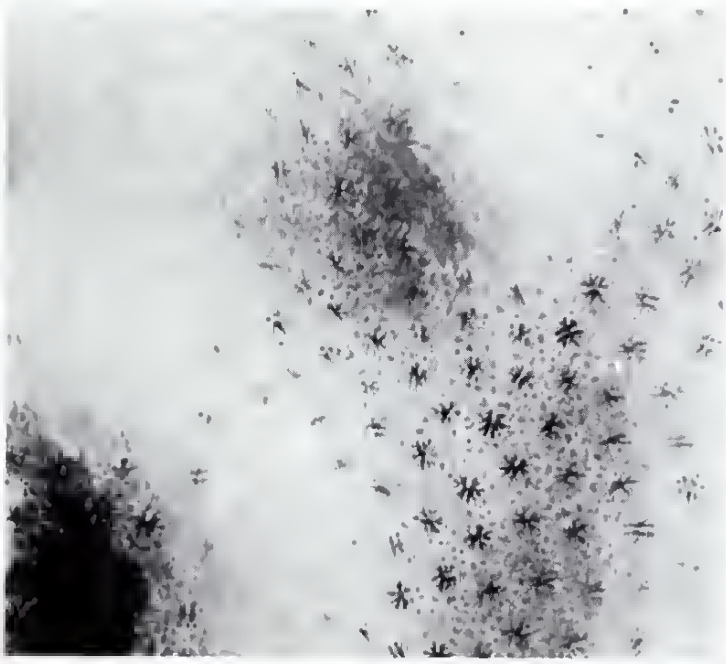


Fig. 64▼

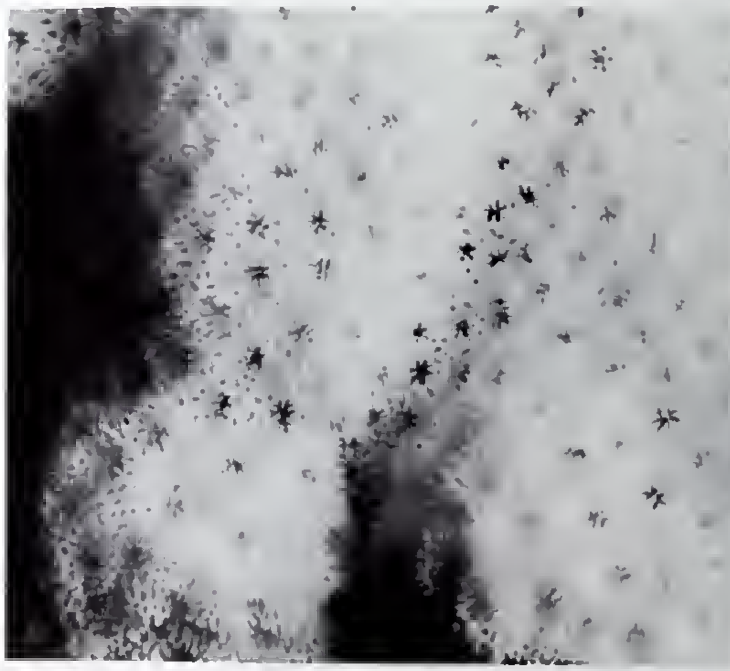


Fig. 65▼

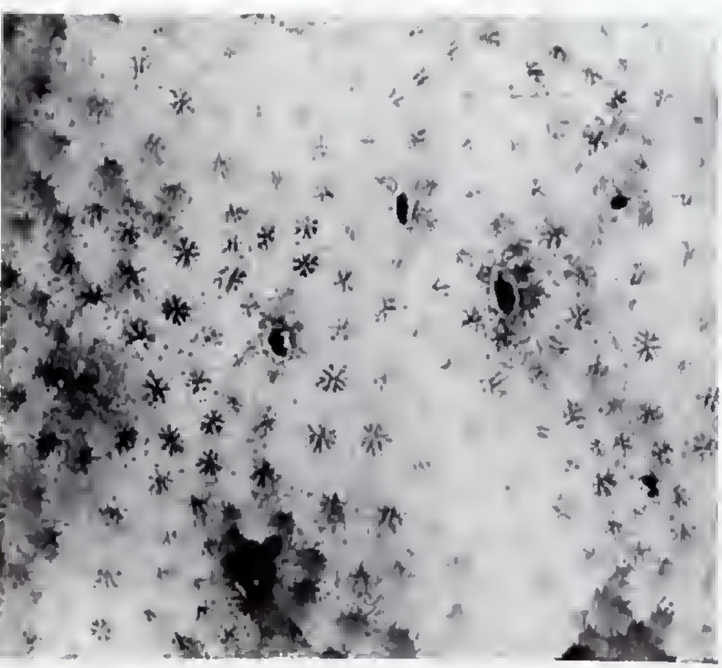


Fig. 66▼

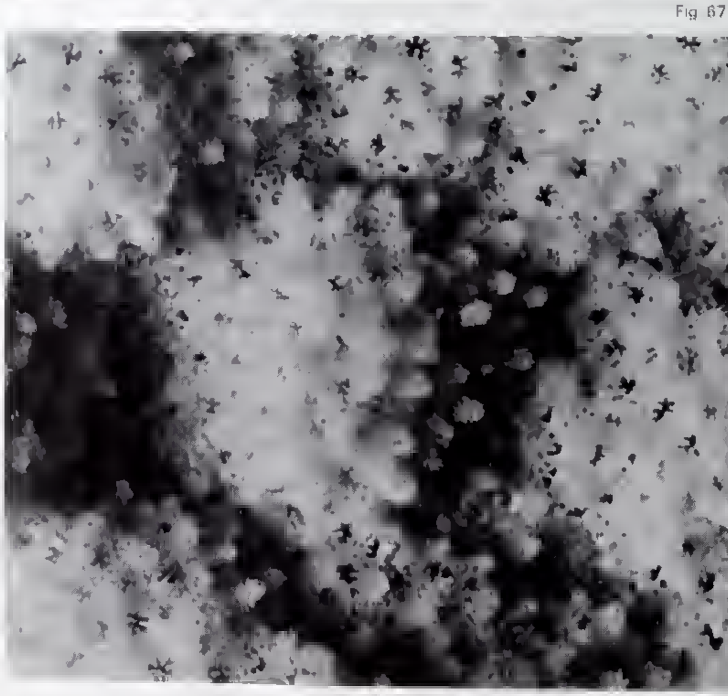


Fig. 67▼

Characters

Colonies are flat, explanate plates which may develop nodular upward growths toward their centre. Plates are bifacial with small, widely spaced corallites on the undersurface and a poorly developed epitheca. Nodular upward growths may be widely separated or compacted to form sub-columnar expansions.

Figs. 62-67 *Montipora turtlensis* (× 5)

Fig. 62, 63 Same corallum from Sue Island, collecting station 17.
Fig. 64 From the Pompey Complex, collecting station 72.
Fig. 65 From between Brisk and Falcon Islands, Palm Islands, collecting station 41.
Fig. 66 From Wye Reef, collecting station 163.
Fig. 67 From Lizard Island, collecting station 89.

Figs. 68-71 *Montipora turtlensis*

Fig. 68 From the Turtle Islands, holotype, same corallum as Fig. 59 (× 20).
Fig. 69 From the Turtle Islands, same corallum as Fig. 60 (× 20).
Figs. 70, 71 Same corallum from Chesterfield Atoll and same corallum as Fig. 61 (× 20 and 40 respectively).

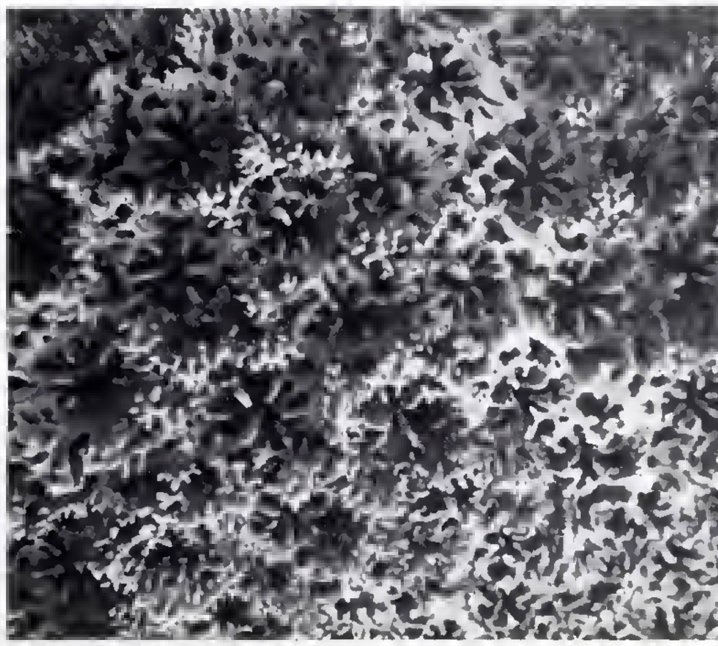
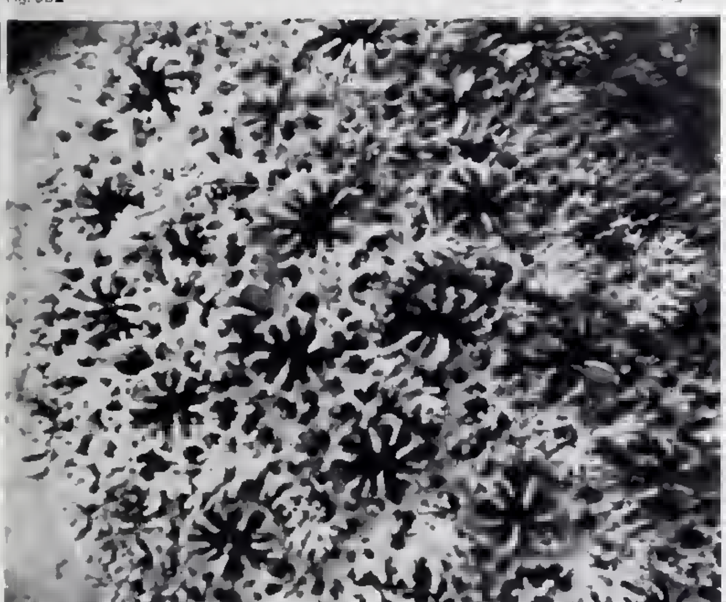
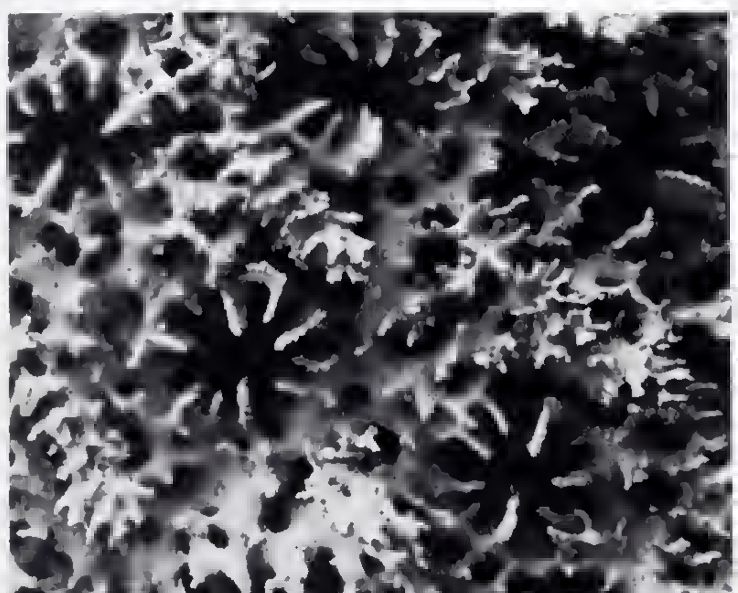


Fig. 68▲ Fig. 70▼ Fig. 69▲ Fig. 71▼





Corallites are closely compacted, mostly immersed and have well-defined thecae with calices 0.6-0.7mm diameter. Those on flat surfaces have irregular septa of widely spaced spines. Primary septa are $<\frac{2}{3}$R; secondary septa are $<\frac{1}{2}$R and incomplete. Corallites on nodules have regular primary septa composed of non-tapering spines, sometimes with thickened tips, up to $\frac{3}{4}$R. Secondary septa are reduced to irregular rows of small spines. Corallites on nodules are surrounded by small fused papillae becoming sub-foveolate. Papillae are less well-developed on flat surfaces and may be absent on flat surfaces between nodules. The reticulum is coarse. Reticulum spinules and papillae spinules are usually of similar size and may become very elaborated.

Living colonies are usually colourful with cream tips to nodules and mixtures of brown, green or purple basal parts.

Affinities

The only described species which *M. turtlensis* closely resembles is *M. peltiformis* and *M. alveopora* Bernard, 1897 from the Loyalty Islands. The holotype of the latter has conical rather than nodular upward growths and more widely spaced corallites, with calices 0.5mm diameter. Papillae are hardly formed and spinules are not elaborated. The septation and other coenostial characters of both species are similar.

Of the east Australian species, *M. turtlensis* may be indistinguishable from *M. mollis* (see p. 32) and *M. peltiformis in situ. Montipora peltiformis* has better-developed, more uniform papillae with thecal and reticulum papillae slightly differentiated (a reliable character). Primary septa are tapered and may fuse.

Etymology

Named after the Turtle Islands where this species is common.

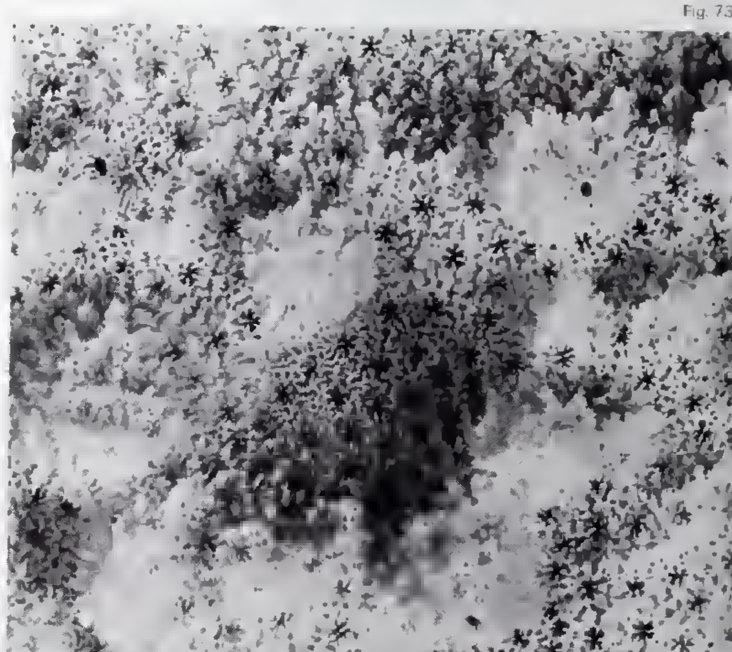
Holotype (Fig. 59)

Dimensions: A flat plate 20.8cm wide, with nodular upward growths up to 4.4cm high
Locality: Turtle Islands, northern Great Barrier Reef
Depth: 6m
Collector: J. E. N. Veron
Holotype: Queensland Museum, Australia

Figs. 72, 73 *Montipora peltiformis* from Broadhurst Reef, collecting station 223, same corallum as Figs. 78, 79 (× 0.75 and 5 respectively).

Fig 72▼

Fig. 73



Paratypes

British Museum (Natural History)
Australian Institute of Marine Science

Distribution

Known only from the east and west coasts of Australia.

Montipora peltiformis Bernard, 1897

Synonymy

Montipora peltiformis Bernard, 1897; Nemenzo (1967).

Bernard's holotype of *M. peltiformis* (BMNH 1886-12-9-284), a re-description of Quelch's (1886) *M. patula* from Ambon, is a flat plate with no development of nodular upward growth such as occurs with most east Australian colonies. Papillae are also poorly developed.

Material studied

Big Mary Reef, Great Detached Reef, Tijou Reef, Magdelaine Cay, Flinders Reef, Coral Sea, Palm Islands, Keeper Reef, Broadhurst Reef (10 specimens), **Magnetic Island** (9 specimens), **Chesterfield Reefs** (3 specimens), **Flinders Reef (Moreton Bay)** (7 specimens).

These localities include collecting stations 5, 8, 45, 187, 200, 210, 215, 223, 225, 226, 227.

Characters

Colonies are sub-massive or are flat explanate plates. Either growth form may develop nodular upward growths toward their centres. Plates may be bifacial with small, widely spaced corallites on the undersurface or may have an extensive epitheca, almost to the corallum margin. Nodular upward growths are usually irregular in size and shape but do not develop into columns.

Corallites are crowded and are mostly immersed. Those on concave surfaces between nodules are the most crowded and have calices approximately 0.6mm diameter. Primary

Figs. 74-81 *Montipora peltiformis*

Figs. 74, 75 Holotype from Ambon (× 20 and 40 respectively).
Figs. 76, 77 From Magnetic Island (× 20 and 40 respectively).
Figs. 78, 79 From Broadhurst Reef, same corallum as Figs. 78, 79 (respectively) (× 20 and 40 respectively).
Figs. 80, 81 From Chesterfield Atoll, collecting station 215 (× 20 and 40 respectively).

Fig 74▾

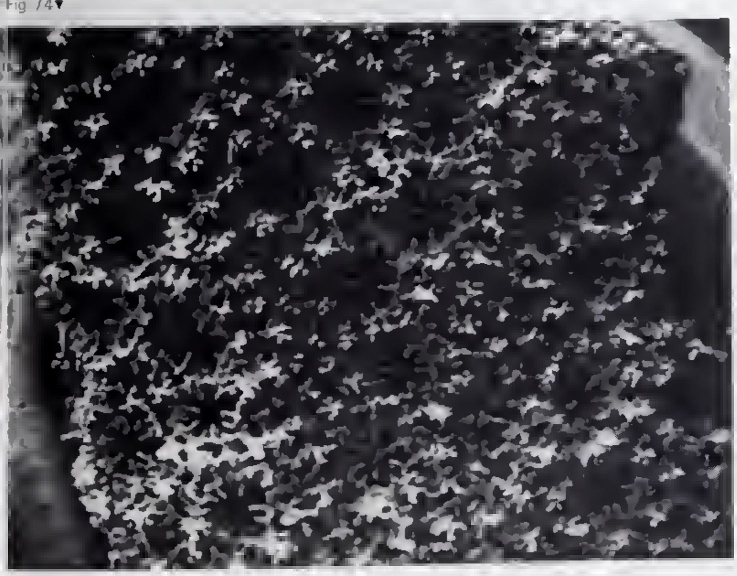


Fig 75▾

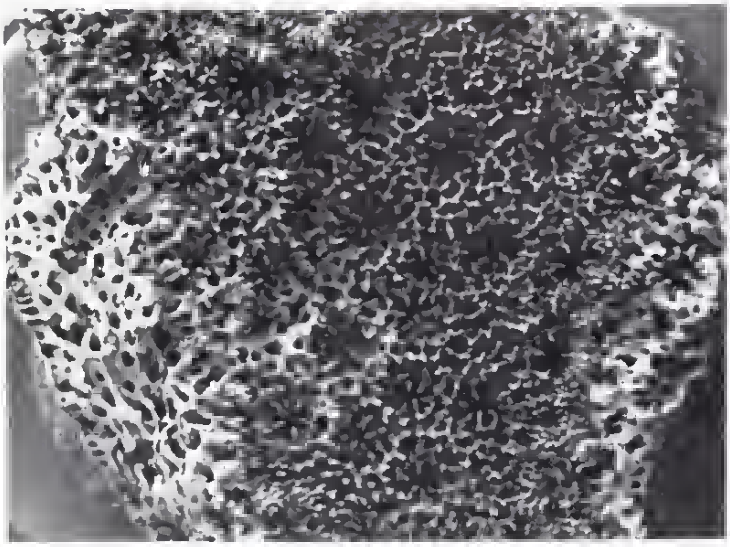


Fig. 76▲

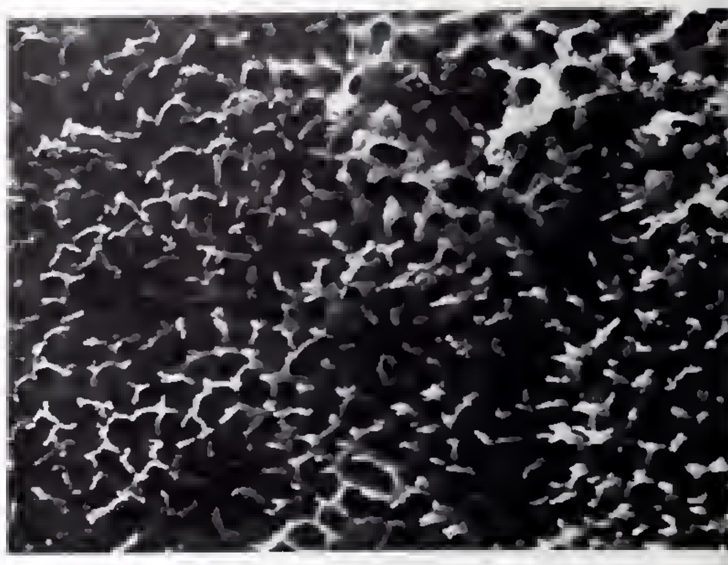


Fig. 77▲

Fig. 78▼

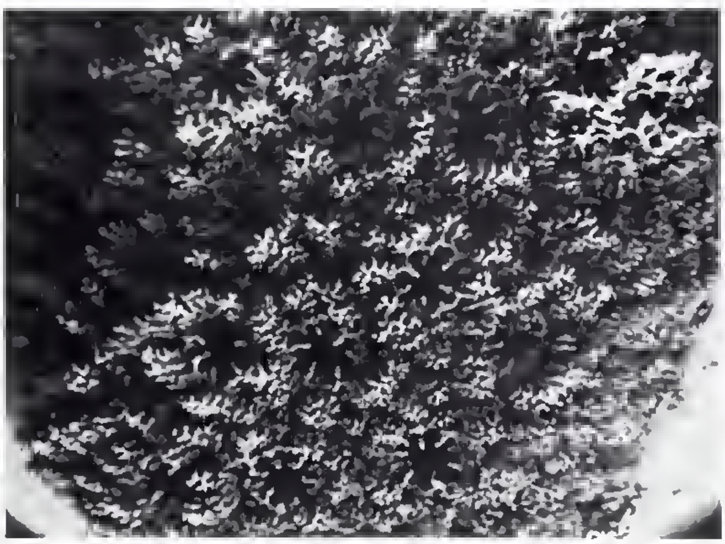


Fig. 79▼

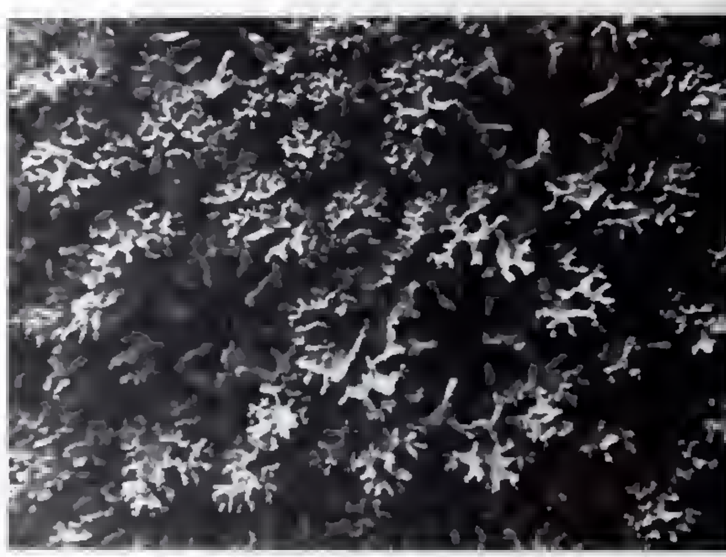


Fig. 80▼

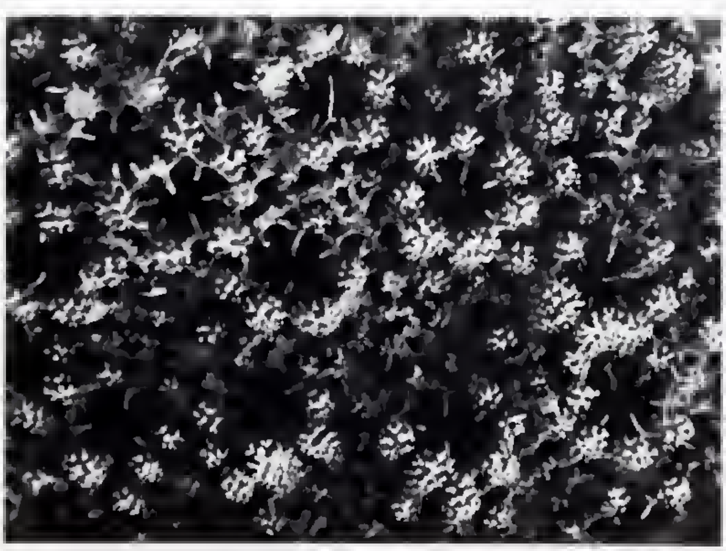


Fig. 81▼

septa are up to $\frac{2}{3}$R and are slightly tapered so that some fuse deep within the corallite. Secondary septa are $<\frac{1}{2}$R, usually incomplete and irregular. All septa consist of rows of spines. Thecal and reticulum papillae are usually slightly different, especially on nodules where the former form a distinct circle around the corallites. Papillae are usually unfused but sometimes form short ridges. They are usually absent from concave surfaces. The reticulum is coarse and covered with spinules which may be slightly elaborated, whereas spinules on papillae are usually very elaborated.

This species is usually found on shallow reef slopes but is seldom common. The only colour recorded is pale brown.

Affinities

Montipora peltiformis is closest to *M. turtlensis* (see p. 36). It also resembles *M. mollis*, especially *in situ*, although the presence of thecal papillae remains diagnostic.

Distribution

Recorded from Madagascar throughout the tropical Indian Ocean, east to the Philippines and eastern Australia.

Montipora turgescens Bernard, 1897

Synonymy

Montipora turgescens Bernard, 1897; Scheer & Pillai (1974); Zou (1975).

Montipora caliculata (Dana); Vaughan (1917); not Dana (1846).

Bernard's *M. turgescens* (syntype BMNH 1892-12-1-2) is a small encrusting specimen from the southern Great Barrier Reef which superficially has little in common with most coralla of the present series but which has corallites resembling those of the encrusting margins of some coralla from protected reef slopes.

Montipora profunda Bernard, 1897 (BMNH 1897-11-19-2) from the Ellice Islands may be a synonym of *M. turgescens*.

Figs. 82, 83 *Montipora turgescens* (× 0.5)
Fig. 82 From Sue Island, collecting station 17.
Fig. 83 From between Brisk and Falcon Islands, Palm Islands, collecting station 41.

Fig. 82▼

Fig. 83▼

Material studied

Big Mary Reef, Little Mary Reef (2 specimens), **Sue Island** (2 specimens), **Thursday Islands** (2 specimens), **Martha Ridgeway Reef** (2 specimens), **Wye Reef** (2 specimens), **Tijou Reef** (3 specimens), **Corbett Reef, Houghton Island** (2 specimens), **Lizard Island** (3 specimens), **Hope Island, Low Isles, Flinders**

Figs. 84-87 *Montipora turgescens* (× 5)

Figs. 84, 85 From Magdelaine Cay, collecting stations 200, 201 (respectively); Fig. 85, same corallum as Figs. 88, 89.

Fig. 86 From Lihou Reef, collecting station 202.

Fig. 87 From Mellish Reef, collecting station 209.

Figs. 88-93 *Montipora turgescens*

Figs. 88, 89 Same corallum from Magdelaine Cay and same corallum as Fig. 85 (× 20 and 40 respectively).

Figs. 90, 91 Same corallum from Sue Island, collecting station 17 (× 20 and 40 respectively).

Figs. 92, 93 Same corallum from Falcon Island, Palm Islands, collecting station 41 (× 20 and 40 respectively).

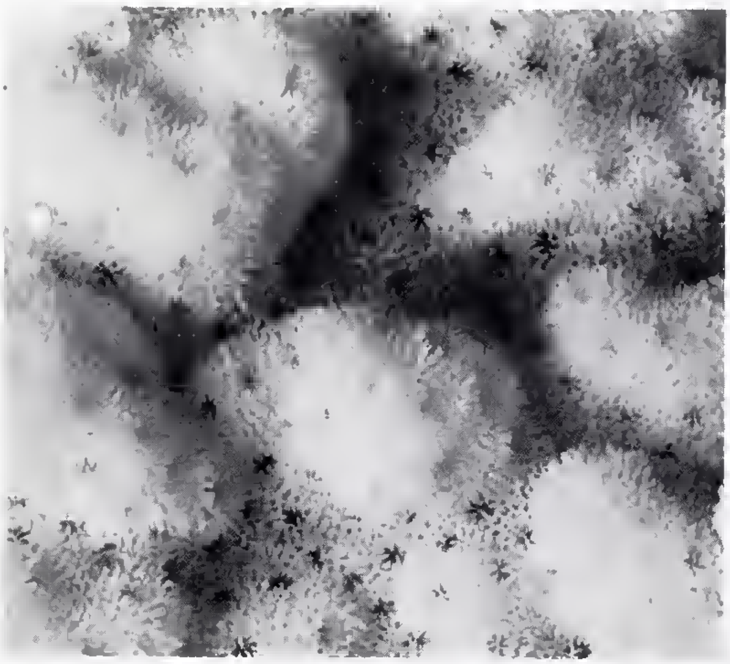


Fig. 84▲

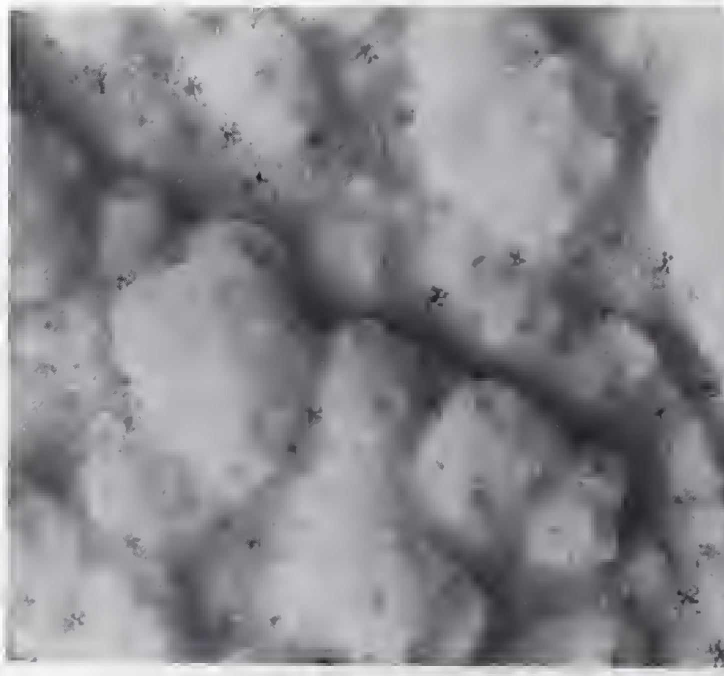


Fig. 85▲

Fig 86▼

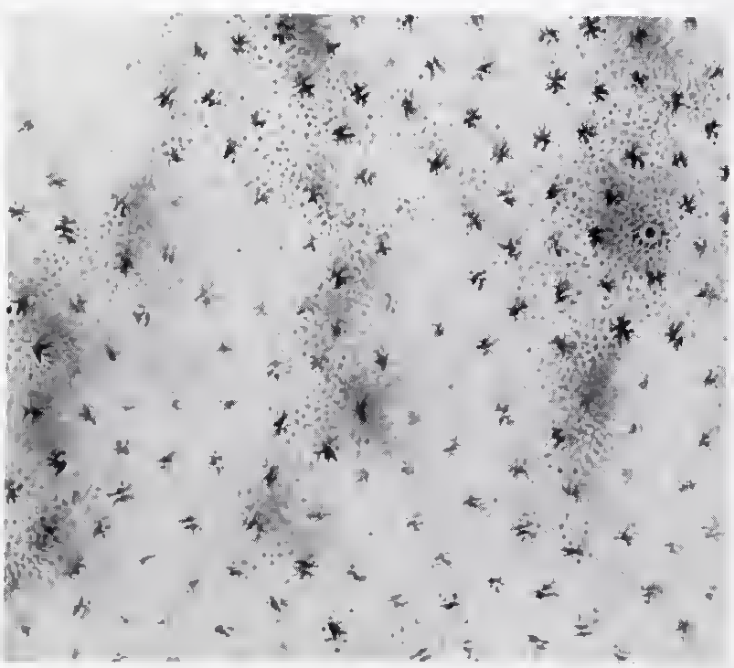


Fig. 87▼

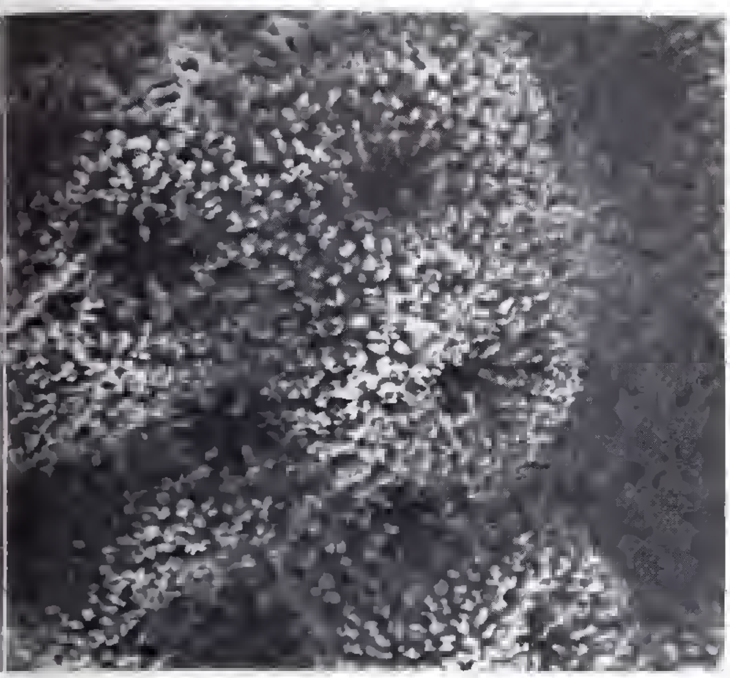


Fig 88▲

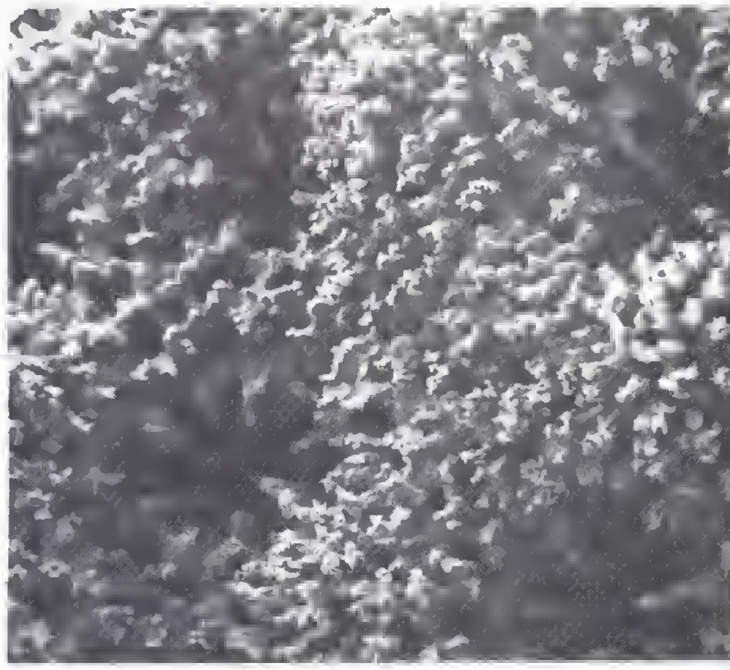


Fig 89▲

Fig 90▼

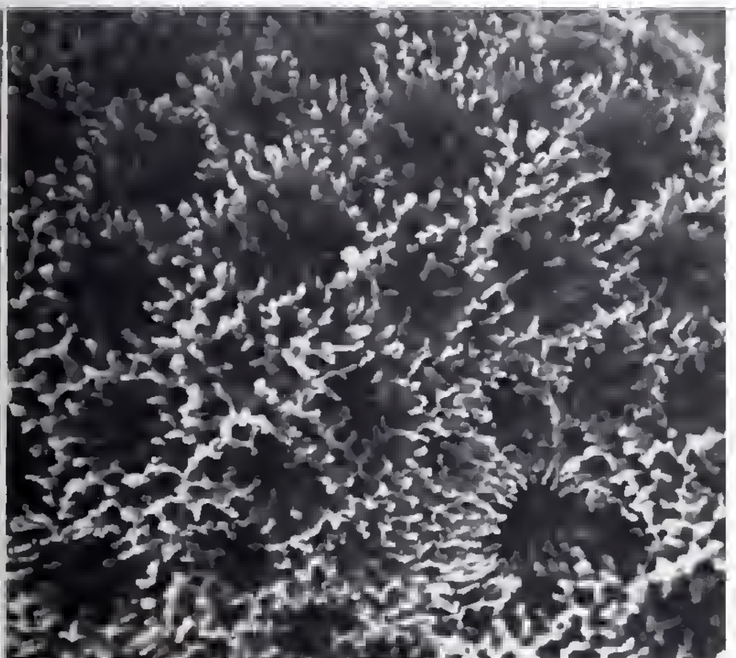


Fig 91▼

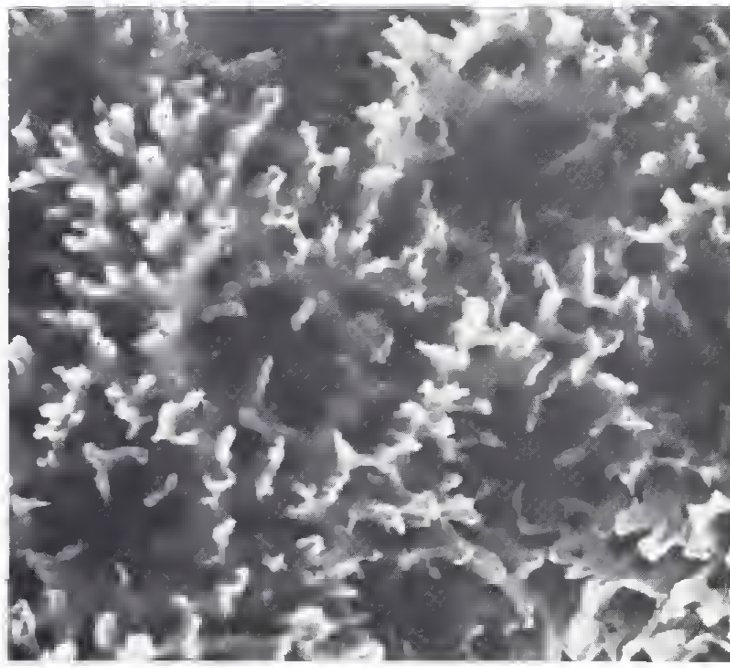


Fig 92▼

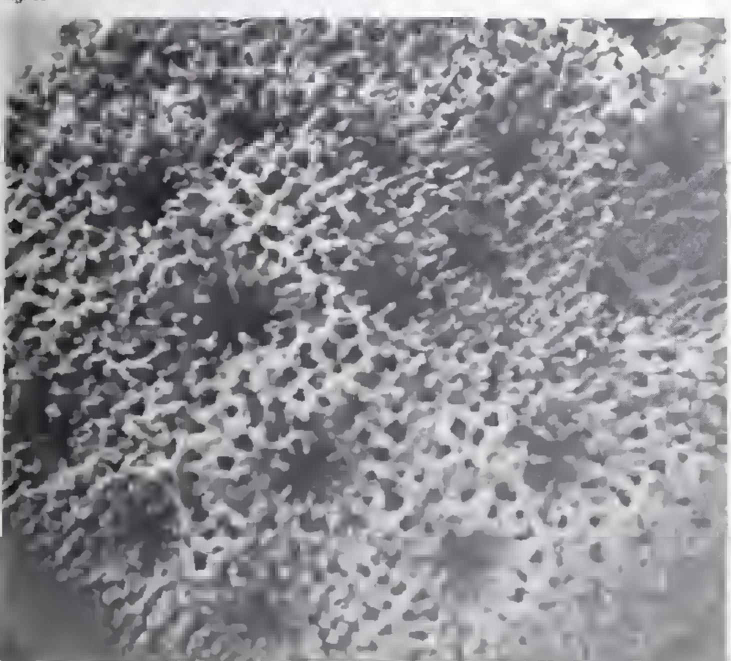
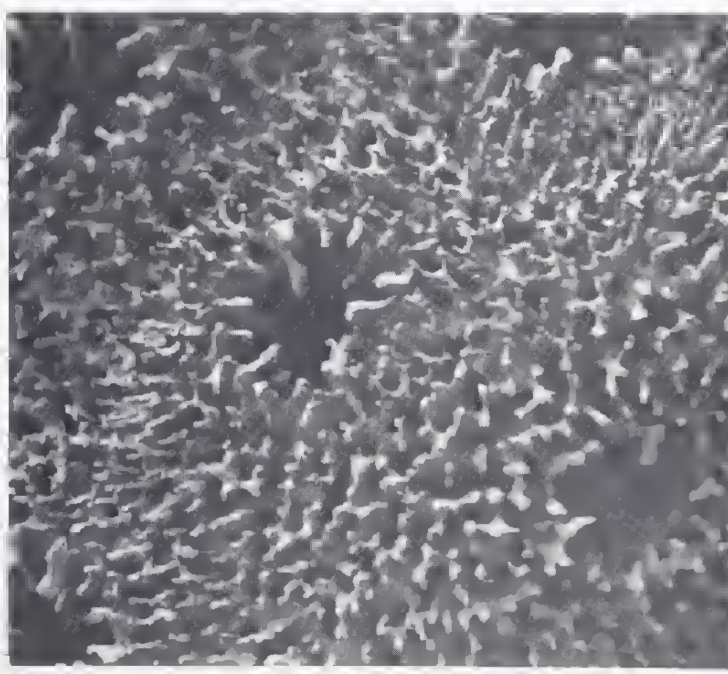


Fig 93▼



Reef (Coral Sea), Britomart Reef, Rib Reef (10 specimens), **Palm Islands** (23 specimens), **Broadhurst Reef** (15 specimens), **Darley Reef, Chesterfield Reefs, Pompey Reef** (2 specimens), **Bushy Island-Redbill Reef** (3 specimens), **Fitzroy Reef** (6 specimens), **Middleton Reef** (21 specimens), **Elizabeth Reef** (5 specimens), **Lord Howe Island**.

These localities include collecting stations 8, 11, 16, 17, 40, 41, 42, 43, 45, 54, 57, 60, 72, 73, 89, 154, 159, 162, 163, 164, 165, 167, 174, 186, 187, 197, 210, 222, 223, 226, 230, 231, 233, 234, 236, 238, 239.

Characters

Colonies are massive, flattened or hemispherical, or plate-like or columnar. The surface may be raised into a pattern of convex subcircular mounds, 3-12mm diameter. Corallites are uniformly distributed on and between these mounds and are immersed, with calices 0.7-0.9mm diameter. The thecal rim is usually distinguishable. Septa are tapered and are in two complete cycles reaching $\frac{2}{3}R$ and $\frac{1}{2}R$ deep within the corallite, where some may have thickened or fused margins. They are usually short near the corallite rim. They are composed of regular rows of spines, those of both cycles being of similar size. Immature corallites are budded in undifferentiated reticulum and appear as clusters of thin irregular septal spines, similar to reticulum spinules, but without elaborations. The reticulum is uniform in structure, spongy, with an outer covering of highly elaborated spinules.

The present series has very uniform corallite and coenostial structures but varies greatly in the degree of development of the surface mounds. These may be small or absent on flat or concave surfaces and also vary greatly in size on convex surfaces, much of this variation being found in single coralla. In some coralla (e.g. Fig. 88), they may be small enough to form the walls of single corallites which consequently appear to be exsert and similar to the mixed corallites of *M. nodosa* and *M. australiensis*.

Living colonies are uniform in colour, usually brown, cream or purple.

Affinities

The majority of coralla in the present series have clearly formed surface mounds (e.g. Fig. 87) which distinguishes this species from all others. Coralla which have small mounds tend superficially to resemble those of *M. nodosa* and *M. australiensis* but are always readily distinguishable by their uniform coenosteum. Coralla from shallow protected biotopes may also resemble *M. mollis* and *M. spongodes*. The former is distinguished initially by its differing growth form and smaller corallites, the latter as noted below (p. 46).

Distribution

Probably widely distributed from the western Indian Ocean east to the Ellice Islands and Samoa.

Montipora sp. 2

Material studied

Fitzroy Reef (5 specimens), **Llewellyn Reef** (2 specimens).

These localites are collecting stations 196, 197.

Characters

'Coralla are flat plates or columns, the former usually in tiered whorls, with or without small nodular expansions on the upper surface and with a well-developed epitheca. Corallites are immersed, uniformly spaced, approximately 1mm diameter. Primary septa consist of rows of thick spines $< \frac{2}{3}R$, usually irregular in length. Secondary septa are thinner, irregular, incomplete, $< \frac{1}{3}R$. The coenosteum is coarse and spongy.

The only recorded colour is uniform purple.

Fig. 95▲

Fig. 94▲

Figs. 94, 95 *Montipora* sp. 2 (× 0.5)
Fig. 94 From Llewellyn Reef, collecting station 196, same corallum as Fig. 96.
Fig. 95 From Fitzroy Reef, collecting station 197, same corallum as Fig. 97.

Habitat preferences and skeletal variation

Montipora sp. 2 has been found only in the lagoons of Fitzroy and Llewellyn Reefs where it is very abundant.

Affinities

As *Montipora* sp. 2 has been recorded only in the lagoons of two nearby reefs, there is a possibility that the present series is only an ecomorph of another species. It is closest to *M. turgescens* but is much coarser than *M. turgescens* in all skeletal characters.

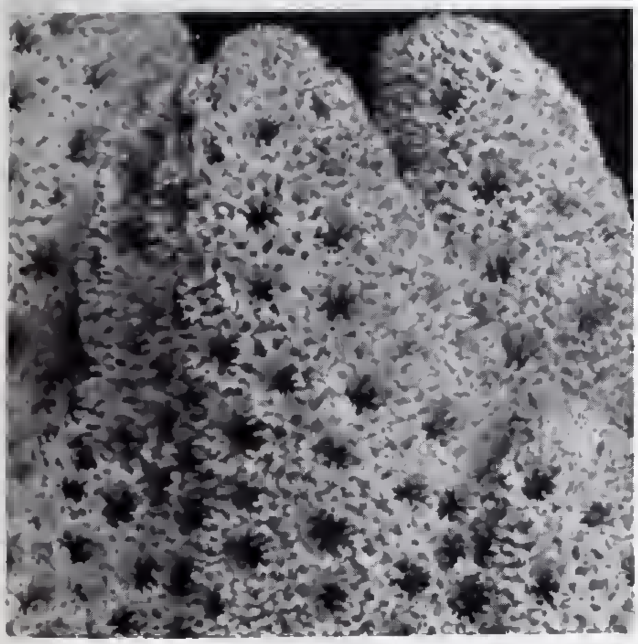
Distribution

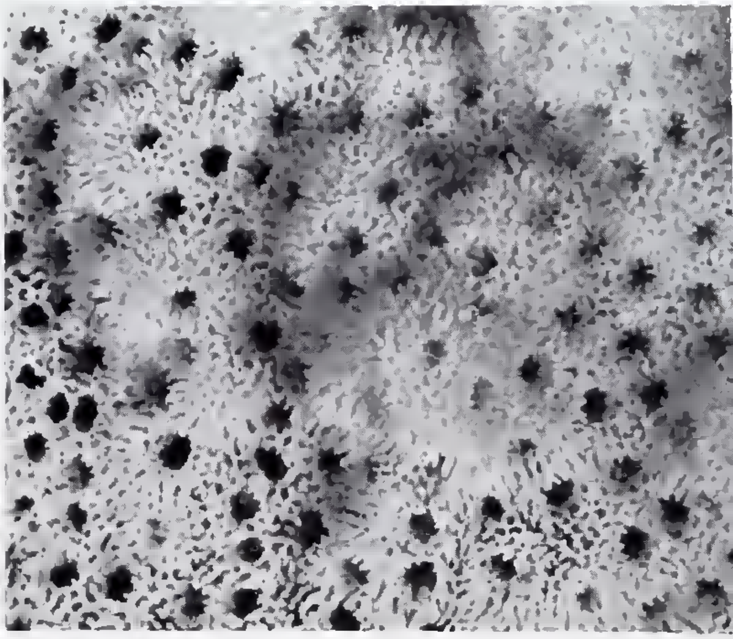
Recorded only from the southern Great Barrier Reef.

Figs. 96, 97 *Montipora* sp. 2 (× 5)
Fig. 96 From Llewellyn Reef, same corallum as Fig. 94.
Fig. 97 From Fitzroy Reef, same corallum as Fig. 95.

Fig 96▼

Fig. 97▼





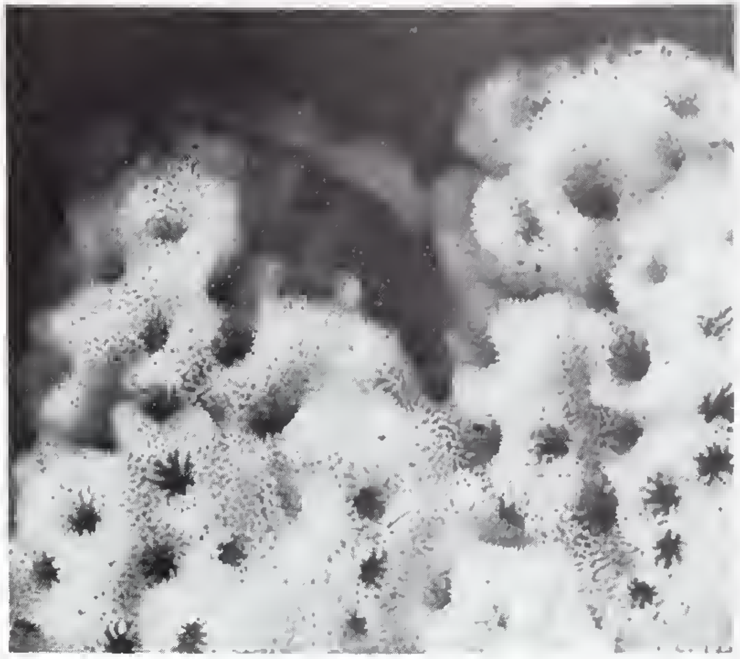


Fig 98▲

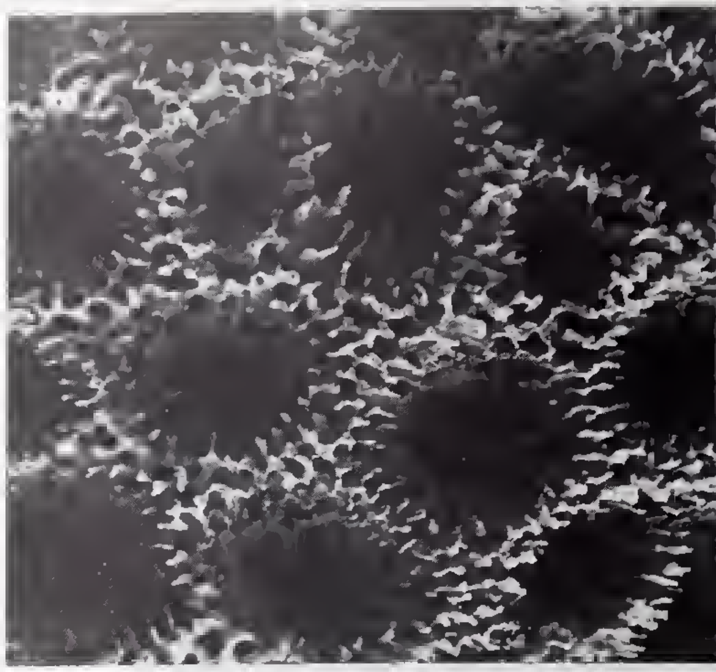


Fig. 9

Figs. 98, 99 *Montipora* sp. 3 from Lord Howe Island, collecting station 145 (× 5 and 20 respectively).

Montipora sp. 3

Material studied

Lord Howe Island (2 specimens).

These localities are collecting stations 145, 147.

Characters

Coralla are encrusting, with nodular expansions irregularly developed on the upper surface. Two short rootlets occur on the undersurface of one corallum. Corallites are immersed to sub-foveolate, the latter occurring primarily on the upward growths. Septa are in two complete cycles of $\frac{3}{4}$R and $\frac{1}{2}$R. The coenosteum is coarse.

Affinities

The two coralla from Lord Howe Island do not resemble any other in the present collections. The species appears to be either endemic to Lord Howe Island or an extreme geographic variant of another species, possibly *Montipora* sp. 2.

Montipora spongodes Bernard, 1897

Synonymy

Montipora spongodes Bernard, 1897.

Bernard's syntypes from several localities are all similar to each other. No holotype is designated.

Material studied

Davies Reef (3 specimens), **Flinders Reef (Moreton Bay)** (12 specimens), **Middleton Reef** (6 specimens), **Lord Howe Island** (2 specimens).

These localities include collecting stations 147, 227, 231, 233, 234.

Figs. 100-102 *Montipora spongodes* (× 0.5)

Figs. 100, 101 From Elizabeth Reef, collecting stations 239 and 238 (respectively). Fig. 100, same corallum as Figs. 103-105.

Fig. 102 From Flinders Reef (Moreton Bay), collecting station 227, same corallum as Figs. 106-108.

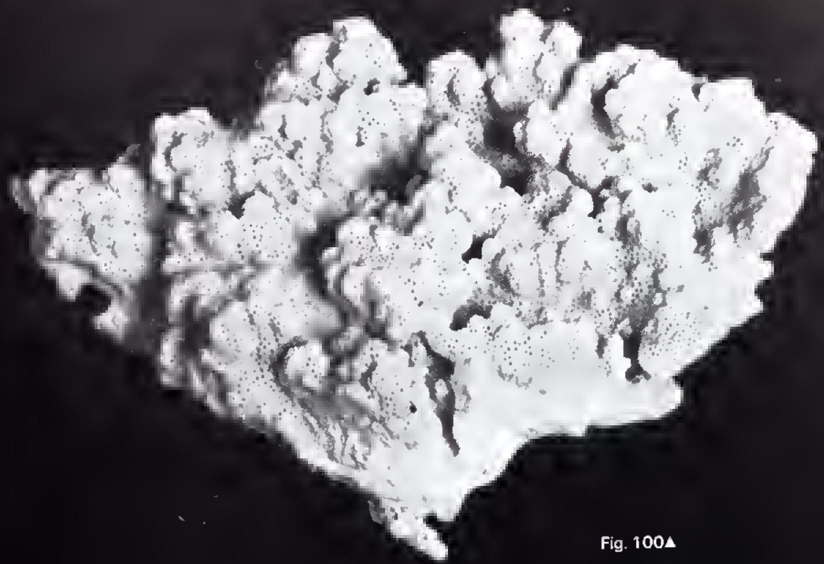


Fig. 100▲

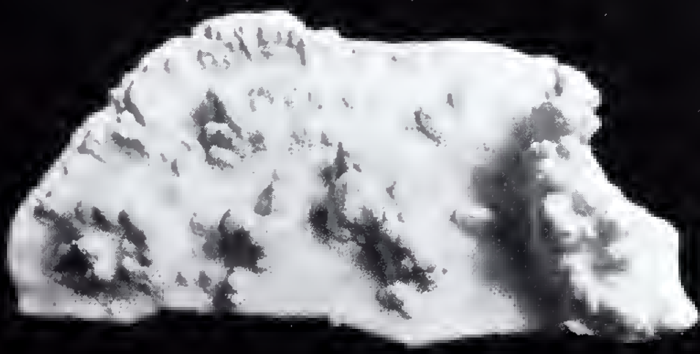
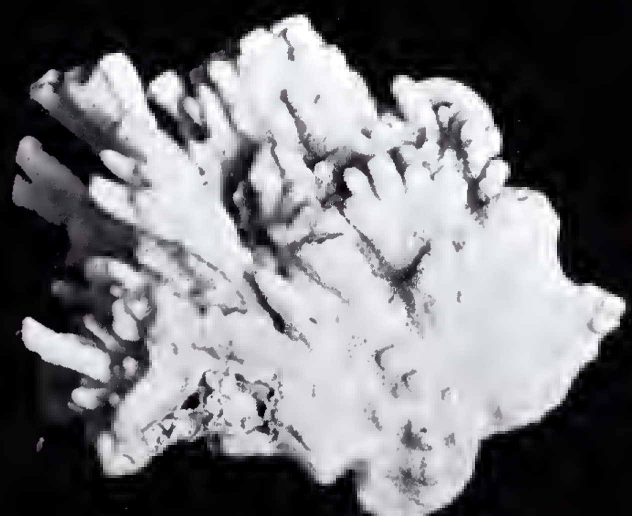


Fig. 101▲

Fig. 102▼



Characters

Colonies have irregular encrusting or plate-like bases which may have downward projecting rootlets. Upward growths consist of irregular mounds or ridges which may develop into irregularly dividing and anastomosing columns.

Corallites are evenly distributed and are characteristically widely spaced (by 2-4 calice diameters). Corallites are immersed. Calices are 0.7-0.8mm diameter. Septa are composed of regular rows of terete spines and are in complete cycles, sub-equal, $<\frac{1}{2}$R or $\frac{2}{3}$R and $\frac{1}{3}$R respectively. The reticulum is medium-fine, very uniform and is always completely glabrous. Reticulum spinules have no elaborations.

The only recorded colours of living colonies are a uniform pale cream to deep grey.

Affinities

Montipora spongodes is readily distinguished from other glabrous species by its growth form and widely spaced corallites. It is closest to *M. turgescens* which is distinguished by its growth form, having more compacted corallites with thecal rims and elaborated reticulum spinules.

Distribution

Widely distributed from the western Indian Ocean east to the South China Sea and Great Barrier Reef.

Figs. 103-108 *Montipora spongodes*

Figs. 103-105 From Elizabeth Reef, same corallum as Fig. 100 (× 5, 20 and 40 respectively).

Figs. 106-108 From Flinders Reef (Moreton Bay), same corallum as Fig. 102 (× 5, 20 and 40 respectively).

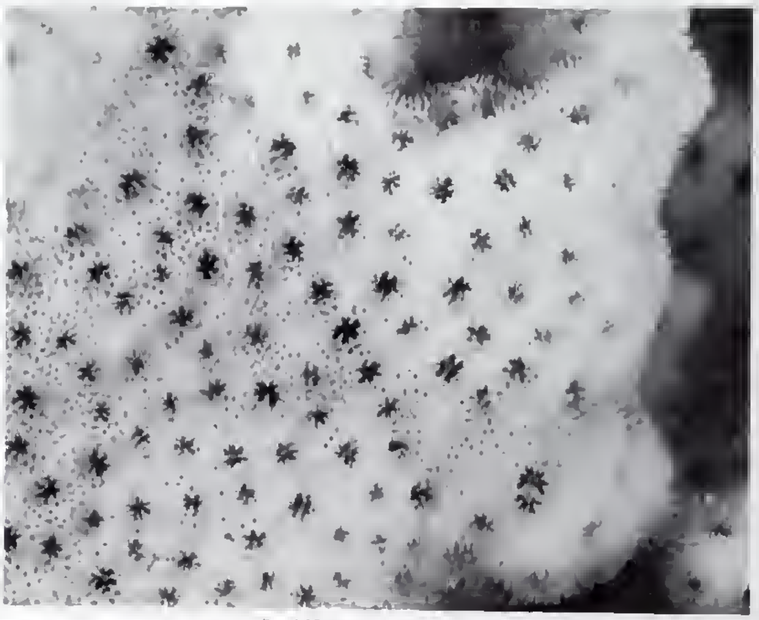


Fig. 103▲

Fig. 104▼

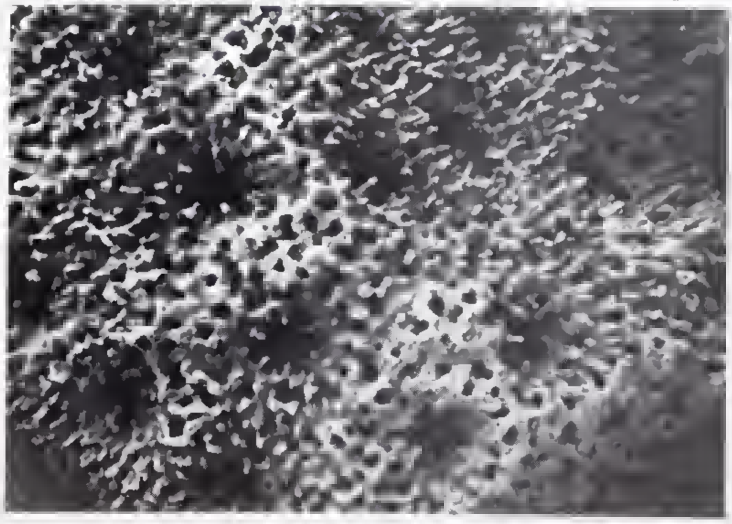
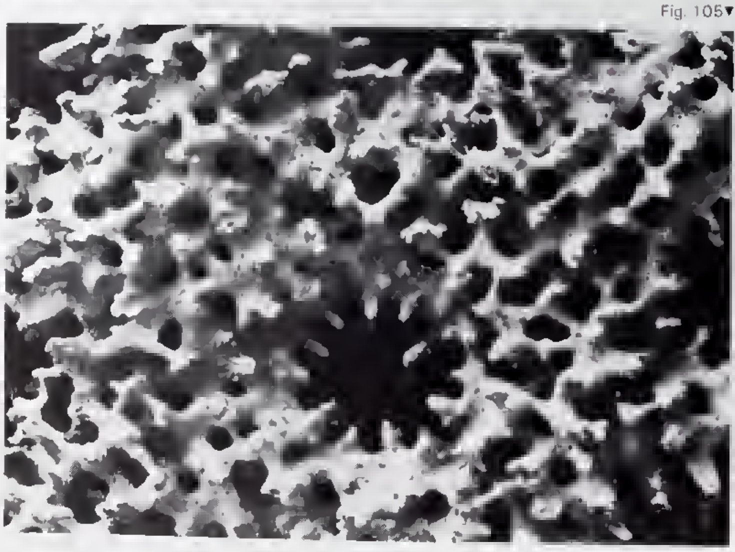


Fig. 105▼



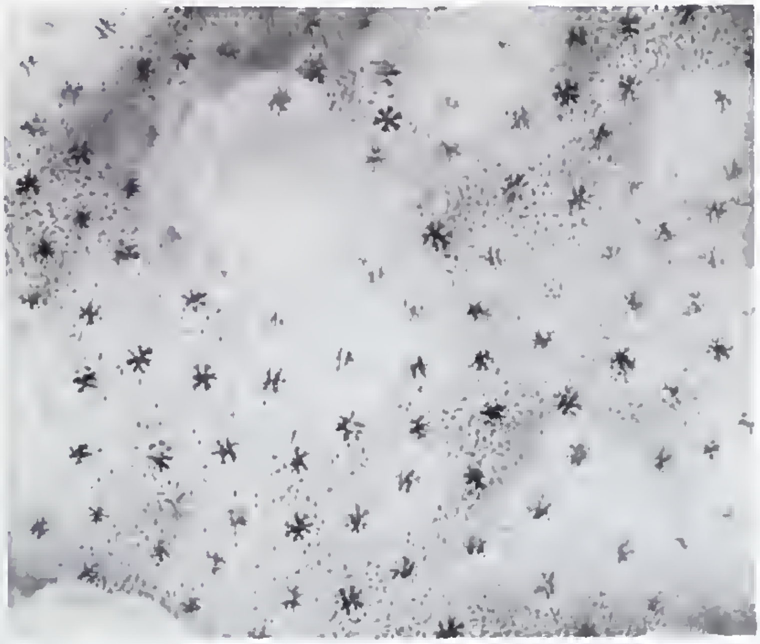


Fig. 106▲

Fig. 107▼

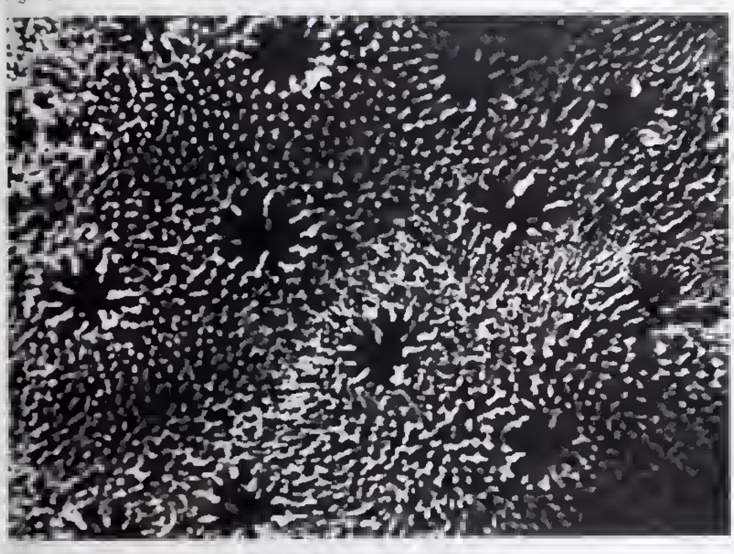
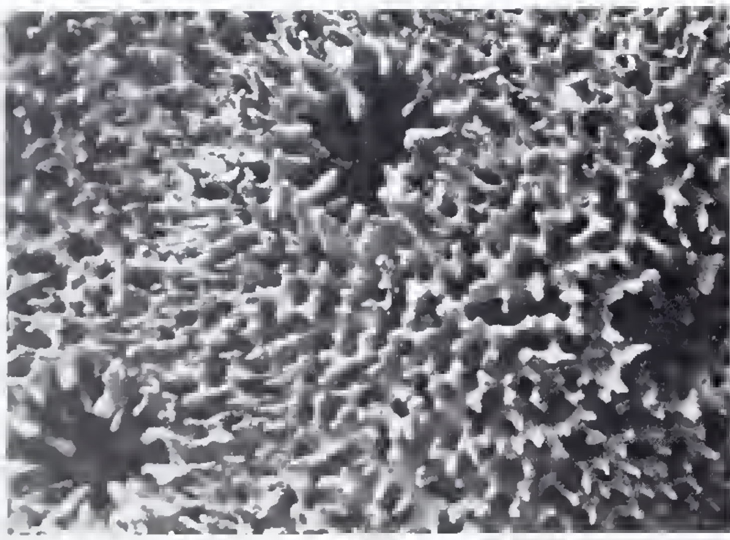


Fig. 108▼



Montipora spumosa (Lamarck, 1816)

Synonymy

Porites spumosa Lamarck, 1816.

Montipora spumosa (Lamarck); Vaughan (1918); Matthai (1923); Stephenson & Wells (1955); Ma (1959); not Bernard (1897).

Montipora guppyi Bernard 1897; Eguchi (1938); Ma (1959).

?*Montipora coalita* Nemenzo, 1967.

Lamarck's type consists of the end of a column 26mm wide. Corallites are similar to most specimens in the present series and the reticulum has the coarse spongy structure characteristic of the species. The holotype of *M. guppyi* (BMNH 1884-11-21-37) is a plate-like corallum of *M. spumosa*; his figured *M. spumosa* is *M. mollis*. Nemenzo's *M. coalita* appears also to fall within the range of variation of *M. spumosa*.

Fig. 109▲

Fig. 109 *Montipora spumosa* from Falcon Island, Palm Islands, collecting station 174, same corallum as Figs. 110, 116 (× 0.5).

Material studied

Big Mary Reef (93 specimens), **Little Mary Reef** (3 specimens), **Arden Island, Great Detached Reef, Bird Island** (2 specimens), **Sir Charles Hardy Islands, Tijou Reef** (2 specimens), **Houghton Island, Rib Reef** (4 specimens), **Palm Islands** (9 specimens), **Broadhurst Reef** (5 specimens), **Chesterfield Reefs, Flinders Reef (Moreton Bay)**.

These localities include collecting stations 1, 16, 37, 38, 41, 43, 45, 46, 91, 155, 161, 174, 179, 183, 186, 187, 222, 227.

Characters

Colonies are encrusting or form irregular upward plate-like or columnar expansions from an encrusting base. Plate-like expansions are always convoluted; they may be bifacial or backed with epitheca or be irregular mixtures of both. Columns are frequently hollow tubes with open or enclosed ends and are usually composed of irregularly fused ridges.

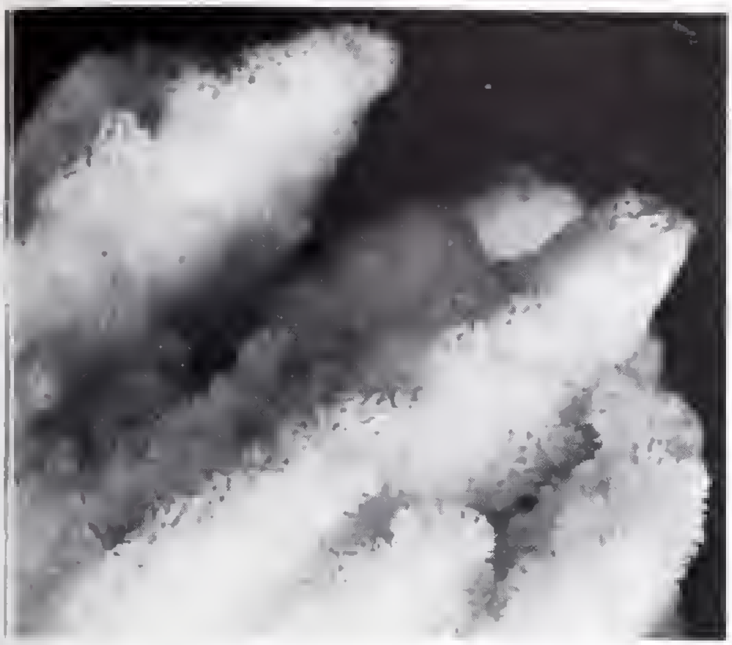


Fig 110▲

Fig 111▲

Figs. 110, 111 *Montipora spumosa* (× 5)
Fig. 110 From Falcon Island, Palm Islands, same corallum as Figs. 109, 116.
Fig. 111 From Orpheus Island, Palm Islands, same corallum as Figs. 112, 113.

Encrusting colonies usually develop rootlets. This species frequently overgrows other corals and assumes their shape.

Corallites are usually irregularly distributed and are widely separated. They are immersed with calices 0.6-0.8mm diameter. Primary septa are complete, $<\frac{2}{3}$R and consist of widely spaced spines which are usually irregular and sometimes partly fused deep within the corallite. Secondary septa are $<\frac{1}{2}$R, incomplete to absent, and consist of relatively small irregular spines. The reticulum is very coarse and is uniform in structure. Tuberculae of irregular shapes may be formed but these intergrade with the larger mounds and ridges which cover the corallum surface. Coenosteum spinules are always highly elaborated.

Living colonies are usually mottled brown and cream. They may have pink margins.

Figs. 112-119 *Montipora spumosa*
Figs. 112, 113 From Orpheus Island, Palm Islands, same corallum as Fig. 111 (× 20 and 40 respectively).
Figs. 114, 115 From Great Palm Island, collecting station 37 (× 20 and 40 respectively).
Fig. 116 From Falcon Island, Palm Islands, same corallum as Figs. 109, 110 (× 20).
Fig. 117 From Falcon Island, Palm Islands, collecting station 41 (× 40).
Figs. 118, 119 From Eclipse Island, Palm Islands, collecting station 59 (× 20 and 40 respectively).

Fig. 112▼

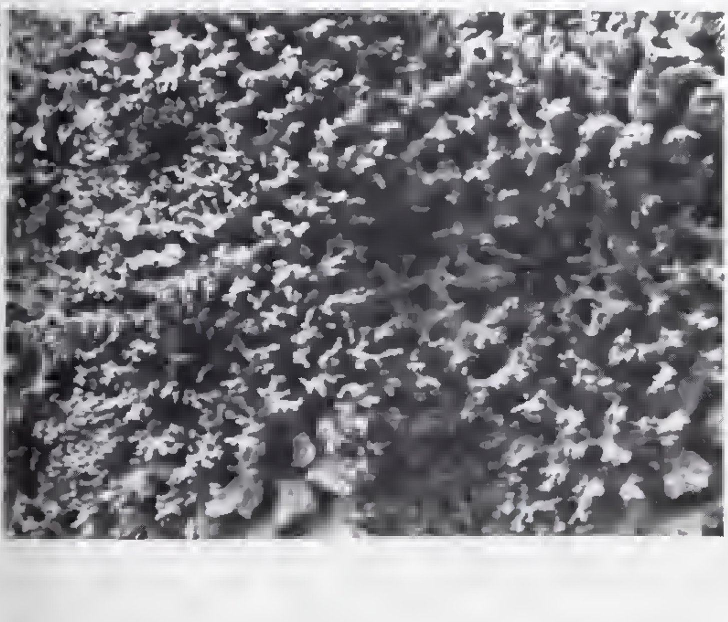
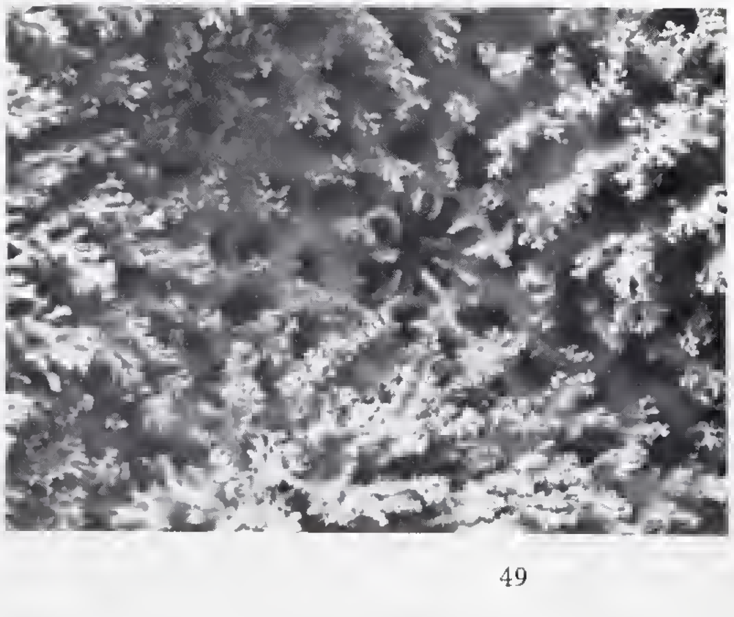


Fig 113▼



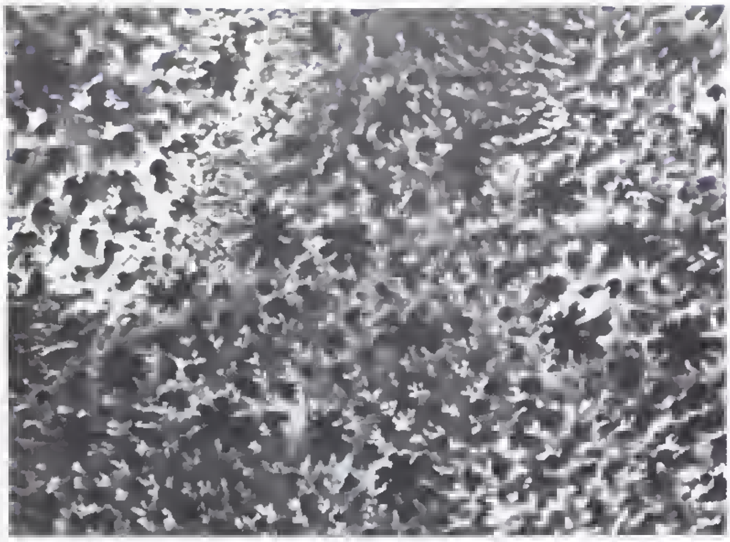


Fig 114▲

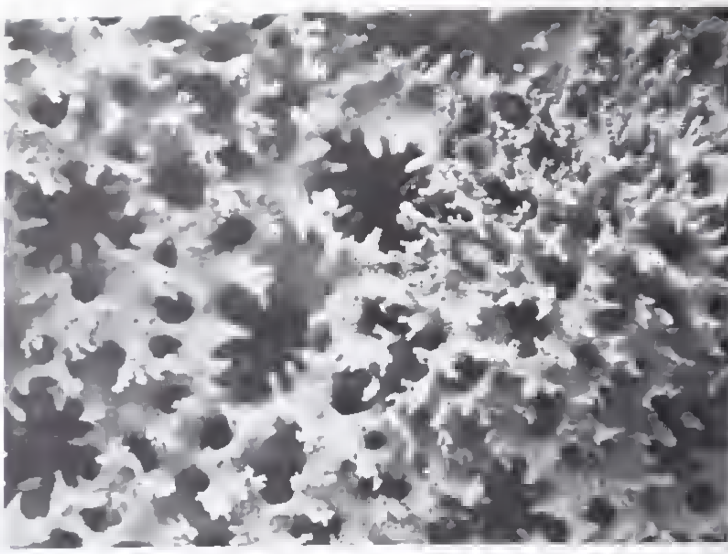


Fig. 115▲

Fig. 116▼

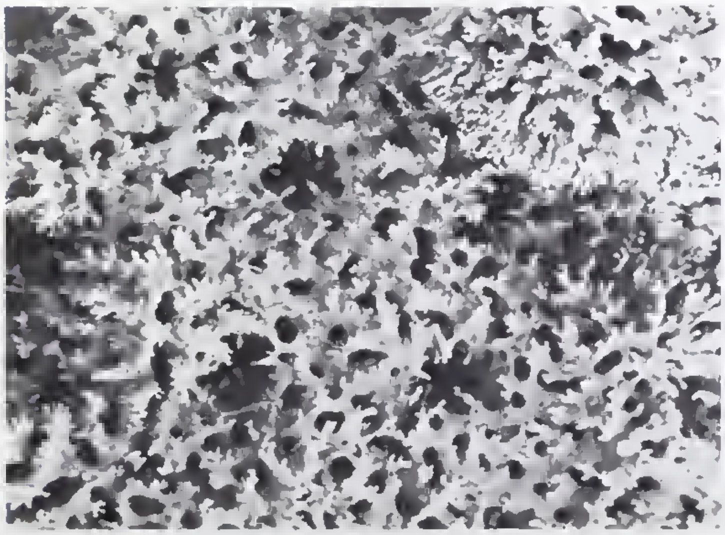
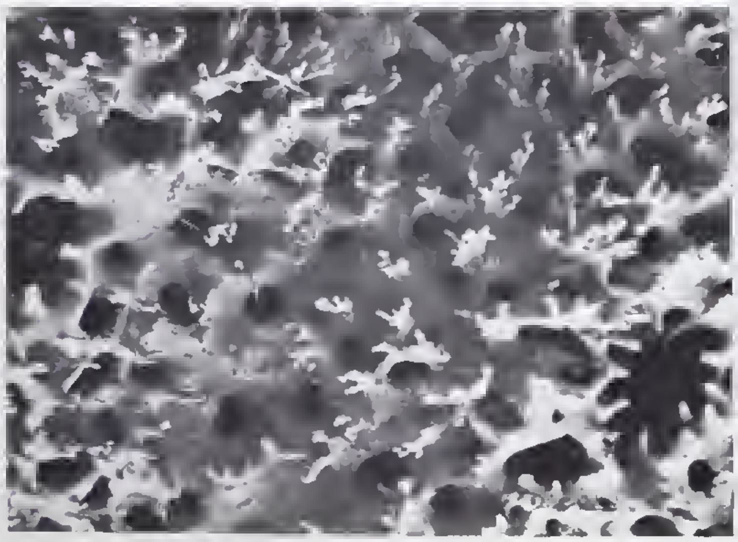


Fig. 117▼

Fig. 118▼

Fig. 119▼



Affinities

Montipora spumosa is a distinctive species with no clear affinities except to *Montipora* sp. 2. *In situ* it can be confused with several other species, especially *M. verrucosa*, but the coarse reticulum remains clearly visible.

Distribution

Recorded in the central Indo-Pacific east to Fiji.

Montipora sp. 4

Material studied

Rib Reef, Bushy Island-Redbill Reef, Chesterfield Reefs.

These localities include collecting stations 73, 210, 222.

Characters

The present collections contain three coralla which appear to be the same species from very different environments and widely separated localities. They are thick plates with a nodular upper surface. Corallites are immersed with calices 0.9-1.2mm diameter. Septa are tapered; primary septa are mostly fused, secondary septa are complete, $<\frac{2}{3}R$. The reticulum is coarse and covered with tapered or slightly elaborated spinules.

The colour of one specimen was a deep purple brown; that of the others is unrecorded.

Affinities

This species appears to be undescribed. It is closest to *M. spumosa* but has larger corallites and a different growth form.

Distribution

Known only from eastern Australia.

Montipora undata Bernard, 1897

Synonymy

Montipora undata Bernard, 1897; Ma (1959).

?*Montipora denticulata* Bernard, 1897; Ma (1959).

Montipora colei Wells, 1954.

Montipora denticulata (syntype BMNH 1893-9-1-88) appears to be a deep water ecomorph of *M. undata*. The holotype of *M. colei*, also from deep water, is identical to several coralla of the present series; its affinity with *M. undata* was suggested by Wells (1954).

Figs. 120-122 *Montipora undata* (× 0.5)

Fig. 120 From Yorke Island, collecting station 13, same corallum as Figs. 123, 124.
Fig. 121 From Sue Island, collecting station 17, same corallum as Figs. 125, 126.
Fig. 122 From Raine Island, collecting station 151, same corallum as Figs. 127, 128.

Figs. 123-128 *Montipora undata*

Figs. 123, 124 Same corallum from Yorke Island and same corallum as Fig. 120 (× 5 and 20 respectively).
Figs. 125, 126 Same corallum from Sue Island and same corallum as Fig. 121 (× 5 and 20 respectively).
Figs. 127, 128 Same corallum from Raine Island and same corallum as Fig. 122 (× 5 and 40 respectively).

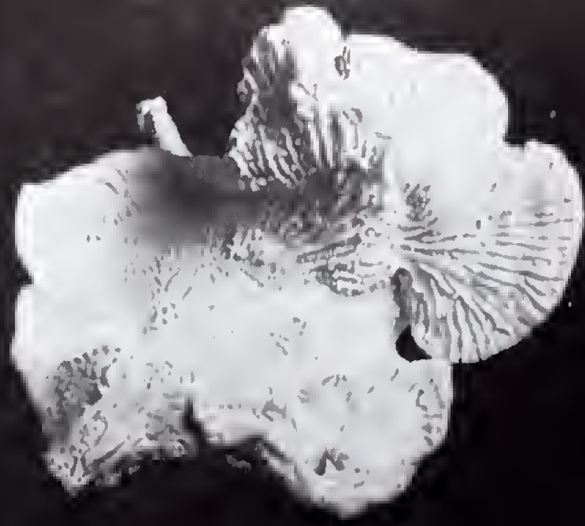


Fig. 120▲

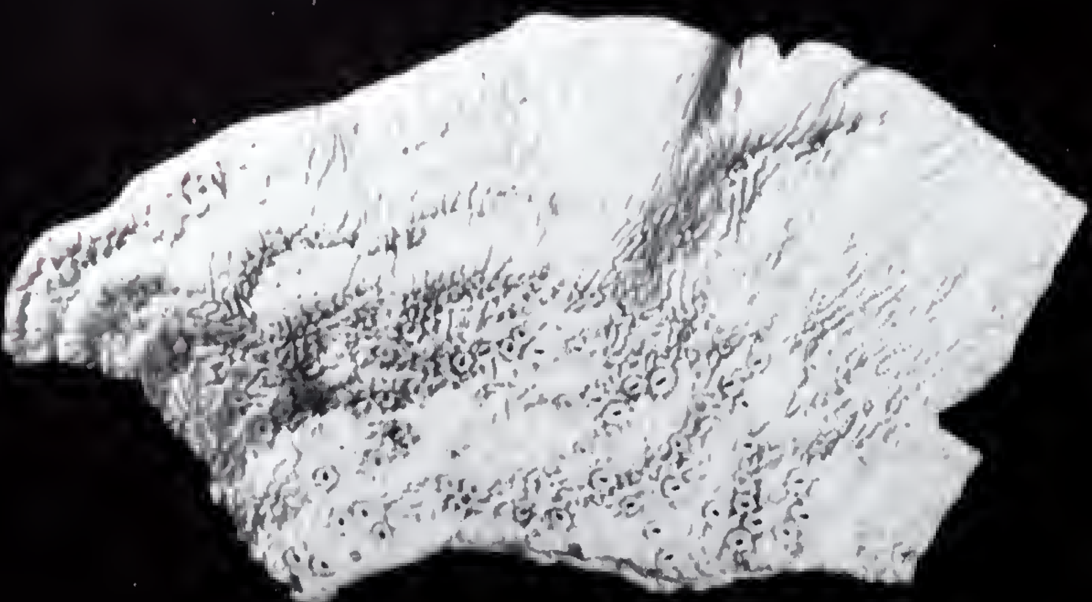


Fig. 121▲

Fig. 122▼

Fig 123▲

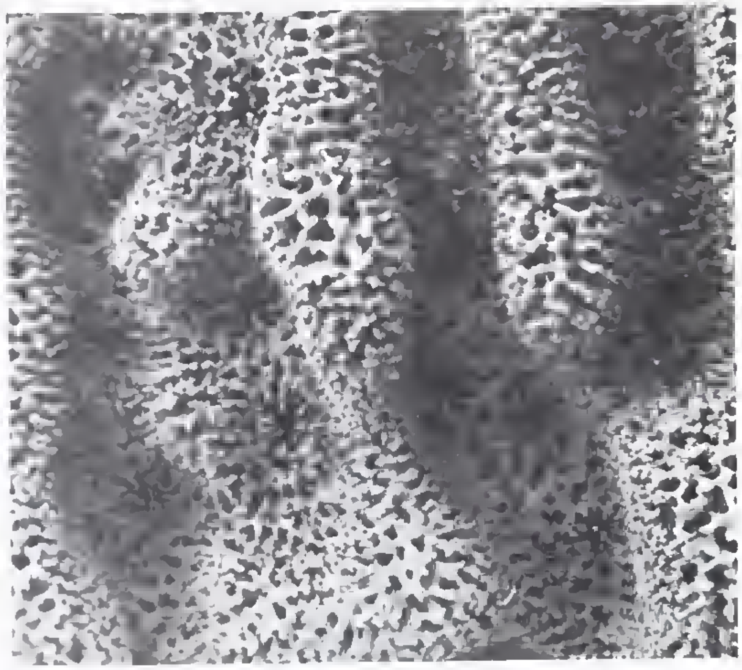


Fig 124▲

Fig. 125▼

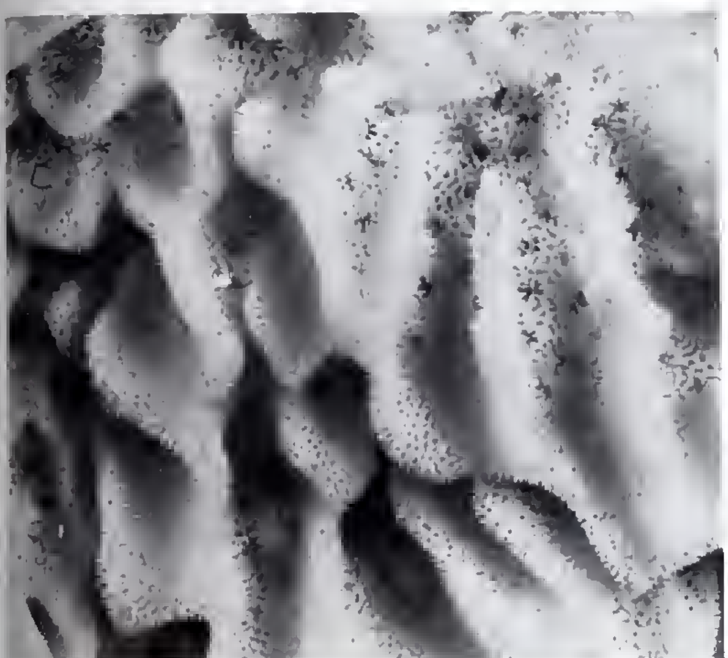


Fig 126▼

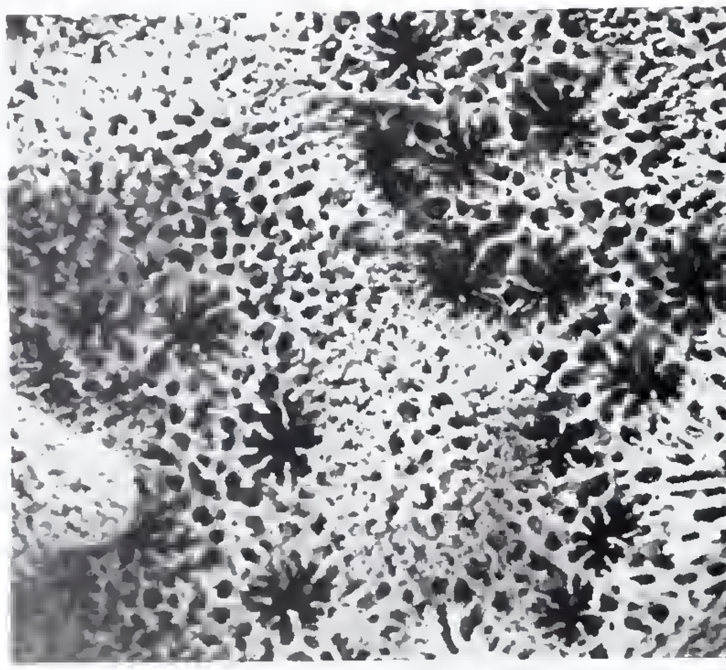


Fig 127▼

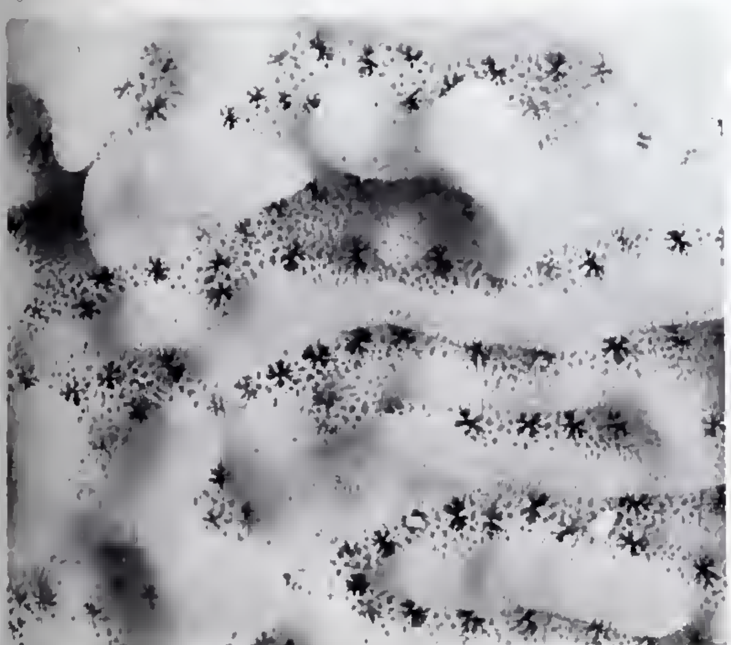


Fig. 128▼

Material studied

Yorke Island (2 specimens), **Arden Island, Sue Island** (2 specimens), **North West Reef, Turtle Islands, Raine Island** (3 specimens), **Great Detached Reef** (2 specimens), **Martha Ridgeway Reef** (2 specimens), **Tijou Reef** (2 specimens), **Mellish Reef, Britomart Reef, Rib Reef** (8 specimens), **Palm Islands** (3 specimens), **Broadhurst Reef, Magnetic Island, Whitsunday Islands.**

These localities include collecting stations 1, 6, 13, 14, 17, 31, 56, 97, 151, 152, 154, 165, 168, 177, 183, 206, 222, 223.

Characters

Colonies form horizontal or vertical plates, which may be contorted into whorls or tubes, or form thick columns which may be flattened or branched. The whole surface is covered with tuberculae which are usually fused into ridges. On flat surfaces, these ridges are usually parallel and perpendicular to the corallum margins. On columns, especially those with contorted surfaces, the ridges slope in groups to form a pattern of flame-shaped projections where they meet other ridges sloping in the opposite direction. This pattern, which is similar to that of *Porites rus* Forskål, is characteristic of *M. undata.*

Corallites are immersed, and are restricted to the valleys between ridges. Thecae are indistinct. Calices are 0.4-0.6mm diameter. Septa consist of rows of spines of irregular length usually arranged in a single cycle of $\frac{1}{2}$-$\frac{2}{3}$ R. Rarely, an incomplete second cycle occurs. The reticulum is medium-fine, that of the ridges and valleys being similar. The septal spines and coenostial spinules are of similar simple structure, giving the corallum surface a uniform appearance.

Living colonies are usually uniform purple, pink or brown and frequently have pale growing margins.

Affinities

Montipora undata is closest to *M. danae.* It is distinguished by having thin coenostial ridges rather than ridges of fused verrucae and has the smaller corallites with less well-developed septa.

Distribution

Recorded from Western Australia, the Philippines, Indonesia and the Great Barrier Reef.

Montipora danae Edwards & Haime, 1851

Synonymy

?*Porites maeandrina* Ehrenberg, 1834.

Manopora tuberculosa (Lamarck); Dana (1846); not Lamarck (1816).

Montipora rus (Forskål); Edwards & Haime (1851); Klunzinger (1879); not Forskål (1775).

Montipora danae Edwards & Haime, 1851; Bernard (1897); Wells (1954); Ma (1959); Nemenzo (1967).

Montipora maeandrina (Ehrenberg); Bernard (1897).

?*Montipora crassireticulata* Bernard, 1897; Ma (1959).

?*Montipora brueggemanni* Bernard, 1897.

Figs. 129-132 *Montipora danae* (× 0.5)
Figs. 129, 130 From Corbett Reef, collecting station 164, Fig. 129 same corallum as Figs. 133, 143, 144.
Fig. 131 From Dewar Island, Murray Islands, collecting station 29, same corallum as Figs. 141, 142.
Fig. 132 From Big Mary Reef, collecting station 187.

Fig. 129▲

Fig. 130▼

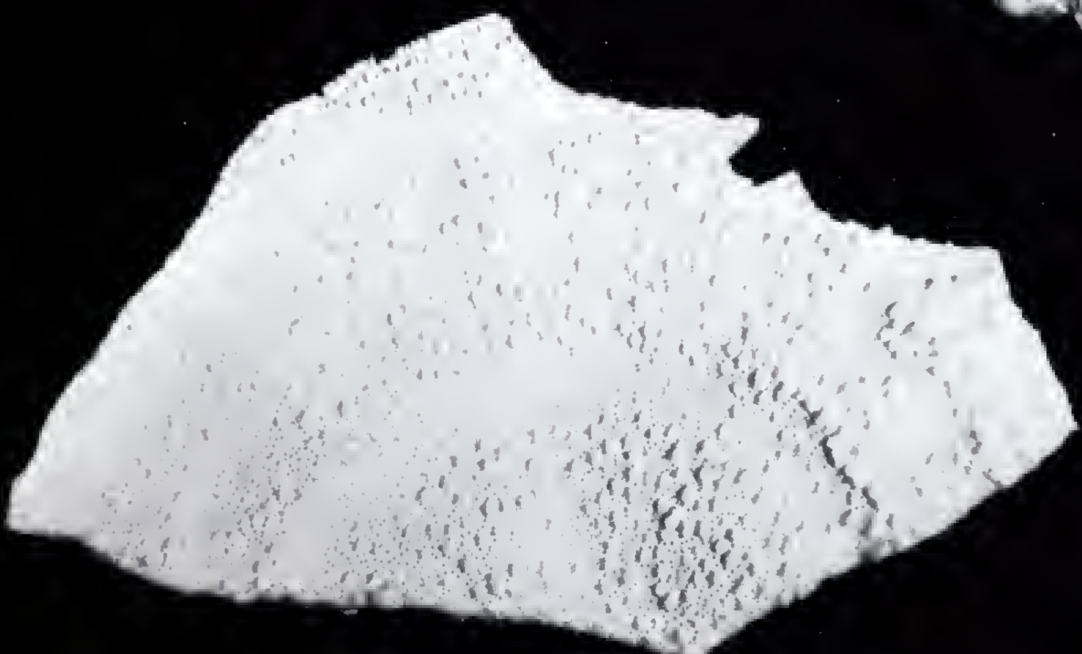
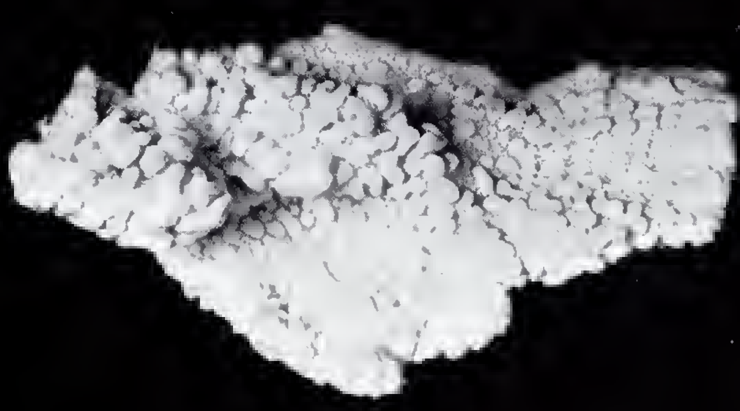


Fig. 131▲

Fig. 132▼



Specimen YPM 4221 of *M. danae* Edwards & Haime from Fiji is a fragment of this species and is possibly a piece of Dana's misidentified *M. tuberculosa* (Lamarck) (USNM 307). As no type specimen has been found in the MNHN, USNM 307 is selected by the authors as the lectotype of the species. Bernard's (1897, p. 101) identification of Ehrenberg's *P. maeandrina* cannot be substantiated; the type is lost.

The type specimens of Bernard's *M. crassireticulata* (BMNH 1893-9-1-91) and *M. brueggemanni* (BMNH 1862-2-4-47), which are very similar, are only fragments with no verrucae but with a *M. danae*-like reticulum and corallites associated with deep water forms of *M. danae*.

Material studied

Yorke Island (7 specimens), **Little Mary Reef** (4 specimens), **Arden Island, Murray Islands** (2 specimens), **Raine Island** (2 specimens), **Martha Ridgeway Reef** (6 specimens), **Wye Reef, Tijou Reef, Corbett Reef** (8 specimens), **Houghton Island, Lizard Island Lagoon, Rib Reef** (3 specimens), **Myrmidon Reef, Palm Islands** (11 specimens), **Broadhurst Reef** (7 specimens), **Bowden Reef** (2 specimens), **Chesterfield Reefs** (4 specimens), **Bushy Island-Redbill Reef, Swain Reef** (2 specimens), **Fitzroy Reef, Flinders Reef (Moreton Bay), Middleton Reef** (3 specimens), **Elizabeth Reef, Lord Howe Island** (3 specimens).

These localities include collecting stations 8, 13, 16, 28, 29, 41, 43, 45, 55, 79, 100, 143, 144, 151, 154, 159, 163, 164, 170, 177, 183, 185, 187, 191, 210, 213, 221, 222, 227, 230, 231, 233, 236.

Characters

Colonies are massive, sub-massive, columnar or plate-like. Their surface is covered with verrucae which may be irregular or dome-shaped or fused into long low ridges perpendicular to the margins of plates. Verrucae on plates from deep or turbid water tend to be elongate, low and widely separated, with corallites arranged in radiating rows. Verrucae on columns are larger and less regular, while those on sub-massive and massive coralla are contorted and fused into irregular shapes.

Corallites are situated between verrucae and are thus arranged in rows on plate-like coralla. They are immersed with a distinguishable although highly porous theca. Calices are 0.6-0.7mm diameter. Septa are composed of spines of uniform length. Primary septa are $<\frac{3}{4}$ R, secondary septa are composed of smaller spines $<\frac{1}{2}$R, are usually incomplete, sometimes absent. The reticulum is fine, that of the verrucae being finer than that of the valleys, and is covered with spinules with elaborated tips.

Living colonies are usually brown or pale blue with growing margins paler than the colony centres.

Affinities

Montipora danae is closest to *M. verrucosa*. It is distinguished by its wider range of growth forms, more irregular verrucae, smaller corallites and by the septa which do not taper. Calices of *M. danae* are therefore shallow while those of *M. verrucosa* are relatively large, open and deep.

Montipora danae may also resemble sub-massive forms of *M. spumosa* which may have corallites and 'verrucae' of similar size and distribution. The latter is reliably distinguished by its coarse, uniform coenosteum and by having corallites on (as well as between) the 'verrucae'.

Distribution

Widely distributed from the Red Sea east to the Marshall Islands and the south-west Pacific.

Figs. 133-136 *Montipora danae* (× 5)

Fig. 133 From Corbett Reef, same corallum as Figs. 129, 143, 144.

Fig. 134 From Orpheus Island, Palm Islands, collecting station 91, same corallum as Figs. 137, 138.

Fig. 135 From Sue Island, collecting station 17, same corallum as Figs. 139, 140.

Fig. 136 From the Swain Reefs, collecting station 81.

Fig. 133▼

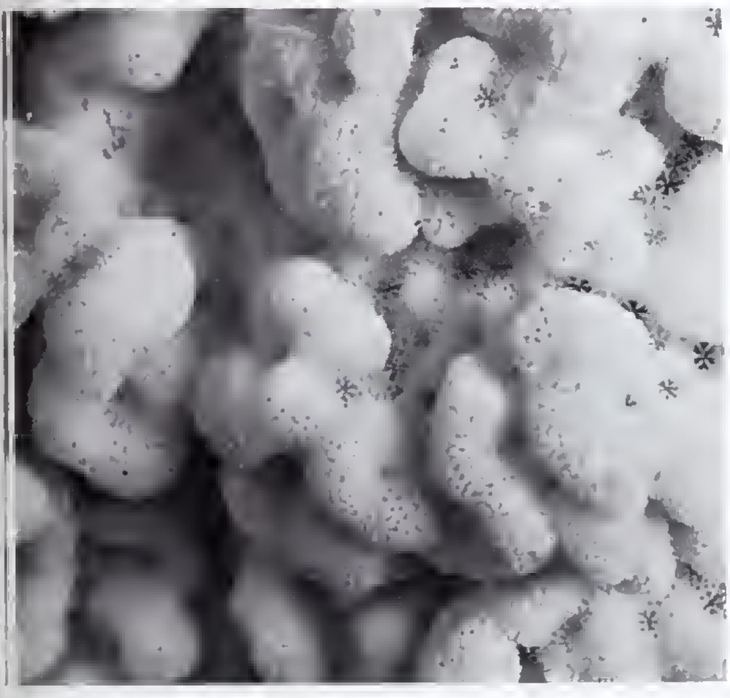


Fig. 134▼

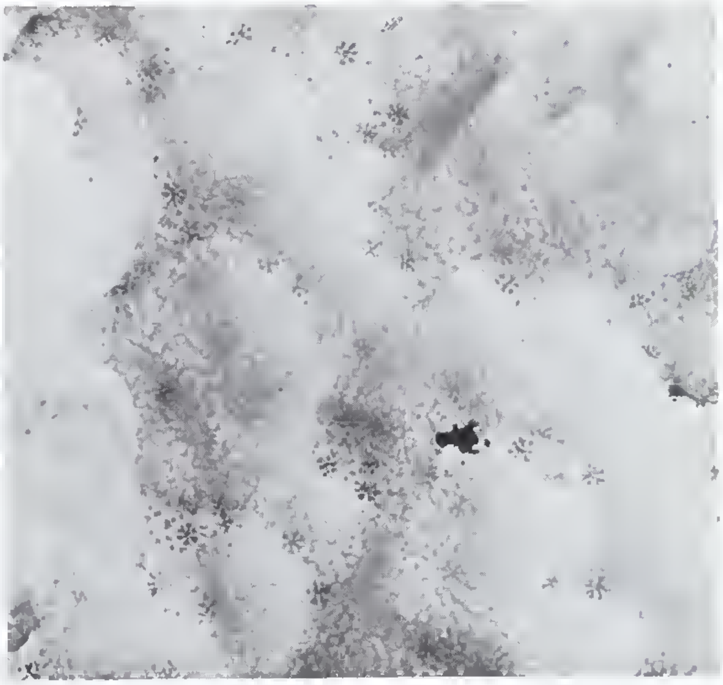


Fig. 135▼

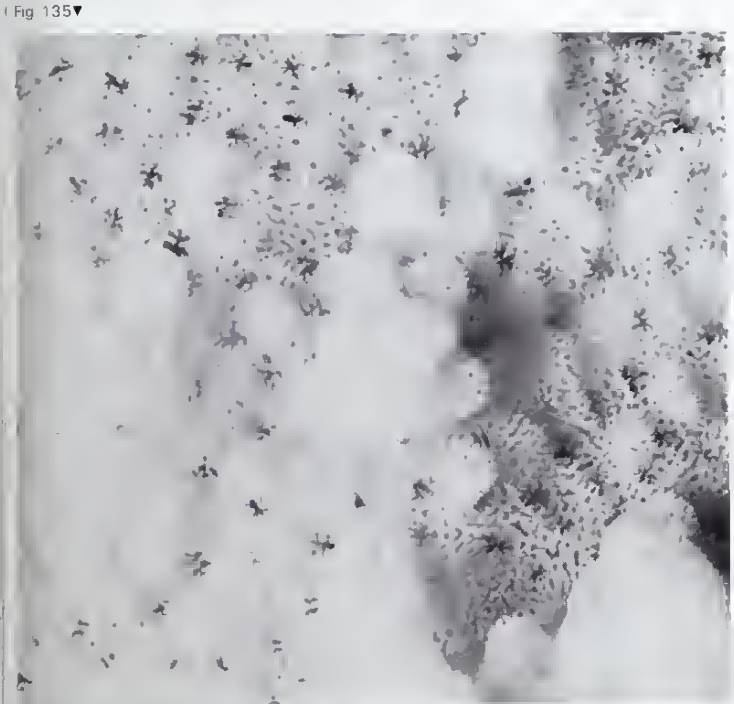


Fig. 136▼

Figs. 137-144 *Montipora danae*

Figs. 137, 138 Same corallum from Orpheus Island, Palm Islands and same corallum as Fig. 134 (× 20 and 40 respectively).

Figs. 139, 140 Same corallum from Sue Island and same corallum as Fig. 135 (× 20 and 40 respectively).

Figs. 141, 142 Same corallum from Dewar Island, Murray Islands and same corallum as Fig. 131 (× 20 and 40 respectively).

Figs. 143, 144 Same corallum from Corbett Reef and same corallum as Figs. 129, 133 (× 20 and 40 respectively).

Fig 137▲

Fig. 138▲

Fig. 139▼

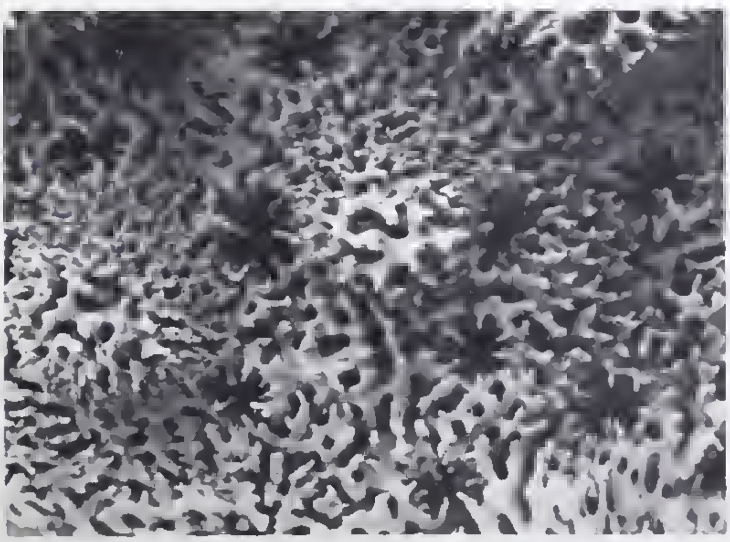


Fig. 140▼

Fig. 141▼

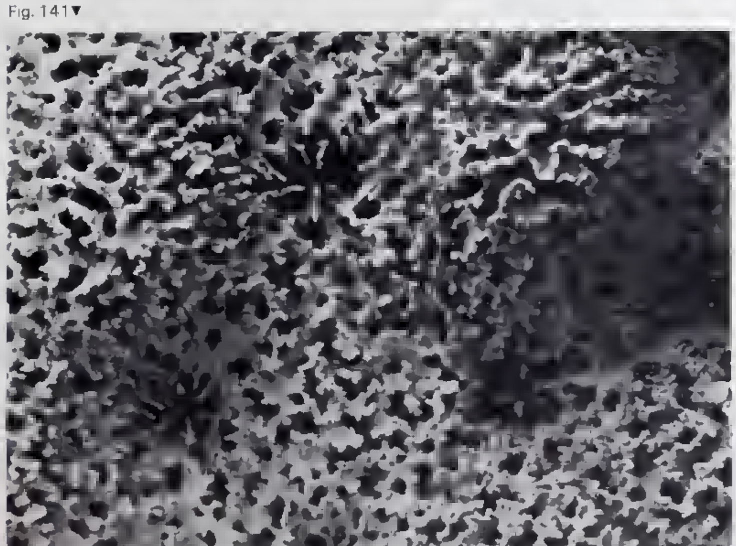
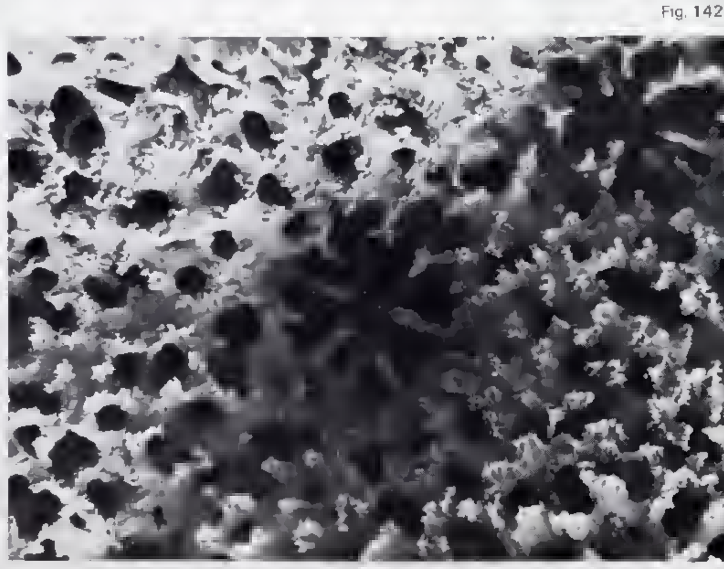


Fig. 142▼



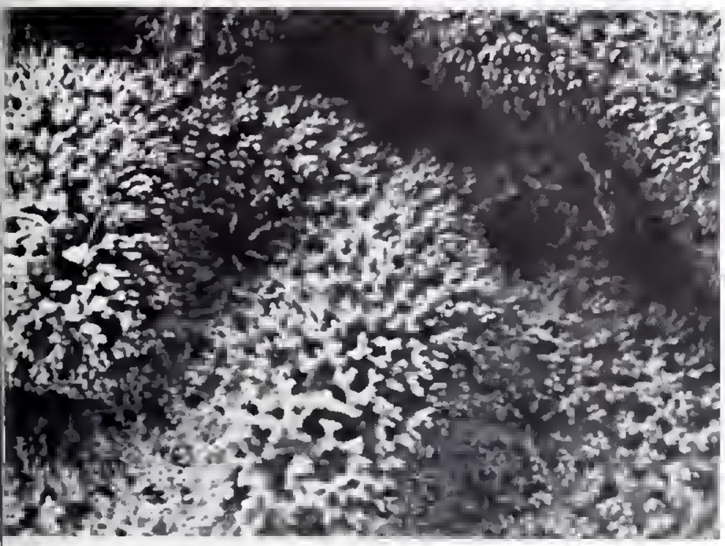


Fig. 143▲

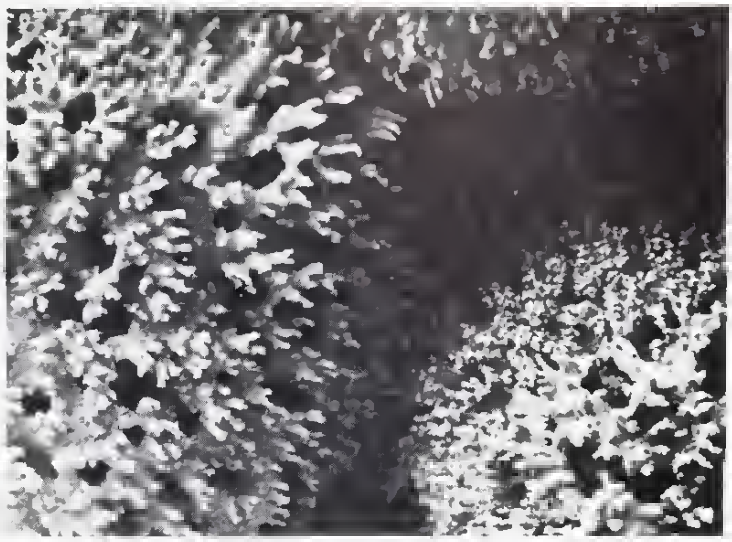


Fig. 144▲

Montipora verrucosa (Lamarck, 1816)

Synonymy

Porites verrucosa Lamarck, 1816.

Agaricia papillosa Lamarck, 1816 (*pars*).

Montipora verrucosa (Lamarck); Quoy & Gaimard (1833); ?Edwards & Haime (1851); Quelch (1886); Bernard (1897, *pars*); Whitelegge (1898); Gardiner (1898); Studer (1901); Vaughan (1907, 1918); Gravier (1911); Matthai (1923); Yabe & Sugiyama (1935c); Eguchi (1938); Crossland (1952); Boschma (1954); Wells (1954); Ma (1959); Nemenzo (1967); Chevalier (1968); not Klunzinger (1879).

Montipora papillosa (Lamarck); de Blainville (1834); Edwards & Haime (1860); Quelch (1886); Bernard (1897); Ma (1959).

Manopora verrucosa (Lamarck); Dana (1846).

Manopora papillosa (Lamarck); Dana (1846).

Manopora planiuscula Dana, 1846.

Montipora planiuscula (Dana); Bernard (1897).

Montipora ambigua Bernard, 1897; Yabe & Sugiyama (1932); Ma (1959).

Montipora conferta Nemenzo, 1967.

Lamarck's type series of *M. verrucosa* (MNHN 23, 261g, 419 and 420) are all this species; specimen MNHN 261g from Tonga, mentioned by Bernard (1897, p. 104), is designated the lectotype. Of Lamarck's types of *M. papillosa*, specimen MNHN 225b is *M. foliosa*, while MNHN 235a is a flat, foliose plate of *M. verrucosa*.

Dana's *M. planiuscula* (USNM 311, type?) from Fiji has very weakly developed verrucae but is close to several *M. verrucosa* in the present series.

Figs. 145-147 *Montipora verrucosa* (× 0.75)

Fig. 145 From Corbett Reef, collecting station 164, same corallum as Fig. 148.
Fig. 146 From Big Mary Reef, collecting station 187, same corallum as Fig. 149.
Fig. 147 From Osborne Reef, collecting station 162.

Figs. 148-153 *Montipora verrucosa*

Fig. 148 From Corbett Reef, same corallum as Fig. 145 (× 5).
Fig. 149 From Big Mary Reef, same corallum as Fig. 146 (× 5).
Fig. 150 From Corbett Reef, collecting station 164 (× 40).
Fig. 151 From Great Detached Reef, collecting station 5 (× 40).
Fig. 152 From Curacao Island, Palm Islands, collecting station 177 (× 40).
Fig. 153 From Houghton Island, collecting station 16 (× 40).

Fig. 145▲

Fig. 146▲

Fig. 147▲

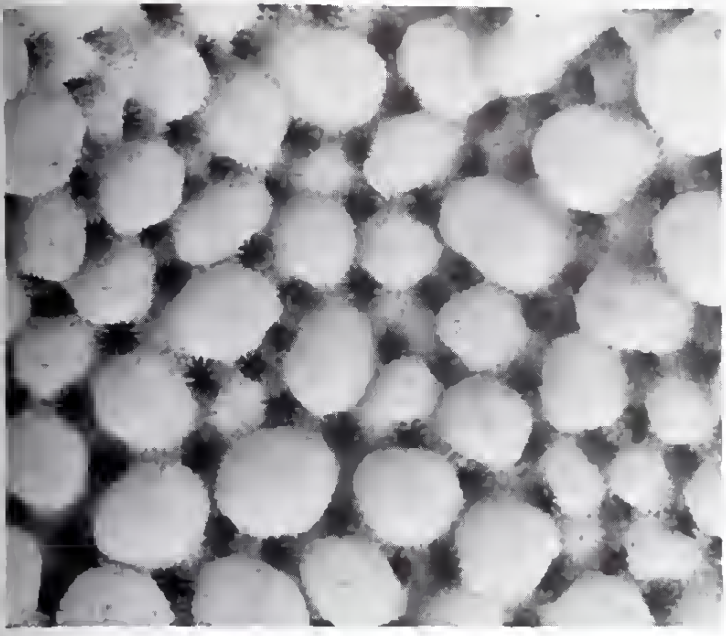


Fig. 148▲

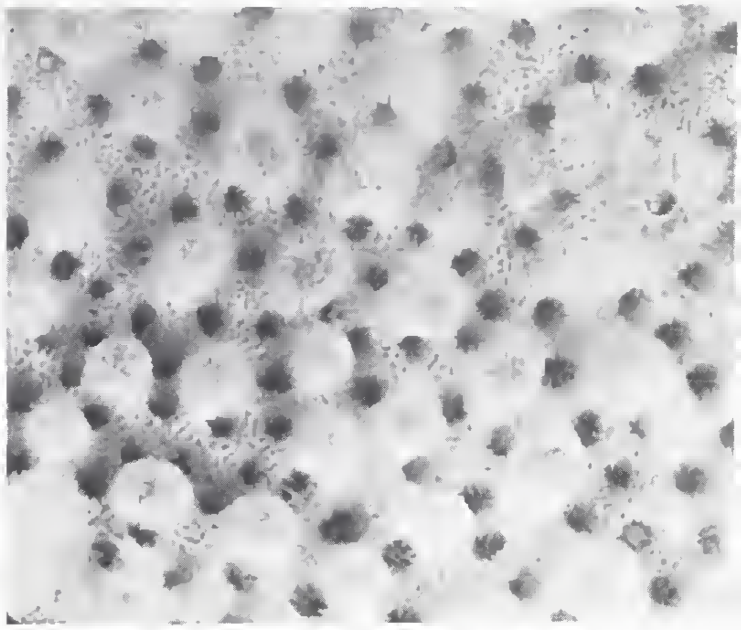


Fig. 149▲

Fig. 150▼

Fig. 151▼

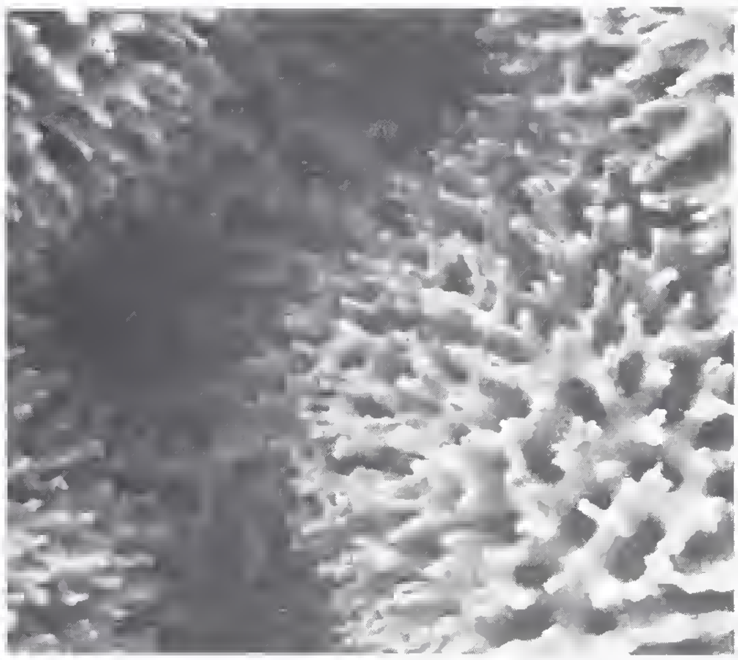


Fig. 152▼

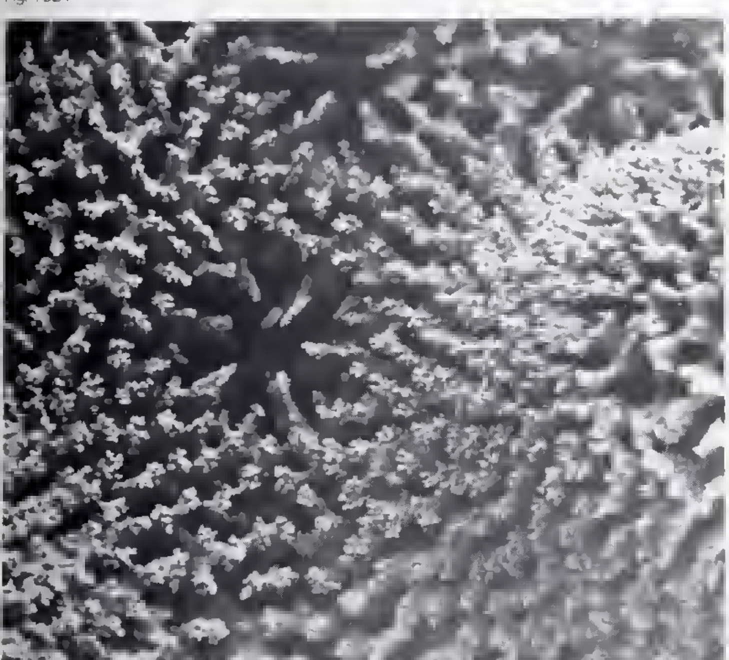
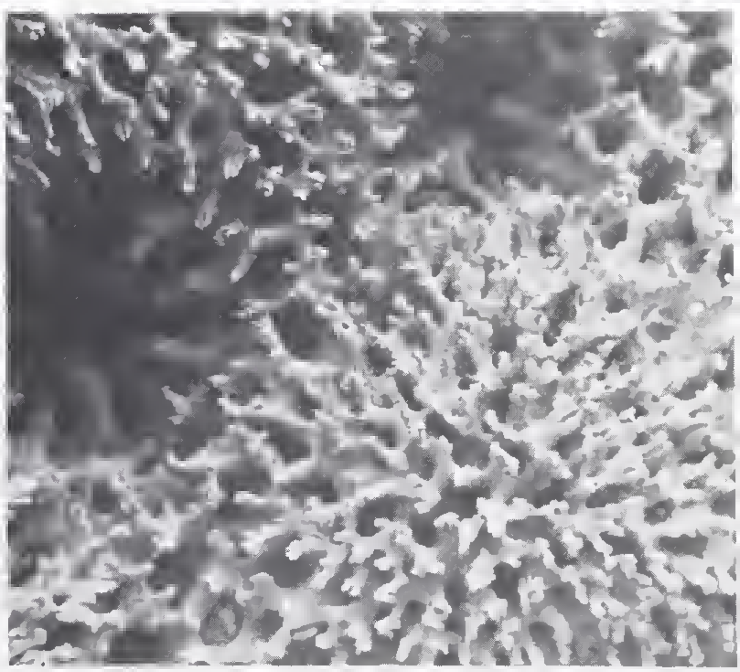


Fig. 153▼



Bernard's account of *M. verrucosa* includes three specimens from the Great Barrier Reef which he describes separately as distinct varieties. Of these, two varieties are *M. verrucosa*, while one variety is *M. monasteriata*. Bernard's holotype of *M. ambigua* (BMNH 1892-12-1-288) is a plate-like *M. verrucosa* from Torres Strait.

Boschma (1954) suggests that three of Vaughan's (1907) *Montipora* from Hawaii (*M. tenuicaulis*, *M. bernardi* and *M. studeri*) are synonyms of *M. verrucosa*. This study indicates that these species are likely to be synonyms of each other but are probably not *M. verrucosa*.

Material studied

Yorke Island (7 specimens), **Little Mary Reef, Arden Island, Murray Islands, Sue Island, Turtle Islands** (2 specimens), **Raine Island** (3 specimens), **Great Detached Reef, Bird Island, Martha Ridgeway Reef** (5 specimens), **Tijou Reef** (5 specimens), **Corbett Reef** (4 specimens), **Houghton Island, Hope Island, Willis Islet** (4 specimens), **Magdelaine Cay** (6 specimens), **Britomart Reef** (2 specimens), **Rib Reef** (8 specimens), **Palm Islands** (49 specimens), **Broadhurst Reef** (2 specimens), **Chesterfield Reefs** (15 specimens), **Bushy Island-Redbill Reef** (2 specimens), **Swain Reefs, Fitzroy Reef** (2 specimens).

These localities include collecting stations 5, 13, 16, 17, 28, 31, 34, 36, 37, 41, 42, 43, 45, 55, 57, 60, 77, 80, 152, 154, 155, 159, 161, 162, 164, 165, 167, 168, 170, 174, 177, 183, 185, 187, 191, 197, 199, 200, 212, 213, 215, 216, 222.

Characters

Colonies are sub-massive or plate-like, with their surfaces uniformly covered with verrucae of uniform size and shape (usually 2-3.5mm diameter). Plate-like coralla usually have a poorly-developed epitheca and usually the small verrucae along the periphery are joined to form short ridges perpendicular to the margin. Corallites are immersed and are uniformly interspersed in the flat reticulum between (never on) the verrucae. Calices are 0.9-1.3mm diameter; thecae are seldom distinguishable. Septa are tapered and characteristically plunge steeply within the corallites. They are in two complete cycles and are composed of rows of spines, sometimes fused into dentate plates. Spines of primary septa usually have thickened tips which may fuse. Secondary septa are subequal to $\frac{1}{3}$R and have finer spines. The reticulum is spongy, that of the verrucae is relatively fine and covered with elaborated spinules.

Living colonies are usually blue or brown, either uniformly coloured or mottled. Polyps are frequently extended during the day and are usually bright blue or green.

Affinities

Montipora verrucosa is closest to *M. danae* (see p. 56).

Distribution

Widely distributed in the tropical Indo-Pacific from the Red Sea east to the Marshall Islands.

Montipora incrassata (Dana, 1846)

Synonymy

Manopora incrassata Dana, 1846.

Montipora prominula Crossland, 1952.

Dana's type series of *M. incrassata* (of which USNM 309 is designated the lectotype) from Fiji, is a flattened corallum with relatively widely-spaced corallites. Crossland's

Figs. 154-156 *Montipora incrassata* (× 0.5)
Fig. 154 From Magdelaine Cay, collecting station 200, same corallum as Fig. 157, 158.
Fig. 155 From Lihou Reef, collecting station 202, same corallum as Fig. 159, 160.
Fig. 156 From Britomart Reef, collecting station 168.

Fig. 154▲

Fig. 155▼

Fig. 156▼

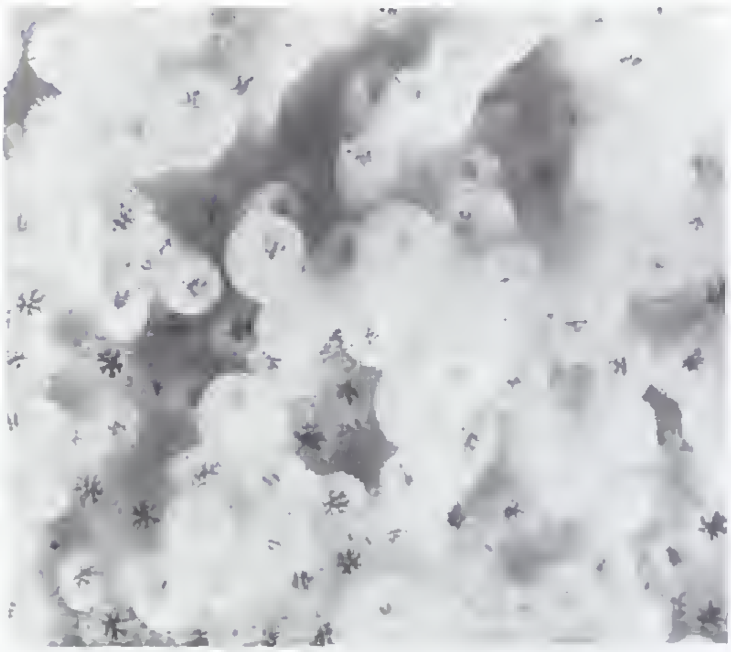


Fig. 157▲

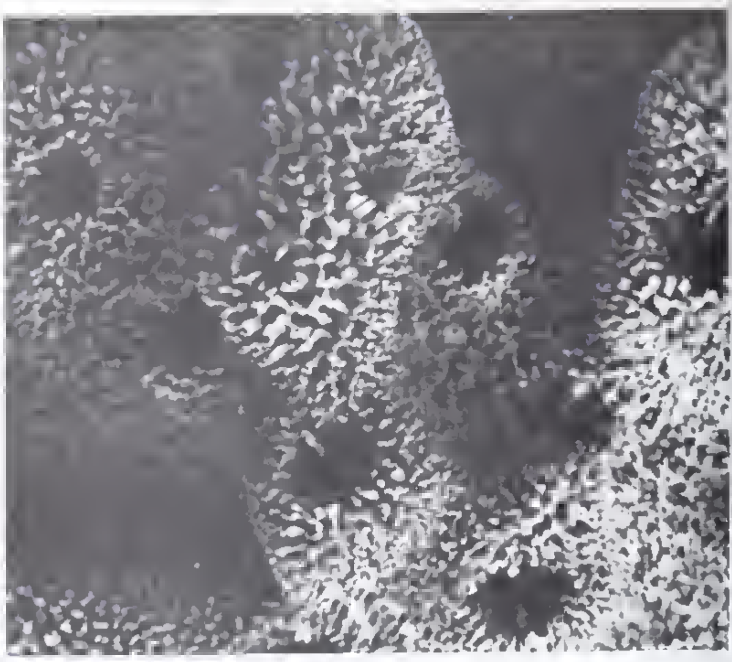


Fig. 158▲

Fig. 159▼

Fig. 160▼

Fig. 161▼

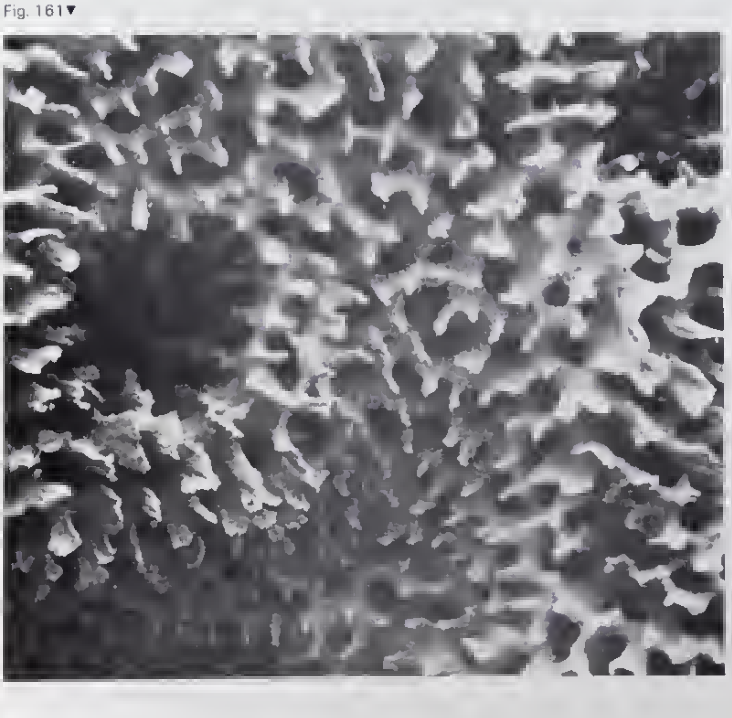


Fig. 162▼

holotype of *M. prominula* (BMNH 1934-5-14-452) is an irregularly contorted dividing branch end and also has widely-spaced, mostly immersed corallites and relatively poorly-developed septa.

Material studied

Little Mary Reef (3 specimens), **Murray Islands** (3 specimens), **Sue Island** (4 specimens), **Raine Island** (2 specimens), **Great Detached Reef** (14 specimens), **Tijou Reef** (2 specimens), **Yonge Reef, Willis Islet** (14 specimens), **Magdelaine Cay** (2 specimens), **Lihou Reefs** (3 specimens), **Mellish Reef** (20 specimens), **Britomart Reef** (3 specimens), **Davies Reef** (2 specimens), **Broadhurst Reef** (6 specimens), **Marion Reef** (4 specimens), **Chesterfield Reefs** (31 specimens), **Pompey Reef** (2 specimens), **Bushy Island-Redbill Reef** (4 specimens), **Swain Reefs** (2 specimens), **Fitzroy Reef** (14 specimens), **Middleton Reef**.

These localities include collecting stations 1, 3, 17, 28, 76, 77, 80, 105, 151, 152, 153, 155, 168, 170, 186, 189, 190, 191, 199, 200, 202, 203, 204, 205, 206, 208, 209, 210, 211, 212, 213, 214, 215, 216, 233.

Characters

Colonies have two basic growth forms, plates and nodular columns. Plate-like coralla are thick and are backed with epitheca up to the perimeter or (more usually) 4cm from the perimeter. Nodular columns are always contorted into irregular shapes with columns covered with irregularly fused nodules and ridges. Both growth forms may occur in the same colony.

Corallites are irregularly distributed irrespective of surface contortions with immersed and exsert corallites intergraded and intermixed. Calices are approximately 1mm diameter, except for those on the tops of columns which are smaller (0.7-0.8mm diameter). Thecae are hardly distinguishable. Exsert corallites are usually on the sides or tops of tuberculae. Plate-like coralla usually have small tuberculae becoming tubular, with a single corallite on their top. Tuberculae may be joined to form low ridges perpendicular to the corallum perimeter.

Septa are in complete cycles and consist of rows of spines, usually fused into a dentate plate, plunging steeply within the corallite. Primary septa are up to $\frac{3}{4}$R or may fuse deep within the corallite where their margins are usually thickened, to form a columella plug. Secondary septa are sub-equal to $\frac{1}{3}$R. The reticulum is spongy, becoming finer on tuberculae and covered with slightly ornamented spinules.

Living colonies are usually a mottled purple or brown.

Affinities

Montipora incrassata is usually distinctive and readily recognisable when nodular columns are developed. Plate-like coralla may resemble similar growth forms of *M. monasteriata* which is distinguished *in situ* by not having tuberculae fused into tubes. It may also resemble *M. foveolata* (see p. 67) and *M. caliculata* which has smaller corallites becoming sub-foveolate rather than tubular.

Distribution

Recorded only from the Great Barrier Reef and Fiji.

Figs. 157-162 *Montipora incrassata*

Figs. 157, 158 Same corallum from Magdelaine Cay and same corallum as Fig. 154 (× 5 and 20 respectively).

Figs. 159, 160 Same corallum from Lihou Reef and same corallum as Fig. 155 (× 5 and 40 respectively).

Fig. 161 From Willis Island (× 60).

Fig. 162 From the Pompey Complex, collecting station 105 (× 80).

Montipora foveolata (Dana, 1846)

Synonymy

Manopora foveolata Dana, 1846.

Montipora foveolata (Dana); Edwards & Haime (1851); Quelch (1886); Whitelegge (1898); Gardiner (1898); Bernard (1897); Crossland (1952); Wells (1954); Ma (1959); Nemenzo (1967).

Montipora socialis Bernard, 1897; Gardiner (1898); Crossland (1952); Wells (1954).

Crossland (1952) and Wells (1954) both discuss differences between *M. foveolata* from Fiji (YPM 4208) and *M. socialis* from the Great Barrier Reef (syntype BMNH 1892-12-1-7) and maintain them as separate species, an opinion not supported by the present study. Bernard (1897) incorrectly synonymised *M. incrassata* Dana with *M. foveolata*.

Material studied

Murray Islands, Dungeness Reef, Sue Island, Triangle Reef (2 specimens), **Raine Island** (2 specimens), **Great Detached Reef** (7 specimens), **Martha Ridgeway Reef** (3 specimens), **Corbett Reef, Bewick Island** (4 specimens), **Yonge Reef** (2 specimens), **Lizard Island** (5 specimens), **Willis Islet** (9 specimens), **Magdelaine Cay** (4 specimens), **Lihou Reefs, Mellish Reef** (5 specimens), **Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef, Palm Islands** (9 specimens), **Chesterfield Reefs** (11 specimens), **Pompey Reef, Swain Reef** (3 specimens), **Fitzroy Reef** (2 specimens), **Llewellyn Reef**.

These localities include collecting stations 1, 9, 17, 18, 28, 43, 45, 70, 77, 122, 151, 152, 154, 157, 159, 164, 168, 191, 192, 199, 200, 202, 206, 208, 209, 210, 212, 214, 216, 226.

Fig. 163 *Montipora foveolata* from the Swain Reefs, collecting station 77, same corallum as Figs. 164, 166 (× 0.5).

Fig. 163▼

Characters

Coralla are massive or form thick plates. Corallites are foveolate or funnel shaped. The funnel is composed of tuberculae which are fused to form a continuous or subcontinuous rim of reticulum around the corallite. This reticulum is medium-fine, with spinules having slightly elaborated tips giving a smooth but highly porous structure. Funnel openings are 1.2-2.0mm diameter. New corallites are formed in this reticulum on actively growing convex surfaces. Mature corallites open at the base of the funnel, are 0.8-1.1mm diameter and have a distinguishable theca. Septa are in complete cycles and are composed of rows of blunt, tapered spines which may bifurcate at their outer extremity, each arm of the bifurcation being fused with a vertical trabecular rod of the theca. Primary septa have fused inner margins, the fusion occurring up to 5mm inside the corallites and forming a distinctive columella plug. The septal spines are usually thickened before the point of fusion and frequently the spines are connected near their tips by a vertical rod. Secondary septa are slightly shorter than the primaries.

The characteristic foveolate appearance is not clear in all coralla. Some may be highly distorted by corallites growing in different directions, and in others the coenosteum of the funnels is very reduced and the corallites are separated by less than a calice diameter.

Living colonies are usually pale brown or cream, sometimes with paler funnel rims, and frequently with bright blue or green polyps extended during the day.

Affinities

Montipora foveolata is readily recognised when corallite funnels are well developed. If they are not, it may resemble *M. incrassata*, *M. venosa* or *M. caliculata*. *Montipora incrassata* has similar but smaller corallites. These are not foveolate, i.e. adjacent corallites do not share a common reticulum wall. *Montipora venosa* also has similar corallites which become foveolate (see p. 70) but only slightly so; primary septa are at most only partly fused and the spines of individual septa are not connected near their tips. *Montipora caliculata* has smaller corallites which are crowded; immersed, sub-foveolate and tubular corallites are usually found on different parts of the same corallum or are intermixed.

Figs. 164, 165 *Montipora foveolata* (× 5)

Fig. 164 From the Swain Reefs, same corallum as Figs. 163, 166.

Fig. 165 From Corbett Reef, collecting station 164, same corallum as Fig. 167.

Fig. 164▼

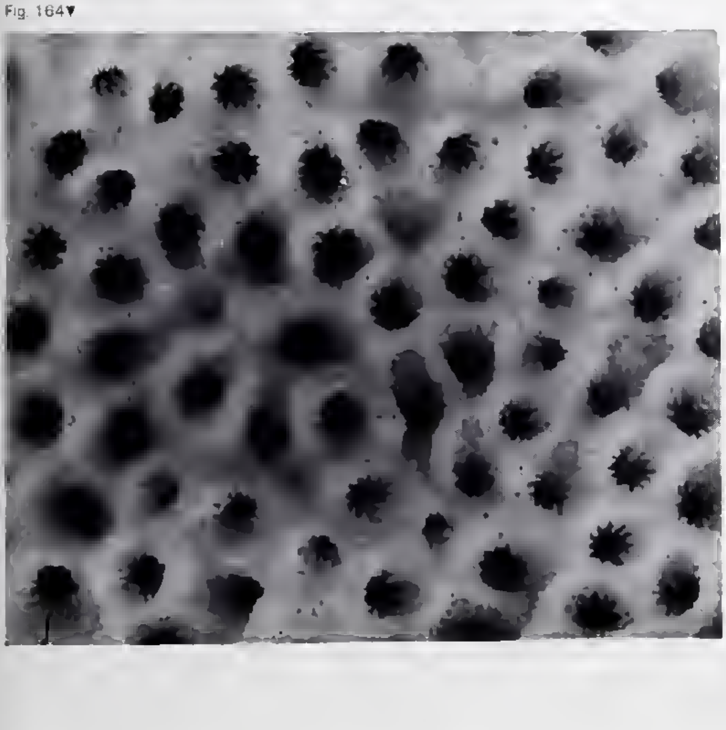
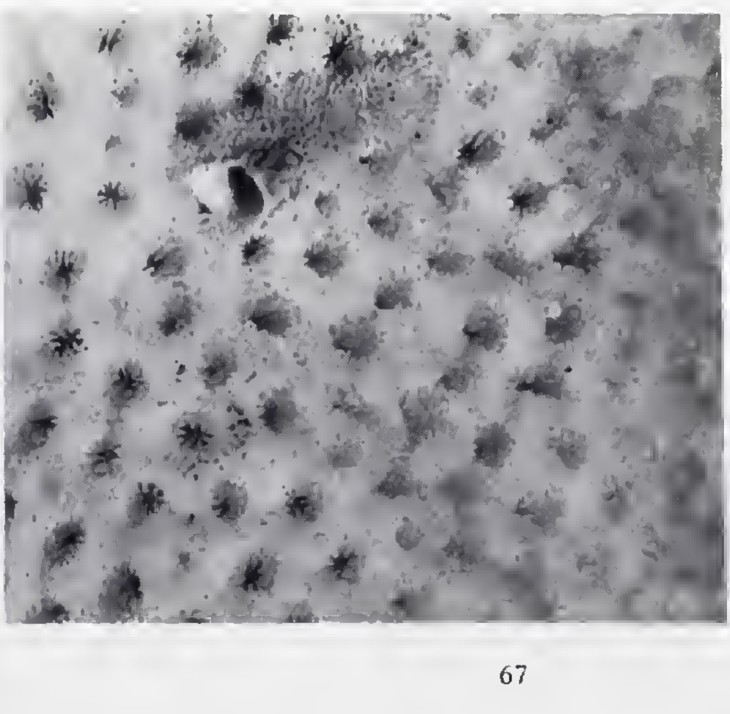


Fig. 165▼



Distribution

Distributed throughout the central and western Pacific and also the west coast of Australia.

Figs. 166-169 *Montipora foveolata*
Fig. 166 From the Swain Reefs, same corallum as Figs. 163, 164, (× 20).
Figs. 167, 168 From Corbett Reef, collecting station 164 (× 40).
Fig. 169 From Martha Ridgeway Reef, collecting station 154 (× 40).

Figs. 170, 171 *Montipora venosa* (× 0.75)
Fig. 170 Holotype from an unknown locality.
Fig. 171 From Sue Island, collecting station 182, same corallum as Figs. 172-174.

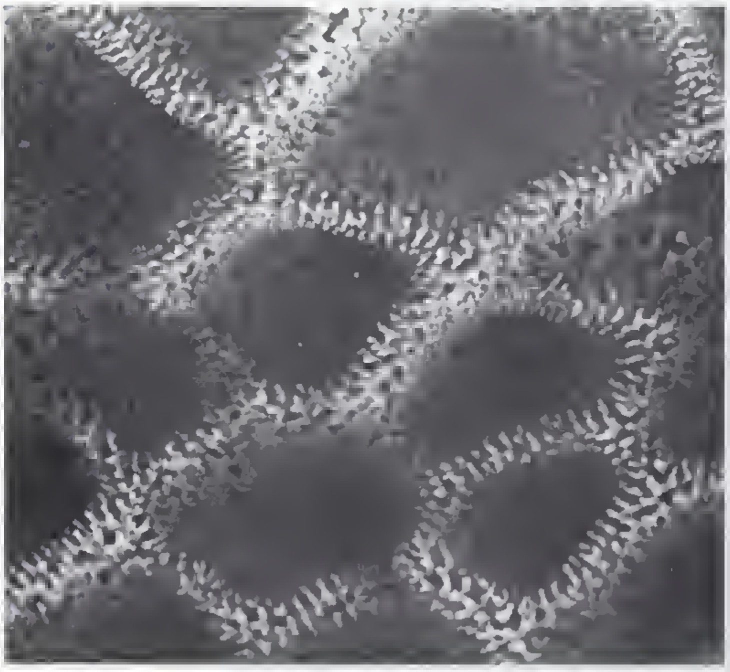


Fig 166▲

Fig. 167▲

Fig. 168▼

Fig 169▼

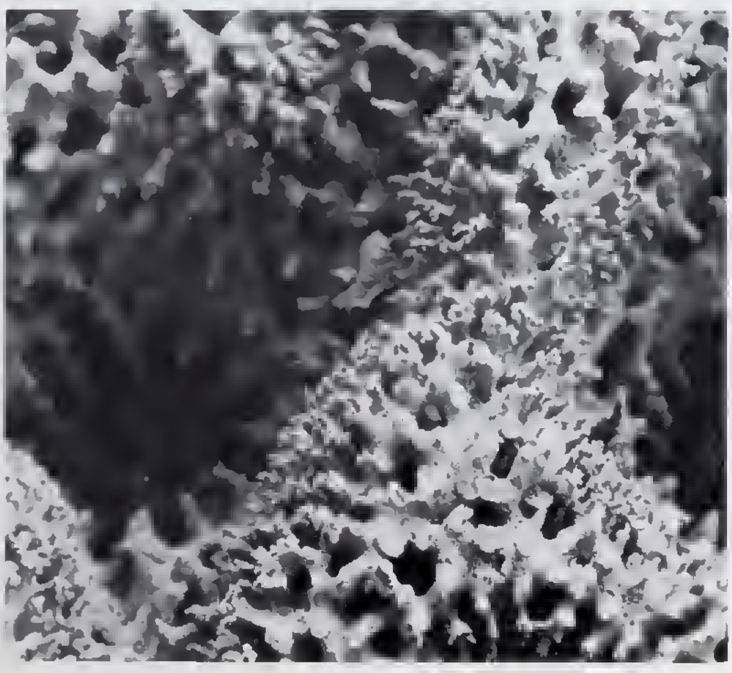


Fig. 170▲

Fig. 171▼

Montipora venosa (Ehrenberg, 1834)

Synonymy

Porites venosa Ehrenberg, 1834.

Montipora venosa (Ehrenberg); ?Bernard (1897); Bedot (1907); von Marenzeller (1907); Vaughan (1918); Mayor (1918); Hoffmeister (1925); Umbgrove (1940); Crossland (1952); Wells (1954); Stephenson & Wells (1955); Veron (1982).

Ehrenberg's holotype (ZMB 952) (Fig. 170), from an unknown locality, has larger corallites than most specimens of the present series but nevertheless has all the characters of the series clearly developed.

Material studied

Yorke Island (2 specimens), **Sue Island, Turtle Islands** (3 specimens), **Raine Island, Great Detached Reef, Bird Island, Corbett Reef, Lizard Island** (2 specimens), **Davies Reef, Palm Islands** (5 specimens), **Magnetic Island** (4 specimens), **Bushy Island-Redbill Reef** (2 specimens), **Fitzroy Reef** (3 specimens), **Flinders Reef (Moreton Bay)** (8 specimens), **Lord Howe Island** (2 specimens).

These localities include collecting stations 1, 13, 41, 45, 60, 73, 147, 151, 161, 164, 165, 182, 187, 197, 227.

Characters

Colonies are massive or sub-massive. Corallites are immersed or exsert, the latter being tubular or funnel-shaped with or without common reticulum walls. The reticulum wall is similar to that of *M. foveolata*, although it is slightly coarser and forms a funnel only slightly wider than the calice diameter. Corallites with and without funnels are intergraded and usually intermixed. Calices are 0.8-1.0mm diameter. Septa are similar to those of *M. foveolata* except that primary septa do not have vertical rods connecting the inner margins of dentations and usually not all primary septa are fused. In some coralla almost all the primary septa have free inner margins. Otherwise, the only variation occurring is in the degree of development of the corallite funnels; in some coralla, development is uniform, in others, it varies greatly between adjacent corallites.

Figs. 172-177 *Montipora venosa*

Figs. 172-174 Same corallum from Sue Island and same corallum as Fig. 171 (× 5, 20, and 40 respectively).

Figs. 175-177 Same corallum from Corbett Reef, collecting station 164 (× 5, 20, and 40 respectively).

Fig 172▼

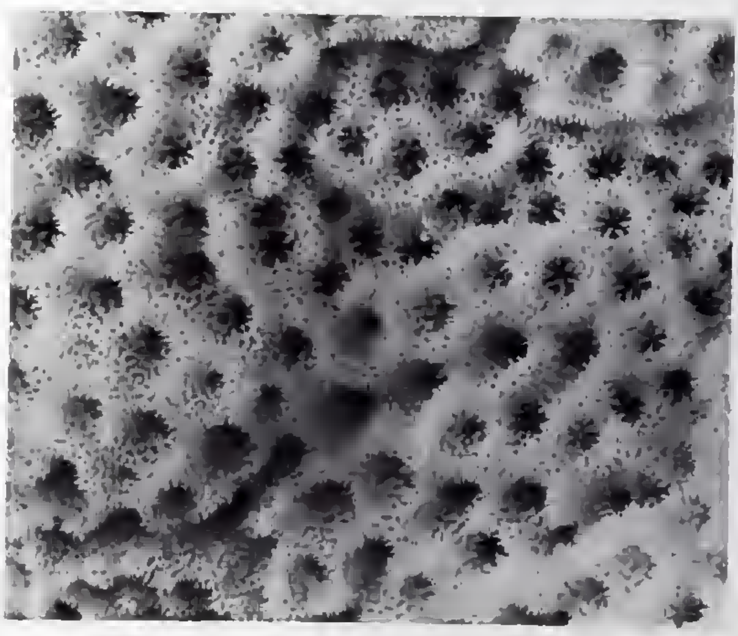
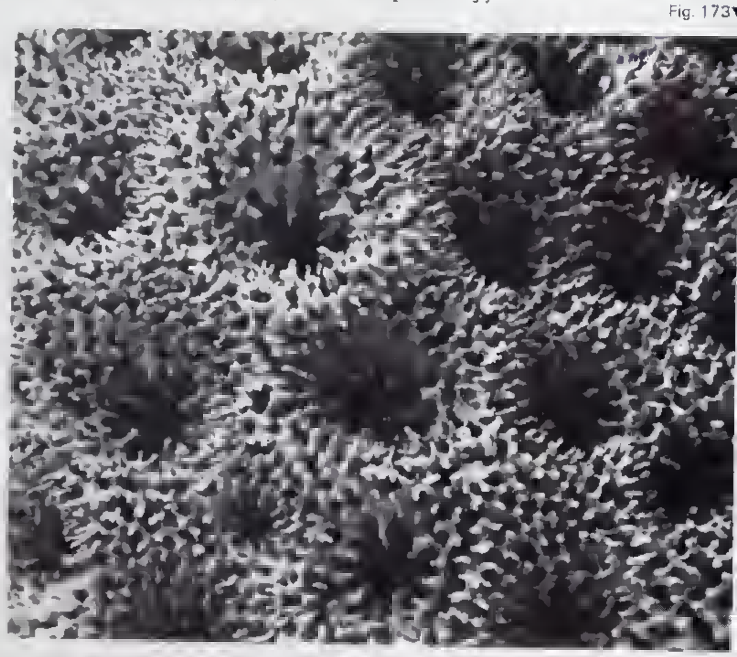


Fig. 173▼



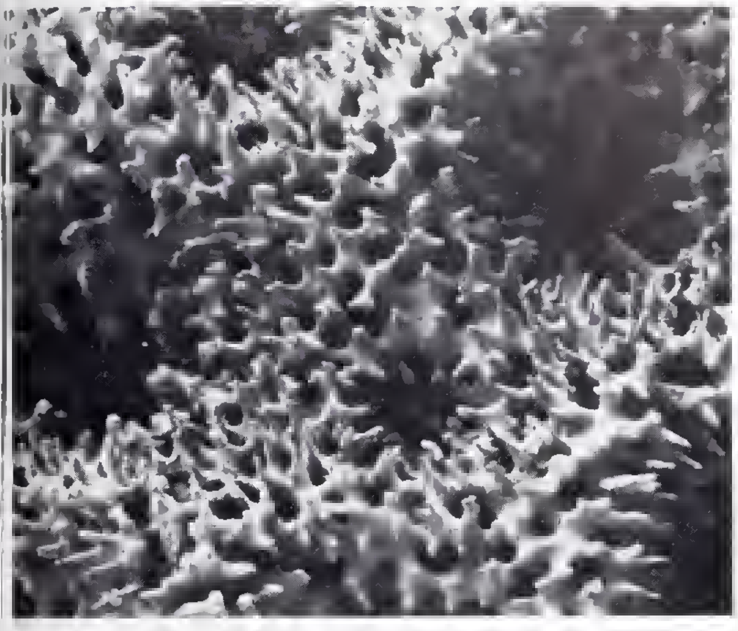


Fig. 174▲

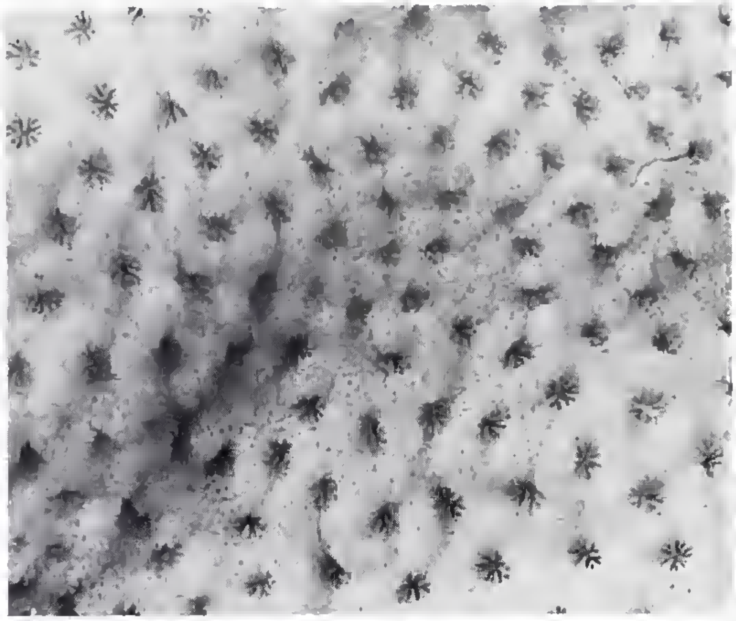


Fig. 175▲

Fig. 176▼

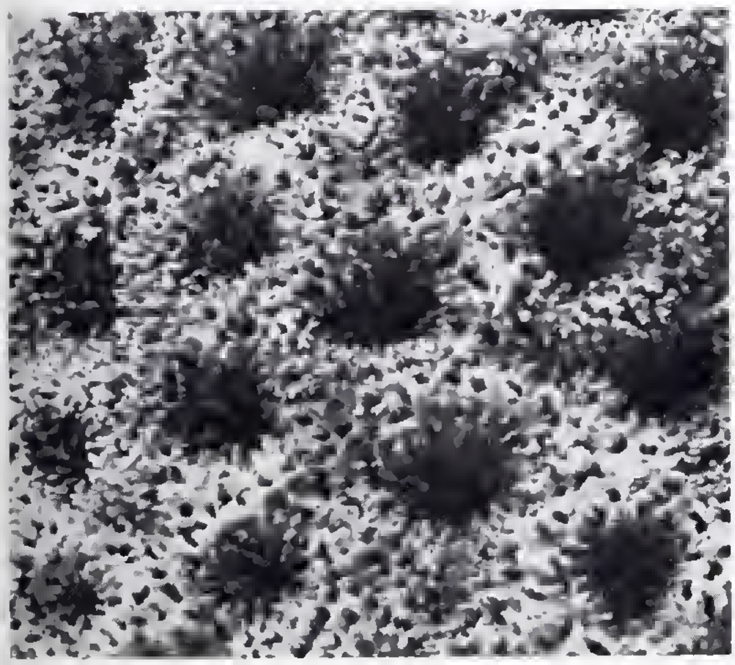
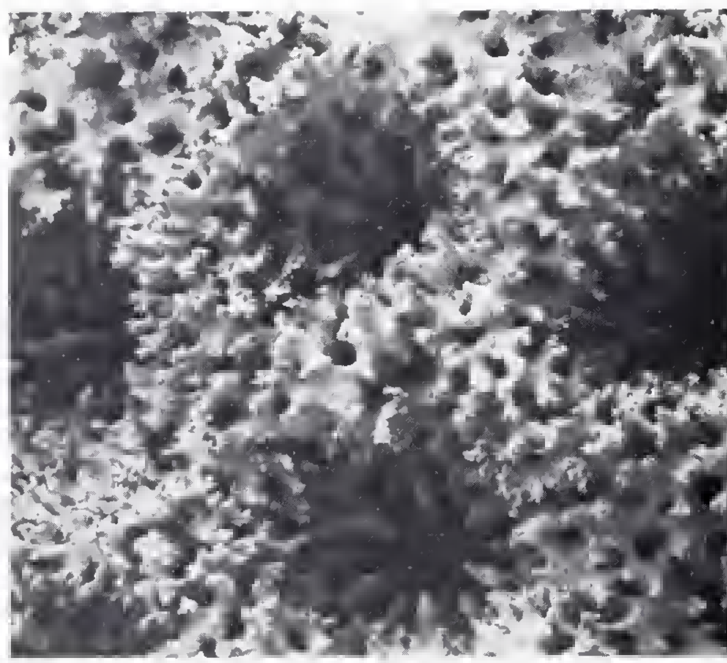


Fig 177▼



This species is uncommon on the Great Barrier Reef; the only recorded colour is pale brown.

Affinities

Montipora venosa is closest to *M. foveolata* (see p. 67) and *M. caliculata*. *Montipora caliculata* is distinguished only by having smaller corallites.

Distribution

Widely distributed in the tropical Indo-Pacific from the Red Sea to the Marshall Islands.

Fig. 178 *Montipora caliculata* from Chesterfield Atoll, same corallum as Figs. 180-182 (× 0.75).

Montipora caliculata (Dana, 1846)

Synonymy

Manopora caliculata Dana, 1846.

Montipora caliculata (Dana); Quelch (1886); Bernard (1897); Gardiner (1898); Wells (1954); not Vaughan (1917).

Dana's type specimens of *M. caliculata* (YPM 4209, MCZ 422 and USNM 335 of which the latter, figured by Dana (Pl. 44, Fig. 1), is here designated lectotype) are all similar massive coralla from Fiji.

Material studied

Little Mary Reef, Great Detached Reef (7 specimens), **Flinders Reef (Coral Sea)** (4 specimens), **Marion Reef, Chesterfield Reefs** (3 specimens), **Flinders Reef (Moreton Bay)**.

These localities include collecting stations 1, 5, 185, 203, 210, 216, 226, 227.

Characters

Colonies are massive or sub-massive. Corallites are sub-foveolate to immersed, these two forms being intergraded and intermixed. Sub-foveolate corallites have funnels up to 1.3mm diameter and the funnel perimeter is usually irregular. Calices are 0.6-0.8mm diameter. Thecae are hardly distinguishable. Septa are in complete cycles and consist of rows of tapered spines. Primary septa plunge steeply within the corallite and may form a columella plug with septal spines having thickened tips. Secondary septa are sub-equal to $\frac{1}{3}$ R. The reticulum is uniform and moderately coarse.

There is little variation in the present series. This species usually occurs on reef faces exposed to wave action and is usually brown or blue in colour.

Affinities

Montipora caliculata is close to *M. venosa* (see p. 71), *M. incrassata* (see p. 65) and *M. foveolata* (see p. 67).

Distribution

Recorded from the western Pacific and the west coast of Australia.

Figs. 179-184 *Montipora caliculata*
Fig. 179 Lectotype USNM 335 from Fiji (× 5).
Figs. 180-182 From Chesterfield Atoll, same corallum as Fig. 178 (× 5, 20, and 40).
Figs. 183, 184 From Great Detached Reef, collecting station 5 (× 20 and 40).

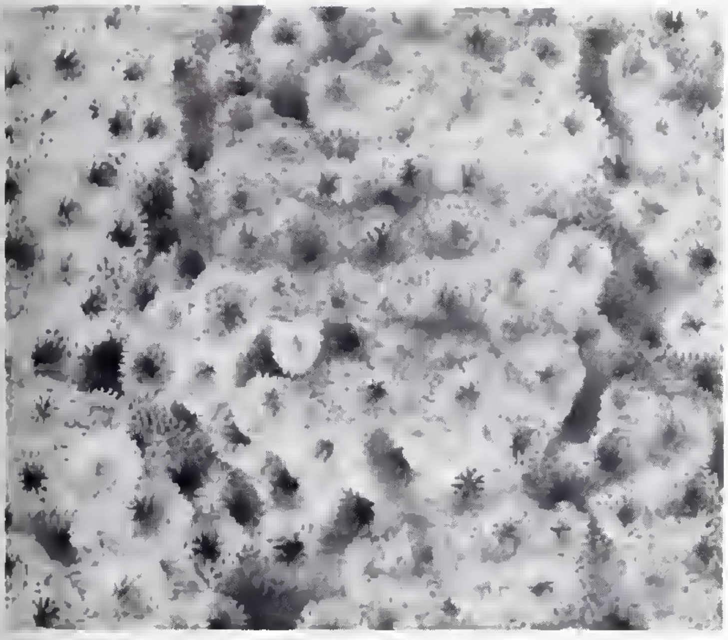


Fig 179▲

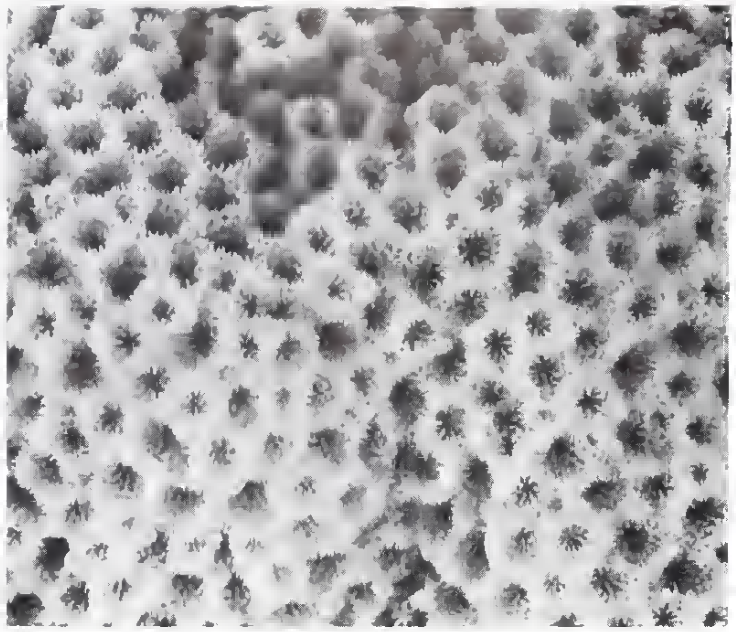


Fig. 180▲

Fig 181▼

Fig 182▼

Fig. 183▼

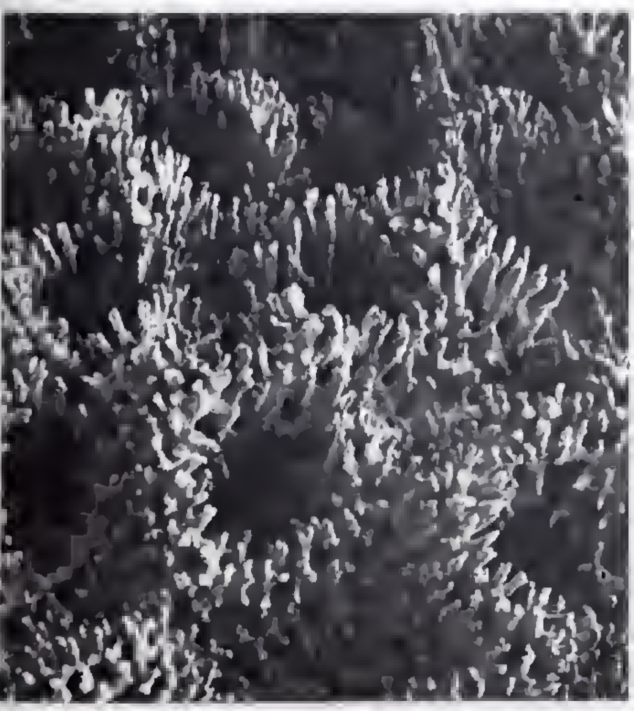
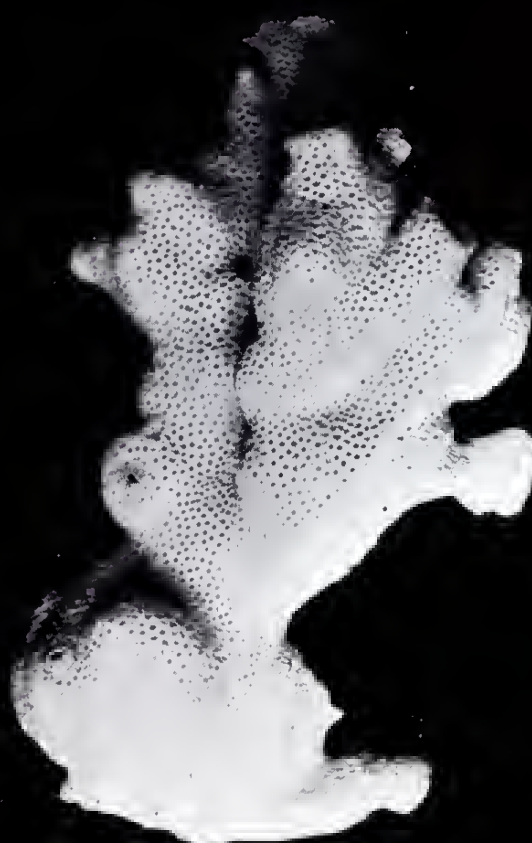


Fig. 184▼

Fig. 185▲

Fig. 186▼

Fig. 187▼



Montipora angulata (Lamarck, 1816)

Synonymy

Porites angulata Lamarck, 1816.

Montipora angulata (Lamarck); Bernard (1897).

Montipora ramosa Bernard, 1897; Nemenzo (1967).

Montipora libera Bernard, 1897.

Montipora rotunda Bernard, 1897.

Montipora cocosensis Vaughan, 1918; Scheer & Pillai (1974).

Montipora fossae Crossland, 1952.

Two fragments of Lamarck's type in the MNHN consists of tips of flattened branches primarily characterised by fine reticulum ridges between the corallites, as is Vaughan's type of *M. cocosensis*. There is little difference between the types of Bernard's species. His series of *M. ramosa* from the Gulf of Mannar (BMNH 1888-11-25-5) displays a wide range of corallite sizes but is confused with *M. digitata*. The holotype of *M. libera* from Torres Strait (BMNH 1897-3-9-201) is an encrusting corallum which does not have the normal growth form of the species. The holotypes of *M. rotunda* (BMNH 1892-12-1-9) and Crossland's *M. fossae* (BMNH 1934-5-14-194), from the Palm Islands and Low Isles respectively, are similar to each other at the centre of variation of the species.

Most descriptions of *M. ramosa* in the literature refer to *M. digitata* Dana (see p. 77).

Material studied

Murray Islands, Houghton Island, Rib Reef, Palm Islands (5 specimens), **Pandora Reef** (2 specimens).

These localities include collecting stations 40, 60, 171, 222.

Characters

Colonies have extensive encrusting bases supporting very irregular, contorted branches. Branches are usually flattened in the plane of division and divide at irregular angles and sometimes anastomose.

Corallites are immersed and are evenly distributed. Calices are 0.7-1.0mm diameter and are of uniform diameter in individual coralla. Septa are in complete cycles and consist of rows of similar, non-tapering spines. Primary septa are $\frac{2}{3}$-$\frac{3}{4}$ R. In some coralla they become elongated deep within the corallite to form a columella plug. Secondary septa are $\frac{1}{2}$-$\frac{1}{4}$ R. Thecae are poorly developed to absent. The reticulum is characteristically coarse with little or no tendency to form spinules. In some coralla the reticulum forms fine ridges between the corallites, giving them a slightly foveolate appearance.

This species is uncommon and is usually found on fringing reefs where it has a uniform pale brown colour.

Affinities

Montipora angulata does not closely resemble any other east Australian species except *M. digitata*, which is readily distinguished by its arborescent growth form and smaller, superficial corallites.

Distribution

Recorded from the Gulf of Mannar in the west, throughout the central Indo-Pacific east to the Great Barrier Reef.

Figs. 185-187 *Montipora angulata* (× 0.75)

Figs. 185, 186 From between Orpheus and Fantome Islands, Palm Islands, collecting station 60; Fig. 186 same corallum as Figs. 190, 191.

Fig. 187 From the Murray Islands, same corallum as Fig. 189.

Fig. 188▲

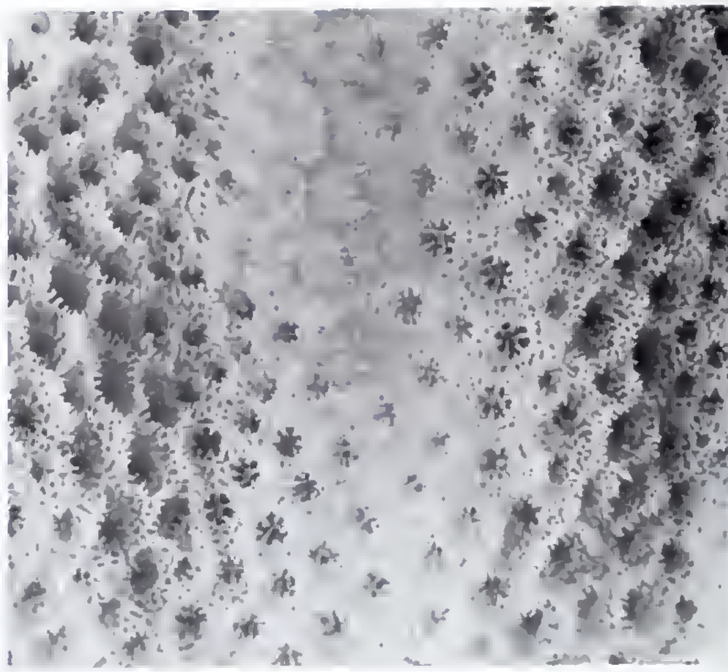


Fig. 189▲

Fig. 190▼

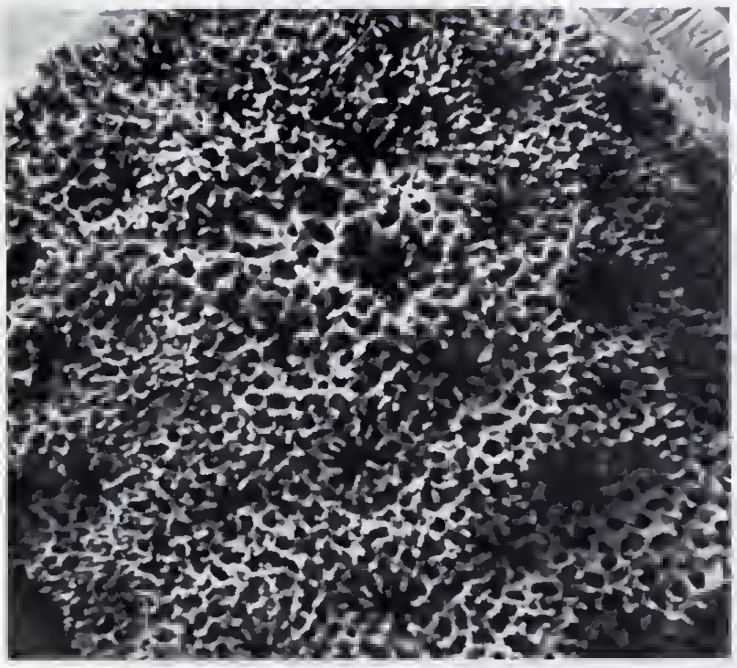


Fig. 191▼

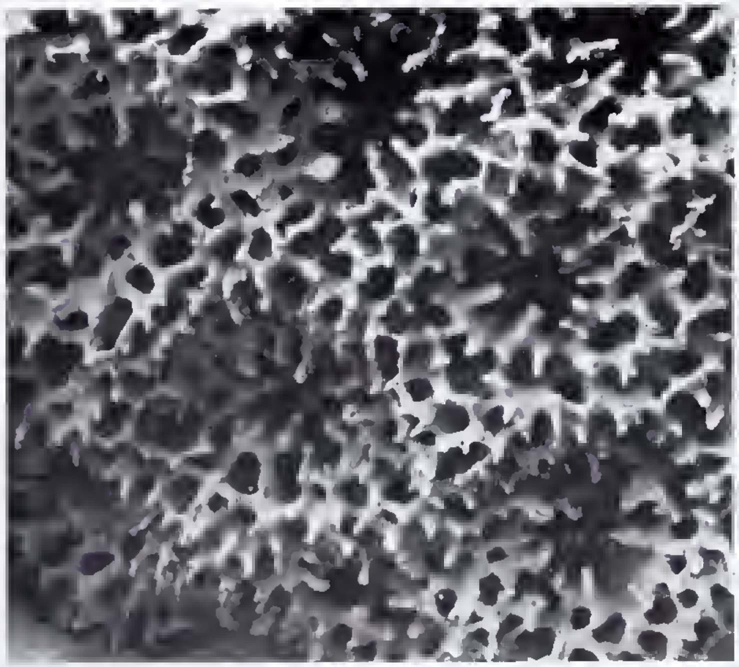


Fig. 192▼

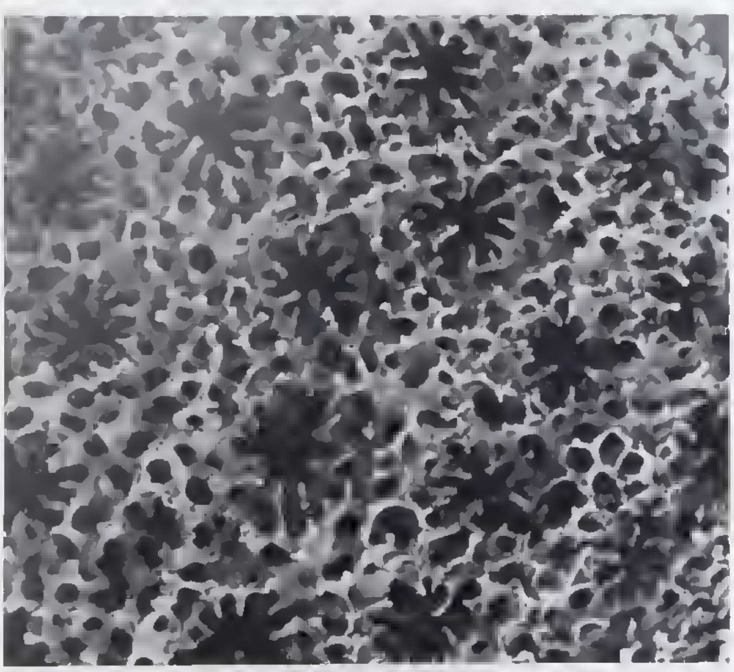
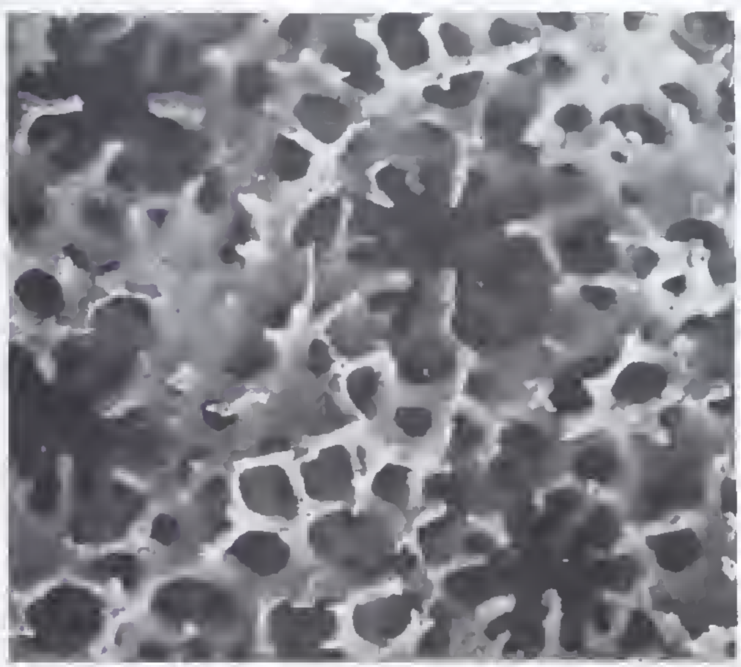


Fig. 193▼



Figs. 188-193 *Montipora angulata*

Fig. 188 From between Orpheus and Fantome Islands, Palm Islands, collecting station 60, same corallum as Figs. 192, 193, (× 5).

Fig. 189 From the Murray Islands, same corallum as Fig. 187 (× 5).

Figs. 190, 191 Same corallum from between Orpheus and Fantome Islands, Palm Islands and same corallum as Fig. 186 (× 20 and 30 respectively).

Figs. 192, 193 From between Orpheus and Fantome Islands, Palm Islands, same corallum as Fig. 188 (× 30 and 40 respectively).

Montipora digitata (Dana, 1846)

Synonymy

Manopora digitata Dana, 1846.

Manopora tortuosa Dana, 1846.

Montipora digitata Dana, 1846; Ortmann (1888); Bernard (1897); Crossland (1952); Stephenson & Wells (1955); Pillai (1967b); Scheer & Pillai (1974).

Montipora tortuosa Dana, 1846; Studer (1880); Bernard (1897); Vaughan (1918); Eguchi (1938).

Montipora rubra (Quoy & Gaimard); Quelch (1886); Bernard (1897); Nemenzo (1967).

Montipora poritiformis Verrill, 1869; Brüggemann (1879a).

Montipora divaricata Brüggemann, 1879a; Bernard (1897); Stephenson & Wells (1955).

Montipora levis Quelch, 1886; Bernard (1897); Vaughan (1918); Matthai (1923).

Montipora irregularis Quelch, 1886; Bernard (1897); Faustino (1927); Nemenzo (1967).

Montipora fruticosa Bernard, 1897; Crossland (1952); Searle (1956); Nemenzo (1967); Zou (1975).

Montipora marenzelleri Bernard, 1897; Nemenzo (1967).

Montipora indentata Bernard, 1897; Matthai (1923).

Montipora nana Bernard, 1897.

Montipora spicata Bernard, 1897.

Montipora alcicornis Bernard, 1897; Nemenzo (1967).

Montipora bolsii Bernard 1897.

Montipora spatula Bernard, 1897.

Montipora spongilla Bernard, 1900.

Montipora ramosa (Bernard); Vaughan (1918); Matthai (1923); Thiel (1932); Eguchi (1938); Crossland (1952); Ma (1959); Veron *et al.* (1974); not Bernard (1897).

Montipora compressa (Esper); Bernard (1897); Faustino (1927); Nemenzo (1967).

Montipora superficialis (Brüggemann); Bernard (1897).

Montipora palmata (Dana); Bernard (1897); not Dana (1846).

The type specimens of *M. digitata* Dana (USNM 312, MCZ 418 and YPM 4218, the latter being two fragments only) are all from Fiji and are very similar. The type specimens of *M. tortuosa* Dana (USNM 310 and YPM 4220) are similar to each other and are distinguished by having corallites up to twice the diameter of those of the *M. digitata* types, and an almost solid reticulum. Vaughan's *M. tortuosa* from the Cocos-Keeling Islands is similar to Dana's *M. tortuosa*, and so is Edwards & Haime's specimen (MCZ 416) from the East Indies, except that the reticulum is more spongy.

The holotype of *M. poritiformis* Verrill (YPM 2023) from the Ryukyu Islands is primarily characterised by a reduced or absent second septal cycle and thick, compacted branches. It shows no significant differences from specimens of the present series.

The type specimens of Bernard listed above fall into four groups:

1. The type specimens of *M. fruticosa* (BMNH 1892-12-1-526 and 328) from the Great Barrier Reef and *M. marenzelleri* (BMNH 1897-6-18-17) from the Solomon Islands

Fig. 194▲

Fig. 195▲

Fig. 196▼

are composed of fine branches which have small crowded corallites, separated in the case of *M. marenzelleri* by fine reticulum ridges.

2. *Montipora indentata* (BMNH 1892-12-1-537) and *M. nana* (BMNH 1882-2-23-158), both from the Great Barrier Reef, *M. spicata* (BMNH 1897-6-18-12) from an unknown locality, *M. alcicornis* (BMNH 1891-3-6-28) from Tonga and *M. spongilla* (BMNH 1899-5-12-19) from Christmas Island have only minor differences in growth form and have similar corallites. Bernard's *M. rubra* (Quoy & Gaimard) and *M. levis* Quelch from Fiji also belong to this group which differs from the first group primarily in having thicker branches and slightly larger corallites.
3. *Montipora bolsii* (BMNH 1883-7-24-103) from Billiton has corallites similar to those of *M. fruticosa*, but has an irregular growth form normally associated with inner reef flats.
4. *Montipora spatula* (BMNH 1892-12-1-277) from the Great Barrier Reef has the thickest branches and largest corallites of Bernard's synonyms. *Montipora compressor* (Esper) of Bernard has corallites of similar size but they are more widely spaced and the corallum has thinner, less calcified branches. The holotype of *M. irregularis* Quelch (BMNH 1886-12-9-285) is similar to *M. spatula* but has slightly wider spaced corallites, similar in structure to those of *M. indentata*. The holotype of *M. divaricata* Brüggemann (BMNH 1876-5-5-75) has corallites very similar to those of *M. irregularis*, but branches are more irregular in shape.

The holotype of *M. obtusata* Quelch from Fiji (BMNH 1886-12-9-254) has close affinities with *M. digitata*. It is a flat plate, 10.4cm diameter, with irregular, upright branches <2.8cm high. The surface is smooth, the reticulum compact. Corallites are small and widely spaced, similar to those of *M. fruticosa*, except that septa are better developed (two sub-equal cycles $<\frac{3}{4}$R).

Figs. 194-196 *Montipora digitata* (× 0.5)

Fig. 194 From Bewick Island, collecting station 39, same corallum as Fig. 197.
Fig. 195 From Broadhurst Reef, collecting station 223, same corallum as Figs. 203, 204.
Fig. 196 From Hope Island, same corallum as Figs. 198, 205.

Figs. 197, 198 *Montipora digitata* (× 5)

Fig. 197 From Bewick Island, came corallum as Fig. 194.
Fig. 198 From Hope Island, same corallum as Figs. 198, 205.

Fig. 197▼

Fig. 198▼

Material studied

Great Detached Reef, Bewick Island (3 specimens), **Houghton Island** (7 specimens), **Three Isles, Hope Island** (9 specimens), **Low Isles** (7 specimens), **Palm Islands** (16 specimens), **Keeper Reef** (2 specimens), **Broadhurst Reef** (3 specimens), **Magnetic Island** (6 specimens).

These localities include collecting stations 5, 18, 39, 40, 45, 60, 223.

Characters and skeletal variation

Despite its extensive synonymy, *M. digitata* has well-defined characters and is readily recognisable. Coralla are digitate to arborescent, with irregularly anastomosing branches which vary in length and shape according to environmental conditions. Coralla from intertidal and subtidal reef flats, where this species is particularly abundant, have short, flattened, highly anastomosed branches and may frequently form 'micro-atolls'. Coralla from deeper water have increasingly elongated branches which develop a lax branching pattern.

The general appearance also varies with depth. Coralla from intertidal biotopes have relatively small, shallow, closely spaced corallites while those from deeper water are larger, more widely spaced and more excavated. Three distinct ecomorphs may be recognised:

1. Coralla from intertidal biotopes protected from strong wave action are encrusting or consist of a tightly compacted mass of branches and plates which are often of even length. Corallites are very fine, with calices 0.3-0.5mm diameter. The first septal cycle is usually complete, $<\frac{1}{2}R$, the septa being composed of irregular spines only. The second cycle is seldom more than a few irregular spines. The reticulum is fine with spinules having elaborated tips. Reticulum ridges are weakly developed or absent.

2. Coralla from subtidal biotopes protected from wave action (Figs. 195, 202) have thin, anastomosing, terete or tapering branches which may be tightly compacted. Corallites are separated by reticulum ridges and are well excavated, with calices up to 0.8mm diameter. Septa are reduced to irregular rows of spines. The reticulum is relatively coarse, becoming flaky.

Figs. 199-206 *Montipora digitata*

Fig. 199, 200 Same corallum from Low Isles (× 20 and 40 respectively).
Figs. 201, 202 Same corallum from Low Isles (× 20 and 40 respectively).
Figs. 203, 204 Same corallum from Broadhurst Reef and same corallum as Fig. 195 (× 20 and 40 respectively).
Fig. 205 From Hope Island, same corallum as Figs. 196 and 198 (× 60).
Fig. 206 From Magnetic Island (× 40).

Fig. 199▼

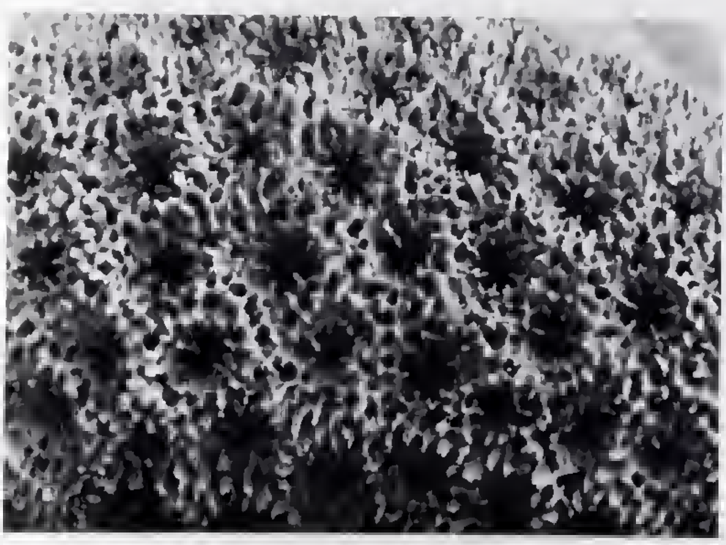
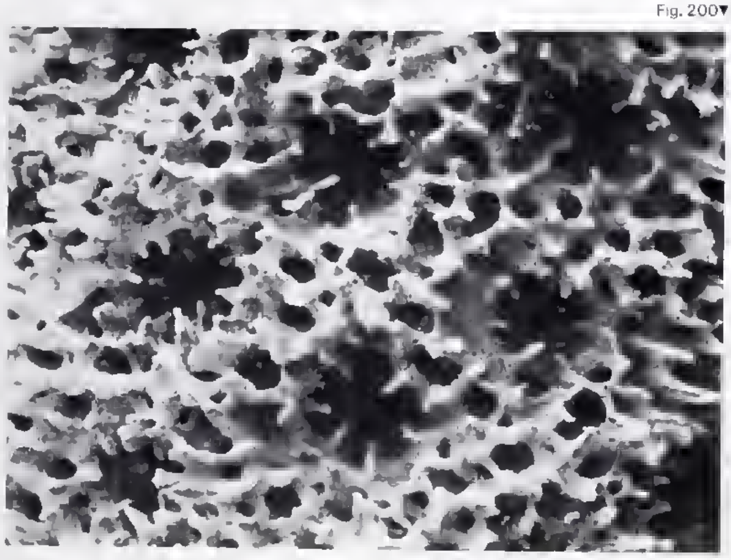


Fig. 200▼



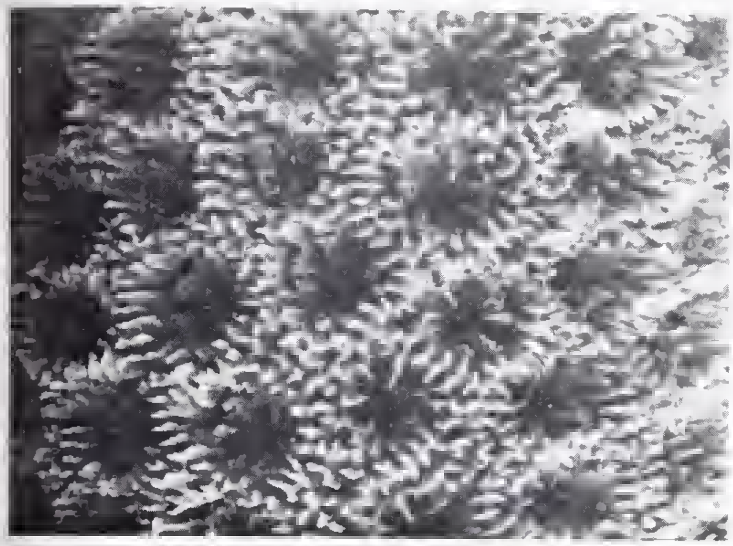


Fig 201▲

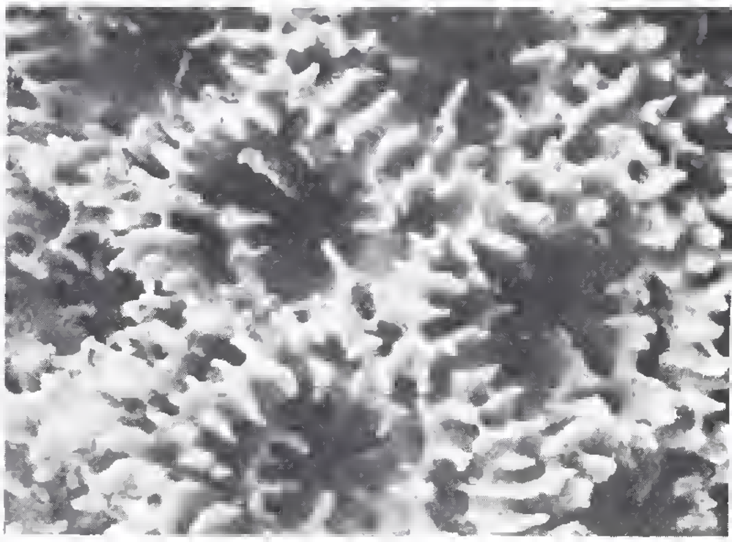


Fig 202▲

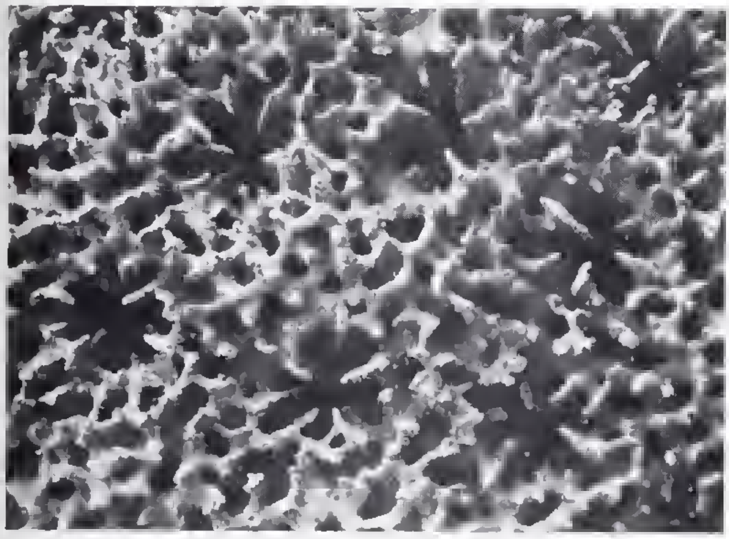
Fig 203▼


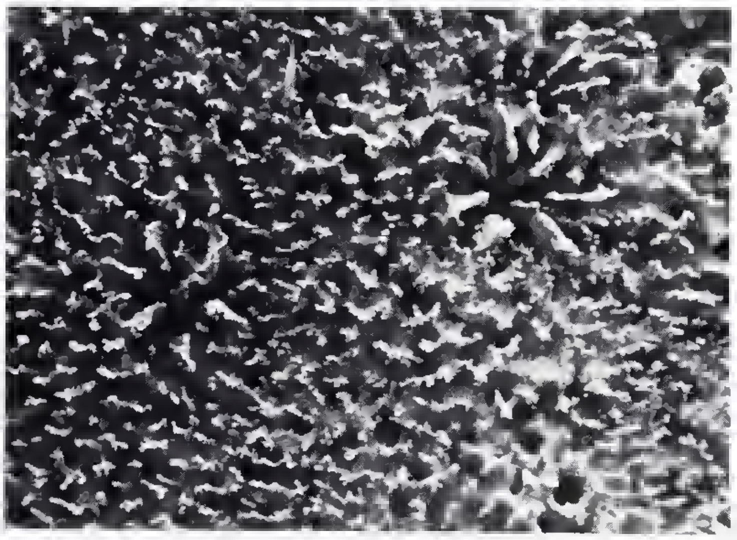
Fig. 204▼


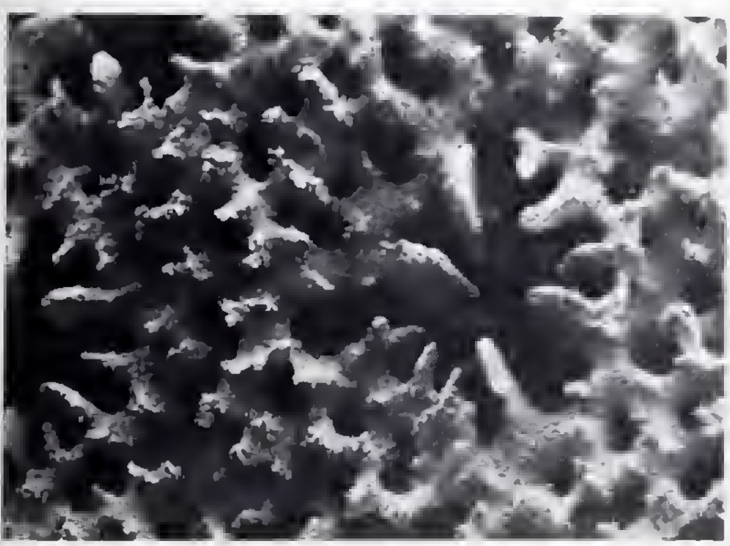
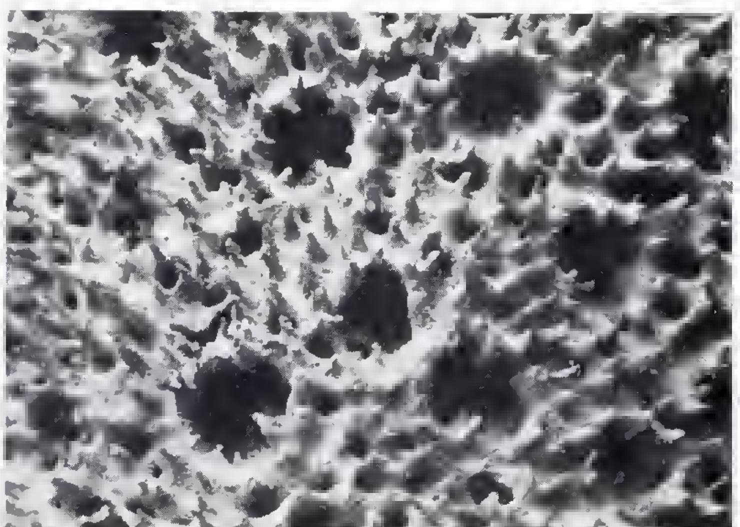
Fig. 205▼


Fig. 206▼


3. Coralla from reef slopes (Fig. 196) become arborescent with branches up to 16mm diameter. Branches are sometimes fused into plates. Corallites are similar in size and shape to those of 2 above but usually have a much better septation. The first septal cycle is complete, $<\frac{2}{3}R$; the second is usually incomplete, $<\frac{1}{3}R$.

Living colonies are usually pale cream or brown in colour.

Affinities

Montipora digitata does not resemble any other east Australian species except *M. angulata* (see p. 75).

Distribution

Widely distributed throughout the tropical Indo-Pacific, from the western Indian Ocean east to Fiji.

Montipora hispida (Dana, 1846)

Synonymy

Manopora hispida Dana, 1846.

?*Manopora expansa* Dana, 1846.

Montipora hispida (Dana); Studer (1880); Ortmann (1888); Bernard (1897); Matthai (1923); Stephenson & Wells (1955); Ma (1959); Nemenzo (1967); Eguchi (1968); Zou (1975).

Montipora expansa (Dana); Studer (1880); Ortmann (1888); Bernard (1897).

Montipora patula Verrill, 1869; Quelch (1886); Bernard (1897); Vaughan (1907).

Montipora hirsuta Bernard, 1897; *non M. hirsuta* Nemenzo, 1967.

?*Montipora stratiformis* Bernard, 1897.

?*Montipora punctata* Bernard, 1897.

Dana's specimen USNM 341 of *M. hispida* from Singapore (probably the specimen illustrated Pl. 44, Fig. 5) is designated lectotype of this species. Specimens USNM 340 and YPM 4214 and 4217 (the latter marked type) from the East Indies may be secondary types of the same species or Dana's *M. spumosa* Lamarck. Only YPM 4214 is identical to specimens in the present collection, the primary type having more proliferous reticulum papillae towards branch ends than found in east Australian coralla.

Dana's *M. expansa* (YPM 4212 and 1890 and USNM 325) includes similar plate-like or foliose coralla from Singapore and Fiji. They are probable synonyms of *M. hispida*, but have reticulum ridges near the perimeter of plates which are not found in any coralla of the present series.

Montipora patula of Verrill (1869) and Vaughan (1907) are similar plate-like *M. hispida* from Hawaii.

The three synonyms of Bernard all have type specimens without the distinctive characters of *M. hispida* clearly developed. The holotype of *M. punctata* from Torres Strait (BMNH 1892-12-1-16) is a poorly calcified plate-like corallum similar to coralla in the present series from turbid water (such as occurs at the type locality). The holotype of *M. hirsuta* from ? Tonga (BMNH 1961-12-6-2) has a very coarse reticulum but has corallites identical to those of some coralla of the present series. The holotype of *M. stratiformis* from New Guinea (BMNH 1897-6-181-1) is a nondescript fragment similar to *M. punctata*.

Material studied

Yorke Island (5 specimens), **Little Mary Reef** (2 specimens), **Arden Island** (4 specimens), **Sue Island** (5 specimens), **Turtle Islands** (4 specimens), **Raine Island** (5 specimens), **Bird Island, Tijou Reef, Lizard Island, Willis Islet** (3 specimens), **Magdelaine Cay** (2 specimens), **Britomart Reef, Rib Reef** (6 specimens), **Palm Islands** (17 specimens), **Broadhurst Reef** (5 specimens), **Magnetic Island** (2 specimens), **Chesterfield Reefs, Pompey Reef** (3 specimens), **Fitzroy Reef**.

These localities include collecting stations 8, 13, 17, 31, 33, 34, 41, 45, 70, 71, 91, 105, 151, 152, 158, 161, 165, 167, 174, 177, 182, 183, 185, 189, 199, 200, 212, 222, 223.

Characters and skeletal variation

Coralla may be massive, sub-massive, columnar, digitate, sub-arborescent, horizontal plates, or various combinations of these forms. Growth form is partly environmentally determined, thus massive, sub-massive and columnar colonies occur in well-illuminated biotopes exposed to wave action, digitate and sub-arborescent colonies occur in more protected biotopes while the wide range of plate-like colonies usually occur in turbid or deep water biotopes. However, it is common for a wide range of growth forms to occur in a single biotope, where growth form appears to be primarily determined by space availability. Thus, lateral plate-like expansions may continue until space becomes restricted, whereupon upward branches develop.

Corallites are immersed to 2mm exsert in the same corallum. Calices are a uniform 0.6-0.7mm diameter. Septa consist of rows of spines with primary septa reaching $\frac{3}{4}$R, usually with one or both directive septa being larger than the others. Secondary septa are $\frac{1}{2}$R to absent. Each corallite is surrounded by 4-8 thecal papillae which may have synapticular connections forming a porous synapticulotheca. Reticulum papillae are smaller and more widely spaced. All papillae are covered with spinules, especially at their tips, giving them a very elaborate appearance. Individual spinules may also have elaborated tips. Beneath the papillae the reticulum is coarse, with individual elements reaching 0.2mm diameter.

All corallites on upward growing surfaces have a very uniform appearance, whilst those on flat surfaces tend to be completely immersed with short, less elaborated papillae. Papillae may be completely absent on plate-like coralla. Corallites have short septa composed of thick spines and usually two complete cycles are formed. At the other extreme, corallites of massive coralla usually have the second cycle reduced or absent. Such coralla may also have a heavily calcified reticulum with the usual coarse spongy structure obliterated (as in Dana's type specimens). Plates are bifacial with small, widely spaced corallites on the undersurface. These may become overgrown by the epitheca.

Living colonies are pale brown, or pale brown with white branch-tips.

Affinities

Montipora hispida has corallites similar to those of *M. efflorescens*, *M. nodosa* (see p. 97) and *M. grisea* (see p. 99), but is usually readily distinguished from these species by its growth forms. In superficial appearance it is closest to *M. efflorescens*, from which it is distinguished by having thecal papillae clearly larger than reticulum papillae, whereas *M. efflorescens* has papillae of almost uniform size (see p. 93).

Plate-like coralla or parts of coralla of *M. hispida*, which have immersed corallites and consequently reduced thecal papillae, are readily confused with several other species, notably *M. peltiformis*. Some flat parts of coralla of these otherwise distinct species may be so alike as to be indistinguishable.

Distribution

Widely distributed in the tropical Pacific east to Hawaii and also in the Indian Ocean west to Sri Lanka.

Figs. 207-213 *Montipora hispida* (× 0.5)

Figs. 207, 208 From Sue Island, collecting station 17; Fig. 207, same corallum as Fig. 222; Fig. 208 same corallum as Figs. 214, 223.
Fig. 209 From the Pompey Complex, collecting station 105, same corallum as Figs. 219, 220, 221.
Fig. 210 From the Turtle Islands, collecting station 165.
Fig. 211 From Rib Reef, collecting station 222.
Fig. 212 From Broadhurst Reef, collecting station 223.
Fig. 213 From Sue Island, collecting station 17, same corallum as Fig. 215.

Fig. 207▼

Fig. 208▼

Fig. 209▼

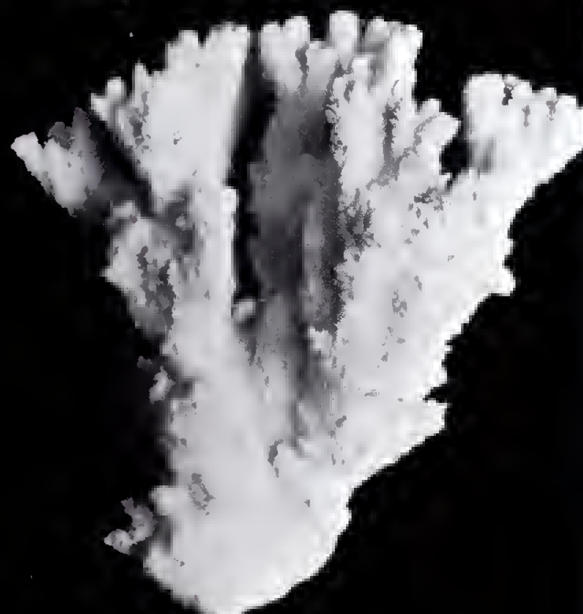


Fig. 210▼

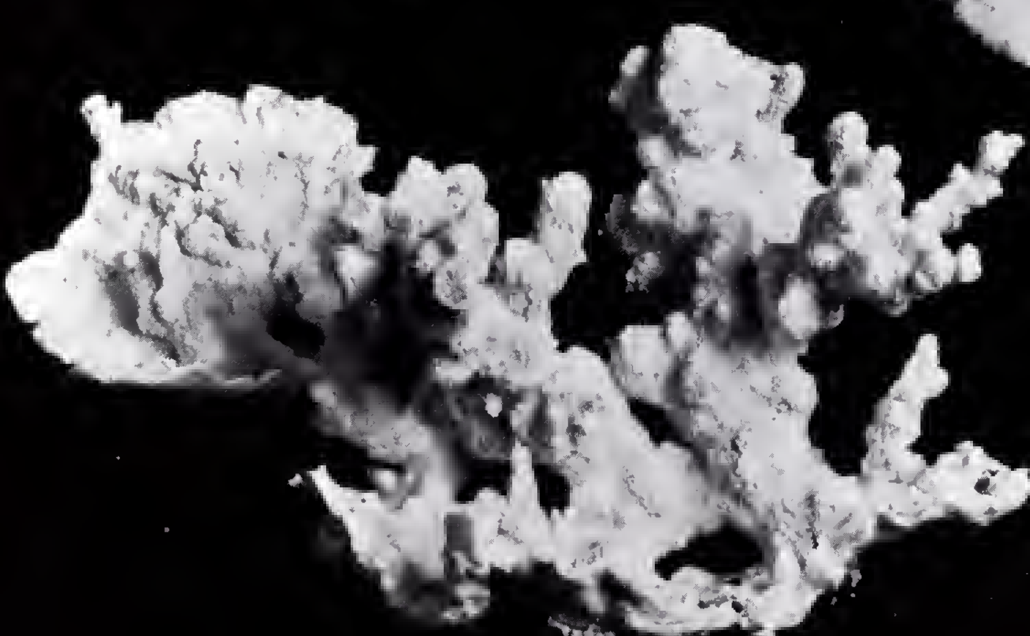


Fig. 211▼

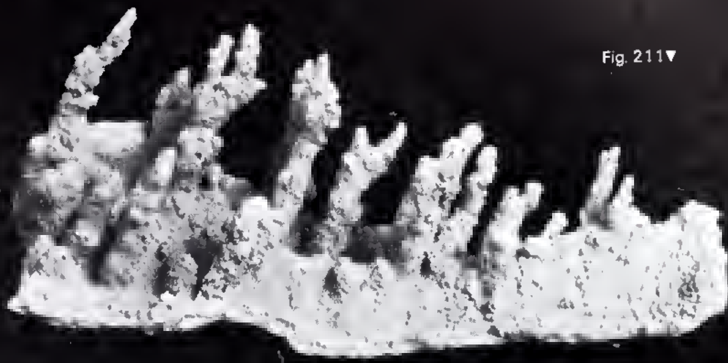


Fig. 212▼

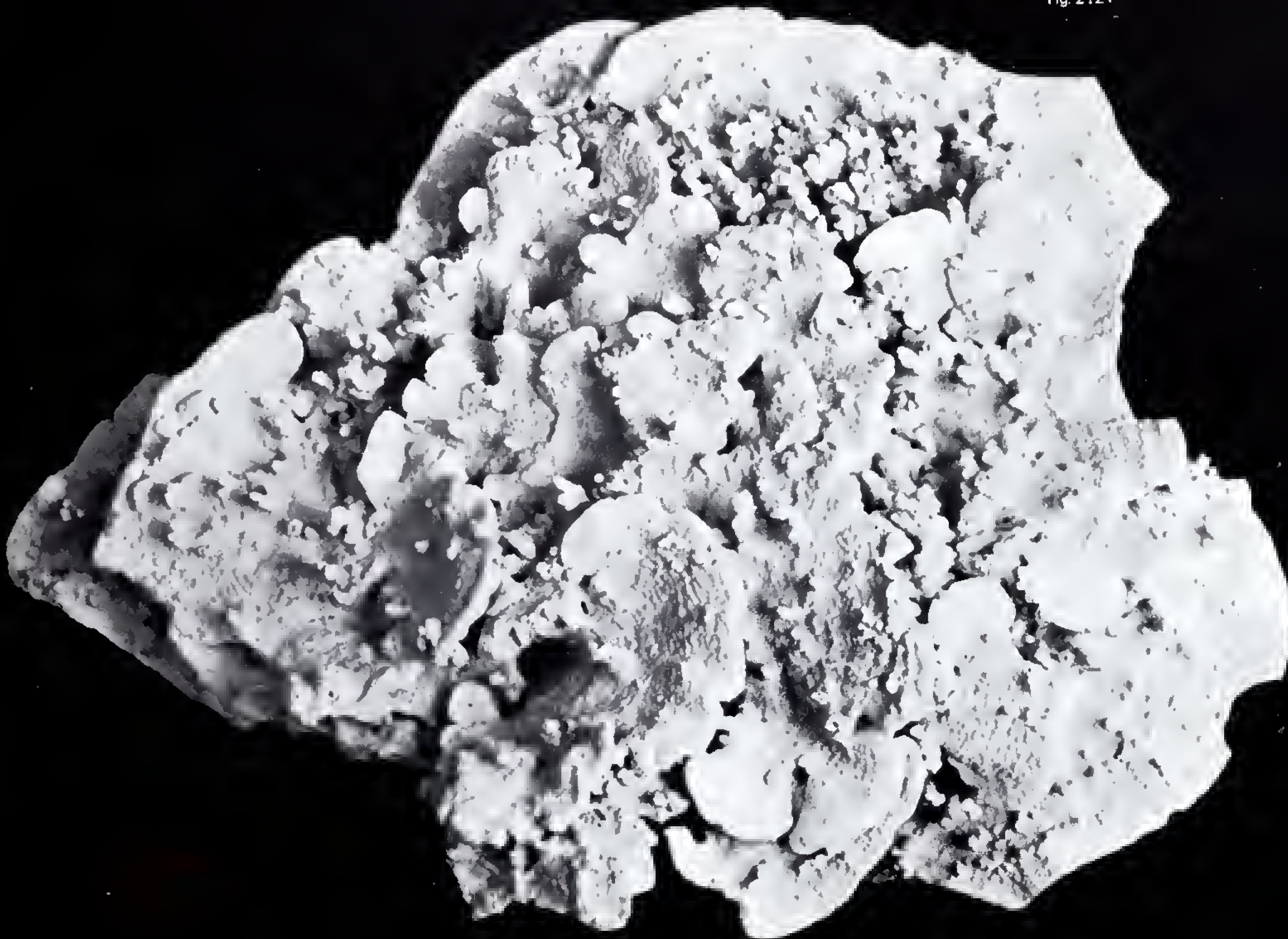
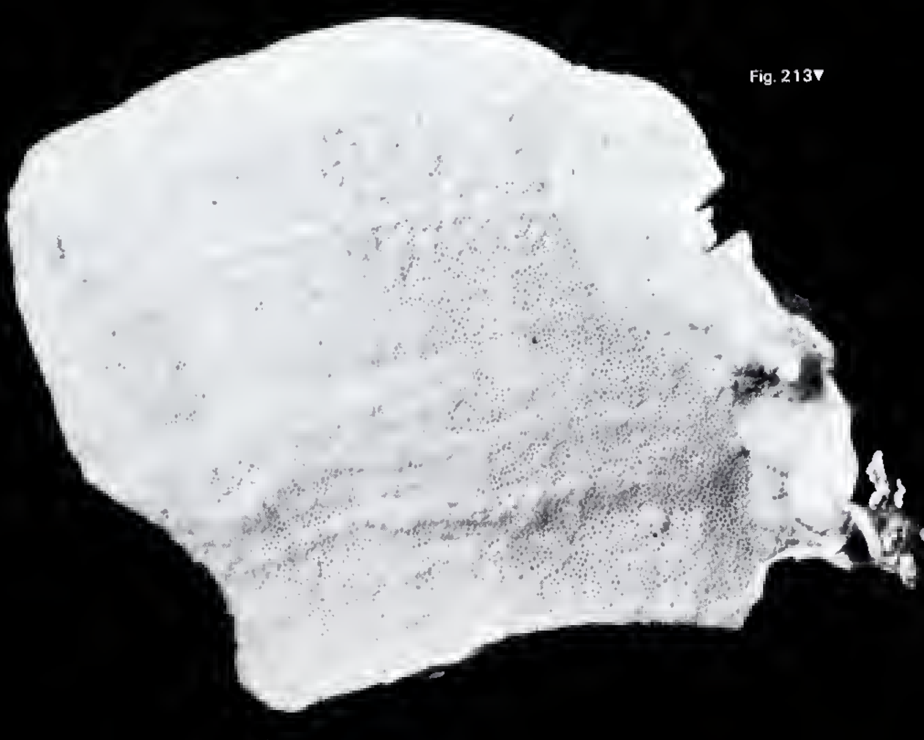


Fig. 213▼



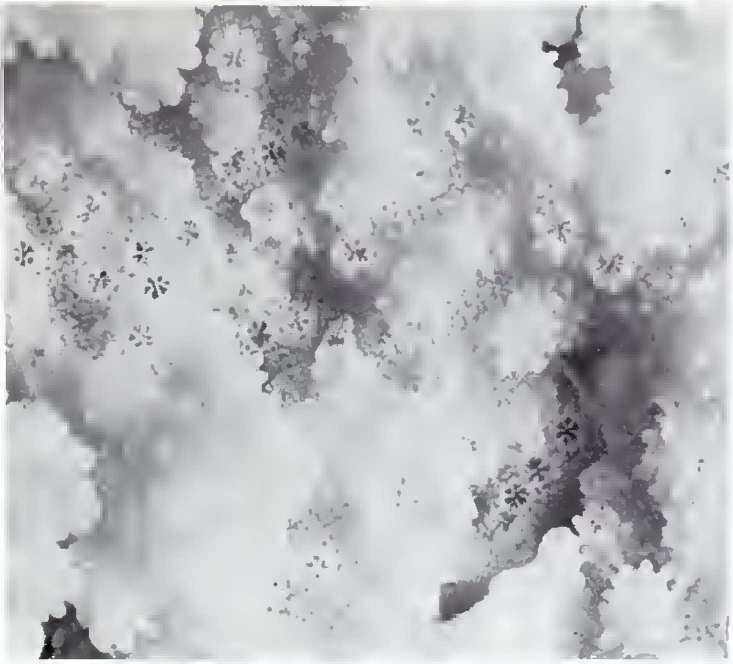


Fig. 214▲

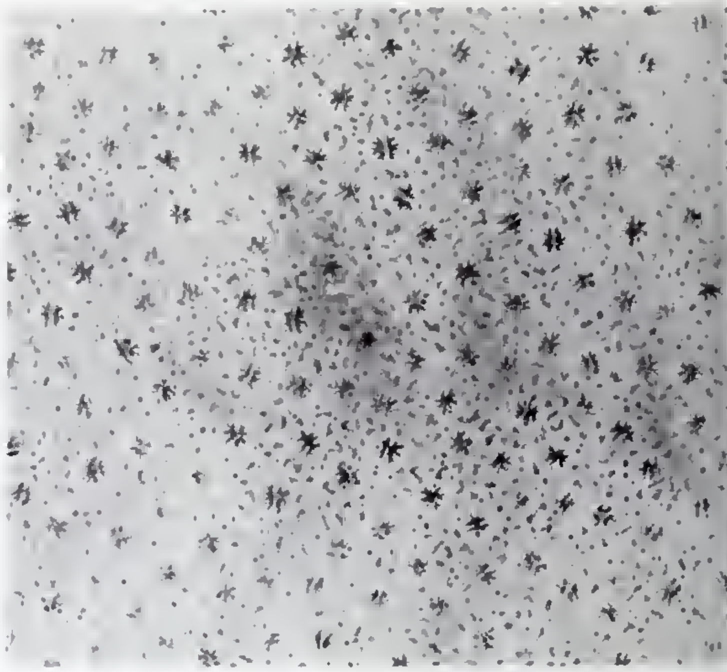


Fig. 215▲

Fig. 216▼

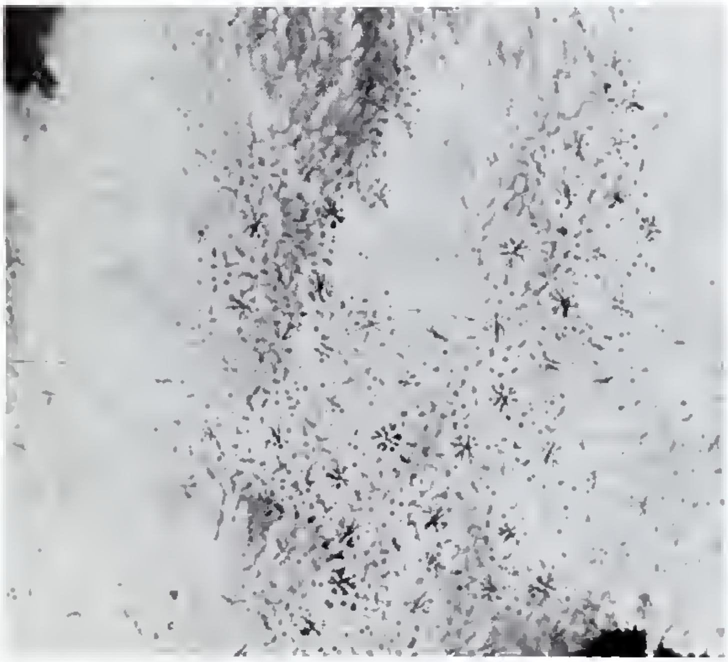


Fig. 217▼

Fig. 218▼

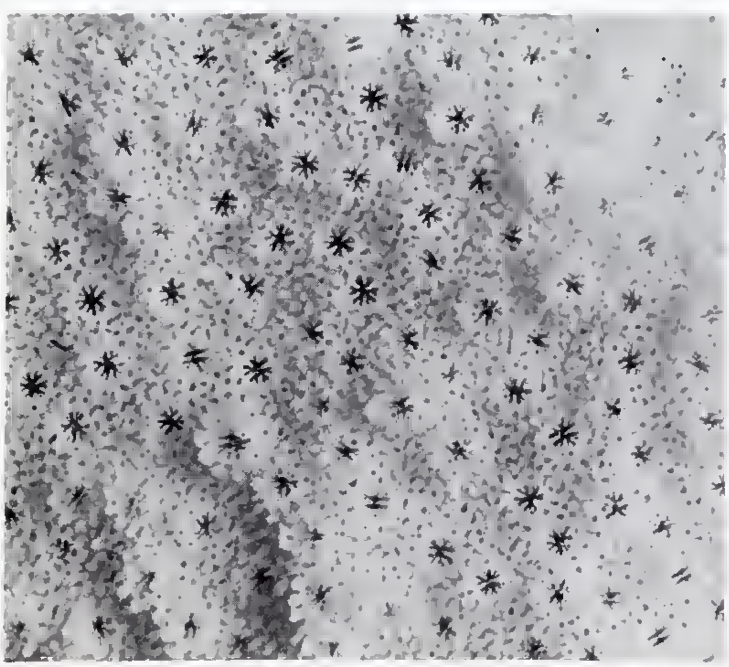


Fig. 219▼

Figs. 214-219 *Montipora hispida* (× 5)

Fig. 214 From Sue Island, same corallum as Figs. 208, 223.

Fig. 215 From Sue Island, same corallum as Fig. 213.

Figs. 216, 217 Same corallum from Yorke Island, collecting station 13.

Fig. 218 From Yorke Island.

Fig. 219 From the Pompey Complex, same corallum as Figs. 209, 220 and 221.

Figs. 220-223 *Montipora hispida*

Figs. 220, 221 Same corallum from the Pompey Complex and same corallum as Figs. 209, 219 (× 20 and 40 respectively).

Figs. 222, 223 From Sue Island, same corallum as Figs. 207, 208 (respectively) (× 40 and 60 respectively).

Fig. 220▼

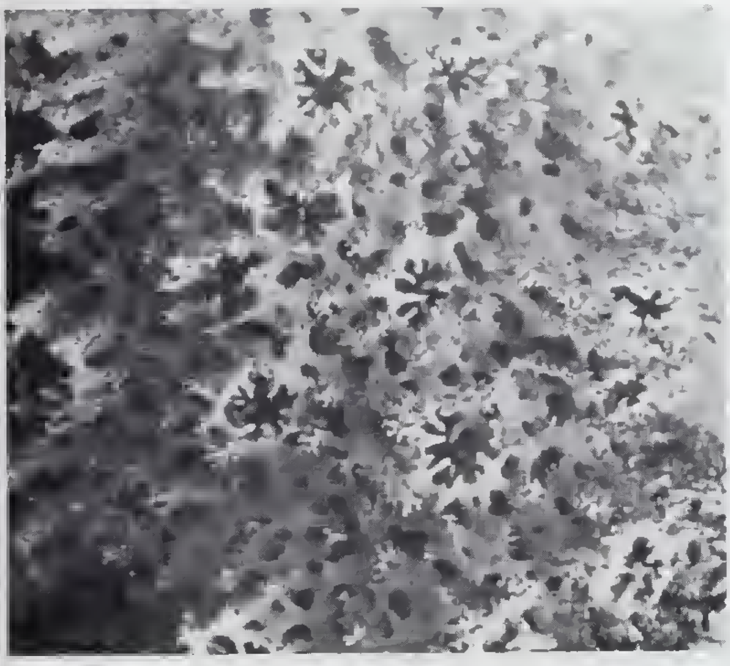


Fig. 221▼

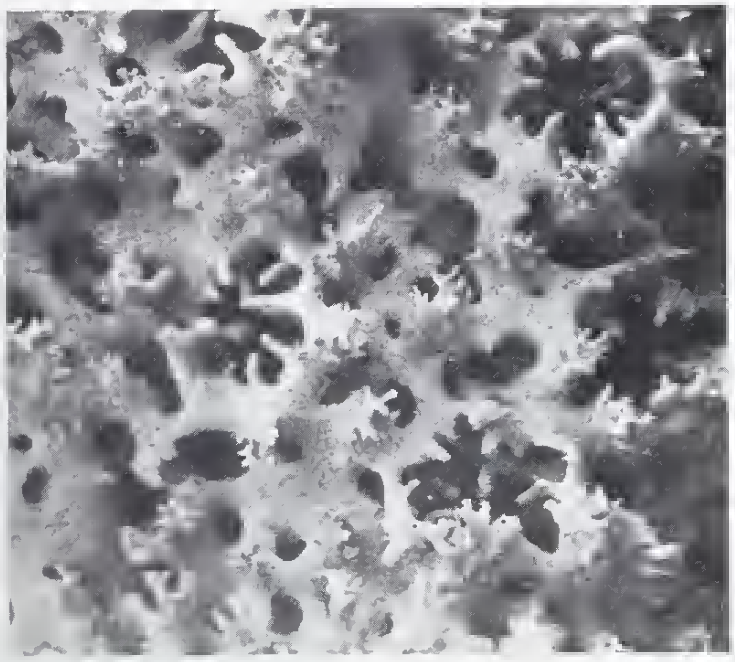


Fig. 222▼

Fig. 223▼

Montipora australiensis Bernard, 1897

Synonymy

Montipora australiensis Bernard, 1897; Matthai (1923); Hoffmeister (1929); Ma (1959).

Bernard's holotype from the Houtman Abrolhos Islands (BMNH 1895-10-9-58) differs from the present series in having a more foliose growth form. Corallite and coenosteum characters, however, are virtually identical to Fig. 229. Hoffmeister (1929, p. 362) notes that this species is very common in Tahiti.

Material studied

Willis Islet, Lihou Reefs (4 specimens), **Flinders Reef (Coral Sea), Marion Reef** (4 specimens), **Chesterfield Reefs**.

These localities include collecting stations 168, 199, 202, 203, 204, 215, 226.

Characters

Colonies form thick, horizontal, bifacial plates with entire margins. Central parts of plates become digitate or columnar. Columns are <2.5cm diameter and are relatively uniform in shape and size. They have rounded ends and frequently divide and anastomose and thus may form a compact mass, up to 25cm in height.

Immersed and exsert corallites are intermixed. The latter are surrounded with fused thecal papillae forming a tube which may be fused with, and indistinguishable from, the theca. In some corallites, the theca and thecal papillae form concentric tubes. Calices are approximately 0.8mm diameter. Septa are in two complete cycles up to $\frac{2}{3}$R and $\frac{1}{2}$R. Primary septa consist of rows of thick spines; one or both directive septa may be distinguished and are sometimes fused deep within the corallite. Secondary septa consist of rows of thinner spines.

The most distinctive characteristic of the species is the reticulum ridges which join corallites. These ridges are particularly prominent near the perimeter of plates and the tops of columns, where they are thin and high and have margins ornamented by transversely flattened spinules. The ridges and fused papillae are all composed of fine reticulum which is distinct from the intervening basal reticulum which is much coarser. Unfused papillae are inconspicuous or absent.

The only recorded colour of living colonies is pale brown. This species has not been found on the Great Barrier Reef.

Affinities

Montipora australiensis has close affinities with *M. nodosa* although coralla are readily distinguished (see p. 97).

Distribution

Recorded from Western Australia to Tahiti.

Figs. 224-226 *Montipora australiensis* (× 0.5)

Fig. 224 From Marion Reef, collecting station 203, same corallum as Figs. 227, 230.
Fig. 225 From Lihou Reef, collecting station 202, same corallum as Figs. 228, 231, 232.
Fig. 226 From Willis Island, collecting station 199, same corallum as Fig. 229.

Figs. 227-232 *Montipora australiensis*

Fig. 227 From Marion Reef, same corallum as Figs. 224 and 230 (× 5).
Fig. 228 From Lihou Reef, same corallum as Figs. 225, 231, 232 (× 5).
Fig. 229 From Willis Island, same corallum as Fig. 226 (× 5).
Fig. 230 From Marion Reef, same corallum as Figs. 224, 227 (× 20).
Figs. 231, 232 Same corallum from Lihou Reefs and same corallum as Figs. 225, 228 (× 20 and 40 respectively).

Fig. 224▲

Fig. 225▼

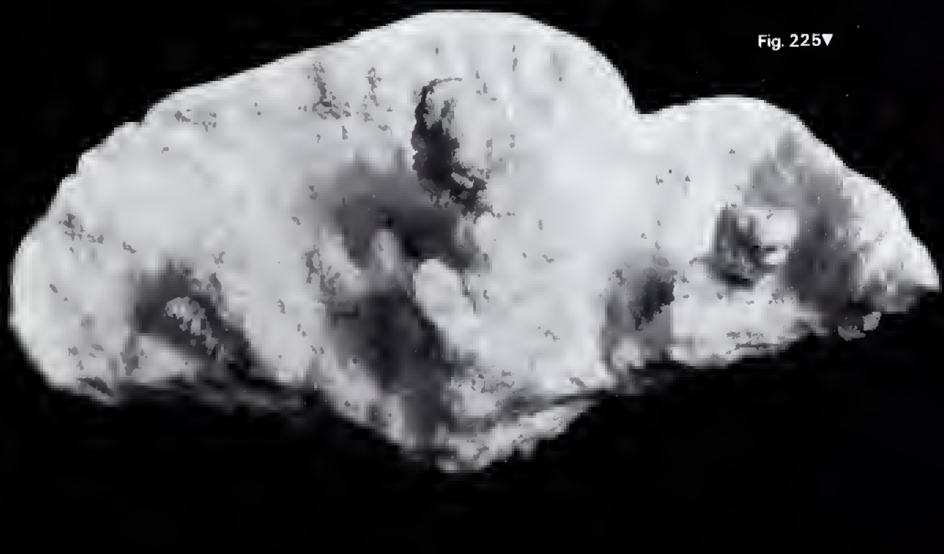


Fig. 226▼

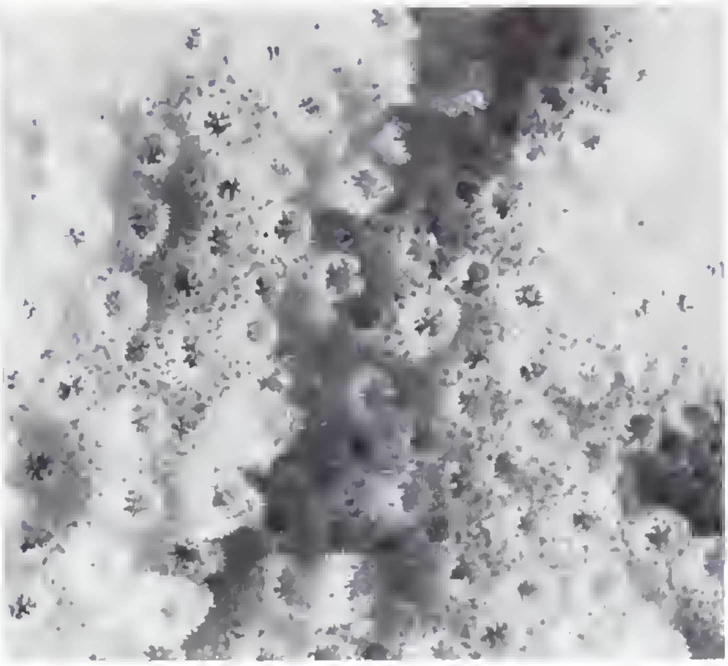


Fig. 227▲

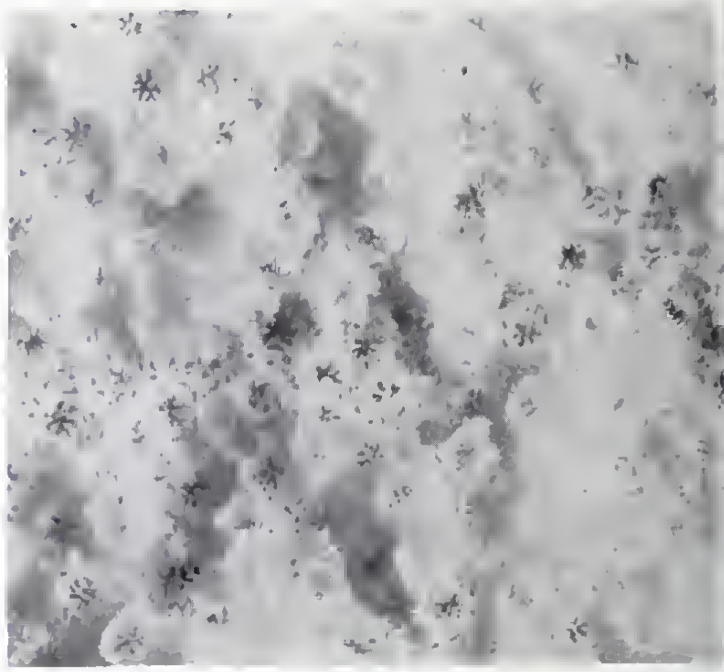


Fig. 228▲

Fig. 229▼

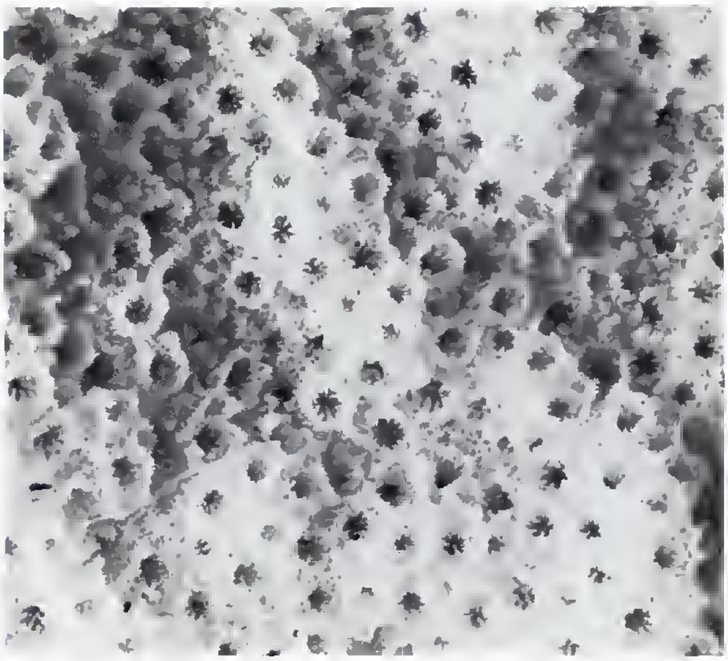


Fig. 230▼

Fig. 231▼

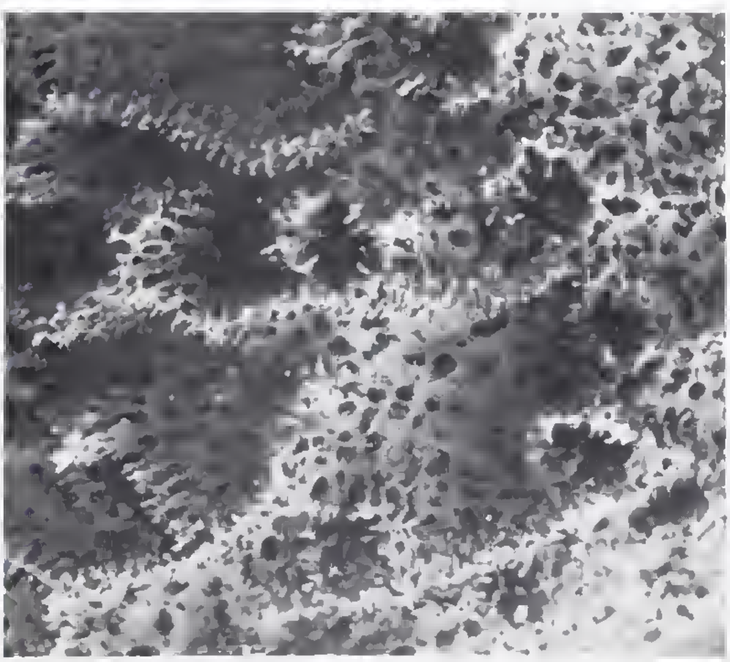


Fig. 232▼

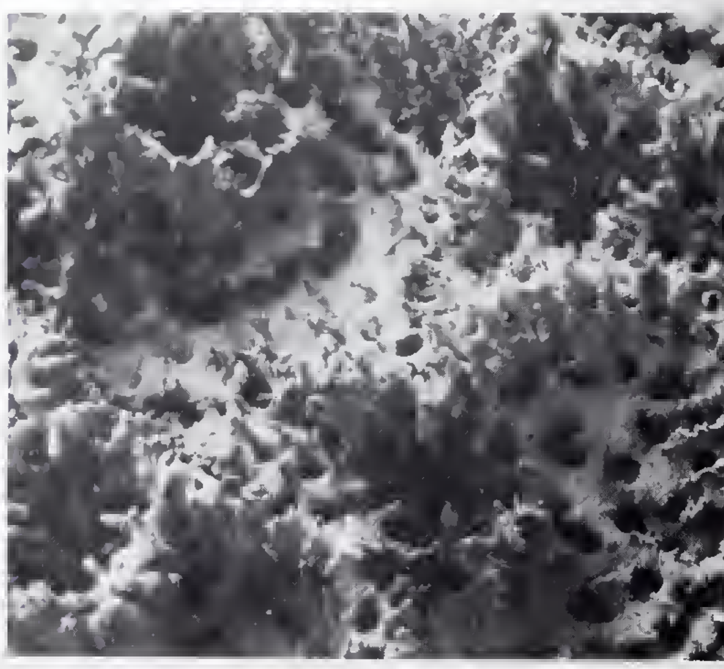


Fig. 233▲

Fig. 233 *Montipora efflorescens* from Willis Island, collecting station 199, same corallum as Fig. 241 (× 0.75).

Montipora efflorescens Bernard, 1897

Synonymy

?*Manopora effusa* Dana, 1846; *non Montipora effusa* Bernard (1897).

Montipora efflorescens Bernard, 1897; Eguchi (1938); Searle (1956).

Montipora trabeculata Bernard, 1897; Hoffmeister (1925); Stephenson & Wells (1955); Zou (1975).

Dana's type series of *M. effusa* from Tahiti (YPM 4213, MCZ 421, USNM 361, of which the last is designated lectotype) differs from the present series in having a more irregular growth form and in having less numerous and less elaborated reticulum papillae.

Of Bernard's two nominal species, *M. efflorescens* (BMNH 1897-10-9-1) is selected as the name of this species, as the holotype is unmistakable. The holotype of *M. trabeculata* from the Great Barrier Reef (BMNH 1892-12-1-268) is an ecomorph of the species from a shallow turbid environment.

Material studied

Big Mary Reef (2 specimens), **Raine Island** (2 specimens), **Great Detached Reef** (2 specimens), **Tijou Reef** (2 specimens), **Corbett Reef, Lizard Island, Willis Islet, Magdelaine Cay, Rib Reef, Palm Islands** (14 specimens), **Broadhurst Reef** (11 specimens), **Magnetic Island, Middleton Reef** (5 specimens), **Elizabeth Reef** (2 specimens).

These localities include collecting stations 1, 37, 38, 41, 42, 43, 45, 57, 151, 155, 156, 164, 174, 187, 199, 200, 222, 231, 233, 236, 238.

Characters

Colonies are massive, with a surface of irregular mounds developing into fused globular protuberances up to 15mm high and 12mm wide. Corallites are separated by 2-4 calice diameters and are immersed, with calices 0.6-0.7mm diameter. Septa are composed of rows of slender spines and are of uniform length or slightly tapered. They are in two complete cycles of $\frac{2}{3}$R and $\frac{1}{3}$-$\frac{1}{4}$R, primary septal spines being thicker than secondary spines and sometimes having thickened tips. The reticulum, when visible, is coarse, but is usually obliterated by papillae. Thecal and reticulum papillae are seldom clearly differentiated and all papillae are covered with elaborated spinules. In some coralla highly elaborated reticulum and papillae spinules form a thick, uniform cover.

This species usually occurs on reef slopes where it may be common. It is usually bright or dark green in colour.

Figs. 234-241 *Montipora efflorescens*

Figs. 234, 235 Same corallum from Orpheus Island, Palm Islands, collecting station 91 (× 20 and 40 respectively).

Figs. 236, 237 Same corallum from Orpheus Island, Palm Islands, collecting station 45 (× 20 and 40 respectively).

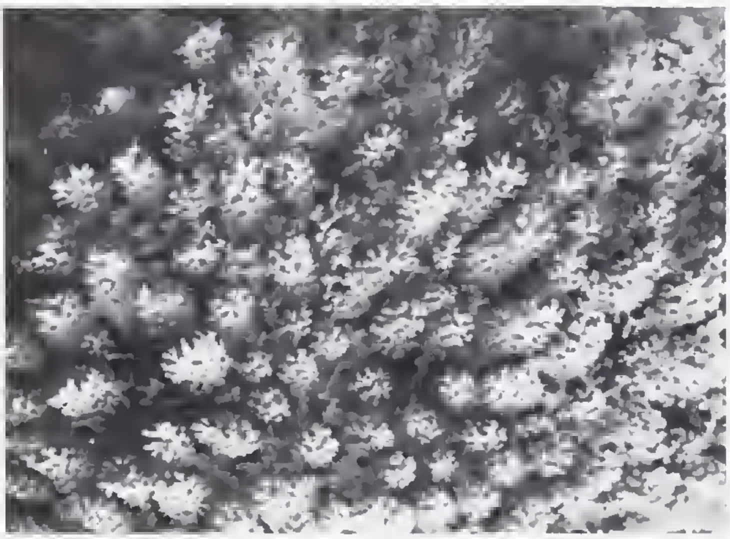


Fig. 234▲

Fig. 235▲

Fig. 236▼

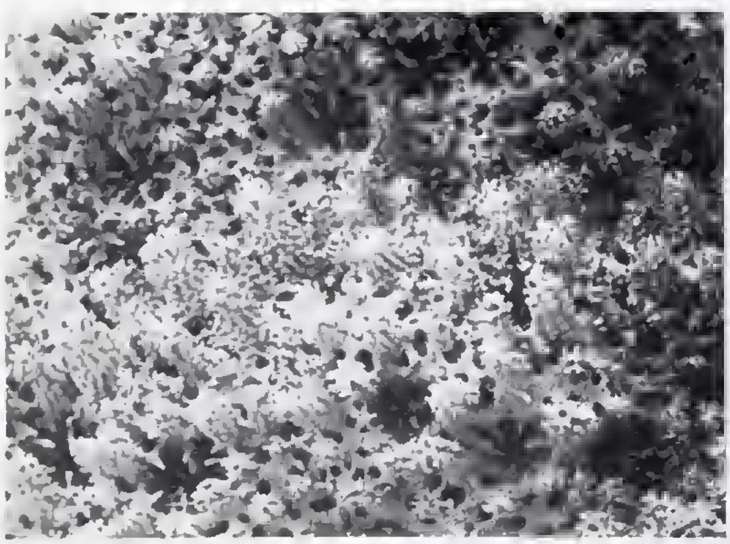
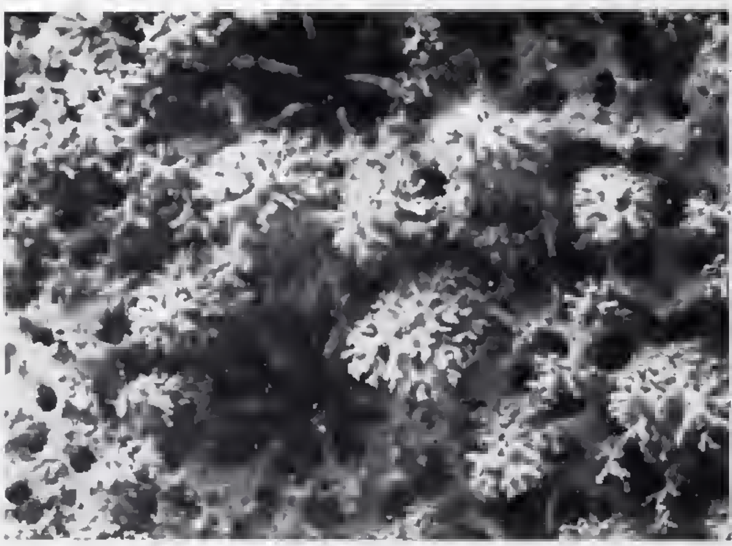


Fig. 237▼



Affinities

Montipora efflorescens may closely resemble *M. hispida* and can also be confused with *M. informis*. Coralla of *M. hispida* from biotopes exposed to strong wave action can have the same massive growth form with globular protuberances as has *M. efflorescens* both having corallites of similar size. These species are distinguished by the presence of strongly differentiated thecal papillae in *M. hispida* and little or no such differentiation in *M. efflorescens*. *Montipora informis* is primarily distinguished by its smaller corallites and also in having fine compacted reticulum papillae of very uniform length and no thecal papillae.

Distribution

Widely distributed in the Pacific east to Tahiti and is also found at Chagos and along the west Australian coast.

Figs. 238, 239 Same corallum from Corbett Reef, collecting station 164 (× 20 and 40 respectively).
Fig. 240 From Three Isles (× 20).
Fig. 241 From Willis Island, same corallum as Fig. 233 (× 20).


Fig. 238▲


Fig. 239▲

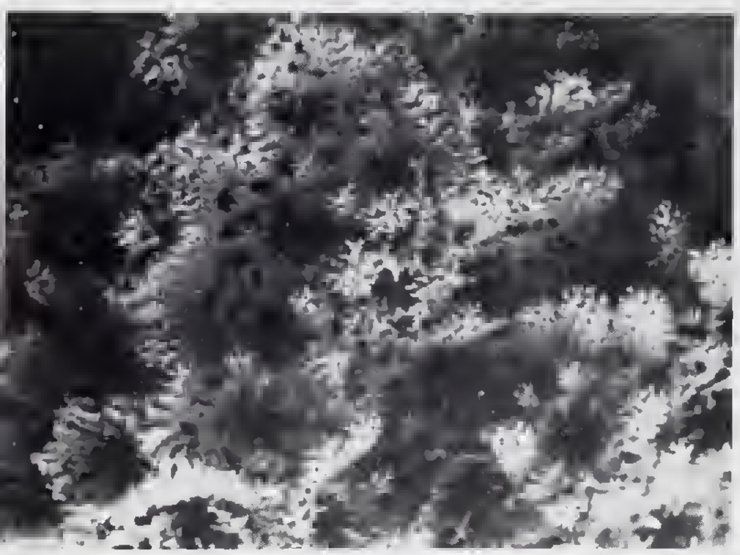
Fig. 240▼


Fig. 241▼


Montipora nodosa (Dana, 1846)

Synonymy

Manopora nodosa Dana, 1846.

Montipora nodosa (Dana); Verrill (1864); Bernard (1897); Ma (1959).

Montipora willeyi Bernard, 1897.

Montipora annularis Bernard, 1897.

Specimens MCZ 1502 and USNM 317 are different colonies of the same species from Fiji, neither of which are designated types. The latter, possibly Dana's Pl. 46, Fig. 2, here designated lectotype, is virtually identical to Fig. 247. The former specimen may be from Edwards & Haime.

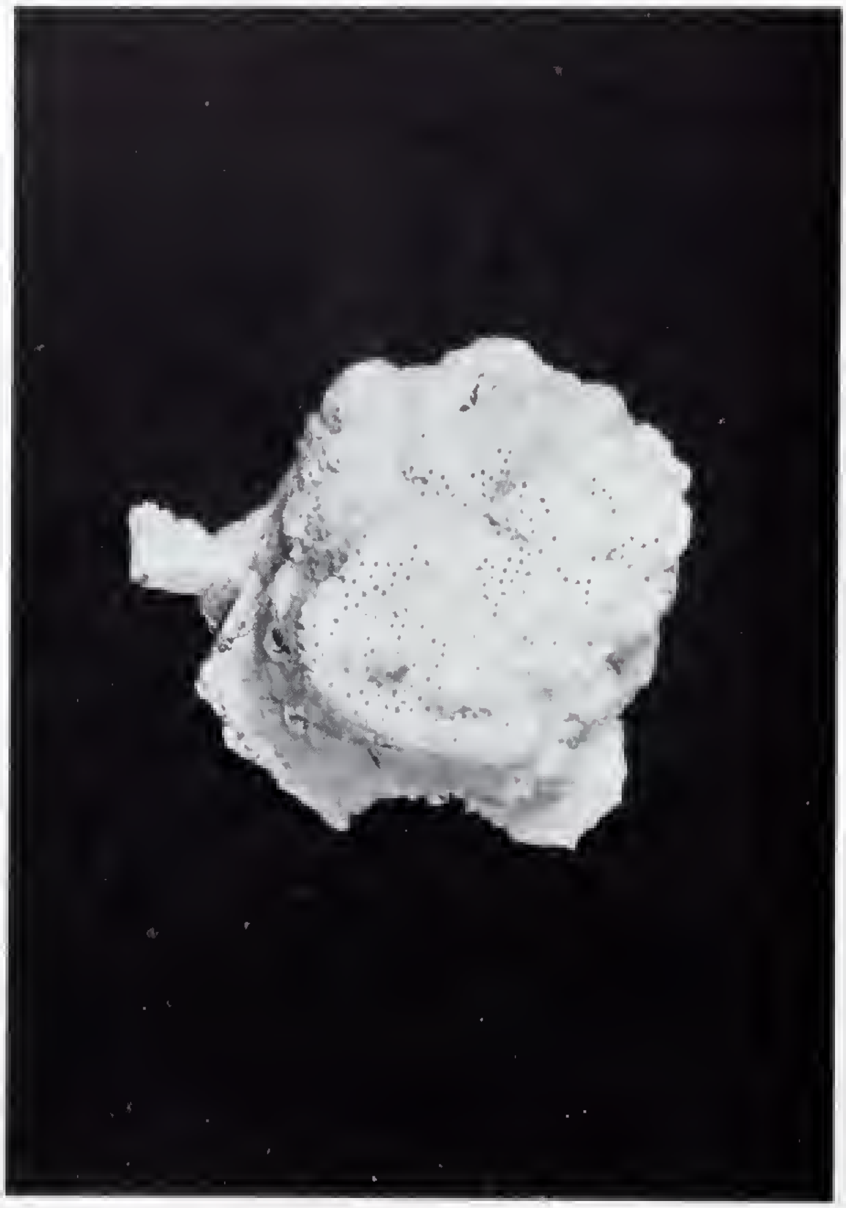


Fig 242▲

Fig. 242 *Montipora nodosa* from Magdelaine Cay, collecting station 200 (× 0.75), same corallum as Fig. 249.

Figs. 243-248 *Montipora nodosa* (× 5)

Fig. 243 From Magdelaine Cay, collecting station 200, same corallum as Fig. 250.
Fig. 244 From Chesterfield Atoll, collecting station 213.
Figs. 245, 246 From Mellish Reef, collecting station 209; Fig. 245 same corallum as Fig. 251.
Figs. 247, 248 From Willis Island, collecting station 199; Fig. 247 same corallum as Fig. 252.

Fig. 243▲

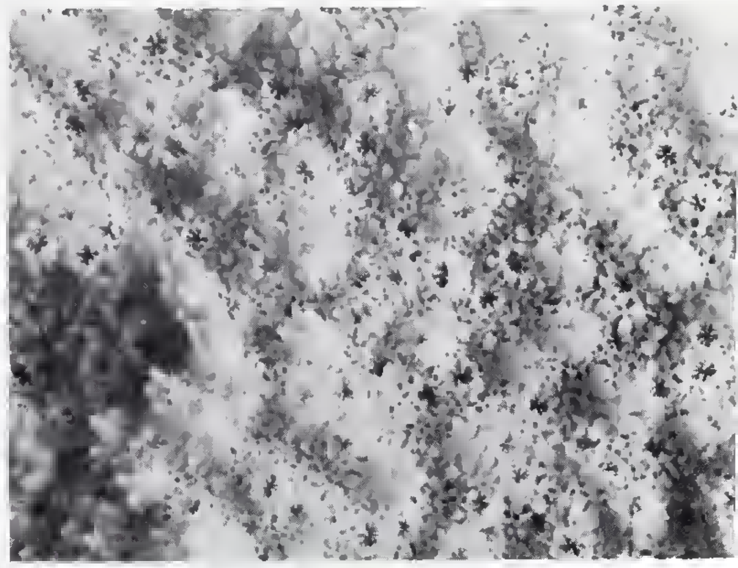


Fig. 244▲

Fig. 245▼

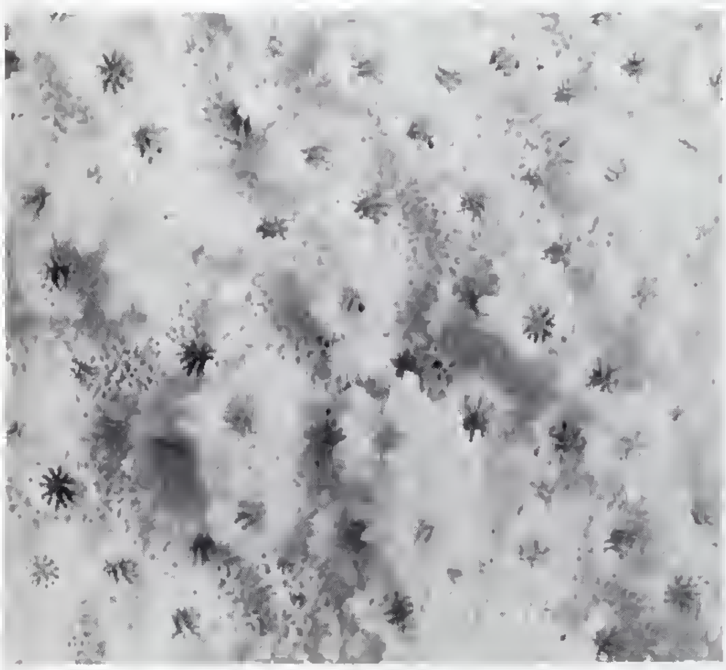


Fig. 246▼

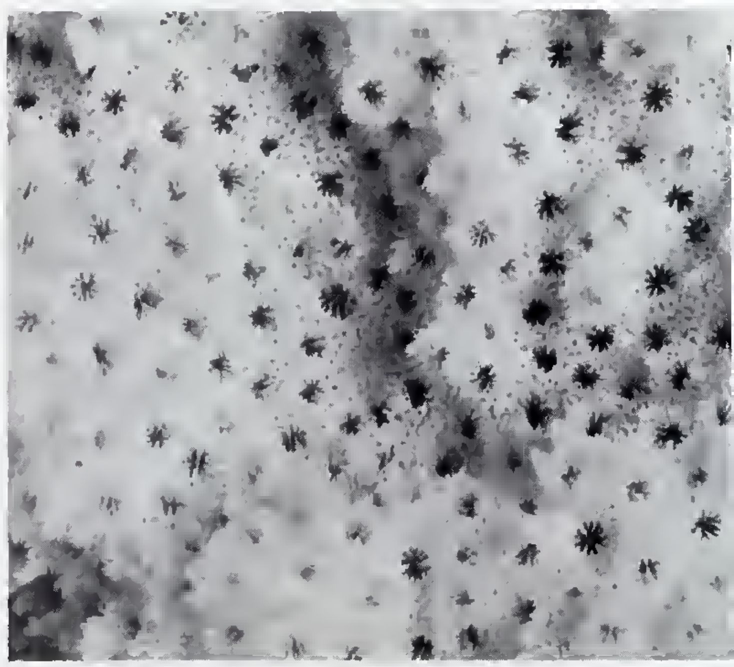


Fig. 247▼

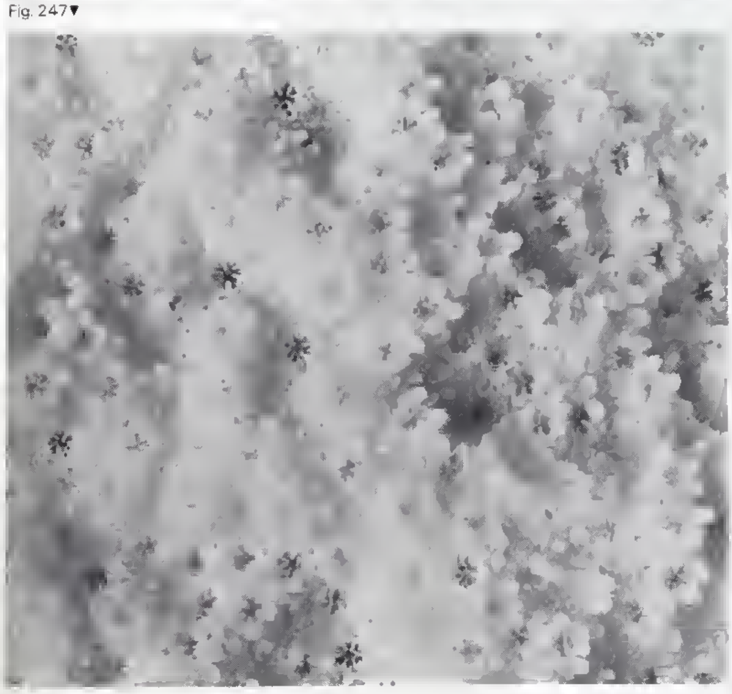


Fig. 248▼

Both nominal species of Bernard are clearly synonyms of *M. nodosa*. The holotype of *M. willeyi* from the Loyalty Islands (BMNH 1897-11-19-10) is similar to Dana's USNM 317, except that it has a more plate-like growth form. The holotype of *M. annularis* from New Guinea (BMNH 1961-12-8-1) is a fragment similar to Fig. 246, except that coenostial spines have more elaborated tips.

The holotype of *M. friabilis* Bernard from an unknown locality (BMNH 1847-1-19-20) is closely related to *M. nodosa*. It is a highly convoluted plate with irregular lobes and tubes and has only slightly exsert corallites with poorly-calcified walls and septa.

Figs. 249-252 *Montipora nodosa*

Figs. 249, 250 From Magdelaine Cay; Fig. 249, same corallum as Fig. 242; Fig. 250 same corallum as Fig. 243 (× 20).

Fig. 251 From Mellish Reef, collecting station 208 (× 40).

Fig. 252 From Willis Island, same corallum as Fig. 247 (× 40).

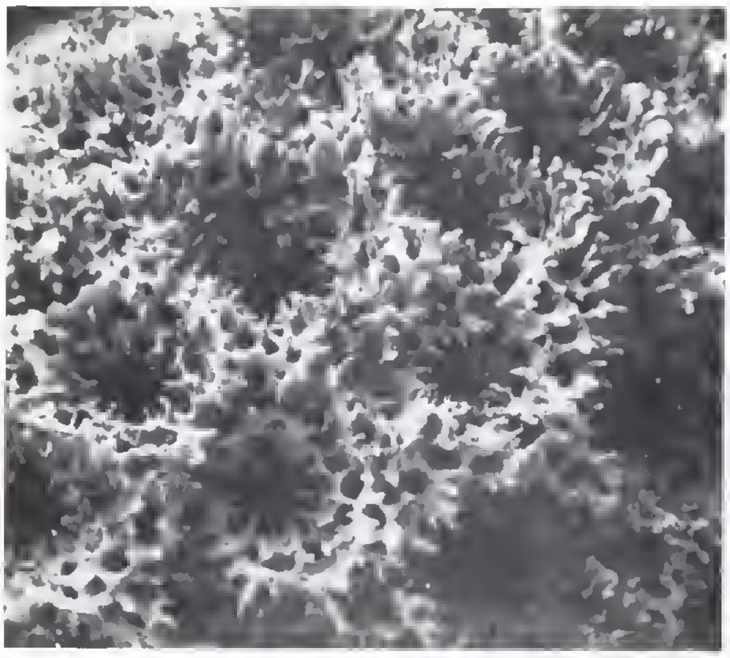


Fig. 249▲

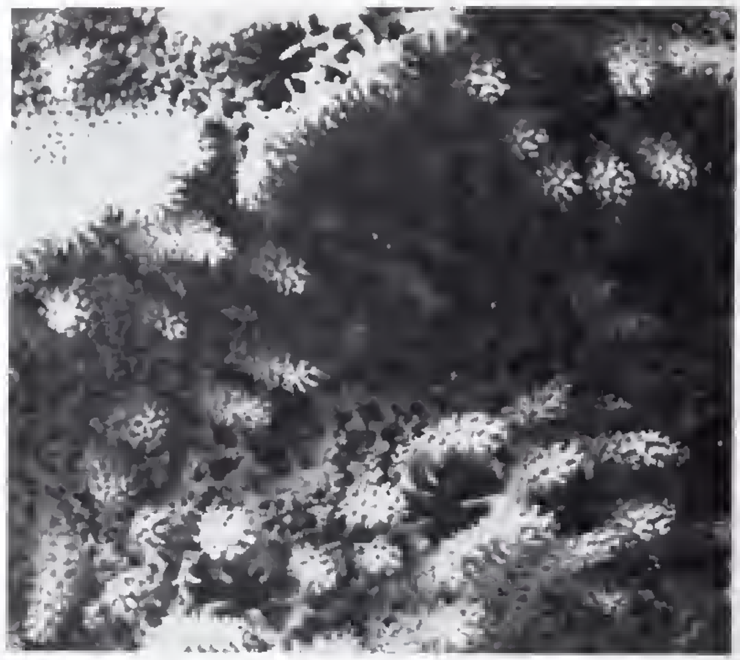
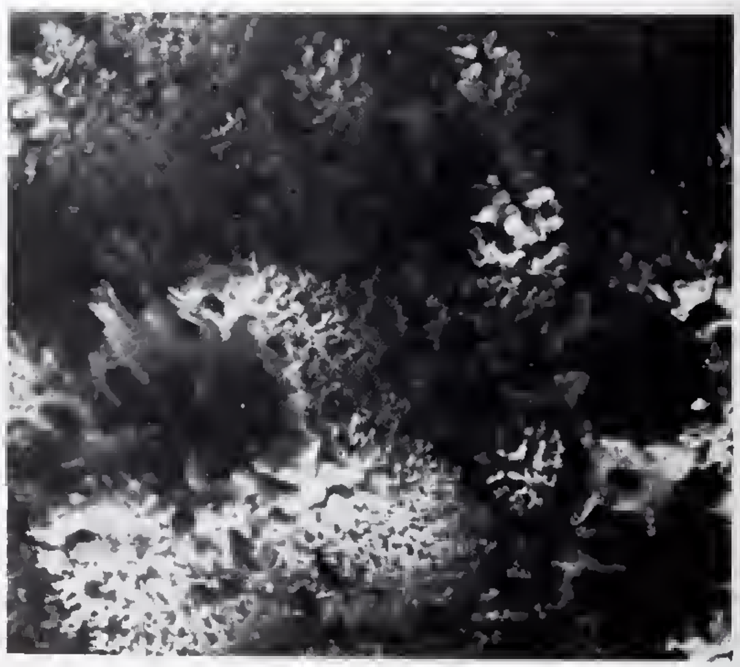


Fig. 250▲

Fig 251▼

Fig. 252▼



Material studied

Murray Islands, Great Detached Reef, Martha Ridgeway Reef (2 specimens), **Tijou Reef, Willis Islet** (4 specimens), **Magdelaine Cay** (7 specimens), **Lihou Reefs** (2 specimens), **Mellish Reef** (3 specimens), **Flinders Reef (Coral Sea), Britomart Reef, Davies Reef, Palm Islands, Marion Reef** (3 specimens), **Chesterfield Reefs** (23 specimens), **Fitzroy Reef, Middleton Reef** (7 specimens).

These localities include collecting stations 1, 27, 45, 154, 155, 168, 190, 199, 200, 202, 204, 205, 209, 210, 212, 214, 215, 216, 226, 231, 233, 234.

Characters

Colonies are massive or form thick plates with entire margins and a well-developed epitheca. Immersed and exsert corallites are intergraded and intermixed. Calices are 0.7-1.3mm diameter, but are uniform within the same corallum. They are surrounded by fused thecal papillae, forming a tube which may be fused with, and indistinguishable from, the theca. Septa are in two cycles, up to $\frac{2}{3}$R and $\frac{1}{2}$R, and consist of rows of spines, those of the first cycle being thicker than those of the second. Reticulum and thecal papillae are similar and are both covered with highly ornamented spinules. The reticulum is medium-coarse, either spongy or covered with elongated spinules.

Living colonies are pale brown in colour.

Affinities

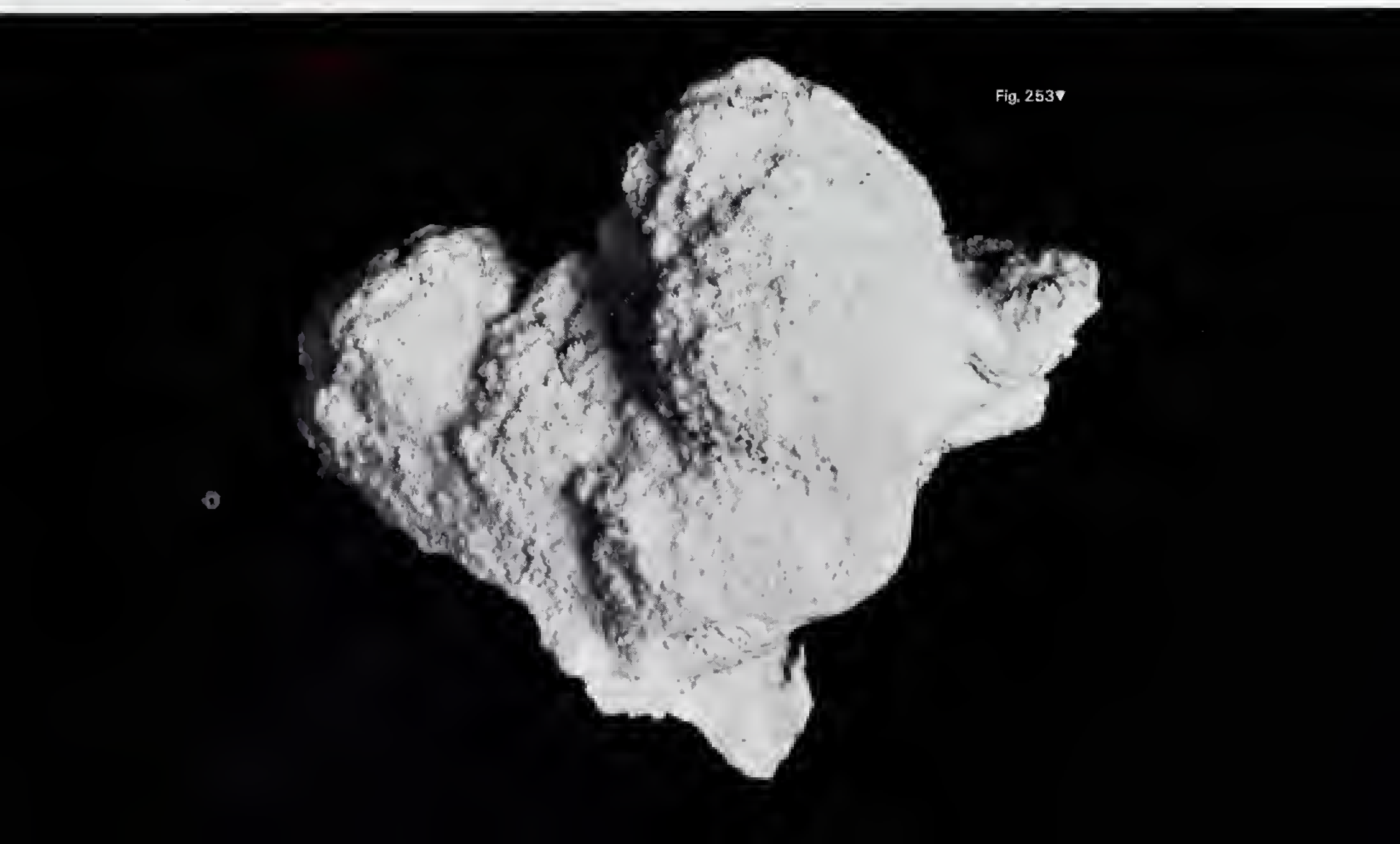
Montipora nodosa is closest to *M. australiensis* and *M. hispida*. All three species have immersed and exsert corallites intermixed, a similar septal configuration and well-developed thecal papillae. *Montipora nodosa* differs from *M. australiensis* in not developing a columnar growth form, in having a well-developed epitheca (not a consistently useful character), in having more numerous and better developed reticulum papillae and in not having reticulum ridges between corallites. *Montipora hispida* never has a similar growth form; plate-like colonies are common but plates are thin and do not have a well-developed epitheca. Reticulum papillae are also much better developed in *M. hispida*.

Montipora nodosa may also be close to *M. grisea* (see p. 99).

Distribution

Recorded from the western Pacific only.

Fig. 253 *Montipora grisea* from Magdelaine Cay, collecting station 200 (× 0.75).



Montipora grisea Bernard, 1897

Synonymy

Montipora grisea Bernard, 1897.

Material studied

Arden Island, Murray Islands (2 specimens), **Sue Island, Thursday Island, Triangle Reef, Raine Island** (4 specimens), **Martha Ridgeway Reef** (3 specimens), **Willis Islet, Magdelaine Cay** (11 specimens), **Lihou Reefs** (5 specimens), **Mellish Reef, Britomart Reef** (2 specimens), **Rib Reef** (7 specimens), **Palm Islands** (4 specimens), **Broadhurst Reef** (2 specimens), **Marion Reef, Chesterfield Reefs** (10 specimens).

These localities include collecting stations 17, 28, 34, 36, 54, 152, 154, 158, 159, 168, 174, 183, 199, 200, 202, 203, 208, 212, 215, 216, 222.

Characters

Colonies are massive or sub-massive, or are thick encrusting plates. Corallites are

Figs. 254-261 *Montipora grisea*
Figs. 254, 255 From Rib Reef, collecting station 222 (× 20 and 40 respectively).
Figs. 256, 257 From Broadhurst Reef, collecting station 223 (× 20 and 40 respectively).
Fig. 258 From Chesterfield Atoll, collecting station 212 (× 20).
Fig. 259 From Britomart Reef (× 20).
Fig. 260 From Rib Reef (× 20).
Fig. 261 From Lihou Reef, collecting station 202 (× 20).

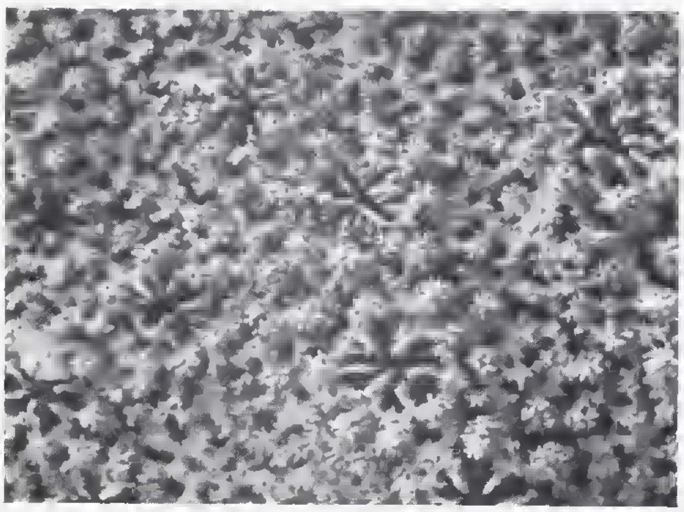
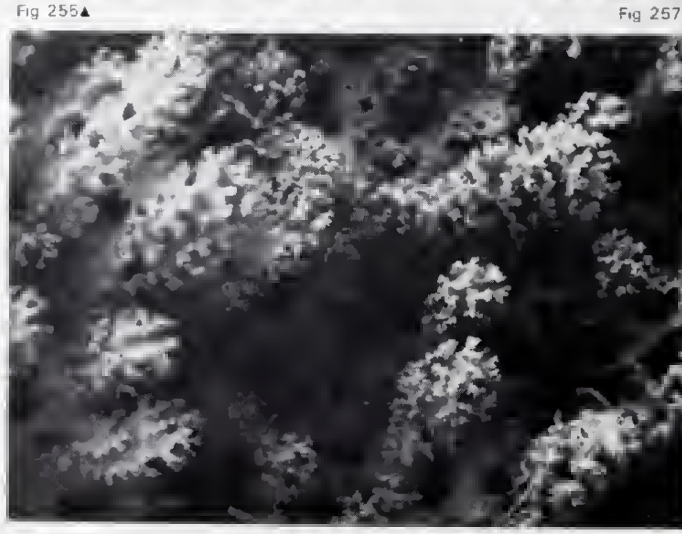


Fig 254▲ Fig 256▼

Fig 255▲ Fig 257▼



exsert, or exsert and immersed corallites are mixed. Calices are usually 0.6-0.8mm diameter, but are occasionally smaller. Septa are composed of non-tapered spines. Primary septa are thicker than secondary septa, are complete, $\frac{2}{3}$-$\frac{3}{4}$R (rarely less). Directive septa are sometimes distinguishable. Secondary septa are $\frac{1}{3}$-$\frac{1}{2}$R and may be incomplete. All corallites are surrounded by 2-7 partly fused thecal papillae which are much taller than the reticulum papillae. All papillae are covered with slightly elaborated spinules. Thecal papillae may form fused cylinders; sometimes those of adjacent corallites are also fused. The reticulum is medium-fine.

Montipora grisea occurs in most reef communities. It is usually dark brown or dark green or mixtures of both, but may be various pale colours or even bright blue or pink in shallow water.

Affinities

Montipora grisea is closest to *M. nodosa* and *M. hispida*. Corallites are smaller than those of *M. nodosa*, papillae are much finer and the reticulum papillae are more numerous. Corallites are very similar to those of *M. hispida*, which is best distinguished from *M. grisea* by its various growth forms. However, massive and sub-massive *M. hispida* may not be separable from *M. grisea* unless both species are collected from the same biotope. In the latter case, *M. hispida* has more prominent thecal papillae and less well-developed secondary septa.

Distribution

Recorded from the west coast of Australia to New Guinea, New Ireland and Tonga.

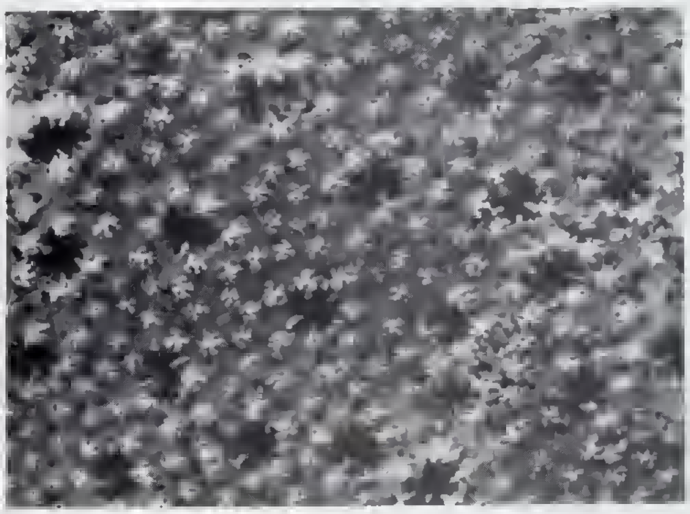


Fig 258▲

Fig 260▼

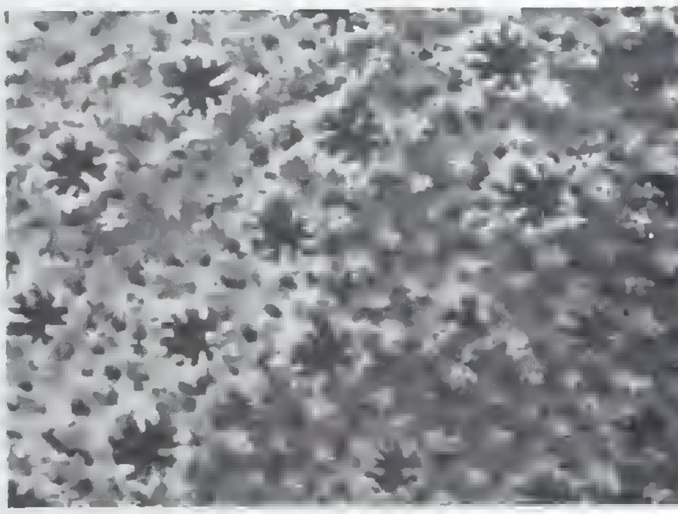


Fig. 259▲

Fig. 261▼

Montipora stellata Bernard, 1897

Synonymy

Montipora stellata Bernard, 1897.

Montipora viridis Bernard, 1897.

Montipora angularis Crossland, 1952.

Montipora strigosa Nemenzo, 1967.

Montipora strigosa var. *tenuis* Nemenzo, 1967.

Montipora hirsuta Nemenzo, 1967 non *Montipora hirsuta* Bernard, 1897.

Bernard's holotype of *M. stellata* (BMNH 1892-12-1-263) is from eastern Australia. The holotype of *M. viridis* from the Solomon Islands (BMNH 1973-5-30-1) has only weakly developed coenostial ridges compared with most specimens in the present series, but all other characters are clearly developed. The type specimens of Crossland and Nemenzo all have the characters of the species clearly developed.

Two other nominal species appear to be closely related to *M. stellata*. They are *M. striata* Bernard from the Houtman Abrolhos Islands (BMNH 1895-10-9-59) and *M. solanderi* Bernard, a series of syntypes from Rodriguez and Mauritius. These are probable synonyms and differ from *M. stellata* in developing more massive growth forms and in having larger corallites with less well-developed septa.

Material studied

Darnley Island, Little Mary Reef (2 specimens), **Turtle Backed Island** (3 specimens), **Sue Island** (4 specimens), **Lizard Island Lagoon, Palm Islands** (7 specimens), **Pandora Reef** (2 specimens), **Broadhurst Reef** (3 specimens), **Magnetic Island** (11 specimens).

These localities include collecting stations 17, 31, 58, 100, 138, 171, 174, 183, 185, 223, 225.

Characters

Coralla have two growth forms. The first consists of contorted laminae which may form tiers or whorls. The second is sub-arborescent with branches irregularly dividing and anastomosing and sometimes being highly contorted. These two forms frequently occur together in the same corallum giving *M. stellata* a very wide range of variation. Colonies are usually small, with branching coralla <30cm in height.

Corallites are immersed and usually have calices a uniform 0.7-0.8mm diameter; in coralla with fine contorted branches they may be much smaller. Septa consist of rows of terete spines, primary septa $\frac{1}{2}$R, secondary septa $<\frac{1}{2}$R and incomplete. There may be some development of a theca, but corallite walls remain indistinct.

The structure of the reticulum varies greatly according to position on the corallum. Reticulum at the base of branches is coarse and spongy, becoming semi-solid. Reticulum papillae are irregular and small. Elsewhere on the corallum the upper layer of reticulum is fine and spongy, with very elaborated spinules giving a frosted appearance. Thecal papillae are numerous and closely compacted, and may form short, irregular ridges. Most corallites are surrounded by several thecal papillae slightly larger than the reticulum papillae.

Montipora stellata is most common in protected turbid water. It is usually cream or brown with white ridges but is a distinctive pure white in Torres Strait.

Figs. 262-267 *Montipora stellata* (× 0.5)

Figs. 262, 263 From Broadhurst Reef, collecting station 223.
Fig. 264 From Orpheus Island, Palm Islands.
Fig. 265 From Falcon Islands, Palm Island, collecting station 174, same corallum as Fig. 268.
Fig. 266 From Pandora Reef, collecting station 171.
Fig. 267 From Dido Rock, Palm Islands, collecting station 58, same corallum as Figs. 269, 271.

Fig. 262▼

Fig. 263▼

Fig. 264▼

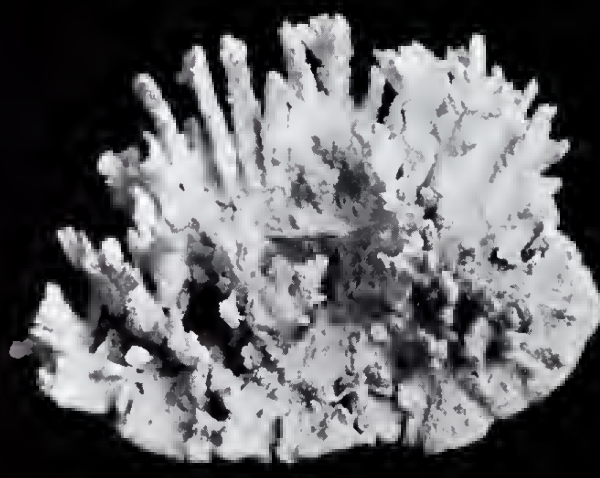


Fig. 265▲

Fig. 266▲

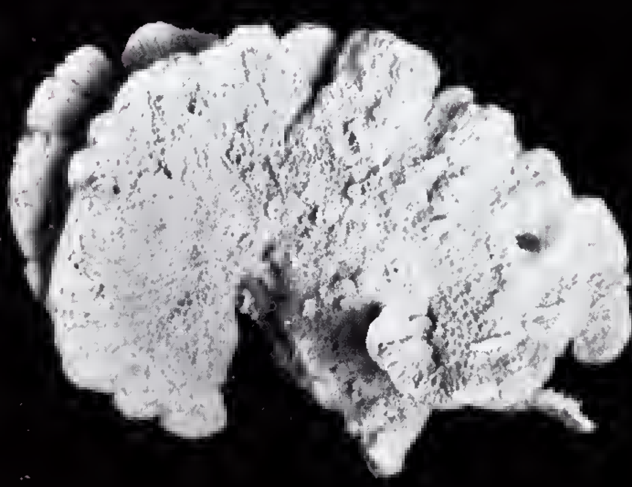


Fig. 267▲

Affinities

This species is very distinctive and has no close affinities on the Great Barrier Reef.

Distribution

Recorded only from the Philippines, the Solomon Islands and the east and west coasts of Australia.

Figs. 268-271 *Montipora stellata*

Fig. 268 From Falcon Island, Palm Islands, same corallum as Fig. 265 (× 5).
Fig. 269 From Dido Rock, Palm Islands, same corallum as Figs. 267, 271 (× 5).
Fig. 270 From Magnetic Island (× 5).
Fig. 271 From Dido Rock, same corallum as Figs. 267, 269 (× 60).

Fig. 268▲

Fig. 269▲

Fig. 270▼

Fig. 271▼

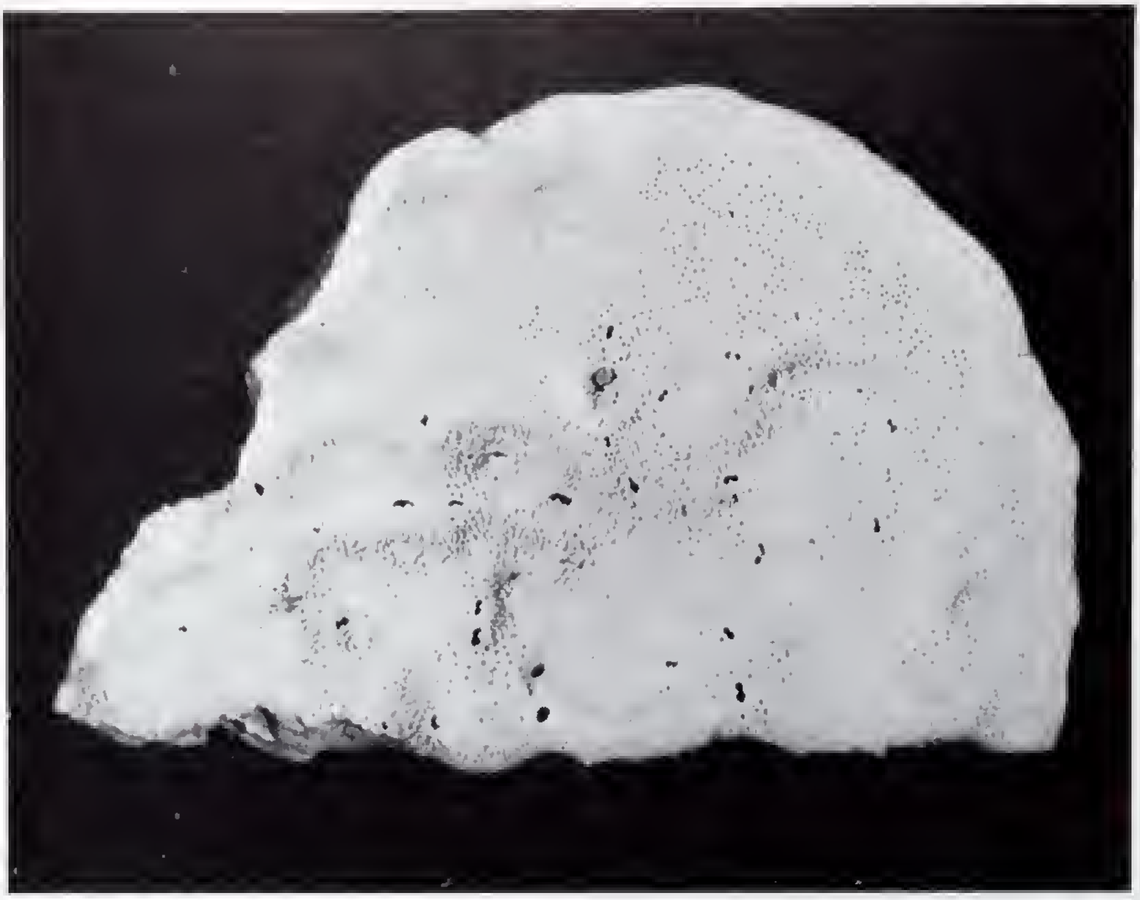


Fig. 272▲

Fig. 272 *Montipora corbettensis* from Corbett Reef, collecting station 164, holotype, same corallum as Figs. 273-275 (× 0.75)

Montipora corbettensis n.sp.

Material studied

Big Mary Reef, Raine Island, Tijou Reef, Corbett Reef, Lizard Island Lagoon, Rib Reef, Palm Islands.

These localities include collecting stations 8, 42, 100, 152, 164, 187, 222.

Characters

Colonies are massive or are thick plates with entire margins which usually have variably shaped upward growths near their centres. The undersurfaces of plates may be covered with widely spaced corallites, or epitheca may extend almost to the margin.

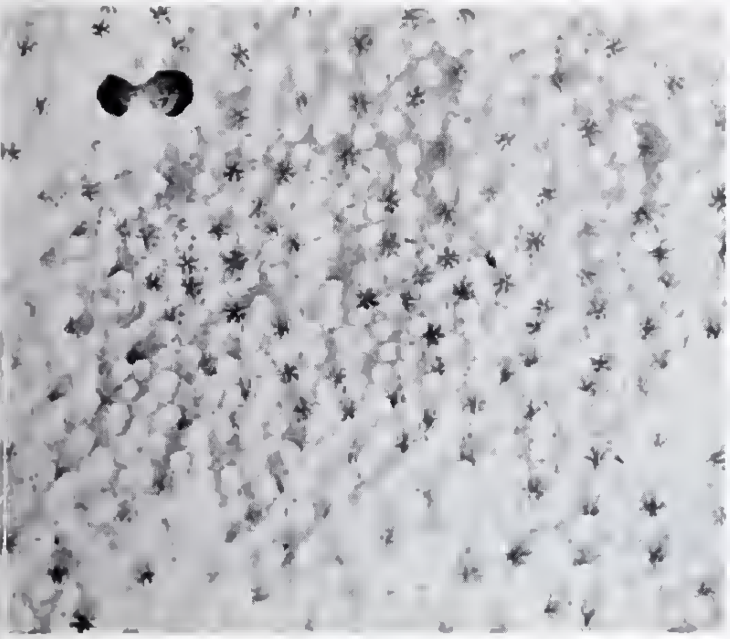
Corallites have calices approximately 0.7mm diameter and are surrounded by papillae of similar diameter. The papillae usually have fused bases which form a slightly foveolate tube. Corallites are immersed or appear excavated beneath the papillae. Papillae are usually fused into short irregular ridges at the margins of plates. All septa are composed of moderately spaced spines. Primary septa are slightly tapered and may fuse deep within the corallite where the tips of spines may be thickened or, in the case of some spines, extended to form a rudimentary columella. Secondary septa are thinner, $<\frac{1}{3}R$, irregular and usually incomplete. The reticulum is coarse and covered with spinules which have few or no elaborations. Spinules on papillae are highly elaborated.

Coralla from relatively turbid environments have poorly-developed papillae and relatively short septa, although primary septa still fuse. Primary septa tend not to fuse in the one corallum obtained from an exposed biotope.

Recorded colours are yellowish-brown and uniform pale brown.

Figs. 273-280 *Montipora corbettensis*

Figs. 273-275 Same corallum from Corbett Reef, holotype, and same corallum as Fig. 272 (× 5, 20 and 40).
Figs. 276-278 Same corallum from Rib Reef, collecting station 222 (× 5, 20 and 40 respectively).
Figs. 279, 280 Same corallum from Raine Island, collecting station 152 (× 20 and 40 respectively).



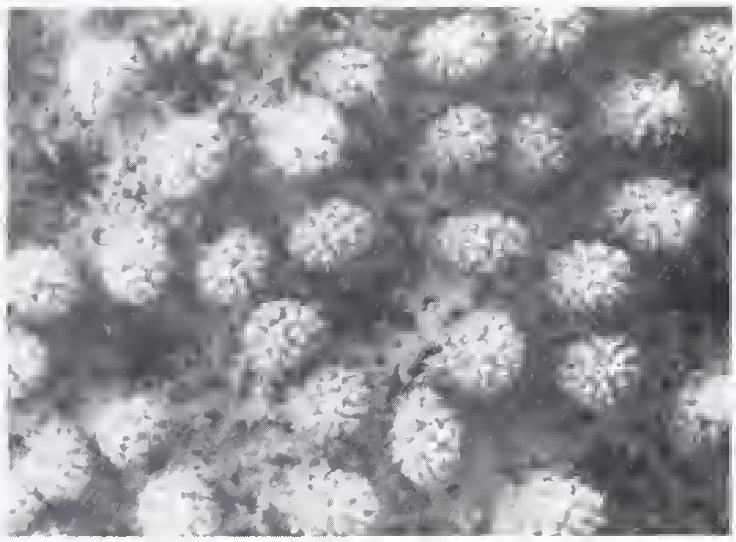
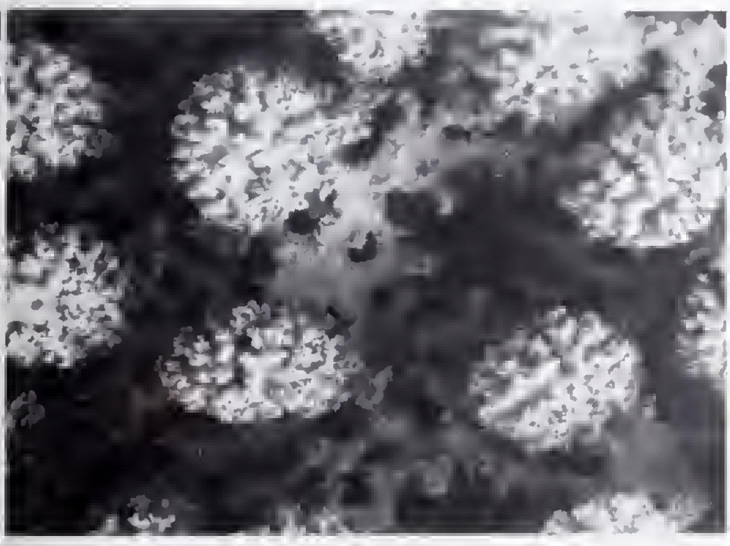


Fig 274▲

Fig. 276▼

Fig 273▲

Fig. 275▼



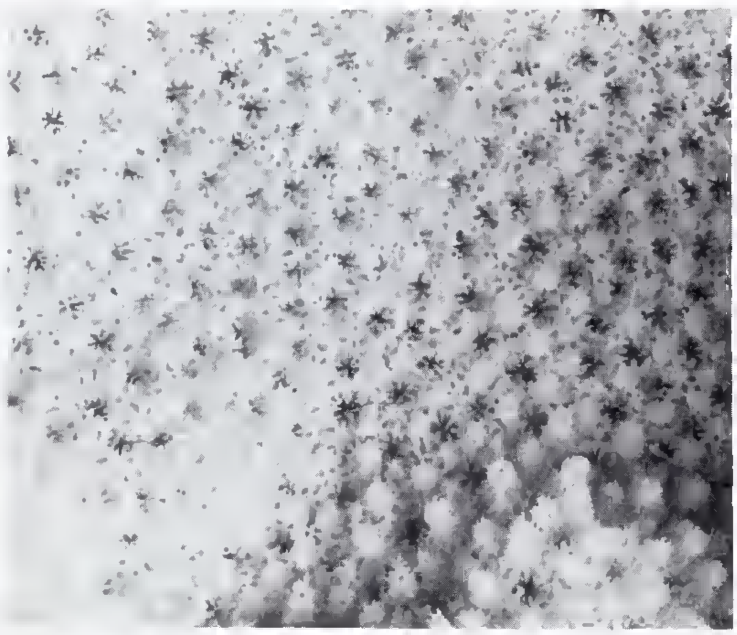
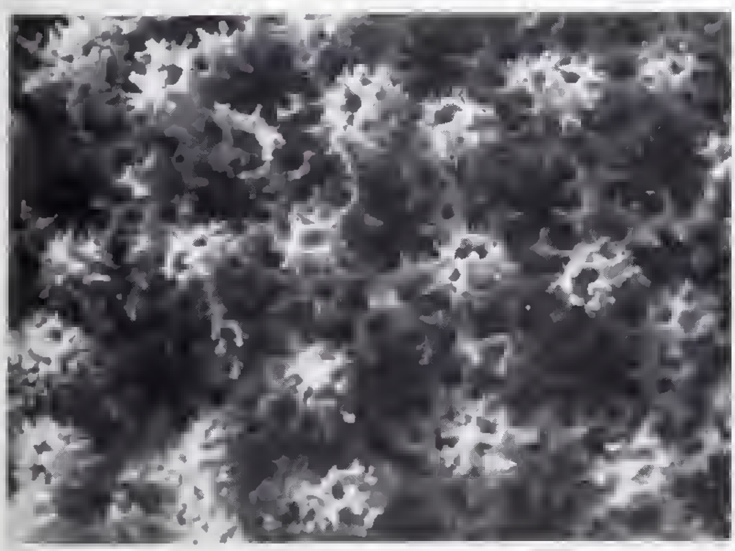


Fig 277▼

Fig. 278▼



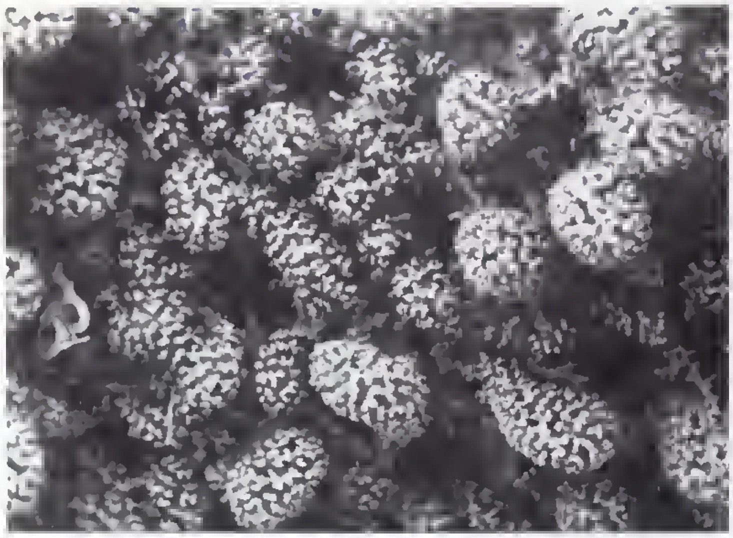


Fig. 279▲

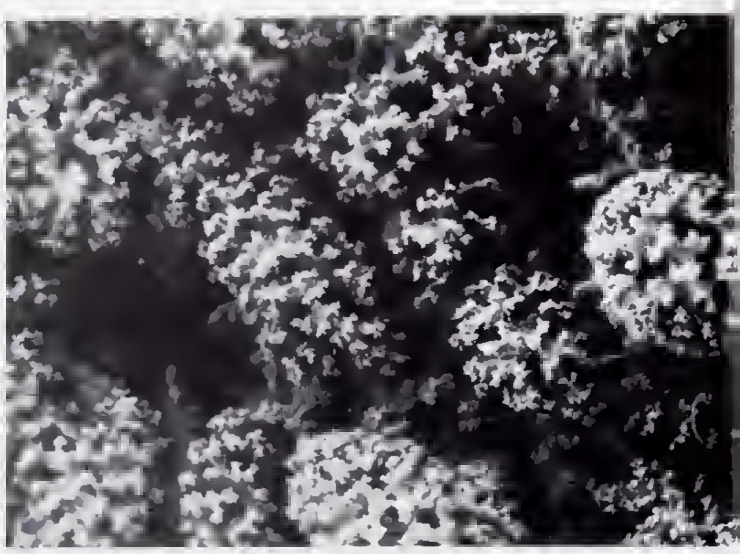


Fig. 280▲

Etymology

Named after Corbett Reef, the type locality.

Holotype (Fig. 272)

Dimensions: A flat plate, 17.2cm wide

Locality: Corbett Reef, northern Great Barrier Reef

Depth: 4m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia.

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Affinities

Montipora corbettensis resembles only *M. informis* (see p. 109).

Distribution

Known only from the Great Barrier Reef.

Montipora informis Bernard, 1897

Synonymy

Montipora informis Bernard, 1897; Vaughan (1918); Matthai (1923); Umbgrove (1940); Crossland (1952); Stephenson & Wells (1955); Searle (1956); Ma (1959); Pillai (1967b); Scheer & Pillai (1974); Veron (1982).

Montipora granulata Bernard, 1897; Wells (1954, 1955); Ma (1959).

Montipora mammillata Bernard, 1897.

All three synonyms of Bernard are from eastern Australia (*M. informis* holotype BMNH 1885-6-30-3, *M. granulata* syntypes BMNH 1897-3-9-202 to 205, *M. mammillata* holotype BMNH 1892-2-1-270) and all are close to various coralla of the present series.

The types of *M. scabricula* Dana from Fiji (YPM 4223 and USNM 138) are close to *M. informis* but septa and reticulum papillae are both less well developed. The holotype of *M. cactus* Bernard from an unknown locality (BMNH 1897-10-9-1) is also close to *M. informis*, but has a sub-arborescent growth form not found in eastern Australia.

Fig. 281▲

Fig. 281 *Montipora informis* from Fitzroy Reef, collecting station 189 (× 0.75).

Material studied

Jervis Reef, Raine Island (7 specimens), **Bird Island, Martha Ridgeway Reef, Tijou Reef, Lihou Reefs** (2 specimens), **Rib Reef** (5 specimens), **Palm Islands** (4 specimens), **Broadhurst Reef** (5 specimens), **Magnetic Island** (3 specimens), **Bushy Island-Redbill Reef, Palmaise Reef, Fitzroy Reef** (4 specimens), **Lady Musgrave Reef.**

These localities include collecting stations 43, 119, 151, 152, 154, 155, 161, 164, 170, 174, 177, 189, 191, 195, 198, 202, 222, 225.

Characters

Colonies are massive, plate-like or encrusting, the latter often overgrowing worm tubes, coral skeletons etc. Corallites are uniformly distributed and have calices 0.4-0.6mm diameter. Coralla from protected turbid environments have the largest corallites with two septal cycles of $\frac{3}{4}$R and $\frac{1}{4}$R, the latter usually being incomplete. Septa are composed of orderly rows of spines. Coralla from environments exposed to strong wave action have small corallites, few or no secondary septa and irregular primary septa. Directive septa may be distinguishable. The reticulum is medium-fine and is uniformly covered with elongated

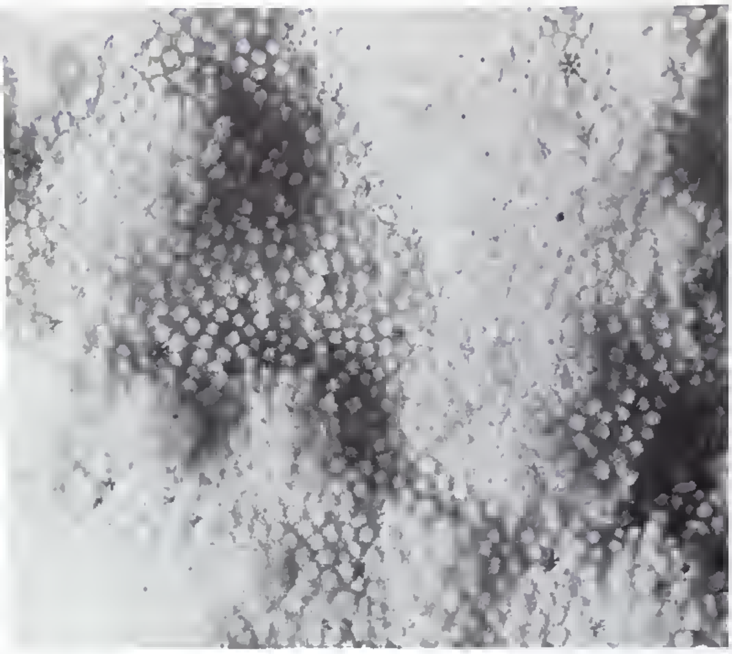


Fig. 282▲

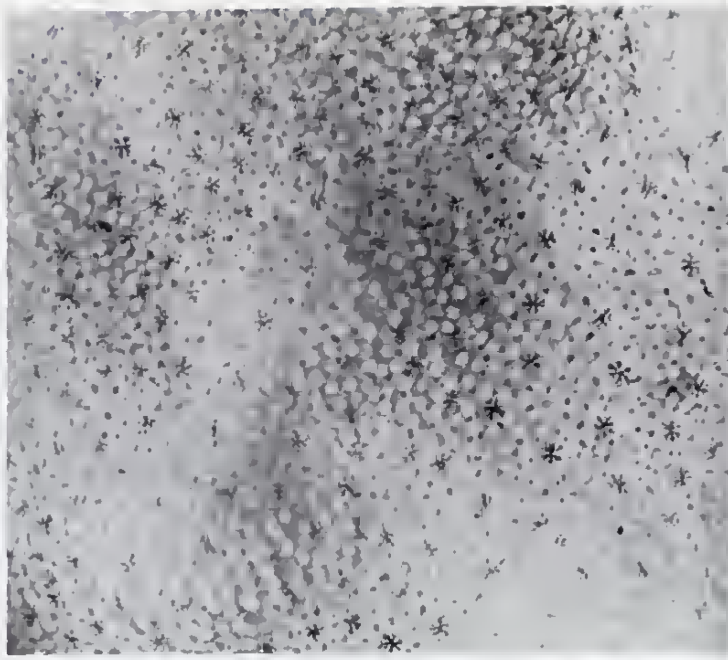


Fig. 283▲

Fig. 284▼

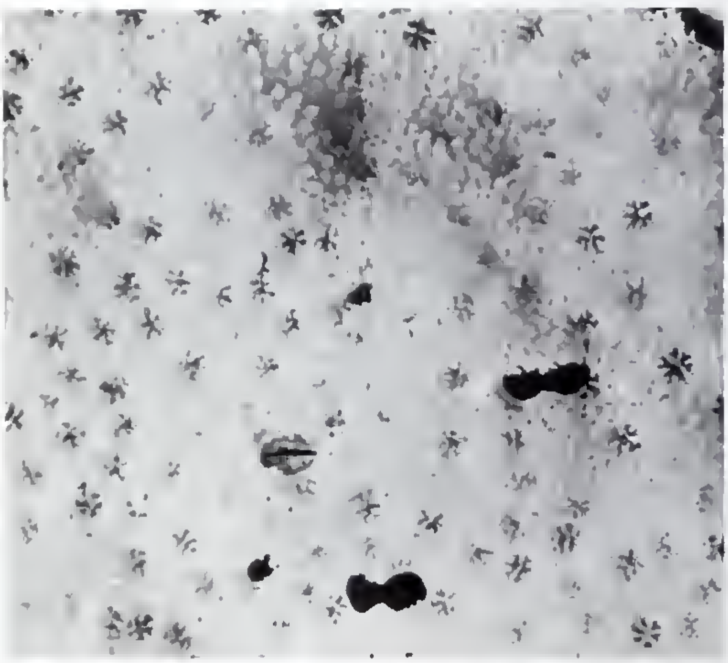


Fig. 285▼

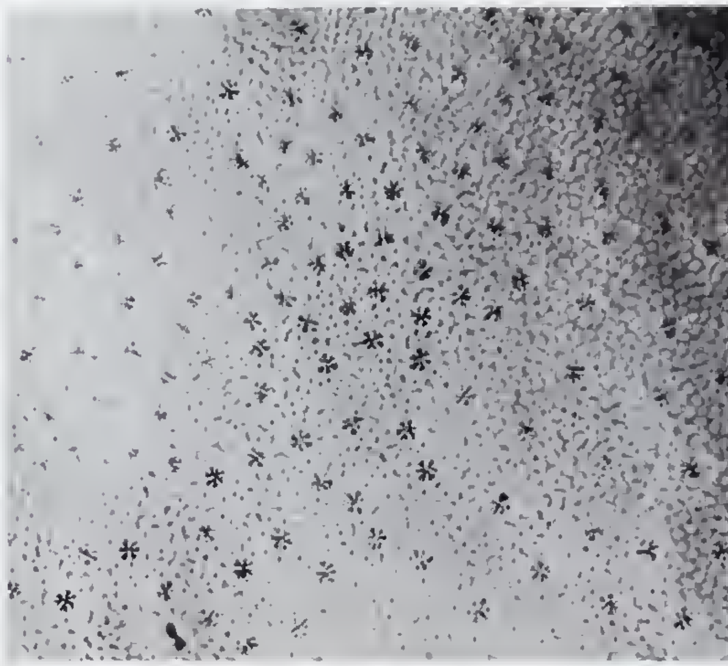


Fig 286▼

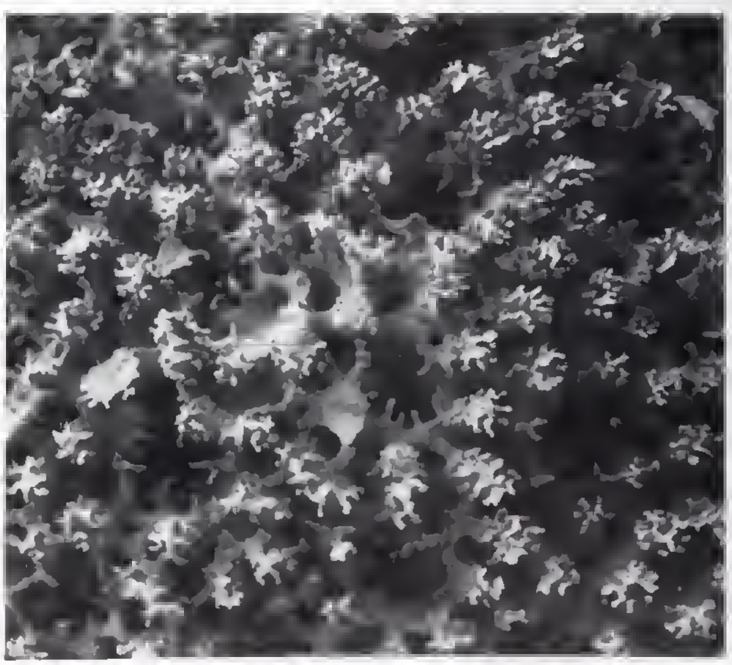
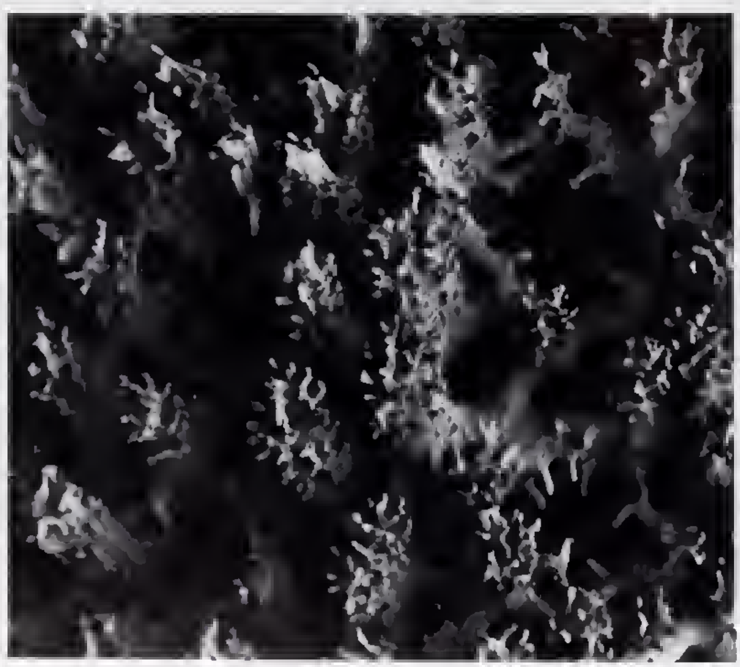


Fig. 287▼



Figs. 282-287 *Montipora informis*
Fig. 282 From Corbett Reef, collecting station 164, same corallum as Figs. 286, 287 (× 5).
Fig. 283-285 From Raine Island, collecting station 151 (× 5).
Figs. 286, 287 Same corallum from Corbett Reef and same corallum as Fig. 282 (× 20 and 40 respectively).

papillae of uniform size. All papillae have elaborated ends. They are never grouped around the corallites (hence there are no conspicuous thecal papillae). The thickness and length of papillae varies greatly among different coralla, those having the largest calices usually having the thickest papillae, which are columnar in shape and are covered with elaborated spinules. They are usually separated by a few threads of spongy coenosteum.

Living colonies are usually brown or mottled brown and white and often papillae have purple tips. White polyps may be extended during the day.

Affinities

Montipora informis resembles *M. corbettensis* in having reticulum papillae without thecal papillae. These species are distinguished by *M. informis* having smaller corallites and smaller, more compacted papillae.

Distribution

Widely distributed in the tropical Indo-Pacific from Madagascar to New Caledonia.

Montipora sp. 5

Synonymy

?*Montipora peltiformis* Bernard; Scheer & Pillai (1974); not Bernard (1897).

Material studied

Murray Island (2 specimens), **Palm Islands.**
These localities are collecting stations 27, 91.

Figs. 288, 289 Same corallum of *Montipora* sp. 5 from the Murray Islands, collecting station 279 (× 5 and 20 respectively).

Fig 288▾

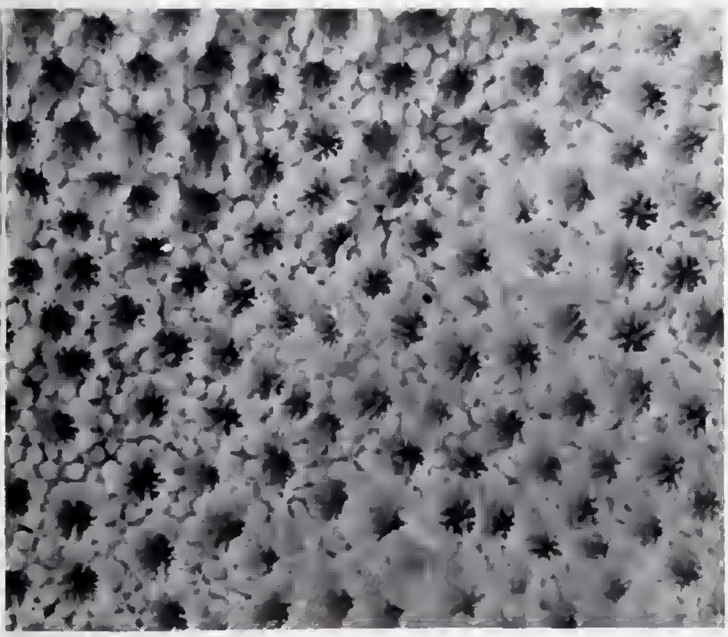
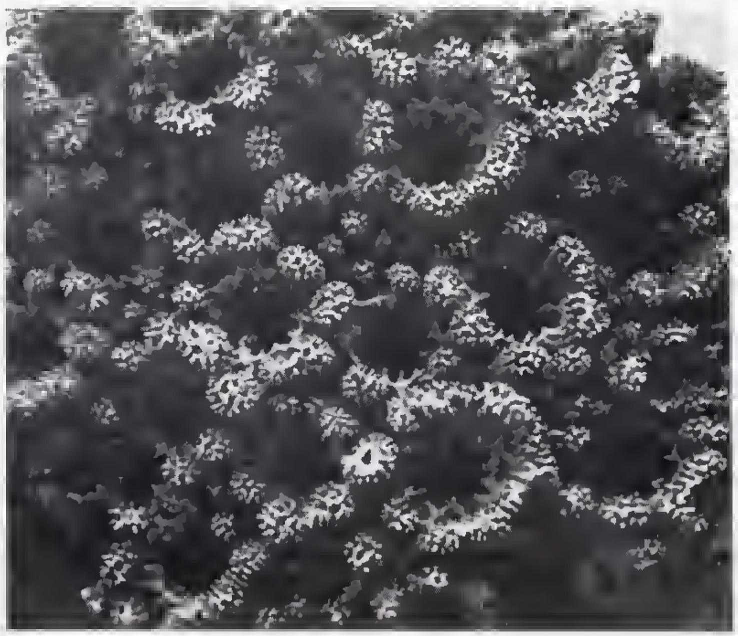


Fig 289▾



Characters

The three specimens of the present series are sub-massive with flat surfaces. Corallites are crowded, funnel shaped, 1.1-1.4mm diameter. Septa are in two cycles of $\frac{3}{4}$R and $\frac{1}{2}$R, the latter sometimes being complete. Both reticulum and thecal papillae are present, the former being relatively small and few in number, the latter large, with rounded tips. Papillae are irregularly interconnected by coenostial rods. The corallum from the Palm Islands has some fusion between the papillae, which become sub-foveolate in places.

The only recorded colour is creamy brown.

Affinities

This species is closest to *M. informis*, but differs conspicuously in having larger corallites with reticulum and thecal papillae differentiated.

Montipora foliosa (Pallas, 1766)

Synonymy

Madrepora foliosa Pallas, 1766; Ellis & Solander (1786).

Agaricia lima Lamarck, 1816.

Manopora lima (Lamarck); Dana, 1846.

Montipora exesa Verrill, 1869; Quelch (1886).

Montipora lichenoides Verrill, 1869.

Montipora foliosa (Pallas); Brüggemann (1879a); Ridley (1883); Quelch (1886); Ortmann (1888, 1889); Bernard (1897); Bedot (1907); Gravier (1911); Vaughan (1918); Gravely (1927); Faustino (1927); Thiel (1932); Yabe & Sugiyama (1932, 1935); Eguchi (1938); Crossland (1952); Stephenson & Wells (1955); Boschma (1959); Ma (1959); Nemenzo (1967); Scheer & Pillai (1974); Pillai & Scheer (1976).

Montipora lima (Lamarck); Brüggemann (1879b); Quelch (1886).

Figs. 290-293 *Montipora foliosa* (× 5)
Fig. 290 From the Murray Islands, collecting station 27.
Fig. 291 From Low Isles, same corallum as Figs. 294, 295.
Fig. 292 From Curacao Island, Palm Islands, collecting station 177, same corallum as Figs. 296, 297.
Fig. 293 From Ashmore Reef, collecting station 106.

Fig. 290▼

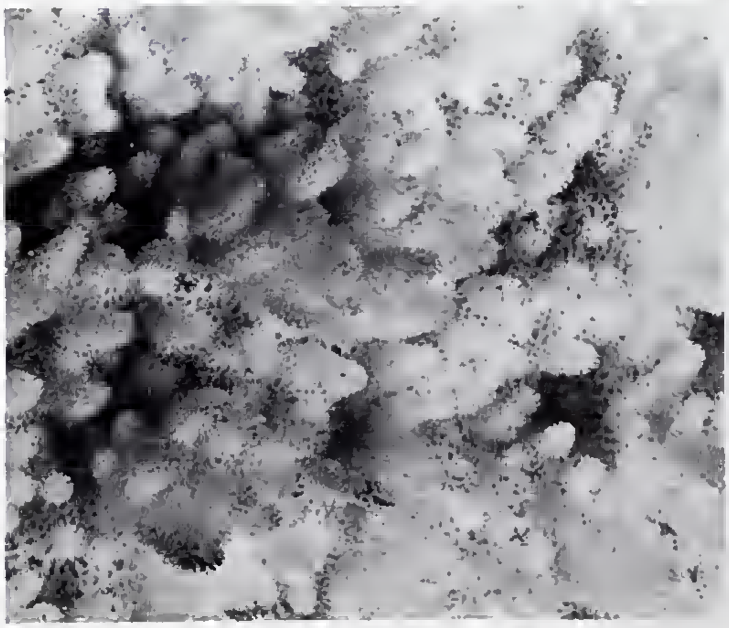
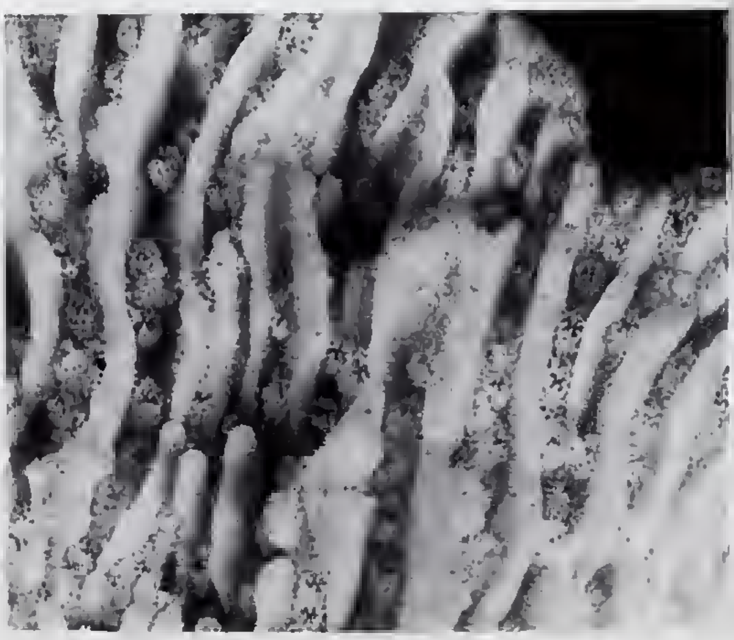


Fig 291▼



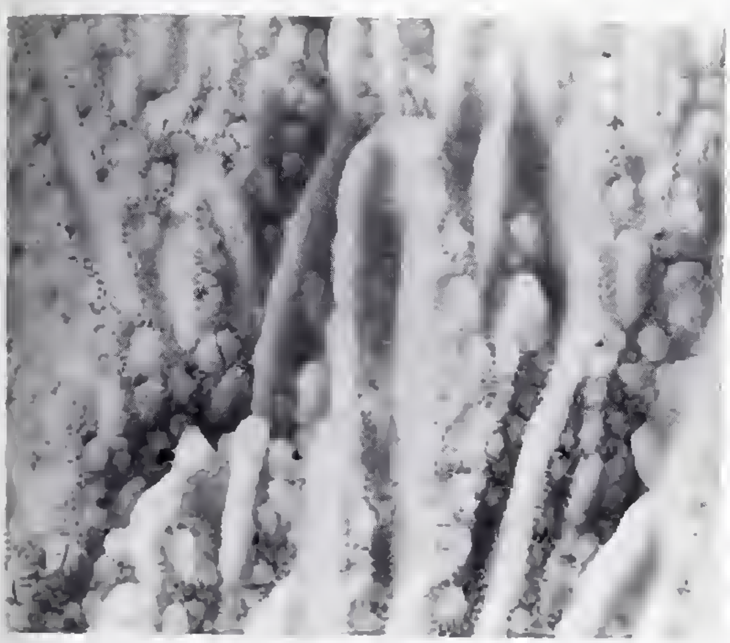


Fig 292▲

Fig. 293▲

Montipora prolifera Brüggemann, 1879b; Bernard (1897); Eguchi (1938); Crossland (1952); Searle (1956); Ma (1959); Nemenzo (1967).

Montipora minuta Bernard, 1897; Wells (1954); Stephenson & Wells (1955); Ma (1959).

Montipora pulcherrima Bernard, 1897; Yabe & Sugiyama (1932, 1935); Ma (1959).

Montipora tubifera Bernard, 1897.

?*Montipora bifrontalis* Bernard, 1897.

Montipora circinata Bernard, 1897.

Montipora variabilis Bernard, 1897; Ma (1959).

Montipora scutata Bernard, 1897.

Montipora undans Crossland, 1952.

Montipora sulcata Crossland, 1952.

Montipora rus (Forskål); Bernard, 1897; not Forskål (1775).

Bernard (1897) is incorrect in asserting that the *M. foliosa* of Ellis & Solander is not the same as that of Pallas, as the drawing of Ellis is close to Pallas's type. Dana's (1846) *M. foliosa* is based on a Red Sea specimen of Ehrenberg which is probably *M. hispida*, as is the *M. foliosa* of Lamarck (ZMB 945).

Both nominal species of Verrill (*M. exesa* holotype YPM 3058, *M. lichenoides* holotype YPM 775) are clearly *M. foliosa*, with all characters well developed. The syntypes of Brüggemann's *M. prolifera* (BMNH 1881-11-22-5 and 6) are also *M. foliosa* and include coralla similar to Fig. 292.

Three nominal species of Bernard, *M. minuta* (syntype BMNH 1892-10-17-137), *M. pulcherrima* (BMNH 1899-9-24-122) and *M. tubifera* (syntype BMNH 1893-9-1-52), are each composed of a series of small specimens from Macclesfield Banks, collected from depths of 24m, 36-47m and 58m (respectively). They are all ecomorphs of *M. foliosa*, showing characteristic skeletal changes with increasing depth and consequent decreasing light availability.

The five remaining nominal species of Bernard are all from eastern Australia. The holotype of *M. circinata* (BMNH 1892-12-1-1) and BMNH 1892-12-1-18 of *M. variabilis* (type missing ?) have the characters of *M. foliosa* best developed, the former being a typical vasiform corallum, with skeletal structures similar to those of *M. minuta* and *M. pulcherrima*. *Montipora scuta* (holotype BMNH 1892-12-1-285), *M. bifrontalis* (holotype

BMNH 1892-12-1-15) and *M. plicata* (schizo-holotype BMNH 1897-3-9-206) all lack the radiating ridges usually found in reef *M. foliosa*, but have the corallites and corallite hoods normally associated with turbid water specimens such as occur around the continental islands of each of the three type localities.

The holotype of *M. sulcata* Crossland (BMNH 1934-5-14-433) is a finely-structured corallum similar to Fig. 296, except that the coenostial ridges are slightly more developed. The holotype of Crossland's *M. undans* (BMNH 1934-5-14-270) is a piece of a corallum that was probably overgrown by another part of the same colony, or another colony.

Montipora cebuensis Nemenzo has large coenostial ridges which become broken up into papillae. It does not closely resemble any east Australian *M. foliosa*, but may represent an extension of the range of growth forms of this species.

Material studied

Arden Island, Murray Islands, Ashmore Reef, Raine Island (8 specimens), **Great Detached Reef, Sir Charles Hardy Islands** (2 specimens), **Martha Ridgeway Reef** (7 specimens), **Tijou Reef** (2 specimens), **Bewick Island, Houghton Island, Yonge Reef** (2 specimens), **Low Isles** (5 specimens), **Lihou Reefs, Rib Reef** (13 specimens), **Palm Islands** (35 specimens), **Pandora Reef, Broadhurst Reef** (12 specimens), **Magnetic Island** (2 specimens), **Bushy Island-Redbill Reef, Swain Reefs, Fitzroy Reef** (6 specimens), **Flinders Reef (Moreton Bay), Norfolk Island.**

These localities include collecting stations 1, 3, 8, 9, 16, 18, 27, 34, 36, 37, 42, 60, 68, 106, 151, 152, 154, 159, 169, 171, 174, 177, 179, 183, 190, 191, 202, 222, 223, 225, 227.

Characters and skeletal variation

Colonies are mostly encrusting, with horizontal laminae forming around the margins. Such colonies may be several m diameter, with the horizontal laminae partly tiered, the upper tiers developing into whorls. In rare instances, parts of colonies may also be sub-massive or develop columns. Horizontal laminae may be unifacial or bifacial, but usually an epitheca covers most of the undersurface, overgrowing the minute, widely-spaced corallites.

The growth form and the fine structure of coralla both vary greatly according to the original position of the corallum on the colony. Thus the uppermost tier of a large colony may have little resemblance to a lower tier which has been partly overgrown.

Corallites have calices 0.6-0.8 mm diameter and are strongly inclined towards the perimeter on laminate coralla. Septa consist of rows of terete spines, the primary cycle $<\frac{3}{4}$R and complete, the secondary cycle sub-equal to absent. Corallites may be immersed with no thecal development or exsert with the upper wall parathecate and the lower (submerged) wall absent or partly septothecate. The coenosteum is medium-coarse and spongy except for that of the papillae which is fine and has spinules with elaborated tips.

The development of papillae varies greatly. Those on very thin laminae, which *in situ* were overshadowed by an upper tier, may be the same dimensions as the corallites and may form ridges behind the corallites. These ridges form the upper wall of the outward-projecting corallite and in almost all coralla, are best developed towards the corallum perimeter, where the largest characteristically form a series of interconnecting radiating ridges up to 40mm long. In most coralla that were not overshadowed *in situ*, the larger radiating ridges are much more exsert than the corallites. The latter lie between them and are usually associated with smaller ridges or conical papillae, which may develop on their upper wall and form a partial hood.

Figs. 294-299 *Montipora foliosa*

Figs. 294, 295 Same corallum from Low Isles and same corallum as Fig. 291 (× 20 and 40 respectively).

Figs. 296, 297 Same corallum from Curacao Island, Palm Islands and same corallum as Fig. 292 (× 20 and 40 respectively).

Figs. 298, 299 Same corallum from Ashmore Reef, collecting station 106 (× 20 and 40 respectively).

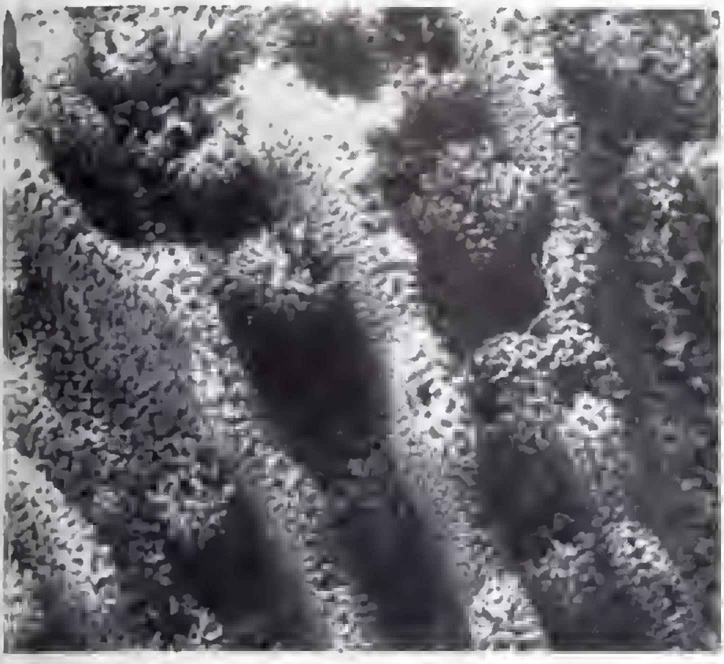


Fig. 294▲

Fig. 295▲

Fig. 296▼

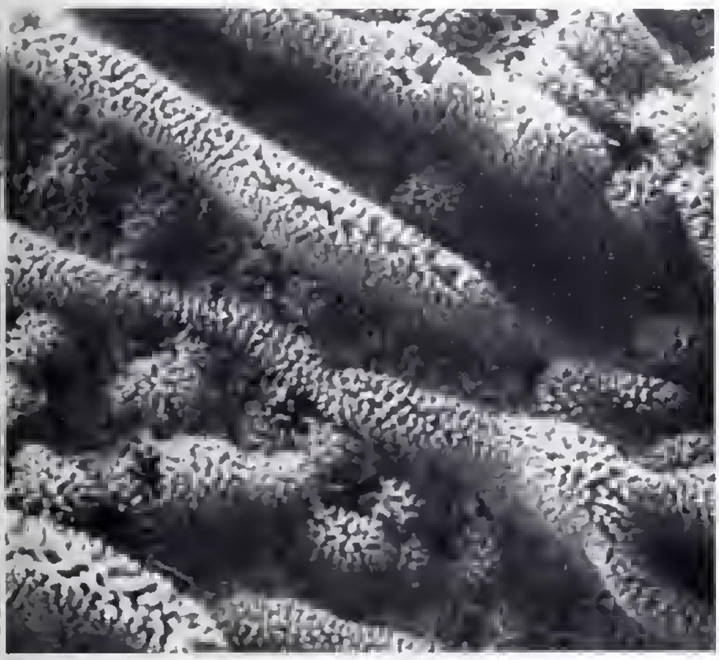


Fig. 297▼

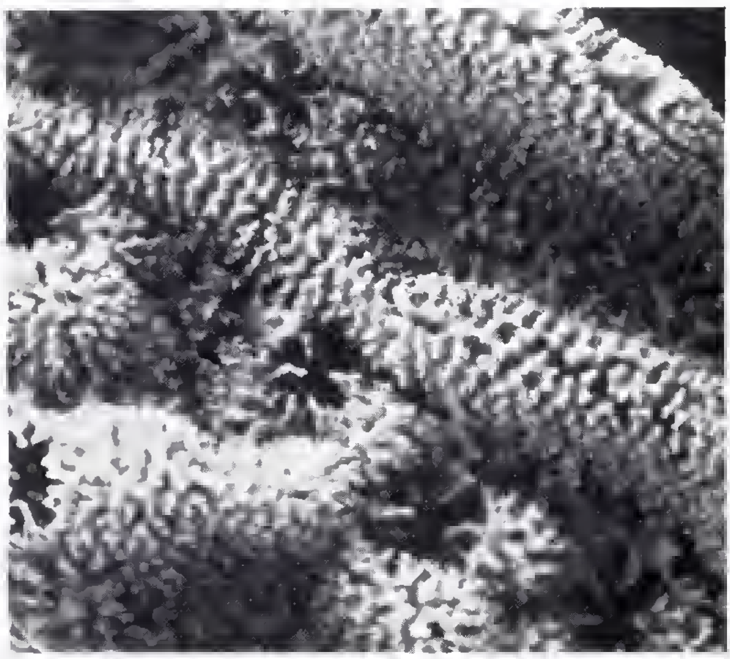


Fig. 298▼

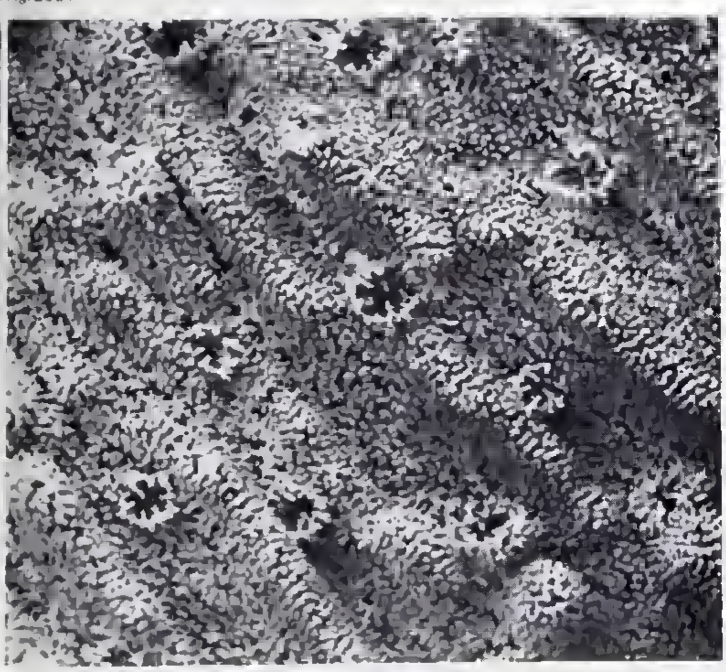
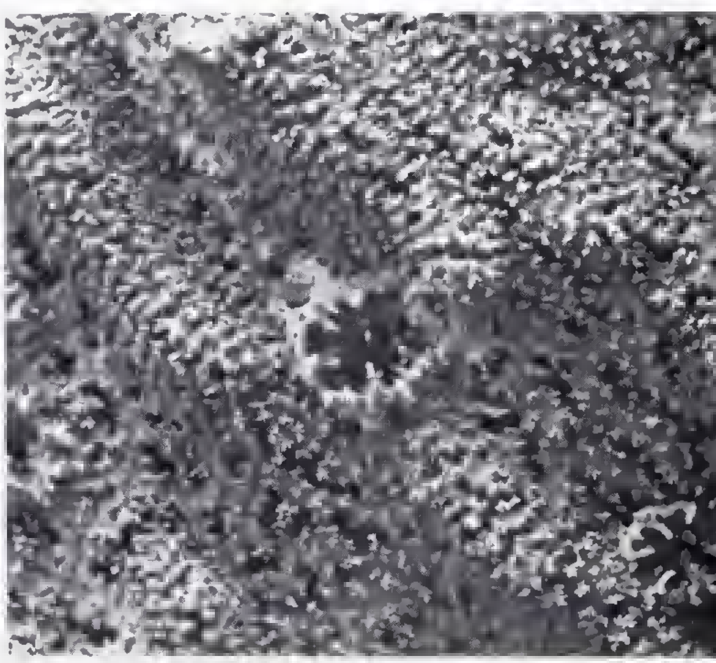


Fig. 299▼



In non-laminate (submassive or columnar) coralla, tuberculae seldom form ridges, rather they become finger-like, up to 4mm long, and compacted.

Living colonies are usually cream or brown in colour.

Affinities

Montipora foliosa most closely resembles *M. aequituberculata* (see p. 118).

Distribution

Widely distributed in the tropical Indo-Pacific from the Red Sea east to the New Hebrides and Fiji.

Montipora aequituberculata Bernard, 1897

Synonymy

Montipora aequituberculata Bernard, 1897.

Montipora amplectens Bernard, 1897.

Montipora ellisi Bernard, 1897.

Montipora erythraea von Marenzeller; Crossland (1952); Stephenson & Wells (1955); ?Umbgrove (1928, 1939); not von Marenzeller (1907).

Montipora composita Crossland, 1952; Wells (1954); Pillai (1967b); Scheer & Pillai (1974).

Montipora aequituberculata is the name selected for this species as it has an east Australian type locality (Torres Strait) and the characters of the holotype (BMNH 1892-12-1-19) are clear. *Montipora amplectens* (holotype BMNH 1884-2-26-24) and *M. ellisi* (holotype BMNH 1838-1-8-3) are from the South China Sea and an unknown locality respectively.

Crossland (1952) used two names for this species, commenting (p. 196) that '*M. composita* may be compared with Bernard's description of *M. aequituberculata*', but goes on to note differences between his two specimens and Bernard's description of *aequituberculata*.

Several other species of Bernard may be synonyms of *aequituberculata*. These include *M. challengeri* from the Philippines (holotype BMNH 1886-12-9-258), *M. listeri* from Tonga (holotype BMNH 1961-12-6-1) and *M. crassifolia* from an unknown locality (syntype BMNH 1897-5-18-5). However, all fall outside the range of variation of east Australian specimens.

In addition, several non-Bernard types may also be synonyms of *M. aequituberculata*. Among these are *M. fragosa* Verrill, 1869 from the central Pacific and *M. verrilli* Vaughan, 1907 from Hawaii. Geographic variation in the species is far from clear and it can only be noted here that most references to *M. verrilli* (other than those from Hawaii), including Vaughan (1918), Hoffmeister (1925), Wells (1954), and Chevalier (1968), appear to be the present species.

Material studied

Yorke Island (3 specimens), **Little Mary Reef, Turtle Islands** (2 specimens), **Raine Island** (8 specimens), **Great Detached Reef** (4 specimens), **Bird Island, Martha Ridgeway Reef** (5 specimens), **Tijou Reef** (4 specimens), **Houghton Island, Low Isles, Magdelaine Cay** (5 specimens), **Britomart Reef** (5 specimens),

Figs. 300-303 *Montipora aequituberculata* (× 0.5)

Fig. 300 From Curacao Island, Palm Islands, collecting station 177 showing the usual corallum shape, same corallum as Figs. 304, 305.

Fig. 301 From Falcon Island, Palm Islands, collecting station 41.

Fig. 302 From the Turtle Islands, collecting station 165, showing contortions in vertical laminae.

Fig. 303 From Fantome Island, Palm Islands, collecting station 34, showing a common growth deformity due to worm tubes, same corallum as Fig. 311.

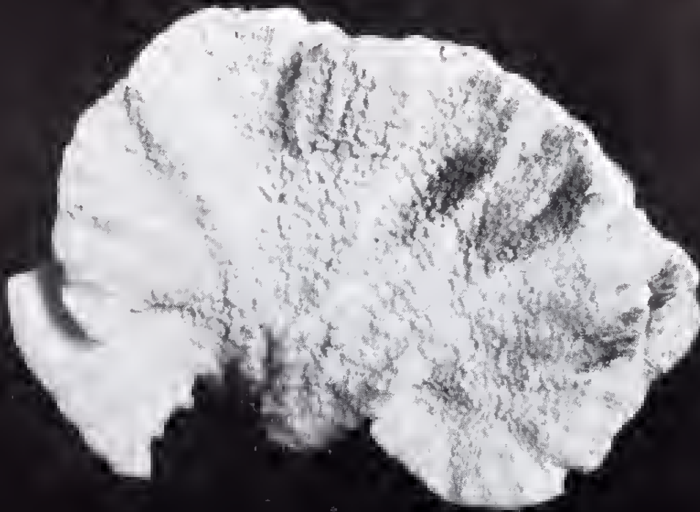


Fig. 300▲


Fig. 301▲

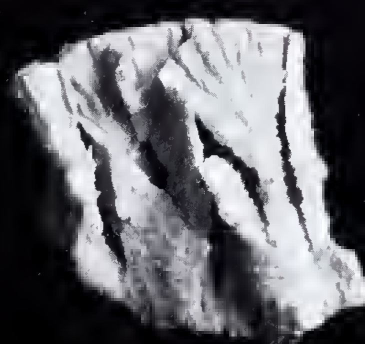


Fig. 302▲

Fig. 303▼

Rib Reef (47 specimens), **Palm Islands** (69 specimens), **Lodestone Reef, Keeper Reef, Broadhurst Reef** (26 specimens), **Magnetic Island** (12 specimens), **Chesterfield Reefs** (2 specimens), **Bushy Island-Redbill Reef** (4 specimens), **Swain Reefs, Palmaise Reef, Fitzroy Reef** (4 specimens), **Middleton Reef** (7 specimens), **Elizabeth Reef** (2 specimens), **Lord Howe Island.**

These localities include collecting stations 1, 5, 6, 8, 13, 34, 36, 37, 41, 42, 43, 45, 56, 57, 60, 79, 91, 145, 152, 154, 155, 159, 161, 165, 168, 169, 174, 177, 185, 187, 189, 191, 197, 198, 200, 210, 216, 222, 223, 225, 230, 231, 233, 234, 236, 239.

Figs. 304-311 *Montipora aequituberculata*

Figs. 304, 305 Same corallum from Curacao Island, Palm Islands, same corallum as Fig. 300 (× 20 and 40 respectively).

Figs. 306, 307 Same corallum from Curacao Island, Palm Islands, collecting station 177 (× 20 and 40 respectively).

Fig 304▲

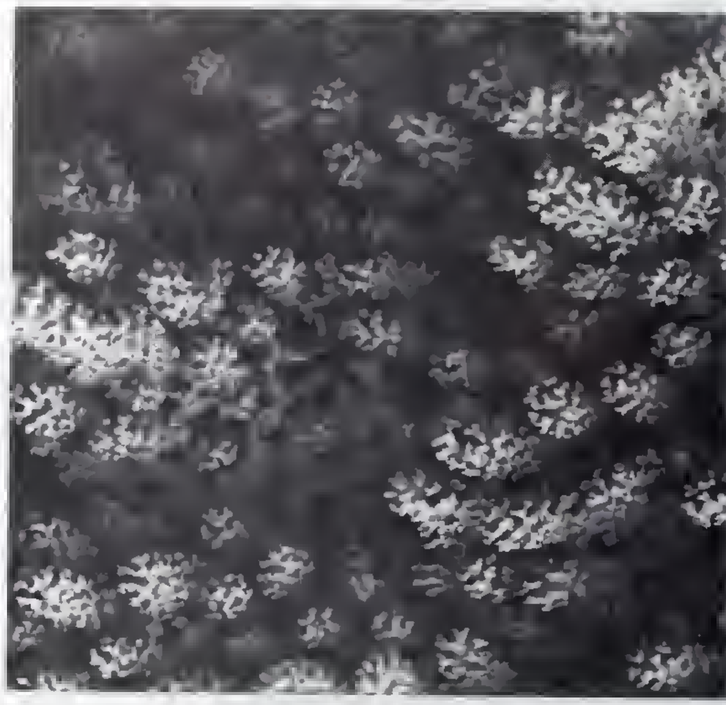


Fig 305▲

Fig 306▼

Fig 307▼

Note on polymorphism, synonymy and distribution

This is the most abundant *Montipora* of eastern Australia. It is also one of the most polymorphic and also appears to be one of the most widespread.

During the present study, several attempts were made (in different parts of the Great Barrier Reef) to find a basis for dividing this species into two or more groups. These attempts were unsuccessful. The description of *M. aequituberculata* given below must, however, be considered tentative, as is the synonymy and the proposed geographic distribution.

Figs. 308, 309 Same corallum from Yorke Island, collecting station 13 (× 20 and 40 respectively).
Fig. 310 From the Swain Reefs, collecting station 79 (× 20).
Fig. 311 From Fantome Island, Palm Islands, same corallum as Fig. 303 (× 40).

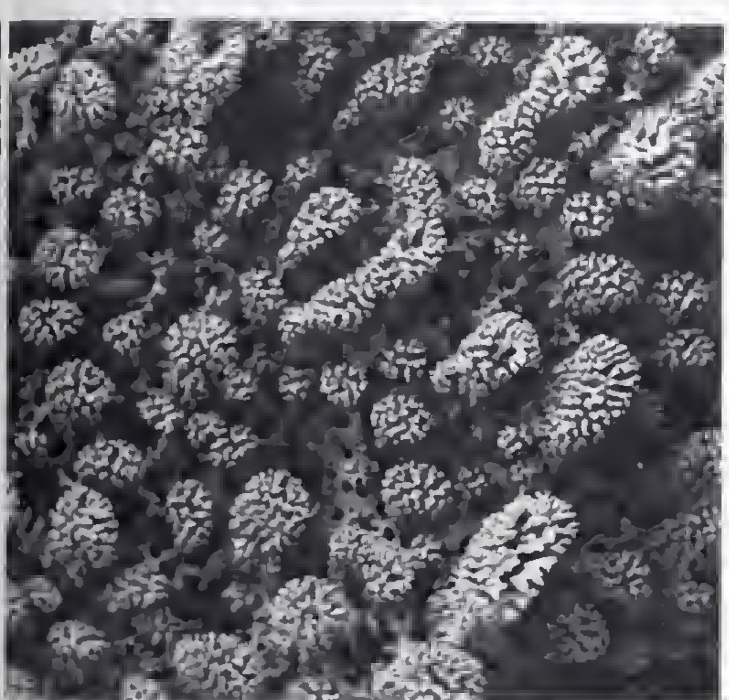


Fig. 308▲

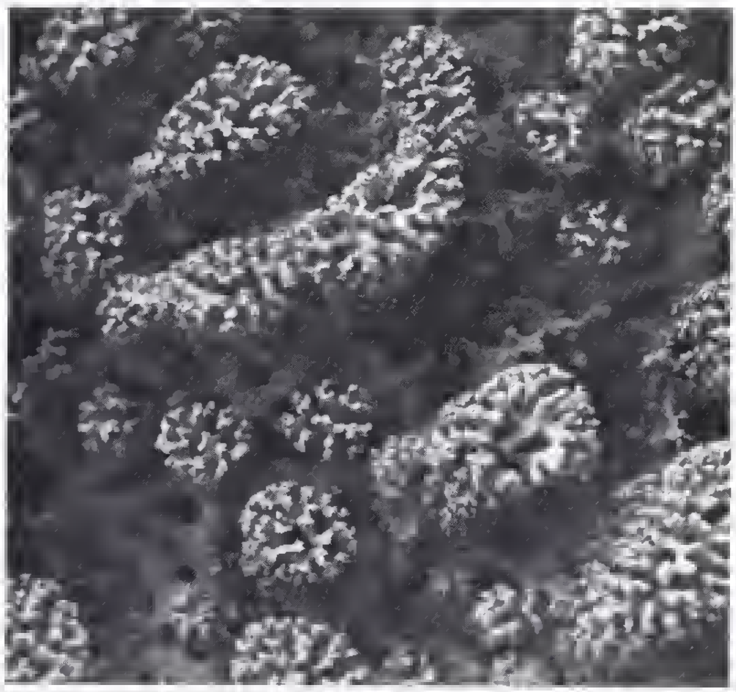


Fig. 309▲

Fig. 310▼

Fig. 311▼

Characters

Colonies are foliose, composed of thin, expanding, flat to contorted laminae, usually with a side attachment and often arranged in oblique overlapping whorls. The epitheca is inconspicuous or absent, the undersurface of laminae being glabrous, except for widely-spaced tuberculae which may contain single minute corallites.

Calices are 0.4-0.8mm diameter. Septa are composed of non-tapered spines. Primary septa are thicker than secondary septa, are complete, $\frac{1}{2}$-$\frac{2}{3}$R. Secondary septa are $<\frac{1}{2}$R, complete to absent. Septation is reduced in corallites near the corallum periphery and in heavily calcified corallites near the corallum base. Corallites are exsert to immersed and are surrounded by thecal papillae which are highly fused and which frequently form long fine ridges perpendicular to the margins of thin laminae. These ridges frequently form hoods over peripheral corallites which are strongly outwardly inclined. Ridges are often absent from thicker laminae. Thecal papillae may form fused cones near the base of laminae. Reticulum papillae are thick and highly fused, and all papillae are coated with highly elaborated spinules. Similar spinules may cover the reticulum, giving all coenostial structures a uniform frosted appearance. The reticulum is medium-fine to medium-coarse but is often obliterated by spinules.

Montipora aequituberculata occurs on sheltered reef slopes and is usually uniform brown or purple in colour.

Affinities

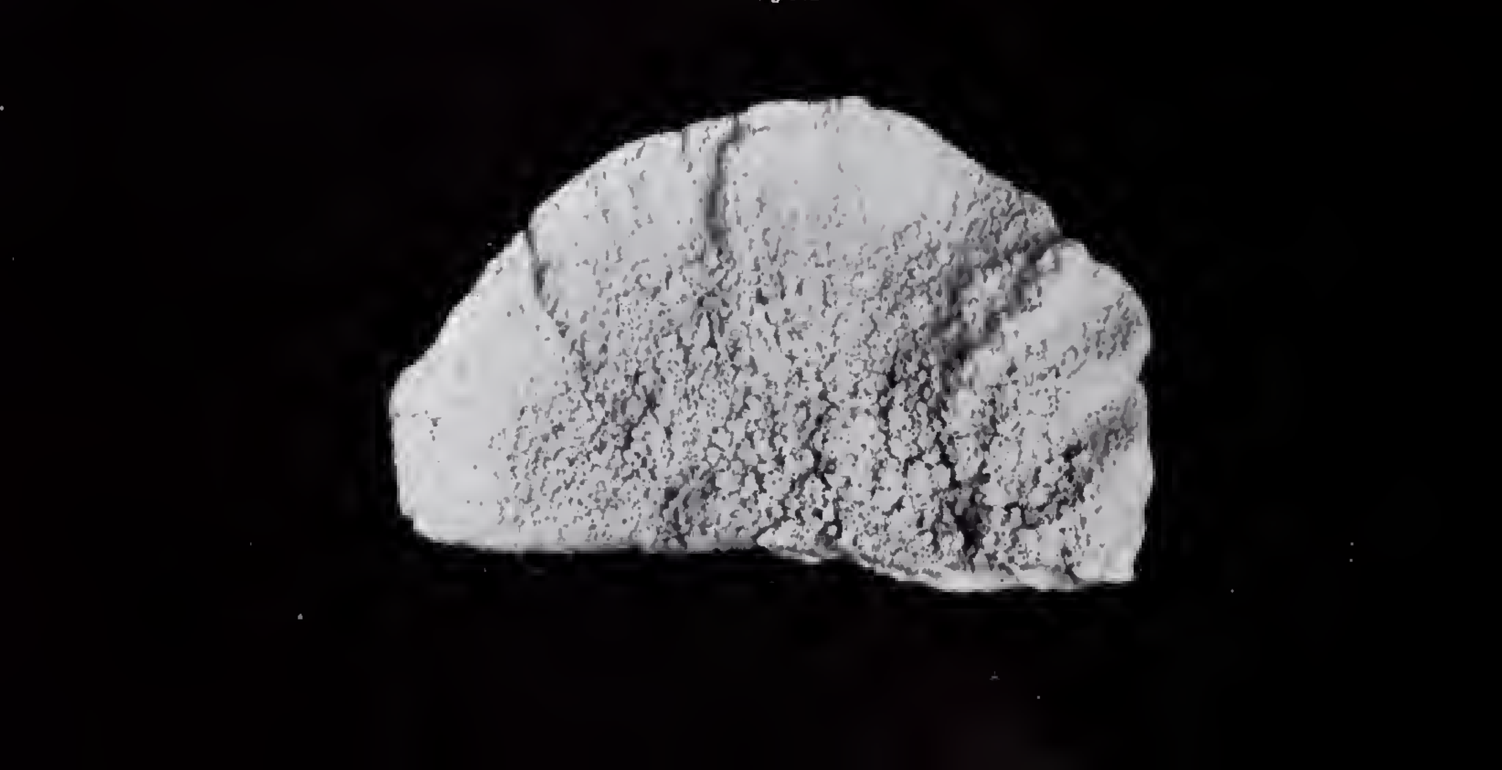
The present series of *M. aequituberculata*, as noted above, is very polymorphic and may contain other species which have not been recognised. The species (or species complex if it is one) is closest to *M. crassituberculata*, from which it can usually be distinguished by its smaller, less exsert corallites and by having much finer plates. *Montipora aequituberculata* has the same growth form and general appearance as *M. foliosa*, but corallites are not inclined as strongly outwards on the corallum, and the reticulum ridges, so characteristic of *M. foliosa*, are at most poorly developed.

Distribution

This species may occur from the Red Sea to the Tuamotu Archipelago (see note above).

Fig. 312 *Montipora crassituberculata* from the Pompey Complex, collecting station 71, same corallum as Figs. 315, 316 (× 0.5).

Fig. 312▼



Montipora crassituberculata Bernard, 1897

Synonymy

Montipora crassituberculata Bernard, 1897.

?*Montipora incognita* Bernard, 1897; Gardiner (1898).

The type locality of *M. crassituberculata* (holotype BMNH 1895-10-9-186) is the Houtman Abrolhos Islands, while that of *M. incognita* (holotype BMNH 1897-9-25-3) is unknown. The latter has slightly larger corallites and a better-developed septation.

It is probable that this synonymy is incomplete.

Material studied

Yorke Island, Sue Island, Raine Island (3 specimens), **Great Detached Reef** (2 specimens), **Martha Ridgeway Reef** (3 specimens), **Willis Islet, Magdelaine Cay** (9 specimens), **Mellish Reef** (2 specimens), **Rib Reef** (6 specimens), **Palm Islands** (4 specimens), **Broadhurst Reef, Magnetic Island** (5 specimens), **Chesterfield Reefs** (11 specimens), **Fitzroy Reef** (9 specimens).

These localities include collecting stations 1, 5, 13, 17, 37, 151, 152, 154, 174, 177, 189, 197, 199, 200, 207, 208, 210, 211, 212, 213, 215, 216, 222, 225.

Characters

Colonies are sub-massive or are thick, sub-encrusting plates. They have entire margins and well-developed epithecae usually extending 1-3cm from the margin. Corallites are immersed to exsert and are conical in shape. Both types usually occur together. Calices are 0.7-0.9mm diameter. Septa are very variable, even between adjacent corallites. They are composed of non-tapered spines which may be regularly or irregularly arranged. Primary septa are usually $<\frac{2}{3}R$ but some may be longer and fused. Directive septa are sometimes distinguishable. Secondary septa are sub-equal to absent and are usually slightly thinner than primaries. Thecae are usually well formed. Thecal and reticulum papillae are both compound and both are covered with elaborated spinules. The reticulum is coarse to very coarse.

Montipora crassituberculata is abundant on the Great Barrier Reef and occurs on most reef slopes. It is usually brown or blue in colour.

Affinities

Montipora crassituberculata is closest to *M. aequituberculata* (see p. 118).

Distribution

Recorded only from the east and west coasts of Australia.

Figs. 313-318 *Montipora crassituberculata*

Figs. 313, 314 Same corallum from the Swain Reefs, collecting station 77 (× 20 and 40 respectively).

Figs. 315, 316 Same corallum from the Pompey Complex and same corallum as Fig. 312 (× 20 and 40 respectively).

Figs. 317, 318 Same corallum from Chesterfield Atoll, collecting station 212 (× 20 and 40 respectively).

Fig. 313▲

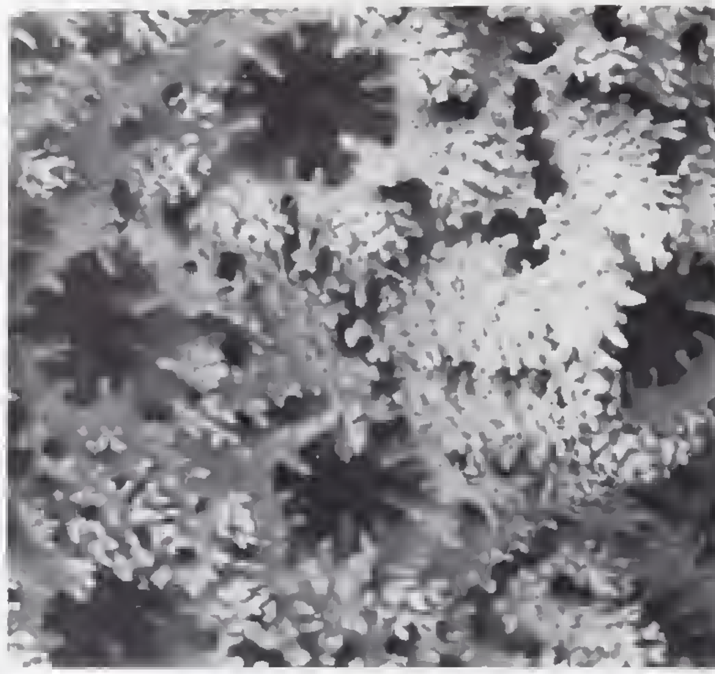


Fig. 314▲

Fig. 315▼

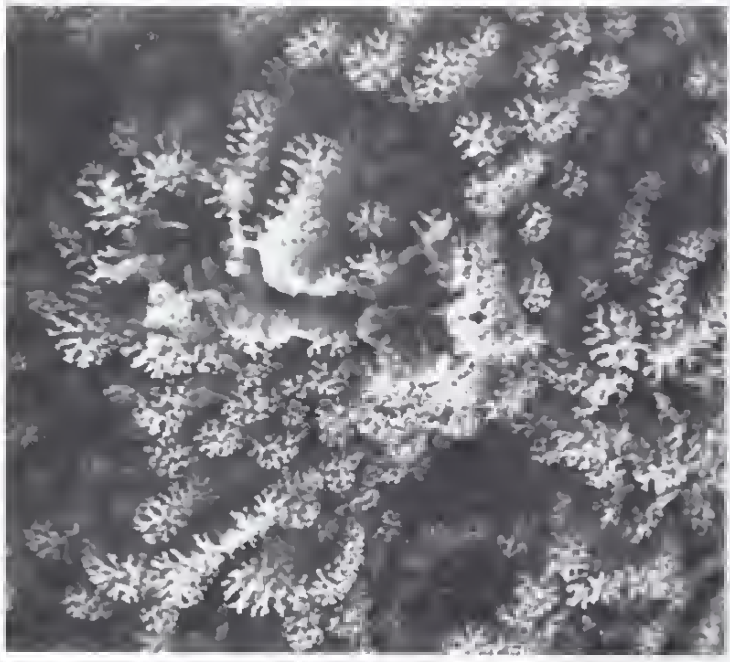


Fig. 316▼

Fig. 317▼

Fig. 318▼

Generic synonymy

Anacropora Ridley, 1884.

Type species

Anacropora forbesi Ridley, 1884.

Introduction

Anacropora is like *Montipora* except that it has arborescent or sub-arborescent growth forms with no tendency to become encrusting or sub-massive. The coenosteum is uniform and is covered with fine, highly elaborated spinules without the development of tuberculae.

There are no axial corallites in *Anacropora*; thus branch growth occurs from undifferentiated coenosteum in which corallites later develop. This is a fundamental difference between *Acropora* and *Anacropora*, the former having specialised corallites for budding, the latter having no such corallites, with budding occurring in undifferentiated coenosteum. This difference has allowed *Acropora* species to have highly deterministic growth strategies, whereas *Anacropora*, with no such capacity for organisation, has essentially one type of growth form.

Anacropora is seldom found in any situation where *Acropora* diversity is high, but may be abundant on fringing reefs where the water is moderately turbid. In such biotopes, *A. forbesi* especially may form dense stands several m diameter. It has not been collected from very deep water on reef slopes of outer reefs, but may be expected to occur there.

Nine nominal species have been previously described: *A. forbesi* Ridley, 1884, *A. gracilis* Quelch, 1886, *A. solida* Quelch, 1886, *A. spinosa* Rehberg, 1892, *A. erecta* Bernard, 1897, *A. reptans* Bernard, 1897, *A. puertogalerae* Nemenzo, 1964, *A. matthaii* Pillai, 1973 and *A. tapera* Zou, 1975. Of these forms, only *A. spinosa* and *A. tapera* are different from any corallum found on the Great Barrier Reef. The type specimen of *A. tapera* has not been re-examined, but its highly irregular corallites are unlike those of any corallum in the present collection. This study indicates that of the remaining nominal species, only *A. puertogalerae*, *A. matthaii* and *A. forbesi* are valid and that the remainder are synonyms of *A. forbesi*.

Anacropora has not previously been recorded from eastern Australia.

Anacropora forbesi Ridley, 1884

Synonymy

Anacropora forbesi Ridley, 1884; Bernard (1897); Yabe & Sugiyama (1941); Pillai (1973).

Anacropora gracilis Quelch, 1886; Bernard (1897); Wells (1954).

Anacropora solida Quelch, 1886; Bernard (1897); Pillai (1973).

Anacropora erecta Bernard, 1897.

Anacropora reptans Bernard, 1897; Wells (1954).

This synonymy includes five of the nine nominal species of *Anacropora* previously described.

The type specimens of *A. forbesi* from the Cocos Keeling Islands (BMNH 1884-2-16-40 to 47), *A. gracilis* from Banda (BMNH 1885-2-1-10), *A. solida* from Fiji (1885-2-1-11), *A. erecta* from the Solomon Islands (BMNH 1975-8-29-1) and *A. reptans* from the South China Sea (BMNH 1893-9-1-197) have been variously discussed by Bernard (1897), Yabe & Sugiyama (1941), Wells (1954) and Pillai (1973). Bernard treated each as separate entities which he did not compare. Yabe & Sugiyama synonymised *A. gracilis* and *A. solida* with *A.*

forbesi, Wells separated *A. gracilis* from *A. forbesi* and Pillai synonymised *A. gracilis* and *A. reptans* with *A. forbesi*, maintaining *A. solida* and *A. erecta* as separate, but possibly synonymous, species.

All these type specimens compare well with various coralla in the present series as described below. Coralla which most closely resemble the type specimens of *A. solida* and *A. erecta* (in having widely separated corallites and a well-calcified coenosteum) came from slightly deeper or more turbid water than those closest to the type of *A. forbesi*.

It should be noted, however, that all the above-mentioned type specimens are small with few, if any, branch tips preserved, these being one of the diagnostic characters separating *A. forbesi* from *A. puertogalerae*.

Material studied

Murray Islands, Tijou Reef, Eyrie Reef, Britomart Reef, Palm Islands (51 specimens), **Magnetic Island** (2 specimens), **Whitsunday Islands** (3 specimens).

These localities include collecting stations 2, 20, 34, 43, 45, 55, 56, 60, 93, 98, 101, 130, 167.

Previous records from eastern Australia

Not previously recorded.

Characters

Colonies are arborescent, usually with dichotomous branching, branches being <10mm diameter and only slightly tapered, with rounded tips. Branches may be short with frequent subdivisions, or up to 18cm long, giving colonies a lax appearance. The bases of branches are dead, usually buried in mud. Corallites are uniformly spaced and uniform within colonies. They are immersed or conical, or have a slightly protuberant lower lip. Calices are rounded, 0.6-1.0mm diameter. Septa are usually in two complete cycles of $\frac{2}{3}$R and $\frac{1}{3}$R. In some coralla, secondary septa are reduced or absent and primary septa are $<\frac{1}{3}$R. In other

Fig 319▲

Fig. 319 *Anacropora forbesi* from Curacao Island, Palm Islands, collecting station 56, same corallum as Figs. 320, 326, 327 (×0.5).

Figs. 320-323 *Anacropora forbesi* (× 5)
Figs. 320, 321 Same colony from Curacao Island, Palm Islands (× 0.5 and 5 respectively).
Figs. 322, 323 From Orpheus Island, Palm Islands (× 5).

ig 320▲ Fig. 322▼ Fig. 321▲ Fig. 323▼

Figs. 324-329 *Anacropora forbesi*
Figs. 324, 325 From Curacao Island, Palm Islands (× 20 and 40 respectively).
Figs. 326, 327 From Barber Island, Palm Islands (× 20 and 40 respectively).
Figs. 328, 329 From Britomart Reef, collecting station 167 (× 20 and 40 respectively).

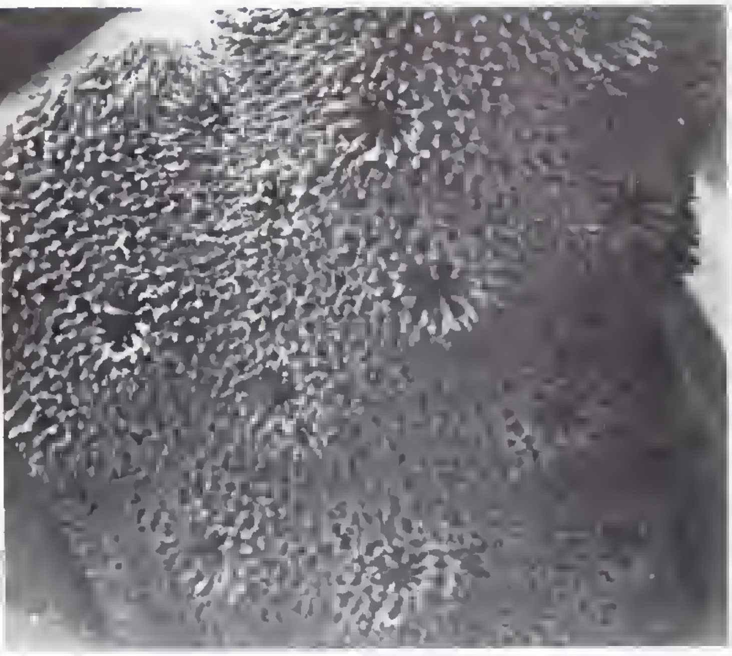


Fig. 324▲

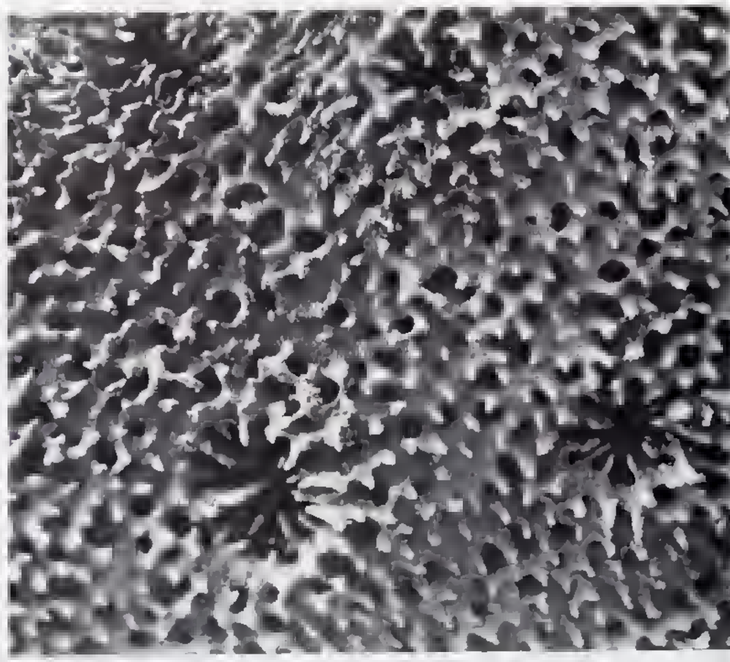


Fig. 325▲

Fig 326▼

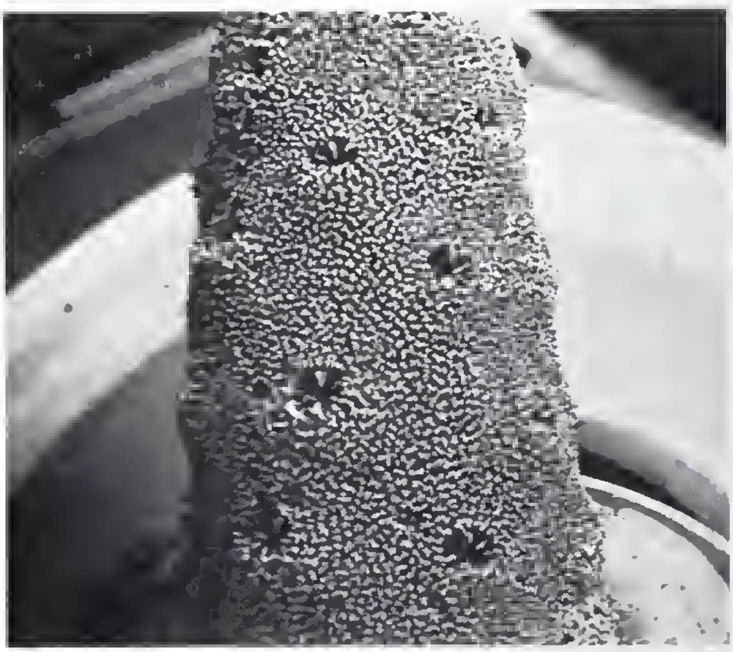


Fig 327▼

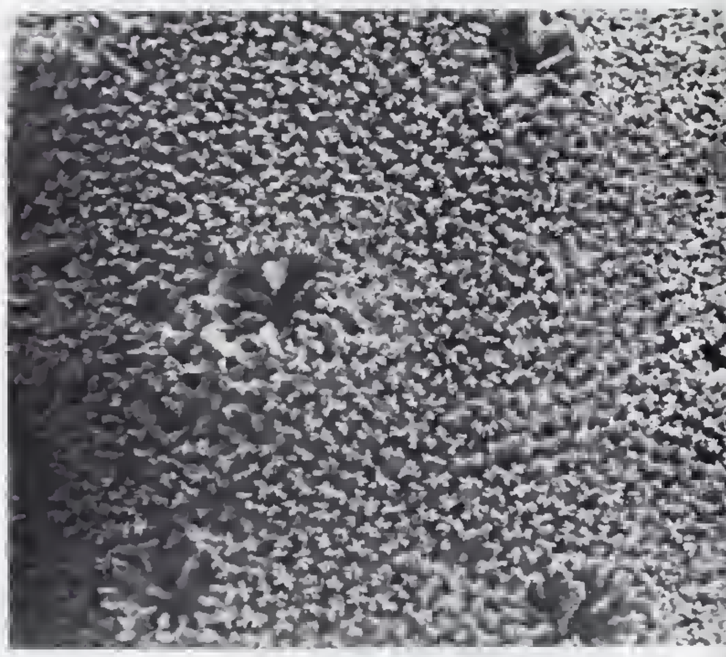
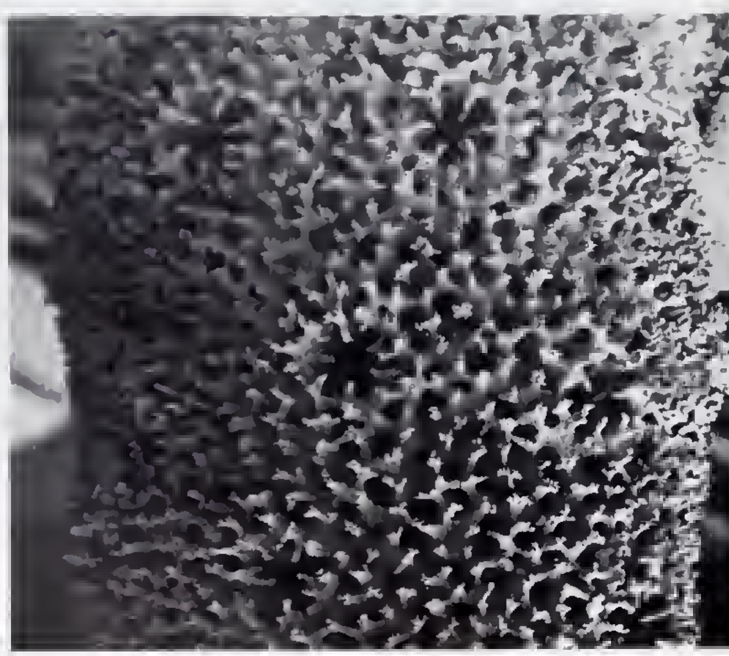


Fig 328▼

Fig 329▼



coralla, the first two cycles reach $\frac{3}{4}$R and $\frac{1}{2}$R and the rudiments of a third cycle may be developed. All septa consist of rows of straight spines. The coenosteum consists of compacted spinules which usually have elaborated tips. The latter may give a frosted appearance or may be fused into a near solid structure.

Living colonies are pale brown with white branch tips. Polyps may be extended during the day. More commonly than most species, colonies may be pure white as a result of expulsion of zooxanthellae.

Habitat preferences and growth form variation

As with all *Anacropora*, *A. forbesi* occurs most commonly on inshore fringing reefs below or at the lower limit of *Acropora*-dominated zones. It is by far the most common *Anacropora* on the Great Barrier Reef and may be the dominant species on horizontal muddy substrates.

The full range of growth forms seen in the present series can occur over a depth range of only 4 to 12m, and other skeletal characters are likewise strongly correlated with depth. Coralla from relatively shallow or clear water have compact branches, corallites with relatively protuberant lower lips and poorly developed septa, and a coenosteum consisting of clearly separated spinules. Coralla from the lower depth limit of the same locality have immersed corallites with well-developed septa and a smooth, nearly solid coenosteum. Some of this variation can be seen in the lower (overgrown) and upper branches of a single large colony.

Affinities

Anacropora forbesi can readily be separated *in situ* from *A. puertogalerae* by its blunt branch tips and open, dichotomous branching pattern. It is distinguished from *A. reticulata* by having smaller corallites, thinner, less curved branches and coenosteum spinules which are not fused into a reticulate pattern.

Distribution

Widespread in the tropical Indo-Pacific, from the Seychelles and Providence Islands in the west to the Marshall Islands in the east.

Anacropora puertogalerae Nemenzo, 1964

Synonymy

Anacropora puertogalerae Nemenzo, 1964.

Pillai (1973) puts *A. puertogalerae* in synonymy with *A. spinosa* Rehberg. The type specimen of *A. spinosa* from Palau is lost, but this appears to be a well-defined species which differs from *A. puertogalerae* in having smaller corallites and much more prominent coenostial spinules beneath the corallites (3-10mm long).

Material studied

Big Mary Reef, Pandora Reef, Lizard Island (6 specimens), **Eyrie Reef, Palm Islands** (45 specimens).

These localities include collecting stations 20, 32, 33, 41, 43, 45, 60, 91, 131.

Previous record from eastern Australia

Not previously recorded.

Characters

Colonies consist of a mass of twisted branches up to 13mm diameter, which taper to a point and which irregularly anastomose. Branches may be tightly compacted to open and sprawling. Their basal parts are usually dead and are often buried in mud.

Corallites are immersed or are conical, with round calices 0.4-0.7mm diameter. Septa are composed of granulated straight or twisted spines; primary septa are thicker than secondary septa. They are well developed, up to $\frac{2}{3}$R and $\frac{1}{3}$R, but some septa of either cycle may be

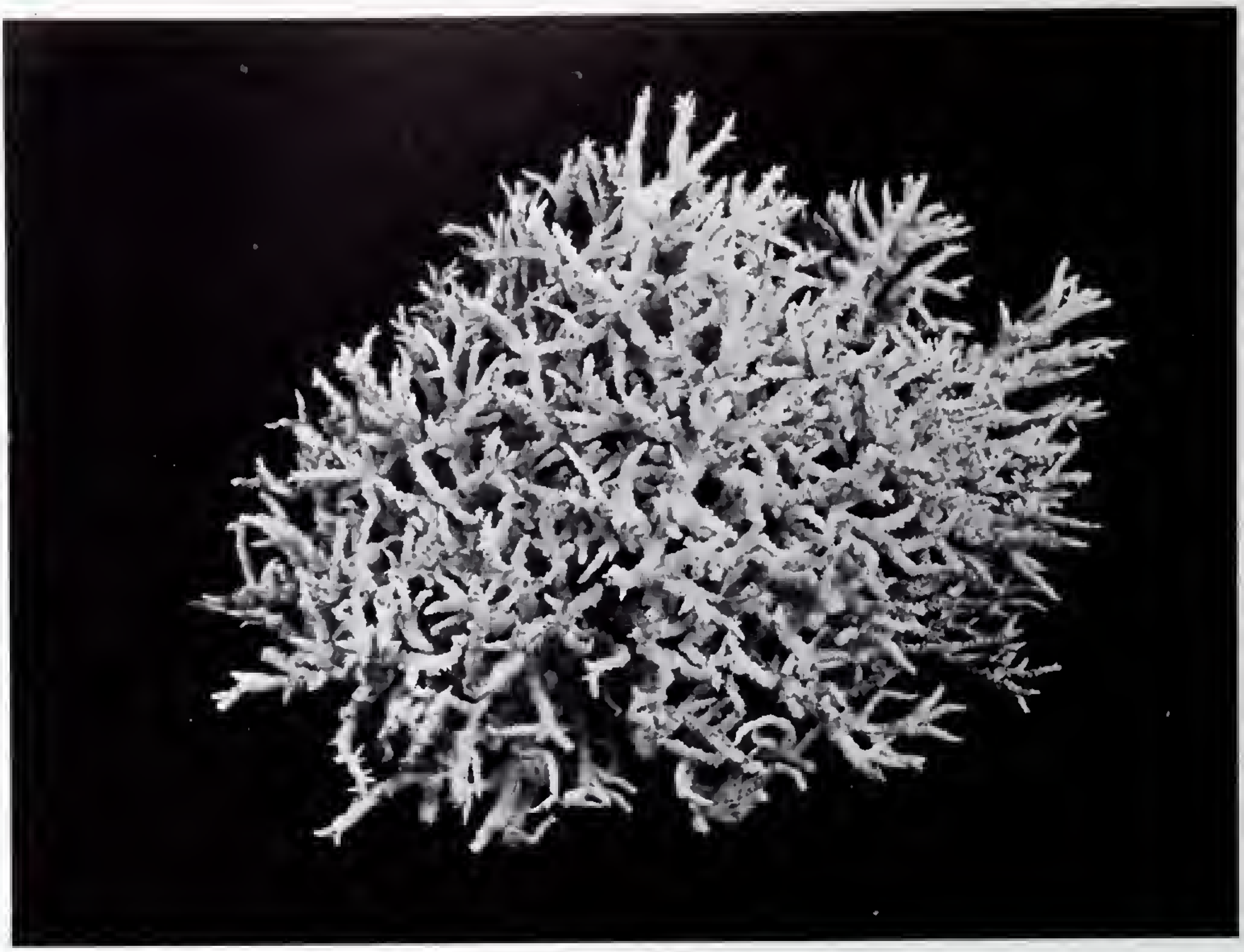


Fig. 330▲

Fig. 330 *Anacropora puertogalerae* from Pandora Reef (× 0.33).

absent and sometimes they are irregular. The coenosteum consists of closely compacted spinules with very elaborated tips. Coenosteum beneath corallites on upper parts of branches may be swollen into a mound or a spine which projects up to 1.3mm and which forms the lower wall of the corallite.

Living colonies are pale brown with white branch tips.

Habitat preferences and growth form variation

As with all *Anacropora, A. puertogalerae* is restricted to turbid waters around fringing reefs and other inner reefs. It may occur in shallow water exposed to moderate wave action, in which case branches are tightly compacted and anastomosed and the colonies are usually hemispherical in shape. Coenostial spinules below corallites on upper branches are usually developed. This species is most common on fringing reefs below the main *Acropora* zone, where it usually grows on soft substrates. Such colonies usually have a sprawling habit and are broken into daughter colonies which may extend for many m, forming a continuous tangle of interlocking branches. In such situations, coenostial spines are not usually

Figs. 331-336 *Anacropora puertogalerae*

Figs. 331, 332 Same corallum from Pandora Reef and same corallum as Fig. 330 (× 5 and 15 respectively).
Figs. 333, 334 Same corallum from between Brisk and Falcon Islands, Palm Islands, collecting station 224 (× 20 and 40 respectively).
Figs. 335, 336 From Orpheus Island, Palm Islands, collecting station 91 (× 20 and 40 respectively).

Fig. 331▲

Fig. 332▲

Fig. 333▼

Fig. 334▼

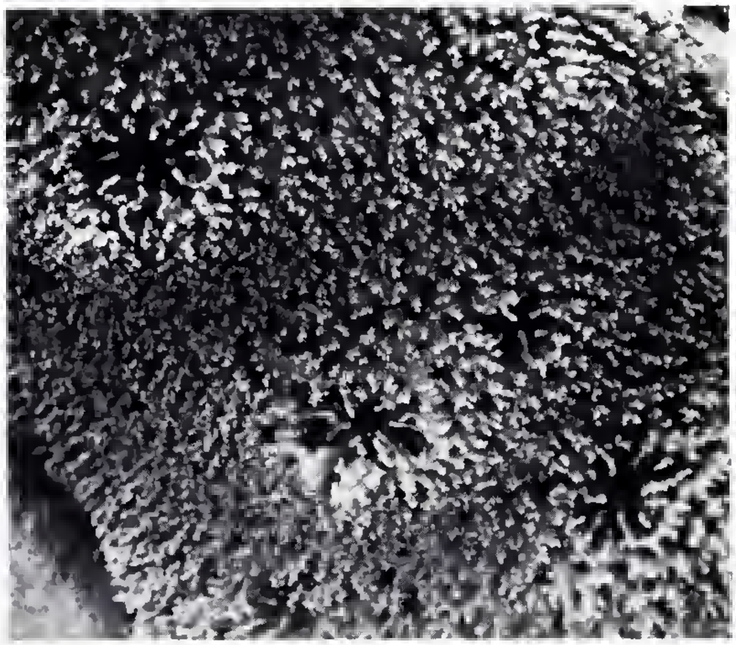


Fig. 335▼

Fig. 336▼

developed. At the lower limit of the species' depth range corallites are <4mm diameter and are widely spaced and the coenosteum is almost solid.

Affinities

Anacropora puertogalerae is readily distinguished from other east Australian *Anacropora* by its sharply pointed branches and, when developed, its coenostial spines. Of non-east Australian species, it is closest to *A. spinosa*.

Distribution

Recorded only from eastern Australia and the Philippines.

Anacropora matthaii Pillai, 1973

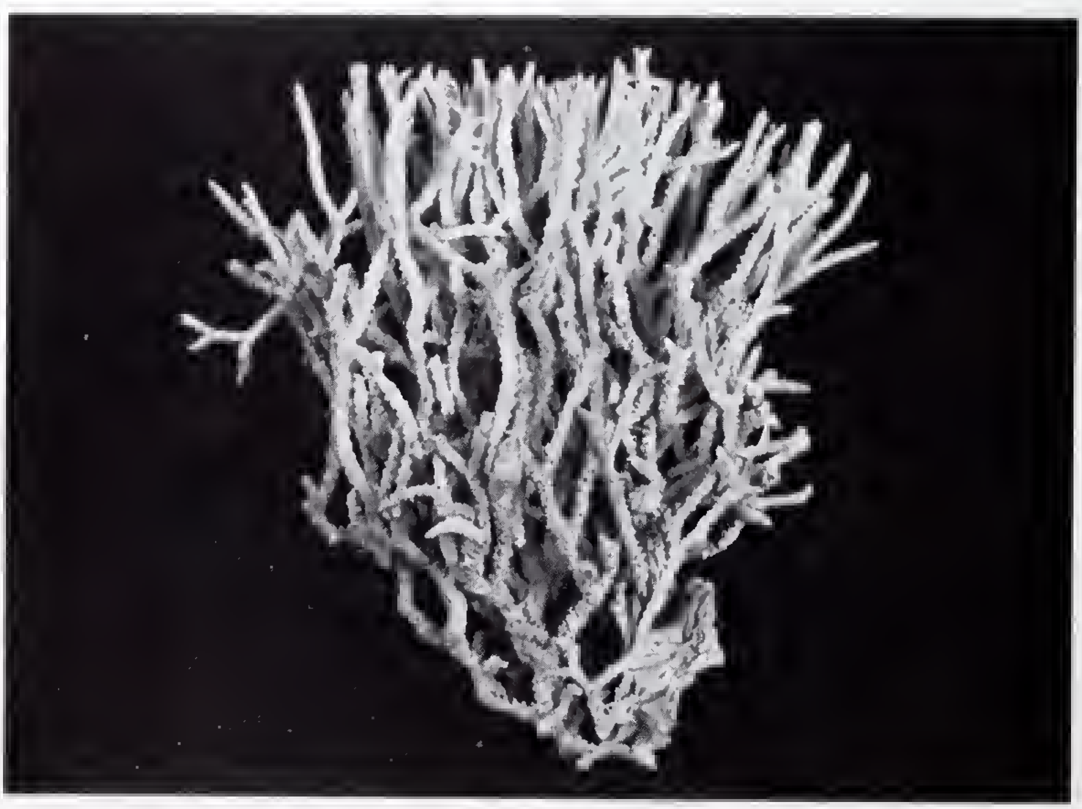
Synonymy

Anacropora matthaii Pillai, 1973.

The holotype (BMNH 1892-4-5-42) from Damar Island, Indonesia, consists of twisted branches 2.2-2.5mm thick with exsert corallites of irregular shape. Calices are 0.5-0.8mm diameter. Septa are irregular with one, rarely both, directive septa reaching R, the remaining first cycle $<\frac{2}{3}$R, sometimes incomplete. Secondary septa are reduced to rows of irregular spines $<\frac{1}{3}$R, usually incomplete. The coenosteum is highly fused and has slightly elaborated, widely spaced, spinules. The coenosteum of the thecae is fused, with irregular perforations and spinules that may become elongated and elaborated.

Fig. 337 *Anacropora matthai* from Orpheus Island, Palm Islands, same corallum as Figs. 338, 339 (× 0.5).

Fig 337▼



Figs. 338-343 *Anacropora matthai*

Figs. 338, 339 Same corallum from Orpheus Island, Palm Islands and same corallum as Fig. 337 (× 5 and 40 respectively).

Figs. 340, 341 From between Orpheus and Fantome Islands, Palm Islands, collecting station 60 (× 20 and 40 respectively).

Figs. 342, 343 From Curacao Island, Palm Islands, collecting station 56 (× 20 and 40 respectively).

Fig. 338▼

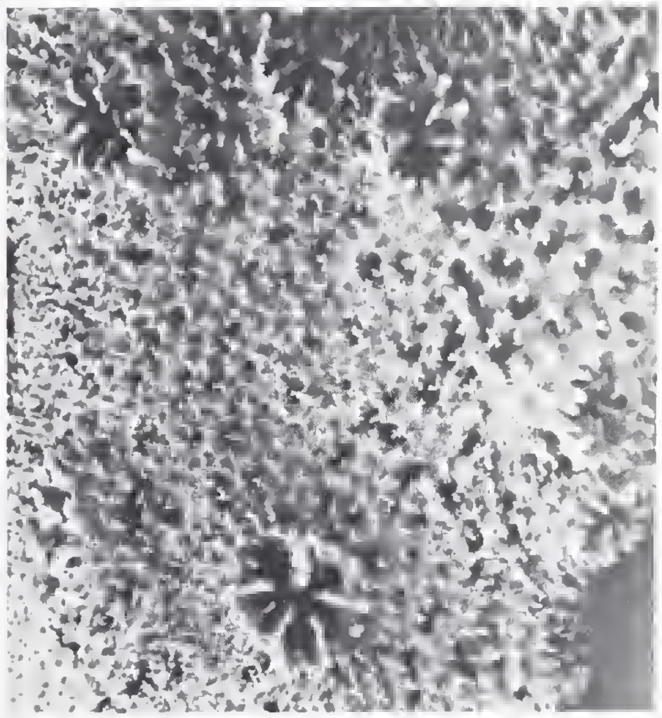


Fig. 339▲

Fig. 340▲

Fig. 341▼

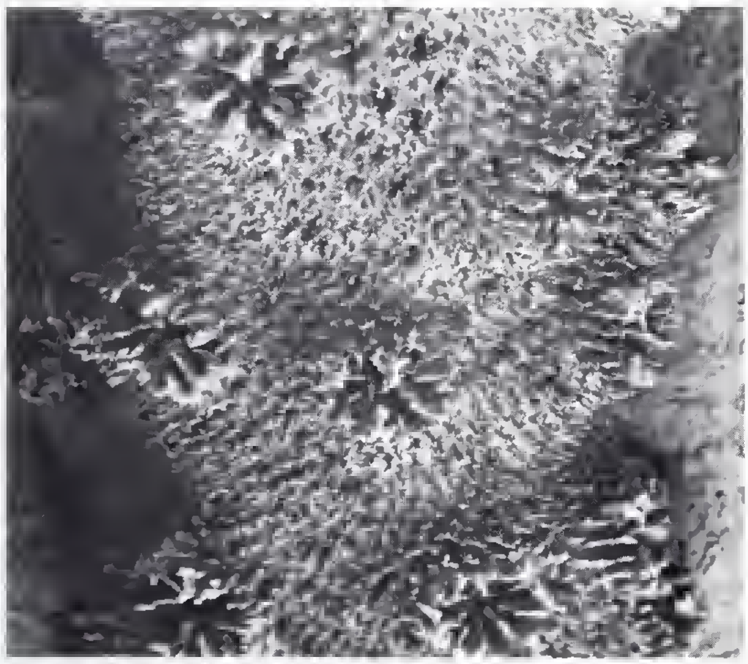
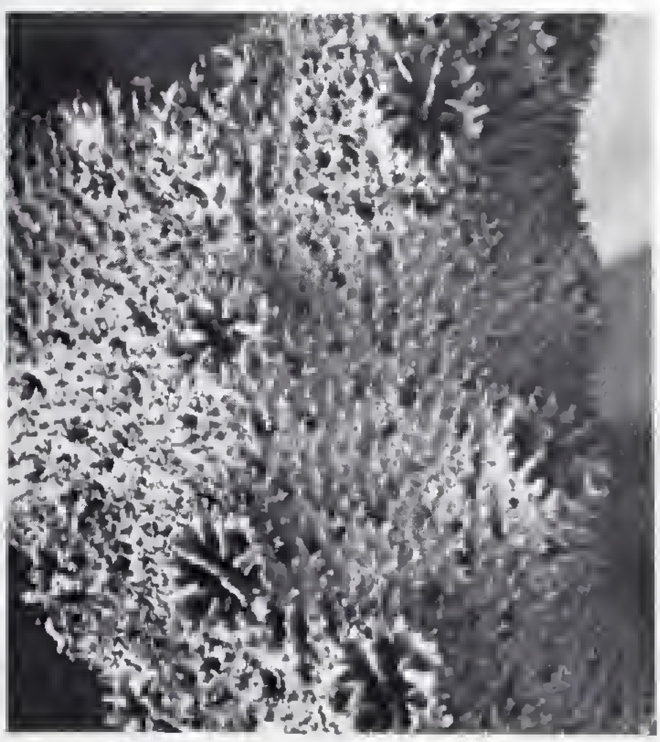


Fig. 342▼

Fig. 343▼



Material studied

Palm Islands (11 specimens), **Pandora Reef.**

These localities include collecting stations 34, 37, 56, 60, 171.

Previous records from eastern Australia

Not previously recorded.

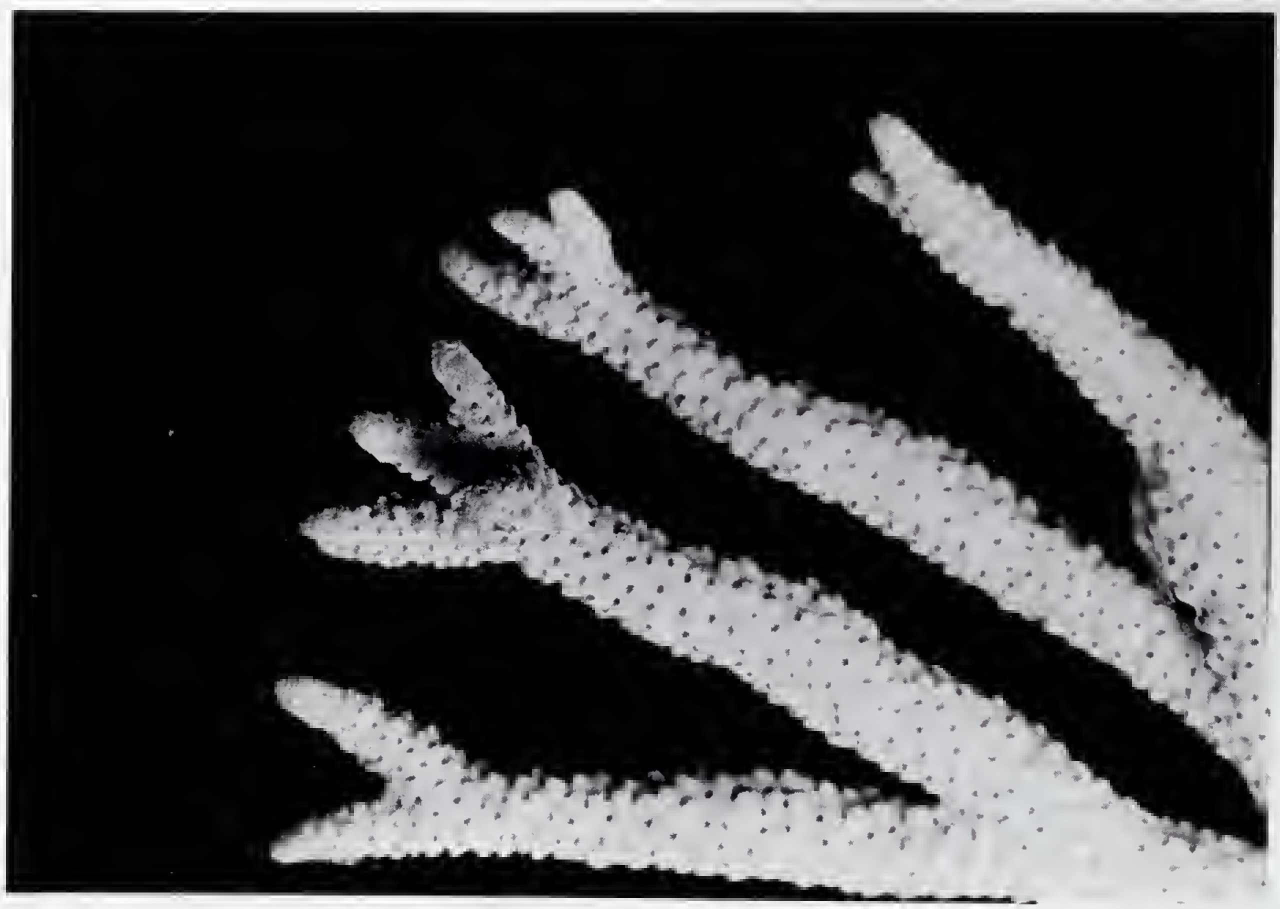
Characters

Colonies are composed of terete branches <5.5mm diameter which divide, usually dichotomously, at irregular intervals. Branches may be closely compacted, forming a thicket, or be open, giving colonies irregular shapes. Corallites are regularly spaced, tubular, up to 1.5mm exsert, with calices 0.5-0.7mm diameter. Septa are very variable and may be as described for the holotype, but usually primary septa are exsert dentate plates up to $\frac{2}{3}$R, symmetrically arranged and uniform in length. Secondary septa are $<\frac{2}{3}$R, usually complete. The coenosteum is uniformly covered with spinules, with slightly to very elaborated tips.

Living colonies are brown with pale brown or cream tips. Polyps are usually extended during the day.

Fig. 344 Holotype of *Anacropora reticulata* from Orpheus Island, Palm Island, collecting station 91, same corallum as Fig. 345 (× 1.3).

Fig. 344▼



Figs. 345-350 *Anacropora reticulata*

Fig. 345 Holotype from Orpheus Island, Palm Islands, same corallum as Fig. 344 (× 5).
Fig. 346 From between Orpheus and Fantome Islands, collecting station 60 (× 10).
Figs. 347-350 From Orpheus Island, Palm Islands (× 10, 20, 30 and 40).

Fig. 345▲

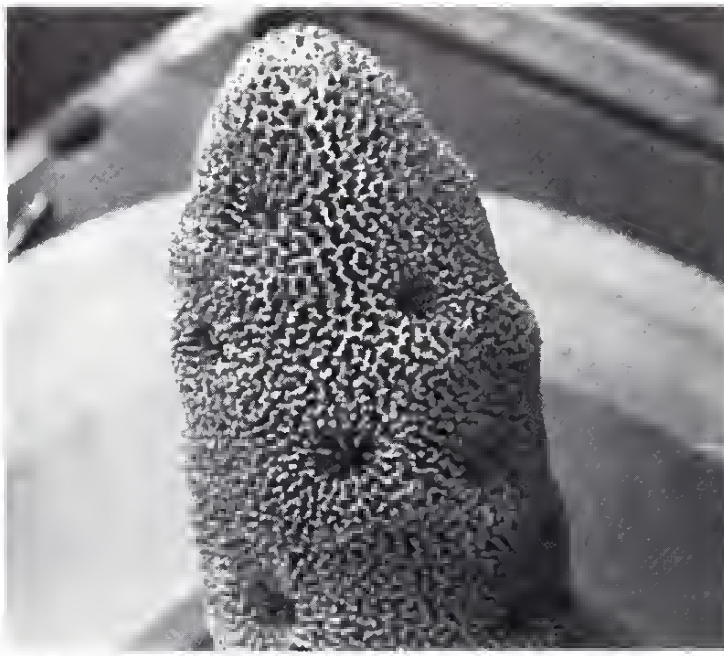


Fig. 346▲

Fig. 347▼

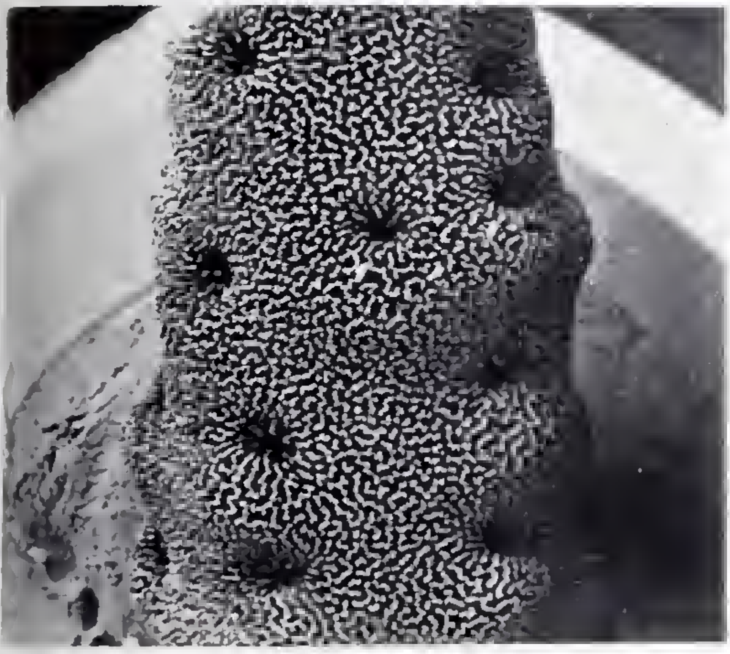
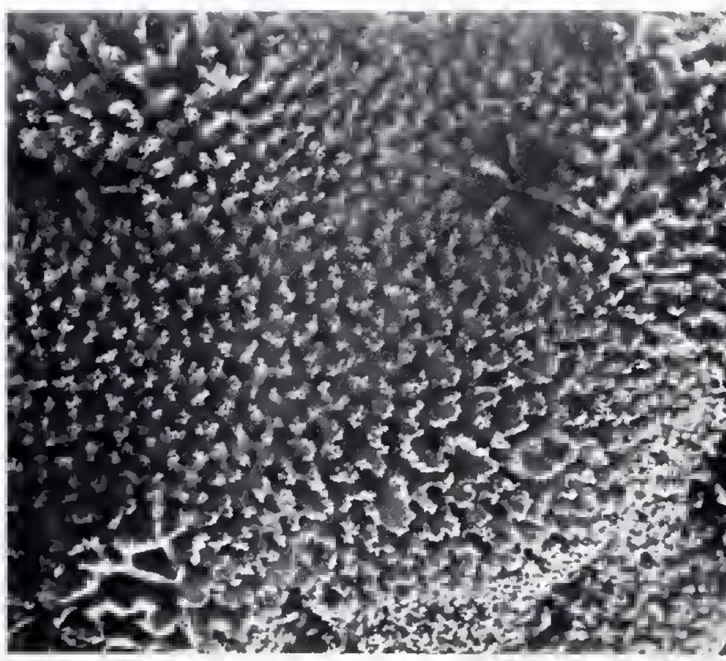


Fig. 348▼

Fig. 349▼

Fig. 350▼



Habitat preferences and growth form variation

This species usually occurs on soft substrates of the lower slopes of fringing reefs and is frequently intermixed with *A. forbesi* or *A. puertogalerae*. It may form a compact thicket of interlocking branches, or (in deeper water) may form a carpet of fine branches which may spread over several m of substrate and which disintegrate if disturbed.

Affinities

As noted by Pillai (1973), *A. matthaii* is distinct from all other *Anacropora*. Its closest affinities are with *A. spinosa*, which has not been found on the Great Barrier Reef and which is readily distinguished by having a projecting lip of coenosteum below the corallites. *Anacropora puertogalerae* is distinguished by the same character but has corallites and coenosteum similar to *A. matthaii* in other respects.

Distribution

Recorded from the Great Barrier Reef and the East Indies.

Anacropora reticulata n.sp.

Material studied

Palm Islands (21 specimens).

These localities include collecting stations 45, 60, 91.

Characters

Colonies are arborescent, with straight tapering branches that divide equally and infrequently at acute angles to form a compact colony. Branches are up to 14mm thick; their lower end is usually dead. Corallites are evenly spaced. They have a thick lower wall along most of the branch length, becoming increasingly immersed towards the branch base. In some coralla which have stunted growth, the lower wall grows up to reduce the calice opening to a slit. Calices are 0.8-1.0mm diameter. Primary septa are $\frac{1}{2}$R, rarely $\frac{3}{4}$R, secondary septa are $\frac{1}{4}$R and are usually complete. Septa are not exsert; they consist of rows of spines which are fine towards branch tips, becoming progressively coarser towards the base of branches. The coenosteum is composed of fine vertical walls of fused spinules, forming a uniform reticulate network, the outward edge of which is elaborated in a similar manner to the spinules of other species.

Habitat preferences and growth form variation

Anacropora reticulata is uncommon except on muddy slopes of fringing reefs of the Palm Islands. Most coralla of the present series are composed of branches up to 25cm long, with only the upper 15-20cm remaining alive. Lower parts of branches are frequently buried in mud. This species may also occur on unconsolidated substrates between islands where tidal currents are strong: these have stunted growth forms and have the enlarged lower walls of corallites noted above.

Affinities

Colonies have larger branches and corallites than other east Australian species and also have a distinct coenosteum composed of a reticulate network of walls with elaborated edges rather than spinules as occurs in other species.

Of non-east Australian species, *A. reticulata* resembles only *A. tapera* Zou in the size and shape of branches, but calice and coenosteum structures bear no resemblance.

Etymology

So named because of the distinctive structure of the coenosteum.

Holotype (Fig. 344)

Dimensions: A subdividing branch with a dead base and 11cm of corallites

Locality: South Pioneer Bay, Orpheus Island, Palm Islands, collecting station 91

Depth: 12m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia.

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Great Barrier Reef.

GENUS *ACROPORA* OKEN, 1815

Generic synonymy

Heteropora Ehrenberg, 1834.

Madrepora Ellis & Solander, 1786, and nineteenth century authors.

Acropora Oken, 1815; Verrill 1902.

Verrill (1902, p. 208) gives reasons for replacing the name *Madrepora* with *Acropora*, and Boschma (1961) gives an historical account of these names in support of an application to the International Commission of Zoological Nomenclature to validate *Acropora*.

Type species

Millepora muricata Linnaeus, 1758 by subsequent designation of the International Commission of Zoological Nomenclature (China, 1963).

Introduction

Acropora is by far the most important genus of extant Scleractinia, having the greatest number of species and also the greatest abundance on most Indo-Pacific reefs.

Not surprisingly, *Acropora* has most of the taxonomic problems found in other scleractinian genera: species are highly polymorphic, different colonies varying within biotopes, but especially varying over the wide environmental as well as geographic ranges which they occupy. With *Acropora*, however, these problems are exacerbated by the number and diversity of both real and nominal species and also by the zoogeographic consequences of the relatively recent speciation the genus has undergone. There are three main difficulties:

(a) Three hundred and sixty-four nominal species of *Acropora* are known to the authors* (Table 2), few of which are recognisable from their original descriptions. In many cases, even type specimens are of limited use without supplementary information, especially on type locality and depth.

Table 2 Nominal species of extant *Acropora* and their type localities

	Type locality
Millepora muricata Linnaeus, 1758	East Indies
Madrepora papillosa Ellis & Solander, 1786	not recorded
Madrepora stigmataria Ellis & Solander, 1786	Seychelles
Madrepora rosacea Esper, 1789	not recorded
Madrepora echidnaea Lamarck, 1816	East Indies, Sulu Sea
Madrepora palifera Lamarck, 1816	'Southern Ocean'
Madrepora flabellum Lamarck, 1816	Caribbean
Madrepora corymbosa Lamarck, 1816	Mauritius
Madrepora plantaginea Lamarck, 1816	'Indian Ocean'
Madrepora pocillifera Lamarck, 1816	'Indian Ocean' or 'Southern Ocean'
Madrepora laxa Lamarck, 1816	'Southern Ocean'
Madrepora abrotanoides Lamarck, 1816	'Indian Ocean'
Madrepora cervicornis Lamarck, 1816	Caribbean
Madrepora prolifera Lamarck, 1816	Caribbean, 'Indian Ocean'
Madrepora palmata Lamarck, 1816	Caribbean
Heteropora abrotanoides Ehrenberg, 1834	not recorded
Heteropora appressa Ehrenberg, 1834	'Indian Ocean', Singapore

* There are 24 additional nominal species of fossil *Acropora* (Pliocene to Eocene) (Wells, pers. comm.). These are not included in this list because they cannot usefully be considered in synonymies of extant species.

	Type locality
Heteropora microclados Ehrenberg, 1834	not recorded
Heteropora millepora Ehrenberg, 1834	'Indian Occan'
Heteropora hemprichii Ehrenberg, 1834	Red Sea
Heteropora forskali Ehrenberg, 1834	Red Sea
Heteropora tubulosa Ehrenberg, 1834	not recorded
Heteropora regalis Ehrenberg, 1834	not recorded
Heteropora decurrens Ehrenberg, 1834	not recorded
Heteropora squarrosa Ehrenberg, 1834	Red Sea
Heteropora imbricata Ehrenberg, 1834	not recorded
Heteropora seriata Ehrenberg, 1834	not recorded
Heteropora tylostoma Ehrenberg, 1834	not recorded
Madrepora alces Dana, 1846	East Indies
Madrepora cyclopea Dana, 1846	Wake I
Madrepora conigera Dana, 1846	Singapore
Madrepora efflorescens Dana, 1846	Sri Lanka, East Indies
Madrepora cytherea Dana, 1846	Tahiti
Madrepora spicifera Dana, 1846	Singapore, Fiji
Madrepora hyacinthus Dana, 1846	Fiji
Madrepora surculosa Dana, 1846	Tahiti, Fiji, East Indies
Madrepora prostrata Dana, 1846	Fiji, Sulu Sea
Madrepora subulata Dana, 1846	East Indies
Madrepora convexa Dana, 1846	Singapore, East Indies
Madrepora aculeus Dana, 1846	Fiji
Madrepora tenuis Dana, 1846	not recorded
Madrepora tubicinaria Dana, 1846	Fiji
Madrepora paxilligera Dana, 1846	Tahiti
Madrepora nasuta Dana, 1846	Tahiti
Madrepora digitifera Dana, 1846	not recorded
Madrepora globiceps Dana, 1846	Tahiti
Madrepora effusa Dana, 1846	Sri Lanka
Madrepora cerealis Dana, 1846	Sulu Sea, East Indies
Madrepora acervata Dana, 1846	Fiji
Madrepora valida Dana, 1846	Fiji
Madrepora retusa Dana, 1846	Fiji
Madrepora ramiculosa Dana, 1846	Fiji
Madrepora echinata Dana, 1846	Fiji, Sulu Sea
Madrepora carduus Dana, 1846	Fiji
Madrepora rosaria Dana, 1846	Fiji
Madrepora florida Dana, 1846	Fiji
Madrepora implicata Dana, 1846	Fiji
Madrepora tortuosa Dana, 1846	Fiji
Madrepora aspera Dana, 1846	Fiji
Madrepora hebes Dana, 1846	Fiji
Madrepora exigua Dana, 1846	Fiji
Madrepora cribripora Dana, 1846	Fiji
Madrepora gravida Dana, 1846	not recorded
Madrepora virgata Dana, 1846	Fiji
Madrepora horrida Dana, 1846	Fiji
Madrepora formosa Dana, 1846	Fiji, Sulu Sea, East Indies
Madrepora brachiata Dana, 1846	Sulu Sea, East Indies
Madrepora arbuscula Dana, 1846	Sulu Sea, East Indies
Madrepora robusta Dana, 1846	Fiji

	Type locality
Madrepora hystrix Dana, 1846	Fiji
Madrepora divaricata Dana, 1846	Fiji
Madrepora austera Dana, 1846	not recorded
Madrepora nobilis Dana, 1846	East Indies
Madrepora secunda Dana, 1846	Singapore, East Indies
Madrepora gracilis Dana, 1846	Fiji, Sulu Sea
Madrepora humilis Dana, 1846	Fiji
Madrepora deformis Dana, 1846	Tahiti
Madrepora cuspidata Dana, 1846	Tahiti
Madrepora labrosa Dana, 1846	Sulu Sea
Madrepora securis Dana, 1846	? East Indies
*Madrepora cuneata*Dana, 1846	Fiji
Madrepora turbinaria Dana, 1846	Tahiti
Madrepora verrucosa Edwards & Haime, 1849	? Tonga
Madrepora danai Edwards & Haime, 1860	Tahiti
Madrepora borealis Edwards & Haime, 1860	not recorded
Madrepora crassa Edwards & Haime, 1860	not known (not Galápagos Is)
Madrepora tuberculosa Edwards & Haime, 1860	not recorded
Madrepora valenciennesi Edwards & Haime, 1860	Sri Lanka
Madrepora rousseauii Edwards & Haime, 1860	Seychelles Is
Madrepora pharaonis Edwards & Haime, 1860	Red Sea
Madrepora ehrenbergi Edwards & Haime, 1860	Red Sea
Madrepora pustulosa Edwards & Haime, 1860	Seychelles Is
Madrepora stigmataria Edwards & Haime, 1860	Seychelles Is
Madrepora arabica Edwards & Haime, 1860	Red Sea
Madrepora longicyathus Edwards & Haime, 1860	not recorded
Madrepora durvillei Edwards & Haime, 1860	Fiji
Madrepora verrucosa Edwards & Haime, 1860	Tonga
Madrepora haimei Edwards & Haime, 1860	Red Sea
Madrepora gonagra Edwards & Haime, 1860	not recorded
Madrepora granulosa Edwards & Haime, 1860	Bourbon Is
Madrepora flabelliformis Edwards & Haime, 1860	Indian Ocean
Madrepora elegans Edwards & Haime, 1860	not recorded
Madrepora circinata Valenciennes, 1860	Str of Malacca (*n.n.*)
Madrepora corymbites Valenciennes, 1860	not recorded (*n.n.*)
Madrepora expansa Valenciennes, 1860	East Indies (*n.n.*)
Madrepora flabilis Valenciennes, 1860	Antilles (*n.n.*)
Madrepora poculenta Valenciennes, 1860	not recorded (*n.n.*)
Madrepora radicans Valenciennes, 1860	Guadeloupe (*n.n.*)
Madrepora cornuta Duchassaing & Michelotti, 1861	Caribbean
Madrepora ethica Duchassaing & Michelotti, 1861	Caribbean
Madrepora thomasiana Duchassaing & Michelotti, 1861	Caribbean
Madrepora tubigera Horn, 1861	Singapore
Madrepora perampla Horn, 1861	Caribbean
Madrepora subaequilis Horn, 1861	not recorded
Madrepora acuminata Verrill, 1864	Kingsmills Is
Madrepora diffusa Verrill, 1864	Kingsmills Is
Madrepora parvistella Verrill, 1864	Singapore
Madrepora turbinata Verrill, 1864	Tahiti
Madrepora tumida Verrill, 1866	Hong Kong
Madrepora prolixa Verrill, 1866	Ousima, Japan
Madrepora pumila Verrill, 1866	Bonin Is

	Type locality
Madrepora striata Verrill, 1866	? Ousima, Japan
Madrepora teres Verrill, 1866	Ousima, Japan
Madrepora turgida Verrill, 1866	Loo Choo Is, China
Madrepora microphthalma Verrill, 1869a	Loo Choo Is, China
Madrepora scherzeriana Brüggemann, 1878	Red Sea
Madrepora selago Studer, 1878	New Ireland
Madrepora candelabrum Studer, 1878	New Ireland
Madrepora rubra Studer 1878	New Ireland
Madrepora nana Studer, 1878	Fiji
Madrepora secale Studer, 1878	Sri Lanka
Madrepora patella Studer, 1878	Solomon Is
Madrepora monticulosa Brüggemann, 1879	Rodriguez
Madrepora obtusata Klunzinger, 1879	Red Sea
Madrepora variolosa Klunzinger, 1879	Red Sea
Madrepora pustulosa Klunzinger, 1879	Red Sea
Madrepora ocellata Klunzinger, 1879	Red Sea
Madrepora pallida Klunzinger, 1879	Red Sea
Madrepora pyramidalis Klunzinger, 1879	Red Sea
Madrepora canaliculata Klunzinger, 1879	Red Sea
Madrepora erythraea Klunzinger, 1879	Red Sea
Madrepora vagabunda Klunzinger, 1879	Red Sea
Madrepora eurystoma Klunzinger, 1879	Red Sea
Madrepora variabilis Klunzinger, 1879	Red Sea
Madrepora superba Klunzinger, 1879	Red Sea
Madrepora microcyathus Klunzinger, 1879	Red Sea
Madrepora spinulosa Klunzinger, 1879	Red Sea
Madrepora scandens Klunzinger, 1879	Red Sea
Madrepora subtilis Klunzinger, 1879	Red Sea
Madrepora capillaris Klunzinger, 1879	Red Sea
Madrepora superba Klunzinger, 1879	? Caribbean
Madrepora tenuispicata Studer, 1880	Singapore
Madrepora manni Quelch, 1886	Philippines
Madrepora canalis Quelch, 1886	Philippines
Madrepora scabrosa Quelch, 1886	Fiji
Madrepora minima Quelch, 1886	New Hebrides
Madrepora confraga Quelch, 1886	Fiji
Madrepora klunzingeri Quelch, 1886	Red Sea
Madrepora mirabilis Quelch, 1886	Banda
Madrepora angulata Quelch, 1886	Philippines
Madrepora parilis Quelch, 1886	Philippines
Madrepora speciosa Quelch, 1886	Tahiti
Madrepora conferta Quelch, 1886	Fiji
Madrepora vastula Quelch, 1886	Fiji
Madrepora brachyclados Ortmann, 1888	Fiji
Madrepora multiformis Ortmann, 1889	Sri Lanka
Madrepora elegantula Ortmann, 1889	Sri Lanka
Madrepora ceylonica Ortmann, 1889	Sri Lanka
Madrepora coalescens Ortmann, 1889	Sri Lanka
Madrepora remota Ortmann, 1889	Sri Lanka
Madrepora compressa Bassett-Smith, 1890	Tizard Bank (South China Sea)

	Type locality
Madrepora dendrum Bassett-Smith, 1890	Tizard Bank (South China Sea)
Madrepora rambleri Bassett-Smith, 1890	Tizard Bank (South China Sea)
Madrepora fragilis Bassett-Smith, 1890	Tizard Bank (South China Sea)
Madrepora cylindrus Ortmann, 1892	Dar-es-Salaam
Madrepora horizontalis Ortmann, 1892	Dar-es-Salaam
Madrepora brueggemanni Brook, 1891	Singapore
Madrepora clathrata Brook, 1891	Mauritius
Madrepora complanata Brook, 1891	Seychelles
Madrepora concinna Brook, 1891	Mauritius
Madrepora delicatula Brook, 1891	Solomon Is
Madrepora diversa Brook, 1891	Diego Garcia
Madrepora hispida Brook, 1891	Banda Sea, Philippines
Madrepora inermis Brook, 1891	'South Seas'
Madrepora intermedia Brook, 1891	Maldives
Madrepora leptocyathus Brook, 1891	Samoa
Madrepora macrostoma Brook, 1891	Mauritius
Madrepora ornata Brook, 1891	Darnley I (GBR)
Madrepora pacifica Brook, 1891	Samoa
Madrepora plicata Brook, 1891	Tonga
Madrepora polymorpha Brook, 1891	Malacca
Madrepora polystoma Brook, 1891	Mauritius
Madrepora procumbens Brook, 1891	'South Seas', Fiji
Madrepora pulchra Brook, 1891	Keeling I
Madrepora samoensis Brook, 1891	Samoa
Madrepora spathulata Brook, 1891	Solomon Is
Madrepora subglabra Brook, 1891	Singapore
Madrepora symmetrica Brook, 1891	Mauritius
Madrepora mexicana Rehberg, 1892	Caribbean
Madrepora coronata Rehberg, 1892	Madagascar
Madrepora repens Rehberg, 1892	Madagascar
Madrepora rudis Rehberg, 1892	Sri Lanka
Madrepora elliptica Rehberg, 1892	Luzon
Madrepora philippinensis Rehberg, 1892	Philippines
Madrepora pelewensis Rehberg, 1892	Palau
Madrepora dichotoma Rehberg, 1892	Palau
Madrepora incrustans Rehberg, 1892	Fiji
Madrepora demani Rehberg, 1892	Philippines
Madrepora edwardsii Rehberg, 1892	Hawaii
Madrepora spinosa Rehberg, 1892	not recorded (*n.n.*)
Madrepora ambigua Brook, 1892	Northumberland I (GBR)
Madrepora arcuata Brook, 1892	Samoa
Madrepora armata Brook, 1892	Singapore, Diego Garcia
Madrepora assimilis Brook, 1892	Ambon
Madrepora australis Brook, 1892	Darnley I, Wreck Bay (GBR)
Madrepora baeodactyla Brook, 1892	Capricorn I (GBR), Rodriguez
Madrepora bifaria Brook, 1892	Java
Madrepora botryodes Brook, 1892	Rodriguez
Madrepora brevicollis Brook, 1892	GBR, Rodriguez

	Type locality
Madrepora bullata Brook, 1892	Port Denison (GBR)
Madrepora calamaria Brook, 1892	Rodriguez
Madrepora clavigera Brook, 1892	not recorded
Madrepora cophodactyla Brook, 1892	not recorded
Madrepora coronata Brook, 1892	Palm & Rocky Is (GBR)
Madrepora decipiens Brook, 1892	Rocky Is (GBR)
Madrepora dilatata Brook, 1892	Tonga
Madrepora elseyi Brook, 1892	North Australia
Madrepora exilis Brook, 1892	Port Denison (GBR)
Madrepora fruticosa Brook, 1892	not recorded
Madrepora gemmifera Brook, 1892	Rocky Is (GBR)
Madrepora grandis Brook, 1892	Palm Is (GBR)
Madrepora guppyi Brook, 1892	Solomon Is
Madrepora irregularis, Brook, 1892	Rodriguez
Madrepora kenti Brook, 1892	Thursday I & Low Woody I (GBR)
Madrepora latistella Brook, 1892	Port Denison (GBR)
Madrepora loripes Brook, 1892	Green & Rock Is (GBR)
Madrepora nigra Brook, 1892	Tizard Bank (South China Sea)
Madrepora oligocyathus Brook, 1892	Mauritius
Madrepora orbicularis Brook, 1892	Sir Lanka
Madrepora patula Brook, 1892	Port Denison (GBR)
Madrepora pectinata Brook, 1892	Thursday I (GBR)
Madrepora rayneri Brook, 1892	Fiji
Madrepora recumbens Brook, 1892	Rocky & Green Is (GBR)
Madrepora reticulata Brook, 1892	Amirante I
Madrepora sarmentosa Brook, 1892	Port Denison (GBR)
Madrepora spectabilis Brook, 1892	not recorded
Madrepora squamosa Brook, 1892	Cleremont & Rocky I (GBR)
Madrepora syringodes Brook, 1892	Palm Is (GBR)
Madrepora tenella Brook, 1892	Macclesfield Bank (South China Sea)
Madrepora tizardi Brook, 1892	Tizard Bank (South China Sea)
Madrepora violacea Brook, 1892	Fiji
Madrepora attenuata Brook, 1893	West Indies
Madrepora smithi Brook, 1893	Tizard Bank (South China Sea)
Madrepora multicaulis Brook, 1893	Ramesvaram
Madrepora listeri Brook, 1893	Tonga
Madrepora affinis Brook, 1893	Darnley Is. (GBR)
Madrepora pruinosa Brook, 1893	Korea
Madrepora africana Brook, 1893	South Africa
Madrepora disticha Brook, 1893	Diego Garcia
Madrepora bottae Brook, 1893	Red Sea
Madrepora amblyclados Brook, 1893	Indo-Pacific
Madrepora indica Brook, 1893	Ramesvaram
Madrepora ortmanni Brook, 1893	Ponape & Bowen (GBR)
Madrepora platycyathus Brook, 1893	Tahiti
Madrepora glauca Brook, 1893	West Australia
Madrepora cancellata Brook, 1893	Louisiade Archipelago

	Type locality
Madrepora hydra Brook, 1893	Singapore
Madrepora anthoceris Brook, 1893	Ramesvaram
Madrepora sinensis Brook, 1893	Taiwan
Madrepora frondosa Brook, 1893	not recorded
Madrepora studeri Brook, 1893	Singapore, Indian Ocean
Madrepora obscura Brook, 1893	Madras
Madrepora dactylophora Brook, 1893	Salawatti
Madrepora cymbicyathus Brook, 1893	Fiji
Madrepora alliomorpha Brook, 1893	Singapore
Madrepora glochiclados Brook, 1893	Indian Ocean
Madrepora heteroclados Brook, 1893	Palau, Ponape, Tahiti
Madrepora obscura Brook, 1893	Ramesvaram
Madrepora orientalis Brook, 1893	Fiji, Ponape
Madrepora quelchi Brook, 1893	Ambon
Madrepora thurstoni Brook, 1893	Ramesvaram
Madrepora vasiformis Brook, 1893	Rodriguez
Madrepora protaeiformis Saville-Kent, 1897	Houtman's Abrolhos Is
Madrepora crateriformis Gardiner, 1898	Ellice Is
Madrepora rotumana Gardiner, 1898	Rotuma
Madrepora profunda Gardiner, 1898	Ellice Is
Madrepora spinalifera Whitelegge, 1898	Ellice Is
Madrepora brooki Bernard, 1900	Christmas I
Acropora dissimilis Verrill, 1902	not recorded
Acropora indurata Verrill, 1902	Australia
Acropora luzonica Verrill, 1902	Philippines
Acropora pachycyathus Verrill, 1902	not recorded
Acropora stellulata Verrill, 1902	? Zanzibar
Acropora bandensis Verrill, 1902	Banda
Acropora secaloides Verrill, 1902	Sri Lanka
Acropora fraterna Verrill, 1902	Tahiti
Acropora wardii Verrill, 1902	? East Indies, Polynesia
Acropora neglecta Verrill, 1902	? Singapore
Acropora urceolifera Verrill, 1902	? East Indies, Indian Ocean
Acropora cytherella Verrill, 1902	Fiji
Acropora cucullata Verrill, 1902	'Indo Pacific'
Acropora paniculata Verrill, 1902	? Fiji, Tahiti
Acropora secundella Verrill, 1902	Port Denison (GBR)
Madrepora contecta Hinde, 1904	Ellice & Solomon Is
Acropora mangarevensis Vaughan, 1906	Tuamotu Archipelago
Acropora diomedeae Vaughan, 1906	Tuamotu Archipelago
Acropora massawensis von Marenzeller, 1907	Red Sea
Acropora eminens von Marenzeller, 1907	Red Sea
Acropora murrayensis Vaughan, 1918	Murray Is (GBR)
Acropora vanderhorsti Hoffmeister, 1925	Samoa
Acropora tutuilensis Hoffmeister, 1925	Samoa
Acropora pagoensis Hoffmeister, 1925	Samoa
Acropora cruciseptata Thiel, 1932	Indonesia
Acropora pinguis Wells, 1950	Cocos-Keeling
Acropora schmitti Wells, 1950	Cocos-Keeling
Acropora jeulini Crossland, 1952	Great Barrier Reef
Acropora brooki Crossland, 1952	June Reef (GBR)
Acropora lutkeni Crossland, 1952	June Reef (GBR)

	Type locality
Acropora otteri Crossland, 1952	June Reef, Ribbon Reef (GBR)
Acropora laevis Crossland, 1952	Great Barrier Reef
Acropora vaughani Wells, 1954	Marshall Is
Acropora palmerae Wells, 1954	Marshall Is
Acropora splendida Nemenzo, 1967	Philippines
Acropora virilis Nemenzo, 1967	Philippines
Acropora dispar Nemenzo, 1967	Philippines
Acropora copiosa Nemenzo, 1967	Philippines
Acropora ponderosa Nemenzo, 1967	Philippines
Acropora varia Nemenzo, 1967	Philippines
Acropora lianae Nemenzo, 1967	Philippines
Acropora multiramosa Nemenzo, 1967	Philippines
Acropora profusa Nemenzo, 1967	Philippines
Acropora insignis Nemenzo, 1967	Philippines
Acropora singularis Nemenzo, 1967	Philippines
Acropora plana Nemenzo, 1967	Philippines
Acropora vermiculata Nemenzo, 1967	Philippines
Acropora loricata Nemenzo, 1967	Philippines
Acropora librata Nemenzo, 1967	Philippines
Acropora multiacuta Nemenzo, 1967	Philippines
Acropora fastigata Nemenzo, 1967	Philippines
Acropora reclinata Nemenzo, 1967	Philippines
Acropora prominens Nemenzo, 1967	Philippines
Acropora meridiana Nemenzo, 1971	Philippines
Acropora bifurcata Nemenzo, 1971	Philippines
Acropora magnifica Nemenzo, 1971	Philippines
Acropora excelsa Nemenzo, 1971	Philippines
Acropora exquisita Nemenzo, 1971	Philippines
Acropora imperfecta Nemenzo, 1971	Philippines
Acropora stoddarti Pillai & Scheer, 1976	Maldive Archipelago
Acropora eibli Pillai & Scheer, 1976	Maldive Archipelago
Acropora caroliniana Nemenzo, 1976	Philippines
Acropora tubiformis Eguchi & Shirai, 1977	Japan
Acropora yaeyamaensis Eguchi & Shirai, 1977	Japan
Acropora spiniformis Eguchi & Shirai, 1977	Japan
Acropora bushyensis Veron & Wallace	this study
Acropora verweyi Veron & Wallace	this study
Acropora lovelli Veron & Wallace	this study
Acropora kirstyae Veron & Wallace	this study
Acropora donei Veron & Wallace	this study
Acropora yongei Veron & Wallace	this study
Acropora azurea Veron & Wallace	this study
Acropora solitaryensis Veron & Wallace	this study
Acropora chesterfieldensis Veron & Wallace	this study
Acropora willisae Veron & Wallace	this study

(b) The zoogeography of species is more complicated than in most other scleractinian genera. East Australian *Acropora* assemblages appear to be composed of endemic species, species which are abundant over a wide Indo-Pacific range, and species which are abundant in one or more particular regions but are rare over a wide range. In each case, continual geographic variation and perhaps recognisable geographic subspecies are involved. This situation is consistent with the notion that historical events, including Pleistocene sea level changes, have created a high diversity of taxa of widely differing ages and distributions.

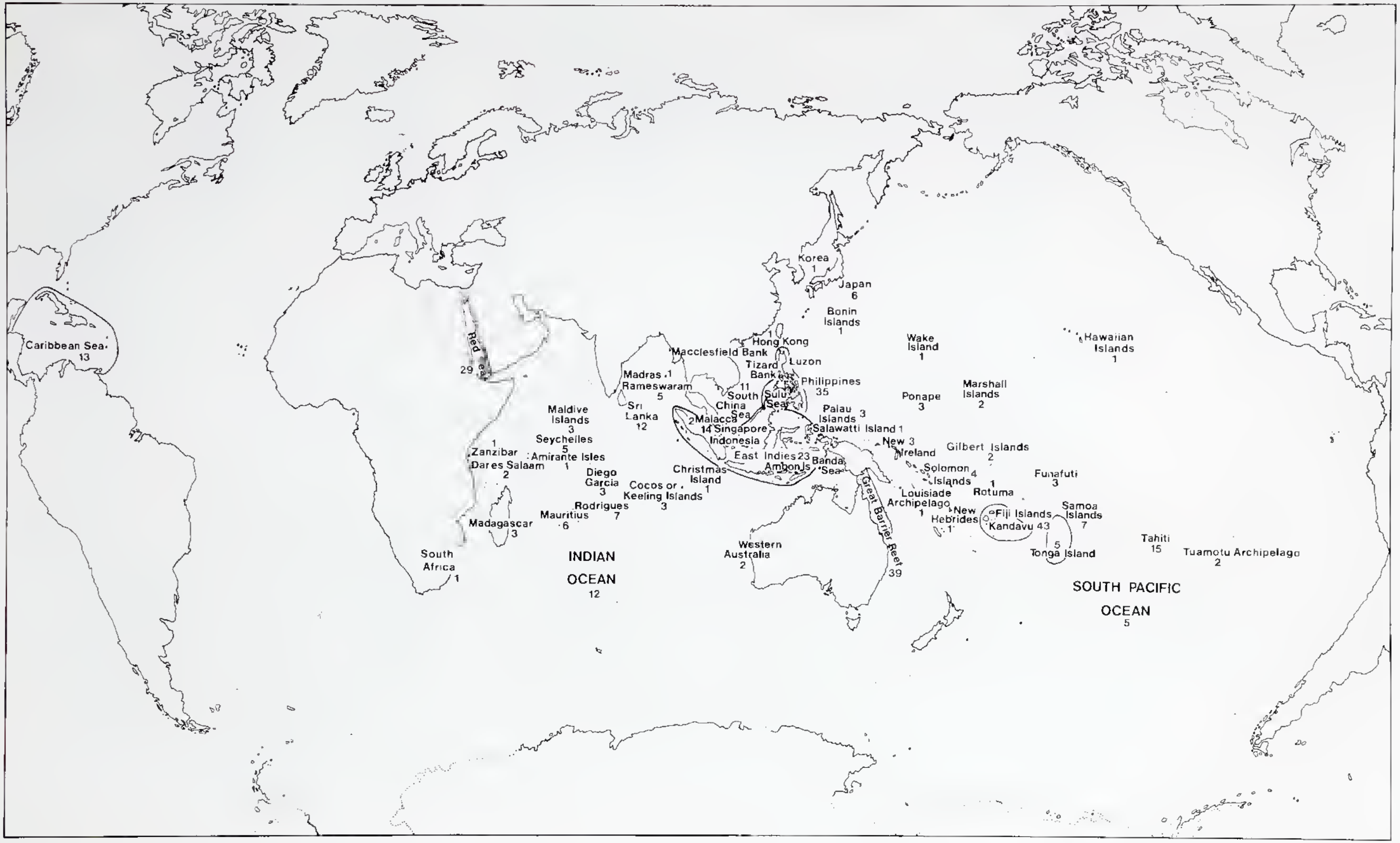
(c) In any given field situation, the presence of an uncommon species is usually masked by one or more common species which it resembles. Thus, uncommon species are usually recognised *in situ* only if they have distinctive characteristics (e.g. *A. polystoma*, *A. listeri*, *A. subglabra*) or if they occur with greater abundance in specific biotopes (e.g. *A. palmerae*, *A. multiacuta*, *A. kirstyae*, *A. azurea*, *A. bushyensis*) or in geographically remote situations where diversity is low (*A. lovelli*, *A. solitaryensis*).

All the above-mentioned aspects of *Acropora* taxonomy are, to some degree, interrelated. As a consequence, relatively few species are taxonomically 'straightforward'. Synonymies are usually complex and for this reason, those given below are primarily based on re-examination of specimens, especially type specimens, rather than on the literature. They also omit many references, as even by the time of Brook (1893), various usages of names had become complicated and, in many cases, unverifiable. Most authors listed in the synonymies below are included because they contributed to present knowledge of the species, either by describing or illustrating it, or by providing further data on its distribution. As with *Montipora*, previous records by non-taxonomists of east Australian species have not been verified; in most cases, names given in the literature do not reliably indicate the species referred to and often names refer only to heterogeneous mixtures of specimens.

Distribution records, which are partly reflected in synonymies, are also complex. The type locality of many species (Table 2) may be remote from the tropical Indo-Pacific centre of diversity (Fig. 351) and type specimens may show major deviations from the range of variation normally found in these regions. Many pre-Dana type specimens are from an unknown locality or from the Red Sea, and these can seldom be associated with east Australian species with certainty. For many species, including these, several type specimens are attributable to a single real species with varying degrees of certainty, depending on the type locality and also on the size and preservation of the type. Uncertainties in synonymies, and changes to commonly used names, are discussed where appropriate below. In each case the object (as with other genera) is not only to provide a nomenclature which is as compatible as possible with previous usages but one which is as stable as possible for the Indo-Pacific as a whole, rather than just for eastern Australia. In some cases, there is insufficient data on geographic distribution and variation to do this with certainty, and some synonymies adopted may require revision after further work.

Most of the species units and the names given them by Wallace (1978) have not been altered in the present study, although all the field work and re-examination of type specimens were undertaken independently of that study. Changes that have been made are as follows:

Fig. 351 Type localities of nominal *Acropora* species.



Caribbean Sea 13
Red Sea 29
South Africa 1
Zanzibar 1
Dares Salaam 2
Madagascar 3
Maldive Islands 3
Seychelles 5
Amirante Isles 1
Diego Garcia 3
Mauritius 6
Rodrigues 7
INDIAN OCEAN 12
Madras 1
Rameswaram 5
Sri Lanka 12
Cocos or Keeling Islands 3
Christmas Island 1
Macclesfield Bank
Hong Kong 1
Tizard Bank
South China Sea 11
Malacca 2
Singapore 14
Indonesia
East Indies 23
Ambon Is.
Banda Sea
Sulu Sea
Luzon
Philippines 35
Korea 1
Japan 6
Bonin Islands 1
Palau Islands 3
Salawatti Island 1
Western Australia 2
Great Barrier Reef 39
New Ireland 3
Wake Island 1
Ponape 3
Marshall Islands 2
Gilbert Islands 2
Solomon Islands 4
Louisiade Archipelago 1
New Hebrides 1
Rotuma 1
Fiji Islands
Kandavu 43
Funafuti 3
Samoa Islands 7
Tonga Island 5
Hawaiian Islands 1
Tahiti 15
Tuamotu Archipelago 2
SOUTH PACIFIC OCEAN 5

Wallace (1978)	This study
A. abrotanoides (Lamarck, 1816) *A. rotumana* (Gardiner, 1898)	*A. danai* (Edwards & Haime, 1860)
A. delicatula (Brook, 1891)	*A. selago* (Studer, 1878)
A. diversa (Brook, 1898)	*A. secale* (Studer, 1878)
A. haimei (Edwards & Haime, 1860)	*A. yongei* n.sp.
A. intermedia (Brook, 1891)	*A. nobilis* (Dana, 1846)
A. splendida Nemenzo, 1967	*A. valenciennesi* (Edwards & Haime, 1860)
A. squarrosa (Ehrenberg, 1834)	*A. loripes* (Brook, 1892)
A. tubicinaria (Dana, 1846)	*A. bushyensis* n.sp.
A. variabilis (Klunzinger, 1879)	*A. valida* (Dana, 1846)
A. rosaria (Dana, 1846) *A. longicyathus* (Edwards & Haime, 1860)	*A. longicyathus* (Edwards & Haime, 1860)

A total of 73 species of *Acropora* have been recognised in the present study, 67 of which have been given names. The remainder ('sp.' 1-6) are all very rare and await further study before they can be reliably named. In addition, the present collection contains many specimens that have been attributed to species described below with doubt; also there are some that have not been identified and may be valid species omitted from the present study. However, the present study is based on approximately 4500 specimens collected from all the localities indicated in Fig. 1, as well as field work at those localities, and thus it is unlikely that any common east Australian *Acropora* has been omitted from the present account.

Taxonomic History

The early history of the genus *Madrepora*, the name universally used for *Acropora* in the nineteenth century, is given by Brook (1893, pp. 1-7). Up to that time, the genus had been primarily known from the work of Dana (1846), who determined 64 species, 10 from earlier authors (primarily Lamarck (1816) and Ehrenberg (1834)) and 54 new species, mainly based on his own collections from the tropical south Pacific. As with other genera he studied, Dana based his *Acropora* taxonomy on field observations as well as museum work and thus his treatment of the genus, although very incomplete in terms of species described, remained unsurpassed for a century.

Brook's 1893 monograph is central to *Acropora* taxonomy because it provides a thoroughly researched account of all species described up to that time, as well as 93 new 'species' he determined from study of the collections in the British Museum. Because of the number of nominal species he described, many of Brook's species names have survived, but his work was done without ever studying living coral and clearly he did not have Dana's intuitive appreciation of what true species might be. Brook's work, however, stands apart from his successor, Bernard, who, in five succeeding volumes of the *Catalogue of Madreporaria*, lost all notion of systematics and finally abandoned binomial nomenclature.

Brook's monograph remains the only world-wide treatment of the genus. Verrill's (1902) study, in which usage of the name *Acropora* was established, is primarily noted for the 15 new nominal species he created, again without field study.

Many authors since Verrill have been involved, in some way, in *Acropora* taxonomy, primarily because of the overwhelming importance of *Acropora* in almost any aspect of reef research. The need for taxonomy to be readily applied to the reality of living reefs and the inability of purely museum-based studies to do this, created a vacuum between field and traditional taxonomic studies. In the 1930s, Verwey undertook the first detailed *in situ* study of *Acropora* in the Bay of Batavia, but the results have not been published. Nevertheless, Verwey's monograph was long anticipated, notably by Umbgrove (1939, 1940) and Wells (1954), who thus described their own treatment of the genus as provisional only.

Wallace first published an account of *in situ* work on *Acropora* in 1975 and continued with the study of this genus in the central and southern Great Barrier Reef, the results of which (Wallace, 1978) formed the basis of the present study. This is the only instance in which field studies for *Scleractinia of Eastern Australia* have been able to be based in a previously established taxonomic framework.

Morphology

Acropora species stand apart from all other corals in their capacity for rapid, organised growth, a capacity which may well have led to their great numerical dominance in species and abundance in recent times. The key to this capacity is the evolutionary development of two corallite types, axial and radial, which have separate functions. In other corals, there are no individual corallites primarily responsible for budding; budding can be undertaken by any individual where space or other constraints on growth form allow. Such constraints,

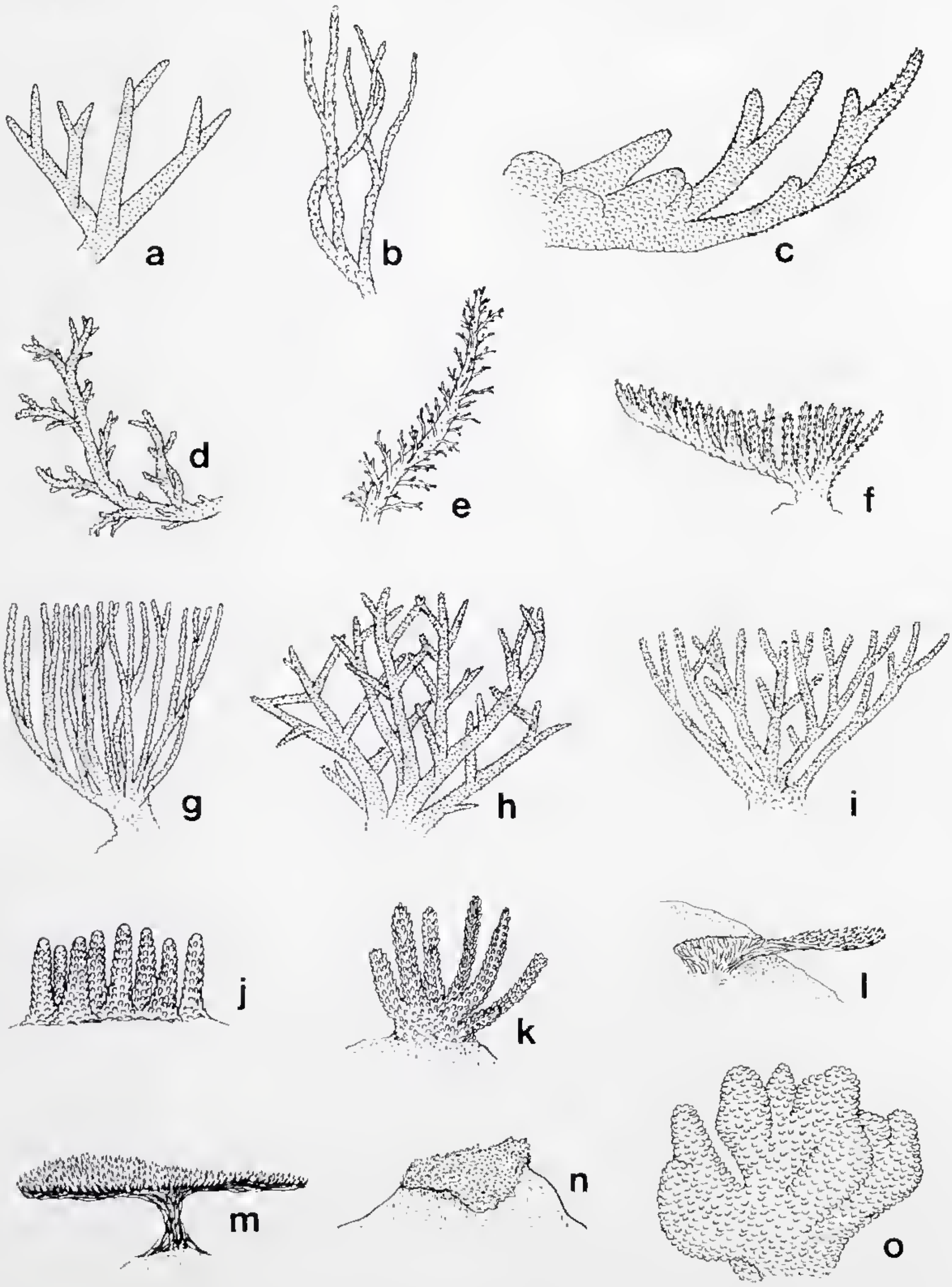


Fig. 352 Colony shapes of *Acropora* species: (a, b) arborescent (c) sub-arborescent (d, e) hispidose (f, g) corymbose (h) caespitose (i) caespito-corymbose (j) digitate (k) sub-digitate (l, m) plate-like (n) encrusting (o) branches plate-like to wedge-shaped.

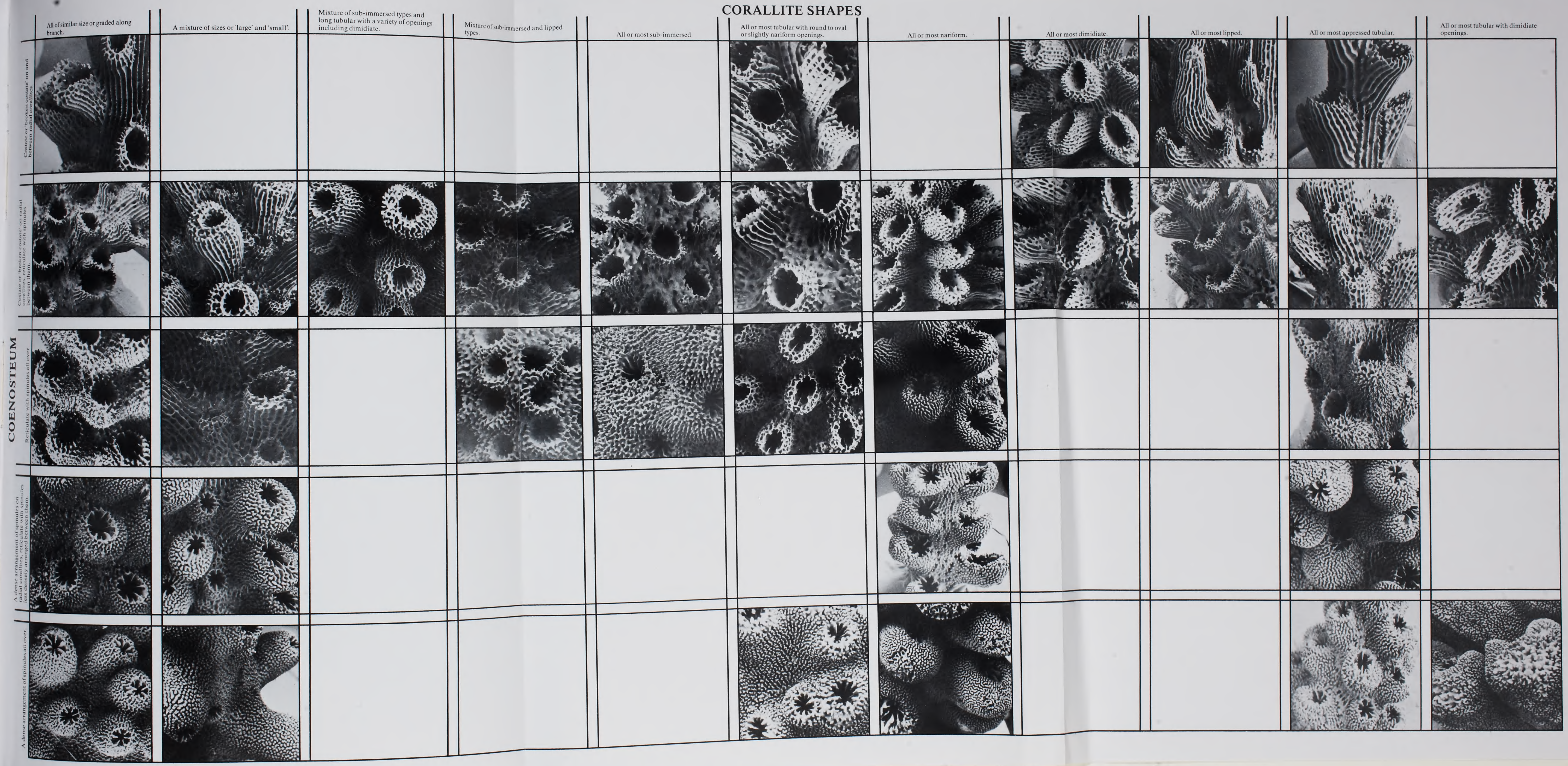
especially where budding takes place only at branch tips or at the edge of plates, may indeed regulate the shape of non-massive colonies. Some deterministic growth forms are also achieved by a few specialised budding patterns (e.g. dendroid patterns), but only *Acropora* are capable of producing large, elaborately structured colonies composed of small individuals.

The most highly organised *Acropora* colonies are the plate- and table-like forms of the *A. hyacinthus* group. Here, very large colonies composed of large numbers of individuals grow in a highly determined manner, allowing them rapidly to overgrow neighbouring colonies and to create at the same time a maximum area for capturing demersal plankton as well as sunlight. Little is known about the methods of integration or communication between individual corallites, but in such colonies the methods that are employed are indeed precise and effective.

The various growth forms of *Acropora* and the names applied to them are illustrated in Fig. 352. The variety of radial corallite shapes and sizes and differences between radial and coenosteum is illustrated in Fig. 353. The terminology applied to the shapes of radial corallites in this study is that of Wallace (1978).

The fine structure of the *Acropora* skeleton is simple by comparison with most other genera. There are no dissepiments or columellae and no patterns of septal fusion. Corallites are composed of a reduction of a simple system of three cycles of radial septo-costae, each element of which is associated with a trabecular pillar. The radial elements extend through one or several concentric cylindrical thecae each composed of a palisade of trabeculae interlinked with synapticulae. The whole of this system is secondarily thickened, usually with spinules, which may obliterate the costate appearance of the corallites and which usually fills the spaces between corallites. Only in rare instances is the third septal cycle clearly developed and in many species, all that remains of the septa of radial corallites is one or both directive septa and a few others arranged symmetrically between them. Septa are usually better developed in axial corallites, which are usually tubular, as well as in incipient axial corallites, which are radial corallites that have started developing into axial corallites.

Fig. 353 Coenostial structures and the shapes of radial corallites of *Acropora* and the terminology applied to them.


CORALLITE SHAPES
All of similar size or graded along branch.
A mixture of sizes or 'large' and 'small'.
Mixture of sub-immersed types and long tubular with a variety of openings including dimidiate.
Mixture of sub-immersed and lipped types.
All or most sub-immersed
All or most tubular with round to oval or slightly nariform openings.
All or most nariform.
All or most dimidiate.
All or most lipped.
All or most appressed tubular.
All or most tubular with dimidiate openings.
COENOSTEUM
Costate or 'broken costate' on and between radial corallites.
Costate or 'broken costate' on radial corallites, reticulate with spinules between them.
Reticulate with spinules all over.
A dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between them.
A dense arrangement of spinules all over.

KEY TO SPECIES OF *ACROPORA* FROM EASTERN AUSTRALIA

This key is for the identification of skeletal specimens. It assumes that the specimen to be identified may be only a portion of a colony. The key aims to accommodate both (a) the variability within species and (b) difficulties of interpretation of some structures in some specimens. As a result of (a) it will be found that many species key out more than once. As a result of (b) in some cases the same result will be obtained by following two or more of a set of choices.

The identification should always be checked against the species description, and the page number for each species is given for this purpose. In many cases the user must make a choice amongst several species, and the decision must be made by consulting the separate species descriptions and their accompanying illustrations.

Species omitted from key

The following species, described in the text, are omitted from the key, as they are absent or rare on the Great Barrier Reef, or poorly known from small series:

A. azurea, *A. chesterfieldensis*, *A. glauca*, *A. listeri*,
A. solitaryensis, *A. tortuosa*, *A. willisae*.

Note Choices can be re-traced via bracketed numbers. Shapes of colonies and of radial corallites are illustrated in Figs. 352 and 353 (respectively).

1(0). Corallum encrusting or with plate or wedge-shaped branches 2
Corallum not encrusting nor with plate or wedge-shaped branches 4

2(1). Coenosteum the same on and between radial corallites: a dense arrangement of spinules all over 3
Coenosteum different on and between radial corallites: costate or 'broken costate' on radial corallites, reticulate with spinules between them . *A. palmerae* (p. 211)

3(2). Radial corallites all or most tubular with round to oval openings .... *A. cuneata* (p. 158)
Radial corallites all or most appressed tubular, with dimidiate openings .... *A. palifera* (p. 153)

4(1). Branching hispidose or irregular hispidose 5
Branching arborescent 9
Branching not arborescent nor hispidose nor irregular hispidose 17

5(4). Radial corallites all of similar size or graded along branch 6
Radial corallites a mixture of sizes or 'large' and 'small' .... *A. lutkeni* (p. 355), *A. elseyi* (p. 385), *A. vaughani* (p. 260)

6(5). Radial corallites all or most subimmersed .... *A. horrida* (p. 251)
Radial corallites all or most tubular with round to oval or slightly nariform openings 7
Radial corallites all or most nariform .... *A. loripes* (p. 397)
Radial corallites all or most lipped .... *A. florida* (p. 416)
Radial corallites all or most appressed tubular 8

7(6). Coenosteum reticulate with spinules all over ...... *A. austera* (p. 262), *A. horrida* (p. 251)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. elseyi* (p. 385)

8(6). Coenosteum costate or 'broken costate' on and between radial corallites .... *A. echinata* (p. 374)
Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. florida* (p. 416)
Coenosteum reticulate with spinules all over ....

A. subglabra (p. 378), *A. sarmentosa* (p. 420), *A. carduus* (p. 382), *A. longicyathus* (p. 392), *A. lovelli* (p. 194)
Coenosteum a dense arrangement of spinules all over .. *A. longicyathus* (p. 392), *A. elseyi* (p. 385), *A. carduus* (p. 382), *A. sarmentosa* (p. 420), *A. loripes* (p. 397)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. elseyi* (p. 385)

9(4). Radial corallites all of similar size or graded along branch 10
Radial corallites a mixture of sizes or 'large' and 'small' 13

10(9). Radial corallites all or most sub-immersed .... *A. horrida* (p. 251)
Radial corallites all or most tubular with round to oval or slightly nariform openings 11
Radial corallites all or most nariform .... *A. valenciennesi* (p. 238)
Radial corallites all or most dimidiate .... *A. valenciennesi* (p. 238)
Radial corallites all or most lipped .... *A. yongei* (p. 293)
Radial corallites all or most appressed tubular 12

11(10). Coenosteum costate or 'broken costate' on and between radial corallites .... *A. formosa* (p. 230)
Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. valenciennesi* (p. 238), *A. formosa* (p. 230)
Coenosteum reticulate with spinules all over .... *A. microphthalma* (p. 242), *A. formosa* (p. 230), *A. horrida* (p. 251), *A. austera* (p. 262)
Coenosteum a dense arrangement of spinules all over .... *A. formosa* (p. 230), *A. vaughani* (p. 260), *A. brueggemanni* (p. 162), *A. microphthalma* (p. 242)

12(10). Coenosteum costate or 'broken costate' on and between radial corallites .... *A. yongei* (p. 293)
Coenosteum a dense arrangement of spinules all over .... *A. palifera* (p. 153), *A. kirstyae* (p. 247)

13(9). Radial corallites all of similar shape or graded along branch 14
Radial corallites in a variety of shapes 16

14(13). Coenosteum the same on and between radial corallites 15
Coenosteum different on and between radial corallites .. *A. valenciennesi* (p. 238), *A. acuminata* (p. 235), *A. formosa* (p. 230), *A. grandis* (p. 226)

15(14). Coenosteum costate or 'broken costate' on and between radial corallites .... *A. acuminata* (p. 235), *A. formosa* (p. 230)
Coenosteum reticulate with spinules all over .. *A. acuminata* (p. 235), *A. formosa* (p. 230), *A. grandis* (p. 226)
Coenosteum a dense arrangement of spinules all over .... *A. formosa* (p. 230), *A. acuminata* (p. 235), *A. vaughani* (p. 260)

16(13). Radial corallite mixture of sub-immersed types and long tubular with a variety of openings including dimidiate .... *A. nobilis* (p.214), *A. robusta* (p. 201)
Radial corallite mixture of sub-immersed and lipped types .... *A. aspera* (p. 268), *A. pulchra* (p. 272)

17(4). Branching pattern digitate from an encrusting base 18
Branching pattern thick horizontal branch with proliferous tips . *A. danai* (p. 207)
Branching pattern caespitose 22
Branching pattern corymbose or caespito-corymbose 26
Branching pattern thin horizontal plate with small secondary branches 38

18(17). Radial corallites all of similar size or graded along branch 19
Radial corallites a mixture of sizes or 'large' and 'small' 20

19(18). Coenosteum the same on and between radial corallites: a dense arrangement of spinules all over . *A. humilis* (p. 166), *A. multiacuta* (p. 184), *A. verweyi* (p. 191)
Coenosteum different on and between radial corallites: costate or 'broken costate' on radial corallites, reticulate with spinules between them ... *A. robusta* (p. 201), *A. digitifera* (p. 180), *A. bushyensis* (p. 187)

20(18). Radial corallites all of similar shape or graded along branch 21
Radial corallites in a variety of shapes *A. robusta* (p. 201), *A. polystoma* (p. 219)

21(20). Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. secale* (p. 350), *A. robusta* (p. 201)
Coenosteum reticulate with spinules all over .... *A. secale* (p. 350)
Coenosteum a dense arrangement of spinules all over .... *A. secale* (p. 350), *A. humilis* (p. 166), *A. lutkeni* (p. 355)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. secale* (p. 350), *A. lutkeni* (p. 355)

22(17). Radial corallites all or most sub-immersed .... *A. horrida* (p. 251)
Radial corallites all or most tubular with round to oval or slightly nariform openings 23
Radial corallites all or most nariform 24
Radial corallites all or most appressed tubular 25

23(22). Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. valida* (p. 346)
Coenosteum reticulate with spinules all over .. *A. gemmifera* (p. 170), *A. horrida* (p. 251), *A. austera* (p. 262), *A. valida* (p. 346)
Coenosteum a dense arrangement of spinules all over .... *A. valida* (p. 346), *A. vaughani* (p. 260)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. valida* (p. 346)

24(22). Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. divaricata* (p. 364), *A. cerealis* (p. 334)
Coenosteum reticulate with spinules all over .. *A. cerealis* (p. 334), *A. divaricata* (p. 364)
Coenosteum a dense arrangement of spinules all over ....
A. loripes (p. 397), *A. cerealis* (p. 334)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. cerealis* (p. 334)

25(22). Coenosteum reticulate with spinules all over ... *A. subglabra* (p. 378), *A. carduus* (p. 382), *A. longicyathus* (p. 392)
Coenosteum a dense arrangement of spinules all over ... *A. longicyathus* (p. 392), *A. carduus* (p. 382), *A. loripes* (p. 397), *A. kirstyae* (p. 247), *A. elseyi* (p. 385)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. elseyi* (p. 385)

26(17). Radial corallites all of similar size or graded along branch 27
Radial corallites a mixture of sizes or 'large' and 'small' 32

27(26). Radial corallites all or most tubular with round to oval or slightly nariform openings ..... *A. valida* (p. 346), *A. bushyensis* (p. 187), *A. monticulosa* (p. 174), *A. verweyi* (p. 191)
Radial corallites all or most nariform 28
Radial corallites all or most dimidiate 29
Radial corallites all or most lipped 30
Radial corallites all or most appressed tubular 31

28(27). Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. divaricata* (p. 364)
Coenosteum reticulate with spinules all over .... *A. valida* (p. 346), *A. donei* (p. 286), *A. divaricata* (p. 364)
Coenosteum a dense arrangement of spinules all over. .... *A. loripes* (p. 397)
Coenosteum a dense arrangement of spinules on radial corallites, reticulate with spinules less densely arranged between .... *A. nasuta* (p. 339)

29(27). Coenosteum the same on and between radial corallites: a dense arrangement of spinules all over .... *A. humilis* (p. 166)

Coenosteum different on and between radial corallites: costate or 'broken costate' on radial corallites, reticulate with spinules between them . *A. digitifera* (p. 180)

30(27). Coenosteum the same on and between radial corallites .... *A. selago* (p. 283), *A. tenuis* (p. 279), *A. anthocercis* (p. 314)

Coenosteum different on and between radial corallites ...... *A. subulata* (p. 322), *A. selago* (p. 283), *A. millepora* (p. 274)

31(27). Coenosteum costate or 'broken costate' on and between radial corallites .... *A. tenuis* (p. 279)

Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. latistella* (p. 318)

Coenosteum reticulate with spinules all over .... *A. donei* (p. 286), *A. aculeus* (p. 328), *A. nana* (p. 325), *A. sarmentosa* (p. 420), *A. dendrum* (p. 290)

Coenosteum a dense arrangement of spinules all over .... *A. loripes* (p. 397), *A. sarmentosa* (p. 420), *A. caroliniana* (p. 409)

32(26). Radial corallites all of similar shape or graded along branch 33

Radial corallites in a variety of shapes 37

33(32). Coenosteum the same on and between radial corallites 34

Coenosteum different on and between radial corallites 36

34(33). Coenosteum reticulate with spinules all over 35

Coenosteum a dense arrangement of spinules all over .... *A. humilis* (p. 166), *A. lutkeni* (p. 355), *A. valida* (p. 346), *A. secale* (p. 350)

35(34). Radial corallites all or most tubular with round to oval or slightly nariform openings .... *A. secale* (p. 350), *A. valida* (p. 346)

Radial corallites all or most nariform .... *A. donei* (p. 286)

Radial corallites all or most appressed tubular .... *A. donei* (p. 286)

36(33). Radial corallites all or most tubular with round to oval or slightly nariform openings .... *A. secale* (p. 350), *A. lutkeni* (p. 355), *A. valida* (p. 346), *A. monticulosa* (p. 174)

Radial corallites all or most nariform .... *A. nasuta* (p. 339)

37(32). Radial corallites mixture of sub-immersed types and long tubular with a variety of openings including oval or nariform .... *A. polystoma* (p. 219), *A. samoensis* (p. 178)

Radial corallites mixture of sub-immersed and lipped types ... *A. aspera* (p. 268), *A. pulchra* (p. 272)

38(17). Radial corallites all or most nariform 39

Radial corallites all or most dimidiate .... *A. clathrata* (p. 360)

Radial corallites all or most lipped .... *A. hyacinthus* (p. 310), *A. paniculata* (p. 306), *A. cytherea* (p. 298), *A. anthocercis* (p. 314)

Radial corallites all or most appressed tubular 40

39(38). Coenosteum the same on and between radial corallites. .... *A. loripes* (p. 397)

Coenosteum different on and between radial corallites ..... *A. clathrata* (p. 360), *A. microclados* (p. 302)

40(38). Coenosteum costate or 'broken costate' on radial corallites, reticulate with spinules between them .... *A. latistella* (p. 318)

Coenosteum reticulate with spinules all over .... *A. aculeus* (p. 328), *A. nana* (p. 325)

Coenosteum a dense arrangement of spinules all over ...... *A. granulosa* (p. 405), *A. loripes* (p. 397)

Subgenus Isopora Studer, 1878

Type species *Acropora palifera* (Dana, 1846) (subsequent designation, this study)

Despite the large number of species in the genus *Acropora*, classifications defining sub-groups on the basis of branching patterns and corallite shapes (Dana, 1846; Edwards & Haime, 1860; Brook, 1893; Nemenzo, 1967) have been, on the admission of their authors, little more than a means of partitioning for convenience.

Only one sub-group appears to be well founded and to have characters consistently separating it from other species of the genus. This is the *Isopora* sub-genus of Brook (1893), *Madrepora* section G of Dana (1846) and the sub-group *Isopora* of Nemenzo (1967). This group is distinguished by having more than one 'axial' corallite per branch. Branches are correspondingly thick and have cross-sections of varying shape, depending on the grouping of the 'axial' corallites. The group is further distinguished by the structure of the coenosteum, which bears uniformly distributed spinules with very elaborated tips, and also by having two forms of radial corallites, the simpler of which occurs in all three species. Furthermore, all *Isopora* species brood planulae (Atoda, 1951; Kojis, pers. comm.) and this has not been observed in any other east Australian *Acropora* species.

The species included are *A. palifera* (Lamarck) and *A. cuneata* (Dana), both with many synonyms, and *A. brueggemanni* (Brook). *Acropora brueggemanni*, which has mainly single axial corallites but sometimes more than one axial per branch, was previously placed in sub-genus *Tylopora* by Brook (1893) and in the '*Eumadrepora* group' by Nemenzo (1967). However, Brook (1893), Crossland (1952) and Wallace (1978) have all noted its affinities with the other species of *Isopora*, a view supported by the present study.

All three species are at their greatest abundance in shallow water communities, notably outer reef slopes exposed to strong to extreme wave action, as well as protected inner reef flats, shallow lagoons and reef-back margins. All such habitats except the last have characteristically low *Acropora* diversities. *Acropora palifera*, in particular, may be very dominant on the exposed outer slopes of barrier reefs and may also be the major component of some zones on fringing and mid-shelf reefs.

Acropora (Isopora) palifera (Lamarck, 1816)

Synonymy

Astrea palifera Lamarck, 1816.

Madrepora labrosa Dana, 1846; Edwards & Haime (1860); Bassett-Smith (1890); Verrill (1902).

Isopora labrosa (Dana); Studer (1878).

Madrepora palifera (Lamarck); Brook (1893); Verrill (1902).

Acropora palifera (Lamarck); Vaughan (1918); Matthai (1923); Hoffmeister (1925); Faustino (1927); Thiel (1932); Crossland (1952); Wells (1954); Scheer (1964, 1972); Nemenzo (1967); Chevalier (1968); Scheer & Pillai (1974); Potts (1976).

Acropora prominens Nemenzo, 1967.

Acropora labrosa (Dana); Nemenzo, 1967.

Dana's *A. labrosa* was synonymised with *A. palifera* by Brook (1893) and the name has not been used since, except by Nemenzo (1967).

Figs. 354-356 *Acropora palifera* (× 0.33)

Fig. 354 *Acropora palifera* (right) attached to *A. cuneata* (left) from Chesterfield Atoll, collecting station 218.

Fig. 355 From Rib Reef.

Fig. 356 From Falcon Island, Palm Islands, collecting station 174, showing the growth form usually associated with turbid environments, same corallum as Fig. 359.

Fig. 354▲

Fig. 355▲

Fig. 356▲

Material studied

Darnley Island, Arden Island, Murray Islands, Sue Island, Wai-weer Island, Turtle Islands (6 specimens), **Pandora Reef** (5 specimens), **Raine Island, Great Detached Reef** (12 specimens), **Bird Island, Martha Ridgeway Reef, Cat Reef, Franklin Reef, Tijou Reef** (8 specimens), **Corbett Reef, Bewick Island** (3 specimens), **Howick Island** (3 specimens), **Yonge Reef** (6 specimens), **Decapolis Reef, Three Isles** (2 specimens), **Low Isles** (3 specimens), **Magdelaine Cay** (3 specimens), **Lihou Reefs, Mellish Reef, Flinders Reef (Coral Sea)** (2 specimens), **Bowl Reef, Palm Islands** (14 specimens), **Pandora Reef, Darley Reef,**

Figs. 357-360 *Acropora palifera* (× 5)

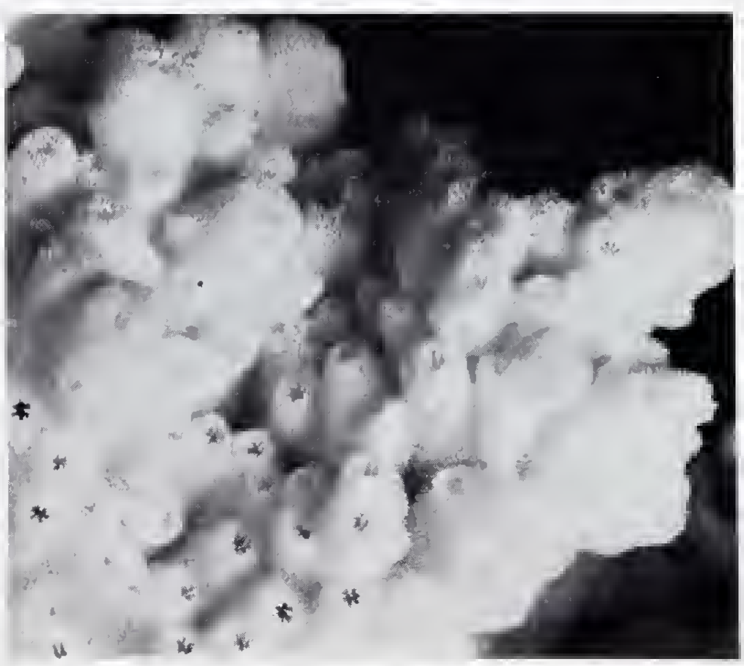
Fig. 357 From Low Isles.
Fig. 358 From Fantome Island, Palm Islands, collecting station 34, same corallum as Fig. 363, 364.
Fig. 359 From Falcon Island, Palm Islands, same corallum as Fig. 356.
Fig. 360 From Lord Howe Island, collecting station 146, showing a tendency to develop axial corallites.

ig. 357▲

Fig 358▲

Fig 359▼

Fig. 360▼



Chesterfield Reefs (8 specimens), **Pompey Reef, Bushy Island-Redbill Reef** (8 specimens), **Swain Reefs, Fitzroy Reef** (3 specimens), **Heron Island, Flinders Reef (Moreton Bay)** (6 specimens), **Middleton Reef** (6 specimens), **Lord Howe Island** (4 specimens).

These localities include collecting stations 1, 2, 5, 6, 8, 9, 18, 27, 31, 34, 55, 73, 76, 86, 92, 105, 135, 143, 146, 148, 150, 152, 154, 155, 160, 161, 164, 165, 172, 173, 174, 175, 177, 182, 190, 197, 200, 202, 209, 210, 215, 217, 218, 226, 227, 231, 234.

Characters

Colonies occur as thick encrusting plates, or plates bearing domes, ridges or columns or as thick cylindrical, irregular, or plate-like branches. Branches may be horizontal or vertical and are sometimes irregularly anastomosed.

Usually, axial corallites can only be recognised along the leading edge of these structures as those being slightly larger than the surrounding radial corallites. Radial corallites are similar in size, tubular, 1-5mm long, partly to fully appressed, with the outer or lower $\frac{1}{2}$-$\frac{2}{3}$ of the wall thickened. The shape of the calices varies from broadly and obviously cochleariform, through just recognisably cochleariform or round to narrow and slit-like, the shape being generally constant within a corallum. The orientation, size and degree of crowding of corallites varies with their position on the corallum.

The coenosteum both on and between corallites consists of closely anastomosed spinules with elaborated tips.

Living colonies are usually pale cream or brown in colour.

Habitat preferences and skeletal variations

Only a small part of the species' total range of growth forms is expressed in any one biotope; thus coralla from widely differing biotopes have very different growth forms and usually have substantially different corallite structures.

Acropora palifera from the outer slope of exposed reefs

This is the dominant reef-building species of most outer slopes exposed to very strong wave action, from Lord Howe Island (31.5°S lat.) (Veron & Done, 1979) to the ribbon and deltaic reefs of the northern Great Barrier Reef (to 9.5°S lat.) (Veron & Hudson, 1978; Veron, 1978). In all biotopes fully exposed to heavy surf (especially in the Northern Region where trade winds predominate), colonies form thick encrusting plates which may exclude all other species. Upward growth appears to be uniform over the colony surface and consequently, colonies are completely flat. With increasing depth (5-10m), and on partly protected outer reef flats, colonies develop one or more low ridges perpendicular to the reef front. These in turn grade into colonies with upward projecting columns (at 10-15m depth, depending on local conditions) and may become ramose. In the latter cases, branches usually remain relatively thick (>10cm) and do not anastomose.

The appearance of the corallites varies according to colony shape. Flat plates have relatively uniform upward projecting, tubular corallites approximately 2mm diameter. Septa are usually in two sub-equal, incomplete cycles and consist primarily of spines projecting $\frac{1}{2}$-$\frac{1}{4}$R. Ridged colonies have similar corallites on horizontal surfaces and short, appressed, nariform corallites on the ridge sides. The latter usually have increased septal development, with the first cycle reaching $\frac{1}{2}$R and often having conspicuous outer directive septa.

Acropora palifera from partly protected back reef margins

Colonies are columnar to ramose, frequently with flattened branches which may anastomose. On sloping substrates, branches may be horizontal and laterally expanded. Corallites on branch sides have a tendency towards a nariform shape and have two incompleted septal cycles reaching $\frac{1}{2}$R and $<\frac{1}{4}$R. Those on branch ends are compacted, cylindrical to immersed and usually have two complete septal cycles reaching $\frac{3}{4}$R and $\frac{1}{2}$R and tending to consist of plates rather than spines. Horizontal branches have mostly elongate, nariform, immersed corallites on the under surface with small apertures ($<$ 1mm).

Only in rare instances are well-differentiated axial corallites developed and these have only been observed on the upper margins of flattened branches where they are up to 7mm exsert and <6.5mm diameter. Calices are small (<1mm) and have a septal arrangement similar to those of the other corallites.

Acropora palifera from turbid biotopes

This species is less commonly found in turbid water around continental islands. Colonies are ramose, with relatively thin (1-2cm diameter) anastomosed branches. Corallites are elongate and widely spaced on branch sides, are tubular appressed in shape and have plate-like primary septa reaching $\frac{3}{4}$R and a usually incomplete secondary cycle reaching $\frac{1}{4}$R.

Figs. 361-364 *Acropora palifera*

Fig. 361 From Rib Reef (× 20).
Fig. 362 From Chesterfield Atoll, collecting station 210 (× 20).
Figs. 363, 364 Same corallum from Fantome Island, Palm Islands, and same corallum as Fig. 358 (× 20 and 400 respectively), Fig. 364 showing the highly elaborated tips of reticulum spinules.

Fig. 361▲

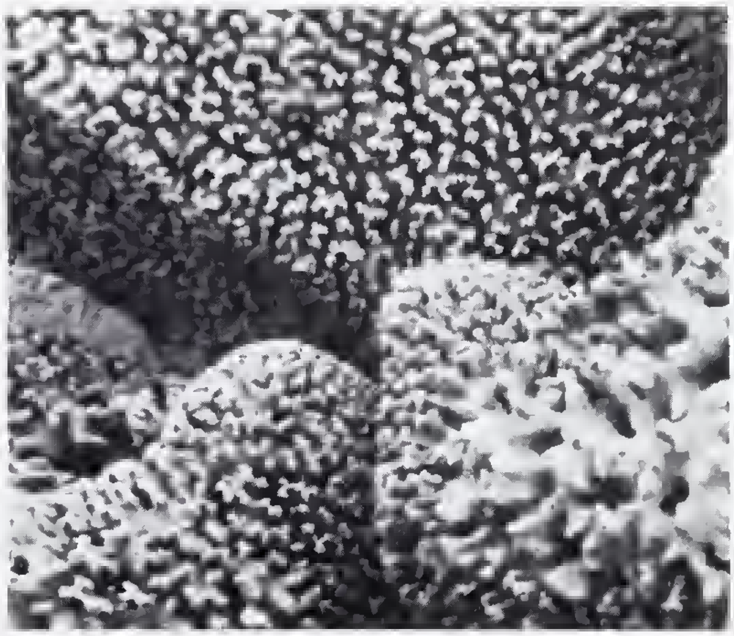


Fig. 362▲

Fig. 363▼

Fig. 364▼

Axial corallites may be developed on branch tips which differ from the others only in being rounded, tubular in shape.

Affinities

Acropora palifera is closest to *A. cuneata* (see p. 161). Underwater, especially along outer reef slopes, *A. brueggemanni* may closely resemble *A. palifera* where the two grow together, but is separated by the presence of thick walled axial corallites at all branch ends and by *A. palifera* having sturdier branches.

Distribution

Widely distributed throughout the tropical and sub-tropical Indo-Pacific, from Madagascar and Diego Garcia in the west to the Marshall Islands and Samoa in the east.

Acropora (Isopora) cuneata (Dana, 1846)

Synonymy

Madrepora cuneata Dana, 1846; Edwards & Haime (1860); Quelch (1886); Brook (1893).

Madrepora securis Dana, 1846; Edwards & Haime (1860); Quelch (1886).

Isopora securis (Dana); Studer (1878).

Madrepora plicata Brook, 1891; Brook (1893).

Madrepora hispida Brook, 1891; Brook (1893).

Acropora plicata (Brook); Vaughan (1918); Matthai (1923); Chevalier (1968).

Acropora hispida (Brook); Faustino (1927); Chevalier (1968).

Acropora cuneata (Dana); Wells (1954).

Acropora securis (Dana); Nemenzo (1967).

Acropora hispida (Brook) is a new name for Quelch's (1886) *A. securis* (Dana). Dana's *A. securis* is an ecomorph of *A. cuneata* found in turbid environments. The priority of *cuneata* over *securis* was established by Wells (1954).

There is very little difference between the holotypes of all the other nominal species.

Acropora crateriformis (Gardiner, 1898) from the Ellice Islands, also recorded by Hoffmeister (1925) from the Ellice Islands and Samoa, is a related species which differs from *A. cuneata* by having smaller corallites and a very reduced septation and by being totally encrusting.

Brook (1893) includes *A. incrustans* Rehberg, 1892 in his *A. plicata*; the type of *A. incrustans* was not re-examined in this study.

Material studied

Triangle Reef, Great Detached Reef (6 specimens), **Tijou Reef** (3 specimens), **Corbett Reef, Bewick Island, Three Isles, Britomart Reef** (3 specimens), **Palm Islands** (8 specimens), **Keeper Reef, Chesterfield Reefs** (8 specimens), **Pompey Reef, Bushy Island-Redbill Reef, Wistari Reef** (2 specimens).

These localities include collecting stations 1, 2, 18, 21, 86, 105, 158, 160, 164, 167, 173, 174, 176, 177, 200, 214, 215, 218.

Characters

Colonies are partly encrusting plates and ridges which develop varying combinations of free horizontal plates (commonly up to 20cm across) and 0.5-3cm thick, upward projecting, flattened branches or plates.

Figs. 365-367 *Acropora cuneata* (× 0.5)

Figs. 365, 366 From Chesterfield Atoll, collecting stations 218 and 215 (respectively); Fig. 365, same corallum as Figs. 368, 369; Fig. 366 same corallum as Fig. 370.

Fig. 367 From Tijou Reef, collecting station 150, same corallum as Fig. 371.


Fig. 365▲


Fig. 366▲

Fig. 367▼


Corallites on the upper faces of branches and plates are tubular or rounded tubular appressed, or are conical, especially near the centre of horizontal plates. They are 1.5-2mm diameter and have rounded calices 0.5-1mm diameter. Those on the undersurface of plates are smaller, more widely spaced and sub-immersed.

A very wide range of septal development may occur in the one colony or along a few cm of a branch. Corallites near branch ends or on flat horizontal surfaces have a primary cycle extending up to $\frac{1}{3}$R with one prominent directive septum, and an incomplete second cycle extending to $\frac{1}{4}$R. Older corallites frequently have two complete cycles extending to $\frac{3}{4}$R and $\frac{1}{2}$R. In all cases, septa consist of plates or spines, usually with granulated sides. There is no tendency to form well-differentiated axial corallites in any corallum of the present series.

Figs. 368-371 *Acropora cuneata* (× 5)
Figs. 368, 369 Same corallum from Chesterfield Atoll and same corallum as Fig. 365.
Fig. 370 From Chesterfield Atoll, same corallum as Fig. 366.
Fig. 371 From Tijou Reef, same corallum as Fig. 367.

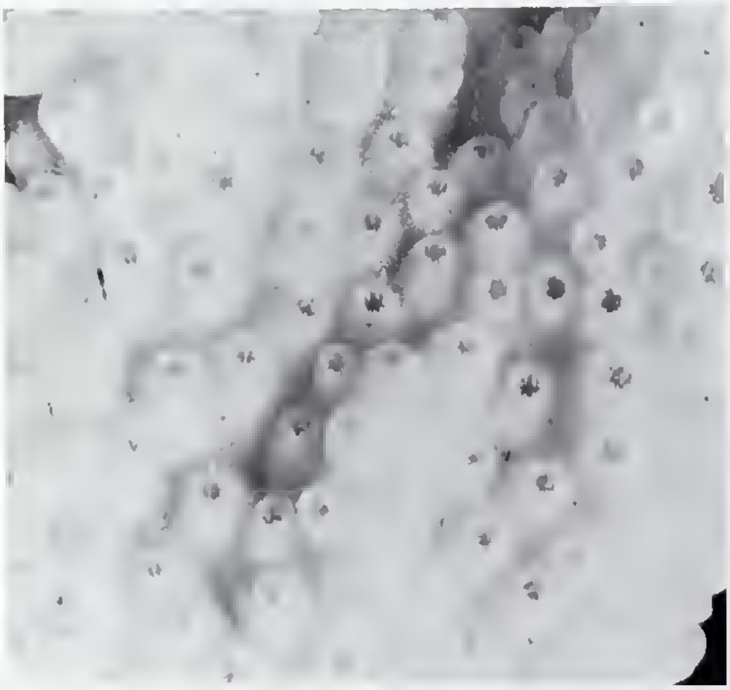


Fig. 368▲

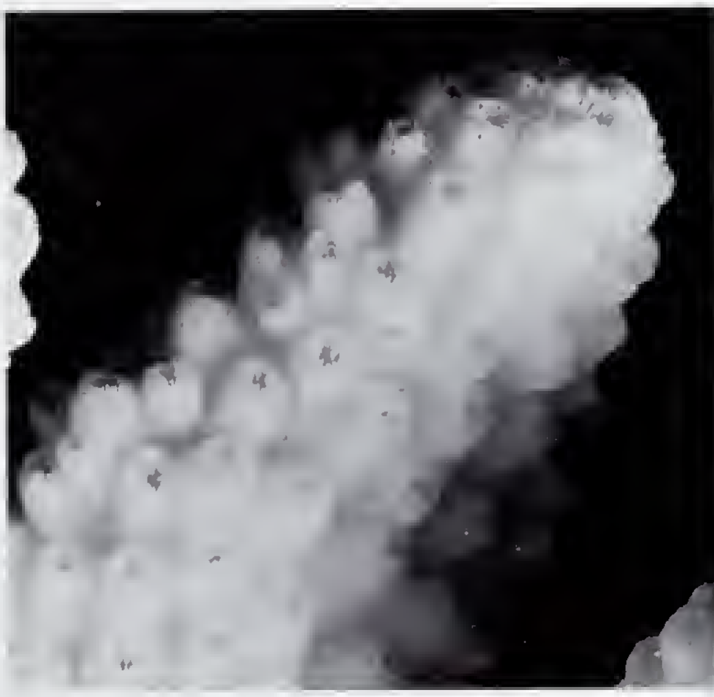


Fig. 369▲

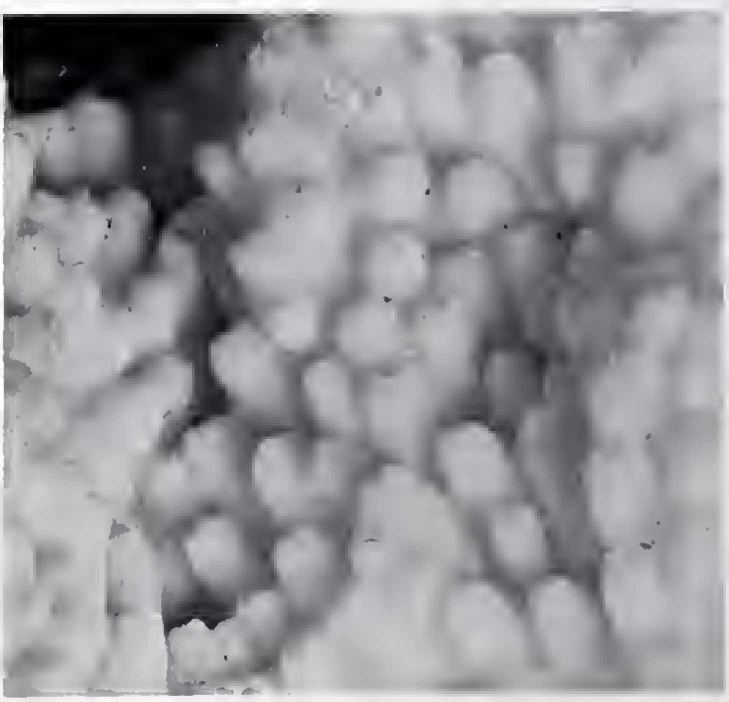
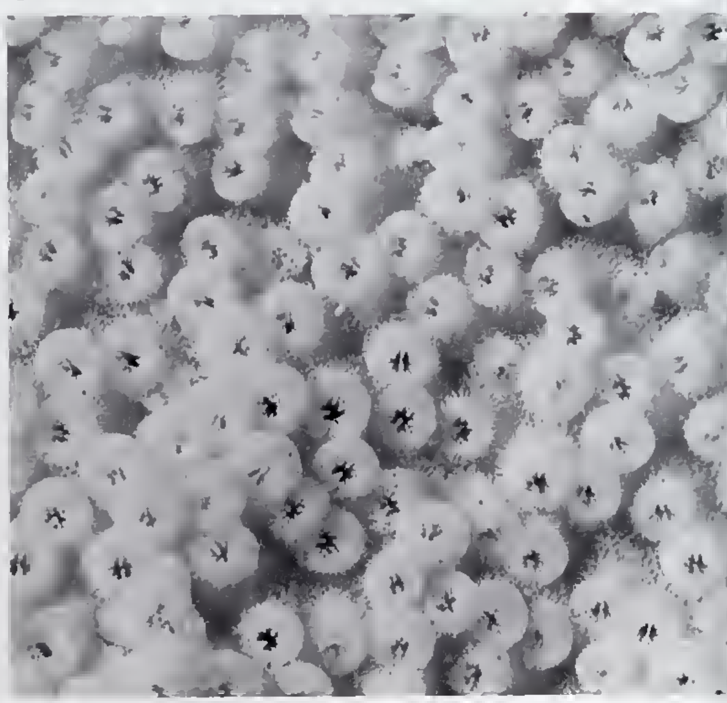
Fig. 370▼


Fig. 371▼


The coenosteum is similar to that of *A. palifera* in consisting of closely anastomosed spinules with elaborated tips, both on and between corallites.

Living colonies are a uniform pale cream to brown in colour.

Habitat preferences and skeletal variations

Acropora cuneata is less common than *A. palifera* and is seldom found in great abundance. Like *A. palifera*, coralla exposed to very strong wave action are primarily encrusting, while those from deeper water or protected reef flats, lagoon or slopes, develop the branches and plates described above. Branches are relatively thick in coralla from partly exposed reef flats and slopes. Coralla from deep water develop a wide variety of plates and branches.

There is little correlation between growth form and the variations in septal development described above. The full range of septal structures is frequently found in a single corallum and, conversely, different coralla from the same biotope have substantially different degrees of septa development.

Affinities

Acropora cuneata is usually clearly distinguished from *A. palifera in situ.* It has finer branches which divide much more frequently and also has a clear tendency to form horizontal plates. The corallites are smaller and tend to be more conical, with relatively round calices, not tending towards a nariform shape as with *A. palifera.* Coralla in heterogeneous collections can also normally be distinguished by these criteria. However, reef flat coralla of both species have very similar growth forms and as both show such great variation in corallite structure, distinctions may become arbitrary.

Distribution

Widely distributed throughout the tropical Indo-Pacific, from Madagascar in the west to the Marshall Islands in the east.

Figs. 372, 373 *Acropora cuneata* (× 20)
Fig. 372 From Chesterfield Atoll, collecting station 218.
Fig. 373 From Falcon Island, Palm Islands, collecting station 174.

ig 372▾

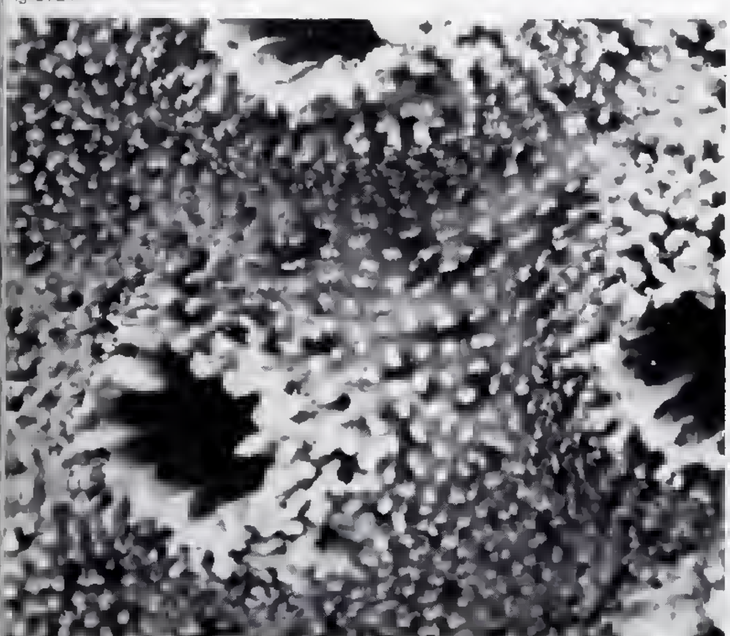
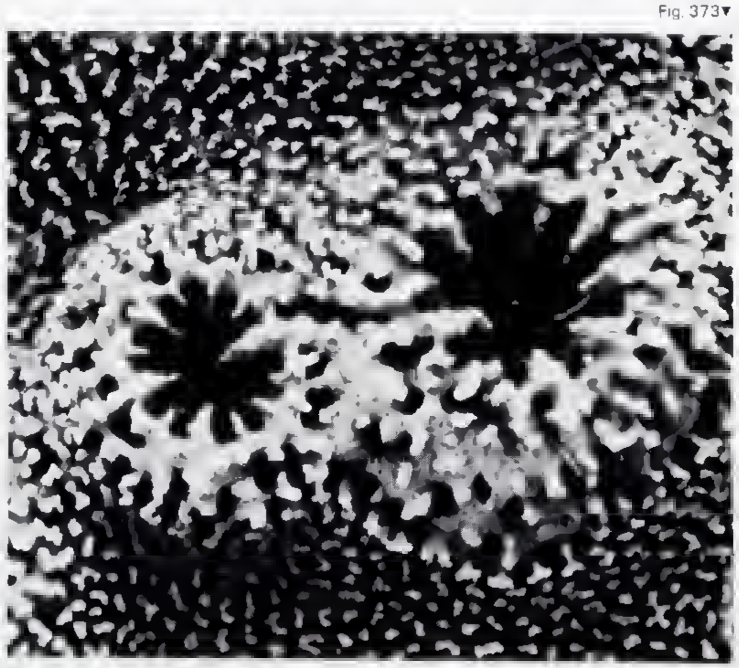


Fig. 373▾



Acropora (Isopora) brueggemanni (Brook, 1893)

Synonymy

Madrepora brueggemanni Brook, 1891; Brook (1893).

?*Acropora pachycyathus* Verrill, 1902.

Acropora brueggemanni (Brook); Crossland (1952); Searle (1956); Nemenzo (1967); Wallace (1978).

Acropora meridiana Nemenzo, 1971.

Verrill's small type of *A. pachycyathus* (YPM 6141) from an unknown locality has highly elaborated coenostial spinules. It is probably this species, although the shape of radial corallites (with dimidiate openings) resembles that of *A. palifera*.

Material studied

Sue Island (3 specimens), **Turtle Islands** (9 specimens), **Bushy Islet, Great Detached Reef** (11 specimens), **Bird Island** (2 specimens), **Wye Reef, Tijou Reef** (6 specimens), **Corbett Reef** (2 specimens), **Howick Island, Houghton Island** (4 specimens), **Lizard Island, Decapolis Reef, Hope Island, Low Isles** (2 specimens), **Palm Islands** (11 specimens).

These localities include collecting stations 1, 16, 34, 40, 41, 45, 100, 155, 156, 160, 161, 163, 164, 165, 174, 175, 182.

Characters

Colonies are arborescent with an irregular, lax, branching pattern. Branches are 1.5-4cm thick and are terete except in coralla from protected biotopes where they taper gradually. Branch tips are always blunt. They usually have a single axial corallite, but may have two or three. Axial corallites have very thick walls and reach 9mm diameter. Calices are 0.7-1.4mm diameter, usually only slightly larger than those of radial corallites. Radial corallites are tubular appressed, rounded tubular or, frequently, sub-immersed. As with the other species of the *A. palifera* group, they are usually irregular in size, shape and orientation.

Septa are usually plate-like with undulated margins. Radial corallites usually have two complete cycles; primary septa are $\frac{1}{2}$-$\frac{3}{4}$R, secondary septa $\frac{1}{2}$R to absent. Axial corallites have slightly better-developed septa and a rudimentary third cycle is sometimes developed. As with other *A. palifera* group species, the coenosteum on and between the corallites is similar, consisting of compact, anastomosing spinules with elaborated tips.

Habitat preferences and skeletal variations

Acropora brueggemanni occurs in shallow water, including exposed outer reef slopes and protected reef flats. Coralla from exposed biotopes form thick, non-anastomosing, tapering branches which divide infrequently. Axial corallites, which may be single or multiple, have very thick walls. Radial corallites are usually sub-immersed and frequently have irregular orientations, especially on flattened surfaces.

Coralla from protected reef flats have thinner, more frequently dividing branches and relatively exsert corallites, especially on the distal parts of branches.

Affinities

As noted above (p. 153), *A. brueggemanni* is grouped with *A. palifera* and *A. cuneata*. All three species have very similar coenostial structures and the colony shape of *A. palifera* and *A. brueggemanni* from the same biotope may be almost identical. However, *A. brueggemanni* is readily distinguished by the presence of a single axial corallite on the tips of most or all branches.

Figs. 374-377 *Acropora brueggemanni* (× 0.33)

Fig. 374 From Corbett Reef, collecting station 164, same corallum as Figs. 378, 379, 382.
Fig. 375 From Willis Island, collecting station 199, same corallum as Fig. 383.
Fig. 376 From Great Detached Reef, collecting station 1, same corallum as Fig. 380.
Fig. 377 From Houghton Island, collecting station 16, same corallum as Figs. 381, 384.

Fig. 374▲

Fig. 375▲

Fig. 376▼

Fig. 377▼

Distribution

Restricted to the central Indo-Malayan region, the Philippines and the Great Barrier Reef.

Subgenus Acropora n. subgenus*

Type species *Millepora muricata* Linnaeus, 1758

Subgenus *Acropora* includes all *Acropora* species other than those of subgenus *Isopora* (p. 153) and is created here as a consequence of retaining *Isopora* as a subgenus without making further subdivisions of *Acropora*. This treatment follows that of Wallace (1978) and Nemenzo (1967), except that Wallace omitted *Isopora* from her 1978 publication and Nemenzo used *Isopora* as a group rather than a subgenus.

* Subgeneric names need not be used in non-taxonomic publications.

Figs. 378-381 *Acropora brueggemanni* (× 5)
Figs. 378, 379 Same corallum from Corbett Reef and same corallum as Figs. 374, 382.
Fig. 380 From Great Detached Reef, same corallum as Fig. 376.
Fig. 381 From Houghton Island, same corallum as Figs. 377, 384.

Fig 378▲

Fig 379▲

Fig 380▼

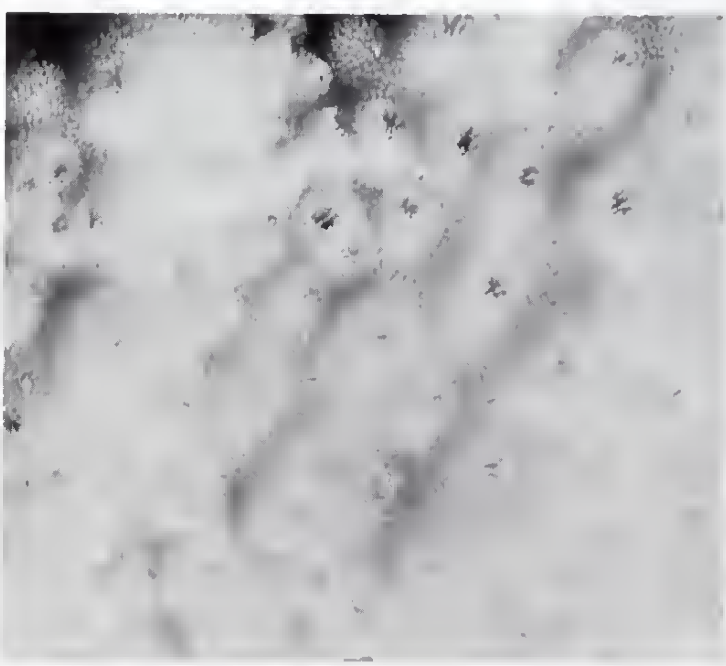
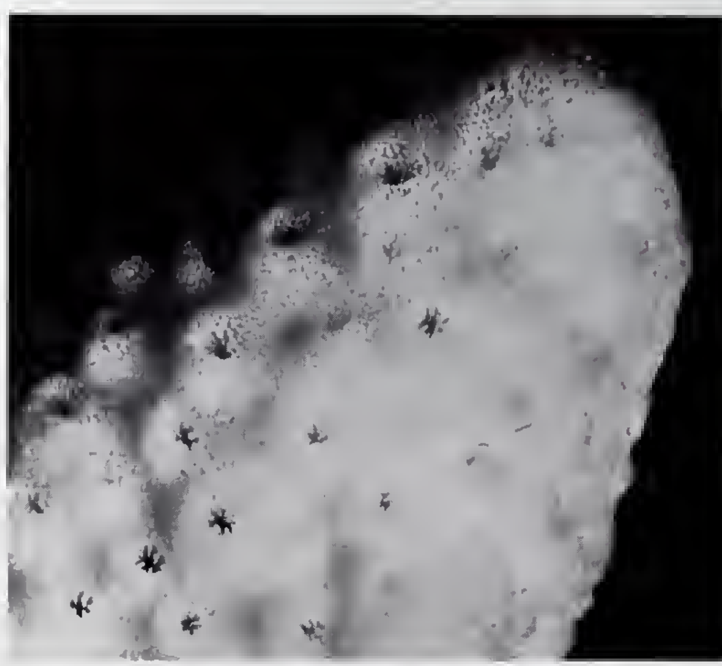


Fig 381▼



Subgenus *Acropora* therefore corresponds to Dana's (1846) *Madrepora* Sections A-F, and Brook's (1893) subgenera *Eumadrepora* Brook, *Odonotocyathus* Brook, *Polystachys* Brook, *Lipidocyathus* Brook, *Tylopora* Brook, *Conocyathus* Brook, *Rhabdocyathus* Brook, *Trachylopora* Brook and *Distichocyathus* Brook. Brook (1893) included *A. brueggemanni* in subgenus *Tylopora*, but noted its affinities with *Isopora*.

Nemenzo (1967) divided the subgenus into five groups: *Eumadrepora* Group, *Polystachys* Group, *Trachylopora* Group, *Tylopora* Group and *Alticyathus* Group. He included *A. brueggemanni* in his *Eumadrepora* Group.

This study and that of Wallace (1978) indicate that there are no subdivisions in subgenus *Acropora* that have systematic significance. Consequently, species are grouped for convenience of identification only and it is emphasised that these groups do not imply any taxonomic affinity of the species contained in them beyond that indicated in the introduction to each group.

Figs. 382-385 *Acropora brueggemanni*

Fig. 382 From Corbett Reef, same corallum as Figs. 374, 378, 379 (× 20).
Fig. 383 From Willis Island, same corallum as Fig. 375 (× 20).
Fig. 384 From Houghton Island, same corallum as Figs. 377, 381 (× 20).
Fig. 385 From Great Palm Island, showing the highly elaborated tips of reticulum spinules (× 400).

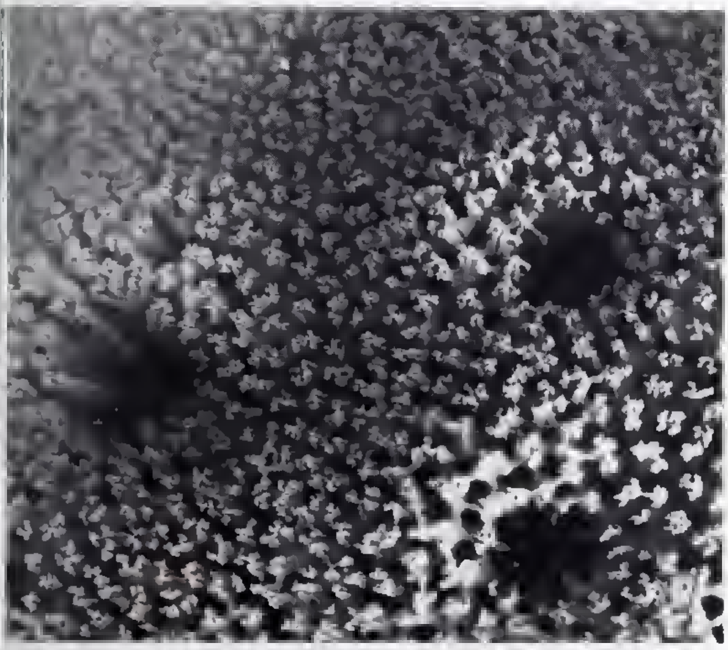


Fig. 382▲

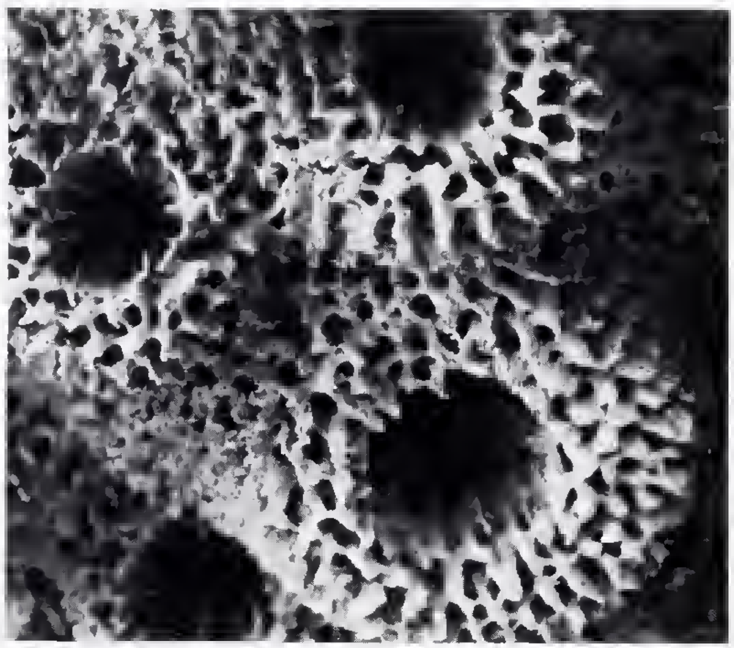


Fig. 383▲

Fig 384▼

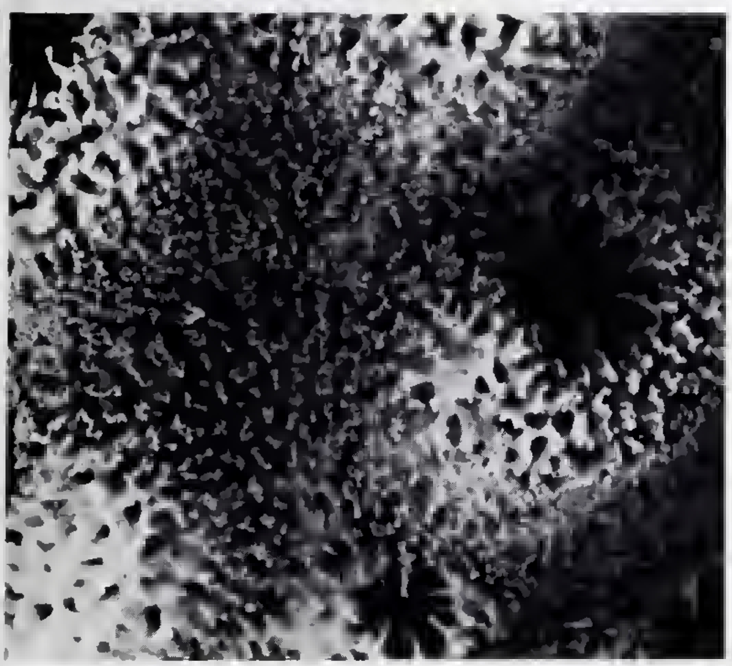


Fig. 385▼

The Acropora humilis group

(a) *Acropora humilis*, *A. gemmifera*, *A. monticulosa*

These three species are all similar heavy-structured species with thick branches and a corymbose growth form. They are usually found in shallow clear water and may be very abundant to dominant on upper reef slopes exposed to strong wave action and on outer reef flats.

The main distinctions between these species are given on p. 173. Wells (1954, p. 425) lists 17 nominal species in his synonymy of *A. humilis*: 'the list of "species" in the synonymy was based on *Acropora* specimens falling into the three formae broadly as follows:

Forma α: *samoensis*, *pelewensis*

Forma β: *humilis*, *pallida*, *fruticosa*, *globiceps*, *acervata*, *leptocyathus*, *canaliculata*, *seriata* (Bedot), *bullata*, *cophodactyla*.

Forma γ: *gemmifera*, *pyramidalis*, *spectabilis*, *guppyi*, *australis*, *contecta*.'

The senior synonyms of Wells's three formae, therefore, correspond to three species distinguished in the present study, two in the present group, plus *A. samoensis*. Wells's grouping was based on growth form rather than corallite characteristics and some junior synonyms have been re-allocated in the present treatment.

All three species, along with *A. lutkeni*, may form dome-shaped compound colonies several m diameter on shelf-edge reefs of the Great Barrier Reef and also on Coral Sea reefs.

(b) *Acropora samoensis*, *A. digitifera* and *A. multiacuta*

These three species are more readily distinguished than the above three. They are also predominantly shallow water species but are less heavily structured, even when occurring on exposed upper reef slopes.

Acropora (Acropora) humilis (Dana, 1846)

Synonymy

Madrepora humilis Dana, 1846; Edwards & Haime (1860); Brook (1893).

?*Madrepora cophodactyla* Brook, 1892; Brook (1893).

Madrepora fruticosa Brook, 1892; Brook (1893).

Madrepora guppyi Brook, 1892; Brook (1893).

Madrepora spectabilis Brook, 1892; Brook (1893).

Madrepora obscura Brook, 1893.

Acropora fruticosa (Brook); Hoffmeister (1925); Eguchi (1938); not Crossland (1952).

Acropora obscura (Brook); Faustino (1927); Nemenzo (1967).

Acropora spectabilis (Brook); Crossland (1952).

Acropora humilis (Brook); Crossland (1952); Wells (1954); Rossi (1954); Stephenson & Wells (1955); Nemenzo (1967); Scheer (1972); Scheer & Pillai (1974); Zou (1975); not Scheer (1967).

Acropora guppyi (Brook); Nemenzo (1967).

The syntypes of Dana are all similar to each other and are identical to various coralla in the present collection.

Of all Brook's nominal species, only *A. cophodactyla* is a doubtful synonym but probably comes from a wave swept reef front. The type localities of *A. guppyi* and *A. obscura* are Madras and the Solomon Islands (respectively), the rest are unrecorded.

Figs. 386-388 *Acropora humulis* (× 0.5)
Fig. 386 From Britomart Reef, collecting station 168, same corallum as Fig. 389.
Fig. 387 From Tijou Reef, collecting station 8, same corallum as Fig. 390.
Fig. 388 From Chesterfield Atoll, collecting station 217, same corallum as Figs. 391, 392.

Fig. 388▼

Fig. 387▼

Fig. 388▼

Acropora ocellata (Klunzinger) from the Red Sea, also recorded by Vaughan (1918) from the Cocos Keeling Islands, is a non-east Australian species, closely related to *A. humilis* as well as to *A. pyramidalis* and *A. pallida* (see p. 170).

Wells (1954) considered *A. humilis*, *A. gemmifera* and *A. samoensis* to be a single species and gave an extensive synonymy to include these species and some of their synonyms (see p. 166).

Material studied

Little Mary Reef (2 specimens), **Arden Island** (4 specimens), **Sue Island, Turtle Islands** (8 specimens), **Raine Island** (7 specimens), **Great Detached Reef** (13

Figs. 389-392 *Acropora humilis* (× 5)
Fig. 389 From Britomart Reef, same corallum as Fig. 386.
Fig. 390 From Tijou Reef, same corallum as Fig. 387.
Figs. 391, 392 Same corallum from Chesterfield Atoll and same corallum as Fig. 388.

Fig. 389▲

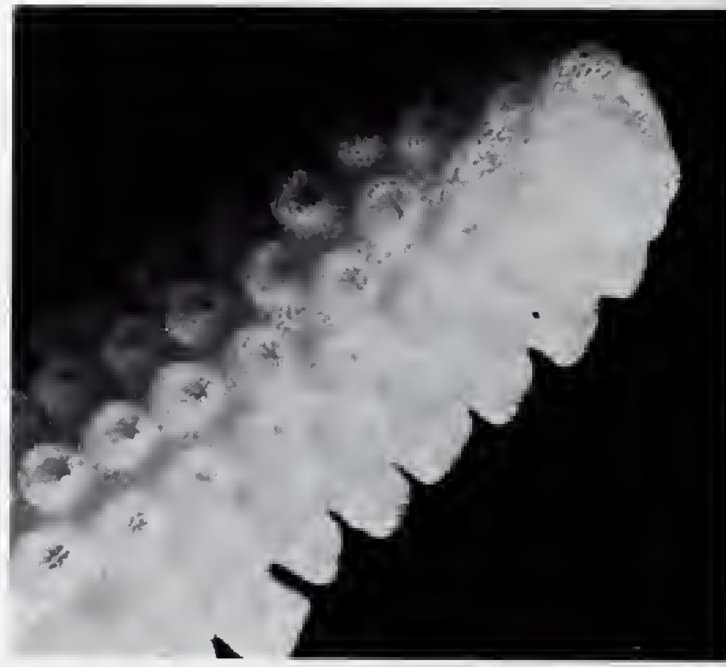


Fig. 390▲

Fig. 391▼

Fig. 392▼

specimens), **Sir Charles Hardy Islands** (4 specimens), **Wye Reef** (4 specimens), **Cat Reef** (5 specimens), **Tijou Reef** (12 specimens), **Corbett Reef** (3 specimens), **Bewick Island** (2 specimens), **Howick Island, Houghton Island** (2 specimens), **Yonge Reef** (7 specimens), **Lizard Island** (2 specimens), **Hope Island** (3 specimens), **Magdelaine Cay, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (12 specimens), **Myrmidon Reef** (2 specimens), **Palm Islands** (15 specimens), **Darley Reef** (3 specimens), **Chesterfield Reefs, Pompey Reef, Bushy Island-Redbill Reef, Swain Reefs** (2 specimens), **Fitzroy Reef** (2 specimens).

These localities include collecting stations 1, 2, 3, 5, 6, 8, 9, 16, 18, 32, 34, 36, 40, 41, 45, 55, 57, 60, 76, 80, 89, 103, 148, 151, 152, 155, 158, 162, 163, 164, 165, 167, 168, 174, 175, 177, 179, 182, 183, 185, 190, 200, 201, 217, 219, 221, 226.

Characters

Colonies may be corymbose or caespito-corymbose with a central to side attachment, sometimes broad-based. Branches are digitate, tapered, and vary greatly in thickness, with the thickest branches of mature colonies ranging from 10-27mm diameter.

Radial corallites are usually of two sizes, with the larger becoming longer and broader towards branch bases, where incipient axial corallites are frequently developed. Small-sized corallites are usually interspersed between the larger corallites. The larger radial corallites are up to 3.4mm wide, with calices 0.9-1.3mm wide. They are frequently arranged in rows. They are tubular with slightly to markedly dimidiate openings directed at $>90°$ from the branch and have a thickened outer wall. Primary septa are up to $\frac{1}{3}$R; secondary septa are not usually fully developed, $<\frac{1}{4}$R. Axial corallites are up to 2mm exsert, 3.0-8.0mm diameter, with calices 1.1-1.6mm diameter. Septa are usually in two complete cycles up to $\frac{3}{4}$R and $\frac{1}{2}$R.

The coenosteum, both on and between radial corallites, is reticulate and/or costate, with spinules that are laterally flattened and elaborated.

Living colonies have a wide range of colours, commonly cream, brown or blue with blue or cream tips, deep green with brown tips, grey, pinkish-grey or purple.

Figs. 393, 394 *Acropora humilis* (× 20)
Fig. 393 From Magdelaine Cay, collecting station 201.
Fig. 394 From Little Mary Reef, collecting station 185.

Fig. 393▼

Fig. 394▼

Habitat preferences and growth form variations

The above description applies primarily to the *A. humilis* forma α of Wells (1954). This is generally applicable to *A. humilis* as a whole, except for coralla from extreme environments including reef fronts and outer reef flats, where this species is usually very abundant. Coralla from such biotopes are corymbose with broad encrusting bases and short, thick, tapering branches with few sub-branches. Branches are usually closely compacted making them angular in cross-section. Axial corallites are hemispherical in shape reaching 8mm diameter. Radial corallites are thick-walled, dimidiate, are arranged in rows and increase in size towards the branch base. Septa of all corallites are relatively well developed and frequently axial corallites have a rudimentary third cycle developed.

Colonies from less exposed environments including upper reef slopes, flats and lagoons develop the various growth forms noted above. Those from well-protected biotopes frequently have enlongate, relatively thin (8mm diameter), terete branches. Radial corallites are usually very neatly arranged in equidistant rows and are of very uniform shape and structure, except for those near the base of branches which develop thick walls and may become incipient axial corallites.

Affinities and similar species

Although *A. humilis* is a very well known and widely recognised species, it is very polymorphic and difficult to distinguish as a single discrete species unit. It may thus be difficult to separate from closely related species notably *A. gemmifera* and *A. monticulosa*, especially when these occur together in biotopes exposed to strong wave or current action, where all have similar growth forms (see pp. 173 and 174).

Distribution

Widely distributed throughout the tropical Indo-Pacific, from the Red Sea in the west and to the Marshall Islands, Tuamotu Archipelago and Hawaii in the east.

Acropora (Acropora) gemmifera (Brook, 1892)

Synonymy

Madrepora gemmifera Brook, 1892; Brook (1893).

Madrepora australis Brook, 1892 (*pars*); Brook (1893) (*pars*).

Acropora gemmifera (Brook); Vaughan (1918); Matthai (1923); Crossland (1952); Chevalier (1968).

Acropora fruticosa (Brook); Crossland (1952); not Brook (1892).

The type localities of both *A. gemmifera* and *A. australis* are in the Great Barrier Reef. Brooks syntype BMNH 1846-7-30-20 and 23 of *A. australis* is this species, but the remainder of his series is confused with *A. humilis*.

Crossland's specimen of *A. fruticosa* (BMNH 1934-5-14-51) is *A. gemmifera* (*A. fruticosa* Brook being a synonym of *A. humilis*). Two of Klunzinger's (1879) species from the Red Sea, *A. pyramidalis* and *A. pallida*, are close to (or are partly confused with) *A. gemmifera*. *Acropora pyramidalis* (ZMB 215) may be this species while ZMB 2116 is *A. digitifera*. *Acropora pallida* (ZMB 2128) appears to be either a deep water form of *A. gemmifera* or a synonym of *A. gemmifera*.

Wells (1954) concluded that *A. gemmifera* was a 'form' of *A. humilis* and listed nominal species he considered to be synonyms of this form (see p. 166).

Figs. 395-398 *Acropora gemmifera* (× 0.33)

Fig. 395 From Middleton Reef, collecting station 230, same corallum as Fig. 399.
Fig. 396 From Great Detached Reef, collecting station 1, same corallum as Fig. 400.
Fig. 397 From Tijou Reef, collecting station 8, same corallum as Fig. 401.
Fig. 398 From Myrmidon Reef, collecting station 219, same corallum as Fig. 402.

Fig. 395▲

Fig. 396▲

Fig. 397▲

Fig. 398▲

Material studied

Canoe Cay, Triangle Reef (4 specimens), **Pandora Reef** (6 specimens), **Raine Island** (3 specimens), **Great Detached Reef** (16 specimens), **Sir Charles Hardy Islands, Wye Reef** (2 specimens), **Cat Reef** (2 specimens), **Franklin Reef** (4 specimens), **Tijou Reef** (10 specimens), **Bewick Island, Howick Island, Yonge Reef** (2 specimens), **Lizard Island, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (7 specimens), **Myrmidon Reef** (13 specimens), **Palm Islands** (2

Figs. 399-402 *Acropora gemmifera* (× 5)

Fig. 399 From Middleton Reef, same corallum as Fig. 395.
Fig. 400 From Great Detached Reef, same corallum as Fig. 396.
Fig. 401 From Tijou Reef, same corallum as Fig. 397.
Fig. 402 From Myrmidon Reef, same corallum as Fig. 398.

Fig. 399▲

Fig. 400▲

Fig. 401▼

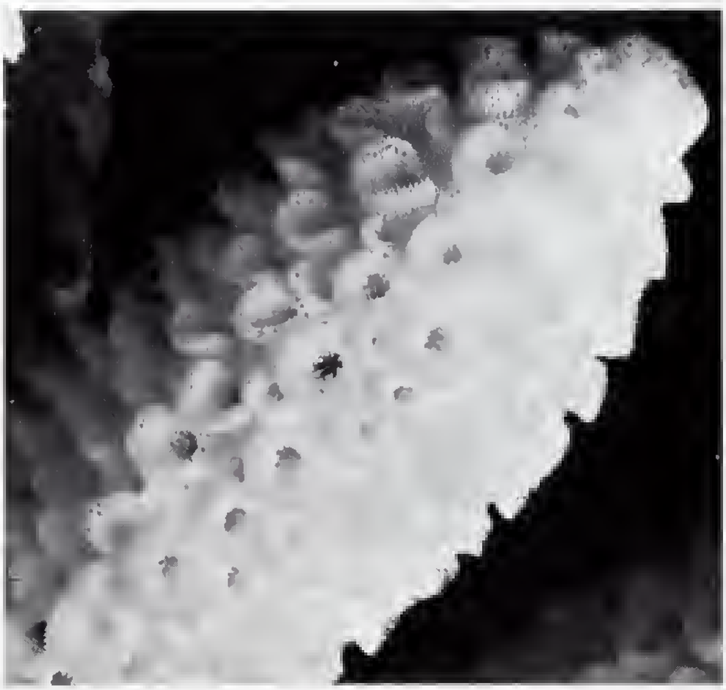
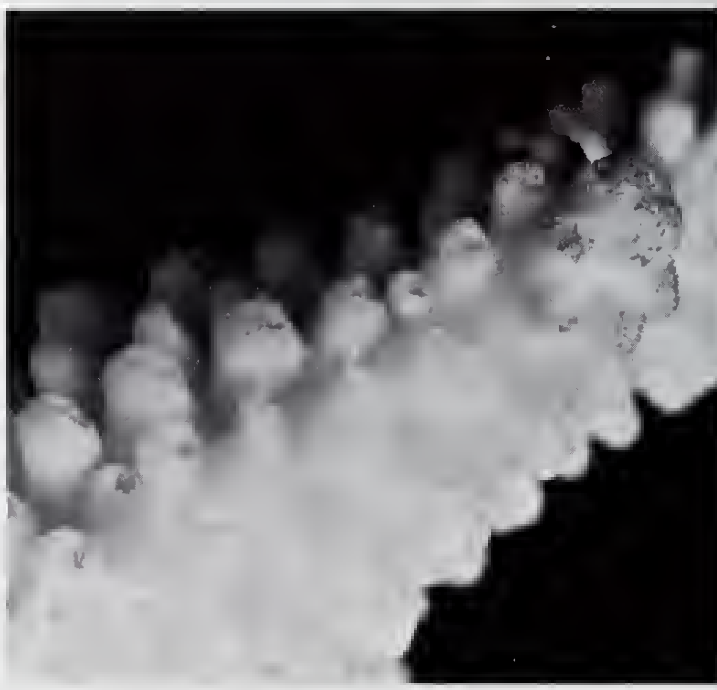


Fig. 402▼



specimens), **Darley Reef, Chesterfield Reefs** (2 specimens), **Flinders Reef (Moreton Bay)** (2 specimens), **Middleton Reef.**

These localities include collecting stations 1, 2, 3, 5, 6, 8, 18, 32, 34, 36, 148, 149, 150, 152, 158, 160, 163, 167, 168, 175, 179, 214, 219, 221, 226, 227, 230.

Characters

Colonies are thick, side-attached, corymbose plates, or are digitate with broad bases, or are groups of corymbose plates arranged in tiers. Branches are thick and tapering. Radial corallites are of two intermixed types. The first are immersed, the second are up to 5mm exsert at the base of branches and gradually decrease in size towards the branch tip (cf. *A. monticulosa*). Incipient axial corallites also develop at the base of branches. The larger sized radial corallites are 2.0-3.4mm diameter, are tubular with rounded to dimidiate openings and calices 0.8-1.0mm diameter. The lower directive septum, or both directive septa, are well developed and the remaining primary septa are bilaterally arranged, $<\frac{1}{4}$R. Secondary septa are $<\frac{1}{4}$R, incomplete or (usually) absent. Immersed radial corallites usually have only primary septa. Axial corallites are $<$2mm exsert, 2.8-4.2mm diameter, with calices 1.0-1.3mm diameter. Septa are usually in two complete cycles of $\frac{2}{3}$R and $\frac{1}{3}$R. The coenosteum on corallites is covered with fine spinules or else is finely costate. Coenosteum between corallites is usually slightly coarser.

Living colonies are mostly pale blue, cream or brown, with blue or white branchlet tips.

Habitat preferences and growth form variation

Acropora gemmifera is common on any upper reef slope exposed to strong wave action. Like *A. humilis* and *A. monticulosa* from such biotopes, branches become progressively shortened and thickened with increased exposure to wave action. Otherwise this species shows little variation.

Affinities and similar species

Acropora gemmifera has clear affinities with *A. monticulosa* and *A. humilis*. It is distinguished from *A. monticulosa* by having radial corallites which increase in size down the sides of branches. Fully developed radial corallites are larger than those of *A. monticulosa*,

Fig. 403 *Acropora gemmifera* from Britomart Reef (× 20).

Fig. 403 ►

are more widely separated by immersed corallites, and are usually dimidiate rather than nariform in shape. Septa, especially secondary septa, are much better developed in *A. monticulosa*. *Acropora humilis* has similar radial corallites as *A. gemmifera* but axial corallites are much larger and provide an easy means of distinction. Where both species occur together (which is usually the case) branches of *A. humilis* are usually thinner than those of *A. gemmifera*.

Because *A. gemmifera* is common on exposed reef slopes where growth forms of otherwise distinct species converge, it may also be confused with *A. robusta*, *A. secale* and *A. lutkeni*.

Distribution

Possibly extends westward to the Red Sea and also occurs in the south-western Pacific including New Caledonia and Fiji.

Acropora (Acropora) monticulosa (Brüggemann, 1879)

Synonymy

Madrepora monticulosa Brüggemann, 1879a; Brook (1893).

Brüggemann's holotype from Rodriguez (BMNH 1876-5-5-93) has short, almost conical branches, characteristic of reef front specimens of this species.

Material studied

Triangle Reef (3 specimens), **Pandora Reef, Cat Reef, Franklin Reef, Yonge Reef, Myrmidon Reef** (13 specimens), **Chesterfield Reefs** (3 specimens).

These localities include collecting stations 148, 150, 158, 214, 217, 219, 221.

Characters

Colonies are thick, side-attached, corymbose plates or groups of corymbose plates arranged in tiers. Branches are very thick and taper, giving a conical shape. Adjacent radial corallites may be the same or different sizes, but larger corallites are approximately uniform in size and shape over the whole colony except branch tips (cf. *A. gemmifera*). They are tubular, with rounded to nariform openings <3mm long and <2.6mm diameter, with calices 0.8-1.0mm diameter. Septa are in two complete sub-equal cycles of $\frac{1}{3}$R, or are up to $\frac{1}{2}$R and $\frac{1}{4}$R; they have a neat appearance. Axial corallites are <3.5mm diameter, with calices 0.8-1.1mm diameter. Septa are identical to those of radial corallites. The coenosteum on corallites is covered with fine spinules or is finely costate. The coenosteum between corallites is usually slightly coarser.

Living colonies are blue or cream in colour, usually with pale branchlet tips.

Habitat preferences and growth form variation

Acropora monticulosa occurs only in shallow water and is usually found on upper reef slopes with *A. humilis* and *A. gemmifera*, both of which are much more common. All three species have progressively shortened, thickened branches as exposure to wave action increases. Occasionally, on upper reef fronts of very exposed reefs, *A. monticulosa* forms dome-shaped compound colonies as does *A. humilis* and *A. lutkeni*.

Affinities

Acropora monticulosa is closest to *A. gemmifera* (see p. 173). It also resembles *A. humilis*, which is readily distinguished by its larger axial corallites and by having radial corallites which increase in size away from the branch tip. Radial corallites of *A. humilis* are also larger, less uniform, and have less well-developed secondary septa.

Figs. 404-407 *Acropora monticulosa* (× 0.5)

Figs. 404, 405 From Myrmidon Reef, collecting stations 219 and 221 (respectively), same coralla as Figs. 408, 409 (respectively).

Fig. 406 From Chesterfield Atoll, collecting station 214.

Fig. 407 From Cat Reef, collecting station 148.

Fig. 404▲

Fig. 405▼

Fig. 406▼

Fig. 407▼

Distribution

Previously known only from Rodriquez.

Acropora (Acropora) sp. 1

Material studied

Little Mary Reef, Swain Reef.

These localities are collecting stations 76, 186.

Characters

The two coralla of the present series (from opposite ends of the Great Barrier Reef) have digitate growth forms with terete branches. Incipient axial corallites are developed

Figs. 408-411 *Acropora monticulosa* (× 5)
Figs. 408, 409 From Myrmidon Reef, same coralla as Figs. 404, 405 (respectively).
Fig. 410 From Chesterfield Atoll, same corallum as Fig. 406.
Fig. 411 From Cat Reef, same corallum as Fig. 407.

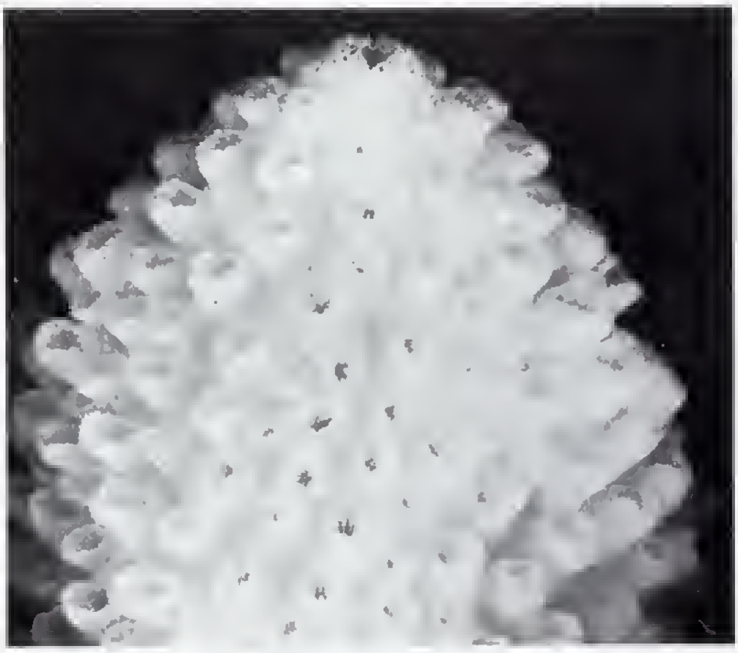


Fig 408▲

Fig. 409▲

Fig. 410▼

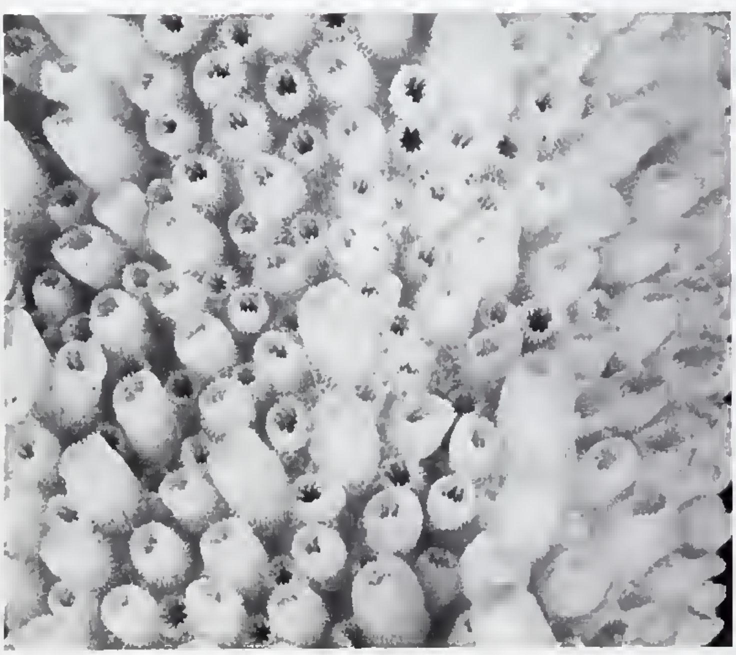
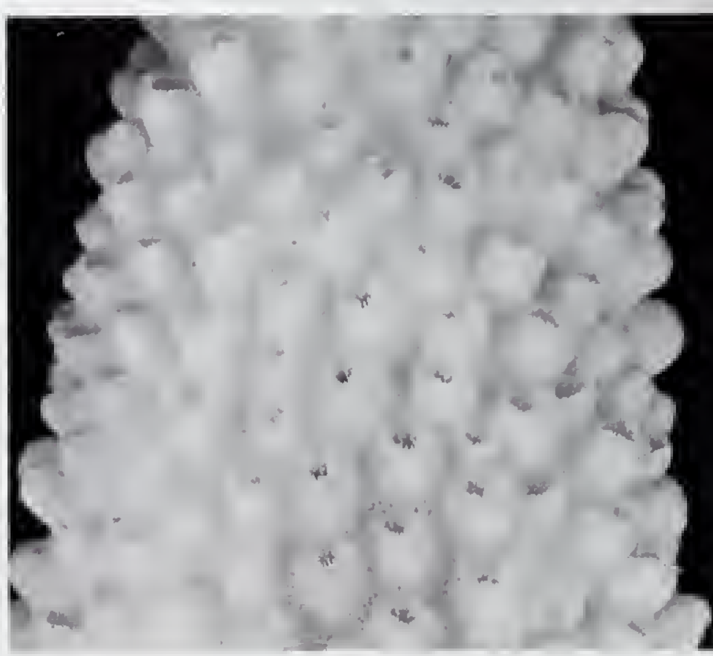


Fig. 411



towards the base of branches; otherwise radial corallites are uniform in size and shape and are arranged in neat rows. They are short, appressed, <2.3mm diameter with calices 0.9mm diameter. Directive septa are well developed, the remaining primary septa are $<\frac{1}{4}$R and secondary septa are absent. Axial corallites are non-exsert, up to 6.2mm diameter with calices 1.3mm diameter and septa in two complete cycles of $\frac{3}{4}$R and $\frac{1}{2}$R. The coenosteum is uniform on and between corallites and is medium-coarse with laterally flattened spines forming lines or costae on some branches.

Affinities

Acropora sp. 1 does not closely resemble any other species. Its closest affinities are probably with *A. humilis*.

Figs. 412, 413 Same corallum of *Acropora* sp. 1 from Little Mary Reef (× 0.5 and 5 respectively).

Fig. 412▼

Fig. 413▼

Acropora (Acropora) samoensis (Brook, 1891)

Synonymy

?*Madrepora plantaginea* Lamarck, 1816; Edwards & Haime (1860); Brook (1893).

Madrepora samoensis Brook, 1891; Brook (1893).

Acropora samoensis (Brook); Hoffmeister (1925).

Acropora plantaginea (Lamarck); Hoffmeister (1929).

Brook's type series of *A. samoensis* from Samoa (BMNH 1875-10-2-18 to 20) is identical to various coralla in the present series.

Brook (1893, p. 156) gives an extensive synonymy of *A. plantaginea*, noting 'a number of specimens which form part of Lamarck's collection in the Paris Museum are labelled *Madrepora plantaginea*, but are referable to at least three species'. Specimens MNHN 310a and e may be Lamarck's types and were the specimens described by Edwards & Haime as *A. plantaginea*. However, as the type series is confused, this name cannot be used.

Acropora acervata Dana from ?Fiji (USNM 271, type ?) is similar to coralla of the present series, but radial corallites differ in being smaller and in having a much better septation.

Material studied

Triangle Reef, Wizard Islet, Great Detached Reef, Franklin Reef, Three Isles, Mellish Reef, Britomart Reef (5 specimens), **Chesterfield Reefs** (8 specimens), **Fitzroy Reef.**

These localities include collecting stations 1, 150, 157, 167, 190, 209, 212, 214, 216, 217, 218.

Characters

Colonies are central to side-attached, caespitose to caespito-corymbose, with terete or slightly tapering branches giving a compact bushy appearance.

Radial corallites are usually of two sizes and shapes. The larger corallites are tubular or

Fig. 414 *Acropora samoensis* from Mellish Reef, collecting station 209 (× 0.33).

Fig. 414▼

tubular appressed, thick-walled and have oval openings. They are <2.8mm diameter, with calices 0.7-1.3mm diameter. They may be aligned in rows but are mostly irregularly spaced, being separated by the smaller corallites which are irregularly oriented and are tubular appressed to sub-immersed with rounded openings. All radial corallites have a poorly-developed septation, the first cycle consisting of two directive septa and the remainder $<\frac{1}{3}R$ or absent and the second cycle $<\frac{1}{4}R$, incomplete or absent. Axial corallites are uniform in size and appearance, approximately 2mm exsert, 3-4.5mm diameter, with calices 1.2-1.4mm diameter. Septa are in two complete cycles up to $\frac{2}{3}R$ and $\frac{1}{3}R$.

Figs. 415-418 *Acropora samoensis* (× 5)

Figs. 415, 416 Same corallum from Mellish reef and same corallum as Fig. 414.

Figs. 417, 418 Same corallum from Chesterfield Atoll.

Fig. 415▲

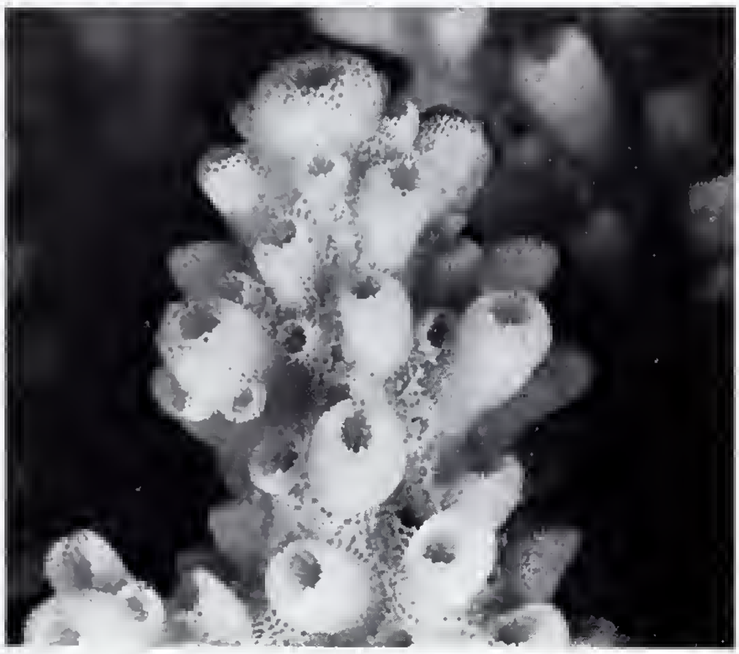
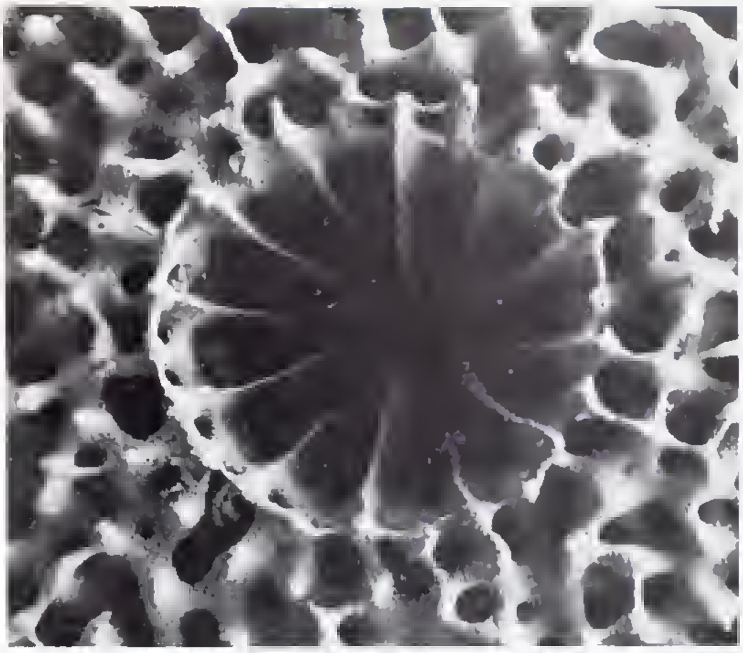


Fig. 416▲

Fig 417▼

Fig 418▼



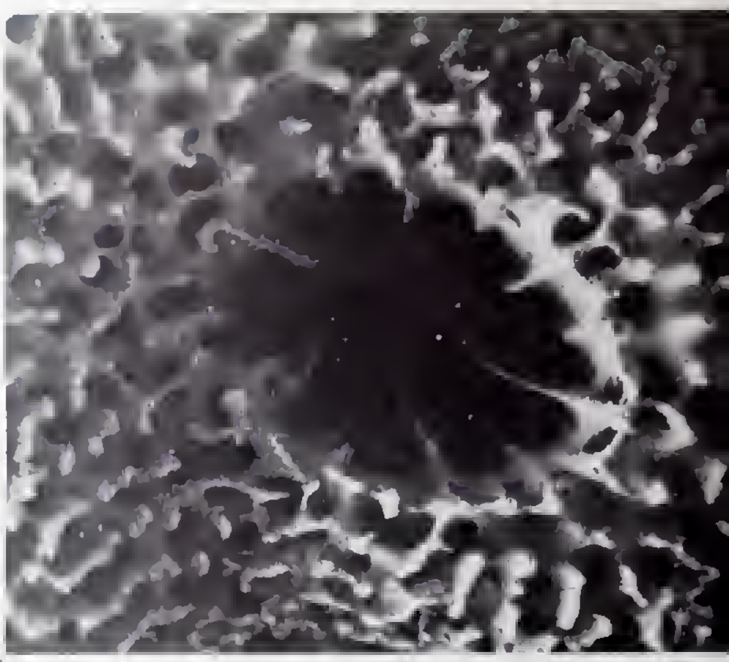


Fig. 419▲ Fig. 420

Figs. 419, 420 *Acropora samoensis* from Britomart Reef, collecting station 167 (× 20).

The coenosteum on and between corallites is reticulate, with very fine costae visible in thin-walled distal corallites.

Living colonies are usually purple in colour.

Habitat preferences and growth form variation

Acropora samoensis is usually found in shallow water and extends to about 12m depth on most reef slopes. Coralla from upper reef slopes have a thick base, although branches are not digitate. With increasing depth, coralla become increasingly flat and side-attached.

Similar species

Acropora samoensis closely resembles *A. humilis* and was included in the synonymy of that species by Wells (1954) as forma α (see p. 166). It is distinguished from *A. humilis* by its caespitose growth form in biotopes where *A. humilis* is corymbose and by its smaller axial corallites. It has relatively irregular radial corallites which are usually of two sizes. It is generally lighter in structure than *A. humilis* with deep reef slope colonies resembling *A. sarmentosa*.

Distribution

Largely unknown, but probably restricted to the south-western Pacific, including Fiji and Samoa.

Acropora (Acropora) digitifera (Dana, 1846)

Synonymy

Madrepora digitifera Dana, 1846; Brook (1893).

?*Madrepora effusa* Dana, 1846.

Madrepora leptocyathus Brook, 1891; Brook (1893).

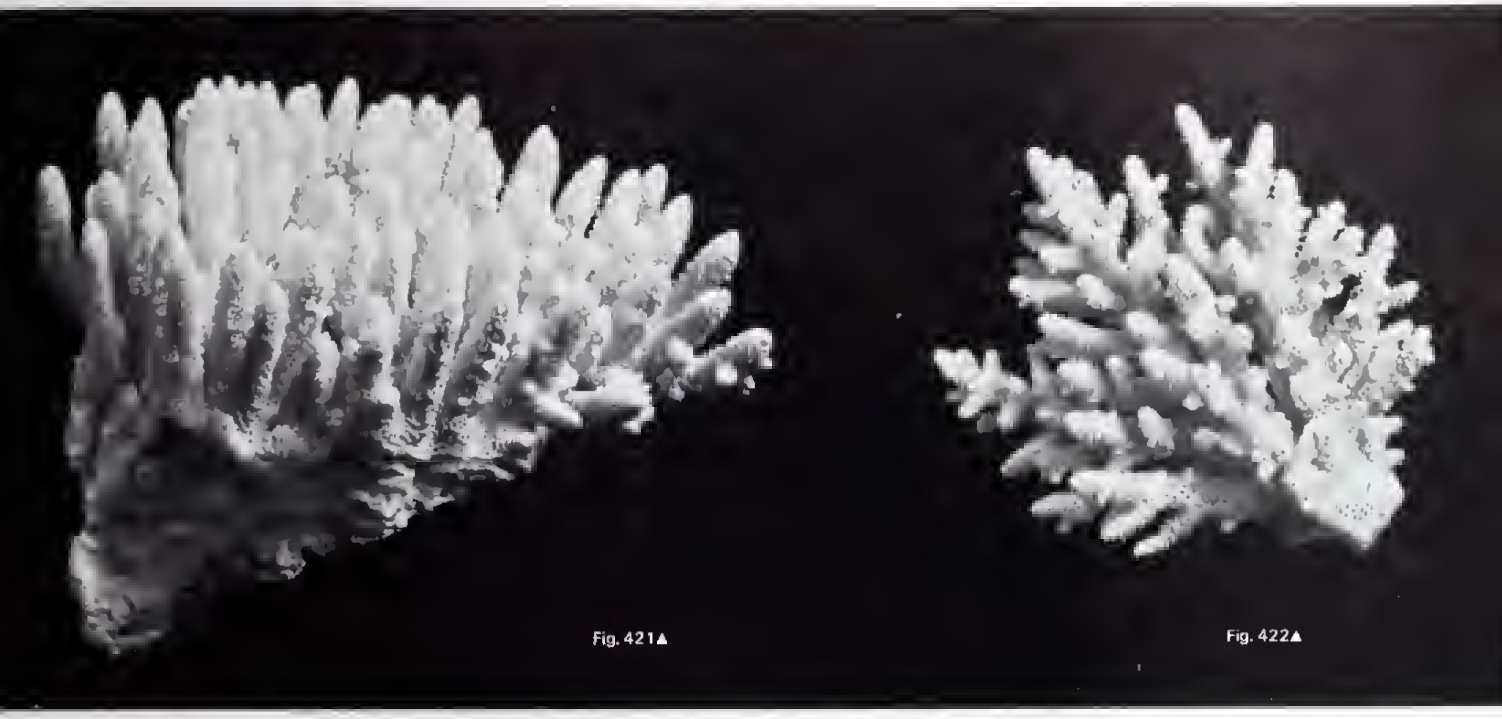
Madrepora brevicollis Brook, 1892; Brook, (1893).

Madrepora baeodactyla Brook, 1892; Brook (1893).

?*Madrepora calamaria* Brook, 1892; Brook (1893).

?*Acropora fraterna* Verrill, 1902.

Acropora wardii Verrill, 1902.



Figs. 421, 422 *Acropora digitifera* (× 0.5)
Fig. 421 From Magdelaine Cay, collecting station 201 showing the usual growth form in intertidal biotopes, same corallum as Figs. 423, 427.
Fig. 422 From Little Mary Reef, collecting station 185, same corallum as Figs. 424, 425.

Acropora digitifera (Dana); Verrill (1902); Vaughan (1918); Matthai (1923); Crossland (1952); Wells (1954, 1955); Stephenson & Wells (1955); Nemenzo (1967); Pillai (1967b).

Acropora leptocyathus (Brook); Hoffmeister (1925, 1929).

Ehrenberg's holotype of *A. seriata* (ZMB 889) from an unknown locality has thick-walled radial corallites averaging 3.2mm diameter, with calices 1.8mm diameter. It appears to be a closely related species to *A. digitata* rather than a synonym. Dana's holotype of *A. effusa* from Sri Lanka (YPM 8147) also differs from any corallum in the present series in having a wide range of radial corallite sizes and shapes. Brook's *A. brevicollis* and *A. baeodactyla* from the Great Barrier Reef and Rodriguez (respectively) are similar. His *A. calamaria*, also from Rodriguez, differs from any corallum in the present series in having larger, more exsert and less crowded radial corallites. Of Verrill's (1902) two synonyms, the holotype of *A. fraterna* from Tahiti (YPM 2032) is a hardly recognisable branchlet tip approximately 2cm long, while the syntypes of *A. wardii* from 'East Indies or Polynesia' (YPM 6151 a & b) are small branchlets, clearly of *A. digitifera*.

Material studied

Little Mary Reef (2 specimens), **Great Detached Reef, Tijou Reef** (2 specimens), **Yonge Reef** (2 specimens), **Lizard Island, Magdelaine Cay** (5 specimens), **Mellish Reef, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (2 specimens), **Pandora Reef, Palm Islands** (2 specimens), **Chesterfield Reefs, Polmaise Reef, Fitzroy Reef** (11 specimens), **Myora (Moreton Bay)** (8 specimens), **Middleton Reef** (4 specimens), **Elizabeth Reef** (2 specimens).

These localities include collecting stations 2, 5, 34, 100, 160, 167, 177, 185, 190, 191, 198, 201, 209, 214, 226, 228, 230, 231, 233, 240.

Characters

Colonies are corymbose or caespito-corymbose with a central to lateral attachment. Corymbose colonies usually have a broad, highly fused base with short branches.

Radial corallites are tubular, 1.3-2.4mm diameter, with rounded to dimidiate openings sometimes flaring as lips. They may be similar or mixed in size and are usually arranged in rows. They have calice diameters of 1.0-1.3mm. Septa are in two cycles up to $\frac{2}{3}$R and $\frac{1}{2}$R, although they may be greatly reduced and sub-equal. Axial corallites are <3.7mm diameter with calice diameters of 0.9-1.6mm. Septa are in two cycles up to $\frac{3}{4}$R and $\frac{2}{3}$R but may also be

Figs. 423-426 *Acropora digitifera* (× 5)
Fig. 423 From Magdelaine Cay, same corallum as Figs. 421, 427.
Figs. 424, 425 From Little Mary Reef, same corallum as Fig. 422.
Fig. 426 From Fitzroy Reef, collecting station 190, same corallum as Fig. 428.

Fig. 423▲

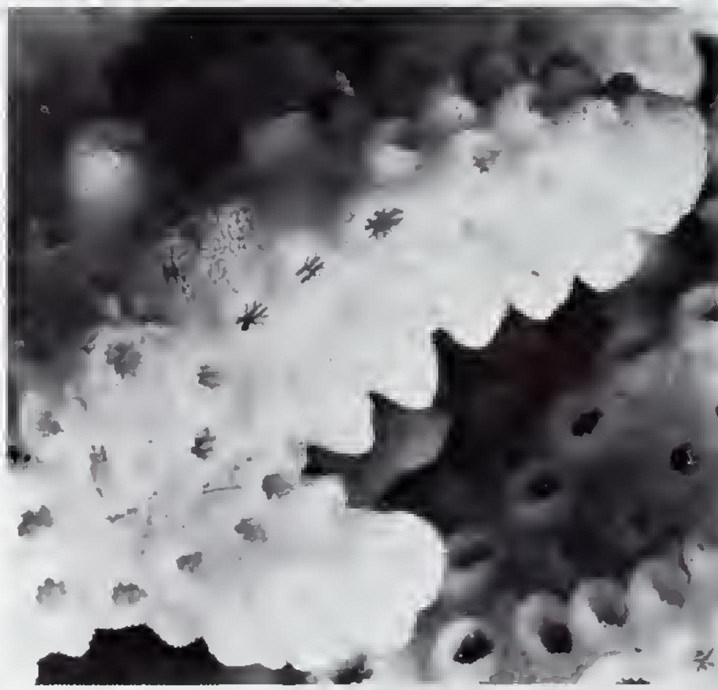


Fig. 424▲

Fig. 425▼

Fig. 426▼

reduced to $\frac{1}{3}$R and $\frac{1}{4}$R. The coenosteum on and between corallites consists of dense spinules with a reticulate structure clearly visible beneath. Fine costae are sometimes developed.

Living colonies recorded in the present study are pale brown, cream or yellow with pale blue or cream branch tips.

Habitat preferences and growth form variation

Acropora digitifera from subtidal biotopes

The species is rare except for the subtidal tops of wave-washed back margins of some reefs. In these biotopes it frequently combines with *A. humilis* to form an almost continuous cover and can be the dominant species in bands up to a few m wide. Colonies have short upright branches growing from a solid basal plate. Coralla in the present series collected from such biotopes have a reduced septation with the two septal cycles in axial corallites frequently being incomplete.

Acropora digitifera from reef slopes

Coralla collected from below low tide level are caespito-corymbose and lack the neat appearance of corymbose coralla described above. Corallites are similar in size, shape and general appearance to those described above but have a much better developed septation.

Affinities

Wallace (1978) notes that *A. digitifera* has the appearance 'of a diminutive, "neat" *A. humilis*' and certainly these species are closely related. They are, however, readily distinguished as *A. digitifera* has smaller branches and smaller corallites, especially a smaller axial corallite. It is distinguished from *A. samoensis* by similar characters and its more compact branching, from *A. gemmifera* by having much thinner branches and from *A. bushyensis* as described on p. 190.

Distribution

Widely distributed in the tropical Indo-Pacific, west to Madagascar and east to Samoa.

Figs. 427, 428 *Acropora digitifera* (× 20)
Fig. 427 From Magdelaine Cay, same corallum as Figs. 421, 423.
Fig. 428 From Fitzroy Reef, same corallum as Fig. 426.

Fig. 427▼

Fig 428▼

Acropora multiacuta Nemenzo, 1967

Synonymy

Acropora multiacuta Nemenzo, 1967; Scheer & Pillai (1974); Wallace (1978).

Material studied

Murray Islands, Lodestone Reef, Broadhurst Reef (37 specimens), **Darley Reef, Pompey Reef.**

These localities include collecting stations 23, 70.

Characters

Coralla have encrusting bases from which extremely elongate primary axial corallites protrude, these corallites having incipient axial corallites towards their base. Primary axial corallites are up to 68mm exsert, up to 14mm diameter at their base and taper to be 2.6-4.5mm diameter at their tip. Incipient axial corallites are much less exsert but are of similar shape. Septa are very variable, they may be absent, or the first cycle well developed (up to R) and the second cycle $<\frac{1}{3}$R, or both cycles indistinguishable and their lengths irregular. Radial corallites are tubular or tubular appressed, with circular to oval openings. Septa are absent or consist of a few rows of spines.

The coenosteum on and between corallites is smooth with a fine reticulate structure and few spinules. Fine costae are sometimes developed.

Living colonies are a pale blue or pink.

Habitat preferences and growth form variation

Acropora multiacuta is extremely rare, although it is abundant on Broadhurst Reef where it has a wide range of growth forms, depending on the degree to which the primary axial corallites are exsert and on the density of the incipient axial corallites. Primary axial corallites may be straight, curved or twisted, and colonies may have an irregular appearance. This species appears to be restricted to biotopes with very shallow water protected from strong wave action.

Affinities

The extreme development of the primary axial corallites makes this species unlike any other *Acropora*. It is placed in the *A. humilis* group because of the large axial corallites, but radial corallites and the coenosteum show similarities with the *A. loripes* group.

Distribution

Recorded from the Nicobar Islands (Scheer & Pillai, 1974), the Philippines (type locality) and the Great Barrier Reef.

Figs. 429-431 *Acropora multiacuta* (× 0.5)

Fig. 429 From Darley Reef.

Figs. 430, 431 From Broadhurst Reef; Fig. 430 same corallum as Fig. 432; Fig. 431 same corallum as Figs. 433, 436.

Fig. 429▼

Fig. 430▼

Fig. 431▼

Figs. 432-435 *Acropora multiacuta* from Broadhurst Reef, Fig. 432 same corallum as Fig. 430; Fig. 433 same corallum as Figs. 431, 436 (× 5).

Fig. 432▲

Fig. 433▲

Fig. 434▼

Fig. 435▼

Figs. 436, 437 *Acropora multiacuta* from Broadhurst Reef, Fig. 436 same corallum as Figs. 431, 433 (× 20).

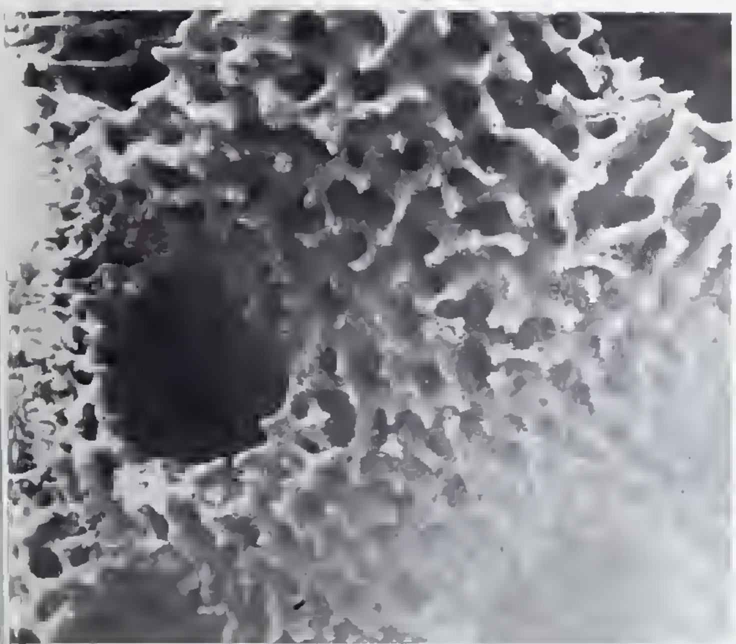


Fig. 436▲

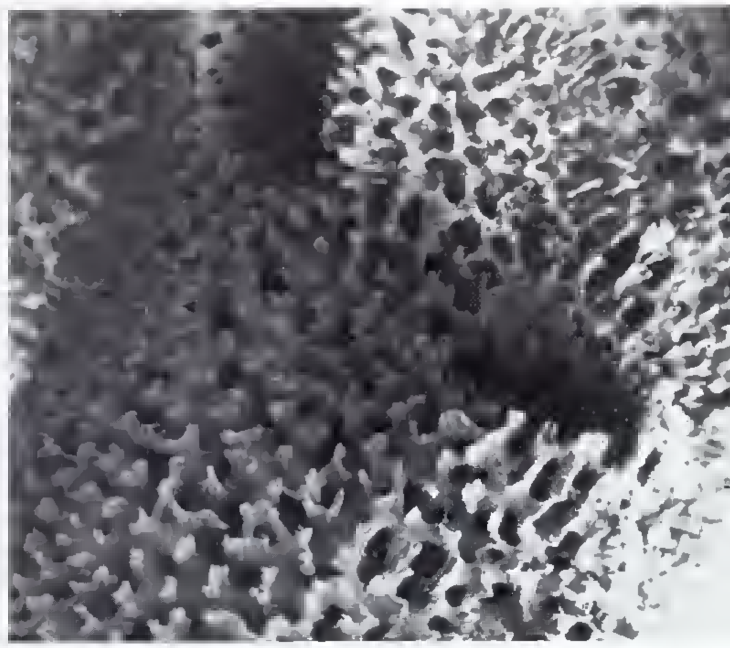


Fig. 437▲

The *Acropora lovelli* group

This arbitrary group is composed of species which have unclear affinities but which have some resemblance to each other or to species of the *A. humilis* group. They are all uncommon except in very specific habitats of particular reefs.

Acropora (Acropora) bushyensis n.sp.

Synonymy

Acropora tubicinaria (Dana); Wallace (1978); not Dana (1846).

Dana's *tubicinaria* from Fiji (USNM 258 and fragments YPM 4172 and MCZ 318) and *A. tubicinaria* of Wells (1954) from the Marshall Islands are similar coralla which differ from the present species in being more caespitose, in having radial corallites with flaring lips, and in having better developed septa.

Material studied

Bushy Island-Redbill Reef (24 specimens).
This locality is collecting station 73.

Characters

Colonies form digitate or caespito-digitate bushes up to 25cm diameter. Branches subdivide at irregular intervals but seldom anastomose. They are terete or tapered, up to 1cm diameter and 6cm in length.

Axial corallites are 1.8-3.2mm diameter with calices 1.0-1.2mm diameter. Septa are in two complete cycles, $\frac{3}{4}$R and $\frac{1}{4}$R. Radial corallites are short, tubular, partly appressed with circular openings 0.8-1.1mm diameter. They are not arranged in rows. Septa are poorly developed, sub-equal, consisting of little more than slightly dentate ridges, or rarely, are in two cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R. Incipient axial corallites occur, but not abundantly. All corallites are finely costate. Where coenosteum occurs between corallites, it is coarse and flaky.

Figs. 438, 439 *Acropora bushyensis* (× 0.75)
Fig. 438 Holotype from Bushy Island-Redbill Reef, collecting station 73, same corallum as Figs. 440, 441, 444.
Fig. 439 From Bushy Island-Redbill Reef, collecting station 73, same corallum as Figs. 442, 443, 445.

Fig. 438▲

Fig. 439▼

Living colonies are pale brown, occasionally with blue tips to branches. This species is abundant in the high ponded lagoon of Bushy Island-Redbill Reef, but it has not been recorded elsewhere in the present study. Wallace also records it from Masthead Reef and Great Keppel Island.

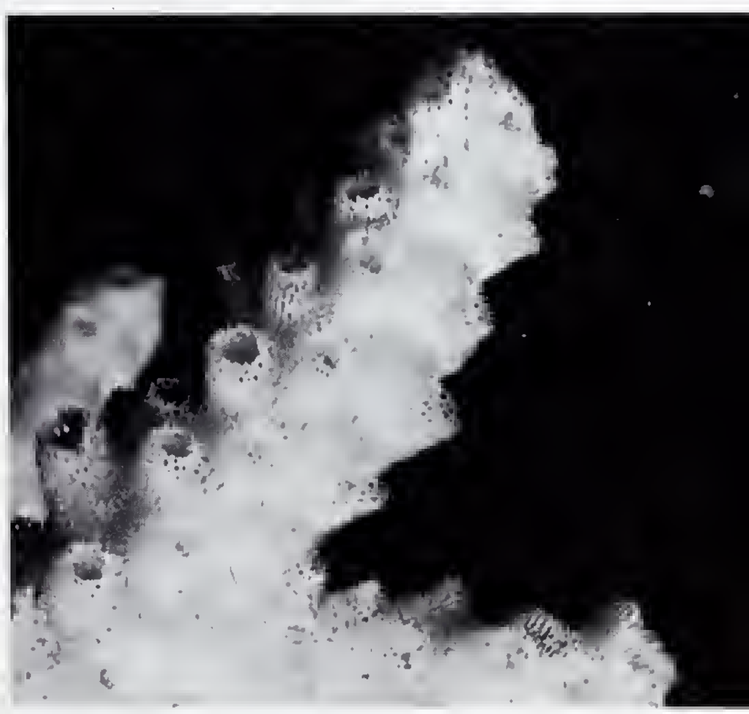
Figs. 440-443 *Acropora bushyensis* (× 5)

Figs. 440, 441 Holotype from Bushy Island-Redbill Reef, same corallum as Figs. 438, 444.

Figs. 442, 443 From Bushy Island-Redbill Reef, same corallum as Figs. 439, 445.

Fig. 440▲ Fig. 442▼

Fig. 441▲ Fig. 443▼



Similar species

Acropora bushyensis does not closely resemble any other species except *A. digitifera* which is readily distinguished by the lack of sub-branches in digitate coralla, but also by the radial corallites which are longer, more dimidiate, arranged in rows and have a much better septation.

Etymology

Named after Bushy Island, where the species is abundant.

Holotype (Fig. 446)

Dimensions: Maximum dimension is 21.2 cm. An entire colony

Locality: Lagoon at Bushy Island-Redbill Reef, collecting station 73

Depth: 0.5m below ponded lagoon water level

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Great Barrier Reef.

Figs. 444, 445 *Acropora bushyensis* from Bushy Island-Redbill Reef; Fig. 444, holotype, same corallum as Figs. 438, 440, 441; Fig. 445, same corallum as Figs. 439, 442, 443 (× 20).

Fig 444▾

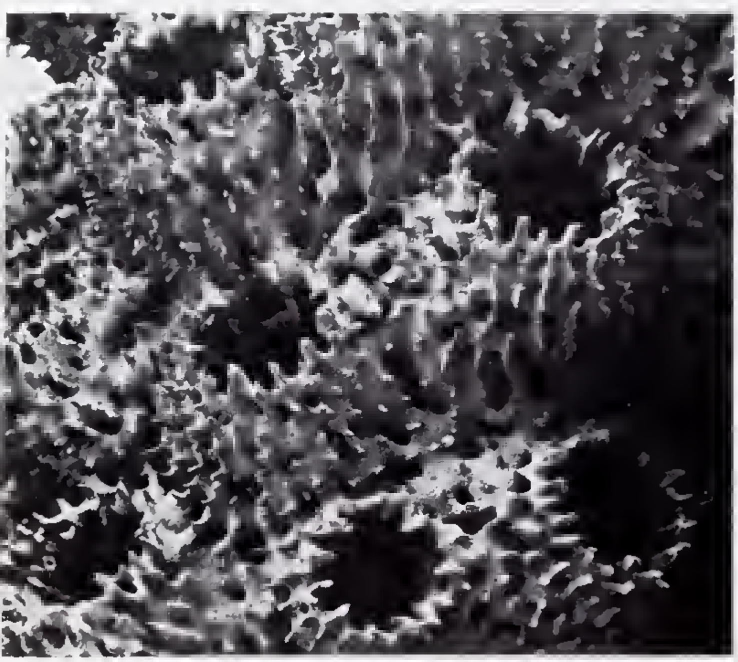


Fig 445▾

Acropora (Acropora) verweyi n.sp.

Material studied

Big Mary Reef, Little Mary Reef, Sue Island, Turtle islands (10 specimens), **Pandora Reef, Great Detached Reef** (2 specimens), **Howick Island** (2 specimens), **Willis Islet** (2 specimens), **Magdelaine Cay** (4 specimens), **Mellish Reef** (2 specimens), **Flinders Reef (Coral Sea)** (3 specimens), **Myrmidon Reef** (12 specimens), **Palm Islands** (2 specimens), **Davies Reef, Chesterfield Reefs** (3 specimens), **Polmaise Reef, Fitzroy Reef** (31 specimens), **Lady Musgrave Reef** (10 specimens), **Flinders Reef (Moreton Bay)** (2 specimens).

These localities include collecting stations 1, 45, 158, 165, 174, 175, 182, 185, 187, 190, 191, 191, 193, 194, 195, 197, 198, 199, 200, 207, 209, 212, 216, 219, 221, 226, 227.

Characters

Colonies are digitate, rarely caespito-digitate or sub-corymbose. Branches are terete, uniformly arranged, up to 9cm long and 7-9mm thick. Subdivisions are infrequent except at growing margins. Radial corallites are arranged in uniform rows and are tubular appressed sub-equal in size, with wide, rounded openings and thick outer lips. They are 2-2.5mm diameter, with calices 0.9-1.4mm diameter. Septa vary in development down branchlets. Corallites on upper parts of branches usually have prominent directive septa reaching $\frac{3}{4}$R deep within the corallite, the remaining primary septa reaching $\frac{1}{2}$R. Secondary septa are sub-equal, to $<\frac{1}{4}$R and may be incomplete. Corallites lower down branches have progressively less well-developed septa till they become sub-equal, $<\frac{1}{4}$R. All septa of radial corallites are composed of spines. Axial corallites are up to 2.5mm exsert, 2.8-3.5mm diameter, with calices 0.8-1.1mm diameter. Primary septa usually reach $\frac{3}{4}$R deep within the corallite, secondary septa are sub-equal to very reduced and incomplete. Septa of axial corallites are usually plate-like. The coenosteum is uniform on and between corallites and consists of a uniform cover of elaborated spinules which are not arranged in rows.

Living colonies are always a distinctive uniform creamy-brown with yellow axial corallites (a common colour of *A. austera*).

Skeletal variation

Acropora verweyi is usually found on exposed upper reef slopes or in other parts of reefs where water circulation is good. It rarely occurs on lower slopes and shows very little skeletal variation, except that coralla from progressively more exposed habitats have progressively thicker, more widely spaced corallites.

Similar species

Acropora verweyi and *A. bushyensis* have very similar growth forms and branch and corallite dimensions. They are readily distinguished by *A. bushyensis* having shorter radial corallites which are thin-walled with a poorly developed septation and also by the coenosteum which, in *A. bushyensis*, is costate on corallites and coarse and flaky between them.

Figs. 446–448 *Acropora verweyi* (× 0.5)
Fig. 446 Holotype from Magdelaine Cay, collecting station 200, same corallum as Figs. 449, 450, 453.
Figs. 447, 448 From Myrmidon Reef, collecting station 221, same coralla as Figs. 451, 452 (respectively).

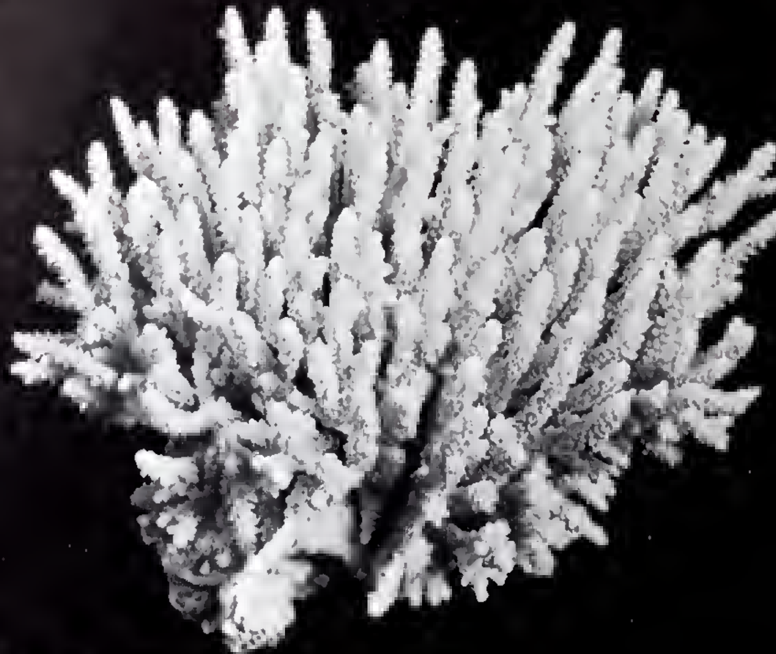
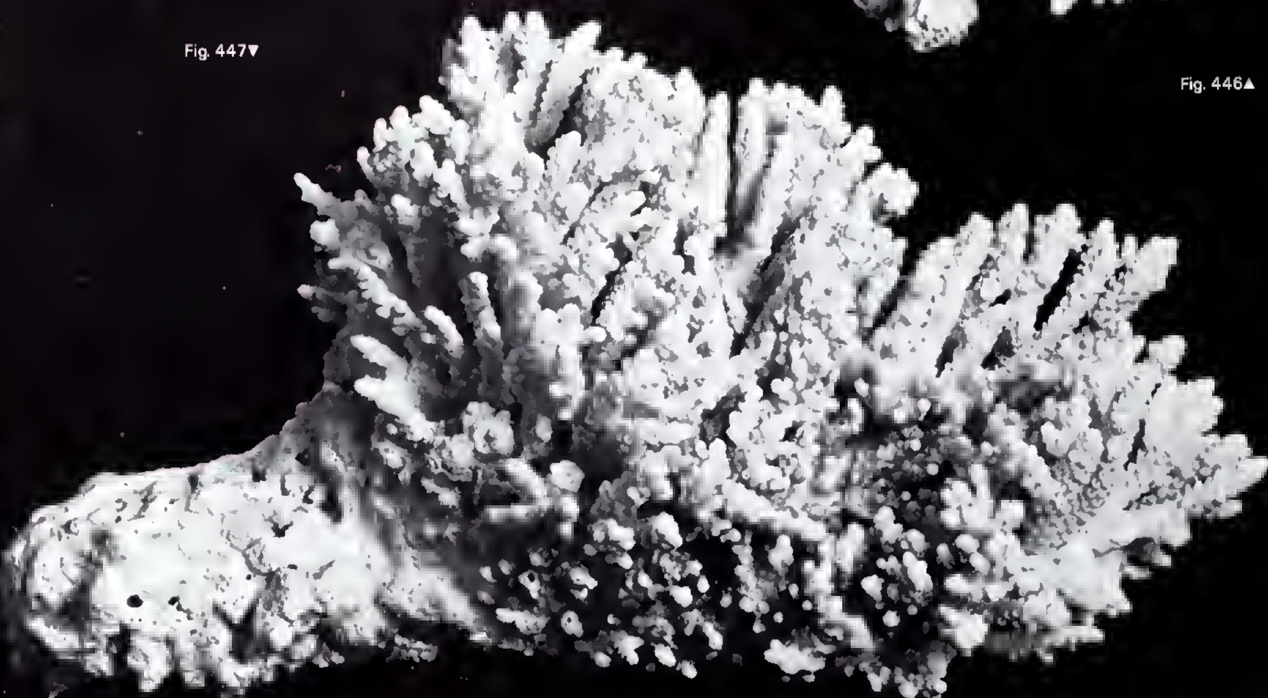


Fig. 446▲

Fig. 447▼



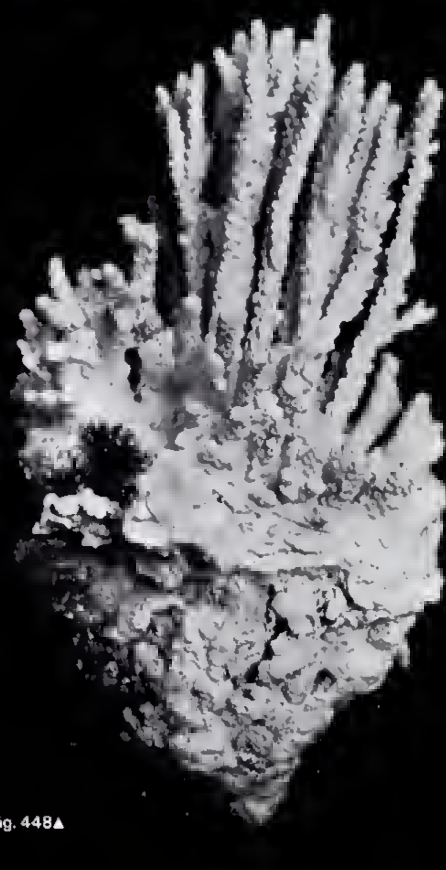


Fig. 448▲

Holotype (Fig. 446)

Dimensions: A whole corallum 10.5cm high excluding the base

Locality: Magdelaine Cay

Depth: 8m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Figs. 449-452 *Acropora verweyi* (× 5)

Figs. 449, 450 From Magdelaine Cay, holotype, same corallum as Figs. 446, 453.

Figs. 451, 452 From Myrmidon Reef, same corallum as Figs. 447, 448 (respectively).

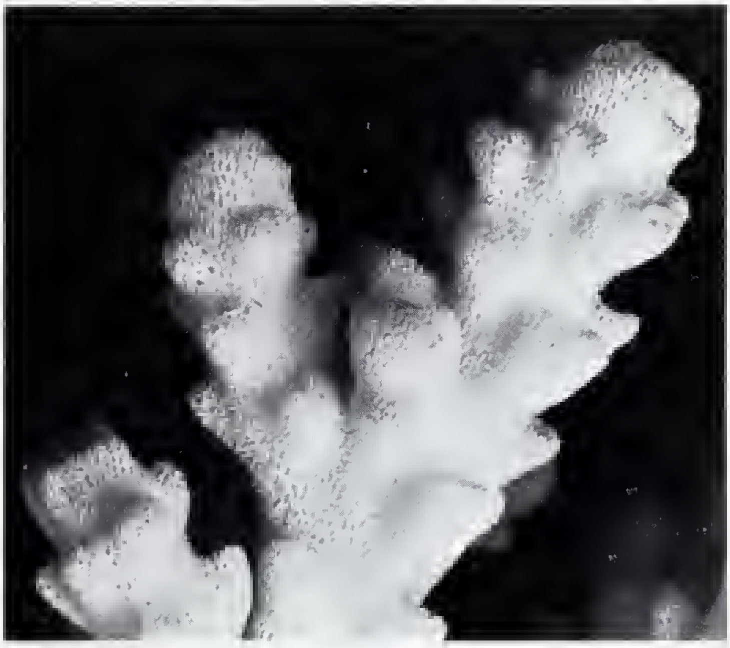


Fig. 449▲ Fig. 451▼ Fig. 450▲ Fig. 452▼

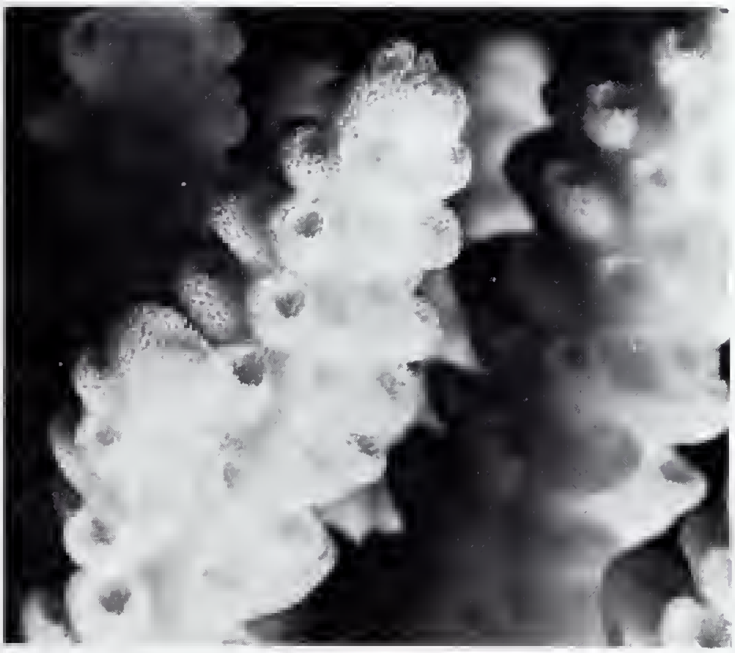


Fig. 453▲

Fig. 454▲

Figs. 453, 454 *Acropora verweyi* (× 20)
Fig. 453 From Magdelaine Cay, holotype, same corallum as Figs. 446, 449, 450.
Fig. 454 From Myrmidon Reef.

Etymology

Named after the late Dr Jan Verwey of The Netherlands.

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science

Distribution

Known only from the Great Barrier Reef and the Coral Sea.

Acropora (Acropora) lovelli n.sp.

Material studied

Palm Islands (2 specimens), **Middleton Reef** (26 specimens), **Elizabeth Reef** (10 specimens), **Lord Howe Island.**

These localities include collecting stations 147, 224, 231, 232, 233, 234, 235, 238, 239, 240.

Characters

Colonies are caespitose to hispidose. Caespitose colonies have basal stocks up to 4cm thick. Main branches are terete or slightly tapered, up to 1.5cm thick, straight or curved. Sub-branches are of irregular lengths and thicknesses. Hispidose colonies are composed of compacted, elongate, tapering branches with short sub-branches projecting at approximately 90° in a manner similar to *A. florida.*

Radial corallites are mostly immersed on lower branches and are tubular appressed on upper branches, with thick lower walls. They are 2-3.5mm diameter, mostly with rounded calices 1.3-1.5mm diameter. Some upper branch corallites have dimidiate openings approximately 1.0mm wide and 1.5mm long. The latter have bilaterally arranged septa with

Figs. 455-458 *Acropora lovelli* (× 0.33)
Fig. 455 From Lord Howe Island, collecting station 143, same corallum as Figs. 459, 463.
Fig. 456 Holotype from Middleton Reef, collecting station 123, same corallum as Figs. 460, 464.
Figs. 457, 458 From Elizabeth Reef, collecting station 239, same coralla as Figs. 461, 462 (respectively).

Fig. 455▲

Fig. 456▲

Fig. 457▼

Fig. 458▼

prominent directive septa reaching R deep within the corallite. The remaining first cycle reach $\frac{1}{2}$R, the second cycle $<\frac{1}{3}$R, incomplete to absent. Rounded calices have two complete septal cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R. Primary septa are usually solid, dentate plates. Axial corallites are dome-shaped, up to 4.3mm diameter with calices 0.9-1.6mm diameter. Septa are in two complete cycles up to $\frac{2}{3}$R and $\frac{1}{3}$R. The coenosteum is the same on and between corallites and is reticulate or finely costate.

Living colonies are pale brown or pale blue in colour.

Figs. 459-462 *Acropora lovelli* (× 5)

Fig. 459 From Lord Howe Island, same corallum as Figs. 455, 463.
Fig. 460 From Middleton Reef, holotype, same corallum as Figs. 456, 464.
Figs. 461, 462 From Elizabeth Reef, same coralla as Figs. 457, 458 (respectively).

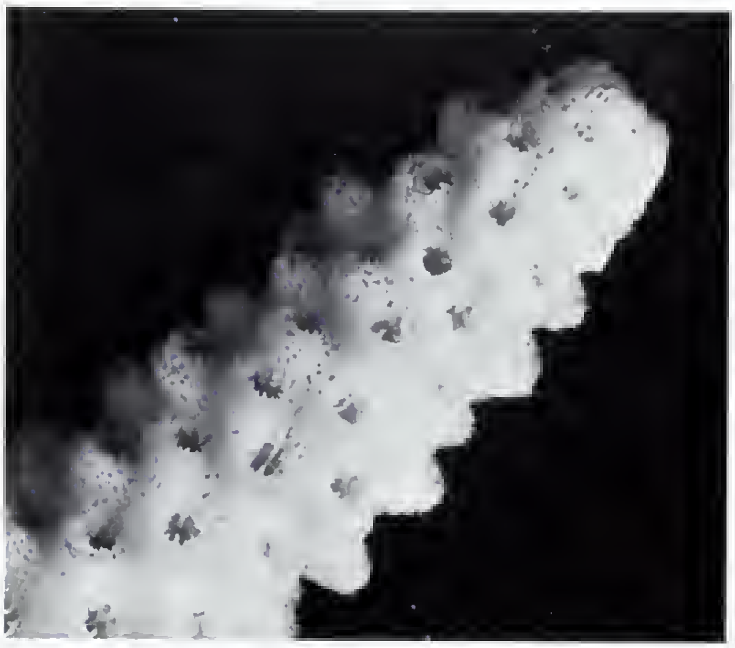


Fig. 459▲

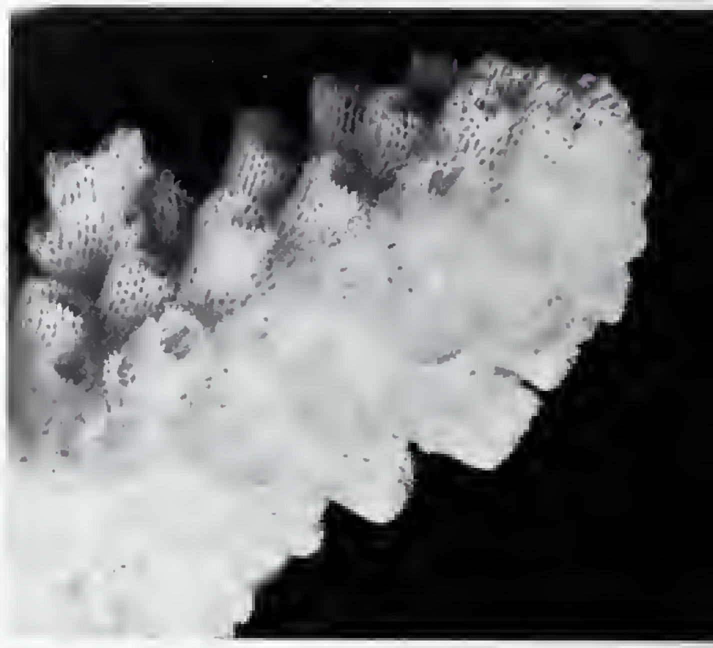


Fig. 460▲

Fig. 461▼

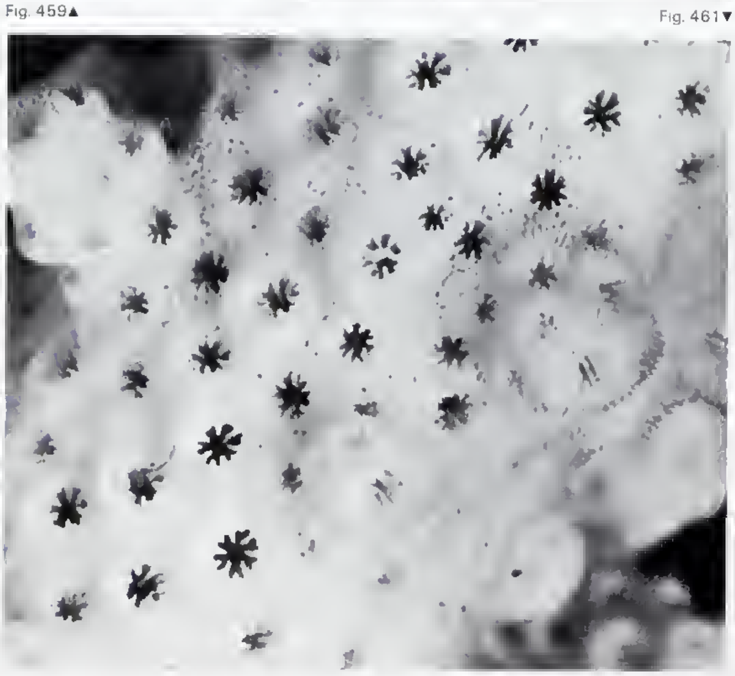


Fig. 462▼

Habitat preferences and growth form variation

This very distinctive species is abundant on reefs south of the Great Barrier Reef (Lord Howe Island, Elizbaeth Reef and Middleton Reef) but only two specimens have been found on the Great Barrier Reef. At Lord Howe Island it forms extensive caespitose stands in shallow, protected lagoon entrances (*Acropora* sp. of Veron & Done, 1979); at Middleton Reef it forms similar stands, becoming arborescent in the shallow lagoon; at Elizabeth Reef colonies are similar except in lagoonal areas exposed to strong tidal currents, where it forms thick arborescent thickets in shallow water and open arborescent thickets on the lagoon floor (10m).

Caespitose coralla, especially those from Lord Howe Island, are much less calcified than arborescent coralla.

Affinities

There are some structural similarities between caespitose *A. lovelli* and sub-digitate *A. samoensis* and also between arborescent *A. lovelli* and *A. florida* (in the latter case mainly because of the shape of sub-branches). However, *A. lovelli* shows no close affinity with any other species and at best only superficially resembles *A. samoensis* and *A. florida*.

Etymology

Named after Mr Ed Lovell, in recognition of his work for *Scleractinia of Eastern Australia*.

Holotype (Fig. 456)

Dimensions: A caespitose corallum 25cm high and 17.5cm maximum width

Locality: Middleton Reef lagoon, collecting station 234

Depth: 4m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Figs. 463, 464 *Acropora lovelli* (× 20)

Fig. 463 From Lord Howe Island, same corallum as Figs. 455, 459.

Fig. 464 From Middleton Reef, holotype, same corallum as Figs. 456, 460.

Fig. 463▾

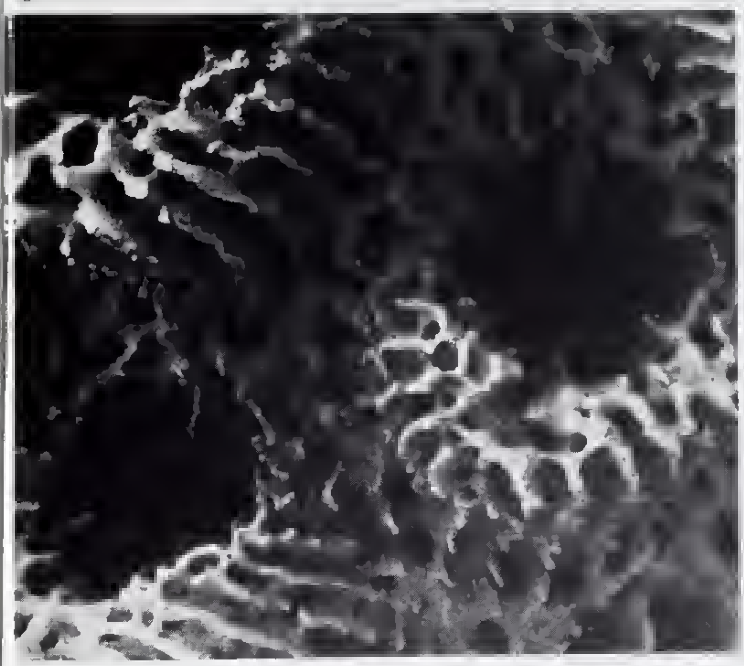
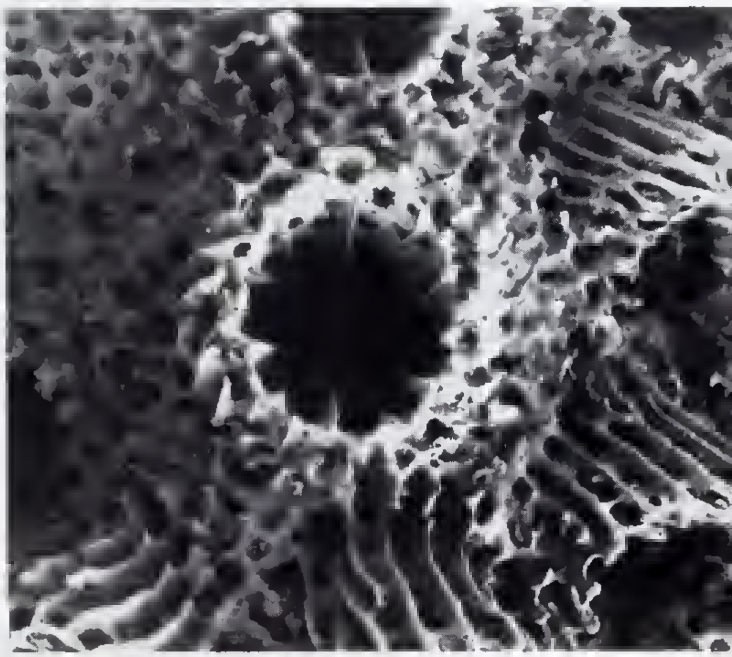


Fig. 464▾



Paratypes

British Museum (Natural History)

Australian Institute of Marine Science

Distribution

Known only from eastern Australia.

Acropora (Acropora) glauca (Brook, 1893)

Synonymy

Madrepora glauca Brook, 1893.

Madrepora tumida Verrill; Brook (1893); not Verrill (1866).

Material studied

Pandora Reef, Sir Charles Hardy Islands (2 specimens), **Turtle Islands** (2 specimens), **Flinders Reef (Moreton Bay)** (10 specimens), **Middleton Reef** (5 specimens), **Elizabeth Reef** (5 specimens), **Lord Howe Island** (6 specimens).

These localities include collecting stations 146, 147, 165, 179, 227, 229, 230, 231, 232, 238, 240.

Characters and skeletal variation

This species is known only from one certain (Fig. 465) and four doubtful specimens from the Great Barrier Reef, but occurs at all the main coral-inhabited localities south of the Great Barrier Reef. It is abundant only at Lord Howe Island (the dominant species of Boat Harbour, Veron & Done, 1979 (as *A. clathrata*)) where it is extremely polymorphic.

Fig. 465 from the Turtle Islands is caespito-corymbose, while all coralla south of the Great Barrier Reef are corymbose plates, some with tall branches, others with hardly any development of branches (Fig. 468). All specimens have in common similar, distinctive corallites and a similar coenosteum.

Axial corallites are 0-1mm exert, 3.1-4.1mm diameter, with calices 1-1.3mm diameter. Primary septa are up to $\frac{3}{4}$R, secondary septa $\frac{1}{2}$-$\frac{2}{3}$R and a third cycle may be partly formed. Radial corallites are short, tubular appressed, with rounded openings, except towards branch ends where they become slightly nariform with thick lips. They are 2.6-3.4mm diameter with calices 0.8-1.3mm diameter. First cycle septa are $\frac{1}{3}$-$\frac{3}{4}$R, second cycle septa are usually complete $\frac{1}{4}$-$\frac{1}{2}$R, and occasionally there are some weakly developed third cycle septa. Septa of axial corallites and primary septa of radial corallites are usually plate-like. Immersed corallites on lower branches retain a well-developed septation. Variation in septal composition is not geographic but occurs in the one population at Lord Howe Island. The coenosteum is reticulate or finely costate. It is similar both on and between corallites, or is slightly coarser between corallites.

Living colonies are pale cream to green in colour.

Affinities and similar species

The affinities of *A. glauca* are with the *A. lovelli* group, although it does not closely resemble any species of that group.

The large plate-like colonies at Lord Howe Island superficially resemble *A. clathrata*, but the present species is most readily confused with *A. solitaryensis* from which it is distinguished by the shape of its branches, the shape of radial corallites (which are strongly nariform in *A. solitaryensis*) and by the presence of a well-developed septation in both axial and radial corallites.

Figs. 465-468 *Acropora glauca* (× 0.5)

Fig. 465 From Turtle Islands.
Fig. 466 From Lord Howe Island, collecting station 147.
Fig. 467 From North Solitary Island, collecting station 229.
Fig. 468 From Middleton Reef, collecting station 231.

Fig. 465▲

Fig. 466▼

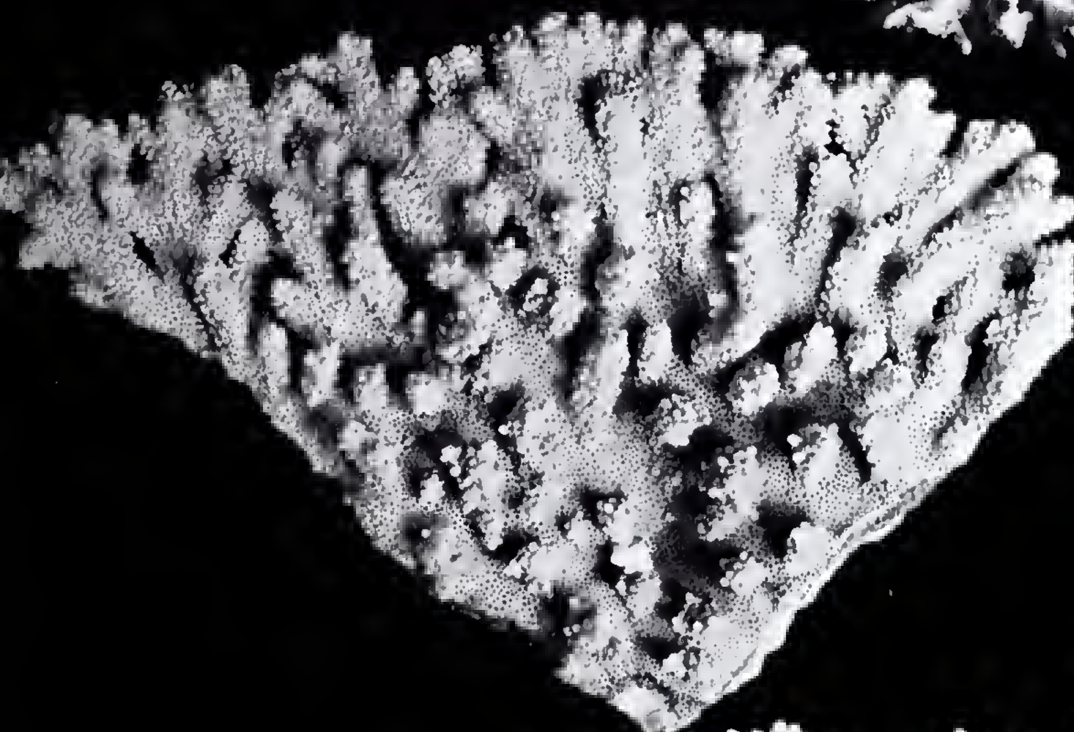


Fig. 467▲

Fig. 468▼

Distribution

Recorded from the east and west coasts of Australia and possibly from the South China Sea.

Figs. 469-472 *Acropora glauca* (× 5)
Fig. 469 From the Turtle Islands, same corallum as Fig. 465.
Fig. 470 From Lord Howe Island, same corallum as Fig. 466.
Fig. 471 From North Solitary Island, same corallum as Fig. 467.
Fig. 472 From Middleton Reef, same corallum as Fig. 468.

Fig. 469▲

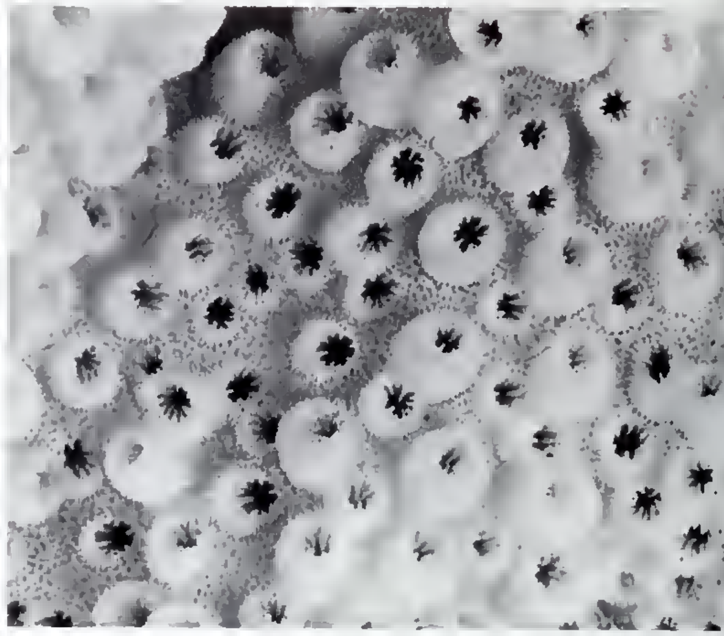
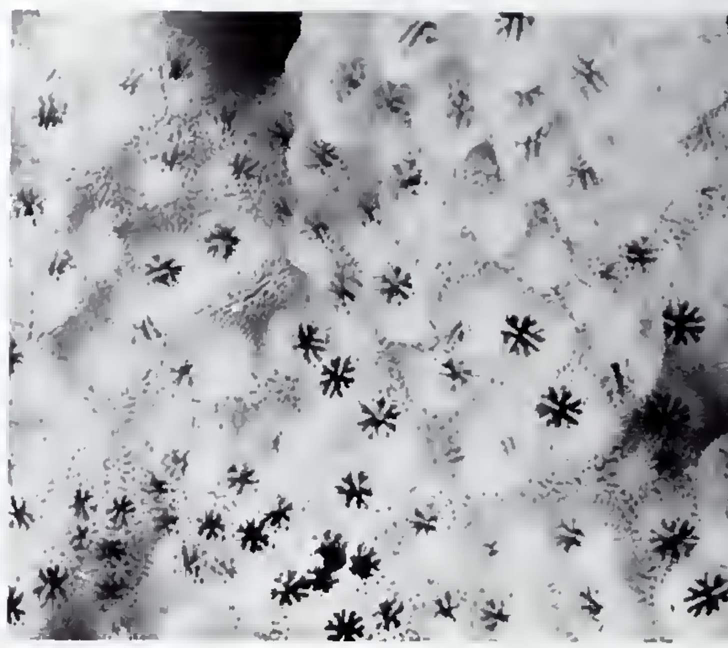


Fig. 470▲

Fig. 471▼

Fig. 472▼



The *Acropora robusta* group

Species of this group have very similar ranges of radial corallite structure and a virtually identical coenosteum. They are separated on the basis of growth form differences which are usually clear in biotopes where they co-occur. They are characteristically heavily calcified with thick basal plates or branches or both. Radial corallites are of two sizes: the taller are tubular with round, oval, dimidiate or nariform openings; the shorter usually have only part of the wall developed and may be regarded as sub-immersed.

Radial corallites of *A. robusta* and *A. danai* reach their greatest length near branch ends but all corallites may become sub-immersed on proximal surfaces. These species are separated by differences in branching patterns as described below (p. 207). However, distinctions are not always clear and it is probable that previous records of '*A. abrotanoides*' (Vaughan, 1918; Wells, 1954; Wallace, 1978) refer to one or other of these species.

Acropora polystoma shows little tendency to form thick branches other than the thickened base at the point of attachment. The branching pattern is corymbose, with colonies closely resembling very proliferous branching units of *A. danai*.

Acropora nobilis belongs with this group although, with an arborescent growth form, it is also close to, and readily confused with, species of the *A. formosa* group.

Acropora palmerae, a rare species on exposed outer reef flats, is also distinguished by its growth form, corallites being hardly distinguishable from any of the above species.

In all these species, the coenosteum on radial corallites is costate or broken costate and between corallites it is spongy or reticulate with occasional simple spinules.

Acropora listeri has been found only in the Coral Sea beyond the Great Barrier Reef. It has a growth form intermediate between *A. danai* and *A. polystoma*. Radial corallites are a mixture of sizes rather than two distinct sizes and they have oval, downward opening calices giving branch surfaces a prickly appearance.

All species of the *A. robusta* group occur only in shallow reef biotopes especially those exposed to strong wave action.

Acropora (Acropora) robusta (Dana, 1846)

Synonymy

Madrepora robusta Dana, 1846; Brook (1893).

Madrepora conigera Dana, 1846; Brook (1893).

Madrepora pacifica Brook, 1891; Brook (1893).

Madrepora ambigua Brook, 1892; Brook (1893).

Madrepora decipiens Brook, 1892; Brook (1893).

Madrepora smithi Brook, 1893.

Madrepora brooki Bernard, 1900.

Acropora decipiens (Brook); Vaughan (1918); Matthai (1923); Nemenzo (1967); Zou (1975).

Acropora brooki (Bernard); Crossland (1952).

Acropora pacifica (Brook); Crossland (1952); Nemenzo (1967); Zou (1975).

Acropora robusta (Dana); Nemenzo (1967); Wallace (1978).

Acropora smithi (Brook); Scheer and Pillai (1974).

?*Acropora pinguis* Wells, 1950; Scheer and Pillai (1974).

Acropora ponderosa Nemenzo, 1967.

Acropora conigera from Tahiti (USNM 239, not YPM 4207) and Singapore (USNM 240) differs from *A. robusta* from Fiji (USNM 297) in having corallites with a very reduced septation. Dana's *A. cyclopea* from Wake Island (USNM 233) may also be a wave-eroded *A. robusta* but is unidentifiable.

Figs. 473-477 *Acropora robusta* (× 0.33)

Fig. 473 From Esk Island, Palm Islands, collecting station 42, same corallum as Fig. 478.
Fig. 474 From Magdelaine Cay, collecting station 201, same corallum as Fig. 479.
Fig. 475 From Lihou Reef, collecting station 202, same corallum as Fig. 480.
Fig. 476 From Chesterfield Atoll, collecting station 210, same corallum as Figs. 481, 482.
Fig. 477 From Chesterfield Atoll, same corallum as Fig. 483.

Fig. 473▲

Fig. 474▼

Fig. 475▼

Fig. 476▲

Fig. 477▼

Of the type specimens of Brook, those of *A. ambigua* (BMNH 1892-6-8-278) and *A. decipiens* (BMNH 1892-6-8-81 to 85) from the Great Barrier Reef and that of *A. pacifica* (BMNH 1895-10-2-13) from Samoa are the same as many coralla of the present series and have no unusual characteristics. The type of *A. smithi* (BMNH 1889-9-24-100) from Tizard Bank is heavily calcified with thick branches and evidently came from a high energy environment. Bernard's holotype of *A. brooki* (BMNH 1899-5-12-32) is similar to that of *A. smithi.*

Well's holotype of *A. pinguis* from the Cocos-Keeling Islands differs from east Australian *A. robusta* by having relatively small, uniform corallites, but in all other respects it is similar. Wells (1950) notes its resemblance to *A. conigera* Dana.

Material studied

Yorke Island, Little Mary Reef, Arden Island (2 specimens), **North West Reef, Triangle Reef** (2 specimens), **Raine Island** (5 specimens), **Great Detached Reef** (4 specimens), **Sir Charles Hardy Islands, Cat Reef** (3 specimens), **Franklin Reef, Tijou Reef** (5 specimens), **Jewell Reef, Yonge Reef** (2 specimens), **Magdelaine Cay** (5 specimens), **Mellish Reef** (6 specimens), **Yule Reef, Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef** (19 specimens), **Palm Islands** (8 specimens), **Darley Reef** (3 specimens), **Chesterfield Reefs** (16 specimens), **Bushy Island-Redbill Reef, Flinders Reef (Moreton Bay)** (2 specimens).

These localities include collecting stations 1, 2, 3, 6, 9, 13, 14, 36, 37, 42, 61, 80, 148, 150, 151, 152, 158, 160, 167, 168, 177, 179, 183, 185, 200, 201, 209, 210, 212, 214, 217, 218, 226, 227.

Characters

Colonies are typically irregular in shape, consisting of anastomosing horizontal branches with a side or central attachment and upturned ends, the latter forming thick cones or bosses near the colony centre. Branches tend to be more anastomosed and radial corallites less protuberant towards the colony centre; thus different parts of the same colony may be very dissimilar. Coralla also exhibit wide variation according to their exposure to wave action and the species is thus described below as three different ecomorphs.

Living colonies are 'bright green with deep pink branch-tips and pink-brown, yellow-brown or cream' (Wallace, 1978).

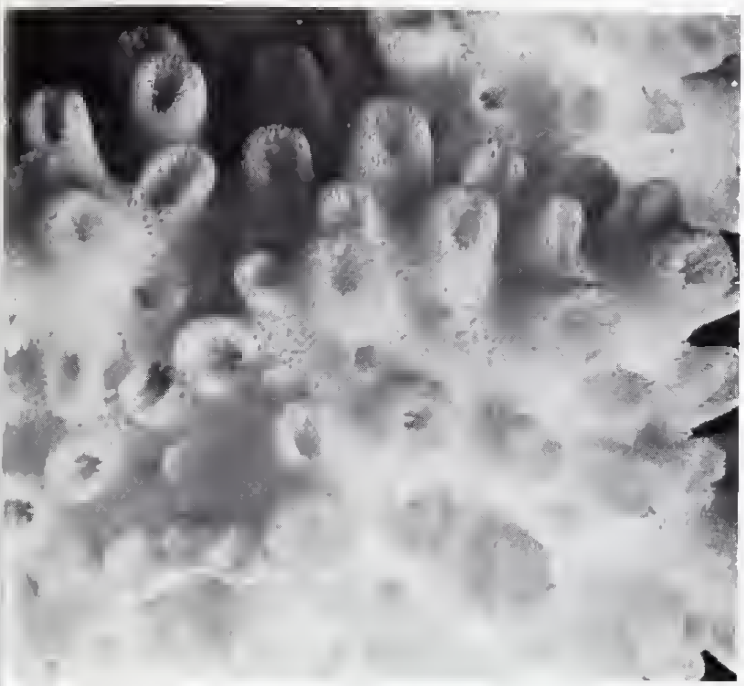
Habitat preferences and skeletal variation

Acropora robusta is restricted to shallow reef biotopes, most commonly those exposed to strong wave action. As noted above, major variations in growth form occur within the one colony, in different colonies of the same biotope and in the different types of habitats it occupies.

Much variation in branching pattern is attributable to the nature of the substrate and to the growing space available. Variation in corallite structure is, in turn, largely dependent on branching pattern. Thus, where space is restricted, peripheral branches tend to be thickened and resemble the central branches, and corallites are correspondingly similar. At the other extreme, when the substrate is flat and horizontal growth unrestricted, peripheral branches sprawl over a wide area. Branches are relatively thin and irregular, with proliferous radial corallites markedly divided into two different sizes, especially within 10cm of branch tips.

Figs. 478-483 *Acropora robusta* (× 5)

Fig. 478 From Esk Island, Palm Islands, same corallum as Fig. 473.
Fig. 479 From Magdelaine Cay, same corallum as Fig. 474.
Fig. 480 From Lihou Reef, same corallum as Fig. 475.
Figs. 481, 482 Same corallum from Chesterfield Atoll and same corallum as Fig. 476.
Fig. 483 From Chesterfield Atoll, same corallum as Fig. 477.

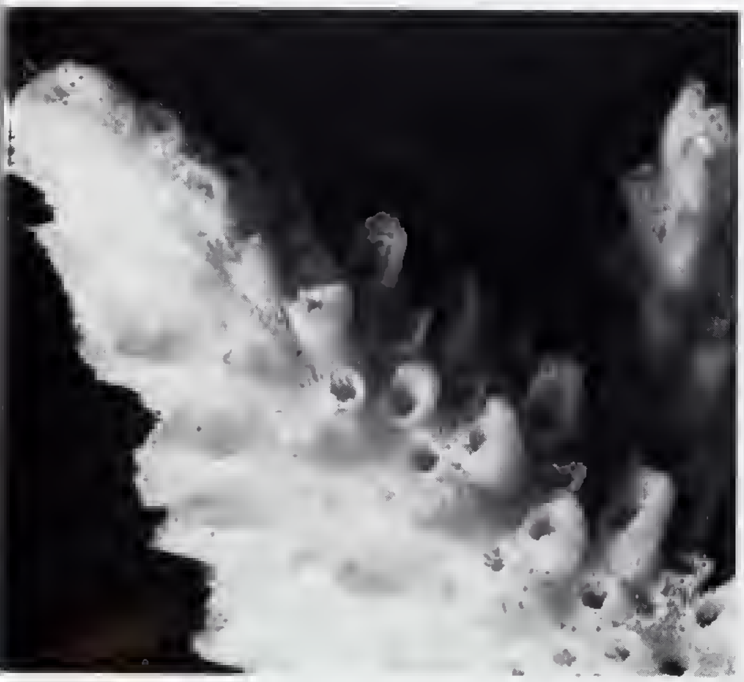


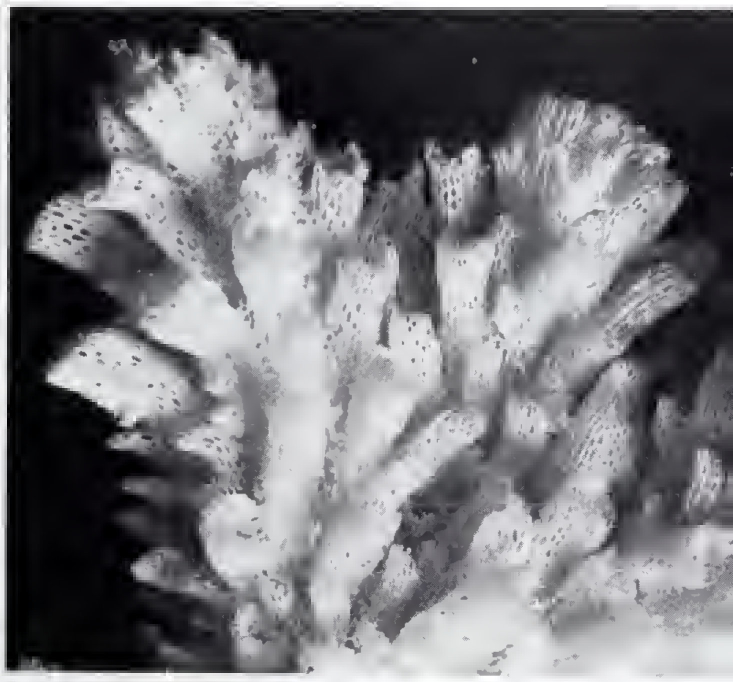
ig. 478▲

Fig. 480▼

Fig. 479▲

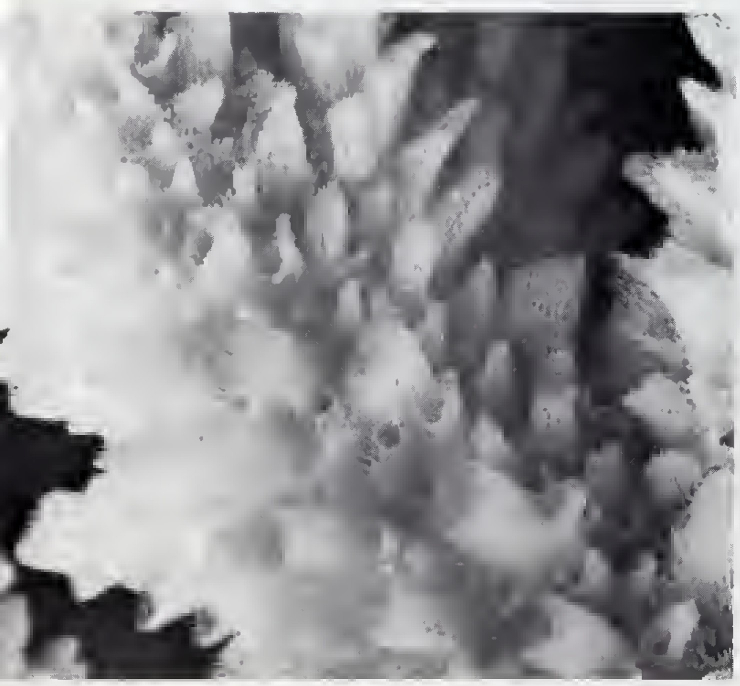
Fig. 48





ig. 482▼

Fig. 48



Such variation normally occurs between different colonies in the same biotope and frequently occurs within the one colony. Variations reflecting major habitat differences are superimposed on these, with the following descriptions applicable to the major habitat types in which *A. robusta* normally occurs. In all cases, however, the coenosteum between corallites is similar, consisting of irregularly fused simple spinules usually forming a spongy or reticulate pattern.

Acropora robusta from shallow reef fronts

When exposed to very strong wave action colonies develop very sturdy, mostly non-anastomosing branches bearing cones or distorted humps which usually have no discernible axial corallites. Radial corallites are rounded tubular to nariform in shape. Two cycles of strongly dentate septa, $\frac{1}{2}$R and $\frac{1}{4}$R, occur in tubular corallites, while nariform corallites have a very prominent outer directive septa and a very reduced or absent second cycle.

Acropora robusta from upper reef slopes

Coralla from well illuminated reef slopes below the depth of strong wave action are composed primarily of horizontal anastomosing branches, <3cm thick, with upturned, tapering ends. Radial corallites, particularly those towards the branch ends, are of very unequal length with approximately half sub-immersed and half up to 4mm exsert with strongly dimidiate lips. Directive septa are well developed, especially the central septum on the lip which may extend to the calice centre. The remaining first cycle septa are $\frac{1}{2}$R or less, those closest to the branch being least developed. Second cycle septa are $<\frac{1}{4}$R or absent. The septa of immersed corallites are relatively poorly developed, usually being an incomplete first cycle only. All radial corallites are costate with the costae on lips being adjoined by synapticulae forming a lattice. Axial corallites have two complete septal cycles, $\frac{1}{3}$R and $<\frac{1}{4}$R, which are slightly dentate. They have inner diameters of 1.2-1.5mm.

Acropora robusta from protected fringing reefs

Coralla protected from wave action but exposed to maximum light have relatively thin, frequently anastomosing branches. Corallites are well calcified with relatively thick walls. Radial corallites have a wide range of sizes; the larger are rounded, tubular, only slightly

Figs. 484, 485 *Acropora robusta* (× 20)
Fig. 484 From Chesterfield Atoll, collecting station 214.
Fig. 485 From Britomart Reef, collecting station 168.

Fig 484▼

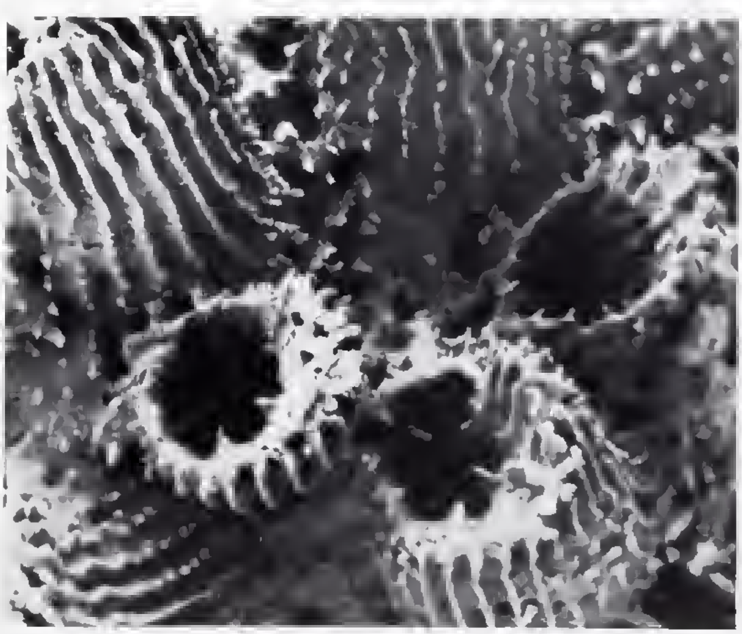


Fig. 485▼

appressed and are evenly distributed, sometimes in rows. They are 2.0-2.3mm diameter with calices 1.0-1.2mm diameter and have 1 or 2 directive septa and two complete septal cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R. Corallites tending to become nariform have reduced septa on the inner side. Axial corallites are 3.5mm diameter with calices 1.3mm and have two complete septal cycles, $\frac{1}{2}$R and $\frac{1}{3}$R with smooth margins. All corallites are finely costate, the costae having smooth margins.

Affinities and similar species

As noted in the introduction to the *A. robusta* group, *A. robusta* and *A. danai* have very similar radial corallites and a virtually identical coenosteum. They are separated by differences in secondary branching pattern, with *A. robusta* having thick, low, main branches with little proliferation and *A. danai* branches usually having a major upward growth component before becoming horizontal and proliferous. *In situ*, coloration can also be used to separate these species in most cases.

Acropora robusta is also very close to *A. nobilis*. The latter's arborescent growth form is very distinctive *in situ* and in the laboratory, except where samples are small, in which case the two species may not be separable.

Distribution

Widely distributed in the tropical Indo-Pacific, west to Chagos and east to Tahiti.

Acropora (Acropora) danai (Edwards & Haime, 1860)

Synonymy

Madrepora deformis Dana, 1846; Edwards & Haime (1860), *non Madrepora deformis* Michelin.

?*Heteropora abrotanoides* Lamarck, 1816.

Madrepora danai Edwards & Haime, 1860; Brook (1893).

Madrepora danae Verrill, 1864.

Madrepora irregularis Brook, 1892; Brook (1893).

Madrepora abrotanoides (Lamarck); Brook (1893).

Madrepora rotumana Gardiner, 1898.

Acropora danai (Edwards & Haime); Wells (1954).

Acropora rotumana (Gardiner); Hoffmeister (1925); Wells (1954); Pillai & Scheer (1976); Wallace (1978).

Acropora abrotanoides (Lamarck); Vaughan (1918); Crossland (1952); Wells (1954); Wallace (1978).

?*Acropora irregularis* (Brook); Pillai & Scheer (1976).

Brook (1893, p. 57) gives a description of what was probably Lamarck's type of *A. abrotanoides* in the MNHN but the specimen has since been lost and its identity is uncertain. Ehrenberg's *A. abrotanoides* is probably *A. tenuis*, while Dana's *A. abrotanoides* is probably *A. profunda* (Gardiner, 1898) (included in *A. polymorpha* (Brook, 1891) by Brook (1893), a mistake continued by Vaughan (1918) and Wells (1954)). Brook (1893, p. 57) also suggested that *A. danai* (= *A. danae*) (holotype USNM 303 from Tahiti) is a probable 'variety' of *A. abrotanoides* (Lamarck), a conclusion supported by Wallace (1978). This study has shown that the *A. abrotanoides* and *A. rotumana* of Wells (1954) and Wallace (1978) are the same species and that the name *danai* is applicable to it.

Figs. 486-488 *Acropora danai* (× 0.33)

Fig. 486 From Chesterfield Atoll, collecting station 218.
Fig. 487 From Britomart Reef, collecting station 167, same corallum as Fig. 490.
Fig. 488 From Chesterfield Atoll, collecting station 214.

Fig. 488▼

Fig. 487▼

Fig. 488▼

Material studied

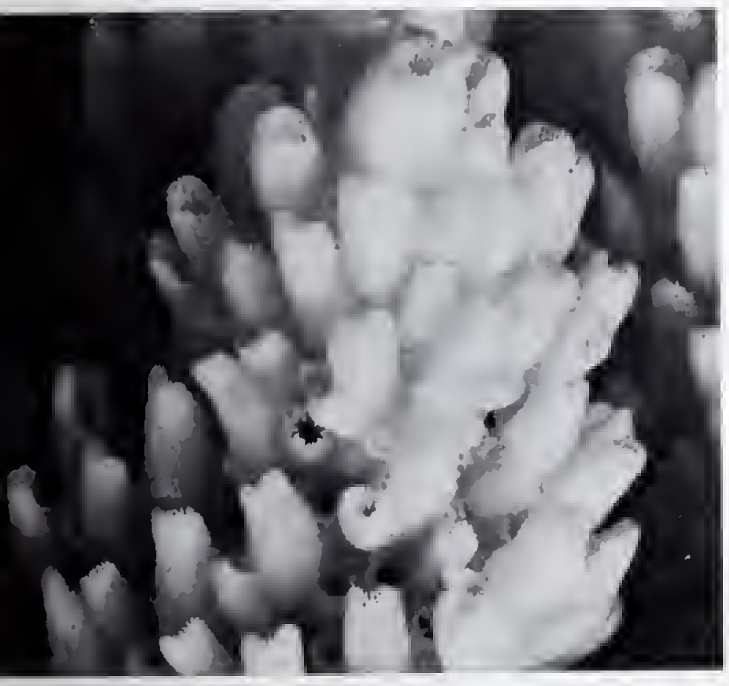
Triangle Reef, Pandora Reef, Raine Island, Great Detached Reef (4 specimens), **Wye Reef, Franklin Reef** (4 specimens), **Tijou Reef, Willis Islet** (3 specimens), **Mellish Reef** (6 specimens), **Flinders Reef (Coral Sea)** 3 specimens), **Britomart Reef** (15 specimens), **Myrmidon Reef** (9 specimens), **Chesterfield Reefs** (17 specimens), **Fitzroy Reef** (5 specimens), **Lady Musgrave Reef** (5 specimens), **Harvey Bay, Flinders Reef (Moreton Bay), Middleton Reef** (7 specimens), **Elizabeth Reef** (5 specimens).

Figs. 489-492 *Acropora danai* (× 5)

Fig. 489 From Wye Reef, collecting station 163.

Fig. 490 From Britomart Reef, same corallum as Fig. 487.

Figs. 491, 492 Same corallum from Chesterfield Atoll, collecting station 218, showing corallites at a branch tip and base (respectively).



g. 489▲

Fig. 490▲

Fig. 491▼

Fig. 492▼

These localities include collecting stations 1, 2, 150, 152, 158, 163, 167, 190, 191, 194, 197, 199, 207, 208, 210, 211, 212, 214, 217, 218, 219, 221, 226, 227, 230, 231, 233, 236, 237, 240.

Figs. 493-496 *Acropora danai* (× 20)

Fig. 493 From Britomart Reef, collecting station 167.
Fig. 494 From Mellish Reef, collecting station 208.
Fig. 495 From Chesterfield Atoll, collecting station 213.
Fig. 496 From Mellish Reef, collecting station 207.

Fig. 493▲

Fig. 494▲

Fig. 495▼

Fig. 496▼

Characters

Colonies consist of thick sprawling horizontal branches proliferating distally into short oblique branchlets or short thick upwardly projecting conical branches or various mixtures of both. Horizontal branches may be free or encrusting; they are usually flattened and divide frequently. Upward projecting branches are usually developed near the corallum centre. Corallites vary greatly in different coralla but are similar on different parts of the same corallum, except for those near branch tips which are relatively exsert. Corallites are of mixed shapes and sizes, ranging from immersed to tubular, up to 3mm exsert, with circular or nariform openings. Immersed corallites are relatively abundant on concave surfaces. Septa are best developed in exsert corallites where two cycles are at the most $\frac{1}{3}$R and $\frac{1}{4}$R, with the second cycle incomplete or absent. They are highly dentate and directive septa are usually prominent. Axial corallites are tubular, rounded, 2.0-2.5mm diameter, with calices 0.7-1.2mm diameter and have two septal cycles of up to $\frac{2}{3}$R and $\frac{1}{4}$R, the latter usually incomplete. These septa are usually plate-like, with only slight dentations. All corallites are costate, the costae bearing blunt spinules. The coenosteum is spongy with irregular, blunt, or slightly elaborated spines.

Living colonies are deep pinkish-brown or green.

Habitat preferences and growth form variation

Acropora danai occurs in shallow water where *Acropora* diversity is high, especially on outer reef slopes exposed to strong wave action. Coralla from such habitats have short, thick branches and thick-walled corallites. Coralla from protected biotopes have thin, irregularly sprawling branches and relatively small, thin-walled corallites. Such colonies may be up to 5m diameter, with a central branching area up to 1m high.

Similar species

Acropora danai is closest to *A. robusta* (see p. 207). Corallites are also very similar to those of *A. nobilis*, although the latter is readily distinguished by its arborescent growth form.

Distribution

Widely distributed in the tropical Indo-Pacific, west to Madagascar and east to Tahiti.

Acropora (Acropora) palmerae Wells, 1954

Synonymy

Acropora palmerae Wells, 1954

Material studied

Myrmidon Reef (3 specimens), **Lady Musgrave Reef, Flinders Reef (Moreton Bay)** (9 specimens), **Middleton Reef.**

These localities include collecting stations 195, 221, 227, 230.

Characters

Colonies form flat encrusting plates up to 2m diameter. Short incipient branches are sometimes formed; rarely, these take the form of an anastomosing thicket. Axial corallites, if present, are <2.8mm diameter with calices 0.9-1.3mm diameter. Septa are in two irregular cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R, with secondary septa usually incomplete to absent. Radial corallites are immersed to 1.5mm exsert, the latter tending to develop nariform openings which face different directions. Calices are 0.9-1.0mm diameter. Septa are completely irregular in

Figs. 497-499 *Acropora palmerae* (× 0.5)
Figs. 497, 498 From Flinders Reef (Moreton Bay), collecting station 227; Fig. 498 showing extreme development of branches; Fig. 497 same corallum as Figs. 500, 501; Fig. 498 same corallum as Fig. 502.
Fig. 499 From Myrmidon Reef, collecting station 221, same corallum as Fig. 503.


Fig. 497▲


Fig. 498▲

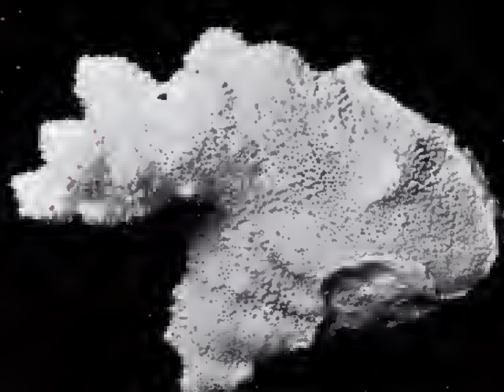


Fig. 499▲

shape, length and number; directive septa are usually distinguishable. Corallites are costate, the coenosteum between corallites is coarse and spongy.

Living colonies are a pale or pinkish-brown.

Habitat preferences and growth form variation

This usually rare species has only been seen in abundance on Myrmidon Reef in the Great Barrier Reef (where it is the dominant species of the outer reef flat, exposed to extreme wave action). It has also been studied at the Marshall Islands (type locality), where it occupies similar biotopes, as well as an artificially created inner reef flat pool at Enewetak Atoll. At these localities, most coralla consist entirely of encrusting plates; rarely, small incipient branches are formed. *Acropora palmerae* is also abundant at Flinders Reef near

Figs. 500-503 *Acropora palmerae* (× 5)
Figs. 500, 501 Same corallum from Flinders Reef (Moreton Bay) and same corallum as Fig. 497.
Fig. 502 From Flinders Reef (Moreton Bay), same corallum as Fig. 498.
Fig. 503 From Myrmidon Reef, same corallum as Fig. 499.

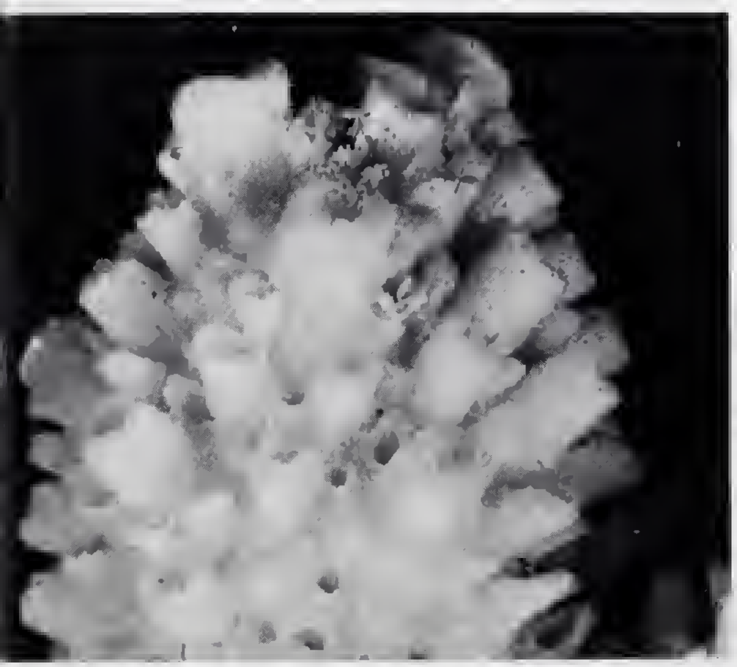


Fig. 500▲

Fig. 501▲

Fig. 502▼

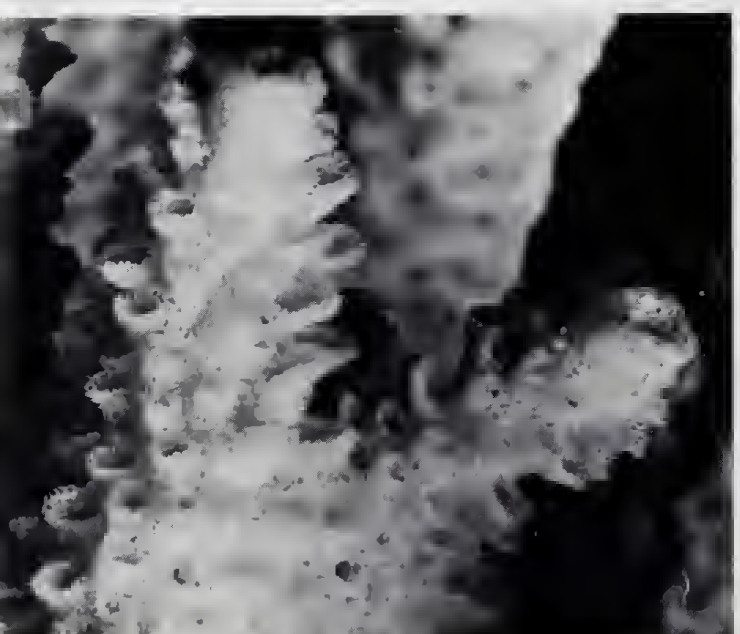


Fig. 503▼

Moreton Bay, where it occurs in shallow water exposed to strong wave action. Here, the majority of coralla have irregular, contorted, anastomosing branches (Fig. 498).

Affinities

As noted above, corallites of *A. robusta*, *A. danai*, *A. nobilis* and *A. palmerae* are hardly distinguishable, although these species are usually readily recognised by their very different growth forms. The usual encrusting growth form of *A. palmerae* is unlike that of any other coral except *A. palifera* and *A. cuneata* from similar high energy environments and on this basis, *A. palmerae* is easily identified. However, there remains some possibility that *A. palmerae* is an ecomorph of *A. robusta*, as the latter species has not been observed in the same biotope as *A. palmerae*.

Distribution

Previously recorded only from the Marshall Islands (type locality).

Acropora (Acropora) nobilis (Dana, 1846)

Synonymy

Madrepora nobilis Dana, 1846; Brook (1893).

?*Heteropora regalis* Ehrenberg, 1834; Edwards & Haime (1860).

?*Madrepora brachiata* Dana, 1846 (*pars*).

?*Madrepora canalis* Quelch, 1886; Brook (1893).

Madrepora intermedia Brook, 1891; Brook (1893).

Acropora canalis (Quelch); Faustino (1927); Crossland (1952).

Acropora intermedia (Brook); Crossland (1952); Stephenson & Wells (1955); Pillai (1967b); Scheer (1972); Wallace (1978).

Fig. 504 *Acropora* community at Broadhurst Reef dominated by extensive stands of *A. nobilis*.

Fig 504▼

The type of *A. nobilis* (YPM 4204, MCZ 342 and USNM 427, of which the former two are only fragments of the latter) from Singapore is a stunted arborescent corallum, characteristic of the present species from shallow water habitats.

The holotype of *A. regalis* Ehrenberg (ZMB 866) from an unknown locality is similar to various coralla of the present series (e.g. Fig. 506). This species was placed in synonymy with *A. muricata* Linnaeus by Brook (1893), who did not separate Indo-Pacific and Atlantic species. The name *regalis* cannot be given to the present series with certainty, especially as the type locality is unknown.

Dana's syntype of *A. brachiata* YPM 4203 from Fiji is *A. formosa*, while USNM 295 from the Sulu Sea may be the present species. Dana's syntypes of *A. cuspidata* from Tahiti (MCZ369 and USNM 314) are a related species differing from *A. nobilis* in having smaller, more crowded corallites.

The holotype of Quelch's *A. canalis* from the Philippines (BMNH 1886-12-9-268) may be a heavily calcified *A. nobilis* with thick corallite walls, more so than any specimens in the present series.

Brook's syntypes of *A. intermedia* from the Maldive Islands (BMNH 1886-11-22-6 & 10) are clearly the present species and thus this name has been used by several recent authors.

Material studied

Big Mary Reef, Little Mary Reef (2 specimens), **Arden Island** (7 specimens), **Sue Island** (2 specimens), **Triangle Reef, Raine Island** (6 specimens), **Great Detached Reef, Bird Island, Sir Charles Hardy Islands** (6 specimens), **Martha Ridgeway Reef** (3 specimens), **Tijou Reef** (4 specimens), **Waining Reef, Howick Island** (2 specimens), **Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (7 specimens), **Palm Islands** (10 specimens), **Lodestone Reef** (2 specimens), **Darley Reef, Chesterfield Reefs** (2 specimens), **Fitzroy Reef** (4 specimens), **Flinders Reef (Moreton Bay)** (9 specimens).

These localities include collecting stations 37, 41, 55, 57, 60, 62, 152, 155, 158, 159, 160, 161, 162, 167, 168, 174, 175, 179, 182, 183, 185, 187, 190, 191, 197, 210, 226, 227.

Characters

Colonies are arborescent, usually large and open, with robust, occasionally anastomosed branches. Small colonies may have an open branching pattern or form compact thickets.

Radial corallites are a mixed variety of shapes and sizes usually ranging from immersed to tubular, up to 4mm (rarely 9mm) exsert with circular, nariform or dimidiate openings and thickened outer walls. The largest corallites are usually evenly distributed and oriented, 2-3.2mm diameter (rarely larger), with dimidiate calices 0.8-1.4mm diameter. Septa are in two usually complete cycles up to $\frac{2}{3}$R and $\frac{1}{4}$R, with larger directive septa. They are usually strongly dentate. Axial corallites are 2.5-4.0mm diameter, with calices 0.8-1.1mm diameter. Septa are slightly better developed than those of radial corallites and are usually less dentate, with no directive septa. All corallites are strongly costate with the coenosteum between corallites open reticulate, with simple spinules.

Living colonies are usually uniform in colour, except for branch tips which are usually paler. Common colours are pale cream, brown, blue, yellow and green.

Habitat preferences and growth form variation

Very large colonies occur in deep sandy lagoons where the species may form extensive monospecific stands, individual colonies being recognisable only by their individual colours. *Acropora nobilis* is also common on reef slopes. Coralla with very open branching patterns

Figs. 505-508 *Acopora nobilis* (× 0.33)

Fig. 505 From Great Palm Island, collecting station 36, same corallum as Fig. 509.
Fig. 506 From Orpheus Island, Palm Islands, collecting station 55, same corallum as Fig. 510.
Fig. 507 From Flinders Reef (Moreton Bay), collecting station 227, same corallum as Fig. 511.
Fig. 508 From Little Mary Reef, collecting station 185, same corallum as Fig. 512.

Fig. 505▲

Fig. 505▲

Fig. 507▲

Fig. 508▼

usually occur in deep water, while compact thickets are found where light availability is maximal. As with *A. formosa*, growth form is also related to age, with older colonies becoming increasingly thick, compact and anastomosed.

Affinities and similar species

Corallites of *A. nobilis* cannot be reliably distinguished from those of other species in the *A. robusta* group, especially *A. robusta* and *A. danai*.

Figs. 509-512 *Acropora nobilis* (× 5)
Fig. 509 From Great Palm Island, same corallum as Fig. 505.
Fig. 510 From Orpheus Island, Palm Islands, same corallum as Fig. 506.
Fig. 511 From Flinders Reef (Moreton Bay), same corallum as Fig 507.
Fig. 512 From Little Mary Reef, same corallum as Fig. 508.

Fig 509▲

Fig. 510▲

Fig. 511▼

Fig. 512▼

Large colonies of *A. nobilis* are readily identifiable in the field. Smaller colonies and sampled coralla are much less easily identified as they have a general similarity to several other species, especially *A. formosa*, *A. grandis* and to a lesser extent, *A. robusta*. *Acropora formosa* is usually distinguished by its smaller branches, more compact branching pattern, its smaller, more tubular corallites and also the absence of dimidiate openings on radial corallites. *Acropora grandis* has branches and corallites of similar size. Large corallites are

Figs. 513-516 *Acropora nobilis* (× 20)
Figs. 513, 514 From Martha Ridgeway Reef, collecting station 159.
Fig. 515 From the Sir Charles Hardy Islands, collecting station 179.
Fig. 516 From Britomart Reef, collecting station 167.

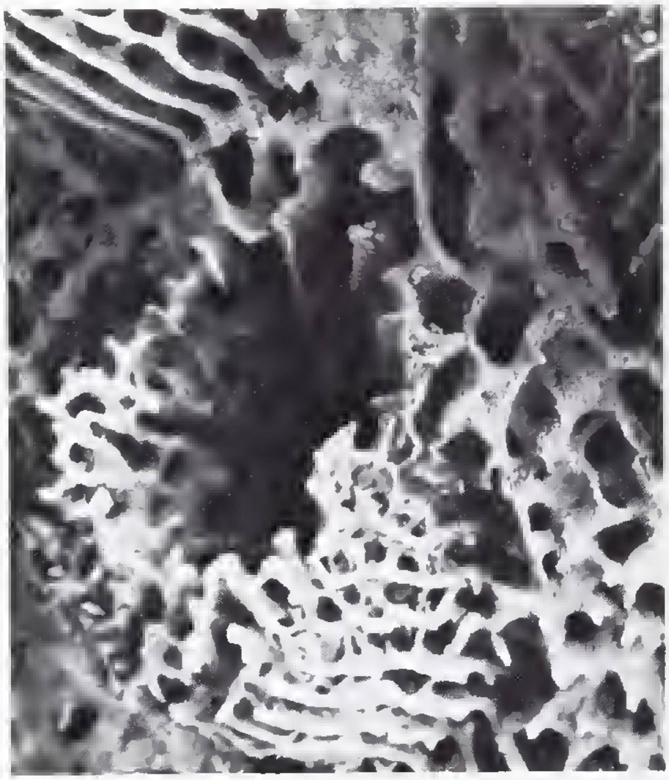


Fig. 513▲

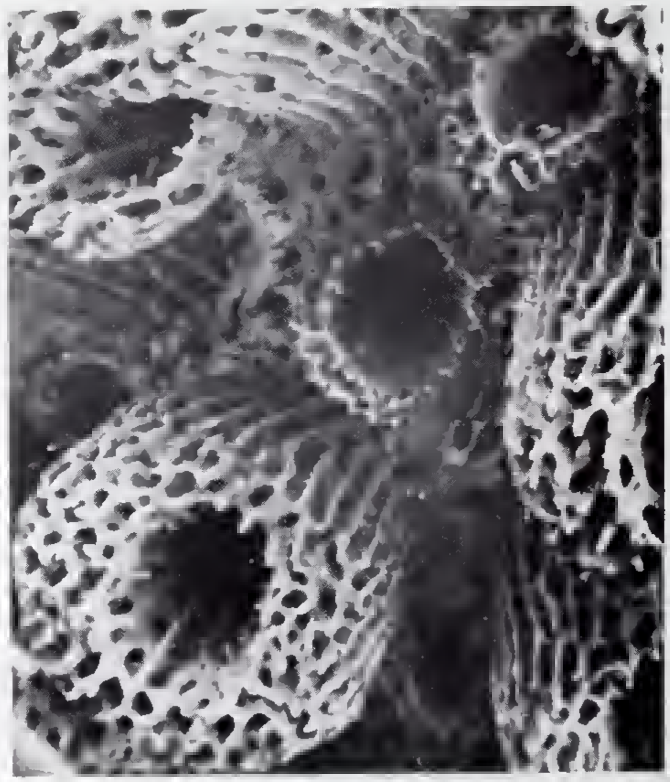


Fig. 514▲

Fig. 515▼

Fig. 516▼

less evenly distributed, lack dimidiate openings and are more exsert and appressed near branch tips, while those of *A. nobilis* are approximately uniform along branches. Larger corallites of *A. grandis* are usually relatively thin walled and, unlike those of *A. nobilis*, readily crumble when pressed. They have a less-developed septation. *Acropora robusta* has a distinctive growth form with anastomosing horizontal branches and is thus seldom confused with *A. nobilis*. However, immature colonies or small pieces of branches may be indistinguishable.

Distribution

Restricted to the central tropical Pacific, west to Malaysia.

Acropora (Acropora) polystoma (Brook, 1891)

Synonymy

Madrepora polystoma Brook, 1891; Brook (1893).

?*Acropora massawensis* von Marenzeller, 1907.

Acropora massawensis von Marenzeller; Hoffmeister (1925).

The holotype of *A. polystoma* is from Mauritius and that of *A. massawensis* is from the Red Sea.

Material studied

Triangle Reef, Pandora Reef, Raine Island, Great Detached Reef (2 specimens), **Franklin Reef** (3 specimens), **Tijou Reef** (2 specimens), **Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (4 specimens), **Myrmidon Reef** (4 specimens).

These localities include collecting stations 2, 149, 150, 152, 158, 160, 167, 168, 219, 221, 226.

Characters

Colonies are side-attached corymbose or form corymbose plates with thick bases. Branchlets are 8-18mm thick and are usually regularly spaced but of irregular size. Radial corallites are very irregular in size and shape, with incipient axial corallites being abundant. The largest radial or incipient axial corallites are up to 6mm exsert, tubular, with rounded or nariform openings; the smallest are tubular appressed to sub-immersed. They have calices 0.6-1.2mm diameter. Septa are poorly developed, with directive septa slightly larger than the others, which are in two sub-equal incomplete cycles of $\frac{1}{4}$R. They have strongly dentate margins, frequently reduced to rows of spines. Axial corallites are <2.7mm diameter, with calices 0.8-1.2mm diameter. They usually have a septation similar to those of radial corallites but sometimes have septa in two complete cycles up to $\frac{1}{3}$R and $\frac{1}{4}$R. All corallites are costate and covered with fine spines. The coenosteum between corallites is reticulate with occasional spinules and may become coarse and spongy.

Habitat preferences and growth form variation

Acropora polystoma is restricted to upper reef slopes exposed to strong wave and current action. Like all species occupying such habitats, *A. polystoma* shows major growth form modifications according to degree of exposure. Coralla from exposed reef fronts form solid plates. Branchlets are short (<4cm) and corallites are relatively compact and similar in size and shape. Corallites on the basal plate are mostly immersed. Coralla from increasingly deeper water have an increasingly perforated basal plate, longer branchlets, and much more irregular corallites as described above. At the lower end of the species' narrow depth range, coralla are corymbose, being primarily composed of branchlets up to 10cm long. These frequently develop sub-branchlets, but are seldom anastomosed. The basal plate remains large and solid.

Affinities and similar species

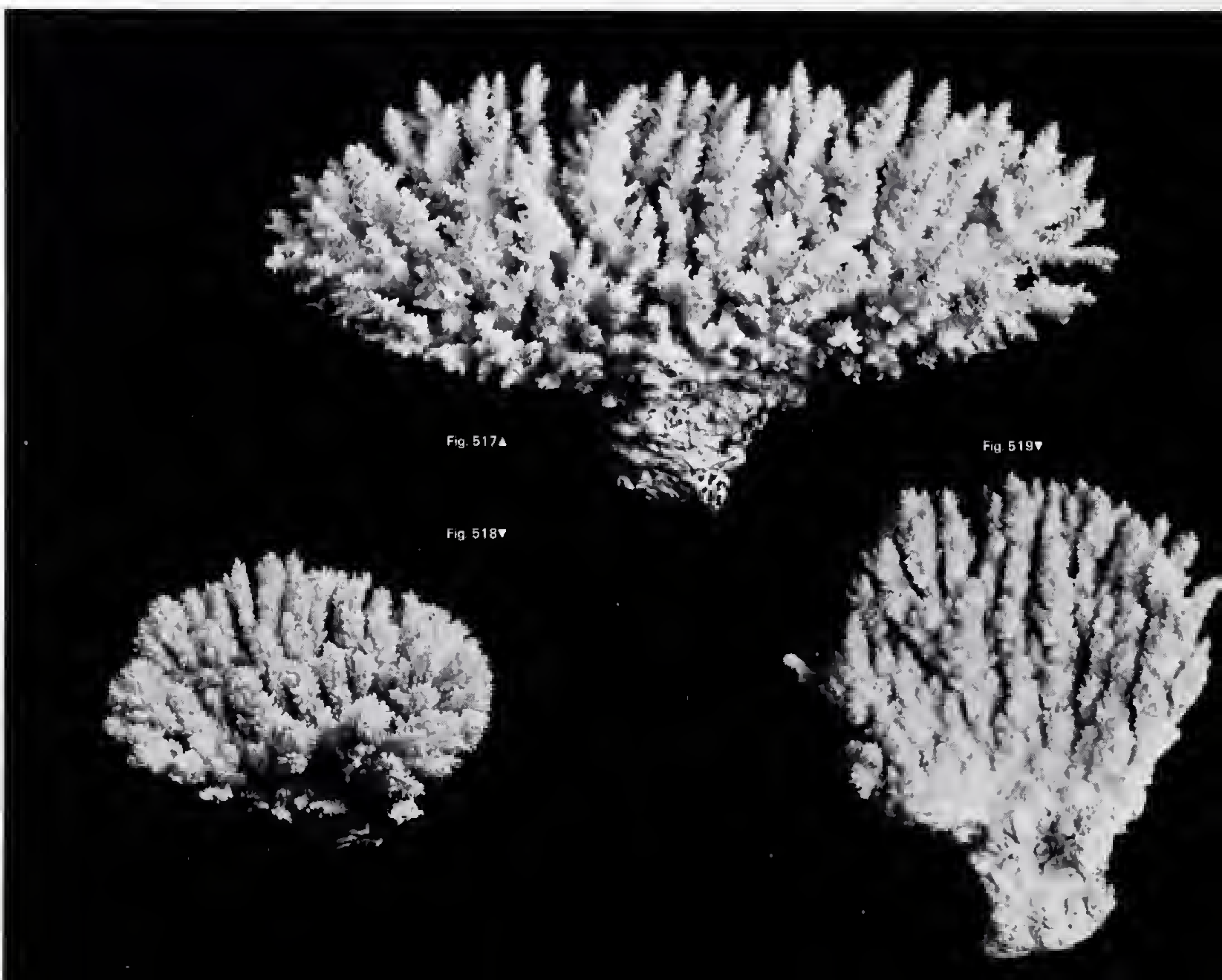
Coralla from very exposed habitats tend to resemble those of several other species, as all develop short thick branches or branchlets in response to very strong wave action. With slightly less exposure, *A. polystoma* develops its specific characters more clearly and is similar to very proliferous *A. danai*. It is usually readily separated by colony shape as branchlets of *A. polystoma* originate from a basal plate, not a thickened branch. It may also resemble species of the *A. nasuta* group, especially *A. lutkeni*, *A. nasuta* and *A. secale*. *Acropora lutkeni* from exposed biotopes may have a plate-like growth form very similar to that of *A. polystoma*, but always has corallites of approximately similar shape and size which are short and tubular appressed, with no tendency to develop the long, tubular radial or incipient axial corallites of *A. polystoma*, and also a very different coenosteum. Differences between this species, *A. nasuta* and *A. secale* are best seen in the shape and distribution of the radial corallites (see pp. 343 and 353). Coenostial structures are the same as for other members of the *A. robusta* group.

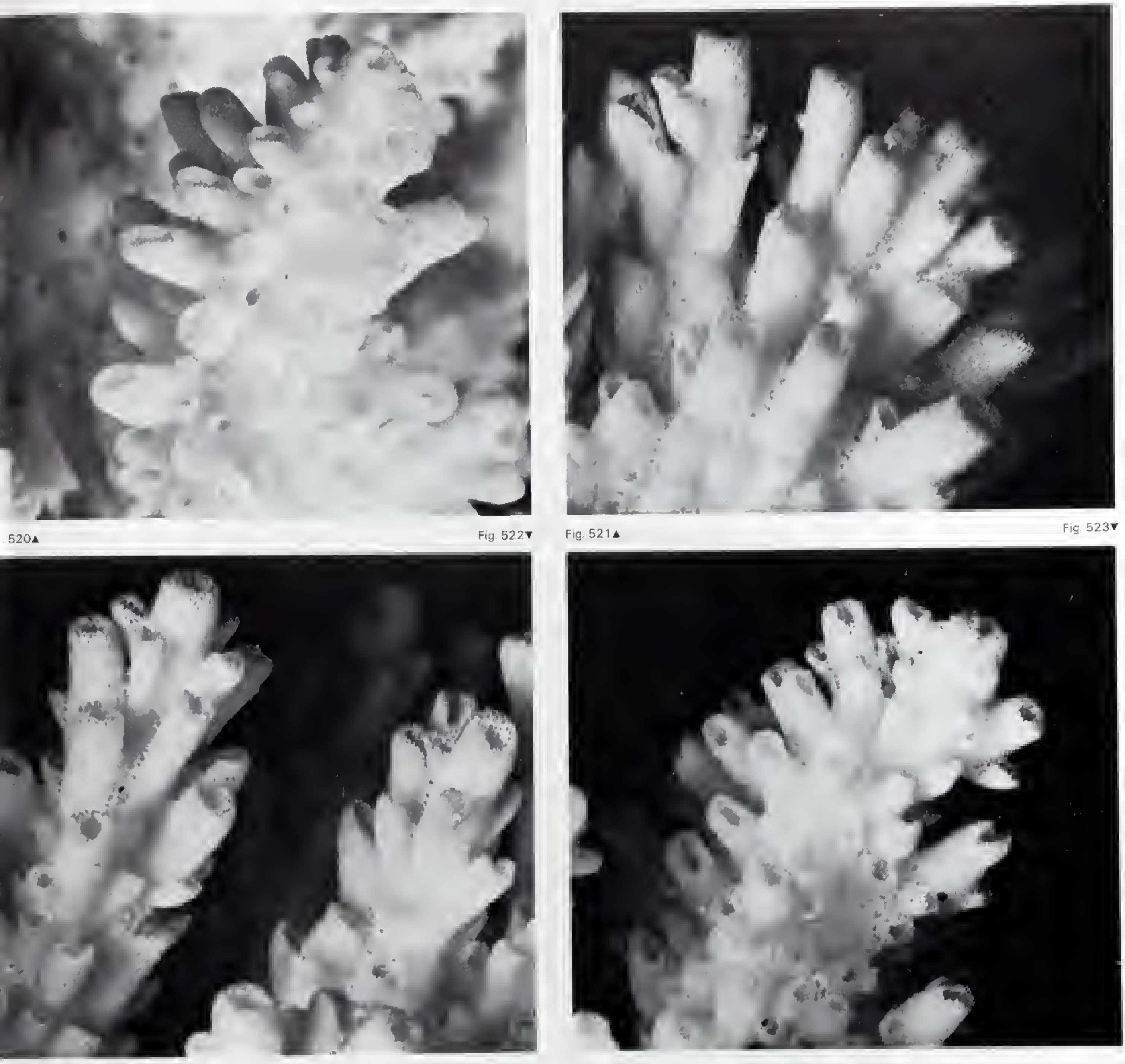
Distribution

Extends westward to Mauritius and possibly the Red Sea and east to Samoa.

Figs. 517-519 *Acropora polystoma* (× 0.33)

Fig. 517 From Rib Reef, same corallum as Fig. 520.
Fig. 518 From Britomart Reef, collecting station 168, same corallum as Figs. 521, 522.
Fig. 519 From Tijou Reef, collecting station 2, same corallum as Figs. 523, 525.





Figs. 520-523 *Acropora polystoma* (× 5)

Fig. 520 From Rib Reef, same corallum as Fig. 517.
Figs. 521, 522 Same corallum from Britomart Reef and same corallum as Fig. 518.
Fig. 523 From Tijou Reef, same corallum as Figs. 519, 525.

Fig 524▲

Fig 525▲

Fig 526▼

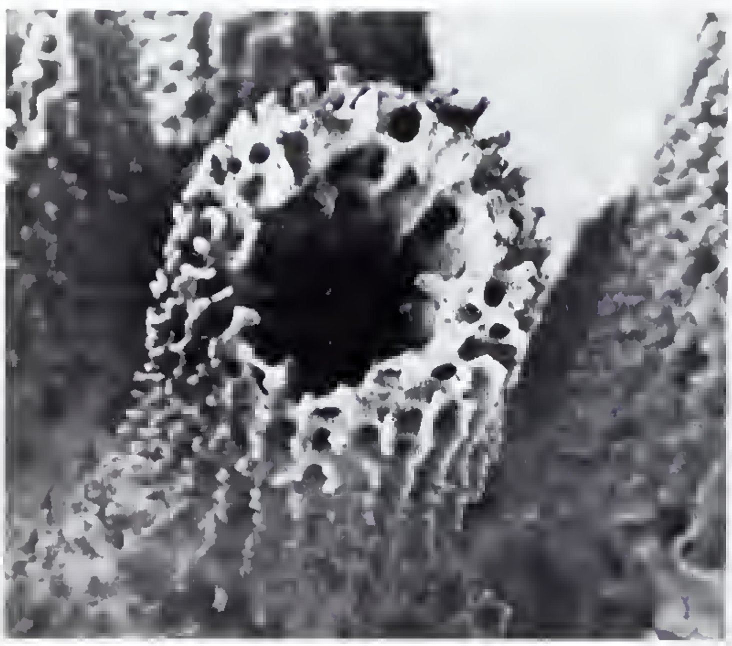


Fig. 527▼

Figs. 524-527 *Acropora polystoma* (× 20)
Fig. 524 From Britomart Reef, collecting station 168.
Fig. 525 From Tijou Reef, same corallum as Figs. 519, 523.
Figs. 526, 527 From Franklin Reef, collecting stations 149, 150 (respectively).

Acropora (Acropora) listeri (Brook, 1893)

Synonymy

Madrepora listeri Brook, 1893.

Acropora tutuliensis Hoffmeister, 1925 (*pars*).

Acropora listeri (Brook); Thiel (1932).

Brook's specimens of *A. listeri* (BMNH 1891-3-6-5 and 8) from Tonga are identical to specimens of the present series. Brook's holotype, also from Tonga, has not been found. Hoffmeister's specimens from Samoa are a series of different species, with one specimen close to coralla of the present series.

Material studied

Franklin Reef, Mellish Reef (2 specimens), **Flinders Reef (Coral Sea)** (2 specimens), **Chesterfield Reefs** (7 specimens), **Middleton Reef** (3 specimens), **Elizabeth Reef.**

These localities include collecting stations 150, 207, 209, 212, 214, 217, 218, 226, 230, 233.

Characters

Colonies are composed of proliferous and irregularly disposed horizontal branches forming heavy corymbose plates with or without thick proliferous vertical branches.

Corallites on thick, main branches are immersed and contrast markedly with those on branch tips or branchlets which are very irregular in size and shape. Incipient axial corallites are usually abundant and are tubular, up to 3.5mm exsert, with round calices 0.8-1.0mm diameter. Shorter corallites usually become increasingly appressed and develop oval nariform openings approximately 1.2mm diameter, with calices 0.4mm diameter. Septa are poorly developed to absent. They are $<\frac{1}{4}$R and are seldom clearly arranged in cycles. Axial corallites, either terminal or incipient, are of similar size to the largest radial corallites and usually have two incomplete septal cycles of $\frac{1}{3}$R, with septa frequently being fused in irregular patterns. All corallites are costate, the costae having blunt spines. The coenosteum between corallites mostly consists of a network of anastomosed spinules.

Habitat preferences and growth form variation

Acropora listeri is an uncommon species restricted to reef fronts exposed to moderate or strong wave action. As far as can be determined from the present series, the full range of growth forms of *A. listeri* occur in the upper 15m of exposed reef fronts.

Affinities

Acropora listeri is distinguished from *A. polystoma* by the latter's usual corymbose-plate growth form and by minor differences in corallite characteristics. These include *A. listeri* having very reduced septa and also the great contrast in shape between the immersed corallites on branches and the corallites on branch tips. It is emphasised, however, that these differences are derived from study of only a small number of specimens and that further work may allow these species to be synonymised.

Distribution

Known from Samoa in the east, westward to Indonesia.

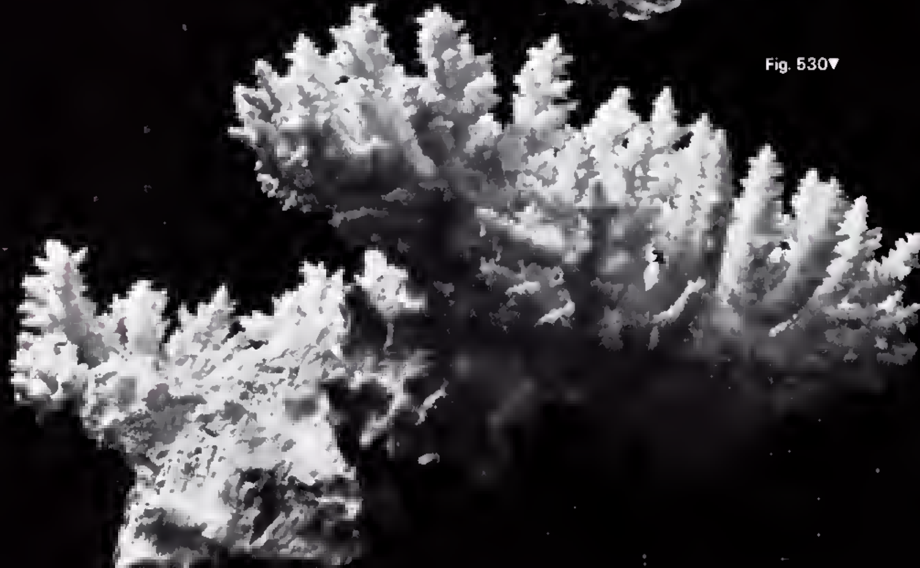
Figs. 528-530 *Acropora listeri* (× 0.5)

Fig. 528 From Chesterfield Atoll, collecting station 214, same corallum as Figs. 531, 535.
Fig. 529 From Chesterfield Atoll, collecting station 217, same corallum as Fig. 532.
Fig. 530 From Mellish Reef, collecting station 209, same corallum as Figs. 533, 534, 536.

Fig. 528▼

Fig. 529▼

Fig. 530▼



The *Acropora formosa* group

The four species of this group have in common an open arborescent or modified arborescent growth form. Open arborescent growth forms occur in *A. grandis* and *A. formosa*, as well as in *A. nobilis* of the preceding group.

Acropora acuminata and *A. valenciennesi* both have anastomosing branches which curve upwards from the horizontal, forming colonies which are partly arborescent, partly corymbose. *Acropora valenciennesi* has branches similar in size to those of *A. formosa*, while

Figs. 531-534 *Acropora listeri* (× 5)
Fig. 531 From Chesterfield Atoll, same corallum as Fig. 528.
Fig. 532 From Chesterfield Atoll, same corallum as Fig. 529.
Figs. 533, 534 Same corallum from Mellish Reef and same corallum as Fig. 530.

Fig. 531▲

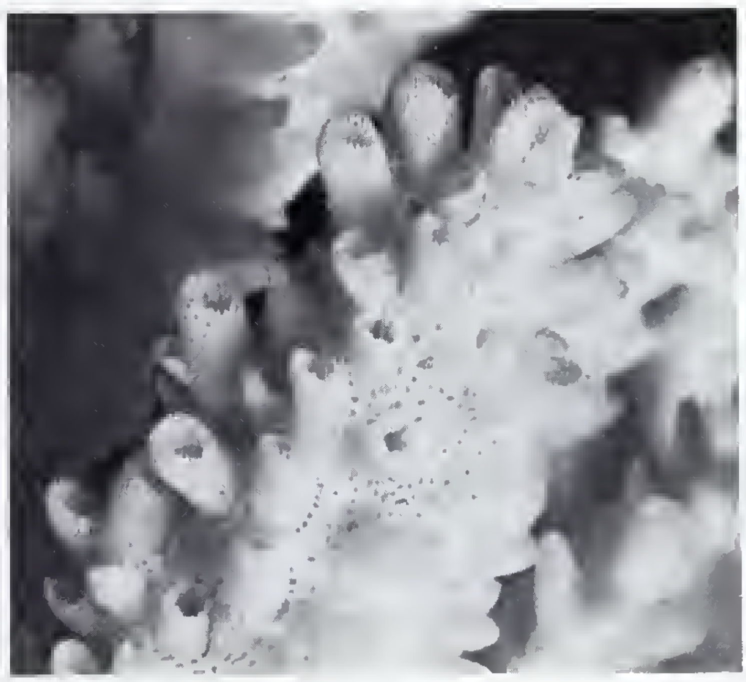


Fig. 532▲

Fig. 533▼

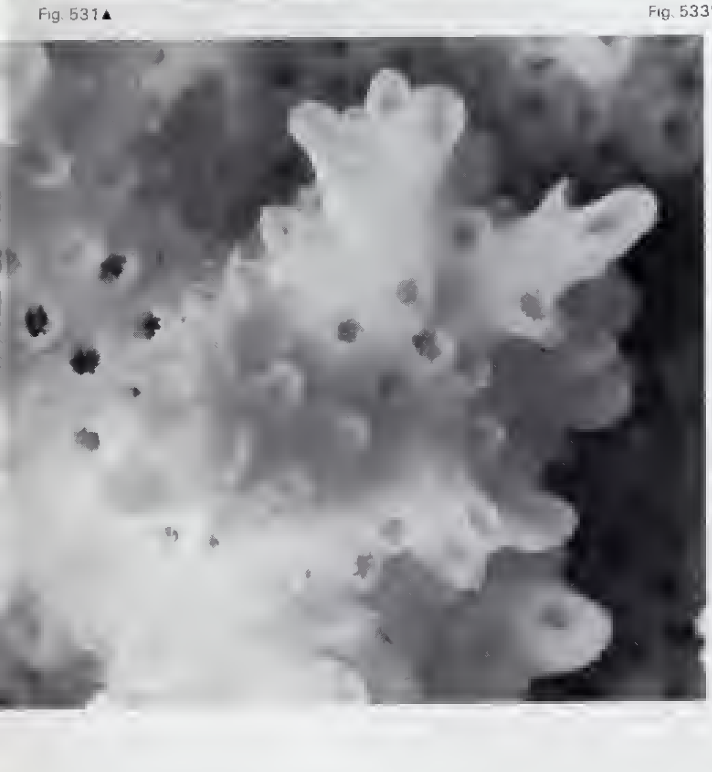


Fig. 534▼

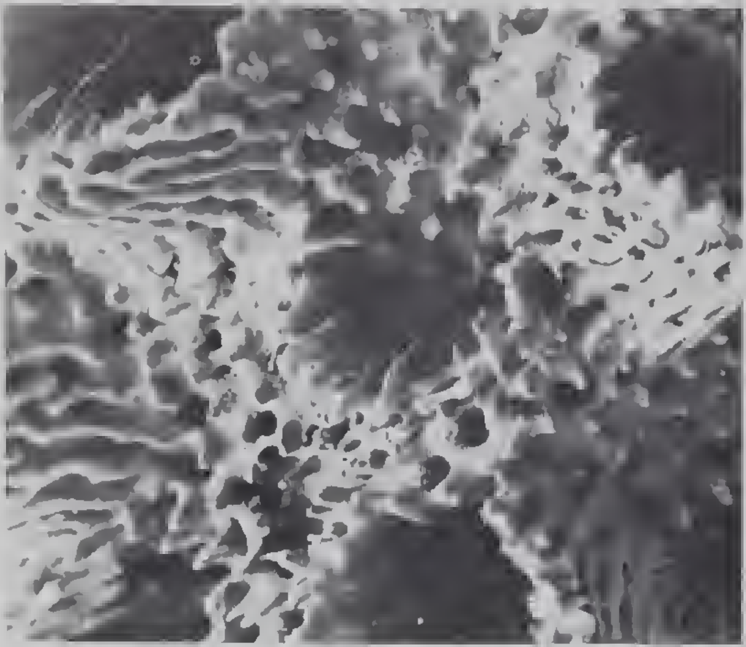


Fig 535▲

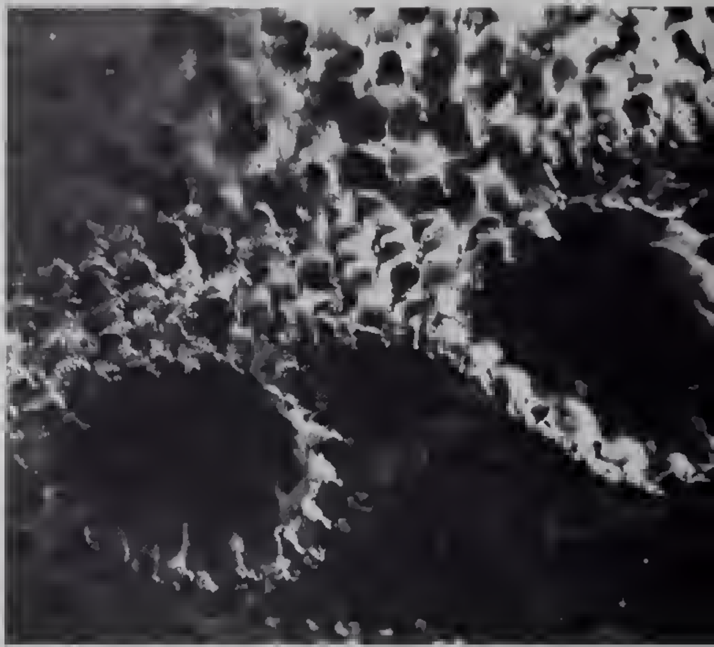


Fig. 5

Figs. 535, 536 *Acropora listeri* (× 20)
Fig. 535 From Chesterfield Atoll, same corallum as Figs. 528, 531.
Fig. 536 From Mellish Reef, same corallum as Figs. 530, 533, 534.

A. acuminata has much smaller branches forming relatively compact colonies. Corallites of *A. valenciennesi* are similar to those of *A. grandis*, while those of *A. acuminata* are unlike those of any other east Australian species.

It should be noted that species of this group have various characters in common with those of other groups, notably the *A. robusta* group, and that in some cases these may reflect closer affinities than indicated by the present, somewhat arbitrary, grouping.

Acropora (Acropora) grandis (Brook, 1892)

Synonymy

Madrepora grandis Brook, 1892; Brook (1893).

Acropora grandis (Brook); Crossland (1952); Wallace (1978).

Acropora vanderhorsti Hoffmeister, 1925.

Acropora dispar Nemenzo, 1967.

The type locality of *A. grandis* (BMNH 1892-6-8-60) is the Palm Islands (Great Barrier Reef), while those of *A. vanderhorsti* and *A. dispar* are Samoa and the Philippines (respectively). All are clearly synonyms.

Material studied

Yorke Island, Little Mary Reef (3 specimens), **Arden Island** (2 specimens), **Turtle Islands** (2 specimens), **Raine Island, Great Detached Reef, Bird Island, Sir Charles Hardy Islands, Martha Ridgeway Reef, Wye Reef, Tijou Reef, Bewick Island** (2 specimens), **Howick Island, Houghton Island** (3 specimens), **Lizard Island** (2 specimens), **Hope Island, Willis Islet, Mellish Reef, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (4 specimens), **Myrmidon Reef** (2 specimens), **Palm Islands** (8 specimens), **Lodestone Reef, Darley Reef** (4

Figs. 537-539 *Acropora grandis* (× 0.33)
Fig. 537 From Tijou Reef, collecting station 156, same corallum as Fig. 540.
Fig. 538 From the Sir Charles Hardy Islands, collecting station 179, same corallum as Fig. 541.
Fig. 539 From Chesterfield Atoll, collecting station 213, same corallum as Figs. 542, 543.

Fig. 537 ▼

Fig. 538 ▼

Fig. 539 ▼

specimens), **Chesterfield Reefs** (19 specimens), **Swain Reefs, Fitzroy Reef** (6 specimens), **Lady Musgrave Reef** (8 specimens), **Flinders Reef (Moreton Bay)** (2 specimens).

These localities include collecting stations 1, 2, 16, 18, 41, 42, 57, 60, 79, 100, 125, 152, 158, 159, 161, 163, 165, 167, 168, 175, 179, 183, 185, 186, 189, 190, 194, 195, 197, 199, 208, 210, 211, 212, 213, 215, 216, 217, 218, 221, 226, 227.

Figs. 540-543 *Acropora grandis* (× 5)
Fig. 540 From Tijou Reef, same corallum as Fig. 537.
Fig. 541 From the Sir Charles Hardy Islands, same corallum as Fig. 538.
Figs. 542, 543 Same corallum from Chesterfield Atoll and same corallum as Fig. 539.

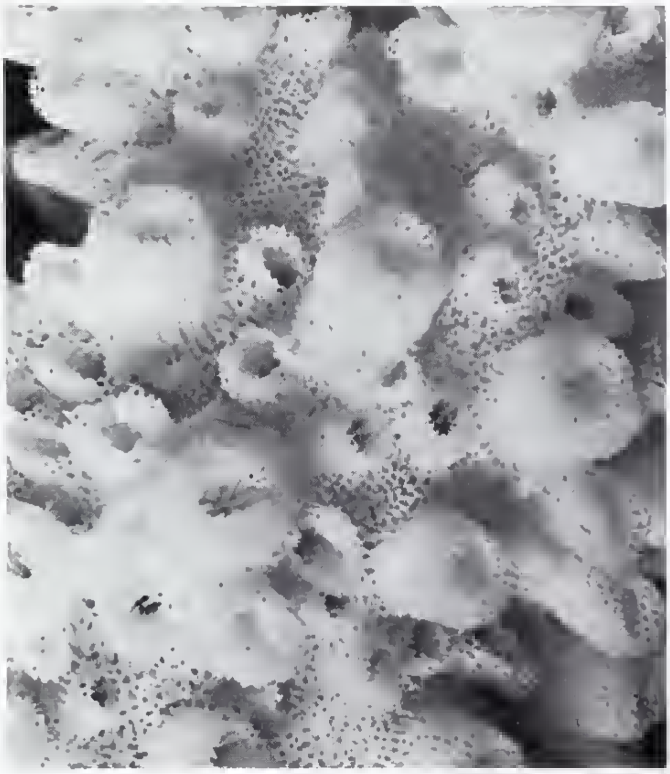


Fig 540▲

Fig. 541▲

Fig 542▼

Fig. 543▼

Characters

Colonies are arborescent with branches up to 12cm thick and over 2m long. Branches may be straight, curved, or completely irregular.

Radial corallites are irregularly scattered, are of mixed sizes and frequently face in different directions. They are tubular with large, rounded to oval openings and may be immersed or protrude up to 7mm straight out from the branch. Protuberant corallites are 1.5-2mm diameter, with calices 0.8-1.2mm diameter. They usually have a moderately well-developed septation with a first cycle of up to $\frac{1}{2}$R and a second incomplete cycle of up to $\frac{1}{4}$R. Most colonies have corallites with smaller septa and septation is frequently reduced to a single directive septum and a few dentations. All septa are strongly dentate. Axial

Figs. 544-547 *Acropora grandis* (× 20)

Fig. 544 From Britomart Reef, collecting station 167.
Fig. 545 From Mellish Reef, collecting station 208.
Fig. 546 From Chesterfield Atoll, collecting station 213.
Fig. 547 From Mellish Reef, collecting station 207.

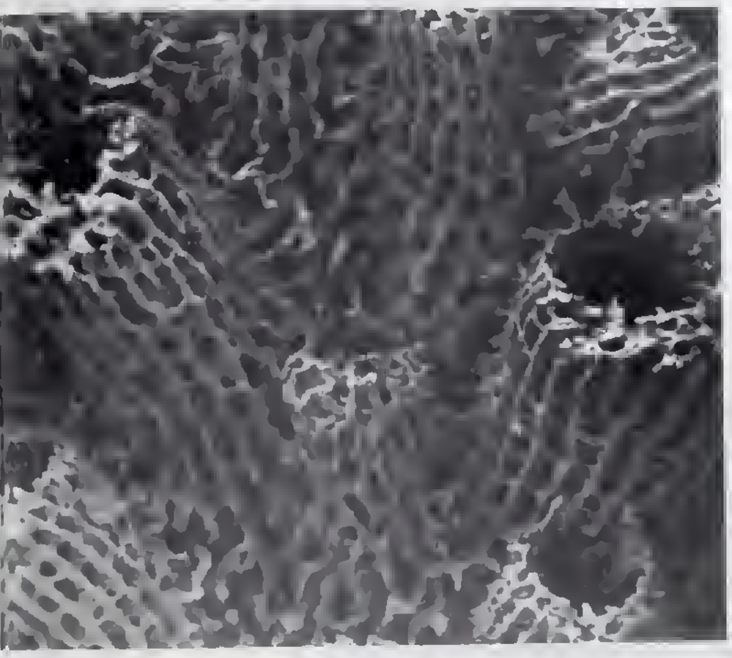


Fig. 544▲

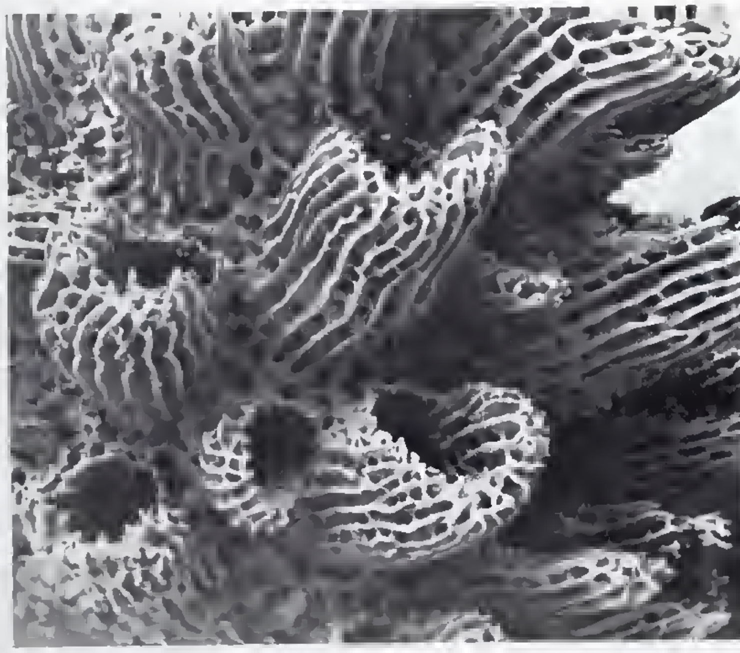


Fig. 545▲

Fig. 546▼

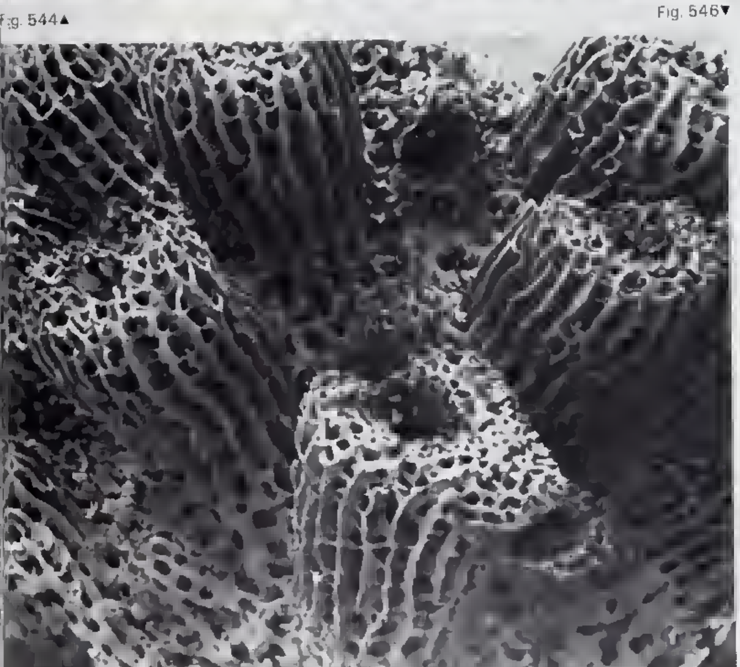


Fig. 547▼

corallites are up to 2.5-3.5mm diameter and up to 5mm exsert. They have calices 1.0-1.7mm diameter and usually have two complete septal cycles of $\frac{1}{3}$R and $\frac{1}{4}$R, although the second cycle may be incomplete or absent. Costae are well developed and usually have smooth margins. The walls of tubular corallites may consist only of costae and adjoining synapticulae, forming an open lattice-like network. Such corallites are very brittle and readily crumble when pressed. The coenosteum between corallites consists of a very coarse network of irregularly fused spinules and plates.

Living colonies are usually dark reddish-brown with very pale branch tips. Other colours include blue, purple and green, usually with paler tips of the same colour.

Habitat preferences and growth form variation

Acropora grandis is found in a wide variety of habitats, from the turbid waters of inshore high islands to the exposed outer slopes of barrier reefs and open ocean platform reefs and atolls. The species is uncommon in inshore waters and colonies are relatively small. Corallites are large, widely spaced and very crumbly, with very few septa developed. Colonies on exposed reefs are frequently very large (up to 7m across) with very thick branches. At the Chesterfield reefs, where *A. grandis* is particularly abundant, main branches are horizontal and there are usually very few sub-branches. Elsewhere, colonies are smaller, with branches extending in any direction. Corallites become increasingly smaller and more calcified in increasingly shallow, exposed biotopes.

Similar species

Although this is a very distinctive species when fully developed, small colonies or small samples from large colonies may be confused with *A. danai*, *A. nobilis* (p. 218) and *A. valenciennesi* (p. 241).

Distribution

Recorded from the Great Barrier Reef, the Philippines and Samoa.

Acropora (Acropora) formosa (Dana, 1846)

Synonymy

Madrepora formosa Dana, 1846.

Madrepora arbuscula Dana, 1846.

Madrepora brachiata Dana, 1846 (*pars*).

?*Madrepora gracilis* Dana, 1846; Brook (1893).

Madrepora virgata Dana, 1846; Brook (1893).

?*Madrepora multiformis* Ortmann, 1889.

Madrepora repens Rehberg, 1892.

Madrepora stellulata Verrill, 1902.

Acropora exigua (Dana); Hoffmeister (1925); Eguchi (1938); Nemenzo (1967).

Acropora formosa (Dana); Hoffmeister (1925, 1929); Faustino (1927); Eguchi (1938); Wells (1950, 1954, 1955); Stephenson & Wells (1955); Nemenzo (1967); Scheer & Pillai (1974); Pillai & Scheer (1976); Wallace (1978).

Acropora arbuscula (Dana), Faustino (1927); Wells (1954); Nemenzo (1967); Scheer & Pillai (1974).

Acropora gracilis (Dana); Faustino (1927); Eguchi (1938).

Acropora virgata (Dana); Wells (1954); Scheer & Pillai (1974).

Figs. 548-550 *Acropora formosa* (× 0.5)

Fig. 548 From Pandora Reef, same corallum as Fig. 551, 552.

Fig. 549 From Falcon Island, Palm Islands, collecting station 174, same corallum as Fig. 553.

Fig. 550 From Fitzroy Island, collecting station 189, same corallum as Fig. 554.

Fig. 548▲

Fig. 549▼

Fig. 550▼

Acropora laevis Crossland, 1952.

Acropora varia Nemenzo, 1967.

The type localities of all Dana's nominal species is Fiji (syntype YPM 4203 of *A. brachiata* only, see p. 215), except for some of the syntypes of *A. formosa* which are from the Sulu Sea.

Figs. 551-554 *Acropora formosa* (× 5)

Figs. 551, 552 Same corallum from Pandora Reef and same corallum as Fig. 548.
Fig. 553 From Falcon Island, Palm Islands, same corallum as Fig. 549.
Fig. 554 From Fitzroy Island, same corallum as Fig. 550.

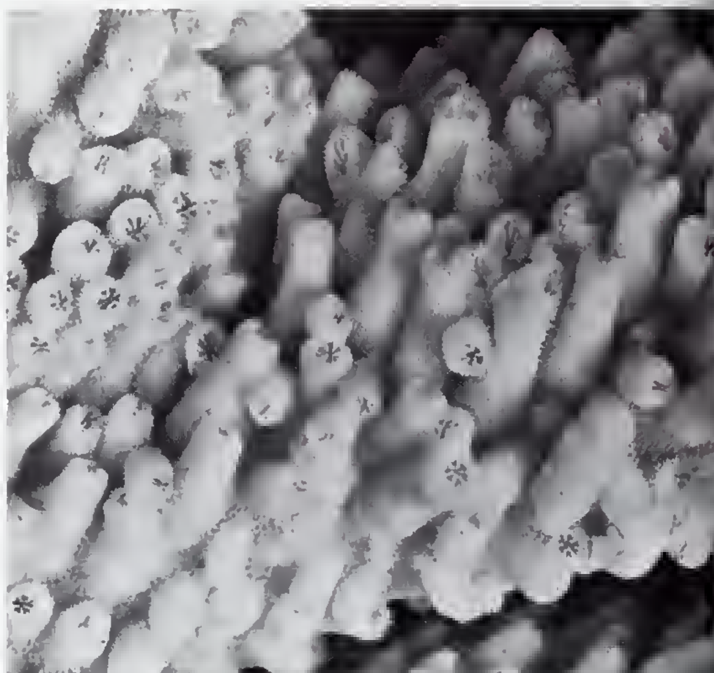


Fig. 551▲ Fig 553▼ Fig 552▲ Fig. 554▼

The holotype of *A. multiformis* Ortmann from Sri Lanka (ZMB 3720) is characterised by having corallites of different sizes facing different directions, in having weakly-developed septa and a coarse coenosteum. In the latter respect they differ from Dana's types and east Australian coralla. Type specimens of the remaining species noted above correspond completely with the present series.

Material studied

Little Mary Reef (7 specimens), **Arden Island** (3 specimens), **Murray Islands, Sue Island, North West Reef, Turtle Islands** (3 specimens), **Pandora Reef** (5 specimens), **Raine Island, Great Detached Reef** (2 specimens), **Sir Charles Hardy Islands** (3 specimens), **Cat Reef** (2 specimens), **Tijou Reef** (3 specimens), **Bewick Island** (2 specimens), **Howick Island** (3 specimens), **Houghton Island, Lizard Island** (4 specimens), **Willis Islet, Low Isles** (3 specimens), **Britomart Reef** (4 specimens); **Dip Reef, Myrmidon Reef, Palm Islands** (28 specimens), **Lodestone Reef, Pandora Reef** (2 specimens), **Davies Reef, Phillips Reef, Darley Reef** (11 specimens), **Table Top Reef, Bushy Island-Redbill Reef, Swain Reefs, Fitzroy Reef** (2 specimens).

These localities include collecting stations 1, 2, 8, 14, 16, 18, 34, 36, 37, 38, 43, 45, 60, 69, 73, 89, 100, 148, 152, 156, 165, 167, 171, 173, 174, 175, 176, 177, 179, 182, 183, 185, 186, 189, 197, 199, 221.

Characters

Colonies are arborescent, usually forming thickets. Branches are relatively straight, usually $<$2cm thick. Branching is irregular and indeterminate.

Radial corallites are tubular to immersed, sometimes appressed, with circular or oval openings. They may be of similar size and evenly distributed in rows, or else have an erratic orientation with adjacent corallites of differing sizes facing in different directions. They may protrude up to 5mm, but are always small, with internal diameters of 0.6-1.2mm. Protuberant corallites near branch tips may have two complete septal cycles up to $\frac{2}{3}$R and $\frac{1}{3}$R, with prominent directive septa. However, the second cycle is usually absent and the first cycle is $\frac{1}{2}$R or less, with conspicuous directive septa. Septa are strongly dentate. Axial corallites are up to 3mm diameter, with calices 0.6-1.2mm diameter. Septa may be completely absent but usually the first cycle is complete, $<\frac{1}{2}$R, with slightly dentate margins and there is usually some development of an incomplete second cycle.

All corallites are finely costate, or have a neat arrangement of fine spinules having simple or elaborated tips. The coenosteum between corallites is similar or finely reticulate.

Living colonies are usually cream, brown or blue in colour with brown, white or blue tips.

Habitat preferences and growth form variation

This is one of the most widespread and abundant of the arborescent *Acropora* and is frequently the dominant species on large areas of lagoons and fringing reefs. As noted by Wallace (1978), colony development is related to age, with large colonies forming a compact mass of thick branches. The species is readily dispersed by storms, with daughter colonies of the same genotype sometimes covering extensive areas. These have thinner branches and a more open branching pattern which resembles older colonies from deeper water.

Affinities

Acropora formosa resembles *A. nobilis* (p. 218) on one extreme and *A. microphthalma* on the other, all three species having similar growth forms. The closest resemblance may be with *A. microphthalma* which has corallites of similar structure and a slightly overlapping size range. Where both species occur together, they are readily distinguished by their differing dimensions and by colour, *A. microphthalma* being a uniform grey or pale brown or cream. In heterogeneous collections, however, the distinction may become arbitrary so that some coralla of the present series cannot be conclusively identified.

Distribution

Widely distributed in the tropical Indo-Pacific, west to Madagascar and east to the Marshall and Phoenix Islands.

Figs. 555-560 *Acropora formosa* (× 20)

Fig. 555 From Fantome Island, Palm Islands, collecting station 34.
Fig. 556 From Cat Reef, collecting station 148.
Fig. 557 From Rib Reef.
Fig. 558 From Britomart Reef.
Fig. 559 From Magnetic Island.
Fig. 560 From Howick Island, collecting station 175.

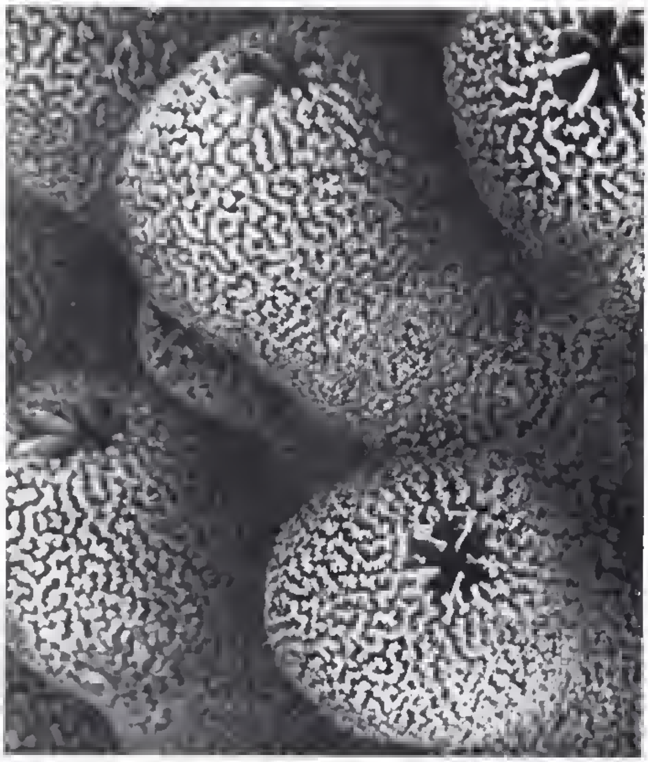


Fig 555▲

Fig 557▼

Fig 556▲

Fig. 558▼

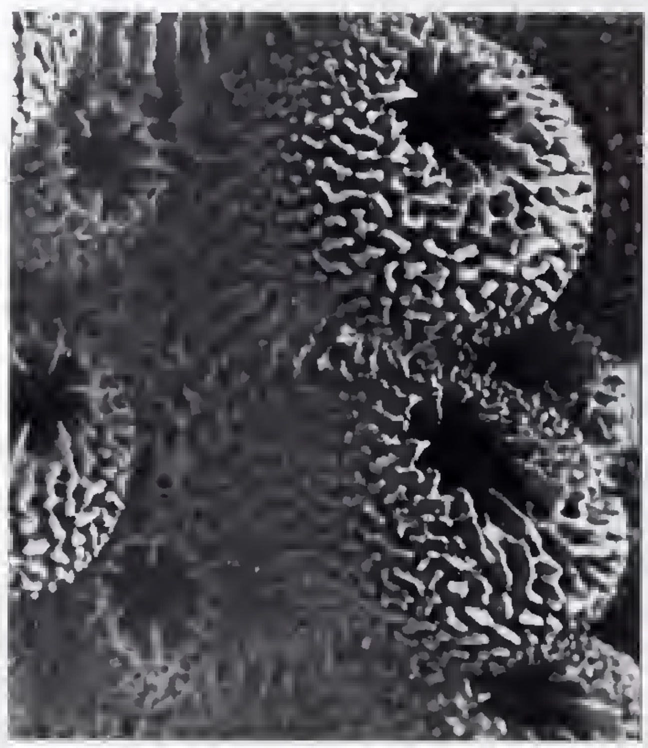


Fig. 559▲

Fig. 560▲

Acropora (Acropora) acuminata (Verrill, 1864)

Synonymy

Madrepora acuminata Verrill, 1864; Brook (1903).

Madrepora diffusa Verrill, 1864; Verrill (1902).

Madrepora ehrenbergii Edwards & Haime; Bassett-Smith (1890); not Edwards & Haime (1860).

Madrepora nigra Brook, 1892; Brook (1893).

Acropora acuminata (Verrill); Verrill (1902); Wells (1954).

Verrill's type specimens of *A. acuminata* (YPM 1807 and MCZ unnumbered) and *A. diffusa* (YPM 1808 and MCZ 146) are both from the Gilbert Islands. Brook's type of *A. nigra* is from the South China Sea. Brook noted (p. 45) that 'the colour of the unbleached corallum is brownish black', which is characteristic of the species.

Material studied

Little Mary Reef, Great Detached Reef, Sir Charles Hardy Islands, Osborne Reef, Macgillivray Reef (2 specimens), **Flinders Reef (Coral Sea)** (26 specimens), **Britomart Reef** (5 specimens), **Myrmidon Reef** (13 specimens), **Palm Islands** (2 specimens), **Chesterfield Reefs** (9 specimens), **Fitzroy Reef** (2 specimens).

These localities include collecting stations 5, 162, 167, 179, 185, 197, 200, 210, 211, 219, 221, 226.

Characters

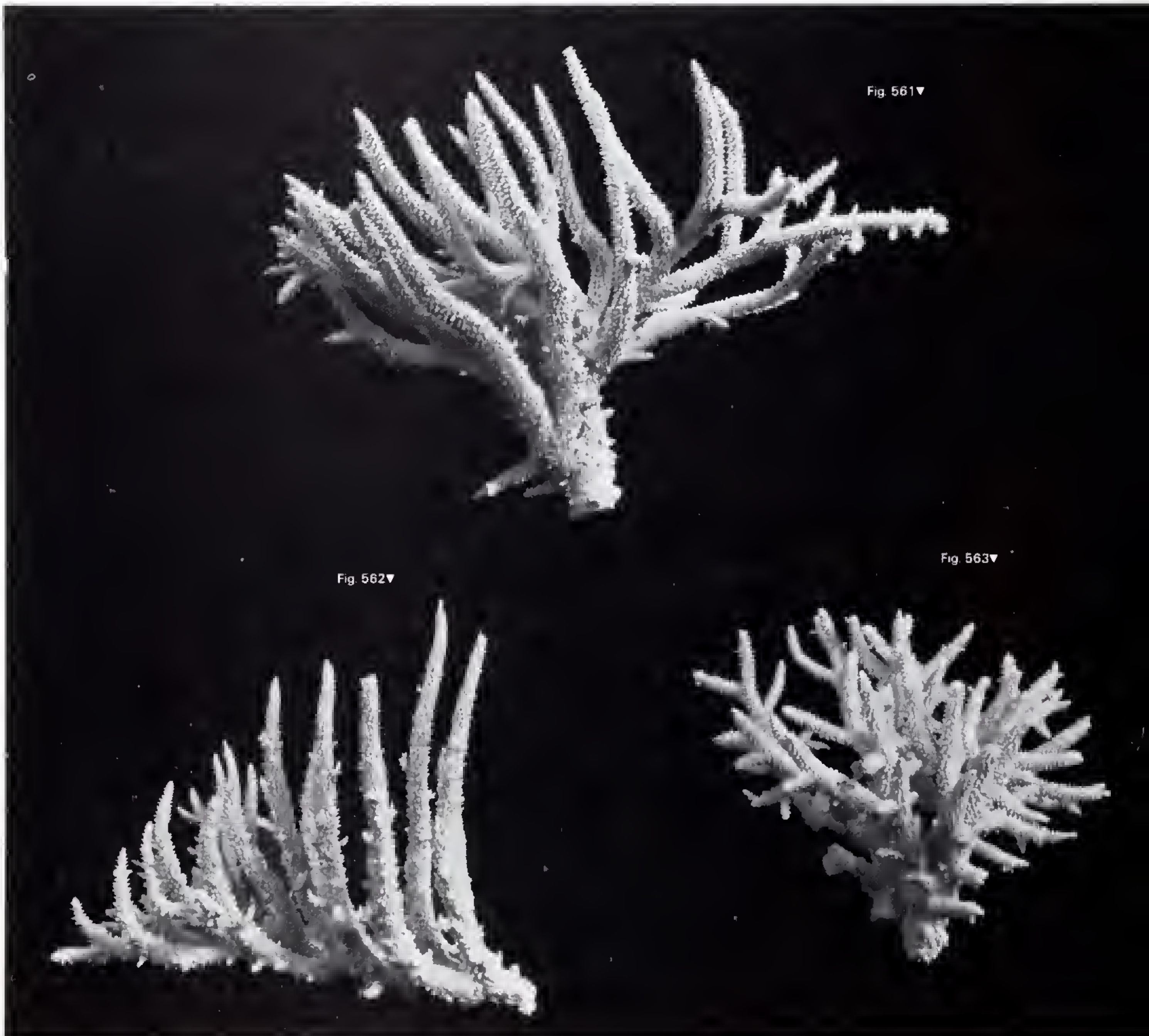
Small colonies are mostly caespito-corymbose. These develop into corymbose tables which may exceed 2m diameter. Horizontal main branches are highly anastomosed, 1.5-3cm diameter. Their ends curve upwards to a vertical or oblique position and become tapered and non-anastomosed.

Corallites on horizontal branches are immersed or tubular appressed. Those on vertical branches are tubular appressed with nariform openings. These may be equally developed in some coralla; in others, they are of two sizes, one being more protuberant and having longer nariform lips than the other. In either case, the corallites are equally spaced, giving a regular appearance. Radial corallites are up to 2.5mm diameter, with calices approximately 0.7mm diameter in the plane of the branch face. They have one large septum down the middle of the outer wall and 2 to 4 pairs of small, highly dentate septa on either side of this. Axial corallites are 1.6-2.9mm diameter, with calices approximately 1.0mm diameter. Septa are in two complete cycles, $\frac{2}{3}$R and $\frac{1}{3}$R, and are slightly dentate.

Corallite walls are strongly costate, with the coenosteum between the corallites being composed of very coarse, irregularly fused spinules and costae.

Living colonies have a wide variety of colours, including bright blue and pale brown, with no particular coloration being characteristic of the species. The coenosteum of coralla usually retains a permanent dark coloration when dried.

Figs. 561-563 *Acropora acuminata* (× 0.33)
Fig. 561 From Flinders Reef (Coral Sea).
Fig. 562 From Chesterfield Atoll, collecting station 210, same corallum as Figs. 564, 565.
Fig. 563 From the Sir Charles Hardy Islands, collecting station 179, same corallum as Fig. 566.



Habitat preferences and growth form variation

Acropora acuminata is uncommon on the Great Barrier Reef. It is found in both turbid fringing reef waters and in reef biotopes with clear water and good circulation.

There is very little variation in the present series and most variation in the species is attributable to differing growth stages rather than environmental influences.

Affinities

When fully developed, *A. acuminata* has a growth form similar to that of *A. valenciennesi*, except that branches are much smaller and more closely compacted. Corallites and the coenosteum of the two species are, however, completely different and *A. acuminata* appears to have no close affinity with any other Great Barrier Reef species.

Figs. 564-567 *Acropora acuminata* (× 5)
Figs. 564, 565 Same corallum from Chesterfield Atoll, same corallum as Fig. 562.
Fig. 566 From the Sir Charles Hardy Islands, same corallum as Fig. 563.
Fig. 567 From Osborne Reef, collecting station 162.

g. 564▲

Fig. 565▲

Fig. 566▼

Fig. 567▼

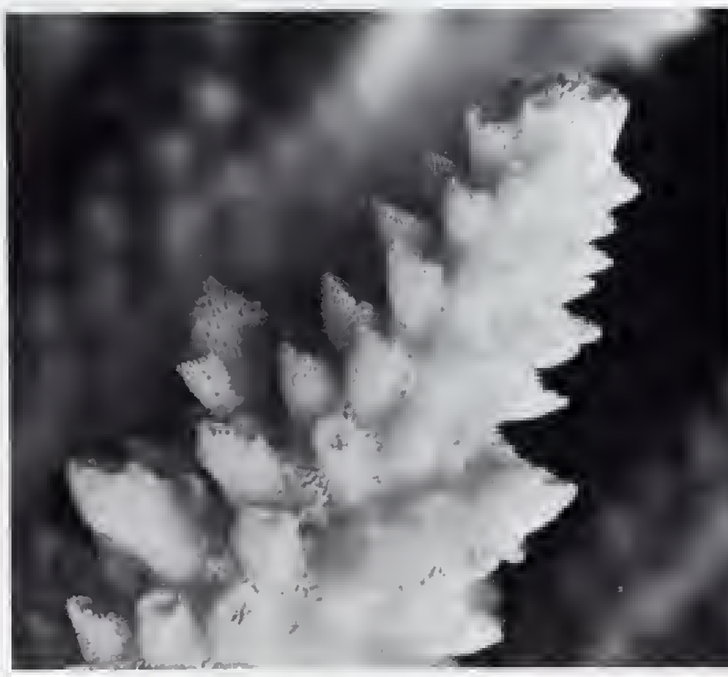


Fig. 568▲

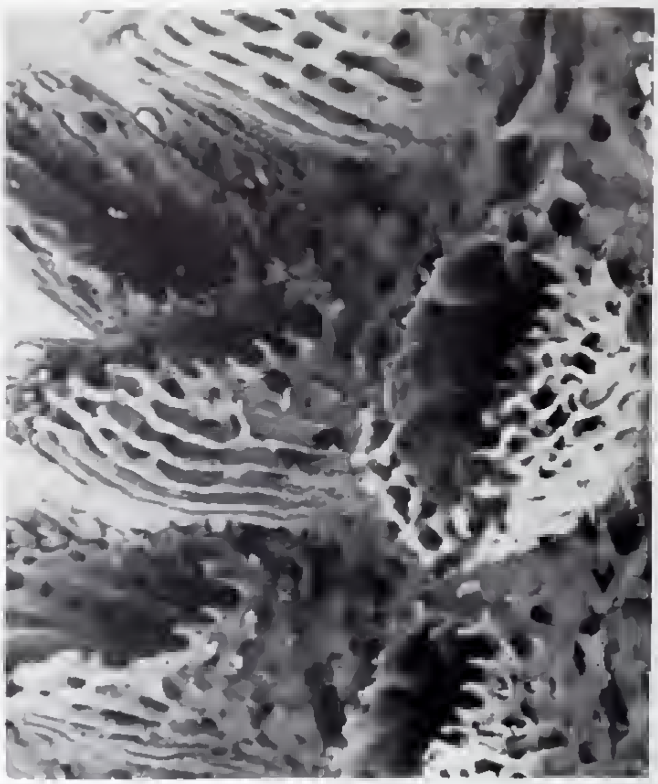


Fig. 569▲

Figs. 568, 569 Same corallum of *Acropora acuminata* from Rib Reef (× 10 and 30 respectively).

Distribution

Recorded from the South China Sea, the Gilbert and Marshall Islands and the Great Barrier Reef.

Acropora (Acropora) valenciennesi (Edwards & Haime, 1860)

Synonymy

Madrepora valenciennesi Edwards & Haime, 1860.

Acropora splendida Nemenzo, 1967; Wallace (1978).

Type specimens of both these species are recognised by their coenostial characters only as they are too small to indicate colony shape.

Material studied

Little Mary Reef (4 specimens), **Arden Island, Murray Islands** (2 specimens), **Raine Island** (3 specimens), **Great Detached Reef, Bird Island, Martha Ridgeway Reef** (2 specimens), **Wye Reef, Macgillivray Reef, Yonge Reef, Flinders Reef (Coral Sea), Britomart Reef** (10 specimens), **Myrmidon Reef** (2 specimens), **Palm Islands,** (9 specimens), **Chesterfield Reefs, Lady Musgrave Reef.**

These localities include collecting stations 9, 34, 45, 57, 60, 152, 154, 159, 161, 163, 167, 168, 173, 177, 181, 183, 185, 186, 195, 200, 217, 219, 220, 226.

Characters

This is one of the most distinctive east Australian *Acropora* which, when fully developed, forms open corymbose tabular colonies up to 4m diameter. Smaller colonies are composed of radiating, anastomosing branches with upturned ends or are caespito-corymbose. Branches are up to 4cm thick in large colonies and anastomose at

Figs. 570-572 *Acropora valenciennesi* (× 0.33)
Fig. 570 From Martha Ridgeway Reef, collecting station 159, same corallum as Fig. 573.
Figs. 571, 572 From Britomart Reef, collecting station 168; Fig. 572 same corallum as Figs. 574, 575.

Fig. 570▼

Fig. 571▼

Fig. 572▼

irregular intervals, forming a very open coarse network. Colonies are usually circular where lateral growth is not restricted.

Radial corallites are neatly and evenly distributed with calices 1.1-1.3mm diameter becoming appressed near branch tips, with round, oval, nariform or dimidiate openings. Radial corallites are frequently unequally developed near branch ends where they are strongly appressed. There are usually two directive septa, with the rest of the first cycle developed to $\frac{1}{3}$R or less and the second cycle sub-equal to absent. Both cycles are strongly dentate. Axial corallites have calices 0.8-1.5mm diameter, with two complete septal cycles, usually $\frac{1}{3}$R and $\frac{1}{4}$R, which are slightly dentate.

Figs. 573-576 *Acropora valenciennesi* (× 5)
Fig. 573 From Martha Ridgeway Reef, same corallum as Fig. 570.
Figs. 574, 575 Same corallum from Britomart Reef and same corallum as Fig. 572.
Fig. 576 From Raine Island, collecting station 152.

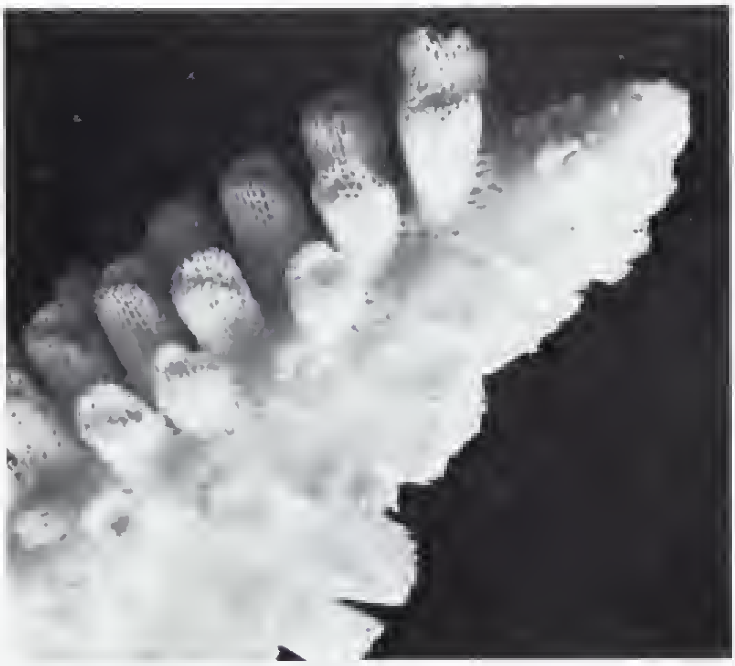


Fig. 573▲

Fig. 574▲

Fig. 575▼

Fig. 576▼

All corallites are costate, with adjoining synapticulae forming lattice-like walls. The coenosteum in between the corallites is composed of a very coarse, open reticulate mixture of spinules and plates.

Living colonies usually have branch ends, branches and corallites of different colours, mostly mixtures of brown, blue and green, with branch ends usually paler than the rest of the colony.

Habitat preferences and growth form variation

Acropora valenciennesi is very conspicuous and may be a dominant species of sheltered reef slopes (Done, in press). It occurs primarily in areas of high *Acropora* diversity, especially reef slopes protected from strong wave action but exposed to currents. There is very little variation in growth form other than that attributable to growth stages and the slope of the substrate, coralla from steeply sloping substrates tending to be relatively flat (Wallace, 1978). Coralla from deep or slightly turbid water appear to have relatively flattened branch ends with more widely spaced, non-appressed corallites.

Similar species

Only the much smaller *A.* cf. *acuminata* forms similar coarse corymbose tables (p. 235). The corallites of *A. valenciennesi* are closest to those of *A. grandis* and small fragments of these species can be confused. Those of *A. grandis* are more tubular, more open and less nariform and they are usually more irregular in length and orientation. Branch ends of *A. valenciennesi* always have their larger corallites equi-distantly arranged in regular sequences; those of *A. grandis* have a ragged appearance, with the longer corallites irregularly distributed.

Distribution

Recorded from Sri Lanka, the Philippines, the Great Barrier Reef, Palau and Fiji.

Figs. 577, 578 Same corallum of *Acropora valenciennesi* from Martha Ridgeway Reef, collecting station 154 (×20).

Fig 578▼

Fig. 577▼

The *Acropora horrida* group

All species in this group show at least some affinities with *A. horrida. Acropora tortuosa* is close to *A. horrida* and may be difficult to distinguish from it, and all species in this group except *A. austera* may have a similar growth form.

Acropora kirstyae and *A. tortuosa* are both rare on the Great Barrier Reef; all the other species in this group are common. All species, except *A. kirstyae* and possibly *A. austera*, are most abundant on fringing reefs or in other turbid water habitats. *Acropora austera* occupies a wide range of habitats from upper reef slopes exposed to strong wave action to deep muddy habitats and, consequently, has a wider range of growth forms than the other species of the group.

Acropora (Acropora) microphthalma (Verrill, 1869)

Synonymy

?*Madrepora exigua* Dana, 1846; Brook (1893).

Madrepora microphthalma Verrill, 1869; Brook (1893).

Madrepora inermis Brook, 1891; Brook (1893).

Acropora exigua (Dana); Hoffmeister (1925); Eguchi (1938); Nemenzo (1967).

Acropora microphthalma (Dana); Wells (1954); Stephenson & Wells (1955); Nemenzo (1967); Wallace (1978).

Acropora inermis (Brook); Wells (1954).

Acropora exigua from Fiji (USNM 288) differs from all coralla of the present series in having poorly calcified corallites combined with a strongly costate coenosteum and appears to be a separate species having close affinity with *A. microphthalma*.

Verrill's type of *A. microphthalma* from the Ryukyu Islands (YPM 774) and Brook's *A. inermis* from the 'south seas' (BMNH 1841-12-11-7) are both close to coralla of the present series.

Material studied

Little Mary Reef (3 specimens), **Arden Island, Turtle Islands** (5 specimens), **Pandora Reef, Raine Island** (3 specimens), **Bird Island** (2 specimens), **Martha Ridgeway Reef** (3 specimens), **Wye Reef, Cat Reef, Tijou Reef, Howick Island** (4 specimens), **Houghton Island, Low Isles, Mellish Reef, Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef** (13 specimens), **Rib Reef, Palm Islands** (22 specimens), **Keeper Reef, Davies Reef, Chesterfield Reefs** (2 specimens), **Bushy Island-Redbill Reef.**

These localities include collecting stations 8, 16, 34, 37, 41, 42, 45, 60, 73, 148, 151, 152, 154, 159, 161, 163, 165, 167, 168, 173, 174, 175, 177, 183, 185, 208, 215, 218, 226.

Characters

Colonies are arborescent with slender, straight, tapering branches. Branching may be open with branches widely spaced or compact with sub-branches forming at acute angles. In either case colonies have a regular, uniform appearance. The basal branches of most colonies are dead and being <2cm diameter, are readily broken. Fragments of colonies are thus readily distributed over extended patches of substrate.

Corallites are small and numerous. Radial corallites are short, tubular appressed, frequently with tubo-nariform openings. They have calice diameters of 0.4-0.6mm. First

Figs. 579-581 *Acropora microphthalma* (× 0.33)
Fig. 579, 580 From Falcon Island, Palm Islands, collecting station 174, Fig. 579 same corallum as Fig. 582.
Fig. 581 From Fantome Island, Palm Islands, collecting station 34, same corallum as Figs. 585, 586.

Fig. 579▼

Fig. 580▼

Fig. 581▼

cycle septa are well developed, up to $\frac{2}{3}$R and strongly dentate. Second cycle septa are rudimentary, incomplete or absent. One directive septum is usually distinguishable. Axial corallites are up to 2.3mm diameter with calice diameters of 0.6-1mm. Primary septa are well developed, up to $\frac{3}{4}$R; secondary septa $< \frac{1}{4}$R or absent. The coenosteum may be spongy on highly calcified branch bases but usually consists of fine spinules with elaborated tips.

Living colonies are a uniform pale grey or sometimes pale brown or cream.

Habitat preferences and growth form variation

Acropora microphthalma occupies most reef biotopes protected from strong wave action. It may be very abundant in turbid water where *Acropora* diversity is low or on sandy substrates in lagoons or around back reef margins. Big colonies with open branching patterns are usually found in such biotopes, with smaller, more compact colonies usually occurring in biotopes exposed to greater water movement, where *Acropora* diversity is usually greater. Coralla from shallow reef biotopes with a high *Acropora* diversity have a relatively dense branching pattern, with crowded, relatively tubular corallites.

Affinities

Acropora microphthalma is the smallest and finest of the arborescent *Acropora* and is readily recognised by both growth form and colour. It is closest to *A. horrida* and *A. vaughani*. *Acropora horrida* has a much less uniform branching pattern and has larger, more widely spaced corallites which are irregular in orientation and prominence giving this species a ragged appearance, the opposite of the uniform, regular corallites of *A. microphthalma*. The coenosteum of *A. horrida* has an open reticulate pattern and large spinules, while that of *A. microphthalma* (and *A. vaughani*) usually consists of closely compacted fine spinules with elaborated tips. *Acropora vaughani* also has a less uniform branching pattern and has larger, more widely spaced corallites which are not appressed as

Figs. 582-587 *Acropora microphthalma* (× 5)
Figs. 582-584 From Falcon Island, Palm Islands, collecting station 174; Fig. 582 same corallum as Fig. 579.
Figs. 585, 586 Same corallum from Fantome Island, Palm Islands and same corallum as Fig. 581.
Fig. 587 From Wistari Reef, collecting station 118, same corallum as Fig. 589.

Fig 582▼

Fig 583▼

Fig. 584▲

Fig. 585▲

Fig. 586▼

Fig. 587▼

they are in *A. microphthalma*. *Acropora vaughani* has a less regular septal development although usually has a better developed second septal cycle. Resemblances between *A. microphthalma* and *A. formosa* are noted elsewhere (p. 233).

Distibution

Widely distributed throughout the tropical and subtropical Indo-Pacific from Madagascar in the west, east to the Marshall Islands and also north to the Ryukyu Islands.

Fig 588▲

Fig. 589▼

Fig. 590▲

Figs. 588-590 *Acropora microphthalma*

Fig. 588 From Britomart Reef, collecting station 167 (× 20).
Fig. 589 From Wistari Reef, same corallum as Fig. 587 (× 20).
Fig. 590 From Britomart Reef, collecting station 168 (× 30).

Acropora (Acropora) kirstyae n.sp.

Material studied

Palm Islands (17 specimens).

These localities include collecting stations 43, 45, 224.

Characters

Colonies have an indeterminate caespito-arborescent form with thin curved branches giving off sub-branches at irregular intervals. Corallites are very small and widely spaced. Those near the base of main branches are immersed while those on finer sub-branches are strongly appressed or tubular appressed, sometimes with a tendency to become nariform. Radial corallites have calice diameters of 0.4-0.5mm. They may be very superficial and almost devoid of septa but in some coralla two complete cycles are developed, up to $\frac{3}{4}$R and $\frac{1}{2}$R. Most radial corallites have a very reduced second cycle. Septa usually consist of rows of spines but if well developed may consist of dentate plates with finely granulated sides. Axial corallites are similar to radial corallites; they may be up to 4mm exsert and 2mm thick. The coenosteum on and between corallites is similar, consisting of uniform closely packed spinules with elaborated tips.

Living colonies are a uniform pale orange brown.

Habitat preferences and growth form variation

The present small series all come from muddy substrates in very protected bays of the Palm Islands where this species is abundant. It has not been observed in reef biotopes and consequently very little is known of its growth form variation.

Similar species

Acropora kirstyae does not closely resemble any other species. It has some resemblance to *A. vaughani* in having small, widely spaced corallites and both species have a similar coenosteum. Radial corallites of these species are, however, very different in shape and orientation and those of *A. kirstyae* have a relatively poor septation.

Etymology

Named after Kirsty Veron in recognition of her assistance in editing the manuscript of *Scleractinia of Eastern Australia.*

Holotype

Dimensions: An upright corallum 17cm high and 16cm wide
Locality: Western side of Falcon Island (Palm Islands)
Depth: 6m
Collector: J. E. N. Veron
Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Great Barrier Reef.

Figs. 591-593 *Acropora kirstyae* from Falcon Island, Palm Islands, collecting station 224; Fig. 593 holotype (×0.5).

Fig. 591▼

Fig. 592▼

Fig. 593▼

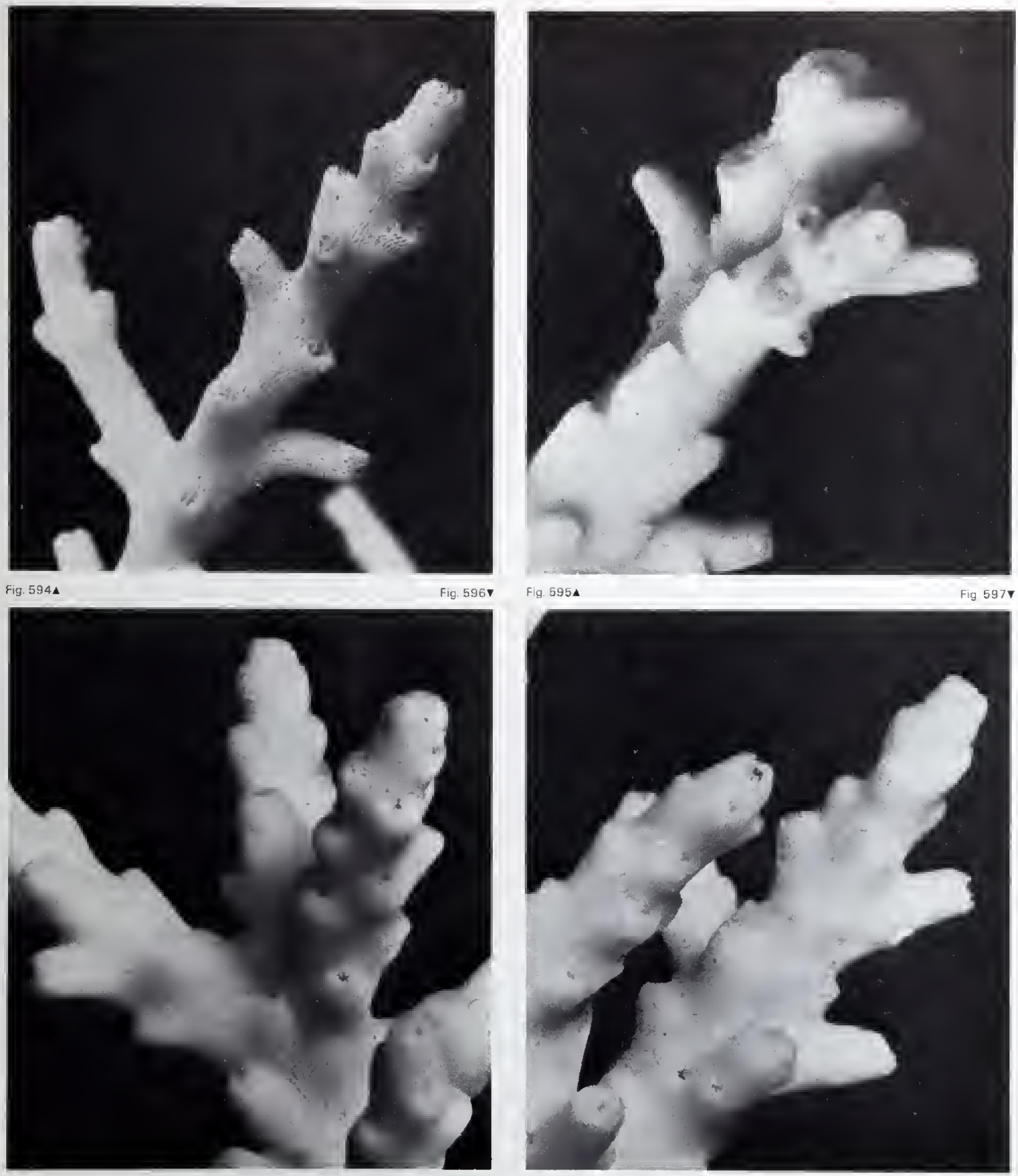


Fig. 594▲ Fig. 596▼ Fig. 595▲ Fig 597▼

Figs. 594-597 *Acropora kirstyae* from Falcon Island, Palm Islands; Figs. 596, 597, same corallum as holotype, Fig. 593 (× 5).

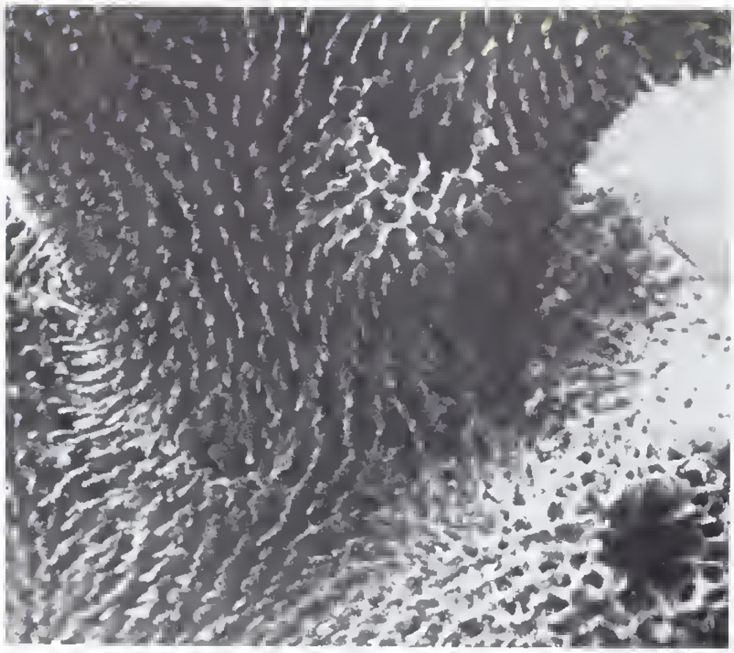


Fig. 598▲

Fig. 599▲

Figs. 598, 599 *Acropora kirstyae* from Falcon Island, Palm Islands, same coralla as Figs. 592, 593 (respectively) (× 10 and 20 respectively).

Figs. 600, 601 *Acropora* sp. 2 from the Pompey Complex, collecting station 70 (× 0.5 and 5 respectively).

Fig. 600▼

Fig. 601▼

Acropora (Acropora) sp. 2

Synonymy

?*Madrepora ramiculosa* Dana, 1846.

Dana's specimens of *A. ramiculosa* from Fiji (USNM 274, MCZ 319 and YPM 4198) differ from the single specimen of this species in the present collection in having more compact branching and better developed septa. Otherwise, the corallites and the coenosteum are very similar. Wells's (1954) *A. ramiculosa* from the Marshall Islands does not appear to be this species.

Material studied

Pompey Reef.

This locality is collecting station 70.

Characters

The single corallum of this species in the present collection is hispidose with proliferous short sub-branches basally, and widely spaced elongate sub-branches towards the ends of main branches. Radial corallites are immersed except for those towards branch ends (and those around incipient axial corallites) which are strongly appressed with nariform openings. Radial corallites have calices 0.9-1.2cm wide. In some corallites both septal cycles are present, but most have only one cycle $<\frac{1}{4}$R, usually incomplete, sometimes absent.

Axial corallites are 2.9-3.5mm diameter, with calices 1.2mm diameter. Septa are in two complete cycles of $\frac{3}{4}$R and $\frac{1}{2}$R. The coenosteum on and between corallites is similar, consisting of closely packed spinules.

Affinities

This species has some resemblance only to *A. kirstyae.*

Acropora (Acropora) horrida (Dana, 1846)

Synonymy

?*Madrepora tylostoma* Ehrenberg, 1834; Brook (1893).

Madrepora horrida Dana, 1846; Brook (1893).

Madrepora arabica Edwards & Haime, 1860; Brook (1893).

Madrepora microcyathus Klunzinger, 1879.

Acropora horrida (Dana); Wells (1954); Wallace (1978).

Dana's syntypes of *A. horrida* from Fiji (USNM 291 and YPM 4191) show no differences from coralla of the present series. The synonyms *A. tylostoma* Ehrenberg (ZMB 902) (from an unknown locality), *A. arabica* Edwards & Haime (ZMB 886, not MCZ) and *A. microcyathus* Klunzinger (ZMB 2220) (both from the Red Sea) are similar to each other and are characterised by a very coarse coenosteum, radial corallites of irregular sizes and orientation and irregular septal development. *Acropora pharonis* Edwards & Haime, 1860 also from the Red Sea (MNHN 300d) may also belong to this species, but is further characterised by anastomosing horizontal branches. It appears that the range of *A. horrida* extends to the Red Sea but the name *A. tylostoma* cannot be adopted for the species as the holotype is not clearly associated with either Red Sea or Pacific type specimens.

Figs. 602-604 *Acropora horrida* (× 0.5)
Fig. 602 From Britomart Reef, collecting station 168, same corallum as Figs. 605, 606.
Fig. 603 From Chesterfield Atoll, collecting station 217, same corallum as Fig. 607.
Fig. 604 From Wye Reef, collecting station 163, same corallum as Fig. 608.

Fig. 602▼

Fig. 603▲

Fig. 604▼

Material studied

Admiralty Island, Yorke Island, Little Mary Reef (15 specimens), **Arden Island** (5 specimens), **Raine Island** (2 specimens), **Sir Charles Hardy Islands** (7 specimens), **Wye Reef** (2 specimens), **Cat Reef, Tijou Reef** (6 specimens), **Howick Island, Lizard Island** (3 specimens), **Britomart Reef** (8 specimens), **Myrmidon Reef** (3 specimens), **Palm Islands** (4 specimens), **Lodestone Reef, Darley Reef** (5 specimens), **Chesterfield Reefs** (4 specimens), **Pompey Reef** (4 specimens), **Redbill Reef, Polmaise Reef, Fitzroy Reef** (2 specimens), **Middleton Reef, Elizabeth Reef** (2 specimens).

These localities include collecting stations 8, 37, 73, 75, 100, 104, 148, 151, 152, 162, 163, 167, 168, 175, 177, 179, 183, 185, 190, 197, 198, 214, 216, 217, 219, 220, 221, 234, 239.

Characters

Occurs as sprawling, arborescent to indeterminate, compact bushy colonies. Corallites are usually widely and irregularly spaced and are irregular in orientation and prominence, giving most colonies a ragged appearance. Some colonies consist only of a few thin, sprawling branches up to 0.5m long with sub-branches. Most colonies have tapering branches which subdivide irregularly according to the irregular development of axial corallites. The latter are slightly larger, thicker walled and more protuberant than radial corallites, but are not strongly differentiated. Some colonies have an almost hispidose growth form, with main branches surrounded by branchlets.

Corallites have calice diameters of 0.6-0.9mm. Septa are very variable, being plate-like in axial and some protuberant radial corallites. The first cycle is complete, $\frac{1}{2}$-$\frac{3}{4}$R, the second cycle incomplete, $<\frac{1}{2}$R. Most radial corallites have a complete first cycle, $<\frac{1}{2}$R with enlarged directive septa and a second cycle incomplete to absent. These septa are usually strongly dentate and irregular. Immersed corallites on main branches usually have a reduced first cycle only. The coenosteum of most coralla is highly porous with an open reticulate pattern and large spinules.

Living colonies are usually uniform in colour, usually pale blue but are sometimes dark blue, or pale yellow or brown. Polyps are pale blue or white and are usually extended day and night.

Habitat preferences and growth form variation

Acropora horrida occupies biotopes ranging from partly exposed reef slopes to deep, relatively turbid waters around fringing reefs. Compared with most *Acropora* this species has a marked preference for turbid conditions and low light availability. Coralla from such environments consist of long sprawling branches which seldom subdivide. Corallites are relatively small and immersed. In less turbid environments branching becomes more frequent and corallites more protuberant. Such coralla usually have the ragged appearance which characterises the species. Coralla from shallow water, especially where exposed to some wave action, are composed of frequently dividing branches and branchlets giving a shrubby growth form.

Affinities and similar species

Acropora horrida is very close to *A. tortuosa* (p. 258), but does not show close affinity with any other species. Its wide range of growth forms may suggest similarity with other *Acropora* from *A. elseyi* to arborescent species, but it is readily distinguished from these by

Figs. 605-610 *Acropora horrida* (× 5)

Figs. 605, 606 Same corallum from Britomart Reef and same corallum as Fig. 602.
Fig. 607 From Chesterfield Atoll, same corallum as Fig. 603.
Fig. 608 From Wye Reef, same corallum as Fig. 604.
Fig. 609 From Howick Island, collecting station 175.
Fig. 610 From Little Mary Reef, collecting station 185.

Fig. 605▲

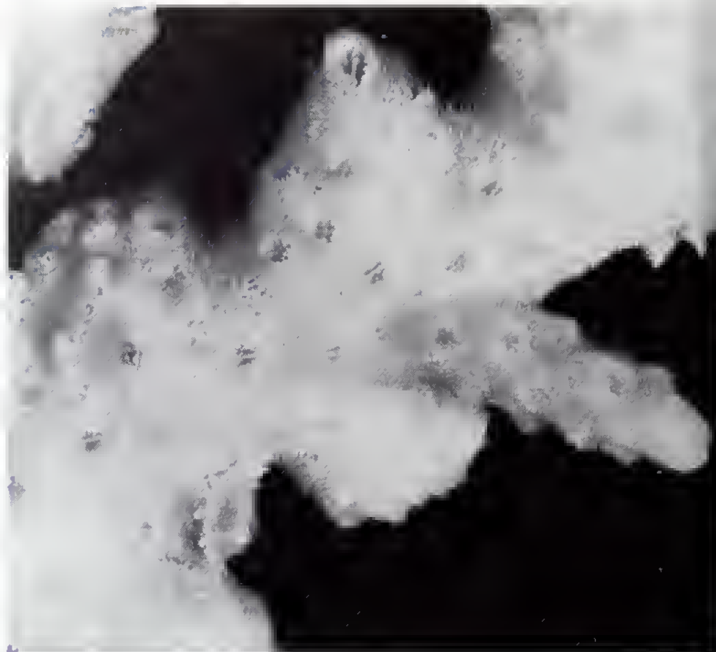


Fig. 606▲

Fig. 607▼

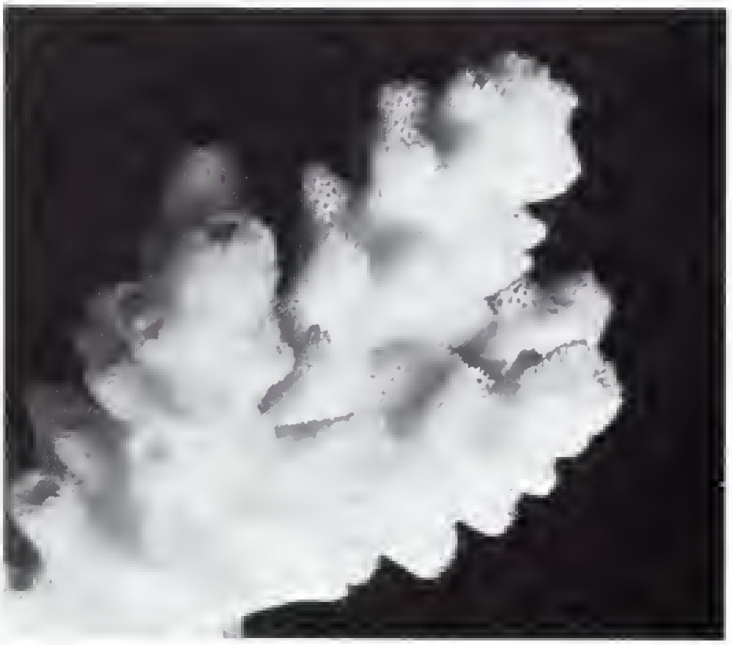


Fig. 608▼

Fig. 609▼

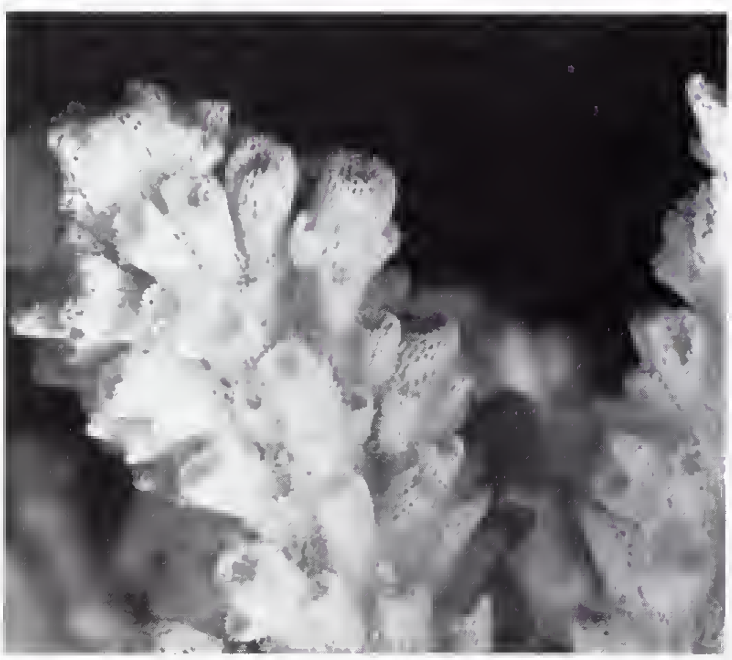


Fig. 610▼

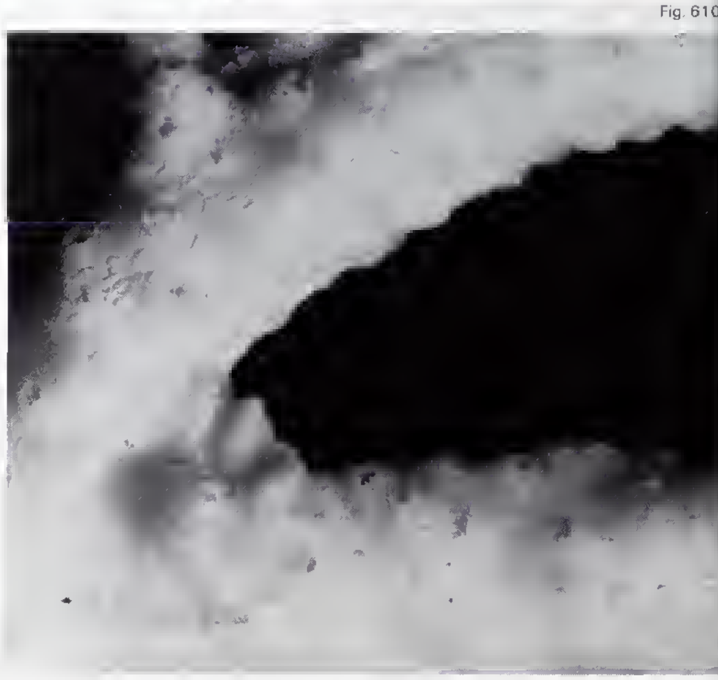


Fig. 611▲

Fig. 612▲

Figs. 611, 612 *Acropora horrida* (× 20)
Fig. 611 From Britomart Reef, collecting station 168.
Fig. 612 From Darley Reef.

its small corallites. In this respect it may resemble *A. vaughani* (p. 261). Underwater, *A. horrida* is usually readily recognisable by its pale blue colour and polyps extended during the day.

Distribution

Widely distributed throughout the tropical Indo-Pacific, west to the Red Sea and east to the Marshall Islands.

Acropora (Acropora) tortuosa (Dana, 1846)

Synonymy

Madrepora tortuosa Dana, 1846; Brook (1893).

Dana's syntypes of *A. tortuosa* from Fiji (USNM 284 and MCZ 390) are compact sub-arborescent coralla with straight tapering branches. They thus have a slightly different growth form from any specimen in the present series, but coenostial and calicular characters are very similar.

Material studied

Little Mary Reef, Franklin Reef, Myrmidon Reef, Middleton Reef (11 specimens), **Elizabeth Reef** (12 specimens).

These localities include collecting stations 149, 185, 220, 231, 234, 239.

Figs. 613-616 *Acropora tortuosa* (× 0.5)
Fig. 613 From Falcon Island, Palm Islands, collecting station 174.
Fig. 614 From Middleton Reef, same corallum as Fig. 621.
Fig. 615 From Little Mary Reef, collecting station 185, same corallum as Fig. 622.
Fig. 616 From Elizabeth Reef, collecting station 239.

Fig. 613▼

Fig. 614▼

Fig. 615▼

Fig. 616▼

Characters

Colonies are caespitose to hispidose with short tapering sub-branches. Axial corallites are up to 2mm exsert, 2.5-3.2mm diameter with calices 1.0-1.3mm diameter. First cycle septa are usually $\frac{1}{2}$-$\frac{2}{3}$R, with directive septa reaching R deep within the corallite. Second cycle septa are complete, up to $\frac{1}{4}$R, to absent. Radial corallites are immersed on main branches. Towards branch ends and on secondary branches they are tubular appressed.

Figs. 617-620 *Acropora tortuosa* (× 5)
Fig. 617 From Little Mary Reef, same corallum as Figs. 615, 622.
Figs. 618-620 From Elizabeth Reef, collecting station 239, Fig. 618 same corallum as Fig. 616.

Fig. 617▲

Fig. 618▲

Fig 619▼

Fig. 620▼

Fig. 621▲

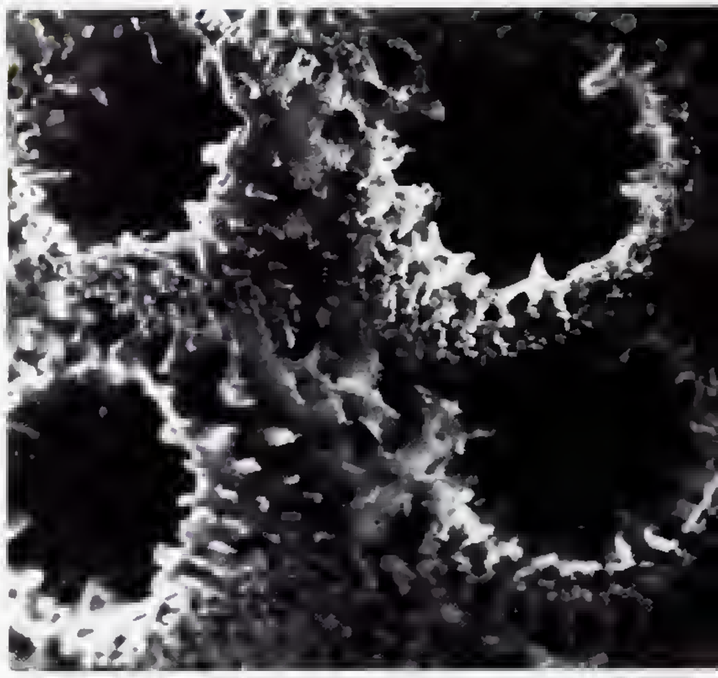


Fig. 6

Figs. 621, 622 *Acropora tortuosa* (× 20)
Fig. 621 From Middleton Reef, same corallum as Fig. 614.
Fig. 622 From Little Mary Reef, same corallum as Fig. 615.

They are widely and unevenly spaced and may point in different directions. They are up to 2.5mm diameter, with round calices 1.0-1.3mm diameter. Directive septa are usually distinct and may reach R deep within the corallite; remaining first cycle septa are $<\frac{1}{4}$R. Second cycle septa are $<\frac{1}{4}$R, incomplete to absent. All septa may have dentate to entire margins, the latter being the more common. The coenosteum is similar on and between corallites, being finely costate, becoming flaky and highly fused.

Living colonies are deep blue to brown in colour. Polyps are not extended during the day.

Habitat preferences

Acropora tortuosa is very rare on the Great Barrier Reef (with only three records in the present series), but is abundant in the lagoons of Middleton and (especially) Elizabeth Reefs, where it forms dense stands with *A. horrida*.

Affinities

Acropora tortuosa is very close to *A. horrida* and both species occupy similar habitats. Both species have corallites of similar shape, which may be irregularly oriented, and both have a similar coarse coenosteum. *Acropora tortuosa* has substantially larger corallites with septa tending to have entire rather than dentate margins. *In situ*, *A. horrida* can also be distinguished by having polyps extended during the day.

Distribution

Previously recorded only from Fiji and the Caroline Islands.

Figs. 623-625 *Acropora vaughani* (× 0.5)
Fig. 623 From Bird Island, collecting station 161, same corallum as Fig. 626.
Fig. 624 From Falcon Island, Palm Islands, collecting station 174, same corallum as Figs. 627, 630, 631.
Fig. 625 From Curacao Island, Palm Islands, collecting station 177, same corallum as Fig. 628.

Fig. 623▲

Fig. 624▼

Fig. 625▼

Acropora (Acropora) vaughani Wells, 1954

Synonymy

Acropora vaughani Wells, 1954; Wallace (1978).

Material studied

Little Mary Reef (2 specimens), **Arden Island, Bushy Islet, Raine Island** (2 specimens), **Bird Island** (6 specimens), **Martha Ridgeway Reef, Wye Reef** (2 specimens), **Corbett Reef, Bewick Island, Howick Island, Houghton Island** (2 specimens), **Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (3 specimens), **Palm Islands** (6 specimens), **Darley Reef**.

Figs. 626-629 *Acropora vaughani* (× 5)

Fig. 626 From Bird Island, same corallum as Fig. 623.
Fig. 627 From Falcon Island, Palm Islands, same corallum as Figs. 624, 630, 631.
Fig. 628 From Curacao Island, Palm Islands, same corallum as Fig. 625.
Fig. 629 From Little Mary Reef.

Fig. 626▲

Fig. 627▲

Fig. 628▼

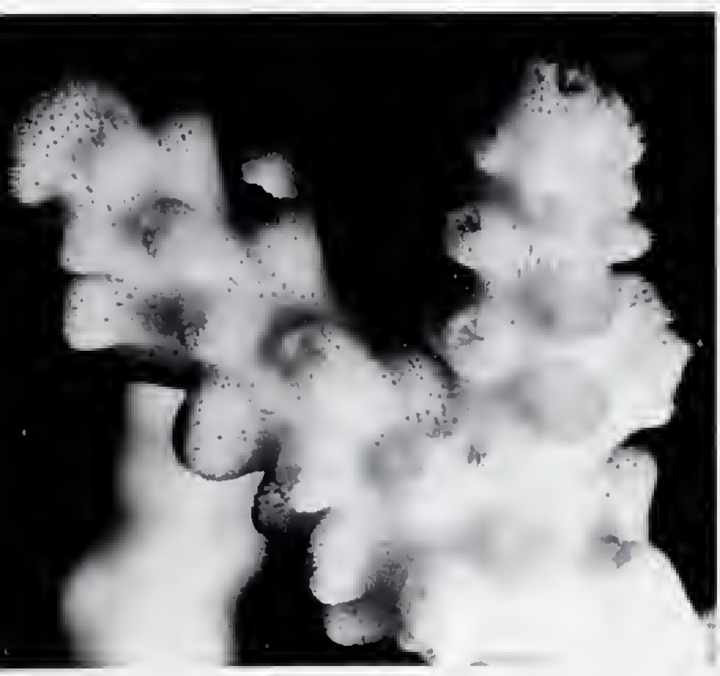


Fig. 629▼

These localities include collecting stations 16, 18, 34, 45, 151, 152, 159, 161, 163, 164, 167, 168, 175, 177, 183, 185, 224, 226.

Characters

Colonies are arborescent, composed of long tapering branches, to caespitose, with main branches covered by branchlets. Main branches are up to 2cm thick; those of shrubby colonies are usually thinner.

Corallites are widely and irregularly spaced and are often irregularly shaped. Those at the base of branches are sub-immersed, while those along branches are rounded, tubular, becoming tubular appressed near the tips, with oval to nariform openings. Radial corallites have calice diameters of 0.3-0.8mm, those nearest branch bases being the smallest. Septal development varies greatly within the one corallum. First cycle septa are $\frac{1}{2}$-$\frac{3}{4}$R, are usually strongly dentate and are equally developed or have one prominent directive. Second cycle septa are usually complete, $\frac{1}{3}$-$\frac{1}{2}$R. Axial corallites are up to 2mm exsert and are 1.5-2.5mm thick, with calice diameters of 0.6-0.9mm. Septa have smooth margins or are slightly dentate. Both cycles are incomplete, sub-equal and $\frac{3}{4}$R, or are unequal, $\frac{3}{4}$R and $\frac{1}{2}$R. The coenosteum is composed of fine, closely compacted spinules, usually with elaborated tips.

Living colonies are uniform in colour, usually blue, cream or pale brown.

Habitat preferences and growth form variation

Acropora vaughani is uncommon in most biotopes and appears restricted to partly protected reef areas similar to those occupied by *A. horrida.* The most arborescent coralla of the present series came from partly exposed fringing reefs, while the smaller more caespitose colonies came from reef biotopes where *Acropora* diversity was generally low. Beyond this, the present series shows no clear correlations between growth form and enviromental conditions.

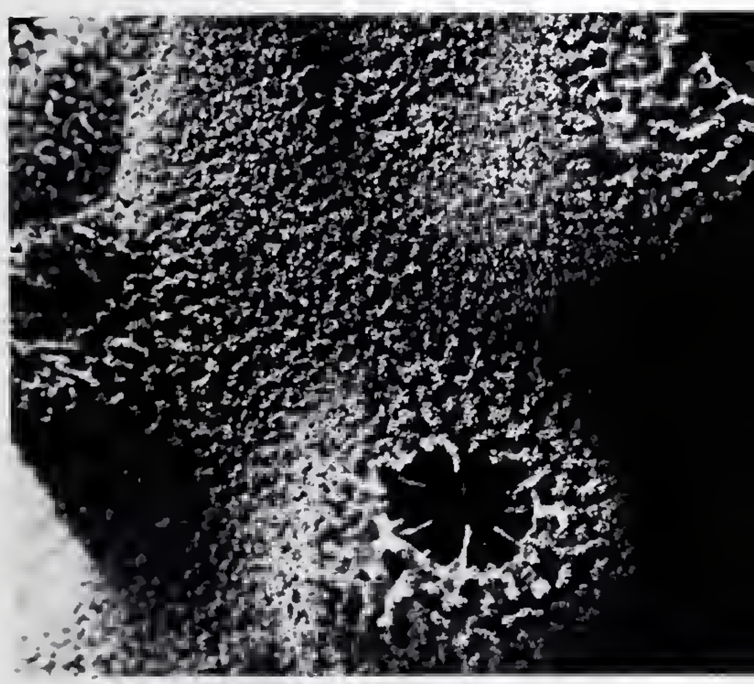
Similar species

Acropora vaughani is closest to *A. horrida* which has a similar range of growth forms and corallites of similar size. Corallites are characteristically more irregular in *A. horrida* and have a more irregular septation with a reduced second septal cycle. The coenosteum of the

Figs. 630, 631 Same corallum of *Acropora vaughani* from Falcon Island, Palm Islands and same corallum as Figs. 624, 627 (× 20).

30▼

Fig. 631▼



two species is very different, that of *A. horrida* forming a reticulate pattern with large spines. Underwater, *A. horrida* is also distinguished by having polyps extended during the day.

Acropora vaughani can also resemble *A. austera* (see p. 266).

Distribution

Known from the west and east coasts of Australia and east to the Marshall and Caroline Islands.

Acropora (Acropora) austera (Dana, 1846)

Synonymy

Madrepora austera Dana, 1846; Brook (1893).

Madrepora scherzeriana Brüggemann; Brook (1893); not Brüggemann (1877).

Acropora multiramosa Nemenzo, 1967.

Acropora austera (Dana); Verrill (1902); Faustino (1927); Wallace (1978).

The only type specimen of this species found was small piece, YPM 4190, from an unknown locality.

Material studied

Canoe Cay (2 specimens), **Yorke Island, Little Mary Reef, Arden Island** (4 specimens), **Deltaic Reef Channel, Turtle Island** (2 specimens), **Raine Island** (8 specimens), **Great Detached Reef** (2 specimens), **Sir Charles Hardy Islands** (4 specimens), **Tijou Reef** (7 specimens), **Howick Island, Houghton Island** (2 specimens), **Willis Islet** (3 specimens), **Magdelaine Cay, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (2 specimens), **Palm Islands** (11 specimens), **John Brewer Reef, Davies Reef, Phillips Reef** (3 specimens), **Marion Reef** (2 specimens), **Darley Reef** (3 specimens), **Chesterfield Reefs** (28 specimens), **Whitsunday Islands, Redbill Reef** (2 specimens), **Fitzroy Reef** (10 specimens), **Llewellyn Reef** (2 specimens), **Lady Musgrave Reef, Flinders Reef (Moreton Bay)** (14 specimens), **Middleton Reef** (8 specimens).

These localities include collecting stations 2, 5, 6, 8, 16, 34, 38, 41, 55 73, 102, 152, 158, 160, 162, 165, 167, 169, 175, 177, 179, 183, 185, 190, 191, 192, 193, 197, 199, 200, 203, 210, 211, 213, 215, 217, 226, 227, 230, 231, 232, 233.

Characters

Colonies have a wide range of growth forms from open arborescent to caespitose. Arborescent colonies have branches up to 4.0cm thick, but are mostly smaller, with branches 1.5cm thick and colonies < 30cm high, excluding dead basal parts. Main branches seldom anastomose. They give off secondary branches and branchlets at irregular intervals and at angles which vary greatly in different colonies.

Radial corallites vary within the one branch in shape, size and orientation, giving an irregular appearance. They are sometimes arranged in rows. They are tubular, rounded to strongly appressed, the latter usually having nariform openings. Protuberant corallites are 2-3mm wide, with calices approximately 1mm diameter. Septation varies greatly both within and between colonies. Second cycle septa are usually incomplete, occasionally absent; first cycle septa are usually $<\frac{1}{2}R$ and are frequently variable in length, with one or two directive septa sometimes conspicuous. Appressed corallites usually have reduced septa adjacent to branches. All septa of radial corallites are strongly dentate. Axial corallites are thick-walled and up to 3mm exsert. 'Outer diameter 2.4-3.8mm; inner diameter 1.0-1.5mm. Septation: all

Figs. 632-635 *Acropora austera* (× 0.5)
Fig. 632 From Fantome Island, Palm Islands, collecting station 34, same corallum as Fig. 636.
Fig. 633, 634 From Chesterfield Atoll, collecting station 210, same coralla as Figs. 637, 638 (respectively).
Fig. 635 From Wye Reef, collecting station 163, same corallum as Fig. 639.

Fig. 632▲

Fig. 633▲

Fig. 634▼

Fig. 635▼

septa usually present, primaries up to $\frac{2}{3}$R, secondaries up to $\frac{1}{2}$R' (Wallace, 1978). However, variation within axial corallites is so great that calice diameters can be as little as 0.4mm and septa can, in some coralla, be almost absent. The coenosteum may be fine with a reticulate pattern or slightly costate or may be coarse and spongy.

Figs. 636-641 *Acropora austera* (× 5)

Fig. 636 From Fantome Island, Palm Islands, same corallum as Fig. 632.
Figs. 637, 638 From Chesterfield Atoll, same coralla as Figs. 633, 634 (respectively).
Fig. 639 From Wye Reef, same corallum as Fig. 635.
Fig. 640 From Flinders Reef (Moreton Bay), collecting station 227.
Fig. 641 From Elizabeth Reef, collecting station 236.

Fig. 636▲

Fig. 637▲

Fig. 638▼

Fig. 639▼

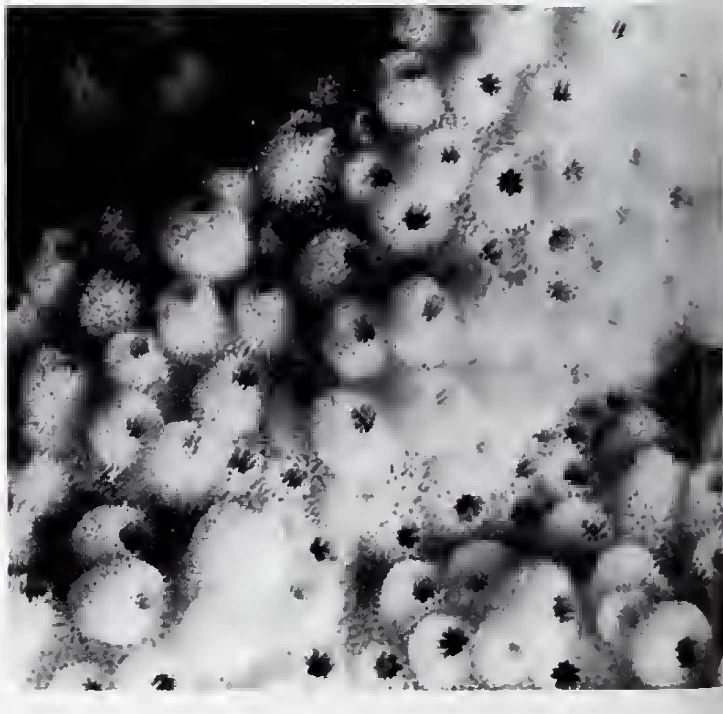


Fig. 640▲

Fig. 641▲

Living colonies have a very wide range of colours including blue, brown, cream, yellow and green. Axial corallites are frequently yellow. 'Extended polyps may be bright orange (axials) and purple (radials)' (Wallace, 1978).

Figs. 642-645 *Acropora austera* (× 20)
Fig. 642 From Howick Island, collecting station 175.
Fig. 643 From Tijou Reef, collecting station 160.
Fig. 644 From Keeper Reef.
Fig. 645 From Hook Reef.

Fig. 642▼

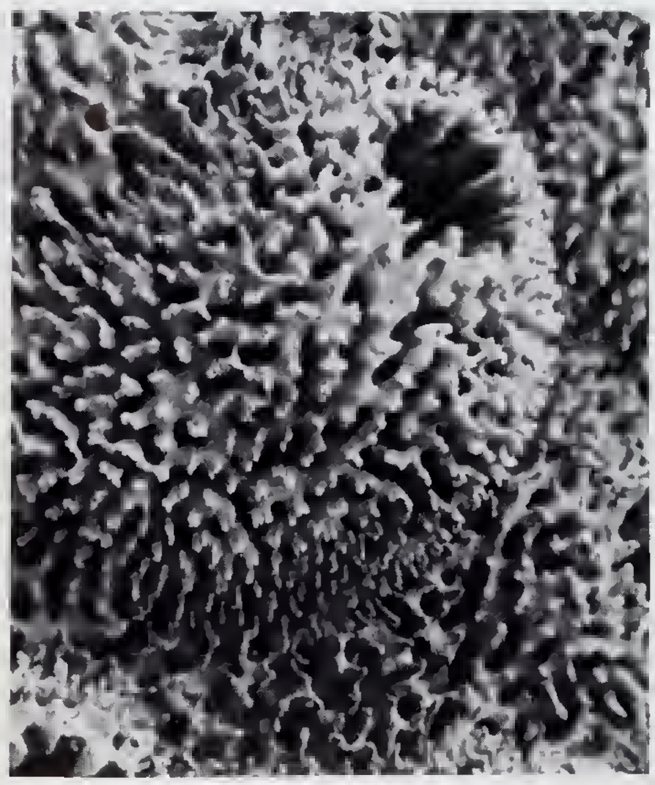


Fig. 643▼

Fig 644▲

Fig 645▲

Habitat preferences and growth form variation

Acropora austera occupies a wide range of biotopes but is most abundant in those exposed to some wave action, particularly on open ocean reefs. Coralla from relatively exposed biotopes are usually arborescent, with thick-walled open corallites. Coralla from increasingly protected biotopes become increasingly caespitose, even sprawling, with relatively small thin-walled and unevenly distributed corallites. The coenosteum between corallites is coarse and spongy in coralla exposed to strong wave action and becomes increasingly fine and reticulate with fine spines in coralla from protected biotopes.

Similar species

Acropora austera does not closely resemble any other species but is sufficiently polymorphic over its full range of enviroments to be sometimes difficult to recognise as a single species, especially in collections without habitat data. It is closest to *A. vaughani* from the most exposed biotopes of this species' enviromental range. *Acropora vaughani* has smaller corallites than those of *A. austera* and a different coenosteum composed of fine, closely compacted spinules with elaborated tips.

Distribution

Widely distributed throughout the tropical Indo-Pacific west to Madagascar and east to the Marshall Islands.

The *Acropora aspera* group

These species are very polymorphic, both in growth form and corallite structure and can be confused in heterogeneous collections. They are primarily characterised by having radial corallites with no upper wall and a lower wall with a rounded or flaring lip. This formation is best developed in *A. millepora* from shallow habitats and least developed in *A. pulchra*.

Figs. 646-648 *Acropora aspera* (× 0.5)

Fig. 646 From Great Detached Reef, collecting station 1, same corallum as Fig. 649.
Fig. 647 From Fantome Island, Palm Islands, collecting station 43, same corallum as Figs. 650, 653.
Fig. 648 From Chesterfield Atoll, collecting station 218, same corallum as Figs. 651, 654.

Fig. 646▼

Fig. 647▼

Fig. 648▼

Acropora (Acropora) aspera (Dana, 1846)

Synonymy

Madrepora aspera Dana, 1846; Brook (1893).

Madrepora hebes Dana, 1846; Brook (1893).

Madrepora cribripora Dana, 1846; Brook (1893).

Madrepora manni Quelch, 1886; Brook (1893).

Madrepora exigua Dana; Brook (1893) not Dana (1846).

Acropora manni (Quelch); Faustino (1927); Nemenzo 1967.

Acropora hebes (Dana); Vaughan (1918); Hoffmeister (1925); Crossland (1952); Wells (1954); Stephenson & Wells (1955); Nemenzo (1967).

Acropora aspera (Dana); Faustino (1927); Crossland (1952); Nemenzo (1967).

?*Acropora yaeyamaensis* Eguchi & Shirai, 1977.

The three nominal species of Dana are all from Fiji, while that of Quelch is from the Philippines.

Material studied

Sue Island (6 specimens), **Turtle Islands** (8 specimens), **Pandora Reef** (2 specimens), **Great Detached Reef** (2 specimens), **Sir Charles Hardy Islands** (3 specimens), **Bewick Island** (2 specimens), **Houghton Island** (3 specimens), **Lizard Island, Three Isles** (3 specimens), **Hope Island** (15 specimens), **Low Isles** (3 specimens), **Flinders Reef (Coral Sea), Britomart Reef** (3 specimens), **Dip Reef** (2 specimens), **Palm Islands** (15 specimens), **Davies Reef, Darley Reef** (3 specimens), **Chesterfield Reefs** (7 specimens), **Redbill Reef** (8 specimens), **Middleton Reef** (3 specimens).

These localities include collecting stations 1, 18, 36, 40, 43, 73, 89, 165, 167, 174, 176, 177, 179, 182, 217, 218, 226, 231.

Characters

This is a very polymorphic species; 'different colonies or parts of a colony can have long, slender spreading branches with scattered radial corallites or shorter, thicker branches, even to the extent of appearing corymbose, with crowded corallites' (Wallace, 1978). Because of its polymorphism, three separate ecomorphs of *A. aspera* are described separately below.

'Colours are commonly pale blue-grey, grey-green, or cream, less commonly bright blue' (Wallace, 1978).

Habitat preferences and skeletal variation

Acropora aspera from exposed reef fronts

Coralla are sub-corymbose with sturdy, tapering, highly anastomosed branches and short, thick sub-branches. Radial corallites are crowded and are of similar size with prominent, rounded lower lips extending well beyond the level of the septa. Corallites are up to 4mm diameter, with calice diameters of 0.8-1.2mm. Septa are thick, strongly dentate, sub-equal and $\frac{1}{3}$R. Corallites on basal branches have a reduced septation but with one or both directive septa remaining conspicuous. Axial corallites are $<$3mm exsert, $<$4.7mm diameter, with calice diameters of 1.0-1.8mm. Septa are in two complete cycles of $\frac{1}{3}$R and $\frac{1}{4}$R. The coenosteum on and between corallites consists of thick, blunt, highly fused spinules.

Acropora aspera from shallow, protected biotopes

This species is particularly abundant on reef flats and shallow lagoons where *Acropora* diversity is low. In such biotopes it readily forms 'micro-atolls' or, in slightly deeper water, arborescent colonies with sturdy branches (10-15mm thick) which seldom anastomose. Radial corallites are crowded (although less crowded than those on coralla from exposed biotopes) and are of two sizes. The larger have prominent rounded lower lips, are <4mm across, with calice diameters of 0.7-1.2mm. Septa are dentate and are in two complete cycles of $\frac{1}{2}$R and $\frac{1}{4}$R. The smaller corallites are mostly immersed, except near branch tips, and are

Figs. 649-652 *Acropora aspera* (× 5)
Fig. 649 From Great Detached Reef, same corallum as Fig. 646.
Fig. 650 From Fantome Island, Palm Islands, same corallum as Figs. 647, 653.
Fig. 651 From Chesterfield Atoll, same corallum as Figs. 648, 654.
Fig. 652 From Curacao Island, Palm Islands, collecting station 177.

Fig. 649▲

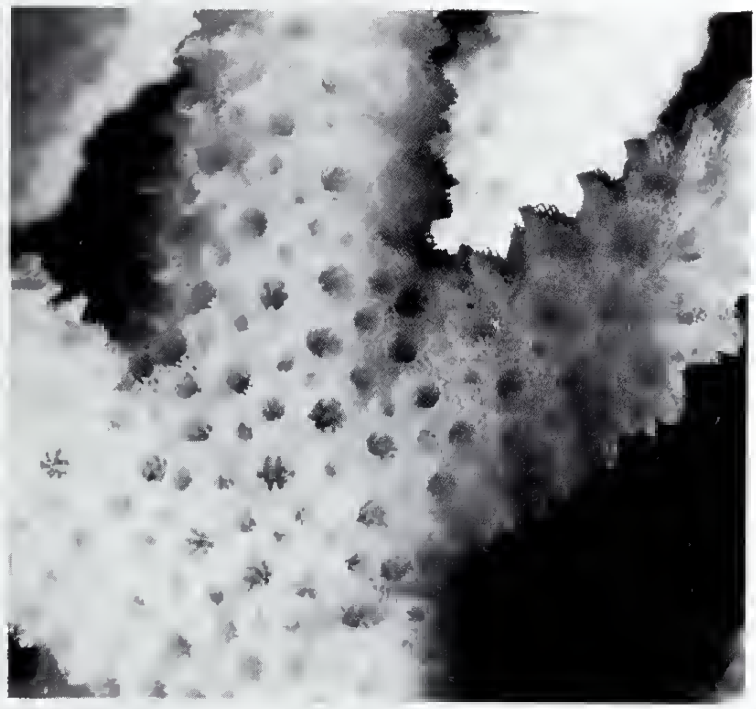
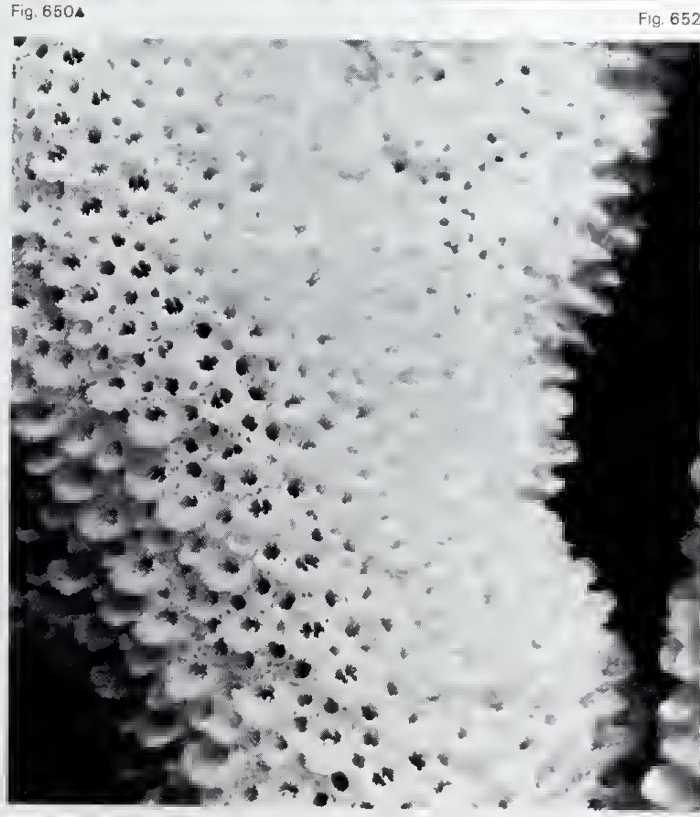


Fig. 650▲

Fig. 651▼

Fig. 652▼



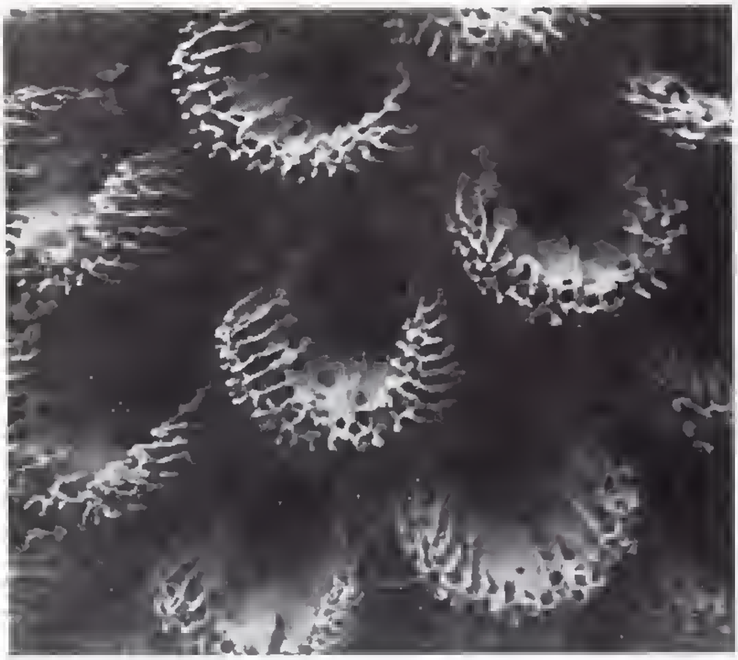


Fig. 653▲

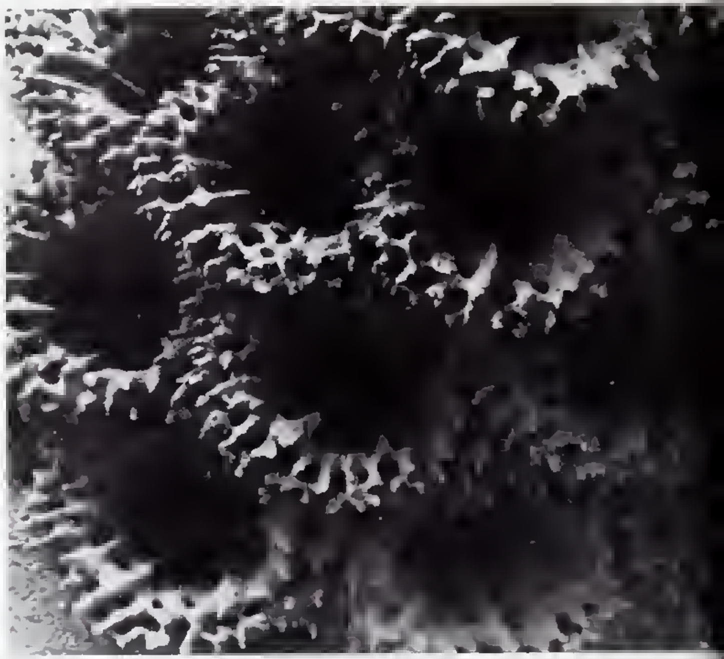


Fig. 654

Figs. 653, 654 *Acropora aspera* (× 20)
Fig. 653 From Fantome Island, Palm Islands, same corallum as Figs. 647, 650.
Fig. 654 From Chesterfield Atoll, same corallum as Figs. 648, 651.

usually <2mm diameter. Axial corallites are <4mm diameter, with calice diameters of 1.4-1.6mm. Septa have smooth margins and are in two complete cycles of $\frac{2}{3}$R and $\frac{1}{4}$R. Coralla are less calcified than those described above, with thinner-walled corallites and a more openly reticulate coenosteum.

Acropora aspera from protected biotopes with reduced light availability

Coralla from deeper reef slopes or from shallow, turbid lagoons are arborescent, having relatively thin (8-11mm thick) branches with relatively small, widely spaced radial corallites which may be of two sizes, although the smaller size is often uncommon or absent. The larger radial corallites are <2mm diameter, with calice diameters of 8.0-1.0mm. They tend to be dimidiate, sometimes with pointed lower lips. Usually only one cycle of septa is developed, <$\frac{1}{4}$R; sometimes only a single septum is developed. Axial corallites are 3-5mm diameter, have calice diameters of 0.8-1.2mm and have two complete cycles of septa of $\frac{1}{3}$R and $\frac{1}{4}$R with smooth margins. All corallites are lightly calcified with highly perforate walls. The coenosteum consists of fine anastomosed spinules.

Affinities

As noted by Wallace (1978), corymbose *A. aspera* may be very similar to *A. millepora* (see p. 278) and the species may resemble *A. pulchra* (see p. 274).

Distribution

Recorded from the Cocos-Keeling Islands, the west Australian coast and the central Indo-Pacific Islands, east to Fiji.

Figs. 655-658 *Acropora pulchra* (× 0.33)
Fig. 655 From Great Detached Reef, collecting station 5, same corallum as Fig. 659.
Fig. 656 From Elizabeth Reef, collecting station 239, same corallum as Fig. 660.
Fig. 657 From Middleton Reef, same corallum as Fig. 661.
Fig. 658 From the Palm Islands, same corallum as Fig. 662.

Fig. 655▼

Fig. 656▼

Fig. 658▼

Fig. 657▲

Acropora (Acropora) pulchra (Brook, 1891)

Synonymy

Madrepora pulchra Brook, 1891; Brook (1893).

Acropora pulchra (Brook); Vaughan (1918); Stephenson & Wells (1955); ?Nemenzo (1967); Chevalier (1968); Zou (1975); Wallace (1978); not Crossland (1952).

Brook (1893) divided his *A. pulchra* into two varieties, var. *stricta* and var. *alveolata*, a distinction maintained by Vaughan (1918) but one which has no defined biological significance. Crossland's (1952) *A. pulchra* is *A. nobilis*.

Material studied

Bramble Cay, Sue Island, Thursday Island, Pandora Reef (5 specimens), **Great Detached Reef, Martins Reef, Low Isles** (2 specimens), **Dip Reef, Pandora Reef, Palm Islands** (8 specimens), **Keeper Reef, Darley Reef** (2 specimens), **Fitzroy Reef** (3 specimens), **Llewellyn Reef** (2 specimens), **Middleton Reef** (8 specimens), **Elizabeth Reef**.

These localities include collecting stations 5, 17, 54, 128, 174, 177, 196, 197, 200, 234, 235, 239.

Characters

Colonies are openly arborescent to compact, corymbose. 'Branch widths are from 7 to 15mm and the overall general colony form can be anything from an arborescent thicket to a neatly caespito-corymbose clump' (Wallace, 1978). Radial corallites are of mixed sizes < 1.7mm wide, with calice diameters of < 1mm. They have lip-like lower walls and rounded or dimidiate openings. Directive septa are prominent, with lobed margins; the remaining first cycle septa are $< \frac{2}{3}R$ but usually consist of rows of spines only. Second cycle septa are incomplete, $< \frac{1}{4}R$. 'Axial corallites: 1 to 2mm exsert; external diameter 2.0 to 3.5mm, internal diameter 0.6 to 1.2mm. Septation: primary septa well developed, up to $\frac{2}{3}R$, secondary septa absent or poorly represented, occasionally all present up to $\frac{1}{4}R$' (Wallace,

Figs. 659-664 *Acropora pulchra* (× 5)

Fig. 659 From Great Detached Reef, same corallum as Fig. 655.
Fig. 660 From Elizabeth Reef, same corallum as Fig. 656.
Fig. 661 From Middleton Reef, same corallum as Fig. 657.
Figs. 662, 663 From the Palm Islands, Fig. 662 same corallum as Fig. 658.
Fig. 664 From Llewellyn Reef, collecting station 196.

Fig. 659▼

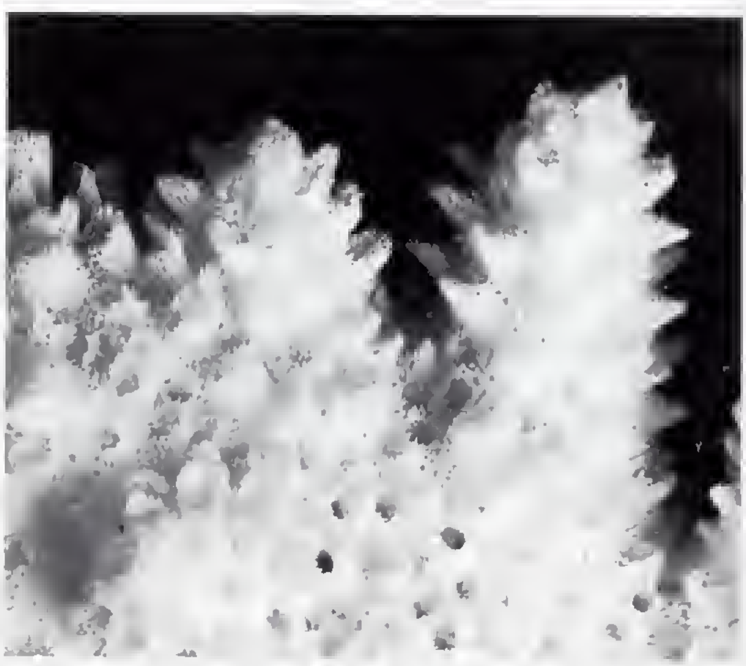


Fig. 6

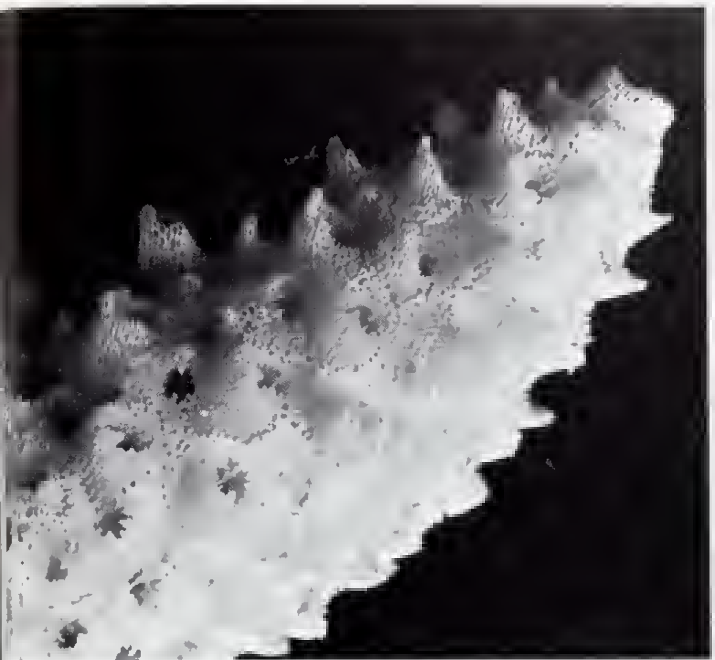


Fig. 661▲

Fig. 662▲

Fig. 663▼

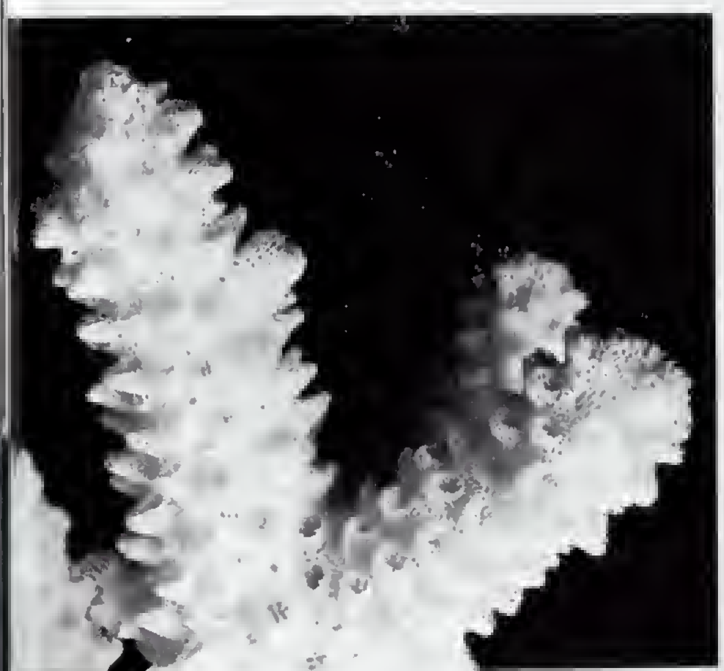


Fig. 664▼

1978). Corallites are finely costate. The coenosteum between corallites consists of loosely anastomosed flattened spinules and is very porous.

'Living colonies are pale to dark brown, often with pale blue tips' (Wallace, 1978).

Habitat preferences and growth form variation

Acropora pulchra is uncommon over most of its range. It is restricted to shallow back reef margins and reef flats where it occurs with *A. aspera*. The present series has little growth form variation, although, as described by Wallace (1978), colonies vary in shape in a manner similar to *A. aspera* from the same biotopes.

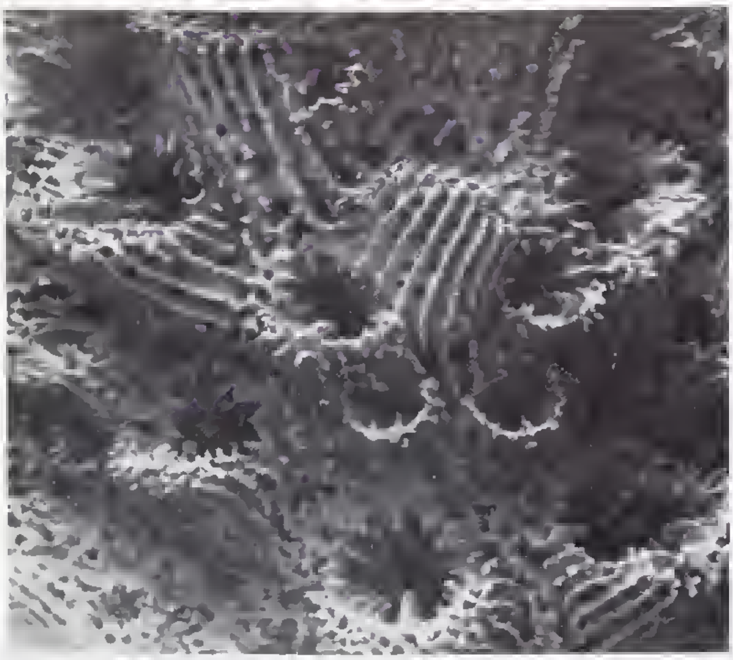


Fig. 665▲

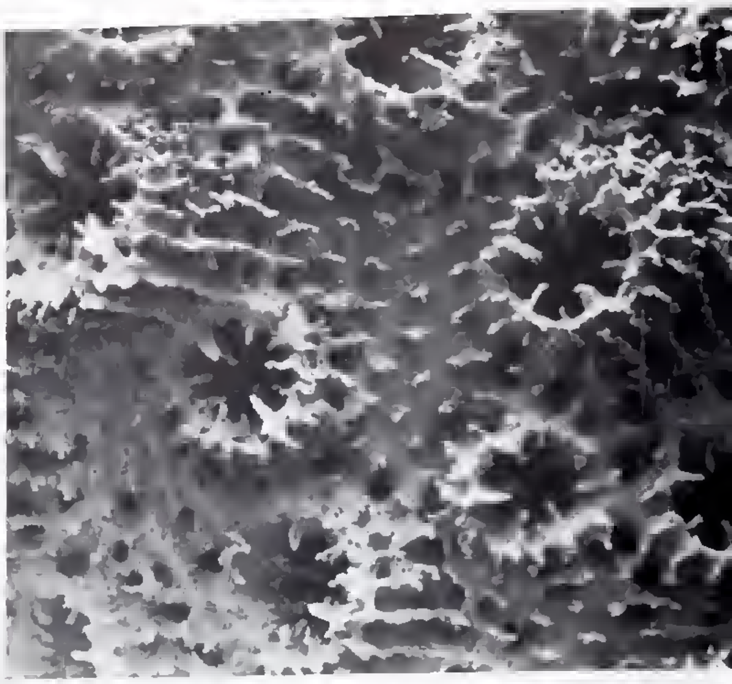


Fig. 666▲

Figs. 665, 666 *Acropora pulchra* from the Palm Islands (× 20).

Affinities

Acropora pulchra is closest to *A. aspera*, being distinguished by its smaller corallites which are of mixed sizes, rather than two distinct sizes. As the corallite sizes of *A. aspera* decrease with decreasing light availability, coralla from partly turbid or deep water may be very similar to *A. pulchra*, except that corallites are less crowded, branching is mostly open and septa are poorly developed (see p. 270). *Acropora pulchra* may also resemble finely branched *A. millepora*, which is distinguished by having radial corallites of uniform size arranged in a characteristically fish scale-like manner.

Distribution

Recorded from the Cocos-Keeling Islands, the west Australian coast and the central Indo-Pacific Islands, east to Fiji.

Acropora (Acropora) millepora (Ehrenberg, 1834)

Synonymy

Heteropora millepora Ehrenberg, 1834.

?*Madrepora convexa* Dana, 1846; Brook (1893).

?*Madrepora prostrata* Dana, 1846.

Madrepora millepora (Ehrenberg); Brook, 1893.

Madrepora spathulata Brook, 1891; Brook (1893).

Madrepora squamosa Brook, 1892; Brook (1893).

Acropora sarmentosa (Brook); Vaughan (1918), not Brook (1892).

Acropora squamosa (Brook); Vaughan (1918); Matthai (1923); Crossland (1952); Stephenson & Wells (1955); Pillai (1967b).

Acropora millepora (Ehrenberg); Verrill (1902); Thiel (1932); Nemenzo (1967); Wallace (1978).

Figs. 667-670 *Acropora millepora* (× 0.5)

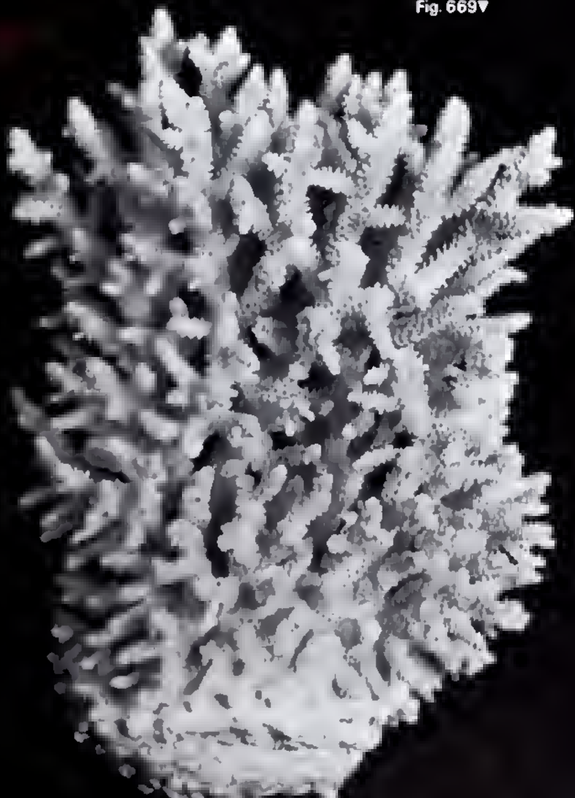
Fig. 667 From Davies Reef, same corallum as Fig. 671.
Fig. 668 From Britomart Reef, same corallum as Figs. 672, 677.
Fig. 669 From Flinders Reef (Coral Sea), collecting station 218, same corallum as Fig. 673.
Fig. 670 From Chesterfield Atoll, collecting station 218, same corallum as Fig. 674.

Fig. 667▲

Fig. 666▲

Fig. 670▼

Fig. 669▼



?*Acropora prostrata* (Dana); Faustino (1927); Wells (1954).

Acropora singularis Nemenzo, 1967.

Acropora librata Nemenzo, 1967.

Ehrenberg's holotype of *A. millepora* from the 'Indian Ocean' (ZMB 854) is clearly representative of this species.

Dana's *A. convexa* from Singapore (USNM 236, YPM 2031) and *A. prostrata* from Fiji (YPM 4180) and the Sulu Sea (USNM 253) are very similar, as are the specimens of authors noted above who have used those names. They differ from coralla of the present series in having wider spaced radial corallites with slightly less well-developed lower lips. They appear to be either variants of *A. millepora* or a separate closely related species.

Material studied

Little Mary Reef, Arden Island (10 specimens), **Sue Island** (2 specimens), **Triangle Reef** (2 specimens), **Great Detached Reef** (2 specimens), **Bird Island** (2 specimens), **Sir Charles Hardy Islands** (3 specimens), **Wye Reef** (3 specimens), **Cat Reef, Tijou Reef, Howick Island** (2 specimens), **Houghton Island** (3 specimens), **Lizard Island Lagoon** (3 specimens), **Hope Island** (2 specimens), **Low Isles** (2 specimens), **Flinders Reef (Coral Sea)** (5 specimens), **Britomart Reef** (7 specimens), **Palm Islands** (27 specimens), **Davies Reef, Magnetic Island, Marion Reef, Darley Reef** (3 specimens), **Chesterfield Reefs** (3 specimens), **Bushy Island-Redbill Reef** (2 specimens), **Fitzroy Reef** (3 specimens), **Flinders Reef (Moreton Bay)** (7 specimens), **Middleton Reef.**

These localities include collecting stations 1, 5, 6, 34, 36, 37, 40, 41, 43, 45, 55, 57, 60, 73, 80, 100, 148, 157, 161, 163, 165, 167, 168, 174, 175, 176, 177, 179, 182, 183, 185, 190, 197, 200, 205, 216, 218, 226, 227, 231.

Characters

Colonies are usually corymbose to tabular, rarely sub-arborescent or bushy, usually with a central to side-attached stalk. They are commonly approximately 1m diameter and approximately circular in outline. Branches are neatly arranged, equidistant from each other, terete or slightly tapering (8-15mm thick). Central branches are vertical, those at the margins curve from horizontal to vertical or oblique. Branching occurs at irregular intervals; main branches are usually highly anastomosed, often forming plates.

'Axial corallites: Barely exsert. Outer diameter 2.4 to 3.9mm; inner diameter 0.9 to 1.6mm. Septation: primary cycle fully developed, up to $\frac{1}{2}$R; secondary cycle usually represented, but not all septa developed, up to $\frac{1}{4}$R.

Radial corallites: no upper wall is developed, the lower half of the wall is expanded as a rounded lip, and the outer edges of this lip may flare away from the opening of the corallite. The primary septa are often well developed, up to $\frac{2}{3}$R, secondaries absent or a few present to $\frac{1}{4}$R' (Wallace, 1978). Radial corallites are characteristically arranged in neat fish scale-like rows spiralling around and/or running lengthwise on branchlets.

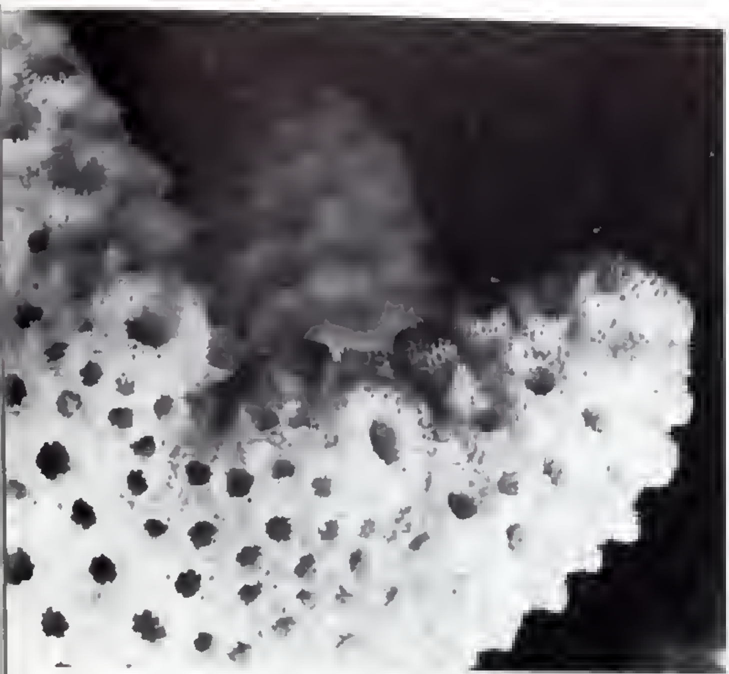
Colonies have a wide variety of colours: green with orange tips is the most common, others are bright salmon pink, bright orange, pale green or multiple colours, predominantly blue or pink.

Habitat and skeletal variations

As with several other *Acropora* species, *A. millepora* is restricted to shallow water,

Figs. 671-676 *Acropora millepora* (× 5)

Fig. 671 From Davies Reef, same corallum as Fig. 667.
Fig. 672 From Britomart Reef, same corallum as Figs. 668, 677.
Fig. 673 From Flinders Reef (Coral Sea), same corallum as Fig. 669.
Fig. 674 From Chesterfield Atoll, same corallum as Fig. 670.
Fig. 675 From Hope Island.
Fig. 676 From Fantome Island, Palm Islands, collecting station 43.



ig. 671▲

Fig. 673▼

ig. 675▼

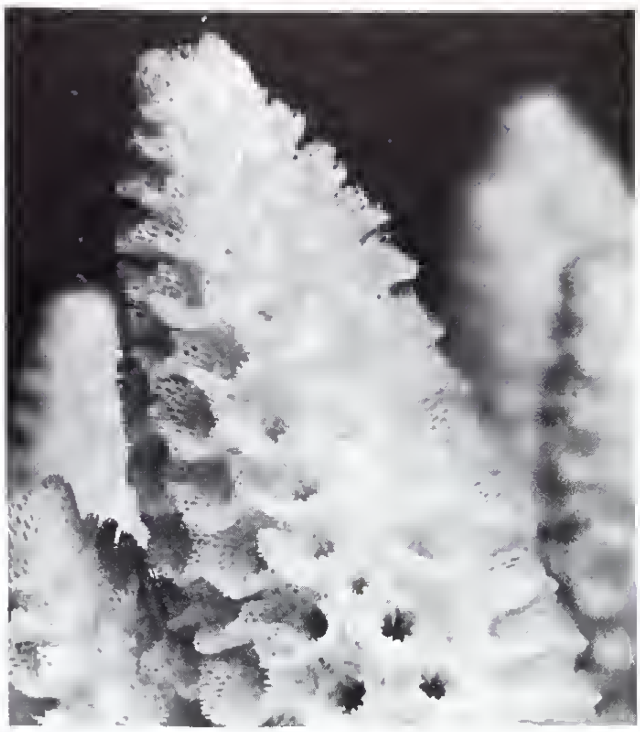


Fig. 672▲

Fig. 674▼

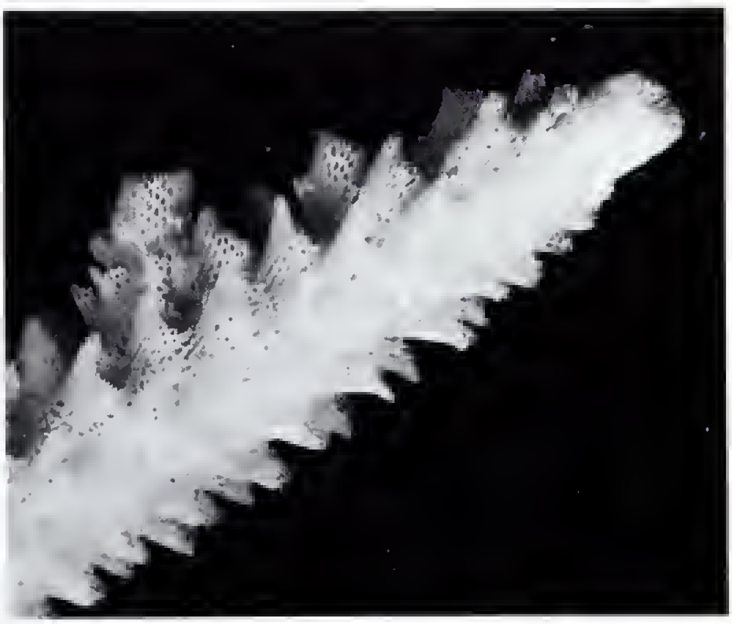


Fig. 676▼

usually on reef flats, or less commonly on reef slopes of <10m depth where water circulation is good.

Coralla from intertidal and subtidal reef flats and lagoons are heavily calcified. Corallites have thick walls and radial corallites are compact. Septa are relatively poorly developed.

Coralla from outer reef slopes, where the species is most abundant, or those from back reef margins, have relatively thick, regularly arranged branches. Corallites are as described above.

Coralla from fringing reefs where the water is relatively turbid usually have thin branches which may be straight and unbranched, or branching may be frequent and sub-equal, with sub-branches irregularly anastomosed. Septa are well developed; the primary septa of axial corallites may reach the centre, with the second cycle $\frac{2}{3}$R. Radial corallites usually have two complete cycles, with very strongly developed directive septa in line with the branch axes.

Affinities and similar species

Acropora millepora is a well-defined species which does not usually resemble any other. Corallite structure most closely resembles that of corymbose *A. aspera* from very shallow water, which has a similar scale-like arrangement of the radial corallites. However, *A. aspera* usually has radial corallites of two different sizes (p. 269) and forms caespitose to arborescent colonies. Underwater, *A. millepora* most closely resembles *A. tenuis*, but radial corallites of the latter are more widely spaced and elongate. *Acropora millepora* from relatively turbid environments, having thin branchlets, can resemble *A. subulata* in growth form, but the appearances of the corallites remains distinctive.

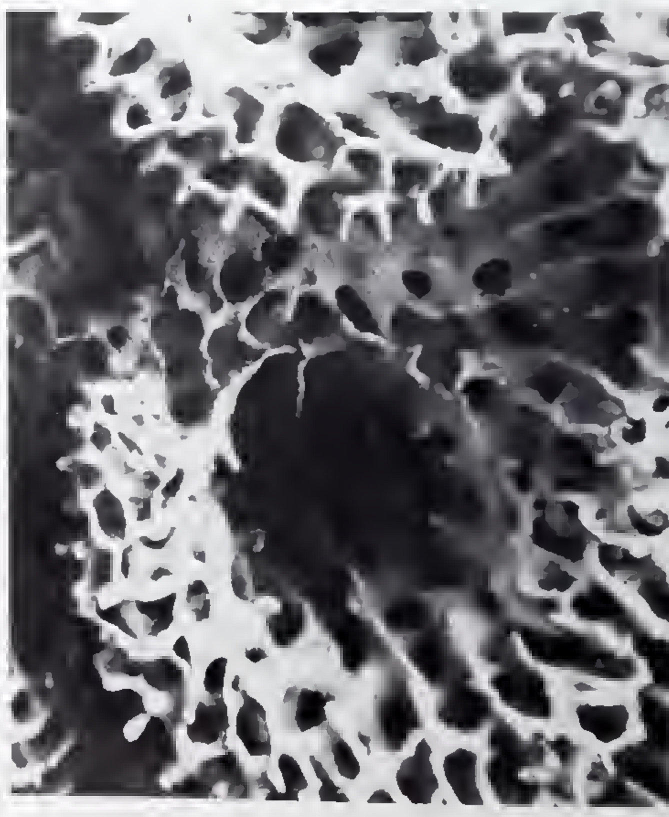
Distribution

Widely distributed in the tropical Indo-Pacific east to the Marshall Islands and Tonga and west to the west Australian coast, Thailand and probably Sri Lanka.

Figs. 677, 678 *Acropora millepora*
Fig. 677 From between Orpheus and Fantome Islands, collecting station 60(× 20).
Fig. 678 From Britomart Reef, collecting station 167 (× 40).

Fig. 677▼

Fig. 678▼



The *Acropora selago* group

Within this group there are close affinities between *A. tenuis* and *A. selago* and also between *A. donei* and *A. yongei*. Both pairs of species have in common similar radial corallites with strongly developed lower walls and flaring or pointed lower lips. The affinities of *A.* cf. *dendrum* are less clear and its inclusion in this group is somewhat arbitrary.

Acropora (Acropora) tenuis (Dana, 1846)

Synonymy

Madrepora tenuis Dana, 1846; Brook (1893).

Madrepora macrostoma Brook, 1891; Brook (1893).

Madrepora bifaria Brook, 1892; Brook (1893).

Madrepora kenti Brook, 1892; Brook (1893).

?*Madrepora africana* Brook, 1893.

Acropora africana (Brook); Crossland (1948).

Acropora tenuis (Dana); Faustino (1927); Wallace (1978).

Acropora macrostoma (Brook); Crossland (1952); Nemenzo (1967).

Acropora kenti (Brook); Wells (1954).

Acropora plana Nemenzo, 1967.

Of Dana's syntypes of *A. tenuis* from an unrecorded locality, YPM 4182 is almost unrecognisable but USNM 259 clearly belongs to the present species.

Of Brook's species, *A. bifaria* from Java, *A. kenti* from the Great Barrier Reef and *A. africana* from Sri Lanka show no deviation from coralla of the present series (*A. africana* being represented in the BMNH by a mentioned specimen only), while his *A. macrostoma* from Mauritius has thick, more compacted branchlets than found in the present series. *Acropora plana* Nemenzo is at the other extreme of the species range, with fine branchlets and small corallites.

Material studied

Little Mary Reef (2 specimens), **Arden Island, Murray Islands, Turtle Islands** (6 specimens), **Raine Island** (4 specimens), **Great Detached Reef, Sir Charles Hardy Islands** (7 specimens), **Martha Ridgeway Reef, Wye Reef, Franklin Reef** (2 specimens), **Tijou Reef** (10 specimens), **Howick Island, Lizard Island, Hope Island, Willis Islet, Magdelaine Cay** (5 specimens), **Mellish Reef, Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef** (17 specimens), **Palm Islands** (13 specimens), **Lodestone Reef, Chesterfield Reefs** (6 specimens), **Bushy Island-Redbill Reef** (2 specimens), **Fitzroy Reef** (10 specimens), **Llewellyn Reef, Lady Musgrave Reef** (3 specimens), **Middleton Reef** (3 specimens), **Elizabeth Reef**.

These localities include collecting stations 1, 2, 8, 34, 37, 42, 55, 57, 60, 73, 100, 149, 150, 151, 152, 155, 158, 159, 160, 163, 165, 167, 168, 169, 174, 175, 179, 181, 183, 185, 190, 191, 192, 194, 197, 199, 200, 208, 210, 211, 216, 226, 231, 236.

Characters

Colonies form thick corymbose plates which are primarily characterised by the neat, regular arrangement of branchlets and the neat arrangement of the radial corallites. Branchlets are up to 9cm long, 7-10mm thick and have few sub-branchlets.

Figs. 679-681 *Acropora tenuis* (× 0.33)

Fig. 679 From Chesterfield Atoll, collecting station 210.
Fig. 680 From Britomart Reef, collecting station 167, same corallum as Fig. 682.
Fig. 681 From Rib Reef.

Fig. 878▲

Fig. 880▼

Fig. 881▼

Radial corallites are appressed, 2.1-3.2mm diameter, with rounded to nariform calices up to 1.8mm diameter. Septa of distal radial corallites are in two sub-equal, incomplete, bilaterally symmetrical cycles and are frequently reduced to rows of spines, except for the more prominent outer directive septum. Those of the more proximal corallites on branchlets are better developed, with the first cycle complete, $<\frac{2}{3}R$, and the second cycle $<\frac{1}{4}R$ or absent. Axial corallites are 2-8mm exsert, 2.4-3.4mm diameter, have calices 0.8-1.2mm diameter and septa in two complete, sub-equal cycles of $<\frac{1}{2}R$.

Figs. 682-685 *Acropora tenuis* (× 5)

Fig. 682 From Britomart Reef, same corallum as Fig. 680.
Fig. 683 From Chesterfield Atoll, collecting station 210.
Fig. 684 From Britomart Reef.
Fig. 685 From the Sir Charles Hardy Islands, collecting station 179.

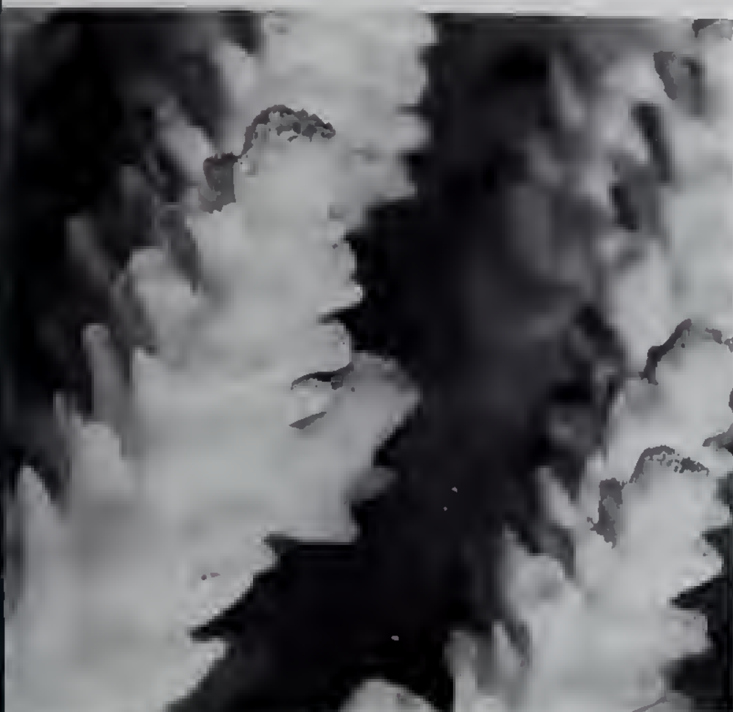


Fig 682▲ Fig. 684▼ Fig. 683▲ Fig. 685▼

All corallites are finely costate. The coenosteum between corallites is also costate, the costae, becoming increasingly calcified proximally, giving an almost smooth surface.

Living colonies are usually cream or blue. They are frequently brightly coloured, with radial corallites or the lips of radial corallites having a different hue from that of the rest of the colony.

Habitat preferences and growth form variation

Acropora tenuis is common in most coral communities with a moderate to high *Acropora* diversity. Well-developed colonies always have the form of a corymbose plate. Colonies from shallow biotopes exposed to full sunlight are relatively well calcified having thick branchlets and relatively large radial corallites with thick walls. Axial corallites are usually < 2mm exsert and there are few, if any, incipient axial corallites. Colonies from increasing depth are increasingly less calcified. Axial corallites become increasingly exsert with incipient axial corallites becoming abundant. Radial corallites are relatively thin-walled and usually have markedly nariform openings.

Similar species

Acropora tenuis is readily distinguished underwater and in the laboratory by the neat arrangement of its branchlets, and particularly by the neat arrangement of its radial corallites which have a rosette-like appearance when viewed from above. It is closest to *A. selago* (see p. 285). (Corallite structures are also similar to those of *A. striata* which occurs in the Marshall Islands, the latter being primarily distinguished by its hispidose branches.)

Distribution

Widely distributed in the tropical Indo-Pacific, west to Mauritius and east to the Marshall Islands.

Figs. 686, 687 *Acropora tenuis* (× 20)
Fig. 686 From Britomart Reef, collecting station 167.
Fig. 687 From Tijou Reef, collecting station 8.

Fig 686▼

Fig 687▼

Acropora (Acropora) selago (Studer, 1878)

Synonymy

Madrepora selago Studer, 1878.

Madrepora delicatula Brook, 1891; Brook (1893).

Acropora delicatula (Brook); Wells (1954); Wallace (1978); not Stephenson & Wells (1955).

Studer's holotype of *A. selago* (ZMB 1970) from New Ireland is a flat plate with fine branchlets, similar to Brook's holotype of *A. delicatula* from the Solomon Islands.

Material studied

Big Mary Reef (2 specimens), **Little Mary Reef** (2 specimens), **Arden Island** (3 specimens), **Murray Islands, Bird Island, Sir Charles Hardy Islands** (4 specimens), **Wye Reef, Tijou Reef** (30 specimens), **Corbett Reef, Howick Island, Lizard Island, Flinders Reef (Coral Sea)** (5 specimens), **Britomart Reef** (28 specimens), **Palm Islands** (9 specimens), **Lodestone Reef, Bowden Reef, Chesterfield Reefs** (4 specimens).

Figs. 688-691 *Acropora selago* (× 0.33)
Fig. 688 From Britomart Reef, collecting station 167, same corallum as Fig. 692.
Fig. 689 From the Murray Islands, collecting station 181, same corallum as Fig. 693.
Fig. 690 From Britomart Reef, same corallum as Fig. 694.
Fig. 691 From Fantome Island, Palm Islands, collecting station 43, same corallum as Fig. 695.

Fig. 888▼

Fig. 689▼

Fig. 690▼

Fig. 691▼

These localities include collecting stations 8, 34, 41, 45, 57, 89, 155, 156, 161, 162, 163, 164, 167, 168, 173, 175, 179, 181, 183, 185, 187, 210, 216, 226.

Characters

Colonies are caespito-corymbose or plate-like with a side attachment. Branches are 3.5-5.5mm thick 1cm from their tips. Sub-branches form at irregular intervals and sometimes they anastomose.

Radial corallites are strongly appressed and cochleariform, giving a rough scale-like appearance. They are <1.9mm wide with calice diameters of 0.7-0.8mm. First order septa are frequently incomplete, $<\frac{1}{2}R$, second order septa are almost always incomplete, $\frac{1}{4}R$ or

Figs. 692-695 *Acropora selago* (× 5)

Fig. 692 From Britomart Reef, same corallum as Fig. 688.
Fig. 693 From the Murray Islands, same corallum as Fig. 689.
Fig. 694 From Britomart Reef, same corallum as Fig. 690.
Fig. 695 From Fantome Island, Palm Islands, same corallum as Fig. 691.

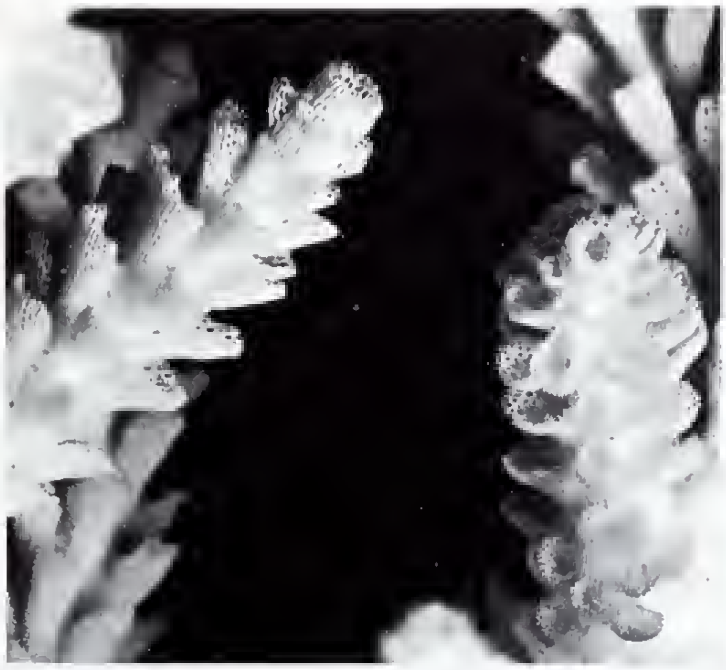


Fig. 692▲ Fig. 694▼ Fig. 693▲ Fig. 695▼

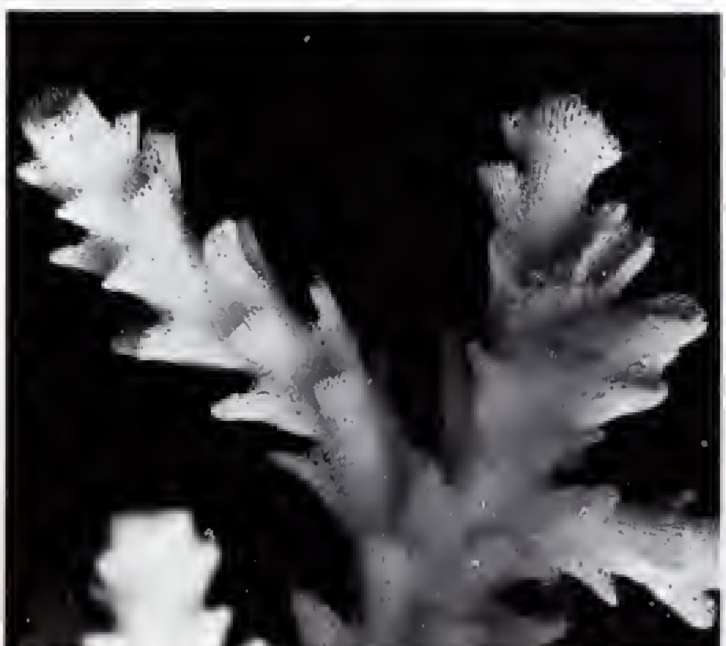


Fig 696▲

Fig. 697▲

Figs. 696, 697 *Acropora selago* (× 20)
Fig. 696 From Falcon Island, Palm Islands, collecting station 57.
Fig. 697 From Britomart Reef, collecting station 167.

absent. Some radial corallites have no septa. Where present, septa are usually strongly dentate. Axial corallites are <3mm exsert, 1.5-2.4mm diameter, with calice diameters of 0.6-0.9mm. Septa are in two cycles of $\frac{1}{4}$-$\frac{1}{2}$R and <$\frac{1}{3}$R, the second cycle frequently being incomplete. All corallites are finely costate, the costae having fine spinules. The coenosteum between corallites is also costate, becoming almost solid on main branches.

Living colonies are mostly pale cream or brown and frequently have polyps extended during the day.

Habitat preferences and growth form variation

Acropora selago occurs in a wide variety of habitats, from exposed outer reef slopes to turbid lagoons and fringing reefs. Compact caespito-corymbose colonies occur in upper reef slopes exposed to strong sunlight and to currents. Colonies become increasingly plate-like at greater depth or where the water is partly turbid.

Similar species

Acropora selago has similarities with *A. tenuis*, *A. aculeus*, *A. subulata* and *A. donei*. Of these it is probably closest to *A. tenuis*, from which it is distinguished by its thinner, more irregular branches and the absence of well-defined branchlets, its lightly structured radial corallites, which are smaller and do not have a rosette-like appearance when viewed from above, and also by the septa of distal radial corallites which are sub-equal in *A. tenuis*. *Acropora aculeus* has thinner branches and smaller, appressed tubular radial corallites with round rather than cochleariform calices, is usually brightly coloured and does not have polyps expanded during the day. *Acropora subulata* and *A. donei* are readily distinguished from *A. selago* by their differing growth forms consisting of fine and coarse tables respectively (see pp. 323 and 287).

Distribution

Recorded from the central western Pacific and the Marshall and Solomon Islands.

Aeropora (Aeropora) donei n.sp.

Material studied

Little Mary Reef (4 specimens), **Arden Island, Murray Islands** (2 specimens), **Raine Island** (3 specimens), **Sir Charles Hardy Islands** (2 specimens), **Cat Reef** (2 specimens), **Lizard Island** (3 specimens), **Hope Island, Magdelaine Cay, Mellish Reef, Flinders Reef (Coral Sea), Britomart Reef** (15 specimens), **Rib Reef, Myrmidon Reef** (2 specimens), **Palm Islands** (17 specimens), **Lodestone Reef, Chesterfield Reefs, Heron Island, Fitzroy Reef** (5 specimens), **Lady Musgrave Reef** (5 specimens), **Flinders Reef (Moreton Bay).**

These localities include collecting stations 34, 43, 57, 60, 100, 148, 152, 158, 167, 168, 173, 174, 176, 179, 181, 183, 185, 186, 188, 190, 191, 194, 195, 197, 200, 207, 210, 219, 220, 226, 227.

Charaeter

Colonies are caespito-corymbose or form large corymbose plates and tables. Branches are highly anastomosed, with main radiating horizontal branches occurring at different levels interconnecting with sub-branches.

Radial corallites are immersed on the proximal part of main branches. On distal parts, they become nariform then dimidiate and cochleariform, with calices 0.3-1.0mm diameter. Sometimes they have two different shapes and sizes, the smaller corallites remaining sub-immersed. Septa are usually not divisible into cycles, there being only a directive septum, with the other septa reduced to bisymmetrically arranged rows of spines. Rarely, septa are in two complete cycles up to $\frac{1}{2}$R and $\frac{1}{3}$R. Axial corallites are 2.5-4.2mm wide, <3mm exsert and have calice diameters of 1.0-1.4mm. Their septation is extremely variable. Septa may be in two cycles of $\frac{2}{3}$R and $\frac{1}{3}$R or be equal and up to 19 in number. In all cases, they are plate-like with smooth margins. All corallites are costate. The coenosteum between the corallites is very coarse, being largely composed of anastomosed spinules with elaborated tips.

Living colonies are usually green, white, cream or, rarely, pale brown.

Habitat preferenees and growth form variation

Acropora donei is very distinctive but seldom seen, as it appears to be restricted to shallow fringing reefs or reef slope habitats where *Acropora* diversity is high. Coralla of the present series vary according to the different growth forms noted above, the thickness of branches and the degree to which they are anastomosed. Coralla from upper reef slopes are plates of thick, highly anastomosed branches with tapering branchlets and prominent corallites. Coralla from deeper water tend to be corymbose with thinner branches.

Similar speeies

Acropora donei has a growth form similar to that of *A. latistella*, only all skeletal structures are several times larger and coarser. Corallites are closest to those of *A. yongei* in so far as both are cochleariform and of similar size. However, they have a completely different septation and these species have different growth forms, with *A. yongei* being arborescent.

Etymology

Named after Dr Terry Done of the Australian Institute of Marine Science.

Figs. 698-701 *Acropora donei* (× 0.33)

Figs. 698, 699 From Lizard Island, Fig. 698 holotype, same corallum as Figs. 702, 708; Fig. 699, same corallum as Fig. 703.

Fig. 700 From Britomart Reef, collecting station 168, same corallum as Figs. 704, 705.

Fig. 701 From the Murray Islands, collecting station 181, same corallum as Figs. 706, 707, 709.

Fig. 698▲

Fig. 699▲

Fig. 700▼

Fig. 701▲

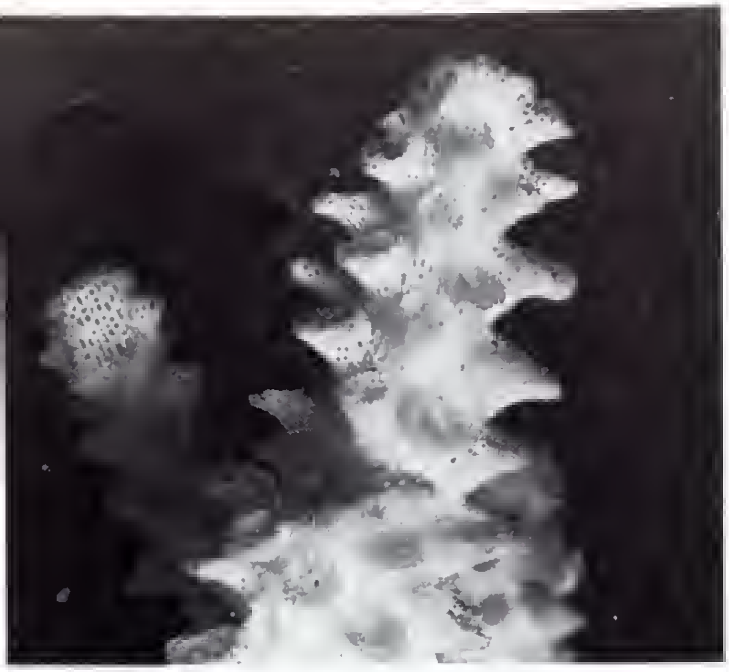


Fig. 702▲

Fig. 704▼

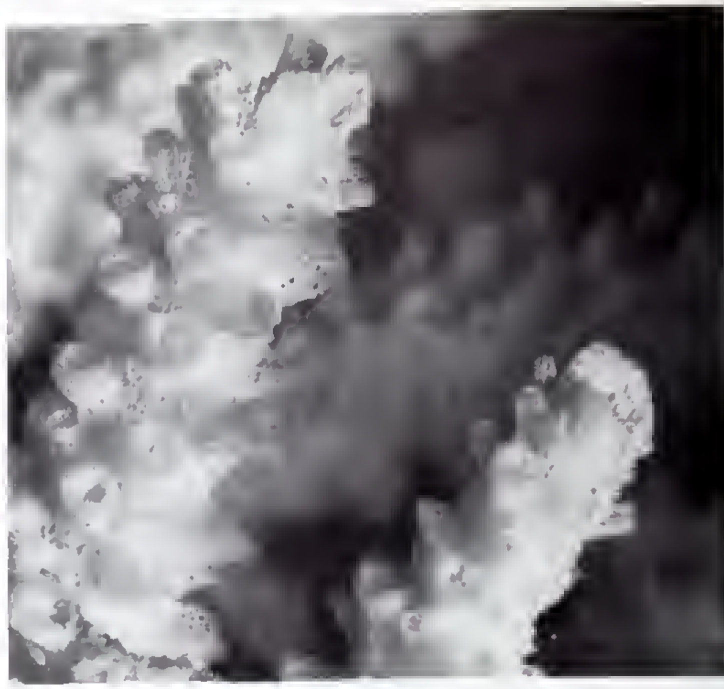


Fig. 703▲

Fig 705

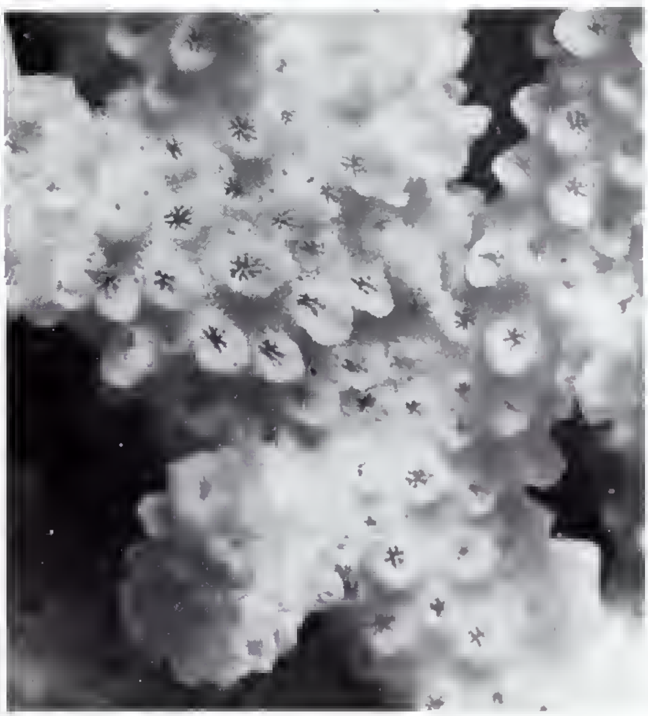
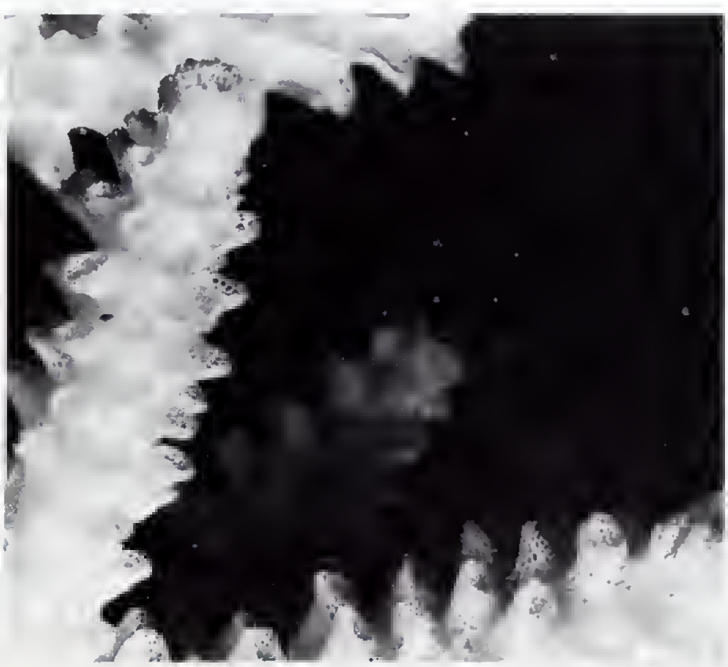


Fig. 707▼

Fig. 706▼



Figs. 702-707 *Acropora donei* (× 5)

Figs. 702, 703 From Lizard Island, Fig. 702, holotype, same corallum as Figs. 698, 708; Fig. 703, same corallum as Fig. 699.

Figs. 704, 705 Same corallum from Britomart Reef and same corallum as Fig. 700.

Figs. 706, 707 Same corallum from the Murray Islands and same corallum as Figs. 701, 709.

Holotype (Fig. 698)

Dimensions: A corymbose plate 30.2 × 27.2cm

Locality: Turtle Islands

Depth: 7m

Collector: T. J. Done

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Great Barrier Reef.

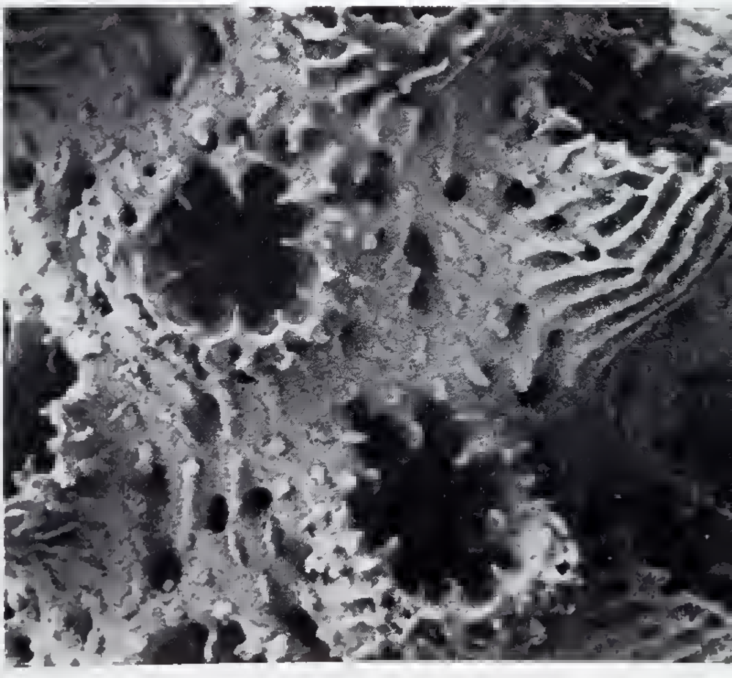
Figs. 708, 709 *Acropora donei* (× 20)

Fig. 708 From Lizard Island, holotype, same corallum as Figs. 698, 702.

Fig. 709 From the Murray Islands, same corallum as Figs. 701, 706, 707.

Fig 708▼

Fig. 709▼



Acropora (Acropora) dendrum (Bassett-Smith, 1890)

Synonymy

Madrepora dendrum Bassett-Smith, 1890; Brook (1893).

Bassett-Smith's syntype from the South China Sea BMNH 1889-9-24-54 is a part of a small corallum close to specimens of the present series. The specimen is in a poor state of preservation, with all axial corallites damaged.

Ehrenberg's specimen of *A. appressa* (ZMB 878) from an unknown locality is a fused plate, with tapering branchlets and strongly appressed radial corallites. It differs from coralla of the present series in the degree of fusion of the basal plate and in having very reduced septa. Brook (1893) records a similar specimen from the Arafura Sea.

Material studied

Britomart Reef (13 specimens), **Lodestone Reef** (2 specimens), **Chesterfield Reefs, Fitzroy Reef** (3 specimens).

These localities include collecting stations 167, 168, 190, 197, 210.

Characters.

Colonies form corymbose plates up to 1m across, usually characterised by tapering branchlets and sub-immersed corallites. Branchlets are smooth or have incipient axial corallites and sub-branchlets developed near their tips. Where incipient axial corallites are prolific, the remaining radial corallites are tubular appressed, usually with nariform openings near branch tips and are sub-immersed elsewhere. They have calice diameters of 0.5-0.9mm. Septa are thick, irregularly fused and very irregular in shape and number, so that separate cycles may not be distinguished. Two directive septa can usually be distinguished (especially in nariform corallites), with the remaining first cycle reaching $\frac{1}{3}$R to $\frac{2}{3}$R. Second cycle septa are sub-equal to absent. They are all strongly dentate. Axial corallites are similar in size and structure to radial corallites, except that septa are usually better developed and more clearly arranged in two cycles, the first up to $\frac{2}{3}$R, the second smaller and incomplete. The coenosteum in and between corallites is uniform and consists of fused blunt spinules.

Habitat preferences and growth form variation

This is an uncommon species occurring only on exposed reef fronts where *Acropora* diversity is high. The present series shows little environment-correlated growth form variation. Some specimens have more proliferous incipient axial corallites than others and there may be considerable variation in the thickness and amount of taper of branchlets. Specimens with strongly tapering branchlets have relatively immersed radial corallites with relatively highly fused, irregular septa. Many specimens of the present series and those observed underwater are heavily infested with barnacles and boring molluscs, giving branchlets a distorted appearance.

Similar species

Structurally, *A. dendrum* belongs with the *A. selago* group, although it has few superficial similarities with other members of this group.

Coralla with tubular rather than sub-immersed radial corallites may be similar to corymbose *A. valida*, which has its largest radial corallites similar in size. *Acropora valida* usually has much more compact sub-branches and radial corallites of varying rather than uniform sizes and a distinct septation with two large directive septa and other bilaterally arranged primary septa.

Fig. 710-712 *Acropora dendrum* from Britomart Reef, collecting station 167; Fig. 710 same corallum as Fig. 713; Fig. 711 same corallum as Figs. 714, 717; Fig. 712 same corallum as Figs. 715, 716 (× 0.5).

Fig. 710▼

Fig. 711▼

Fig. 712▼

Of the other species forming corymbose plates, *A. latistella* is closest to *A. dendrum*, having a very similar growth form and branchlets of similar dimensions. However, *A. latistella* is readily distinguished by having very uniform branchlets and irregularly arranged radial corallites, with expanded lower lips and septa in two complete cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R which show no tendency to fuse.

Distribution

Previously recorded only from the South China and possibly Arafura Seas.

Fig. 713-716 *Acropora dendrum* from Britomart Reef; Fig. 713 same corallum as Fig. 710; Fig. 714 same corallum as Figs. 711, 717; Figs. 715, 716 same corallum and same as Fig. 712 (× 5).

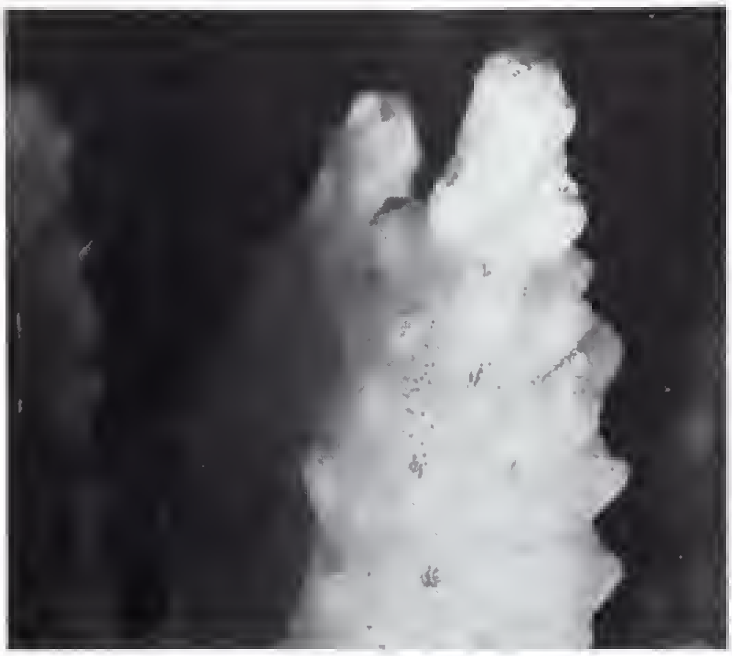


Fig. 713▲

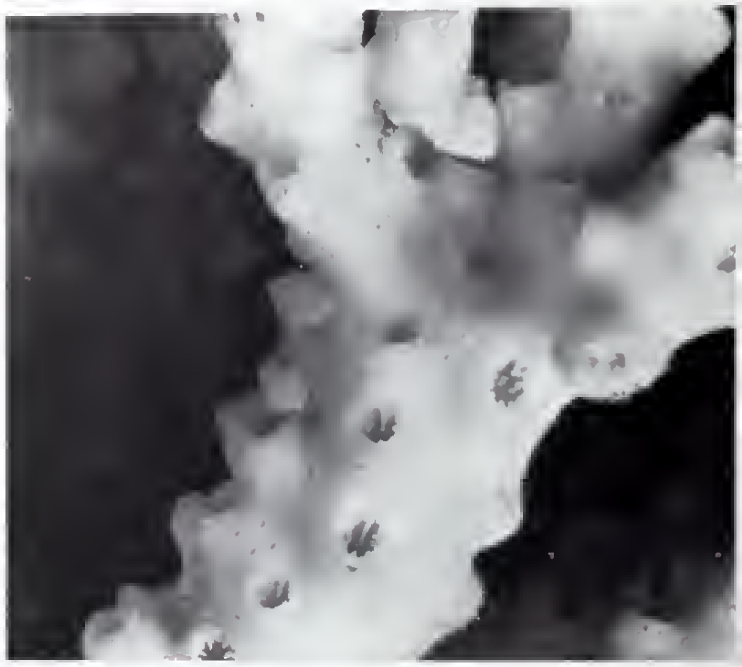
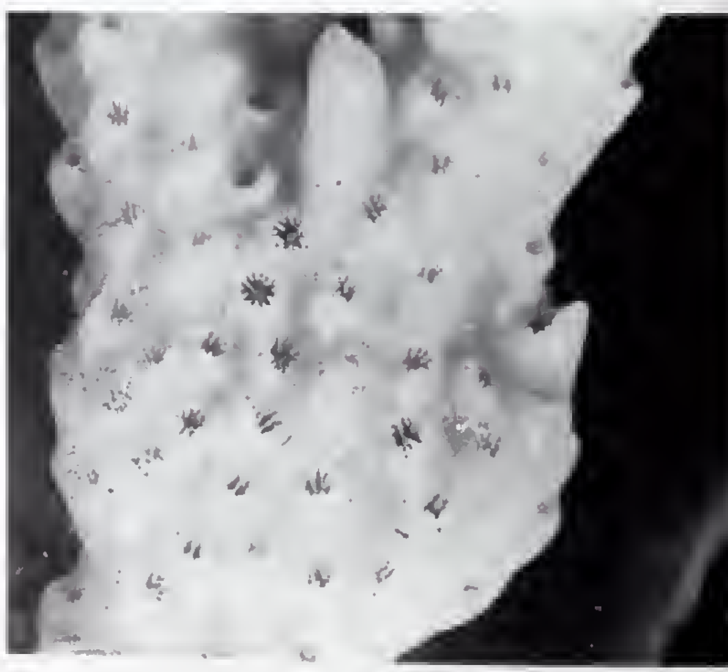


Fig. 714▲

Fig. 715▼

Fig. 716▼



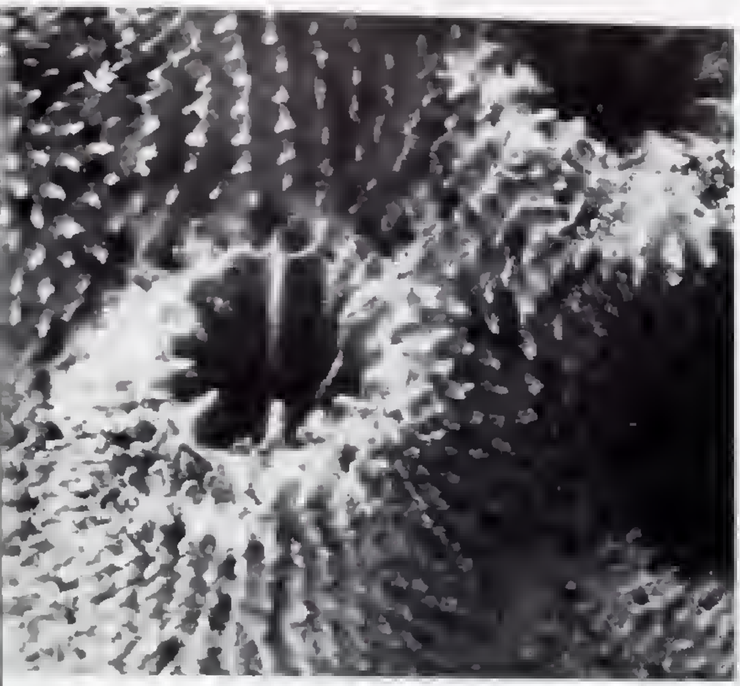


Fig 717▲

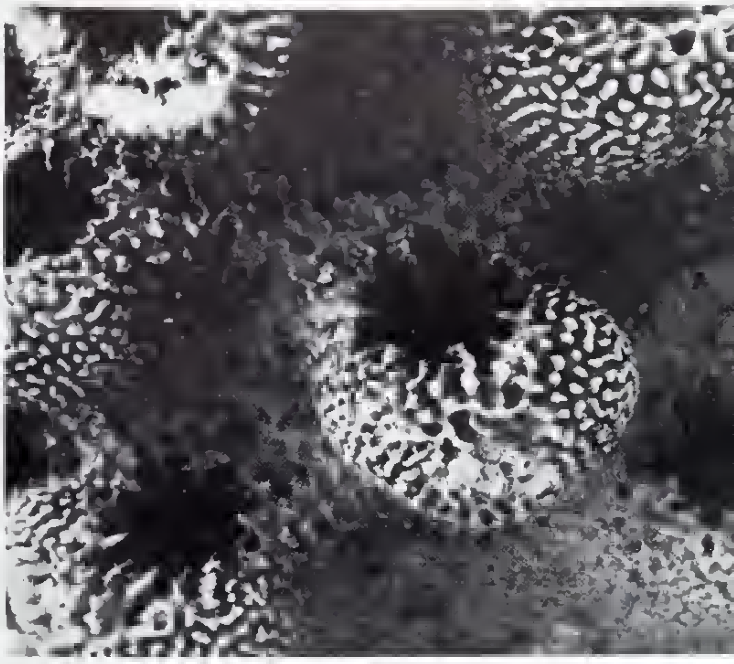


Fig. 718▲

Fig. 717, 718 *Acropora dendrum* from Britomart Reef, collecting station 167, Fig. 717 same corallum as Figs. 711, 714 (× 20).

Acropora (Acropora) yongei n.sp.

Synonymy

Acropora haimei (Edwards & Haime); Vaughan (1918); Crossland (1952); Stephenson & Wells (1955); Nemenzo (1967); Wallace (1978).

Edwards and Haime's type specimen of *A. haimei* from the Red Sea is lost and their description of it is very inadequate. The name has been applied to Red Sea corals by Klunzinger (1879), von Marenzeller (1907) and Rossi (1954), and was used by Brook (1893) for a wide range of Red Sea and Indian Ocean localities. Vaughan (1918) used the name for the present species from the Great Barrier Reef and since then it has been used by many authors. The latest author to have seen the type was Brook (1893), whose description of it is unclear.

The type of *A. pagoensis* Hoffmeister, a flattened, heavily calcified corallum, has similar radial corallites to the present species, but differs in having much better-developed septa and thicker corallite walls. This appears to be the closest described species.

Material studied

Little Mary Reef, Turtle Islands (2 specimens), **Raine Island** (3 specimens,), **Great Detached Reef** (2 specimens), **Bird Island** (3 specimens), **Sir Charles Hardy Islands** (3 specimens), **Cat Reef, Tijou Reef** (4 specimens), **Howick Island, Lizard Island, Hope Island, Britomart Reef** (11 specimens), **Palm Islands** (10 specimens),**Lodestone Reef, Fitzroy Reef, Flinders Reef (Moreton Bay), Middleton Reef** (20 specimens), **Elizabeth Reef** (4 specimens), **Lord Howe Island** (6 specimens).

These localities include collecting stations 1, 5, 8, 34, 37, 55, 60, 147, 148, 152, 160, 161, 162, 165, 167, 168, 175, 179, 185, 190, 227, 231, 233, 234, 235, 238, 240.

Figs. 719-722 *Acropora yongei* (× 0.33)

Fig. 719, 720 From Britomart Reef, collecting station 167; Fig. 719, holotype, same corallum as Figs. 723, 729; Fig. 720 same corallum as Fig. 724.

Fig. 721 From Lizard Island, same corallum as Fig. 725.

Fig. 722 From Lord Howe Island, same corallum as Figs. 726-730.

Fig. 719▼

Fig. 720▼

Fig. 721▼

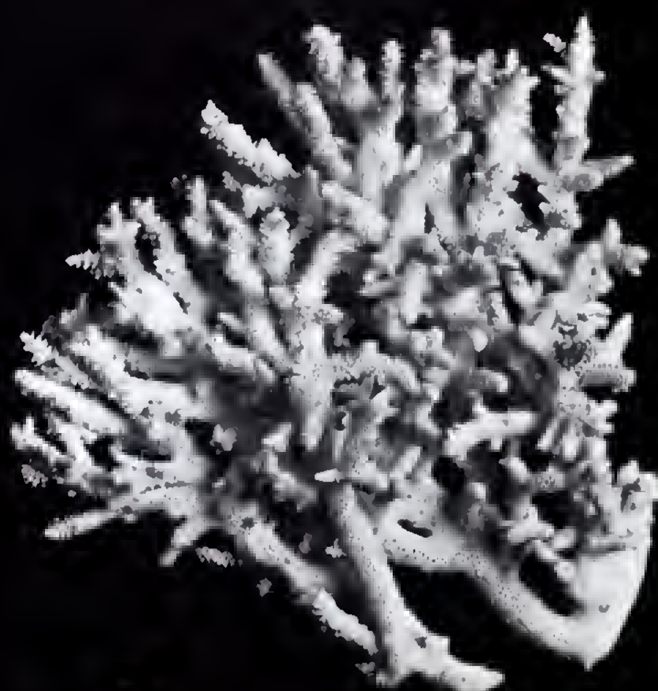


Fig. 722▼

Characters

Colonies are arborescent with straight branches usually dividing at frequent intervals, sometimes forming compact caespito-corymbose bushes. Radial corallites are mostly of

Figs. 723-728 *Acropora yongei* (× 5)

Figs. 723, 724 From Britomart Reef, Fig. 723, holotype, same corallum as Figs. 719, 729; Fig. 724 same corallum as Fig. 720.

Fig. 725 From Lizard Island, same corallum as Fig. 721.

Fig. 726 From Lord Howe Island, same corallum as Figs. 722, 730.

Fig. 727 From Middleton Reef, collecting station 231.

Fig. 728 From Great Detached Reef, collecting station 1.

Fig 723▲

Fig. 724▲

Fig. 725▼

Fig. 726▼

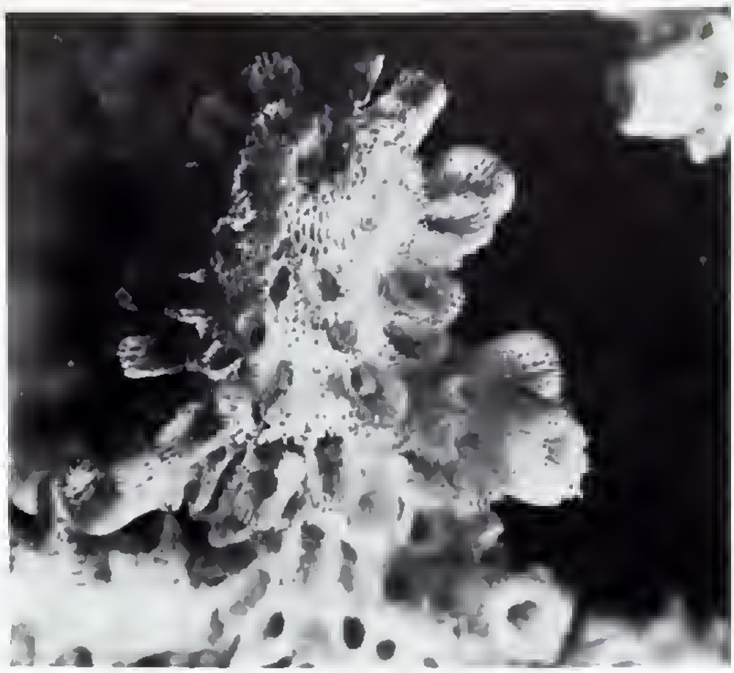


Fig. 727▲

Fig. 728▲

similar size and orientation. They have wide cochleariform calices, 1.1-1.5mm diameter, with projecting outer lips. They are bilaterally symmetrical, with the outermost septa best developed. Septation is very variable, being best developed in arborescent coralla. Directive septa are prominent, reaching R deep within the corallite; the remaining first cycle are $\frac{1}{2}$R-R. Secondary septa are $<\frac{1}{2}$R, sometimes incomplete, rarely absent. Axial corallites have 'outer diameter 2.2 to 3.5mm; inner diameter 0.8 to 1.2mm. Septation: primary septa present to $\frac{2}{3}$R; secondary septa all present, or mostly present, up to $\frac{1}{3}$R' (Wallace, 1978). All corallites are finely costate. The coenosteum between corallites is very variable, being almost solid, with a few spinules to very coarse and spongy in different coralla or, sometimes, different parts of the same corallum.

Living colonies are usually a uniform cream or pale brown.

Habitat preferences and growth form variation

Most of the variation of the present series is attributable to the thickness of branches and the frequency of branching.

Coralla from Lord Howe Island and Elizabeth and Middleton Reefs have similar growth forms to Great Barrier Reef coralla but differ in being less calcified and in having radial corallites with reduced septa. This reaches an extreme in some coralla from Lord Howe Island which have no septa in radial corallites. Coralla from shallow reef slopes exposed to wave action have relatively thick branches (up to 20mm diameter) and a caespito-corymbose growth form. Coralla from deeper water tend to be more openly arborescent. However, *A. yongei* occupies a wide range of habitats, including exposed slopes, shallow reef flats and deep, protected lagoons with relatively minor differences in growth form.

Similar species

Acropora yongei is readily recognised by its protuberant radial corallites with strongly developed outer lips and also by its very well-developed primary septa. Other species with radial corallites of similar shape, including *A. subulata* and *A. tenuis* , have much thinner branches and different growth forms, making *A. yongei* one of the most readily recognised of the Great Barrier Reef *Acropora*. Superficial similarities with *A. donei* are noted on p. 286.

Etymology

Named after Sir Maurice Yonge, leader of the Great Barrier Reef Expedition 1928-29.

Holotype (Fig. 719)

Dimensions: 28.3 × 25.4cm

Locality: Britomart Reef

Depth: 10m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Figs. 729-732 *Acropora yongei* (× 20)
Fig. 729 From Britomart Reef, holotype, same corallum as Figs. 719, 723.
Fig. 730 From Lord Howe Island, same corallum as Figs. 722, 726.
Fig. 731 From Fantome Island, Palm Islands, collecting station 34.
Fig. 732 From Britomart Reef, collecting station 167.

Fig. 729▲

Fig. 730▲

Fig. 731▼

Fig. 732▼

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known from the Great Barrier Reef and the Philippines.

The *Acropora hyacinthus* group

All species in this group except *A. anthocercis* develop plate- or table-like colonies composed of fine, highly anastomosed, primarily horizontal branches and fine, upward projecting branchlets with small corallites.

Acropora anthocercis is somewhat arbitrarily included in this group because of a resemblance to *A. hyacinthus.*

Acropora (Acropora) cytherea (Dana, 1846)

Synonymy

Madrepora cytherea Dana, 1846; Brook (1893).

Madrepora efflorescens Dana, 1846; Brook (1893).

?*Madrepora candelabrum* Studer, 1878.

Madrepora arcuata Brook, 1892; Brook (1893); Studer (1901).

Madrepora armata Brook, 1892; Brook (1893).

Madrepora reticulata Brook, 1892; Brook (1893).

Acropora arcuta (Brook); Studer (1901); Faustino (1927); Thiel (1932).

Acropora cytherella Verrill, 1902.

Acropora corymbosa (Lamarck); von Marenzeller (1907, *pars*).

Acropora cytherea (Dana); Hoffmeister (1929); Crossland (1952); Wallace (1978); Grig *et al.* (1981).

?*Acropora armata* (Brook); Crossland (1952).

Acropora reticulata (Brook); Wells (1954), Pillai & Scheer (1976).

Acropora efflorescens (Dana); ?Scheer & Pillai (1974); Pillai & Scheer (1976).

Taxonomic difficulties of this species are outlined by Wallace (1978, p. 291). Dana's *A. cytherea* from Tahiti is represented by an extensive series of syntypes (from which YPM 4194 should be excluded). His *A. efflorescens* from Sri Lanka (YPM 1799) is an almost solid plate but clearly a synonym. *Acropora candelabrum* Studer (ZMB 1983) is a coarse *A. cytherea*, with relatively strongly tapered branchlets and immersed radial corallites and is just outside the range of variation of the present series. All Brook's nominal species listed above are clearly synonyms of *A. cytherea*, as is *A. cytherella* Verrill. Von Marenzeller's (1907) *Acropora corymbosa* '*cytherea* form' only is *A. cytherea.*

Acropora symmetrica Brook, 1891 (not *A. symmetrica* Rehberg, 1892) from an unknown locality has relatively long, compacted branchlets and prominent axial corallites and may be a synonym of *A. cytherea.* Likewise, *A. vastula* Quelch (BMNH 1889-9-24-116 and 196) from Fiji is a probable synonym of *A. cytherea*, but the holotype is missing.

Material studied

Big Mary Reef, Little Mary Reef, Triangle Reef (2 specimens), **Pandora Reef** (6 specimens), **Raine Island, Great Detached Reef** (4 specimens), **Sir Charles**

Figs. 733–735 *Acropora cytherea* (× 0.5)
Fig. 733 From Great Detached Reef, collecting station 1, same corallum as Fig. 736.
Fig. 734 From Wye Reef, collecting station 163.
Fig. 735 From Britomart Reef, collecting station 167, same corallum as Fig. 737.

Fig. 733▼

Fig. 734▼

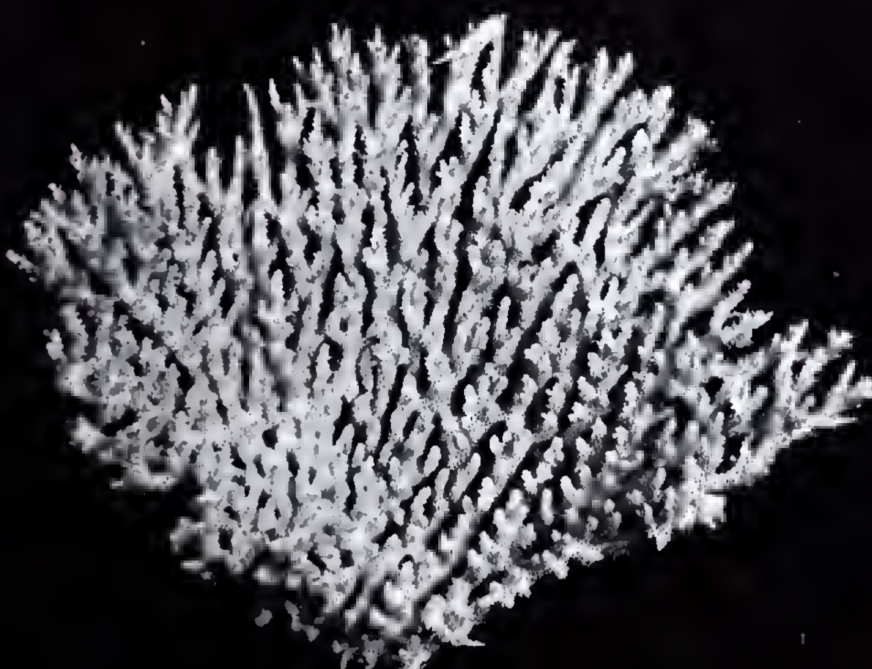


Fig. 735▼

Hardy Islands (6 specimens), **Wye Reef** (2 specimens), **Cat Reef** (3 specimens), **Tijou Reef** (2 specimens), **Howick Island, Houghton Island** (2 specimens), **Mellish Reef, Flinders Reef (Coral Sea)** (6 specimens), **Britomart Reef** (7 specimens), **Dip Reef** (2 specimens), **Myrmidon Reef** (5 specimens), **Palm Islands** (5 specimens), **Fitzroy Reef** (8 specimens), **Flinders Reef (Moreton Bay)** (5 specimens), **Middleton Reef** (5 specimens).

These localities include collecting stations 1, 2, 8, 16, 34, 37, 148, 152, 153, 158, 163, 167, 168, 174, 175, 179, 185, 187, 189, 190, 191, 197, 200, 208, 221, 226, 227, 230, 232.

Figs. 736-739 *Acropora cytherea* (× 5)

Fig. 736 From Great Detached Reef, same corallum as Fig. 733.

Fig. 737 From Britomart Reef, same corallum as Fig. 735.

Figs. 738, 739 Same corallum from Great Detached Reef, collecting station 153, showing corallites at the corallum edge and centre (respectively).

Fig. 736▲

Fig. 737▲

Fig. 738▼

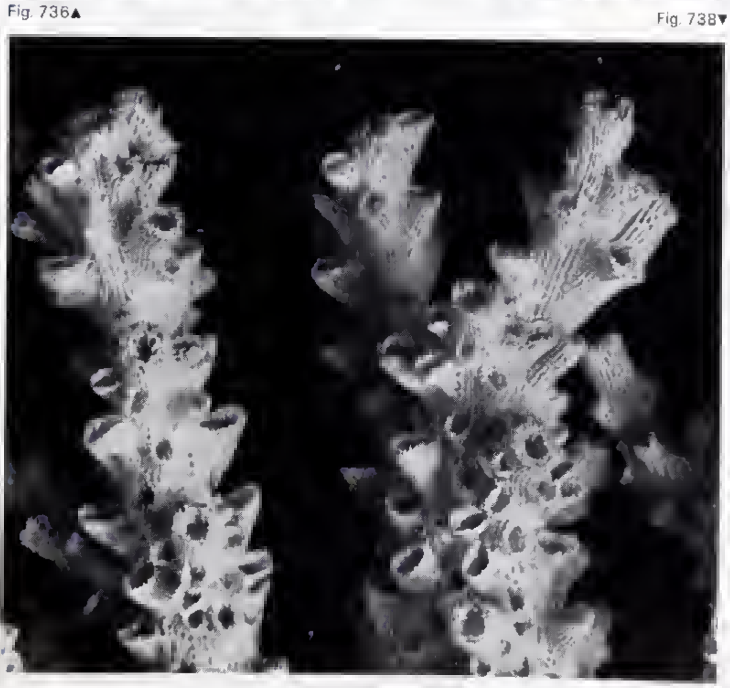
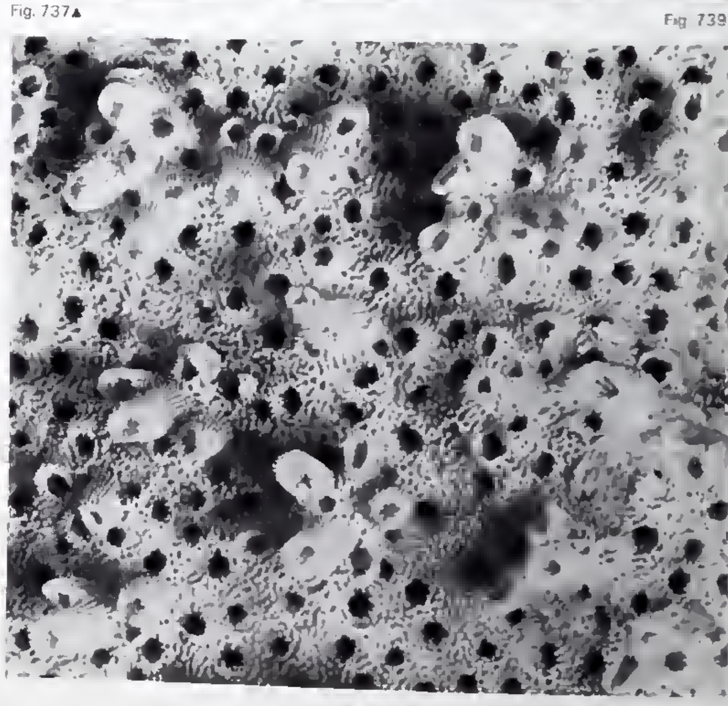


Fig. 739▼



Characters

Young colonies are initially caespito-corymbose, then become vasiform, thence tabular. Mature colonies consist of thin, flat plates or tables reaching >3m diameter. They are composed of radiating branches, usually highly anastomosed, 4-15mm diameter, supporting

Figs. 740-743 *Acropora cytherea* (× 20)

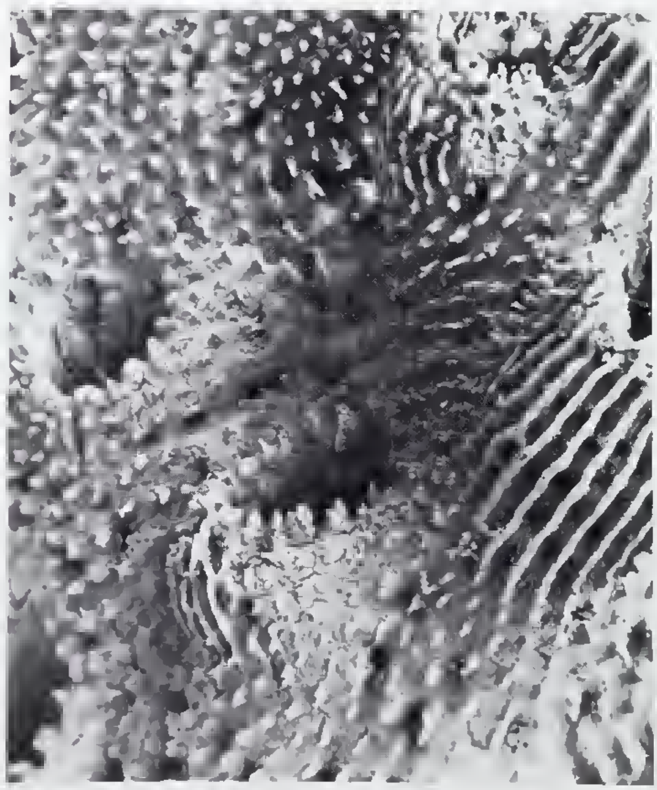
Fig. 740 From Cat Reef, collecting station 148.
Fig. 741 From Little Mary Reef, collecting station 185.
Fig. 742 From the Sir Charles Hardy Islands, collecting station 177.
Fig. 743 From near Triangle Reef, collecting station 158.

Fig 740▲

Fig. 741▲

Fig. 742▼

Fig. 743▼



short branchlets, or bundles of branchlets, each with one or more protuberant axial corallites. Radial corallites are appressed, tubular, with nariform to dimidiate openings and frequently with a slightly flaring lip. Corallites on branches have almost no septa; those on branchlets have a reduced first cycle, usually in the form of spines. Axial corallites are 1-5mm exsert, 1.3-2.5mm diameter, with calices 0.7-1.0mm diameter. They usually have a complete first septal cycle up to $\frac{2}{3}$R, with an occasional, incomplete second cycle.

All corallites are finely costate, the costae and adjoining synapticulae forming a fine lattice network. This network is extended into the coenosteum between corallites which is highly porous and gives the colonies 'a light crumbly texture' (Wallace, 1978).

Living colonies are uniform in colour, usually pale cream, brown or blue. Polyps are frequently extended during the day.

Habitat preferences and skeletal variation

Acropora cytherea is abundant throughout the Great Barrier Reef and extends southward to the Solitary Islands, at the southern limit of *Acropora* distribution. It also occupies a wide range of biotopes and has a correspondingly wide range of skeletal variation. It is common on upper reef slopes exposed to strong wave action but not on reef flats. Coralla are heavily calcified and branches are highly fused forming an almost solid or completely solid plate. Axial corallites are relatively poorly defined. All corallites have relatively well-developed septa. Elsewhere on outer reef slopes, coralla are brittle and lightly calcified and there is much less fusion of branches. Coralla from shallow protected biotopes with clear water are usually relatively heavily calcified, axial corallites remain distinct and fusion of branches is similar to coralla from deeper water on reef fronts.

Affinities

Acropora cytherea is closest to *A. paniculata* and *A. hyacinthus* and all three frequently occur together. Underwater, it is distingushed from *A. paniculata* by distinct axial corallites with relatively short radial corallites. It is initially distinguished from *A. hyacinthus* by the absence of a neat rosette of radial corallites around the axials. Similarities with *A. microclados* are mentioned on p. 306.

Distribution

Widely distributed in the tropical Indo-Pacific, west to the Mascarene Archipelago and east to Tahiti and Hawaii.

Acropora (Acropora) microclados (Ehrenberg, 1834)

Synonymy

Heteropora microclados Ehrenberg, 1834 (*pars*).

?*Heteropora corymbosa* (Lamarck); Ehrenberg (1834).

Madrepora assimilis Brook, 1892; Brook (1893) (= *M. appressa* Ehrenberg of Quelch, 1886).

Acropora brooki Crossland, 1952 *non A. brooki* Bernard (1900).

Acropora corymbosa (Lamarck); Vaughan (1918).

Of the two type specimens of *A. microclados* Ehrenberg in the ZMB (numbers 845 and 1054), number 845 from an unknown locality is in close agreement with coralla of the present series from shallow reef fronts.

Figs. 744-747 *Acropora microclados* (× 0.33)

Fig. 744 From Rib Reef, same corallum as Figs. 748, 752, 753.
Fig. 745 From Chesterfield Atoll, collecting station 218, same corallum as Fig. 749.
Fig. 746 From Britomart Reef, collecting station 167, same corallum as Figs. 750, 754.
Fig. 747 From Cat Reef collecting station 148, same corallum as Figs. 751, 755.

Fig. 744▼

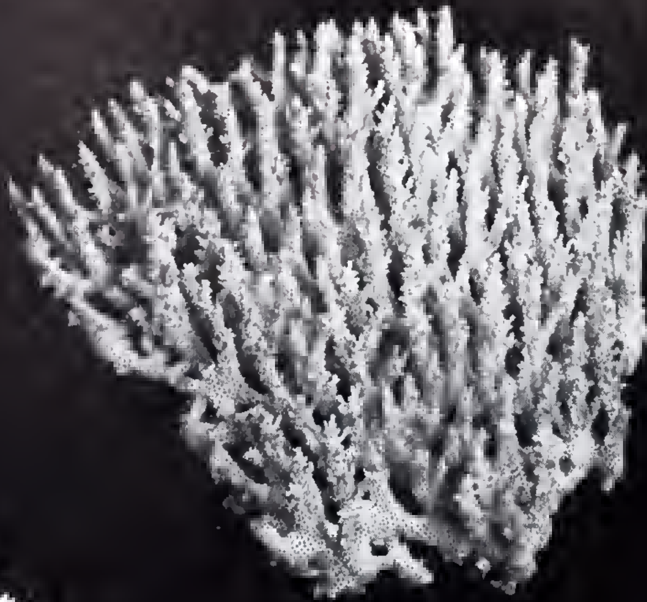
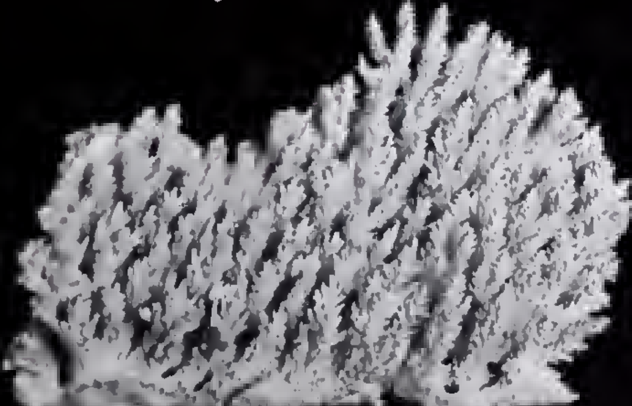


Fig. 745▼

Fig. 746▲

Fig. 747▼



Material studied

Arden Island (2 specimens), **Triangle Reef** (4 specimens), **Great Detached Reef** (4 specimens), **Cat Reef** (2 specimens), **Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef** (3 specimens), **Myrmidon Reef** (3 specimens), **Palm Islands, Chesterfield Reefs, Flinders Reef (Moreton Bay)** (2 specimens).

These localities include collecting stations 1, 60, 148, 158, 167, 183, 210, 220, 221, 226, 227.

Figs. 748-751 *Acropora microclados* (× 5)

Fig. 748 From Rib Reef, same corallum as Figs. 744, 752, 753.
Fig. 749 From Chesterfield Atoll, same corallum as Fig. 745.
Fig. 750 From Britomart Reef, same corallum as Figs. 746, 754
Fig. 751 From Cat Reef, same corallum as Figs. 747, 755.

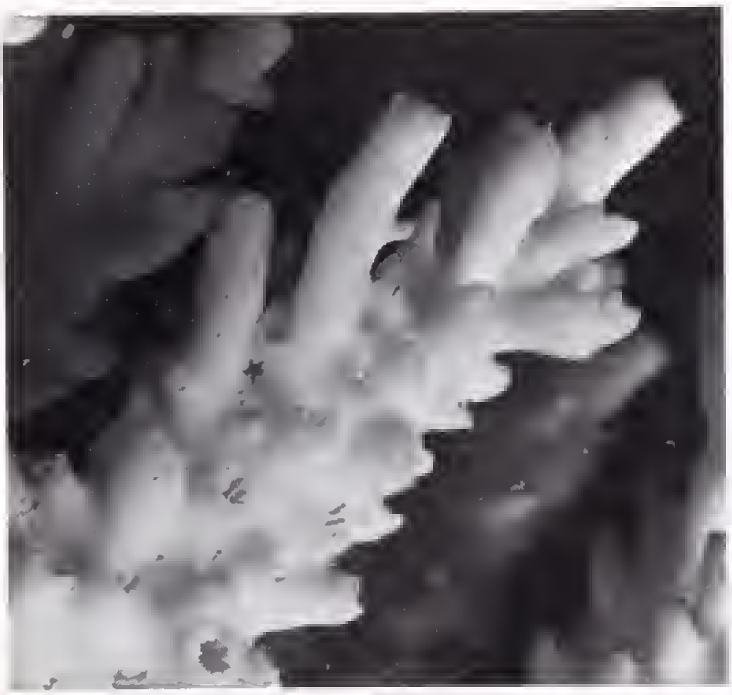


Fig. 748▲

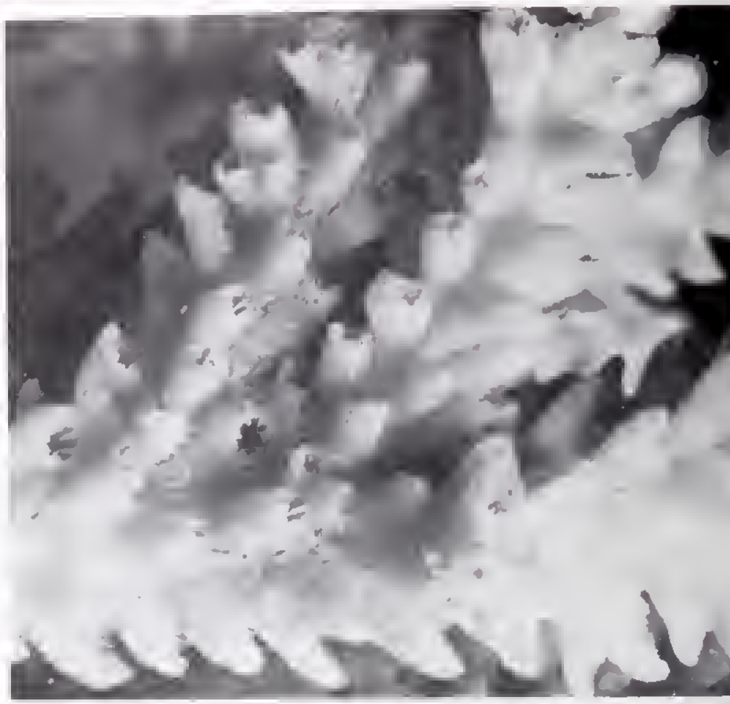


Fig 749▲

Fig. 750▼

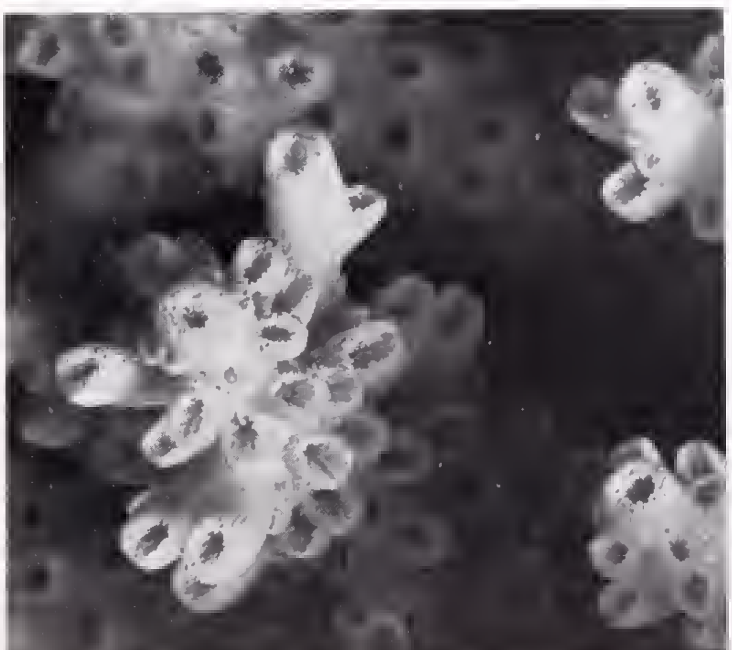
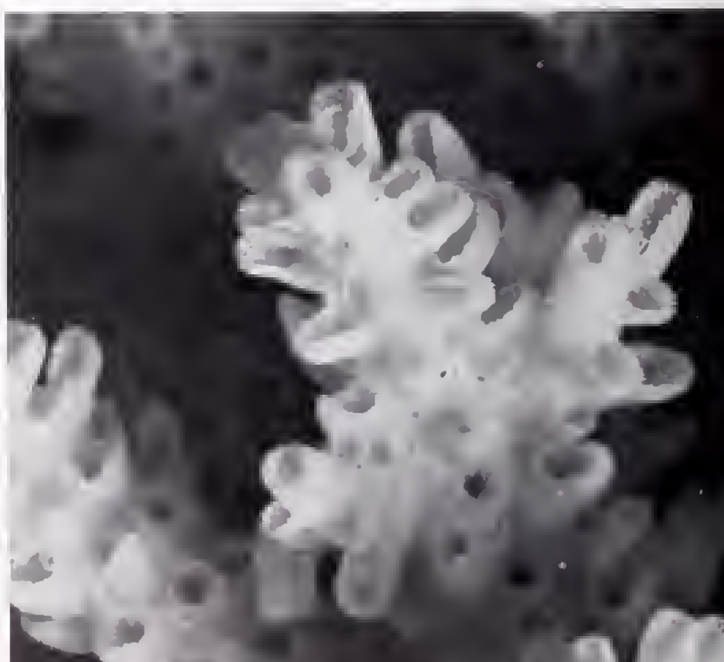


Fig 751▼



Characters

Colonies form corymbose plates, symmetrical around a side attachment, up to approximately 1m diameter. Like *A. cytherea* and *A. hyacinthus*, plates are composed of anastomosed radiating branches 0.7 to 1.1cm diameter, supporting short branchlets which are uniformly obliquely outward pointing at their base and curve to near vertical. Branchlets have one or several axial corallites at their tips, each of which is 2-5mm exsert. Axial corallites are tubular, 1.3-1.8mm diameter, with calices 0.7-0.9mm diameter. Septa are in 2 cycles, $\frac{1}{2}$R (rarely $\frac{2}{3}$R) and $<\frac{1}{4}$R, the latter usually incomplete. Radial corallites are mostly nariform but may become tubular with nariform or labellate openings. They have calice diameters of 0.7-1.2mm. Primary septa are $\frac{1}{3}$R or less, secondary septa $\frac{1}{4}$R to absent.

Figs. 752-755 *Acropora microclados* (× 20)
Figs. 752, 753 Same corallum from Rib Reef and same corallum as Figs. 744, 748.
Fig. 754 From Britomart Reef, same corallum as Figs. 746, 750.
Fig. 755 From Cat Reef, collecting station 148, same corallum as Figs. 747, 751.

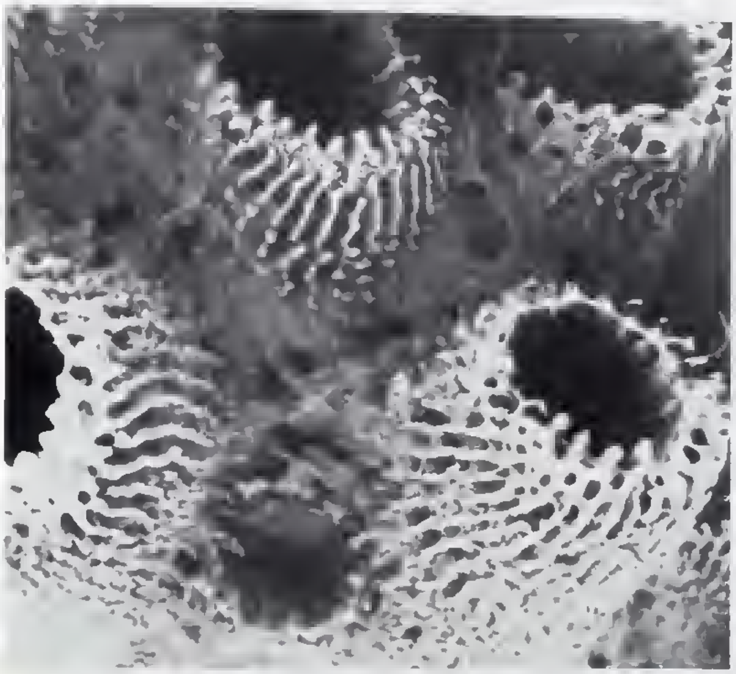


Fig 752▲

Fig 753▲

Fig. 754▼

Fig. 755▼

Directive septa may be well developed. Corallites on branches are mostly immersed and have circular openings and septa absent or similar to those of radial corallites. Septa of all corallites are strongly and irregularly dentate.

All corallites are finely costate. The coenosteum on branches is composed of costae, and irregularly formed spinules.

This species is almost always a distinctive pale pinky-brown colour. Pale grey tentacles are usually extended during the day.

Habitat preferences and growth form variation

The coralla of the present series show little variation; all were obtained from shallow exposed or partly exposed reefs and thus may not reflect the full variability of the species. As with all plate-like species, there is a wide variation in the degree of fusion of radiating branches, from openly reticular to near solid. Some coralla have single axial corallites on branchlets, while others have up to six; the radial corallites of some coralla may be more labellate than others.

Affinities and similar species

Acropora microclados has affinities with both *A. cytherea* and *A. cerealis. Acropora cytherea* may have a similar growth form and has corallites of similar size and shape. Branches are less sturdy and branchlets are much smaller and less corymbose than those of *A. microclados. Acropora cerealis* may also have a similar growth form when it develops into corymbose plates. Such colonies, however, are less regular in shape and appearance, having sub-dividing branchlets of irregular lengths. Axial corallites are less prominent in *A. cerealis* and radial corallites have a more prominent outer lip.

Distribution

Previously recorded only from Indonesia.

Acropora (Acropora) paniculata Verrill, 1902

Synonymy

Acropora paniculata Verrill, 1902.

?*Madrepora confraga* Quelch, 1886.

Only fragments of Verrill's type (YPM 3810) from ?Fiji have been found but these are adequate for recognition of the species. *Acropora confraga* Quelch, 1886 from Fiji is the same or a closely related species but only Quelch's non-type specimen from Malacca (BMNH 1842–11–28–8) has been found and this differs from all specimens of the present series in having fewer incipient radial corallites and a much finer reticulum.

Material studied

Arden Island, Turtle Islands, Raine Island (4 specimens), **Tijou Reef** (8 specimens), **Mellish Reef** (3 specimens), **Britomart Reef** (3 specimens), **Brisk Island, John Brewer Reef.**

These localities include collecting stations 8, 152, 155, 156, 162, 165, 167, 183, 200, 208.

Characters

Colonies form plates or tables which are commonly >1m diameter and up to 5.5cm thick. The branching pattern is essentially similar to that of *A. hyacinthus* and *A. cytherea* in consisting of horizontal, radiating, anastomosing branches, supporting short radiating, anastomosing branchlets, which are nearly horizontal at the corallum margins and nearly vertical at the corallum stalk.

Figs. 756-758 *Acropora paniculata* (× 0.33)
Fig. 756 From Tijou Reef, collecting station 8, same corallum as Fig. 759.
Fig. 757 From Wistari Reef, collecting station 118, same corallum as Figs. 760, 761.
Fig. 758 From Mellish Reef, collecting station 208, same corallum as Figs. 762, 765.

Fig. 756▲

Fig. 757▼

Fig. 758▼

Corallites have a very wide range of shape and size, depending on their position on the corallum. Those occurring on the upper surface of the main radiating branches are sub-immersed, while those occurring on the branchlets are tubular with their lengths increasing towards the branchlet tips. Most tubular corallites have nariform openings; very elongate axial corallites have round openings. There is no consistent pattern of septation. Sub-immersed corallites usually have a complete first cycle, $\frac{1}{4}$-$\frac{3}{4}$R with septa having large, spine-like dentations. A rudimentary second cycle may develop in some corallites. Tubular corallites, including axial and incipient axial corallites, have very deep calices with only an

Figs. 759-764 *Acropora paniculata* (× 5)
Fig. 759 From Tijou Reef, same corallum as Fig. 756.
Figs. 760, 761 Same corallum from Wistari Reef and same corallum as Fig. 757.
Figs. 762-764 From Mellish Reef, Fig. 762 same corallum as Figs. 758, 765.

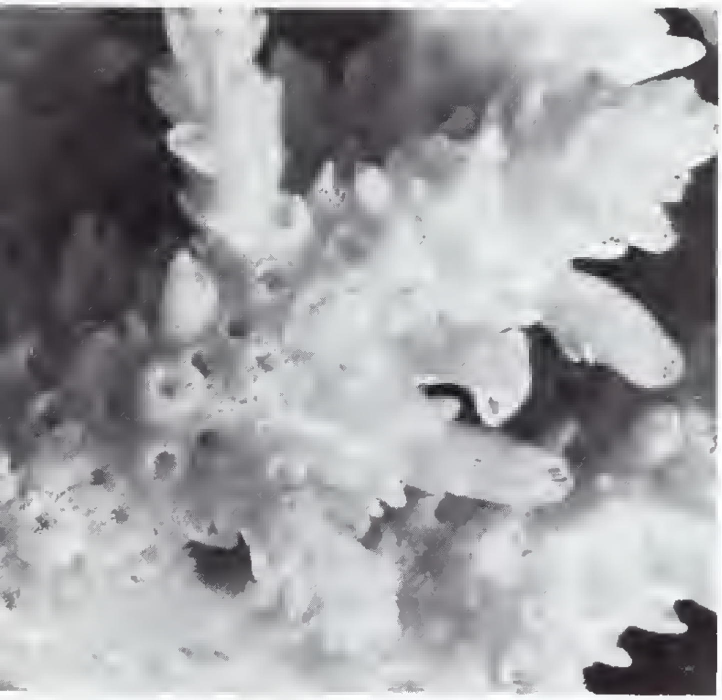


Fig. 759▲

Fig 760▲

Fig 761▼

Fig 762▼

Fig. 763▲

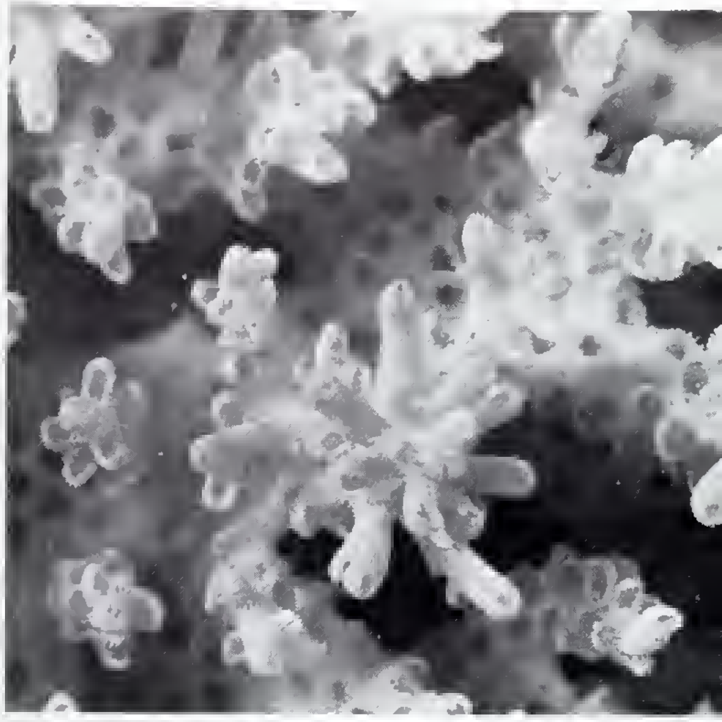


Fig. 76

incomplete first cycle, consisting primarily of rows of spines or of perforated plates, being externally visible.

All corallites have finely costate, porous thecae, with a double row of synapticulae usually being visible. The coenosteum is likewise very porous, mostly consisting of irregular flakes.

Living colonies are cream or blue in colour.

Habitat preferences and growth form variation

Acropora paniculata has only been observed on upper reef slopes where *A. hyacinthus* is common. It is uncommon on the Great Barrier Reef and the present series does not indicate any clear correlation between growth form and environmental parameters.

Fig. 765 *Acropora paniculata* from Mellish Reef, same corallum as Figs. 758, 762 (× 20)

Fig. 765▼

The present series shows substantial variation in the density of branching, in the width of main branches and in the dimensions of the tubular corallites. Variation in these three characters is not correlated. Tubular corallites reach lengths of 15-23mm in different coralla and have external diameters of 1-2.4mm.

Affinities

Acropora paniculata and *A. cytherea* have similar growth forms. Coralla of the former are usually thicker due to a greater number of anastomosing main branches and longer corallites. Branchlets of *A. paniculata* are much less distinct than those of *A. cytherea* and *A. hyacinthus* because the distinction between axial and radial corallites is often only arbitrary. It is also distinguished by having larger, much more elongate tubular corallites.

Distribution

Previously recorded from Fiji and Hawaii.

Acropora (Acropora) hyacinthus (Dana, 1846)

Synonymy

Madrepora hyacinthus Dana, 1846; Brook, 1892.

?*Madrepora spicifera* Dana, 1846; Brook, 1892.

?*Madrepora surculosa* Dana, 1846.

Madrepora patella Studer, 1878; Brook (1893).

Madrepora conferta Quelch, 1886; Brook (1893).

Madrepora pectinata Brook, 1892; Brook (1893).

Madrepora recumbens Brook, 1892; Brook (1893).

Madrepora sinensis Brook, 1893.

Acropora pectinata (Brook); Vaughan (1918); Hoffmeister (1929); Thiel (1932); Crossland (1948); Nemenzo (1967).

Acropora spicifera (Dana); Vaughan (1918); Matthai (1923); Nemenzo (1967).

Acropora hyacinthus (Dana); Hoffmeister (1925) (*pars*); Thiel (1932); Wells (1954, 1955b); Stephenson & Wells (1955); Nemenzo (1967); Pillai & Scheer (1976); Wallace (1978).

Acropora conferta (Quelch); Wells (1954); Zou (1975).

Acropora corymbosa (Lamarck); Stephenson & Wells (1955).

Three species of Dana are confused in the literature: *A. hyacinthus* from Fiji (USNM 246 and MCZ (piece)), *A. spicifera* from Singapore (USNM 244 and YPM 4174) and *A. surculosa* from Fiji (USNM 248, MCZ piece and YPM 4181) and Tahiti (USNM 251). Of these, the types of *A. spicifera* don't correspond well with coralla of the present series, the type of *A. hyacinthus* is a juvenile corallum of this species and those of *A. surculosa* are possibly the present species with unusually robust branchlets and prominent axial corallites outside the range of variation found in the Great Barrier Reef. The name *surculosa* has mostly been used for Great Barrier Reef specimens but Pillai & Scheer (1976) clearly use it for a separate species (probably *A. millepora*).

The remaining nominal species of Quelch, Studer and Brook from Fiji (*A. conferta*), the Solomon Islands (*A. patella*), the Great Barrier Reef (*A. pectinata* and *A. recumbens*) and Taiwan (*A. sinensis*) are all very clear synonyms of *A. hyacinthus*.

Figs. 766-768 *Acropora hyacinthus* (× 0.5)
Fig. 766 From Darley Reef, same corallum as Fig. 769.
Fig. 767 From Great Detached Reef, collecting station 1, same corallum as Fig. 770.
Fig. 768 From Orpheus Island, Palm Islands, collecting station 158.

Fig. 766▲

Fig. 767▼

Fig. 766▼

Material studied

Little Mary Reef, Turtle Islands (2 specimens), **Raine Island, Great Detached Reef** (5 specimens), **Sir Charles Hardy Islands** (7 specimens), **Martha Ridgeway Reef, Cat Reef** (2 specimens), **Franklin Reef** (2 specimens), **Bewick Island** (3 specimens), **Houghton Island, Yonge Reef, Hope Island, Magdelaine Cay, Flinders Reef (Coral Sea)** (4 specimens), **Britomart Reef** (6 specimens), **Myrmidon Reef** (6 specimens), **Palm Islands** (18 specimens), **Keeper Reef, Phillips Reef, Darley Reef** (5 specimens), **Swain Reef, Flinders Reef (Moreton**

Figs. 769-772 *Acropora hyacinthus* (× 5)

Fig. 769 From Darley Reef, same corallum as Fig. 766.

Fig. 770 From Great Detached Reef, same corallum as Fig. 767.

Figs. 771, 772 Same corallum from Britomart Reef, collecting station 167.

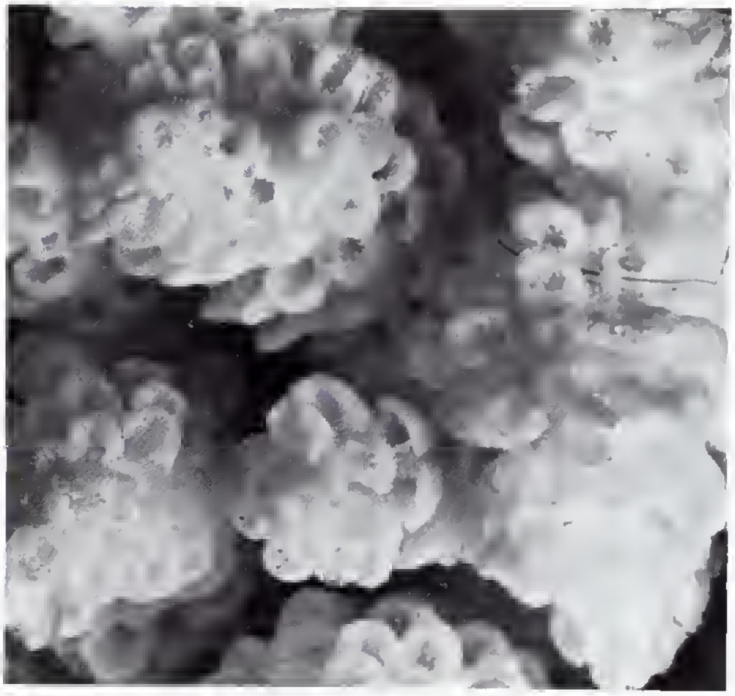


Fig. 769▲

Fig. 770▲

Fig. 771▼

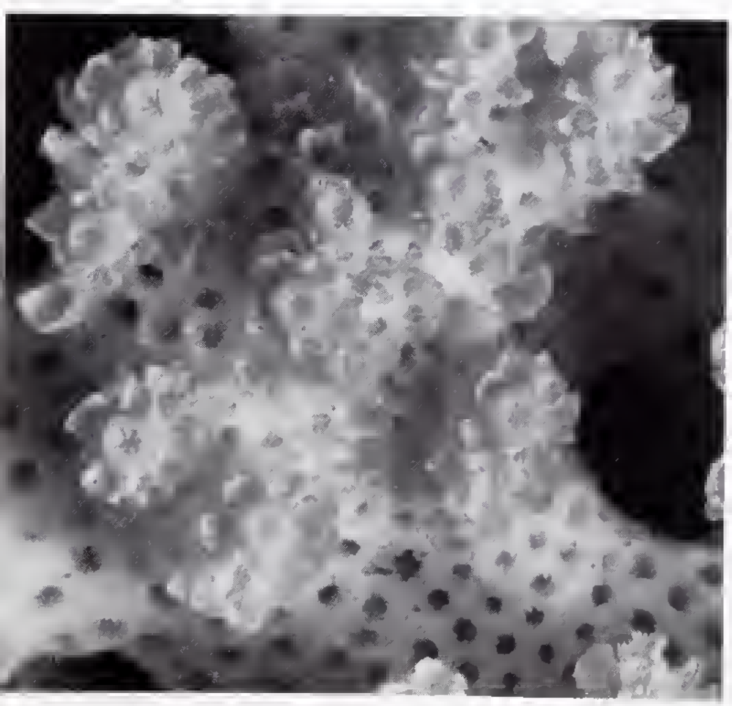


Fig. 772▼

Bay) (5 specimens), **Middleton Reef** (4 specimens), **Lord Howe Island** (3 specimens).

These localities include collecting stations 1, 9, 18, 34, 36, 37, 40, 55, 60, 77, 143, 147, 148, 150, 151, 158, 159, 165, 167, 168, 176, 177, 179, 185, 200, 219, 221, 226, 227, 231, 232, 234.

Characters

Colony formation and growth forms are as described for *A. cytherea* (p. 301).

Axial corallites are 'up to 1.5mm exsert; outer diameter 1.4 to 2.0mm; inner diameter 0.6 to 1.1mm. Septation: primaries present to $\frac{2}{3}$R, secondaries absent, or a few present to $\frac{1}{4}$R' (Wallace, 1978). Axial corallites usually have slightly flaring margins. Radial corallites are arranged evenly around the axial corallite, giving a rosette-like appearance. They are strongly appressed, labellate, with dimidiate or nariform openings. Septal development varies greatly according to environmental conditions (see below). Corallites on horizontal branches are circular, immersed and usually have two incomplete septal cycles, the septa being very short or consisting only of spines.

The walls of all corallites are strongly costate, the costae and adjoining synapticulae forming a fine lattice network.

Living colonies are uniform in colour usually cream, brown or green and may have blue or pink growing margins.

Habitat preferences and skeleton variation

Acropora hyacinthus is very abundant over a wide range of shallow environments. It is an early coloniser after reef denudation and is often the dominant species on regenerating reefs.

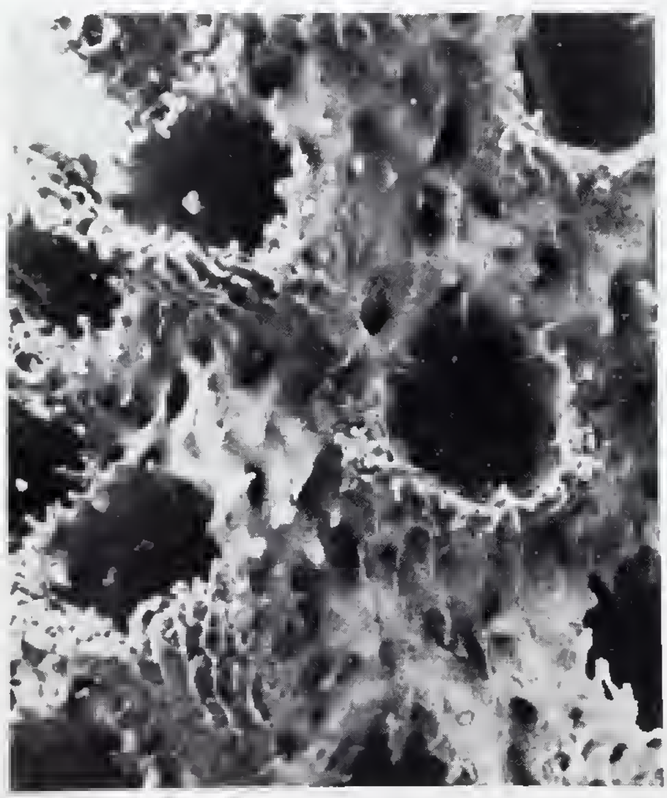
Acropora hyacinthus from exposed biotopes

This species is common on upper reef slopes exposed to very strong wave action. Coralla from such biotopes have a very different appearance from the delicate tabular coralla from more protected biotopes. They are encrusting, thick and heavily calcified, with branches

Figs. 773, 774 *Acropora hyacinthus* (× 20)
Fig. 773 From Darley Reef.
Fig. 774 From Wye Reef, collecting station 163.

Fig 773▼

Fig. 774▼



fused into a solid or almost solid plate. Vertical branchlets are short and thick; axial corallites and the rosette-like appearance of the radial corallites are relatively indistinct. Septa are relatively well developed. Directive septa on radial corallites may reach $\frac{3}{4}$R, the remaining primary septa, $\frac{1}{2}$R. A second cycle is usually complete, $\frac{1}{4}$R or less, or is sometimes reduced to spines. Septa are also relatively well developed in corallites on fused radiating branches. The coenosteum is dense.

Acropora hyacinthus from shallow reef biotopes

Branches are anastomosed into a more or less open network. Vertical branchlets are evenly spaced and have well-defined axial corallites. Radial corallites have large flaring lips. Septal development is very reduced; usually only one incomplete cycle is developed, $\frac{1}{4}$R or less; sometimes there are no septa. The coenosteum is costate, the costae usually have short regular spinules.

Acropora hyacinthus from turbid biotopes

Branches are straight, with relatively little anastomosis. Branchlets are relatively widely spaced and thin. Septation of all but axial corallites is very reduced. The coenosteum is very porous and consists primarily of irregular flakes.

Affinities

Acropora hyacinthus shows close affinity only with *A. cytherea* in the Great Barrier Reef. Similarities between these species and other possible non-Great Barrier Reef species are discussed by Wallace (1978, p. 289).

Distribution

Recorded from the Indo-Pacific, west to the Mascarene Archipelago and east to Tahiti.

Acropora (Acropora) anthocercis (Brook, 1893)

Synonymy

?*Madrepora corymbosa* (Ehrenberg); Klunzinger, 1879.

Madrepora coronata Rehberg; Brook (1892); not Rehberg (1892).

Madrepora anthocercis Brook, 1893.

Brook's syntypes of *A. anthocercis* are all from the Palm Islands and are identical to specimens of the present series which have relatively little thickened axial corallites.

Acropora ceylonica Ortmann, 1889 from Sri Lanka is close to *A. anthocercis* but differs in having a much better-developed septation.

Material studied

Murray Islands, Triangle Reef (2 specimens), **Great Detached Reef** (7 specimens), **Sir Charles Hardy Islands, Cat Reef** (8 specimens), **Franklin Reef** (12 specimens), **Tijou Reef** (7 specimens), **Bewick Island, Flinders Reef (Coral Sea), Britomart Reef** (9 specimens), **Myrmidon Reef** (10 specimens), **Llewellyn Reef, Elizabeth Reef** (3 specimens).

These localities include collecting stations 1, 2, 5, 6, 18, 28, 148, 150, 158, 160, 167, 168, 179, 192, 219, 221, 226, 229, 237.

Characters

Colonies usually form thick plates with a side attachment, but may sometimes have a more central attachment and a sub-corymbose form. In either case, main branches are highly anastomosed forming a thick, heavy base which supports short, thick branchlets. Each

Figs. 775-777 *Acropora anthocercis* (× 0.5)
Fig. 775 From Franklin Reef, collecting station 150, same corallum as Fig. 778.
Fig. 776 From the Sir Charles Hardy Islands, collecting station 179, same corallum as Fig. 780.
Fig. 777 From near Triangle Reef, collecting station 158, same corallum as Fig. 781.

Fig. 775▲

Fig. 776▲

Fig. 777▲

branchlet is composed of several axial corallites and attendant radial corallites. Axial corallites are characteristically large and protuberant, frequently up to 8mm exsert. They taper from 3-5mm thickness at their base to 2-2.5mm at their tips and have calice diameters of 1-1.3mm. First cycle septa are usually complete, $\frac{1}{2}$R to $<\frac{1}{4}$R; second cycle septa, if developed, are $<\frac{1}{4}$R. Radial corallites are nariform, frequently labellate, and have thick outer walls and calice diameters of 0.8-1mm. Septa are poorly developed, $<\frac{1}{4}$R, with usually only one cycle present. The corallites on main branches are immersed and have round openings. Septa are usually absent. All septa have an irregular appearance and are highly dentate.

Figs. 778-781 *Acropora anthocercis* (× 5)

Figs. 778, 779 From Franklin Reef, collecting station 150; Fig. 778 same corallum as Fig. 775.
Fig. 780 From the Sir Charles Hardy Islands, same corallum as Fig. 776.
Fig. 781 From near Triangle Reef, same corallum as Fig. 777.

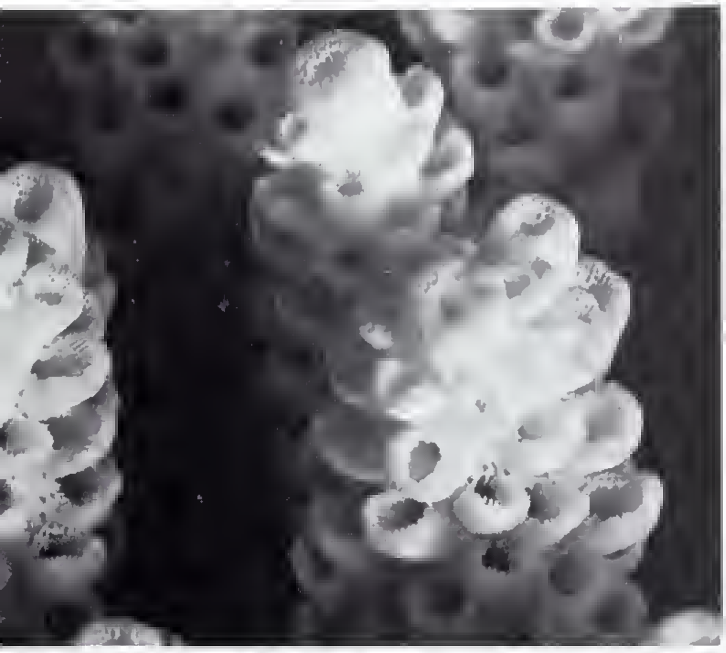


Fig. 778▲ Fig 780▼ Fig. 779▲ Fig. 781▼

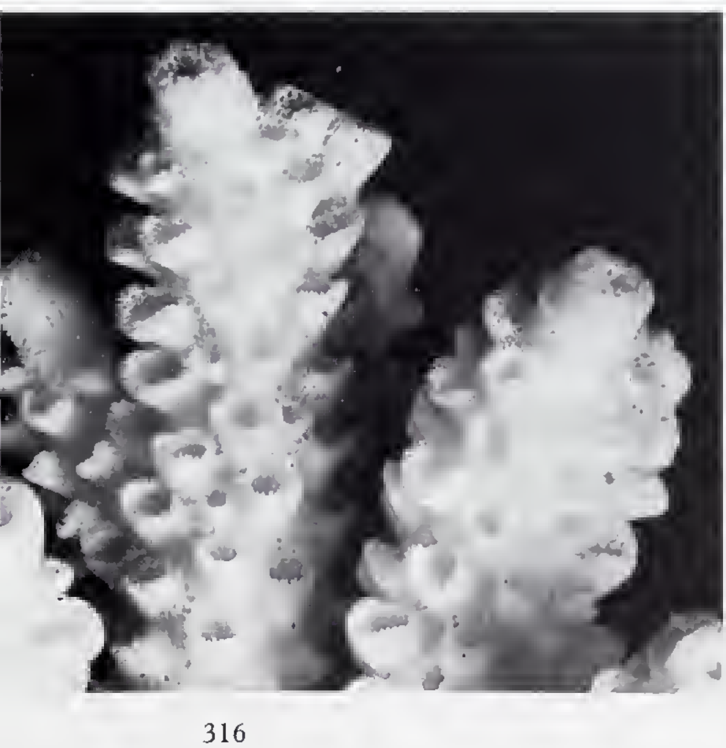


Fig. 782▲

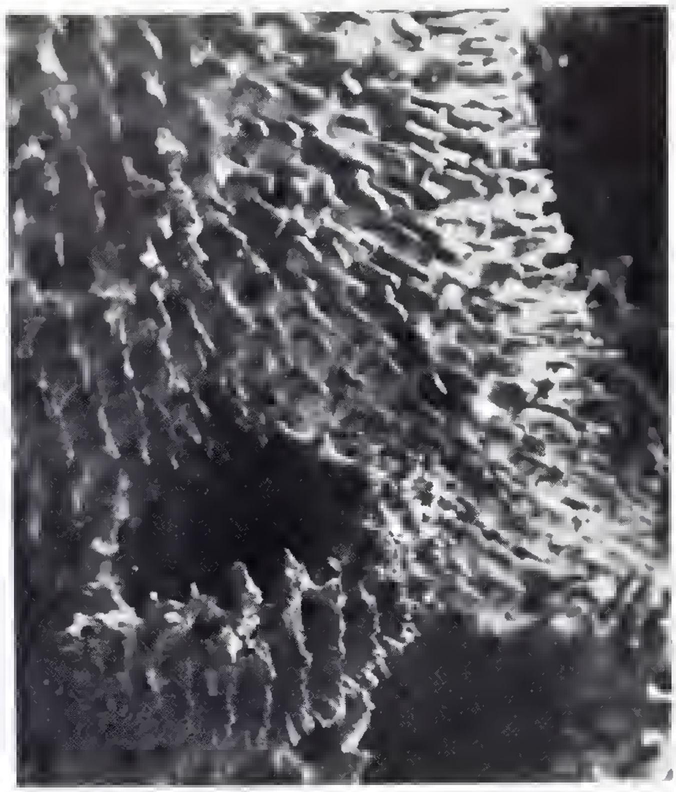


Fig. 783▲

Figs. 782, 783 *Acropora anthocercis* (× 20)
Fig. 782 From Great Detached Reef, collecting station 1.
Fig. 783 From Franklin Reef, collecting station 150.

The coenosteum of both the main branches and corallites is densely covered with rows of very fine spinules.

Living colonies are usually a mixture of colours; pale blue, mauve, purple and grey are the most common.

Habitat preferences and skeletal variation

Acropora anthocercis is largely restricted to shallow water where light penetration and water circulation are good and has a strong preference for biotopes exposed to strong wave action. As with all species occupying exposed biotopes, *A. anthocercis* forms several ecomorphs which are characteristic of specific environmental conditions.

Acropora anthocercis from exposed biotopes

Colonies from biotopes exposed to strong wave action are plate-like or corymbose, <40cm diameter and consist of very thick, solid plates with short, thick branchlets. The upper surfaces of branchlets have many protuberant axial corallites with thick walls. The septa of all corallites are relatively well developed and the whole skeleton is heavily calcified.

Acropora anthocercis from partly protected biotopes

Colonies from shallow reef biotopes not fully exposed to wave action are plate-like and up to 1m diameter. Branchlets are irregular but similar to those described above, except that axial corallites are not so prominent. Radial corallites are more protuberant, tend to be labellate, and are relatively abundant.

Acropora anthocercis from deep reef front biotopes

Colonies are plate-like, up to 1m diameter with regular branchlets, having single axial corallites which are relatively small. Some radial corallites may become exsert and longer than the axial corallites. Radial corallites are usually in rows and are very evenly spaced. Septa are very poorly developed or completely absent from radial corallites.

These colonies have a very regular appearance and differ substantially from those from exposed biotopes.

Similar species

In some respects, coralla from protected biotopes resemble *A. hyacinthus* from exposed biotopes. However, coralla of *A. anthocercis* are always much more solid and have bigger branchlets and axial corallites. Otherwise this species does not closely resemble any other and always remains distinctive, both in the laboratory and underwater.

Distribution

Records are very sparse but this species probably occurs west to Madasgascar and possibly the Red Sea and east to the Great Barrier Reef.

The *Acropora latistella* group

These species all have small appressed corallites and slender branchlets. All form small, bushy colonies and *A. latistella*, *A. subulata* and *A. aculeus* also form large corymbose plates and tables. These species are grouped together more on the basis of superficial similarity than on consideration of affinities.

Acropora azurea is very rare, having been found at a single locality only. *Acropora nana* is usually uncommon but is widespread. The remaining species are widespread and very common and are often among the dominant species of upper reef slopes, where they are all very variable in size, shape and colour.

Acropora (Acropora) latistella (Brook, 1892)

Synonymy

Madrepora latistella Brook, 1892; Brook (1893); Gardiner (1898).

Madrepora patula Brook, 1892; Brook (1893).

Acropora latistella (Brook); Hoffmeister (1925); Crossland (1952); Stephenson and Wells (1955).

Acropora patula (Brook); Crossland (1952); Stephenson & Wells (1955); Nemenzo (1967).

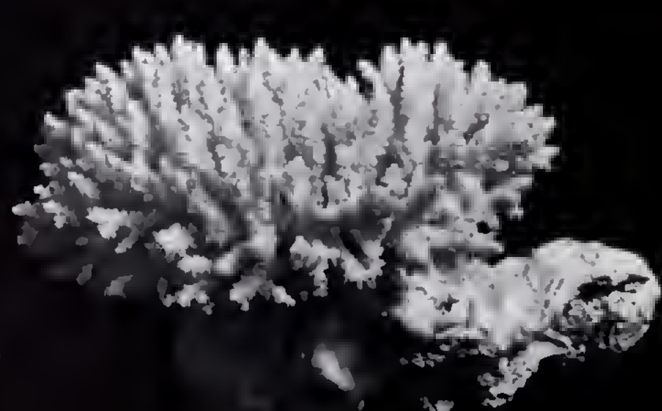
Acropora loricata Nemenzo, 1967.

Acropora imperfecta Nemenzo, 1967.

Figs. 784, 785 *Acropora latistella* (× 0.5)
Fig. 784 From Magdelaine Cay, collecting station 200, same corallum as Fig. 786.
Fig. 785 From near Triangle Reef, collecting station 158, same corallum as Fig. 787.

Fig. 784▼

Fig. 785▼



Brook's syntypes of *A. latistella* from the Great Barrier Reef are clearly representative of this species.

Acropora secaloides Verrill, 1902 from Sri Lanka has a similar growth form to *A. latistella* but differs in having smaller, more appressed radial corallites with less well-developed septa.

Material studied

Little Mary Reef (4 specimens), **Arden Island** (2 specimens), **Turtle Islands** (10 specimens), **Raine Island** (7 specimens), **Great Detached Reef** (3 specimens), **Sir Charles Hardy Islands** (8 specimens), **Wye Reef, Cat Reef** (2 specimens), **Franklin Reef, Tijou Reef** (10 specimens), **Howick Island** (3 specimens), **Willis Islet, Magdelaine Cay** (7 specimens), **Mellish Reef** (3 specimens), **Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef** (22 specimens), **Bowl Reef, Myrmidon Reef** (5 specimens), **Palm Islands** (8 specimens), **Lodestone Reef, Magnetic Island, Marion Reef** (3 specimens), **Chesterfield Reefs** (13 specimens), **Fitzroy Reef** (11 specimens), **Lady Musgrave Reef** (3 specimens), **Flinders Reef (Moreton Bay)** (4 specimens), **Middleton Reef** (17 specimens), **Elizabeth Reef** (14 specimens), **Lord Howe Island.**

These localities include collecting stations 1, 6, 8, 34, 42, 43, 147, 148, 149, 151, 152, 158, 162, 163, 165, 167, 174, 175, 177, 179, 183, 185, 186, 190, 191, 193, 195, 197, 199, 200, 201, 203, 204, 208, 209, 210, 211, 212, 215, 221, 226, 227, 230, 231, 233, 236, 237, 238, 240.

Characters

Colonies are corymbose, corymbose plates or caespitose. Branches are 5-9mm thick, are relatively straight in corymbose and caespitose colonies or curved in corymbose plate colonies. Sub-branches form at acute angles but do not anastomose. Radial corallites are regularly arranged, usually in rows along branches, and are tubular appressed, with open rounded to slightly dimidiate calices. Those towards the proximal ends of branches become immersed. Axial corallites are 2-3mm diameter and $<$ 2mm exsert. Both axial and radial corallites have calices 0.6-0.9mm diameter and septa which slope steeply. Those of axial corallites are in two cycles, usually incomplete, up to $\frac{3}{4}$R and $\frac{1}{2}$R but usually less. They are dentate, especially those of the second cycle. Radial corallites have two incomplete cycles, up to $\frac{1}{2}$R and $\frac{1}{4}$R, but are usually much less, so that most have sub-equal septa of $<\frac{1}{4}$R. One or two directive septa can usually be distinguished.

The coenosteum on radial corallites is costate or broken costate, usually with lines of simple to elaborate spinules. Between corallites, the spinules are still present, sometimes with a dense infilling between them.

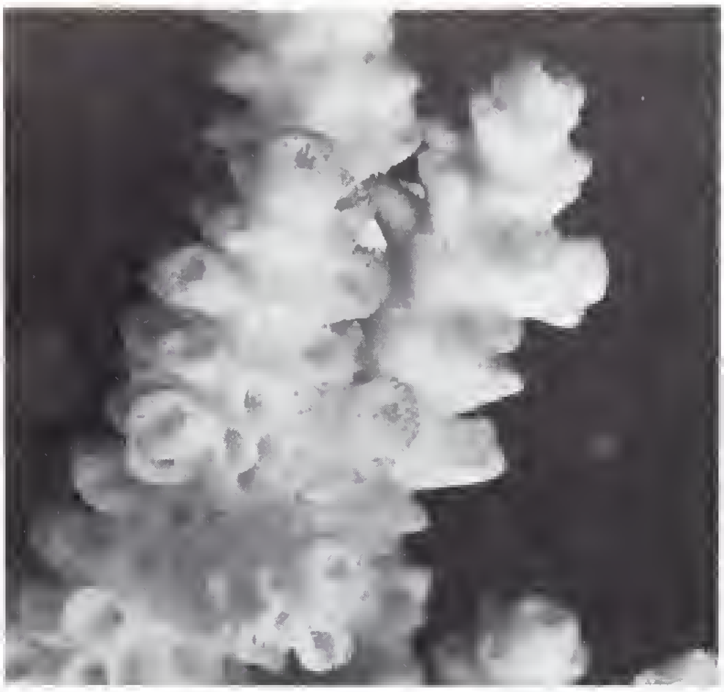
Living colonies are usually a uniform pale cream, grey or brown, sometimes green or purple. Branch ends sometimes have yellow tips.

Habitat preferences and growth form variation

Acropora latistella has a wide distribution along the eastern Australian coast from Lord Howe Island to Torres Strait, and occurs in a wide range of habitats, from exposed outer reef slopes to protected bays of continental islands. However, it most commonly occurs in reef areas protected from strong wave action. Coralla from exposed biotopes are small, well-calcified plates with short regular branches. Those from shallow water partly protected from wave action are mostly corymbose, tending to form corymbose plates. Branches are thin and break readily. Most coralla from protected reef back margins are corymbose plates

Figs. 786-791 *Acropora latistella* (× 5)

Fig. 786 From Magdelaine Cay, same corallum as Fig. 784.
Fig. 787 From near Triangle Reef, same corallum as Fig. 785.
Figs. 788, 789 Same corallum from Franklin Reef, collecting station 149.
Fig. 790 From Corbett Reef, collecting station 164.
Fig. 791 From the Sir Charles Hardy Islands, collecting station 179.



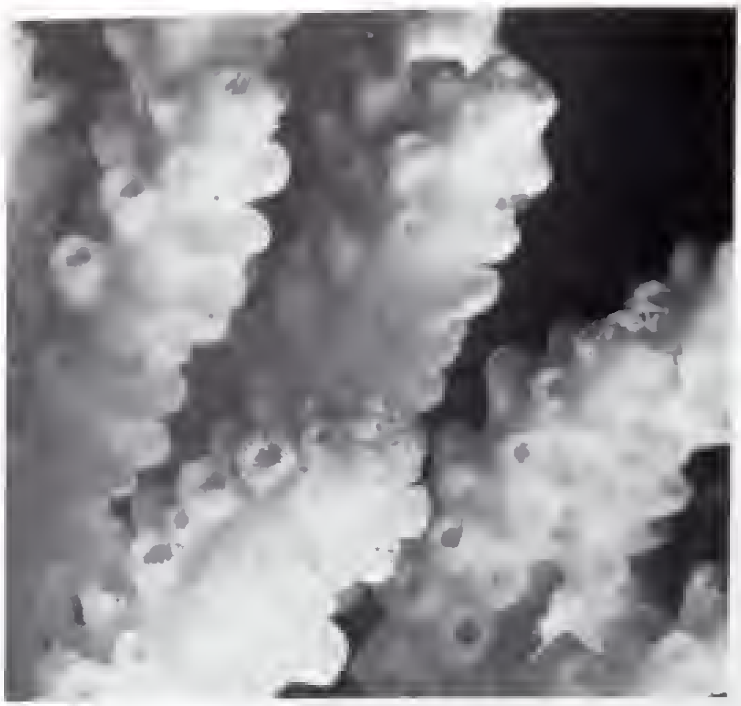
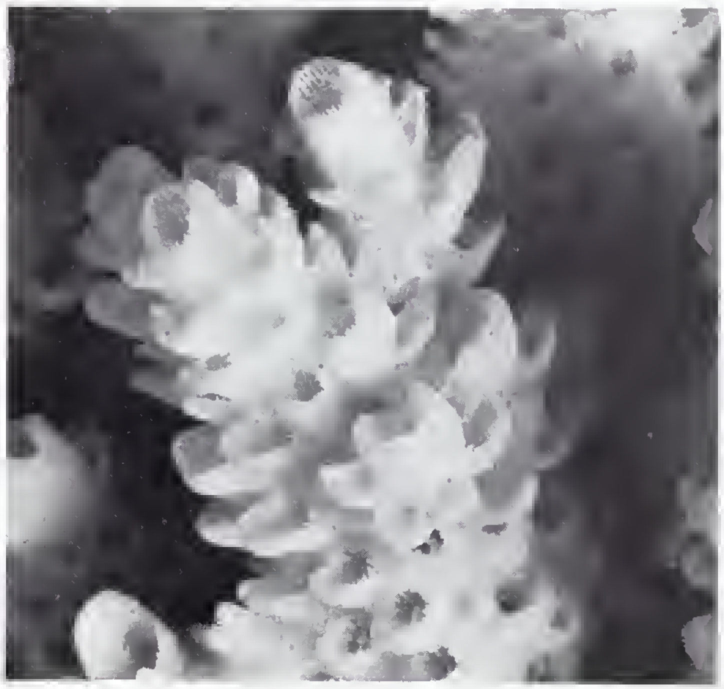


Fig. 786▲

Fig. 788▼

Fig. 787▲

Fig 789▼



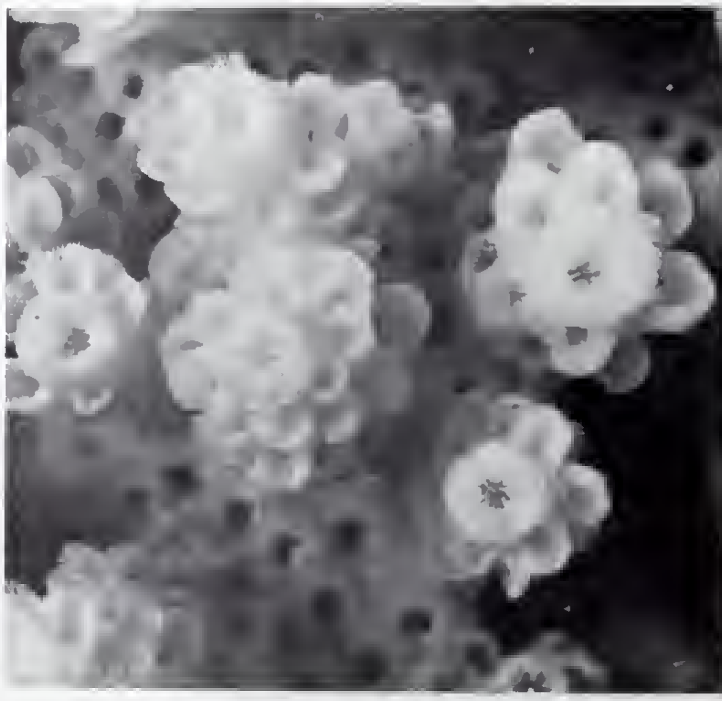


Fig. 790▼

Fig 791▼

or partly indeterminate plates and bushes, with no consistent difference in corallite structure.

Figs. 792-795 *Acropora latistella* (× 20)

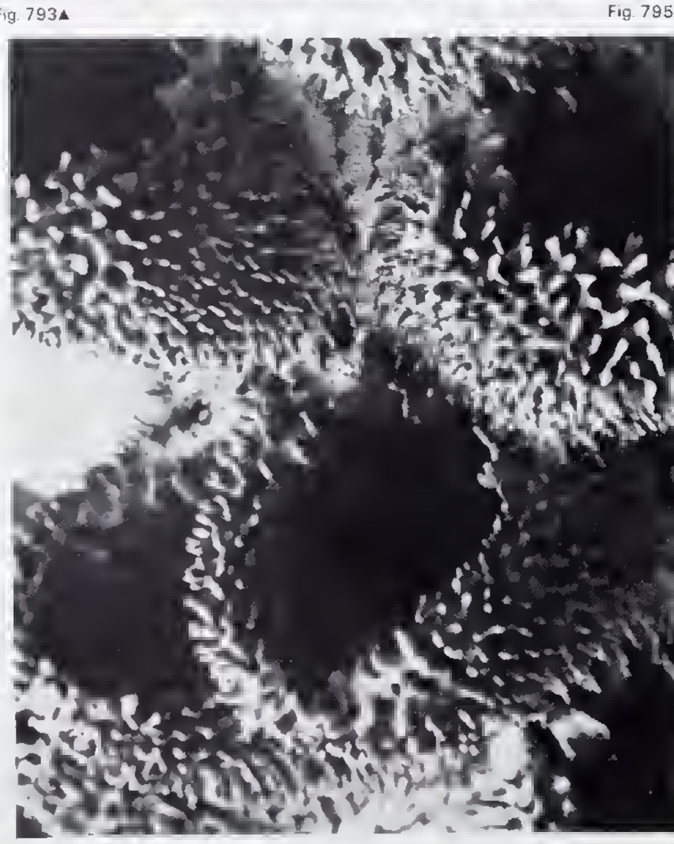
Fig. 792 From Raine Island, collecting station 152.
Fig. 793 From the Sir Charles Hardy Islands, collecting station 179.
Fig. 794 From Howick Island, collecting station 175.
Fig. 795 From Chesterfield Atoll, collecting station 210.

Fig 792▲

Fig. 793▲

Fig 794▼

Fig. 795▼



Similar species

Because of its predominantly corymbose growth forms with middle-size corallites without distinctive characters, *A. latistella* may closely resemble several other species, including *A. aculeus* (see p. 332), *A. cerealis*, *A. valida* and *A. subulata*. *Acropora cerealis* is distinguished by its very regularly spaced corymbose branches which uniformly taper (and are not terete as are those of *A. latistella*) and by the shape of the radial corallites. In *A. latistella*, these have open, rounded calices with relatively thick walls and are not tubo-nariform as in *A. cerealis*. *Acropora latistella* and *A. valida* may be very close, with essentially identical growth forms, but radial corallites of *A. valida* are tubular and strongly appressed with small openings and are of variable sizes. They are not regularly and uniformly arranged as they are in *A. latistella*. Similarities with *A. subulata* are noted on p. 325.

Distribution

Known from the west and east coasts of Australia, the Philippines and Samoa.

Acropora (Acropora) subulata (Dana, 1846)

Synonymy

Madrepora subulata Dana, 1846.

Madrepora frondosa Brook, 1893.

Acropora subulata (Dana); Stephenson & Wells (1955); Nemenzo (1967).

Of Dana's type series, USNM 256 from Fiji is designated lectotype as it is a large, readily identified specimen. It differs from coralla of the present series in having strongly appressed to submerged radial corallites on older branchlets. Corallites are also smaller than those of most (but not all) coralla of the present series. Brook's *A. frondosa* from an unknown locality is near the centre of variation of the species.

Material studied

Big Mary Reef, Little Mary Reef (2 specimens), **Arden Island** (2 specimens), **Raine Island** (2 specimens), **Wye Reef, Cat Reef, Tijou Reef** (3 specimens), **Corbett Reef, Hunters Reef, Lizard Island, Willis Islet** (2 specimens), **Mellish Reef** (2 specimens), **Britomart Reef** (15 specimens), **Myrmidon Reef** (4 specimens), **Palm Islands** (18 specimens). **Broadhurst Reef, Chesterfield Reefs** (2 specimens), **Flinders Reef (Moreton Bay)** (3 specimens).

These localities include collecting stations 2, 34, 43, 60, 100, 148, 152, 155, 158, 162, 163, 164, 167, 168, 174, 177, 183, 185, 187, 199, 200, 208, 210, 211, 219, 227.

Characters

Fully developed colonies consist of horizontal, circular tables, often over 2m diameter, which have a fine precise structure consisting of a network of anastomosing horizontal branches and a mass of vertical or sub-vertical branchlets of similar size, shape and spacing. Smaller colonies usually have a less regular appearance, but are always pillow-shaped or plate-like. Branchlets are usually <4.5mm thick and are 2.5-4cm long. Horizontal branches are very irregular in thickness, depending on the number of neighbouring anastomosing branches.

Axial corallites are up to 4.5mm exsert, 1.4-1.9mm diameter, with calices 0.8-1.2mm diameter. Two complete septal cycles may be present, up to $\frac{3}{4}$R and $\frac{1}{2}$R but are usually much less well-developed, with the second cycle incomplete or absent. Radial corallites on branchlets are very uniform in appearance. They have little or no upper wall, the lower half of the wall is usually expanded as a rounded lip in a manner similar to *A. millepora*. Septa may occur in two complete cycles up to $\frac{1}{3}$R and $\frac{1}{4}$R, but usually there are only 4 septa or less, including a directive septum centred on the upper wall. Radial corallites on main branches are immersed and usually have two complete cycles of short septa.

All non-immersed corallites are costate, the costae and synapticulae sometimes forming a lattice network. The coenosteum between corallites is both costate and spongy and ornamented with spinules.

Living colonies are pale coloured, usually grey or brown but are sometimes blue or green, with or without pale branchlet tips, and frequently have a distinctively coloured outer border approximately 10cm wide. Polyps are frequently extended during the day.

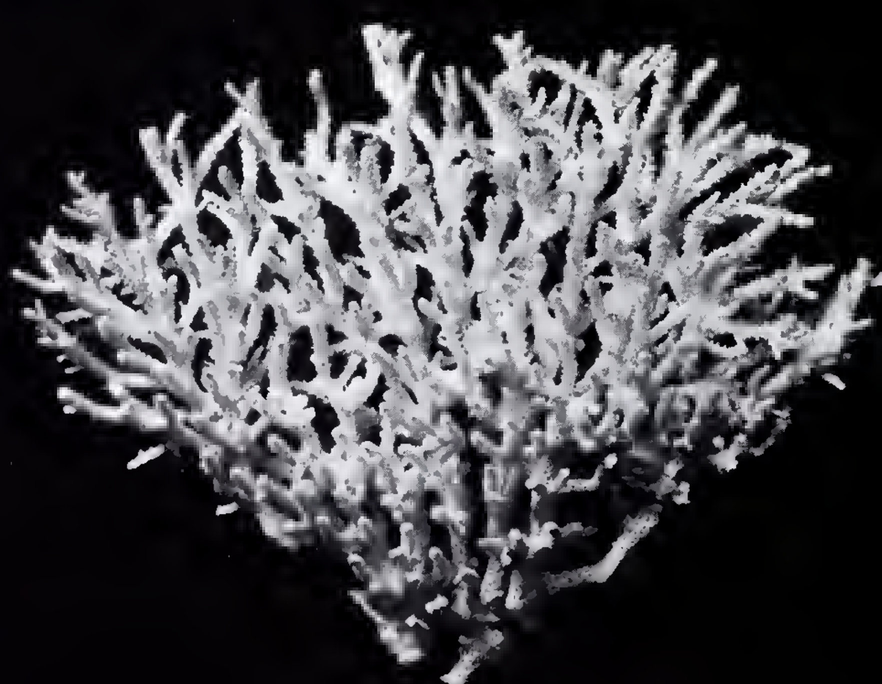
Habitat preferences and growth form variation

Acropora subulata is restricted to reef slopes with a high *Acropora* diversity, exposed to good water circulation but protected from strong wave action. It has seldom been observed in the Northern Region of the Great Barrier Reef but is abundant on some reefs of the Central Region. Fully developed colonies have a high central base and are flat and circular

Figs. 796, 797 *Acropora subulata* (× 0.5)
Fig. 796 From Wye Reef, collecting station 163, same corallum as Fig. 798.
Fig. 797 From Big Mary Reef, collecting station 187, same corallum as Fig. 799.

Fig. 796▼

Fig. 797▼



and have a very neat, well-defined appearance. Less well-developed or young colonies may be vase-shaped and some colonies are irregularly shaped according to space restrictions.

Colonies growing in partly turbid conditions have relatively thin branchlets and exsert axial corallites. Radial corallites are relatively narrow and nariform and incipient axial corallites may be developed and form sub-branchlets. Such colonies have a different appearance from those growing in clear water, where the characteristics of the species, as described above, are more fully developed.

Figs. 798-801 *Acropora subulata* (× 5)

Fig. 798 From Wye Reef, same corallum as Fig. 796.

Fig. 799 From Big Mary Reef, same corallum as Fig. 797.

Figs. 800, 801 From Britomart Reef, collecting station 167, same coralla as Figs. 802, 803 (respectively).

Fig. 798▲ Fig. 800▼ Fig. 799▲ Fig 801▼

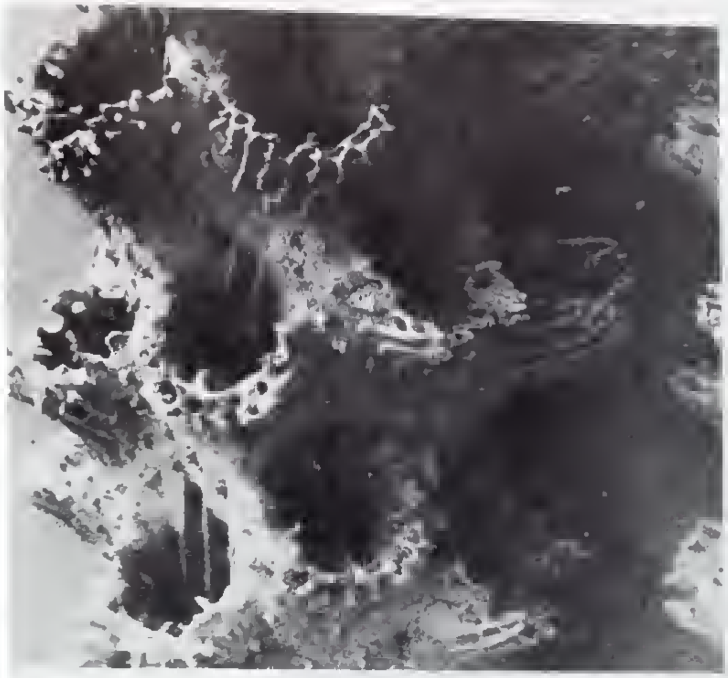


Fig 802▲

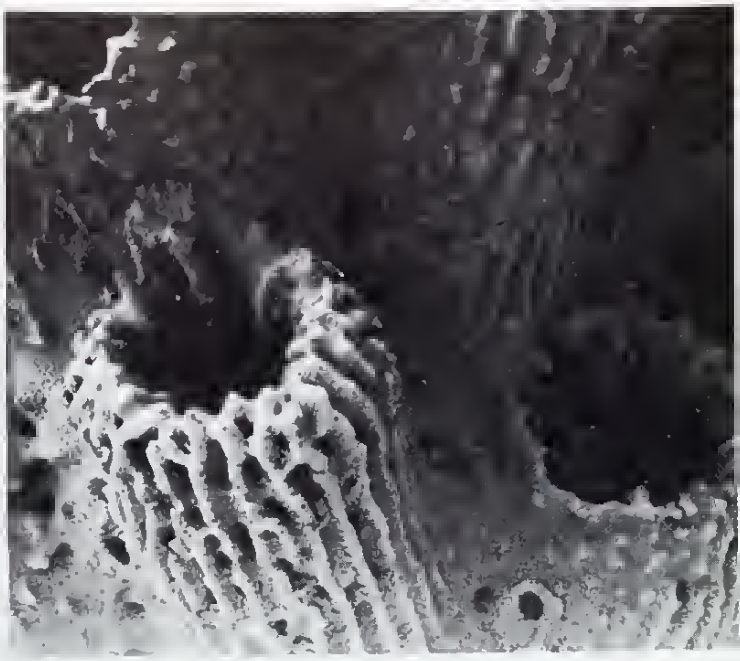


Fig 803▲

Figs. 802, 803 *Acropora subulata* from Britomart Reef, same coralla as Figs. 800, 801 (respectively) (× 10 and 20 respectively).

Similar species

Underwater, large colonies show little resemblance to any other species but pieces of coralla resemble *A. latistella* and also finely branched corymbose *A. millepora*. The latter species is readily distinguished by growth form alone, but also has characteristically fish scale-like radial corallites. *A. latistella* has thicker branchlets and larger radial corallites with wider, rounder lips. *Acropora subulata* from partly turbid water is closest to *A. cytherea*, which also has exsert axial corallites and incipient axial corallites on branchlets. Branchlets of *A. cytherea*, however, are much shorter and radial corallites more irregular, smaller, and more nariform.

Distribution

Known from the Philippines, Fiji, the Great Barrier Reef and possibly north-west Australia.

Acropora (Acropora) nana (Studer, 1878)

Synonymy

Madrepora nana Studer, 1878.

Acropora nana (Studer); Wells (1950).

The holotype of *A. nana* from Fiji has not been re-examined during the present study.

Material studied

Triangle Reef, Franklin Reef, Willis Islet, Mellish Reef (5 specimens), **Flinders Reef (Coral Sea), Britomart Reef** (2 specimens), **Myrmidon Reef** (2 specimens), **Palm Islands, Davies Reef, Marion Reef, Fitzroy Reef** (5 specimens), **Flinders Reef (Moreton Bay).**

These localities include collecting stations 150, 158, 167, 168, 174, 190, 199, 203, 208, 219, 221, 226, 227.

Figs. 804, 805 *Acropora nana* (× 0.5)

Fig. 804 From Myrmidon Reef, collecting station 219, same corallum as Fig. 806.
Fig. 805 From Mellish Reef, collecting station 208, same corallum as Fig. 807.

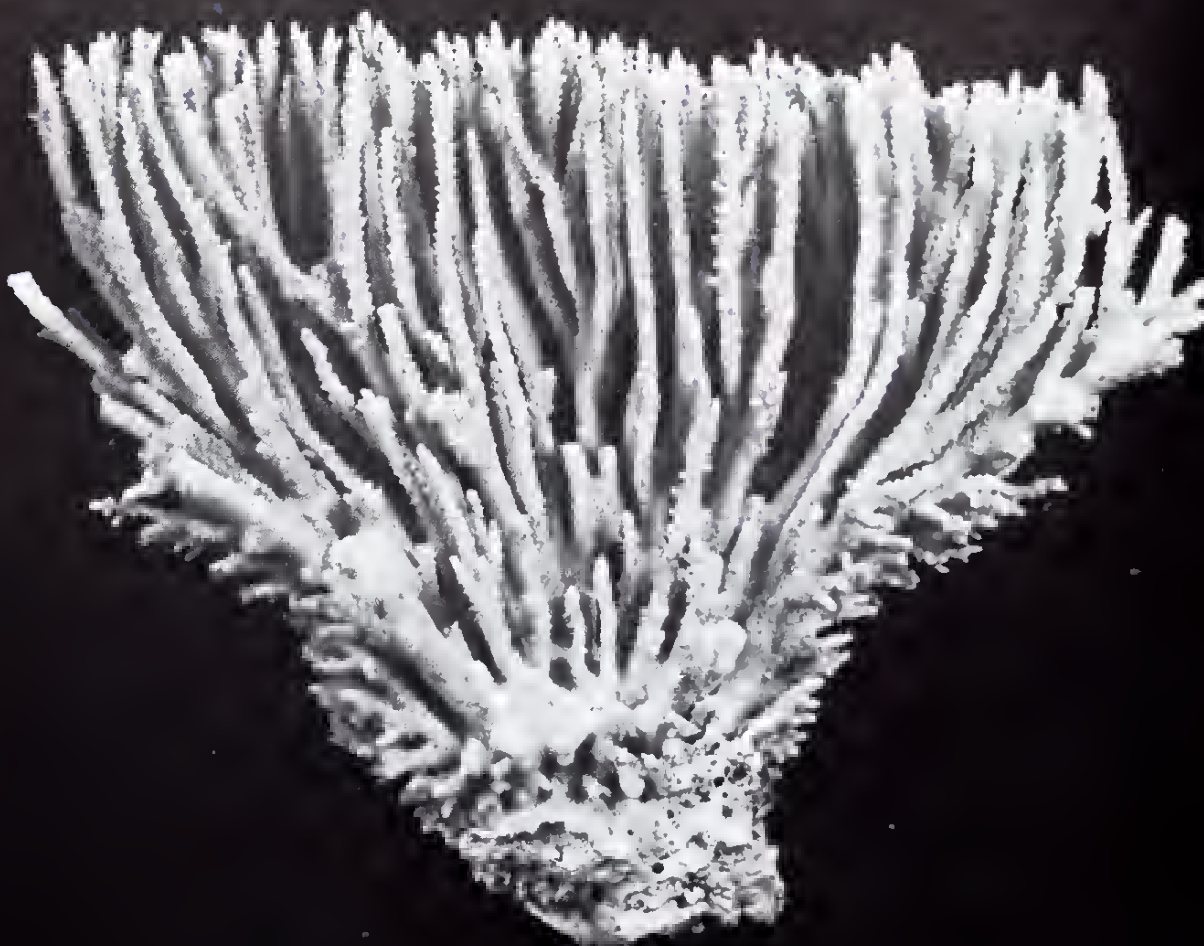


Fig. 804▲

Fig. 805▼

Characters

Colonies consist of dense thickets of branchlets which become fused towards the corallum base. Bases are usually solid, with branchlets or fused groups of branchlets attached directly; but some colonies are sub-corymbose. Branchlets are terete, very long (up to 18cm), 4-10mm diameter, and are usually tightly compacted. Very compacted branchlets seldom divide; more open branching usually results in a more caespitose growth form.

Radial corallites are widely spaced and sub-immersed on lower parts of branchlets, becoming more proliferous and tubular apressed on upper parts. Incipient axial corallites usually occur only in caespitose growth forms or where branchlets have been broken. Radial corallites are 1.3-1.8mm diameter, with rounded calices 0.9-1.1mm diameter. Septal development varies greatly. Immersed corallites usually have sub-equal cycles $<\frac{1}{4}$R; tubular corallites usually have distinct cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R, but these may be more developed, with directives reaching R. Axial corallites are 1.8-2.0mm diameter, with calices 0.9-1.0mm diameter, with sub-equal septa reaching $\frac{3}{4}$R-R deep within the corallite. The coenosteum is medium-coarse, strongly fused and ornamented with rows of flattened spinules. Corallites are finely costate.

Living colonies are cream, blue or pink in colour, usually with pale branchlet tips. This species occurs on upper reef slopes exposed to strong wave action or in more protected biotopes exposed to currents.

Affinities

Acropora nana is close to *A. subulata*, with corallite structures scarcely distinguishable. The latter is usually readily distinguished by its corymbose table-like growth form but in upper reef slopes, where both species may occur together, *A. subulata* can only be distinguished by its caespitose branching pattern, forming pillow-shaped colonies.

Distribution

Previously recorded from the Cocos-Keeling Islands and Fiji.

Figs. 806, 807 *Acropora nana* (× 5)
Fig. 806 From Myrmidon Reef, same corallum as Fig. 804.
Fig. 807 From Mellish Reef, same corallum as Fig. 805.

Fig 806▾

Fig. 807▾

Acropora (Acropora) aculeus (Dana, 1846)

Synonymy

?*Madrepora aculeus* Dana, 1846; Brook (1893).

Madrepora elegantula Ortmann; Brook (1893).

Acropora aculeus (Dana); Faustino (1927); Nemenzo (1967); Wallace (1978).

Acropora tubigera (Horn); Crossland (1952).

Dana's type specimens of *A. aculeus* from Fiji (YPM 4177 and USNM 257) are probably the same corallum, the former being a fragment only. It differs from most coralla of the present series in having very strongly appressed to immersed radial corallites and in having straight branchlets projecting from a semi-solid base (like *A. nana*), rather than the branching pattern described below. It also has smaller corallites than any specimen in the present series. Other characters, including the shape of radial corallites and all fine structural details, agree with various coralla of the present series and thus the name *aculeus* can be accepted with reservation.

The holotype of *A. tubigera* from the East Indies (YPM 1483) is a hardly recognisable fragment but corresponds with non-type specimens in the same collection which are not the present species. Crossland's *A. tubigera* is a heavily calcified specimen of the present species.

Material studied

Arden Island, Deltaic Reef Channel, Triangle Reef, Raine Island (2 specimens), **Great Detached Reef** (5 specimens), **Sir Charles Hardy Islands, Martha Ridgeway Reef** (2 specimens), **Cat Reef, Tijou Reef** (5 specimens), **Houghton Island** (2 specimens), **Lizard Island, Willis Islet** (2 specimens), **Mellish Reef** (2 specimens), **Britomart Reef** (33 specimens), **Myrmidon Reef** (4 specimens), **Palm Islands** (22 specimens) **Pandora Reef, Davies Reef** (2 specimens), **Phillips Reef, Chesterfield Reefs, Redbill Reef, Fitzroy Reef** (2 specimens), **Lady Musgrave Reef** (2 specimens).

These localities include collecting stations 1, 2, 5, 6, 8, 16, 34, 37, 41, 45, 55, 60, 73, 100, 148, 152, 156, 157, 158, 159, 167, 168, 171, 174, 177, 179, 183, 190, 194, 199, 200, 208, 215, 219, 220, 221.

Characters

Colonies are corymbose or corymbose plates. Plate-like colonies usually have a thick side attachment and tapering horizontal branches, which are regularly spaced and seldom anastomosed. Corymbose colonies have finer main branches with a greater tendency to anastomose. Branchlets are long (up to 9cm) and less readily distinguished from main branches. Some colonies consist almost entirely of vertical, elongate, dividing branchlets arising from a consolidated basal plate. In all cases, branchlets are evenly and usually densely distributed and uniform in height and appearance giving colonies a compact, pillow-like appearance. Individual colonies may consist of one or several 'pillows' joined horizontally or tiered.

Branchlets have incipient axial corallites and tubular appressed radial corallites of similar size and shape, with circular to flaring oval openings, 0.8-1.1mm across. Primary septa are $<\frac{1}{2}R$; secondary septa are rudimentary to absent. Septa are slightly to strongly dentate. One directive septum can usually be distinguished. Axial corallites are very variable in appearance. They are 2-4.5mm exsert, tubular, 1.6-2.4mm diameter, with calices 0.8-1.0mm diameter. Septa are in two cycles up to $\frac{2}{3}R$ and $\frac{1}{3}R$, although the second cycle may be absent. All corallites have finely costate lattice-like walls, which become secondarily

Figs. 808-810 *Acropora aculeus* (×0.5)

Figs. 808, 809 From Britomart Reef, collecting stations 167 and 168 (respectively); Fig. 808 same corallum as Figs. 811, 812; Fig. 809 same corallum as Figs. 813, 814.

Fig. 810 From Esk Island, Palm Islands, collecting station 42.

Fig. 808▼

Fig. 809▼

Fig. 810▼

thickened with anastomosed spinules. The coenosteum on and between older corallites consits of spinules with slightly elaborated tips and these may be infilled with scale-like aragonite. Main branches are solid except for irregular slit-like pores.

Living colonies are usually brightly coloured. 'Colours are blue, grey, green, or brown on lower parts of branches, with tips of branches yellow, lime green, pale blue or brown' (Wallace, 1978).

Habitat preferences and growth form variation

Acropora aculeus occurs in most reef biotopes protected from strong wave action. It is particularly abundant in shallow lagoons, where its pillow-like appearance is best

Figs. 811-814 *Acropora aculeus* from Britomart Reef; Figs. 811, 812 same corallum as Fig. 808; Figs. 813, 814 same corallum as Fig. 809 (× 5).

Fig. 811▲

Fig. 813▼

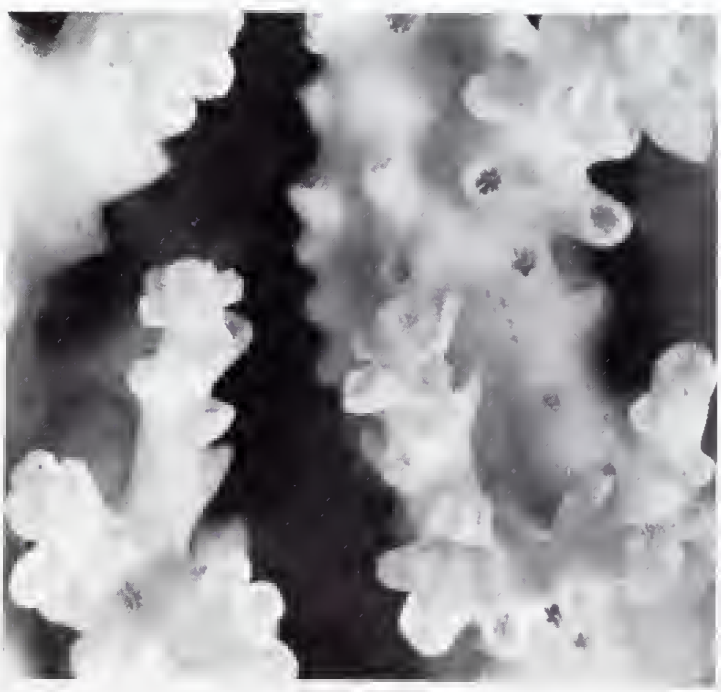


Fig. 812▲

Fig. 814▼

developed. Coralla from increasing depth are increasingly plate-like, with relatively prominent horizontal branches. Coralla from very shallow biotopes may have no horizontal branches and consist of thick masses of vertical branchlets projecting from a broad base.

Figs. 815-818 *Acropora aculeus* (× 20)

Fig. 815 From Rib Reef.

Figs. 816, 817 From between Orpheus and Fantome Islands, Palm Islands, collecting station 60.

Fig. 818 From Mellish Reef, collecting station 208.

Fig. 815▲

Fig. 816▲

Fig. 817▼

Fig. 818▼

Similar species

Acropora aculeus most closely resembles *A. latistella* and *A. cerealis*. *Acropora latistella* may have a similar growth form to *A. aculeus* but has thicker branches, usually less exsert axial corallites and radial corallites which are closer together and have open rounded calices with relatively thick walls and well-developed septa. *Acropora aculeus* has narrow calices, with thin, perforated, costate walls and less well-developed septa. *Acropora cerealis* forms corymbose plates or corymbose tables, without the horizontal branches normally formed by *A. aculeus*. However, these species may be very similar in growth form and in the shape and size of corallites and are best distinguished by *A. cerealis* having relatively short branches which taper and which are uniformly arranged in a characteristically corymbose fashion without irregular horizontal branches at the colony perimeter as normally found in *A. aculeus*.

Distribution

Recorded in the tropical Indo-Pacific, west to Sri Lanka and east to the Marshall Islands and Samoa.

Acropora (Acropora) azurea n.sp.

Material studied

Myrmidon Reef (4 specimens).

This locality is collecting station 221.

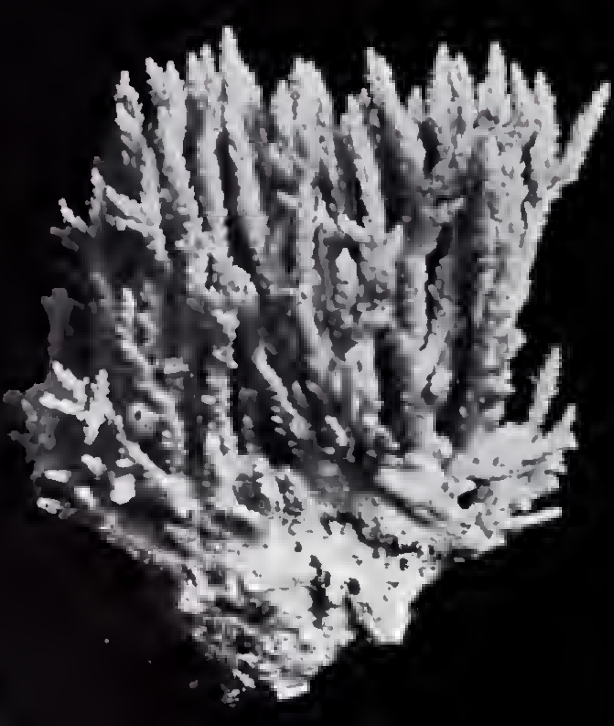
Characters

Colonies are caespitose, composed of irregular, anastomosing branchlets arising from a solid base, giving a bushy appearance. Branchlets are up to 8cm long and 5.5mm thick. Radial corallites on upper parts of branchlets are strongly appressed, with no upper wall developed, and have nariform openings. Those on lower branchlets are sub-immersed with rounded openings. Radial corallites are 0.9-1.0mm diameter, with calices 0.6-0.8mm diameter. Septa are composed of neat rows of spines, those of the first cycle reaching $\frac{2}{3}$R; those of the second cycle are $<\frac{1}{4}$R and are usually incomplete. Axial corallites are 1.5-1.8mm diameter, with calices 0.6-0.8mm diameter. First cycle septa reach $\frac{3}{4}$R, second

Figs. 819, 820 *Acropora azurea* from Myrmidon Reef, collecting station 221; Fig. 819, holotype, same corallum as Fig. 821 (× 0.75).

Fig. 819▼

Fig. 820▼



cycle septa are completely absent or consist of a few spines. The coenosteum is uniform on and between corallites and is similar to that of *A. valida*, consisting of fine spinules giving a frosted appearance.

Living colonies are a uniform sky blue colour.

Skeletal variation

This species has only been found on the upper reef slope of Myrmidon Reef where, despite its delicate appearance, it is exposed to strong wave action. All coralla in the present series are very similar.

Similar species

Acropora azurea has a superficial resemblance to *A. subulata* and *A. aculeus* in that it forms bushes composed of fine branchlets. It is structurally similar to *A. valida*, which is much larger in all skeletal characters.

Etymology

Named after the distinctive colour this species has at Myrmidon Reef.

Holotype (Fig. 819)

Dimensions: 11.5cm high, 15cm wide

Locality: Myrmidon Reef

Depth: 3m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Fig. 821 *Acropora azurea* from Myrmidon Reef, holotype, same corallum as Fig. 819 (× 5).

Fig. 821▼

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Great Barrier Reef.

The *Acropora nasuta* group

These species have in common essentially similar corallite and coenostial structures. With the exception of *A. lutkeni*, they also share corymhose or caespito-corymbose growth forms, which can develop into side attached plates or stalked tables. Environmentally induced growth form variation is also similar in each species and each has similar habitat preferences. As a result, these species are particularly difficult to separate, both *in situ* and in the laboratory. Thus, this is one of the most difficult groups of *Acropora*, but, because of the abundance of most of its species, it is one of the most important.

These species are arranged below so that adjacent species are most similar; the first and last having little in common. The generalised average shape of radial corallites changes from elongate nariform with a 'hooked' outer edge in *A. cerealis*, to nariform or tubo-nariform in *A. nasuta*, to tubular with round to oval or just slightly nariform openings in *A. valida* and *A. secale*, to tubular with round or just slightly oval openings in *A. lutkeni*. Radial corallites are of similar sizes in *A. cerealis* and *A. nasuta*, mixed or similar sizes in *A. valida*, and mixed sizes in *A. secale* and *A. lutkeni*.

The coenosteum on radial corallite walls of each species consists of moderately dense club-shaped spinules with irregular tips, sometimes organised in lines. In the first three species, lightly calcified specimens may be costate. Between corallites, the coenosteum is similar in *A. cerealis*, *A. secale* and *A. lutkeni*, but is more openly reticulate with fewer spinules in the other species.

All species commonly occur together in biotopes with a high *Acropora* diversity. *Acropora nasuta* probably occupies the widest range of habitats, occurring in almost all *Acropora* assemblages except those in very turbid water and those on lagoon floors where hispidose growth forms predominate. *Acropora cerealis* occurs with *A. nasuta* in most habitats except exposed reef flats. *Acropora valida*, and *A. secale* are usually restricted to outer reef flats, upper reef slopes and to fringing reefs. *Acropora lutkeni* has apparently been overlooked in past studies because of its general colony-shape resemblance to *A. humilis*, with which it occurs on outer reef flats and upper reef slopes.

Acropora (Acropora) cerealis (Dana, 1846)

Synonymy

Madrepora cerealis Dana, 1846; Brook (1893).

Madrepora hystrix Dana, 1846; Brook (1893).

Madrepora tizardi Brook, 1892; Brook (1893).

Acropora cerealis (Dana); Faustino (1927); Nemenzo (1967); Wallace (1978).

Acropora hystrix (Dana); Wells (1954).

Acropora tizardi (Brook); Wells (1954); Zou (1975).

There are major differences between Dana's type specimens of *A. cerealis* from the Sulu Sea and *A. hystrix* from Fiji, differences which also occur in the present series. These differences appear to be environmentally induced, with only one species involved. Brook's syntype of *A. tizardi* from the South China Sea (BMNH 1889-9-24-115) is a lightly calcified corallum similar to the type of *A. cerealis*.

Figs. 822-824 *Acropora cerealis* (×0.5)
Fig. 822 From Keeper Reef, same corralum as Fig. 825.
Fig. 823 From Great Detached Reef, collecting station 1, same corallum as Fig. 826.
Fig. 824 From Chesterfield Atoll, collecting station 210, same corallum as Fig. 827.

Fig. 822▲

Fig. 823▼

Fig. 824▼

Material studied

Turtle Islands (5 specimens), **Raine Island** (2 specimens), **Great Detached Reef** (3 specimens), **Tijou Reef** (13 specimens), **Howick Island, Magdelaine Cay** (3 specimens), **Mellish Reef** (2 specimens), **Flinders Reef (Coral Sea)** (11 specimens), **Britomart Reef** (47 specimens), **Rib Reef, Myrmidon Reef** (5 specimens), **Brisk Island** (2 specimens), **Keeper Reef, Chesterfield Reefs** (6 specimens), **Fitzroy Reef, Lady Musgrave Reef** (3 specimens).

Figs. 825-828 *Acropora cerealis* (× 5)

Fig. 825 From Keeper Reef, same corallum as Fig. 822.
Fig. 826 From Great Detached Reef, same corallum as Fig. 823.
Fig. 827 From Chesterfield Atoll, same corallum as Fig. 824.
Fig. 828 From Chesterfield Atoll, collecting station 212.

Fig. 825▲

Fig. 826▲

Fig. 827▼

Fig. 828▼

These localities include collecting stations 1, 5, 8, 152, 156, 158, 162, 165, 167, 175, 191, 194, 195, 200, 207, 208, 210, 211, 219, 221, 226.

Characters

Colonies are caespito-corymbose or form corymbose plates with short, highly anastomosed branchlets. Branchlets of plate-like colonies are regularly spaced and are of similar height and width. They may taper slightly from a diameter of 8-10mm. Those of caespito-corymbose colonies are irregular with sub-branches forming wherever space permits.

Radial corallites vary in shape and size according to colony growth form but are uniform throughout the colony. Plate-like colonies have strongly appressed tubular corallites along the base of branchlets. They become increasingly nariform towards their tips, sometimes developing long, hook-like processes and finally become tubular incipient axials. The same range of corallites are found in caespito-corymbose coralla, except that they are more exsert and incipient axial corallites more proliferous. Nariform radial corallites are 1.0-1.9mm wide, with calices 0.6-0.8mm wide. Only one cycle of septa is usually developed, $<\frac{1}{3}$R, with one or two prominent directives. Sometimes only directive septa are developed. Tubular radial corallites may have better-developed septa with both cycles present up to $\frac{1}{2}$R and $\frac{1}{3}$R.

Axial corallites are tubular, 1-2mm exsert, 1.0-2.2mm diameter, with calices 0.6-0.8mm diameter. Septa are in one or two cycles, complete or incomplete, up to $\frac{2}{3}$R and $\frac{1}{4}$R respectively.

The coenosteum on radial corallites varies from costate to evenly arranged, moderately elaborated spinules. Between radial corallites, the coenosteum is reticulate, with scattered, moderately elaborated spinules.

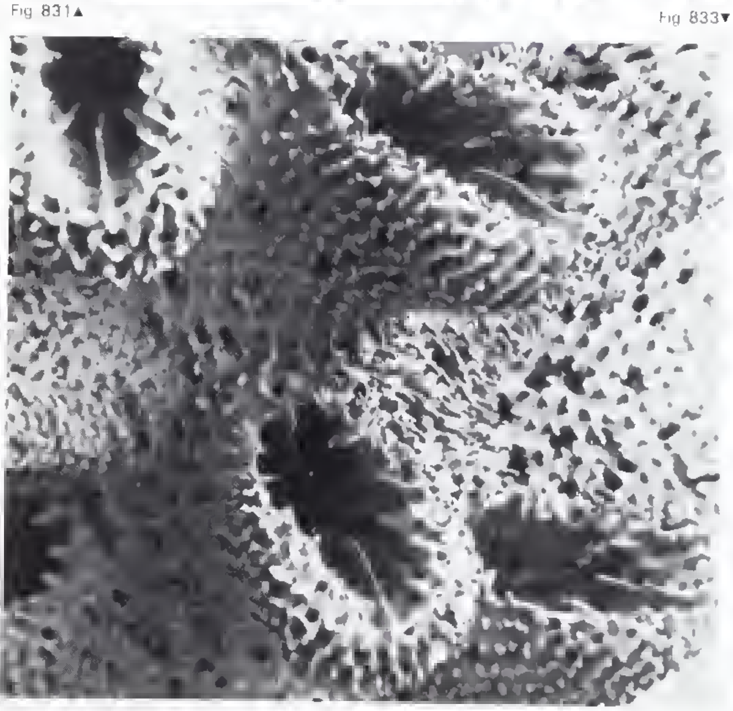
Figs. 829-834 *Acropora cerealis* (× 20)
Figs. 829, 830 Same corallum from Chesterfield Atoll, collecting station 210.
Fig. 831 From Chesterfield Atoll, collecting station 212.
Fig. 832 From Rib Reef.
Fig. 833 From Britomart Reef, collecting station 168.
Fig. 834 From Tijou Reef, collecting station 156.

Fig. 830▼

Fig. 829▼

Fig 831▲

Fig 833▼



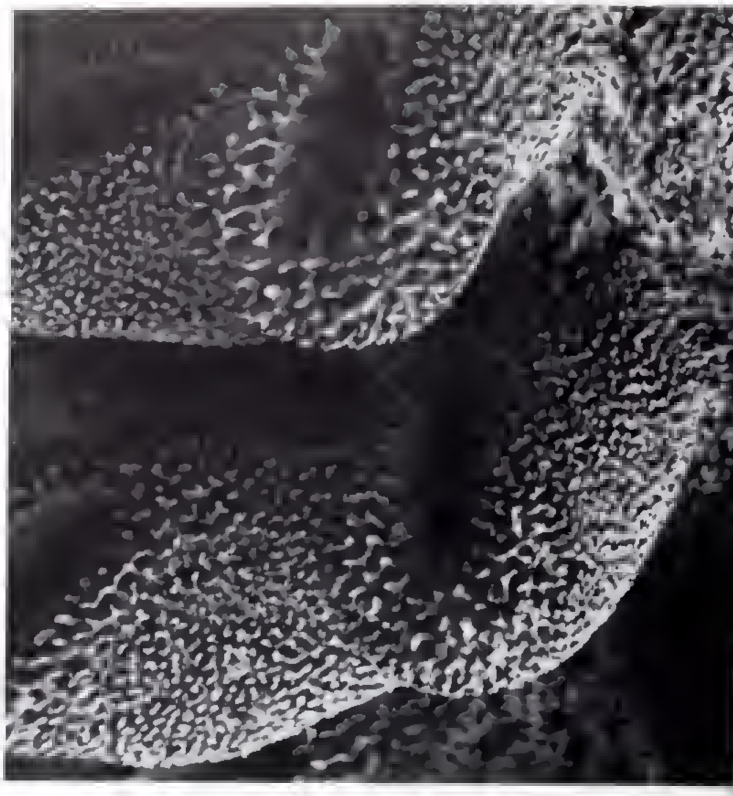


Fig 832▲

Fig 834▼

Living colonies are mostly pale brown, cream or white, with purple, blue or cream branch tips. Sometimes radial corallites are distinctively darker than branches.

Habitat preferences and growth form variation

Acropora cerealis is abundant on the upper slopes of platform or fringing reefs. A wide variety of colony shapes may occur within single biotopes and these are partly attributable to the nature and slope of the substrate at the point of attachment.

Coralla from relatively turbid waters of fringing reefs are relatively lightly calcified and have proliferous incipient axial corallites which are long and tubular.

Similar species

Acropora cerealis resembles several other species with thin branches and a corymbose growth form. These include *A. latistella* (see p. 322), *A. aculeus* (see p. 332), *A. nasuta* and *A. valida*. Thin branched *A. nasuta* may be difficult to distinguish from *A. cerealis*, although the latter almost always has more secondary branching and branches have most of their width made up by corallites. *Acropora valida* is distinguished from *A. cerealis* by having larger branchlets and larger corallites which are strongly tubular appressed, with no tendency to become nariform.

Acropora cerealis may sometimes resemble *A. divaricata*, which can also have a 'spiny' appearance due to prominent incipient axial corallites. *Acropora divaricata* has slightly larger radial corallites, which remain primarily tubular and do not develop the strongly nariform shape of *A. cerealis* corallites. Branches of *A. divaricata* are usually much less anastomosed and more open.

Distribution

Recorded from the Pacific west to the Philippines and Indonesia, and east to the Marshall Islands and Tonga.

Acropora (Acropora) nasuta (Dana, 1846)

Synonymy

Madrepora nasuta Dana, 1846; Brook (1893).

Madrepora canaliculata Klunzinger, 1879; Brook (1893).

Madrepora cymbicyathus Brook, 1893.

?*Madrepora quelchi* Brook, 1893.

Acropora diomedeae Vaughan, 1906.

Acropora canaliculata (Klunzinger); Vaughan (1906); Hoffmeister (1925).

Acropora cymbicyathus (Brook); Hoffmeister (1925); Wells (1954, 1955); Stephenson & Wells (1955).

Acropora quelchi (Brook); Hoffmeister (1925); Faustino (1927); Thiel (1932); ?Crossland (1952); Stephenson & Wells (1955); Nemenzo (1967); Scheer (1972); ?Pillai & Scheer (1976).

Acropora nasuta (Dana); Hoffmeister (1929); Wells (1954); Nemenzo (1967); Wallace (1978).

Dana's extensive syntype series of *A. nasuta* from Tahiti is in close agreement with the present series. Klunzinger's (1879) holotype of *A. canaliculata* from the Red Sea (ZMB 2129) is close to coralla of the present series from a high energy environment.

Brook's *A. quelchi* from Ambon (BMNH 1886-12-9-287), a redescription of Quelch's *A. effusa* (Dana), is a fragment with few distinguishable characters.

Several other nominal species are close to *A. nasuta*. Among these are *A. forskalii* Ehrenberg from the Red Sea (ZMB 897 and 899), which, unlike *A. nasuta*, has prominent axial corallites and *A. multicaulis* Brook, 1893 from Ramesvaram, which differs from *A. nasuta* primarily in its growth form.

Material studied

Little Mary Reef (8 specimens), **Arden Island** (15 specimens), **Sue Island, Turtle Islands** (7 specimens), **Pandora Reef** (3 specimens), **Raine Island** (4 specimens), **Great Detached Reef** (2 specimens), **Sir Charles Hardy Islands** (18 specimens),

Figs. 835-837 *Acropora nasuta* (× 0.5)

Fig. 835 From Britomart Reef, collecting station 167, same corallum as Fig. 838.
Fig. 836 From Mellish Reef, collecting station 207.
Fig. 837 From Fitzroy Reef, collecting station 190.

Fig. 835▼

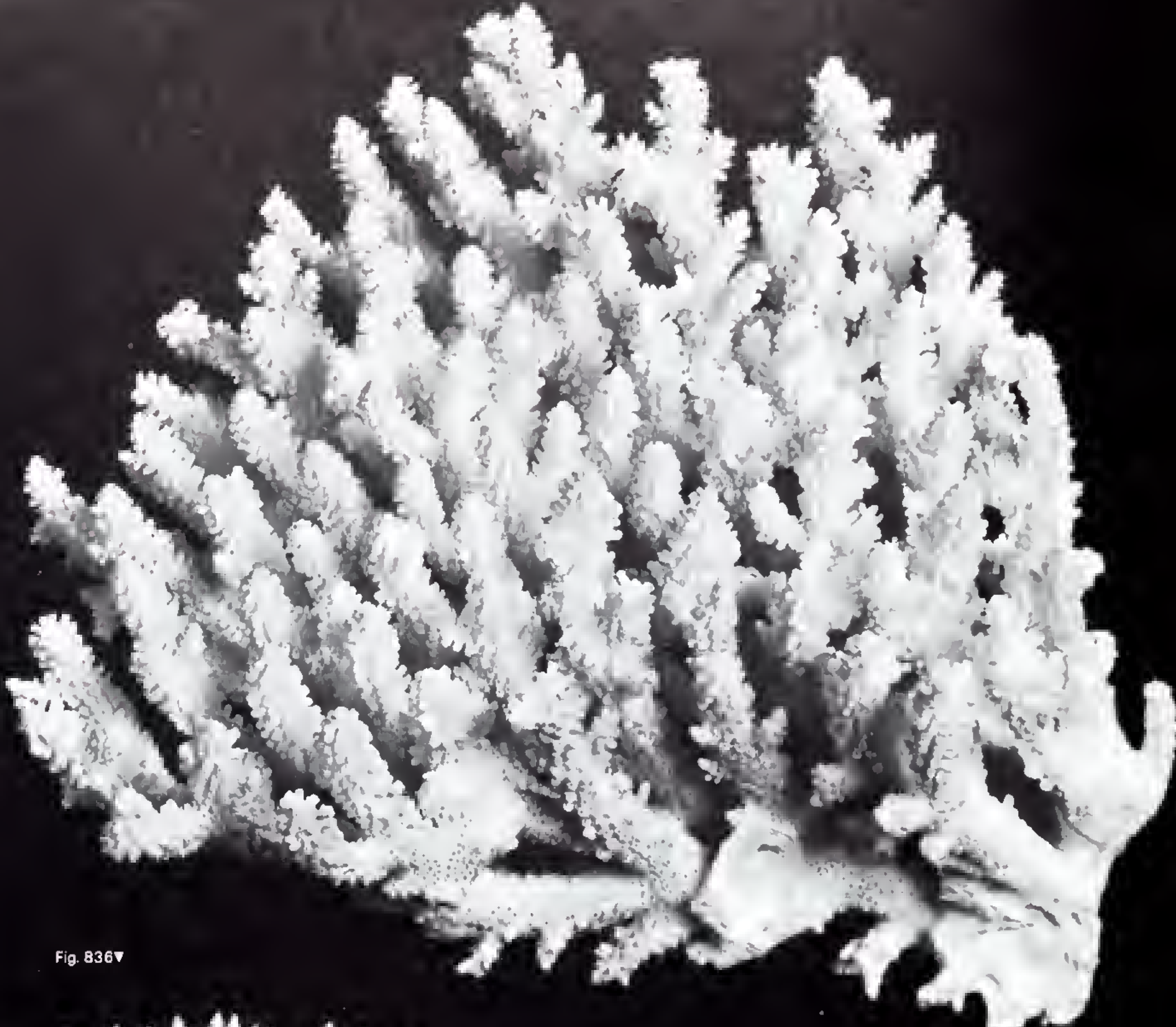


Fig. 836▼

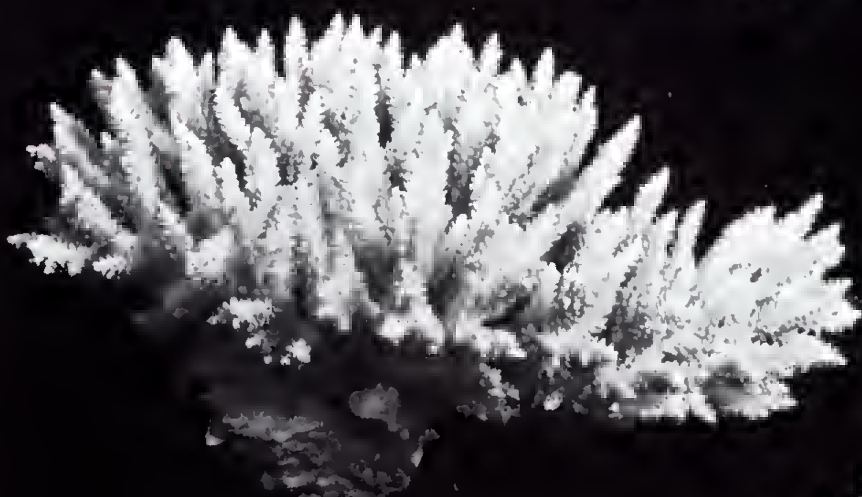


Fig. 837▼

Wye Reef (3 specimens), **Cat Reef, Franklin Reef** (2 specimens), **Tijou Reef** (7 specimens), **Bewick Island** (2 specimens), **Howick Island** (5 specimens), **Houghton Island** (2 specimens), **Yonge Reef, Lizard Island** (3 specimens), **Hope Island, Willis Islet** (2 specimens), **Low Isles, Magdelaine Cay** (3 specimens), **Mellish Reef** (12 specimens), **Flinders Reef (Coral Sea)** (18 specimens), **Britomart Reef**

Figs. 838-841 *Acropora nasuta* (× 5)

Fig. 838 From Britomart Reef, same corallum as Fig. 835.
Fig. 839 From Houghton Island, collecting station 16.
Fig. 840 From Fitzroy Reef, collecting station 190.
Fig. 841 From Chesterfield Atoll, collecting station 210.

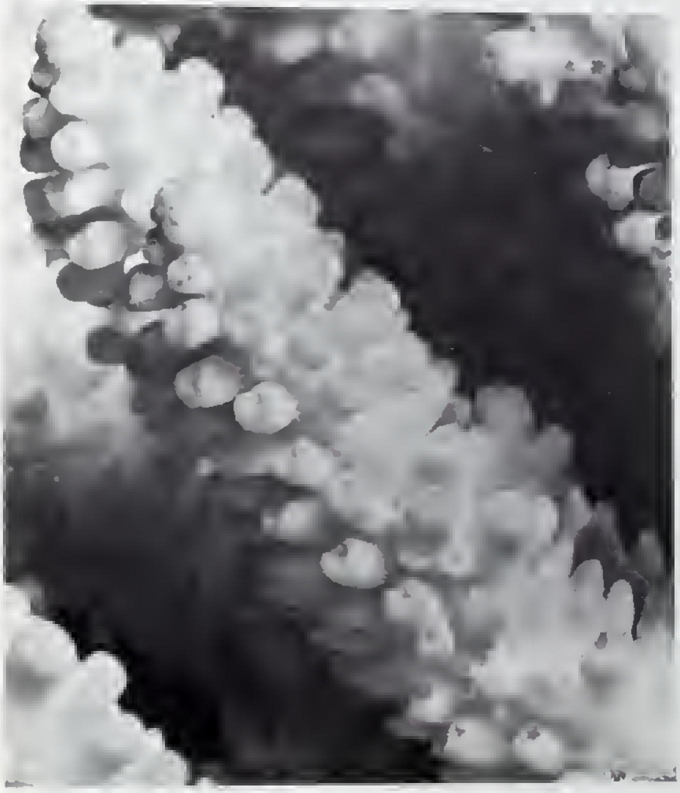


Fig 838▲

Fig. 839▲

Fig. 840▼

Fig. 841▼

(26 specimens), **Rib Reef** (2 specimens), **Myrmidon Reef** (4 specimens), **Palm Islands** (22 specimens), **Darley Reef, Chesterfield Reefs** (6 specimens), **Fitzroy Reef** (17 specimens), **Llewellyn Reef, Lady Musgrave Reef** (6 specimens),

Figs. 842-845 *Acropora nasuta* (× 20)

Fig. 842 From the Turtle Islands, collecting station 165.
Fig. 843 From Arden Island, collecting station 183.
Fig. 844 From Little Mary Reef, collecting station 186.
Fig. 845 From Chesterfield Atoll, collecting station 210.

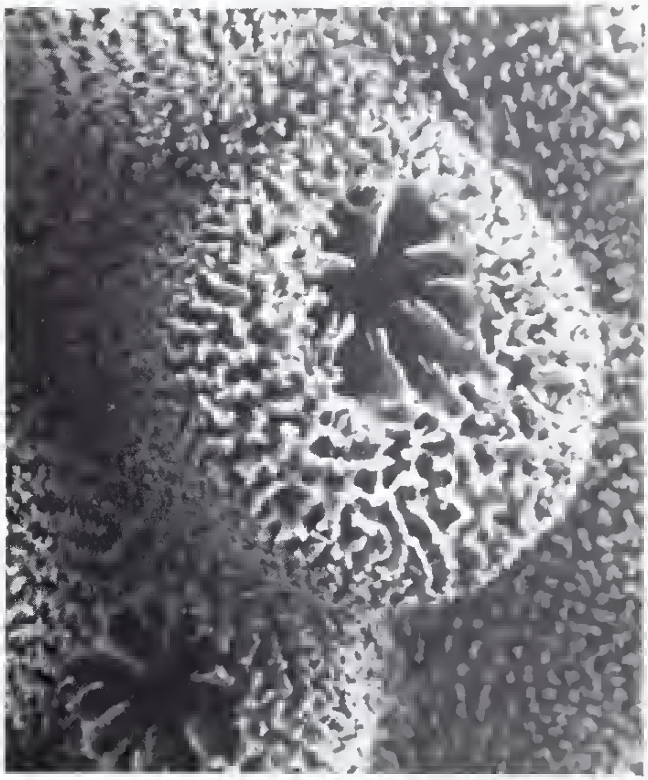


Fig. 842▲

Fig 843▲

Fig 844▼

Fig 845▼

Flinders Reef (Moreton Bay) (2 specimens), **Middleton Reef** (5 specimens), **Elizabeth Reef.**

These localities include collecting stations 1, 2, 8, 9, 16, 18, 34, 36, 37, 41, 60, 100, 148, 149, 150, 151, 152, 155, 158, 160, 163, 165, 167, 168, 173, 174, 175, 176, 177, 179, 182, 183, 185, 186, 190, 191, 192, 193, 195, 197, 199, 200, 201, 207, 208, 209, 210, 211, 214, 215, 219, 220, 221, 226, 227, 231, 233, 237.

Characters

Colonies are corymbose, or form small corymbose tables with branchlets up to 12mm wide, tapering, with or without secondary proliferations. Radial corallites usually form neat rows down branchlets. They are tubo-nariform at branchlet tips and nariform with a thickened lower wall or weakly dimidiate on the remainder of the branchlets. Openings are at 90° to the branches or just less. On the lower parts of branches, small immersed or sub-immersed corallites occur amongst the normal radial corallites. The septation of radial corallites varies from only the directives and a few primary septa, to two complete cycles up to $\frac{2}{3}$R and $\frac{1}{3}$R. Axial corallites are 1 to 2mm exsert, 2.0 to 3.0mm diameter, with calices 0.6 to 1.1mm inner diameter. Primary septa are present up to $\frac{3}{4}$R, secondary septa vary from all absent to complete, $<\frac{1}{4}$R.

The coenosteum on the radial corallites consists of densely arranged, moderately elaborated spinules or spinulose costae. Between corallites, it is reticulate with moderately elaborated spinules.

Living colonies are cream or pale brown with blue branch tips, cream with brown corallites, or greenish-brown with purple or blue corallites.

Habitat preferences and growth form variation

Acropora nasuta occurs in almost all *Acropora* assemblages, except those in very turbid water and on lagoon floors, where hispidose assemblages predominate. Colonies form thin corymbose tables in deeper water or turbid situations are corymbose on reef flats, and are mostly side-attached corymbose on reef slopes.

Within single biotopes, populations may be very polymorphic, particularly with respect to the shape of the radial corallites and the degree of thickening of their lower wall.

Similar species

Acropora nasuta can be readily confused with other corymbose species of the *A. nasuta* group, particularly *A. cerealis* and *A. valida. Acropora cerealis* has more slender branches, more secondary branching and usually more scattered and elongate radial corallites. *Acropora valida* has more tubular radial corallites with smaller, round to oval openings and usually has a more irregular growth form.

Acropora nasuta may also resemble *A. polystoma*, although the latter is usually readily separated by its thicker branches and much larger, more exsert radial corallites of very variable length.

Distribution

Widely distributed in the tropical Indo-Pacific, west to the Red Sea and east to Tahiti.

Acropora (Acropora) sp. 3

Material studied

Britomart Reef.

This locality is collecting station 167.

Characters

The single corallum of this species in the present collection is caespito-arborescent, with compact branches tapering from an average diameter of 8.5mm. Corallites on basal parts of branches are immersed, while those towards branch tips are appressed, with elliptical nariform openings. The latter are arranged in neat rows with calices approximately 1.7mm wide. They have an upper directive septum >R, and a lower directive is usually present; other septa are reduced to a few irregular spines. Immersed corallites have complete primary septa up to $\frac{1}{2}$R, with prominent directives and a secondary cycle of $<\frac{1}{4}$R, incomplete to absent. Axial corallites have calices approximately 1.0mm diameter and two complete septal cycles $<\frac{2}{3}$R. The coenosteum on corallites is composed of fine spinules, which become fused and flaky between corallites.

Affinities

This species does not closely resemble any described species, but probably has closest affinity with *A. nasuta* and *A.* sp. 4.

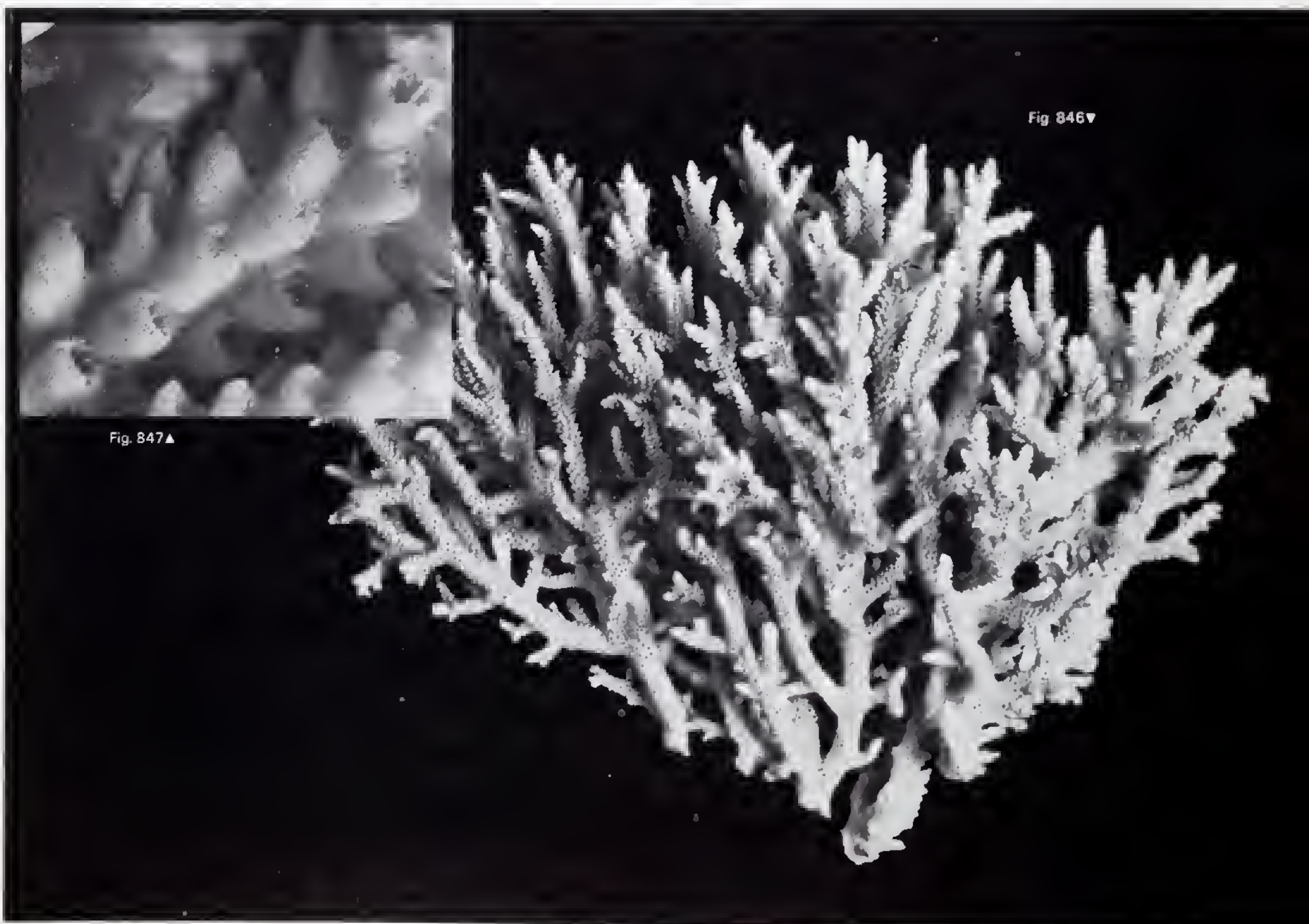
Acropora (Aeropora) sp. 4

Material studied

Martins Reef (2 specimens), **Magdelaine Cay, Fitzroy Reef, Llewellyn Reef, Lady Musgrave Reef.**

These localities include collecting stations 194, 196, 197, 200.

Figs. 846, 847 Same corallum of *Acropora* sp. 3 from Britomart Reef, collecting station 167 (× 0.33 and 5 respectively).



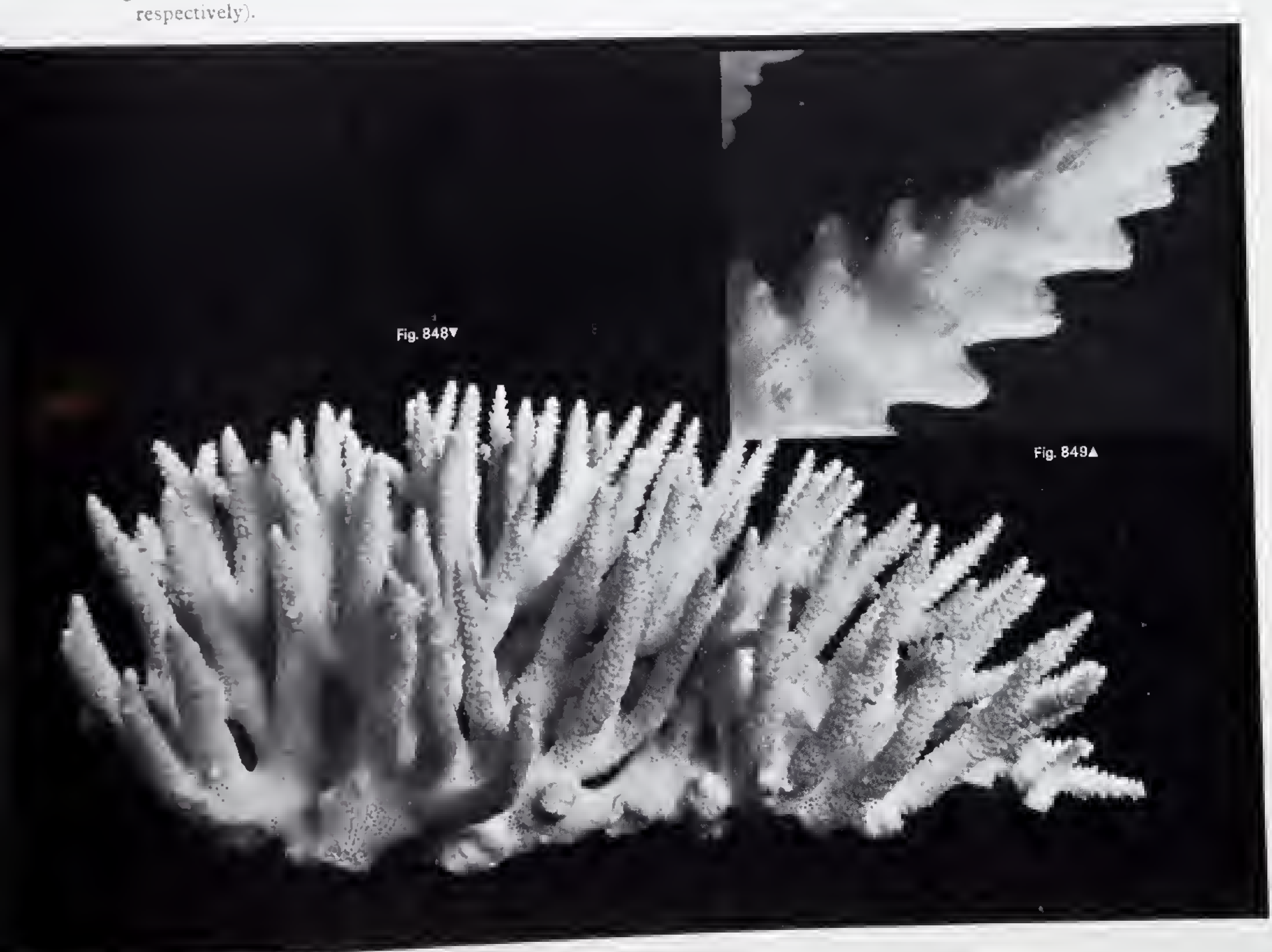
Characters

Coralla attributed to this species are corymbose, consisting of branches tapering from a maximum diameter of 1.7cm. Corallites are immersed on basal branches, becoming appressed, with rounded nariform openings towards branch tips. They are irregularly arranged and frequently face different directions. Calices are 1.1-1.2mm diameter. Corallites on branch bases have primary septa up to $\frac{2}{3}$R and secondary septa up to $\frac{1}{3}$R, while those towards branch tips have a variable but reduced septation, except for the upper directive, which remains prominent. Axial corallites are approximately 3.5mm diameter with calices 1.0-1.2mm diameter and two septal cycles of $\frac{2}{3}$R and $\frac{1}{3}$R. The coenosteum is mostly uniform, consisting of fine spinules which become fused between corallites.

Affinities

This species is closest to *A.* sp. 3 and *A. glauca*.

Figs. 848, 849 Same corallum of *Acropora* sp. 4 from Llewellyn Reef, collecting station 196 (× 0.5 and 5 respectively).



Acropora (Acropora) valida (Dana, 1846)

Synonymy

Madrepora valida Dana, 1846; Brook (1893).

?*Madrepora rousseauii* Edwards & Haime, 1860; Brook (1893).

Madrepora variabilis Klunzinger, 1879; Brook (1893).

Madrepora coalescens Ortmann, 1889; Brook (1893).

Acropora dissimilis Verrill, 1902.

Acropora rousseauii (Edwards & Haime); von Marenzeller (1907).

Acropora variabilis (Klunzinger); Verrill (1902); von Marenzeller (1907); Vaughan (1918); Matthai (1923); Faustino (1927); Wells (1950, 1955); Crossland (1952); Rossi (1954); Stephenson & Wells (1955); Searle (1956); Scheer (1964a); Chevalier (1968); Scheer & Pillai (1974); Pillai & Scheer (1976); Wallace (1978).

Acropora valida (Dana); Verrill (1902); Hoffmeister (1925); Wells (1954); Nemenzo (1967); Zou (1975); Grigg *et al.* (1981).

Acropora dissimilis (Verrill); Faustino (1927); Nemenzo (1967); Zou (1975).

Acropora concinna (Brook); Verrill (1902); Searle (1956).

Dana's type of *A. valida* from Fiji (USNM 272) is a robust corallum, probably from a high energy environment. Edwards & Haime's type of *A. rousseauii* from the Seychelles Islands (MCZ 1076) has prominent axial corallites and in this respect lies outside the usual limits of variation of east Australian coralla. Ortmann's type of *A. coalescens* from Sri Lanka (BM 3716) has thick branches corresponding closely with Dana's type.

Klunzinger's extensive type series of *A. variabilis* from the Red Sea clearly shows that he had a good understanding of intraspecific variation in this species. He divided the species into three varieties: plate-like *leptoclados*, caespitose *pachyclados* and an intermediate variety, *caespitofoliata*, which links the first two varieties with each other and with common growth forms of the species usually found on reef slopes. Brook (1893, p. 161) made Ortmann's *A. coalescens* a fourth variety of *A. variabilis*, following a suggestion from Ortmann to that effect.

Material studied

Arden Island (6 specimens), **Murray Islands** (2 specimens), **Turtle Islands** (4 specimens), **Pandora Reef** (3 specimens), **Great Detached Reef, Sir Charles Hardy Islands, Wye Reef, Cat Reef** (5 specimens), **Franklin Reef** (6 specimens), **Tijou Reef** (4 specimens), **Hunters Reef, Houghton Island, Lizard Island** (2 specimens), **Low Isles, Magdelaine Cay, Mellish Reef, Flinders Reef (Coral Sea), Britomart Reef** (12 specimens), **Dip Reef** (2 specimens), **Myrmidon Reef** (3 specimens), **Palm Islands** (61 specimens), **Phillips Reef** (2 specimens), **Marion Reef, Chesterfield Reefs** (6 specimens), **Whitsunday Islands, Fitzroy Reef** (10 specimens), **Llewellyn Reef** (5 specimens), **Lady Musgrave Reef, Flinders Reef (Moreton Bay)** (4 specimens), **Middleton Reef** (28 specimens), **Elizabeth Reef** (10 specimens).

These localities include collecting stations 5, 8, 16, 32, 36, 37, 42, 45, 55, 57, 91, 98, 148, 150, 160, 162, 163, 165, 167, 173, 174, 176, 177, 179, 183, 190, 191, 192, 195, 200, 205, 207, 210, 211, 213, 215, 221, 226, 227, 230, 231, 232, 233, 236, 237, 238.

Figs. 850-854 *Acropora valida* (× 0.33)

Fig. 850 From Britomart Reef, collecting station 167.
Fig. 851 From Brisk Island, Palm Islands, collecting station 200, same corallum as Fig. 856.
Fig. 852 From Tijou Reef, collecting station 8.
Fig. 853 From Falcon Island, Palm Islands, collecting station 174.
Fig. 854 From Middleton Reef, collecting station 232.

Fig. 850▲

Fig. 851▲

Fig. 852▲

Fig. 853▼

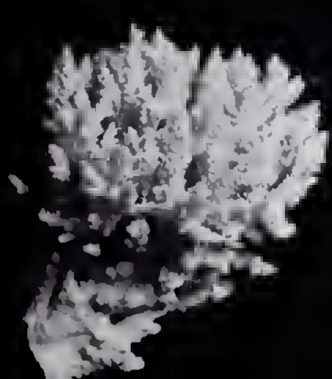
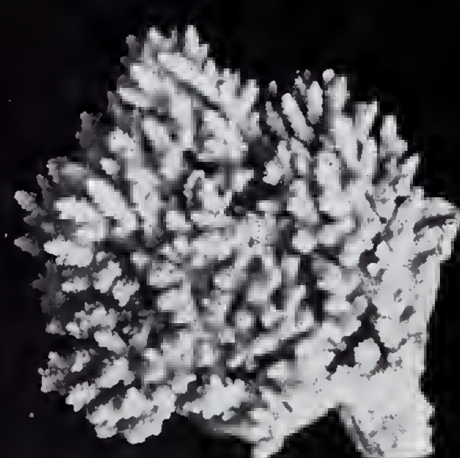


Fig. 854▼



Characters

Colonies are corymbose or caespito-corymbose, forming a range of growth forms, from compact bushes to plates with side attachment or tables. Radial corallites on each corallum are one size or a wide range of sizes. They are sub-immersed to tubular appressed, sometimes with nariform openings, with these shapes usually occurring together. Calices are 0.4-0.7mm diameter. Larger corallites have up to two complete septal cycles of $\frac{2}{3}$R and $\frac{1}{4}$R. Smaller radial corallites, and those with nariform openings, have the second septal cycle reduced or absent and have relatively prominent directive septa. Axial corallites and incipient axial corallites are <2.8mm diameter, with calices 0.7-0.9mm diameter and two

Figs. 855-858 *Acropora valida* (× 5)

Fig. 855 From Britomart Reef, same corallum as Fig. 850.
Fig. 856 From Brisk Island, Palm Islands, same corallum as Fig. 851.
Fig. 857 From Tijou Reef, same corallum as Fig. 852.
Fig. 858 From Middleton Reef, same corallum as Fig. 854.

Fig. 855▲

Fig. 856▲

Fig. 857▼

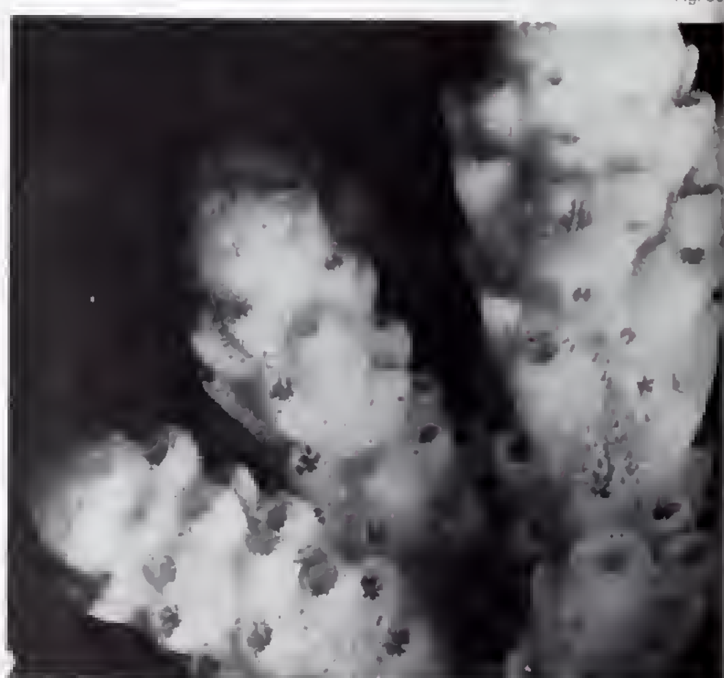


Fig. 858

complete septal cycles up to $\frac{1}{2}$R and $\frac{1}{3}$R. Axial corallites are usually <2mm exsert but occasionally are up to 4mm exsert. Corallites are costate, with fine or coarse costae, with or without prominent synapticulae. The coenosteum between corallites is coarse and spongy.

Figs. 859-862 *Acropora valida* (× 20)

Fig. 859 From Franklin Reef, collecting station 150.
Fig. 860 From Cat Reef, collecting station 148.
Fig. 861 From Chesterfield Atoll, collecting station 212.
Fig. 862 From Great Palm Island, collecting station 176.

Fig 859▲

Fig. 860▲

Fig 861▼

Fig 862▼

Living colonies are frequently cream, brown or yellow, but may be brown with purple branch tips and cream corallites, a colour shared by other species, notably *A. secale.*

Habitat preferences and growth form variation

Acropora valida occurs in most shallow biotopes including those where *Acropora* diversity is low and recently disturbed sites. Coralla from exposed biotopes have a corymbose structure, with straight branches and few sub-branches. Coralla from relatively protected fringing reefs have more widely spaced branchlets, with more exsert radial corallites tending to form incipient axial corallites.

Similar species

Acropora valida is closest to *A. nasuta* (see p. 343) and to *A. cerealis*, which is distinguished by having more plate-like colonies with shorter, more anastomosed branchlets and radial corallites of approximately equal size, except for those developing into incipient axial corallites. Radial corallites of *A. cerealis* are also more nariform than those of *A. valida.*

Acropora secale is also similar to *A. valida* and is initially distinguished by having radial corallites of two distinct sizes and by having a different coenostial structure on and between corallites.

Distribution

Widely distributed in the tropical and subtropical Indo-Pacific, west to the Red Sea and east to Hawaii.

Acropora (Acropora) secale (Studer, 1878)

Synonymy

Madrepora plantaginea Lamarck; Dana (1846).

Madrepora secale Studer, 1878.

Madrepora concinna Brook, 1891; Brook (1893).

?*Madrepora diversa* Brook, 1891; Brook (1893).

?*Madrepora violacea* Brook, 1892; Brook (1893).

Acropora otteri Crossland, 1952.

Acropora diversa (Brook); Wells (1954); Stephenson & Wells (1955); Wallace (1978).

Acropora secale (Studer); Verrill (1902); Nemenzo (1967); Scheer & Pillai (1974).

?*Acropora concinna* (Brook); Pillai & Scheer (1976).

Madrepora secale was designated by Studer as a new name for a specimen which Dana identified as *Madrepora plantaginea* Lamarck. Since Studer offered no additional description, and since his own specimens were apparently different species, Dana's description was accepted as the species description (see Brook, 1893, p. 88) and his specimen as the type (see Verrill, 1902, p. 245). This holotype (YPM 3063) from Sri Lanka is a large corymbose colony close to specimens in the present series.

Brook's *A. diversa* from Diego Garcia (BMNH 1891-4-9-4) has a very reduced septation (mostly septal ridges and no second cycle) and radial corallites are finer and more tubular in shape than in most specimens of the present series. Brook's *A. violacea* from Fiji (BMNH 1862-2-4-31) is similar to his *A. diversa* in both septation and in the shape of radial corallites. Brook's figured syntype of *A. concinna* from Mauritius (BMNH 1878-2-4-3) and *A. otteri* Crossland from the Great Barrier Reef (BMNH 1934-5-14-315) are clear synonyms of *A. secale.*

Figs. 863-865 *Acropora secale* (× 0.5)

Figs. 863, 864 From Franklin Reef, collecting stations 149 and 150 (respectively); Fig. 863 same corallum as Figs. 866, 872; Fig. 864 same corallum as Fig. 867.

Fig. 865 From Martha Ridgeway Reef, collecting station 154, same corallum as Fig. 868

Fig. 883▼

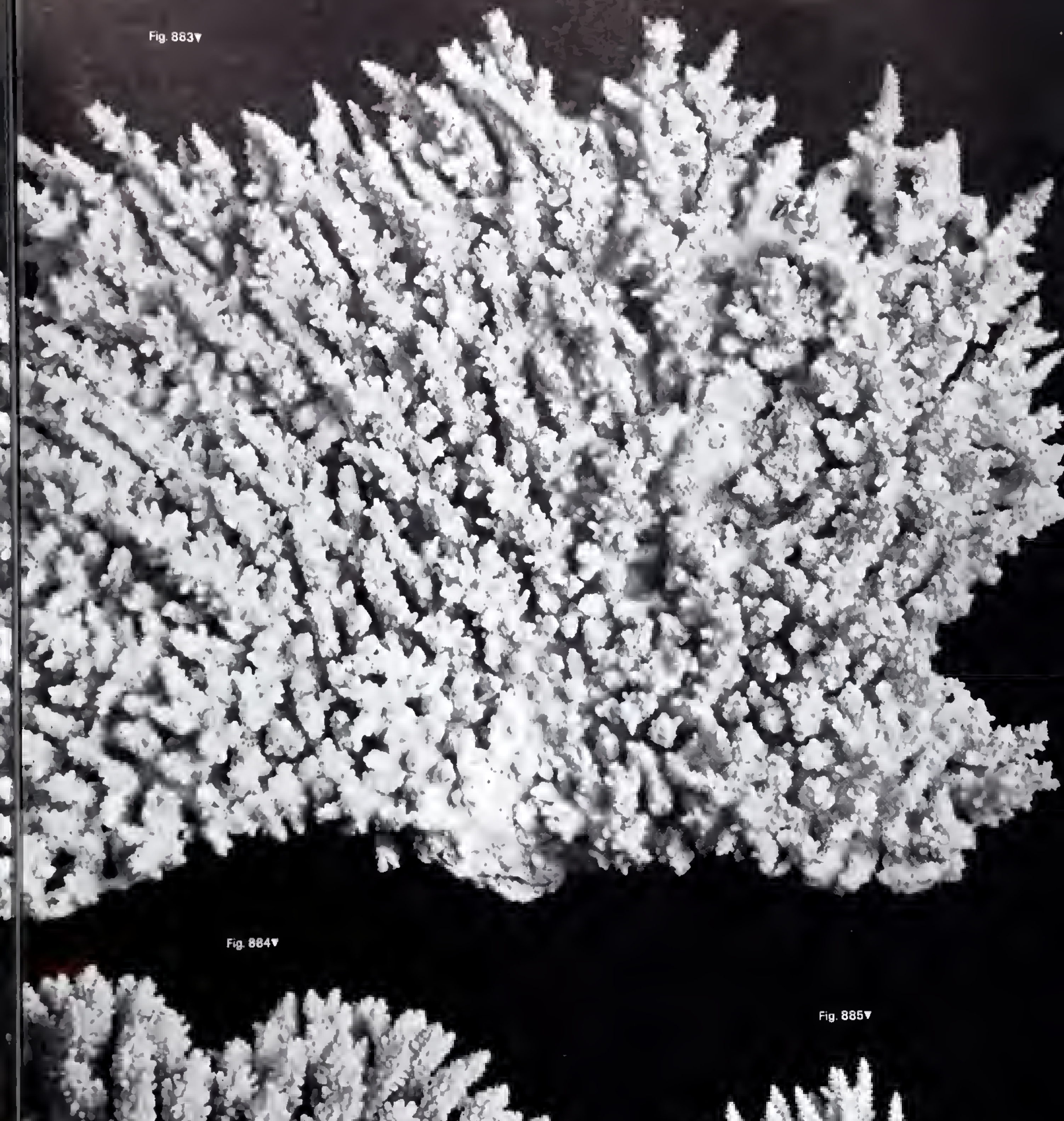


Fig. 884▼

Fig. 885▼

Pillai and Scheer (1976) note that their *A. concinna* (Brook, 1891) from Mauritius is close to *A. secale*.

Material studied

Arden Island (7 specimens), **Sue Island, Turtle Islands, Wizard Islet, Raine Island, Great Detached Reef** (4 specimens), **Sir Charles Hardy Islands, Martha**

Figs. 866-871 *Acropora secale* (× 5)

Figs. 866, 867 From Franklin Reef, Fig. 866 same coralla as Figs. 863, 872; Fig. 867 same corallum as Fig. 864.

Figs. 868, 869 From Martha Ridgeway Reef, collecting stations 154 and 159 (respectively), Fig. 868 same corallum as Fig. 865.

Fig. 870 From Sue Island, collecting station 17.

Fig. 871 From Howick Island, collecting station 175.

Fig. 866▲

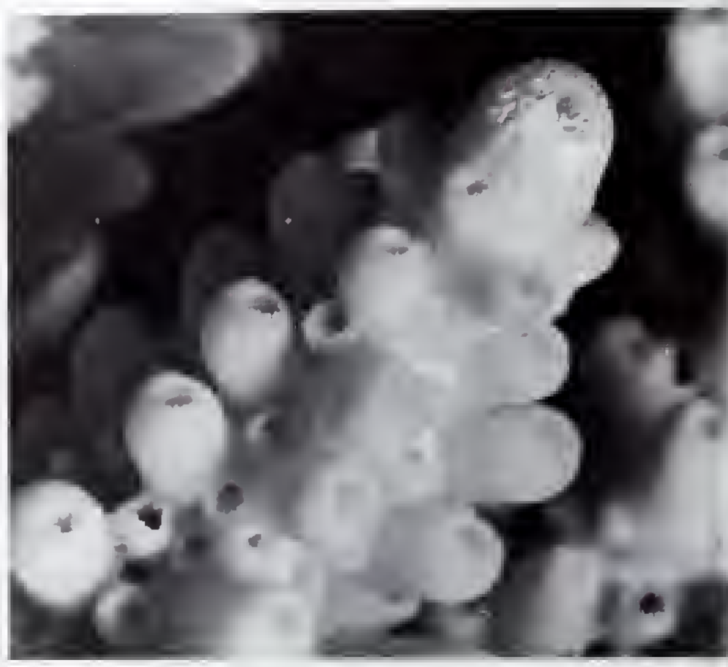


Fig. 867▲

Fig. 868▼

Fig. 869▼

870▲

Fig. 871▲

Ridgeway Reef, Cat Reef, Franklin Reef (9 specimens), **Tijou Reef** (22 specimens), **Howick Island** (6 specimens), **Yonge Reef, Lizard Island, Willis Islet** (2 specimens), **Mellish Reef** (2 specimens), **Flinders Reef (Coral Sea),** (6 specimens), **Britomart Reef** (8 specimens), **Dip Reef, Myrmidon Reef** (12 specimens), **Palm Islands** (6 specimens), **Chesterfield Reefs** (2 specimens), **Flinders Reef (Moreton Bay)** (2 specimens).

These localities include collecting stations 1, 2, 3, 5, 8, 17, 34, 36, 100, 148, 149, 150, 152, 159, 160, 162, 165, 167, 168, 175, 176, 179, 183, 199, 200, 208, 209, 210, 219, 220, 221, 226, 227.

Characters

Colonies are corymbose, or side-attached corymbose plates up to a maximum diameter of about 1m. Branchlets taper from a maximum diameter of 2.5cm, including radial corallites. Incipient branches may be absent to frequent.

Radial corallites are of mixed sizes, sometimes alternating in vertical rows. Tall radial corallites are up to 6mm long, tubular, with round or slightly oval tubo-nariform openings. Primary septa are up to $\frac{1}{3}$R, secondary septa are absent or a few present up to $\frac{1}{4}$R. Short radial corallites are mostly sub-immersed. Axial corallites are 1 to 3mm exsert, 2.4-3.4mm diameter, with calices 0.7-1.2mm diameter. Primary septa are complete $<\frac{3}{4}$R, secondary septa are complete or usually so, $<\frac{1}{3}$R.

The coenosteum consists of simple pointed to laterally flattened spinules densely arranged on the radial corallites, sometimes forming costae. A similar but less dense arrangement occurs between corallites.

Living colonies are cream, deep blue or purple, purple with cream tips, yellow-brown, blue-grey or blue-brown.

Habitat preferences and growth form variation

Acropora secale occurs primarily on outer reef flats, upper reef slopes, back reef areas to about 15m, and on fringing reefs. There is considerable variation in branch width and length, much of which is related to the attachment surface. Thus on solid sloping reef-edges, colonies are side-attached with anastomosed undersurfaces and short branchlets, on less consolidated surfaces branchlets are long (up to 18cm) and very proliferous and on reef tops colonies usually have broad central bases and non-proliferous branchlets. On fringing reefs, a strong central stalk is usually developed.

Similar species

The coenostial structure and corallite shape of *A. secale* closely resembles that of *A. lutkeni*, but these species usually have different growth forms and do not appear similar *in situ*. Small samples are also distinguishable, as *A. lutkeni* has thicker branches and a mixture

Figs. 872-875 *Acropora secale* (× 20)

Fig. 872 From Franklin Reef, same corallum as Figs. 863, 866.
Fig. 873 From Tijou Reef, collecting stations 160 and 8 (respectively).
Fig. 874 From Arden Island, collecting station 183.
Fig. 875 From Yorke Island, collecting station 184.

Fig. 872▲

Fig 873▲

Fig 874▼

Fig 875▼

Fig 876▲

Fig. 876 *Acropora* community at Broadhurst Reef dominated by *A. lutkeni.*

of corallite sizes rather than obviously two sizes, and the tallest radials are generally shorter and broader than those of *A. secale. Acropora secale* can also be confused with species of the *A. humilis* group, especially *A. gemmifera.*

Distribution

Widely distributed in the tropical Indo-Pacific, west to Mauritius and east to the Marshall Islands and the Tuamotu Archipelago.

Acropora (Acropora) lutkeni Crossland, 1952

Synonymy

?*Acropora indurata* Verrill, 1902.

Acropora lutkeni Crossland, 1952.

Acropora scherzeriana (Brüggemann); Vaughan (1918) (*pars*).

Crossland's specimen BMNH 1934-5-14-16 (type ?) from the Great Barrier Reef differs from most specimens of the present series in having radial corallites tending to become nariform rather than tubular.

Acropora indurata Verrill, 1902 from Australia is probably this species but the type specimen (YPM 6155) is a fragment only and not adequate for certain identification. Of Vaughan's (1918) *A. scherzeriana*, only USNM 45581 is *A. lutkeni*; the remainder are *A. humilis* and *A. gemmifera.*

Figs. 877-880 *Acropora lutkeni* (× 0.5)

Fig. 877 From Britomart Reef, collecting station 167.
Fig. 878 From Cat Reef, collecting station 148, same corallum as Figs. 881, 885.
Fig. 879 From Mellish Reef, collecting station 207.
Fig. 880 From Great Detached Reef, collecting station 1, same corallum as Fig. 882.

Fig. 877▼

Fig. 878▼

Fig. 879▼

Fig. 880▼

Material studied

Murray Islands, Deltaic Reef Channel, Thursday Island, Triangle Reef (4 specimens), **Pandora Reef** (9 specimens), **Raine Island** (4 specimens), **Great Detached Reef** (8 specimens), **Martha Ridgeway Reef, Cat Reef** (4 specimens), **Franklin Reef** (4 specimens), **Tijou Reef** (13 specimens), **Bewick Island, Howick Island** (3 specimens), **Willis Islet** (4 specimens), **Low Isles, Magdelaine Cay** (3

Figs. 881-884 *Acropora lutkeni* (× 5)

Fig. 881 From Cat Reef, same corallum as Figs. 878, 885.
Fig. 882 From Great Detached Reef, same corallum as Fig. 880.
Fig. 883 From Mellish Reef, collecting station 208.
Fig. 884 From Franklin Reef.

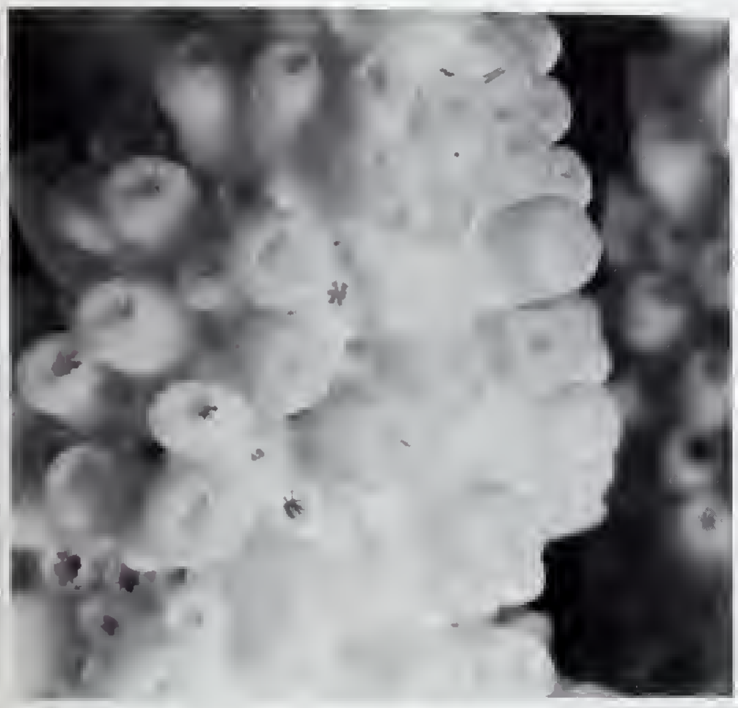


Fig 881▲

Fig. 882▲

Fig 883▼

Fig 884▼

specimens), **Mellish Reef** (21 specimens), **Flinders Reef (Coral Sea)** (8 specimens), **Britomart Reef** (13 specimens), **Myrmidon Reef** (14 specimens), **Palm Islands** (4 specimens), **Phillips Reef, Chesterfield Reefs** (14 specimens), **Polmaise Reef, Fitzroy Reef, Llewellyn Reef** (4 specimens), **Lady Musgrave**

Figs. 885-888 *Acropora lutkeni* (× 20)

Fig. 885 From Cat Reef, same corallum as Figs. 878, 881.
Fig. 886 From Tijou Reef, collecting station 160.
Fig. 887 From Mellish Reef.
Fig. 888 From Martha Ridgeway Reef.

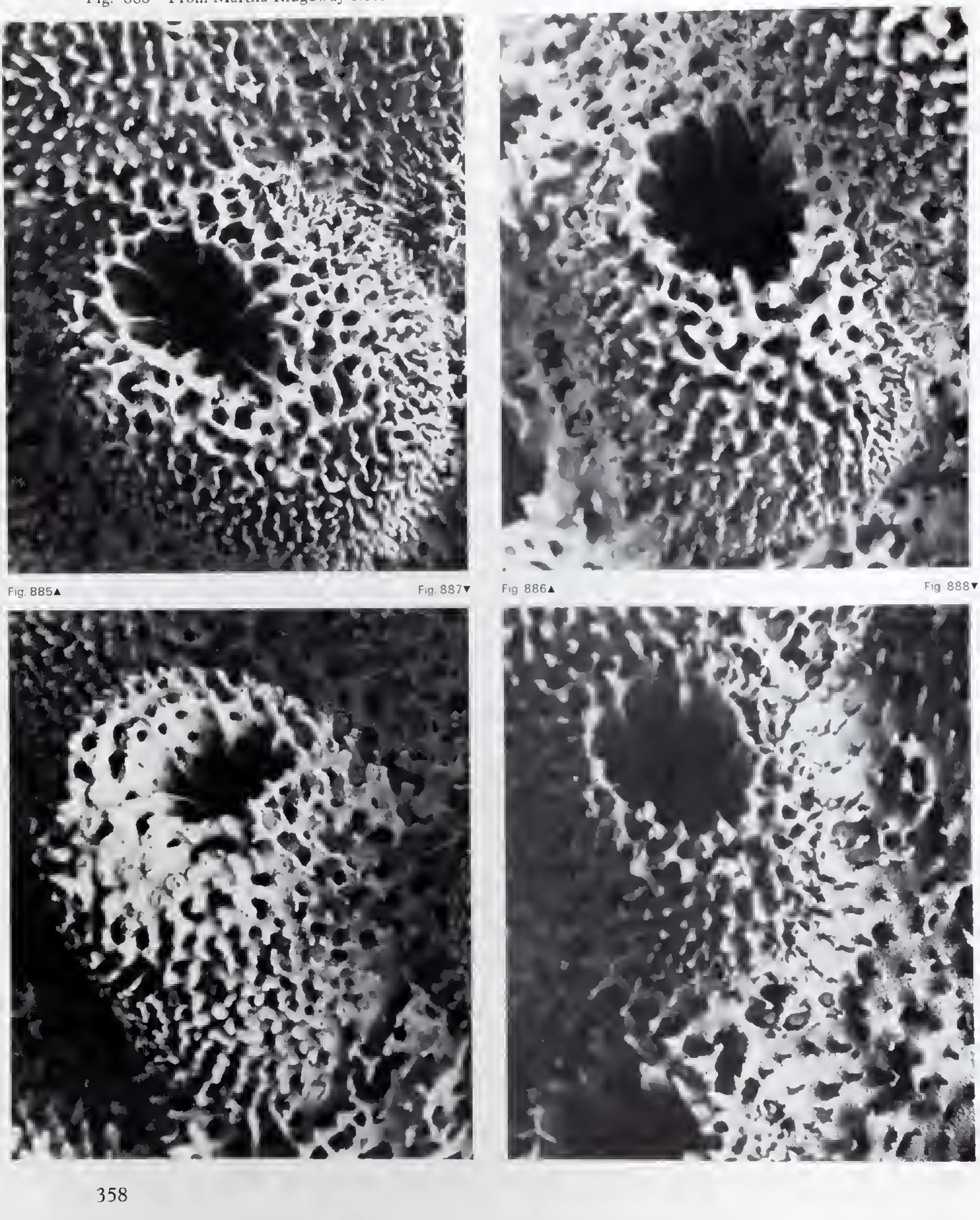


Fig. 885▲ Fig. 887▼ Fig. 886▲ Fig. 888▼

Reef (10 specimens), **Flinders Reef (Moreton Bay)** (7 specimens).

These localities include collecting stations 1, 2, 5, 6, 8, 18, 36, 60, 137, 148, 150, 151, 152, 154, 158, 160, 167, 168, 173, 175, 181, 190, 192, 195, 198, 199, 200, 207, 208, 210, 211, 213, 214, 219, 220, 221, 226, 227, 231.

Characters

Colonies have a wide variety of growth forms, ranging from hispidose to caespito-corymbose and corymbose plates with a side attachment. Much of this variation occurs in the one biotope and sometimes in the one colony. Well-developed hispidose colonies frequently have branches over 40mm thick, which widen into sturdy basal buttresses and such colonies may reach 1m in height. Main branches are vertical and give off side branches or branchlets at acute angles. Corymbose colonies have smaller branches with irregular shapes and orientations. Very large dome-shaped colonies (up to 6m diameter) composed of tiered corymbose plates sometimes occur on very exposed upper reef slopes.

Radial corallites have a characteristically wide range of shapes and sizes, with those on branchlets being up to 5mm exsert and those on main branches short or immersed. Sometimes, the larger corallites are arranged in rows near branch tips. They are up to 3mm diameter with circular, nariform or dimidiate calices, 0.8-1.1mm diameter. Septa are in 2 poorly developed cycles, $\frac{1}{3}$R and sub-equal, to $\frac{1}{3}$R (rarely $\frac{2}{3}$R) and $<\frac{1}{4}$R, with the second cycle incomplete. Directive septa are usually prominent and all septa are strongly dentate. Axial corallites are rounded, 2.6-4.3mm diameter, with calices 0.7-1.2mm diameter. Septa are smooth edged or slightly dentate. They are in two sub-equal cycles of $\frac{1}{3}$R, or have a first cycle developed up to $\frac{2}{3}$R and the second cycle reduced or absent. The coenosteum on radial corallite walls is a dense arrangement of laterally flattened to moderately elaborate spinules. Between corallites it is usually reticulate with some spinules.

Living colonies are uniform grey, cream, brown or purple in colour.

Habitat preferences and growth form variation

Acropora lutkeni is restricted to shallow upper reef slopes exposed to wave or current action and is particularly prevalent on outer barrier and Coral Sea reefs. Like all *Acropora* species occurring in shallow exposed biotopes, *A. lutkeni* undergoes major changes in growth form with minor change in depth and reef configuration. Coralla from shallow water exposed to very strong wave action are mostly encrusting plates. These become caespito-corymbose at slightly greater depth, with some colonies or parts of colonies having arborescent branches.

Affinities

Corymbose coralla with short, even corallites superficially resemble *A. humilis* and *A. gemmifera* from similar exposed reef slopes. *Acropora lutkeni* has longer branches with more subdivisions, less regular radial corallites and less prominent axial corallites than either of these species.

Corallite and coenostial structures are very close to those of *A. secale*, although this species usually has a substantially different gross appearance (see p. 354).

Distribution

Recorded only from the east and west coasts of Australia and the Coral Sea.

The *Acropora divaricata* group

These species are grouped together, as they have similar nariform to tubo-nariform radial corallites and a similar coenosteum between corallites which is reticulate, with spinules having barely elaborated or forked tips. On corallites, the coenosteum is costate or broken costate in lightly calcified coralla or else consists of dense spinules overlying a reticulate structure.

Acropora clathrata is the only shallow-water *Acropora* with horizontal primary as well as secondary branching, the other species having both horizontal and vertical growth components which vary greatly in relative importance.

Acropora (Acropora) clathrata (Brook, 1891)

Synonymy

Madrepora clathrata Brook, 1891; Brook (1893).

Madrepora complanata Brook, 1891; Brook (1893).

Madrepora orbicularis Brook, 1892; Brook (1893).

Madrepora vasiformis Brook, 1893.

Acropora vasiformis (Brook); Pillai & Scheer (1976).

Acropora clathrata (Brook); Wallace (1978).

?*Acropora mangarevensis* Vaughan, 1906.

Brook's holotypes of *A. clathrata* and *A. complanata* are from Mauritius and the Seychelles Islands respectively, the latter being an open branched corallum with hooded corallites. Brook's *A. orbicularis* and *A. vasiformis* and Vaughan's *A. mangarevensis* are all fused plate-like coralla, which appear to be shallow water ecomorphs of this species.

Material studied

Big Mary Reef, Raine Island (2 specimens), **Great Detached Reef** (3 specimens), **Sir Charles Hardy Islands, Tijou Reef** (8 specimens), **Bewick Island, Willis Islet, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef, Darley Reef, Fitzroy Reef, Flinders Reef (Moreton Bay)**.

These localities include collecting stations 1, 2, 6, 18, 152, 160, 167, 179, 187, 197, 199, 226, 227.

Characters

Mature colonies consist of radiating, irregularly anastomosing branches, which usually form plates or groups of plates. These are usually horizontal but may be inclined at irregular angles and frequently have upturned margins. The degree of fusion between branches is extremely variable and colonies vary in general appearance from thick, solid or perforated plates to highly bifurcated plates, becoming sub-arborescent. Branches are uniform in diameter, usually 6-10mm.

There is relatively little development of vertical branchlets such as occurs in other tabulate *Acropora* and axial corallites are consequently poorly differentiated. Primary septa are up to $\frac{1}{3}$R, secondary septa are usually absent. Radial corallites are very variable. 'A number of shapes are possible, and specimens may possess all, some, or only one of the possible types, viz. tubular, with round, oval, or dimidiate openings, tubo-nariform, nariform, rostrato-nariform, dimidiate, sub-immersed or immersed' (Wallace, 1978). Primary septa reach $\frac{1}{3}$R, occasionally $\frac{3}{4}$R and are best developed in the longer corallites. Directive septa are usually obvious. Secondary septa are usually absent. All septa have long, regular dentations on their margins. Corallites have well-developed costae, which usually have spinules. The coenosteum is reticulate.

Living colonies are uniform in colour, usually brown or green.

Habitat preferences and growth form variation

Acropora clathrata is common on upper reef slopes, on reef back margins and on fringing reefs. Most of the variation in the species can occur within a single biotope and hence there are few clear correlations between growth form and environmental parameters.

Figs. 889-891 *Acropora clathrata* (×0.5)

Fig. 889 From Tijou Reef, collecting station 2, same corallum as Fig. 894.

Fig. 890 From Great Detached Reef, collecting station 1, same corallum as Figs. 896, 899.

Fig. 891 From Britomart Reef, collecting station 167, same corallum as Fig. 897.

Fig. 889▼

Fig. 890▼

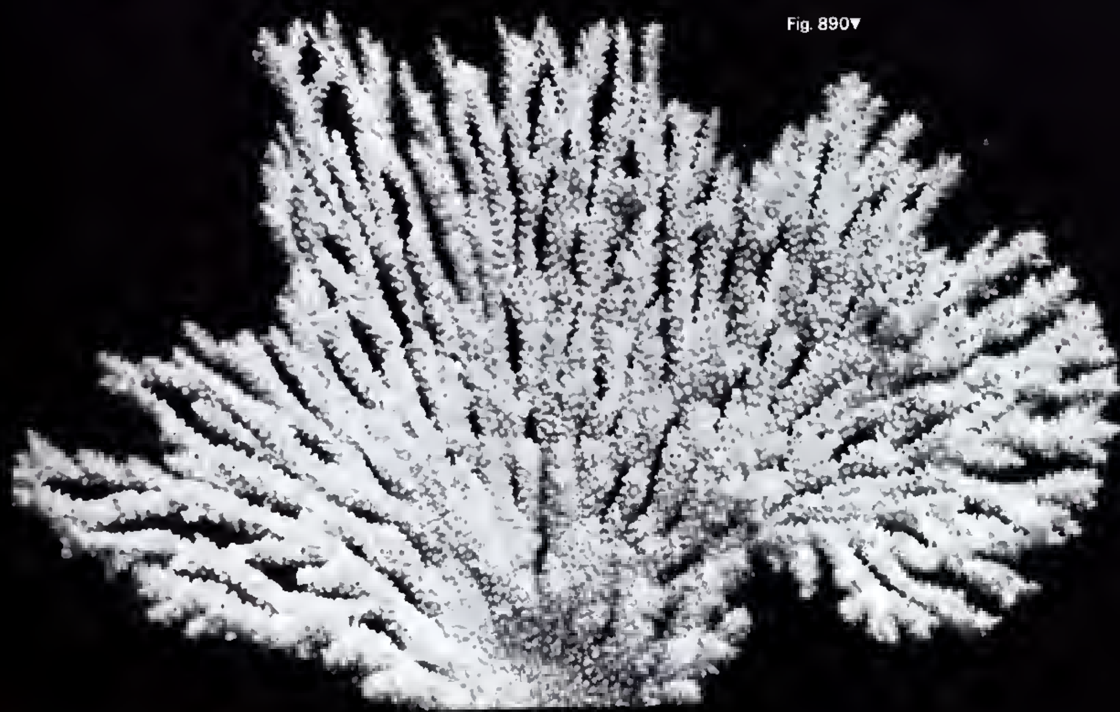


Fig. 891▼

As with other tabulate or plate *Acropora* species, *A. clathrata* from exposed biotopes is relatively well calcified, has highly anastomosed branches which may form solid plates and has relatively well developed septa. Coralla from increasingly deep or turbid water have an increasingly open branching pattern and also show a greater degree of intra-biotope variability.

Figs. 892-897 *Acropora clathrata* (× 5)

Figs. 892, 893 Same corallum from Fitzroy Island, collecting station 197.
Fig. 894 From Willis Island, collecting station 199.
Fig. 895 From Tijou Reef, same corallum as Fig. 889.
Fig. 896 From Great Detached Reef, same corallum as Figs. 890, 899.
Fig. 897 From Britomart Reef, same corallum as Fig. 891.

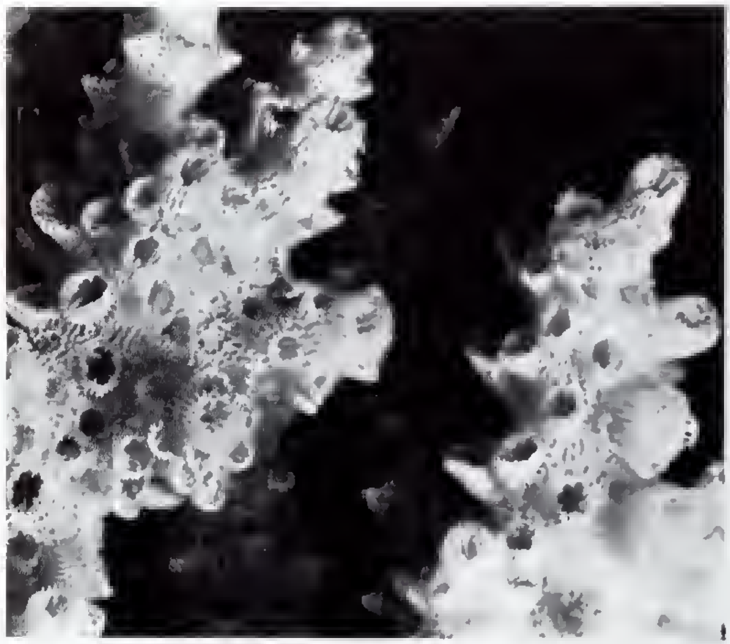


Fig. 892▲

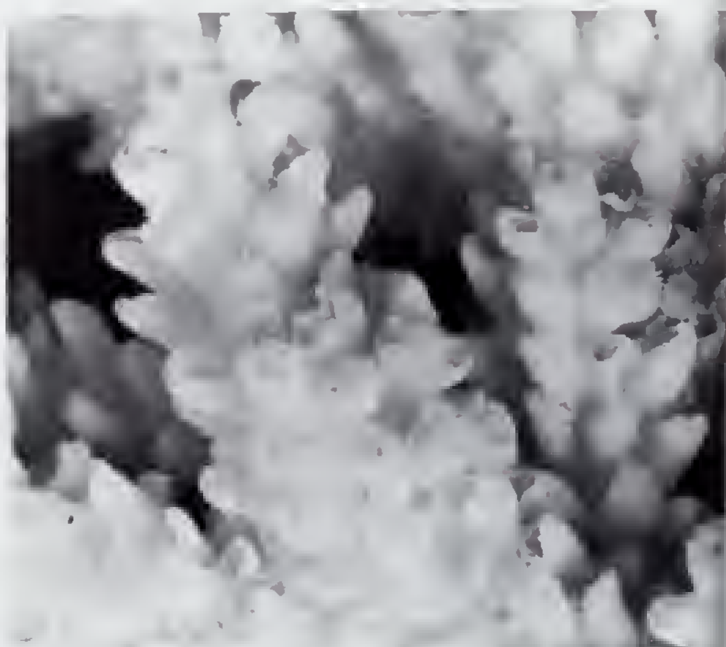
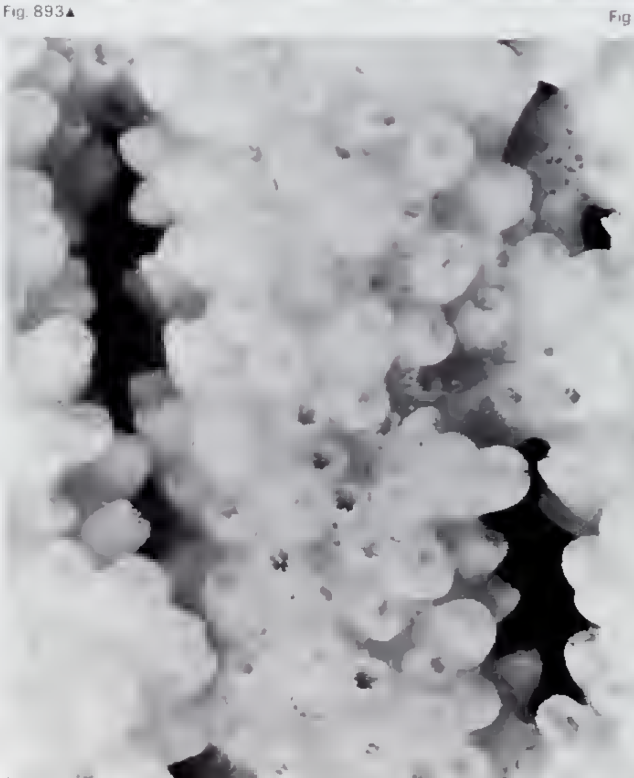


Fig. 893▲

Fig 894▼

Fig 895▼



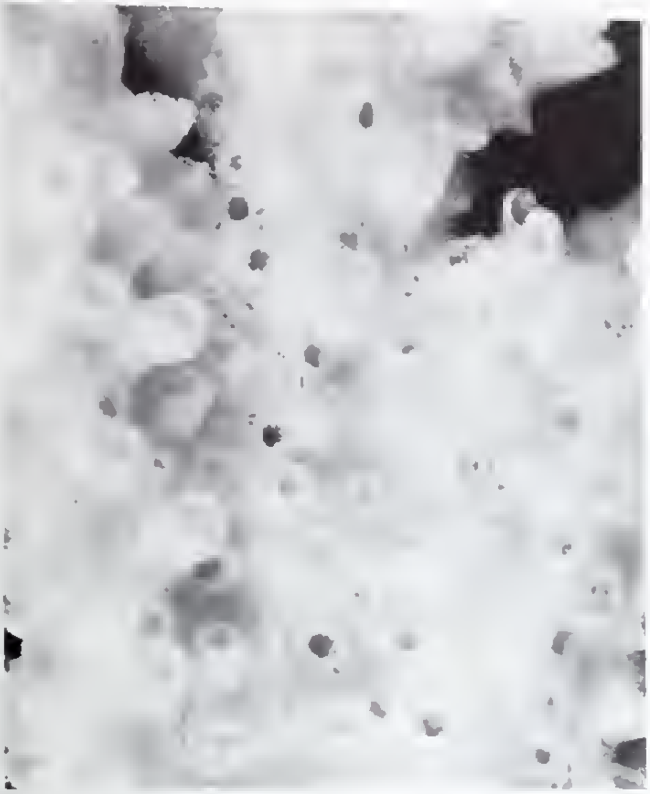


Fig 896▲

Fig. 897▲

Affinities and similar species

Acropora clathrata does not closely resemble any other Great Barrier Reef species. It develops colonies of similar size and shape to those of *A. hyacinthus* and *A. cytherea*, from which it is readily distinguished by having thicker horizontal branches and oblique to

Figs. 898, 899 *Acropora clathrata* (× 20)

Fig. 898 From Willis Island.

Fig. 899 From Great Detached Reef, same corallum as Figs. 890, 896.

Fig 898▼

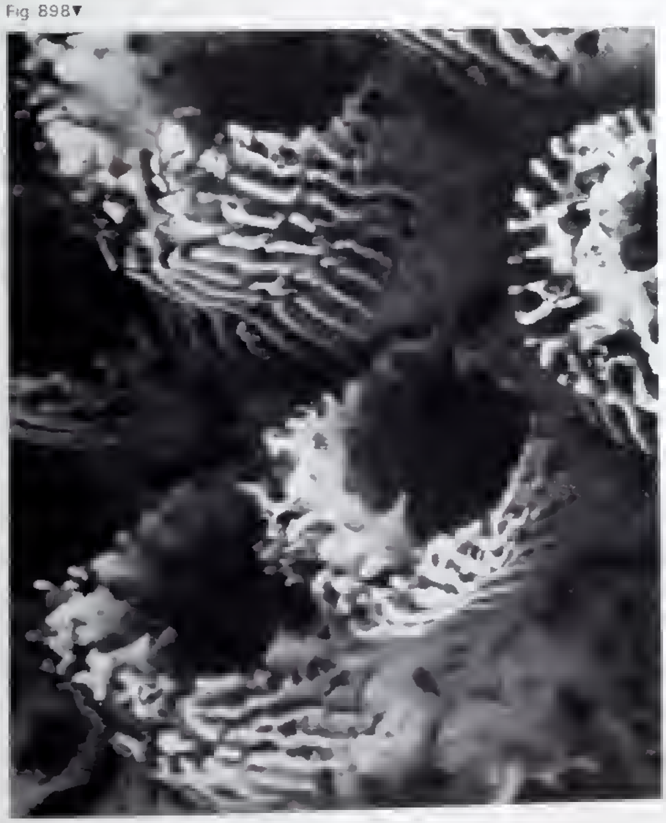


Fig. 899▼

horizontal rather than vertical branchlets. The coenosteum and the shape, size and structure of radial corallites suggest a closer affinity to *A. divaricata* which, however, is readily distinguished by its growth form.

Distribution

Widely distributed in the tropical Indo-Pacific, west to La Réunion and east to the Tuamotu Archipelago.

Acropora (Acropora) divaricata (Dana, 1846)

Synonymy

Madrepora divaricata Dana, 1846; Edwards & Haime (1860); Brook (1893).

Madrepora tenuispicata Studer, 1880; Brook (1893).

Madrepora scabrosa Quelch, 1886.

Acropora excelsa Nemenzo, 1971 (*pars*).

Acropora tenuispicata (Studer); Pillai & Scheer (1974).

Acropora complanata (Brook); Pillai & Scheer (1976); not Brook (1891).

Acropora divaricata (Dana); Wallace (1978).

Dana's holotype of *A. divaricata* from Fiji (USNM 299 and fragment of it, YPM 2008) is close to specimens of the present series with relatively large corallites, as also is Quelch's *A. scabrosa* (BMNH 1885-2-1-16) also from Fiji. Nemenzo's (1971) syntype of *A. excelsa* from the Philippines (number C-1329) is *A. divaricata*, his syntype C-1035 is *A. valida*.

Material studied

Darnley Island (2 specimens), **Little Mary Reef** (5 specimens), **Arden Island** (5 specimens), **Murray Islands** (2 specimens), **Bilibili Island, Triangle Reef** (7 specimens), **Pandora Reef** (4 specimens), **Raine Island** (5 specimens), **Great Detached Reef** (3 specimens), **Sir Charles Hardy Islands** (9 specimens), **Martha Ridgeway Reef** (3 specimens), **Wye Reef** (3 specimens), **Franklin Reef, Tijou Reef** (16 specimens), **Corbett Reef, Waining Reef, Houghton Island, Hope Island** (2 specimens), **Magdelaine Cay, Mellish Reef** (6 specimens), **Flinders Reef (Coral Sea)** (3 specimens), **Britomart Reef** (76 specimens), **Rib Reef, Myrmidon Reef** (4 specimens), **Palm Islands** (39 specimens), **Lodestone Reef** (2 specimens), **Pandora Reef** (2 specimens), **Davies Reef** (2 specimens), **Chesterfield Reefs** (8 specimens), **Fitzroy Reef** (3 specimens), **Llewellyn Reef, Lady Musgrave Reef** (18 specimens), **Flinders Reef (Moreton Bay)** (4 specimens).

These localities include collecting stations 1, 2, 8, 16, 31, 34, 37, 41, 43, 45, 55, 57, 60, 62, 146, 149, 151, 152, 154, 156, 157, 158, 159, 160, 162, 163, 164, 165, 167, 168, 171, 174, 177, 179, 181, 183, 185, 190, 191, 192, 193, 195, 200, 208, 211, 212, 216, 219, 221, 226, 227.

Figs. 900-905 *Acropora divaricata* (× 0.5)

Figs. 900, 901 From the Murray Islands, collecting station 181, same coralla as Figs. 906, 907 (respectively).

Figs. 902, 903 From Britomart Reef, collecting stations 167, 168 (respectively), Fig. 903 same corallum as Fig. 908.

Fig. 904 From Britomart Reef, showing flattened branches associated with a turbid environment, same corallum as Fig. 909.

Fig. 905 From Lady Musgrave Reef, collecting station 195, showing extreme development of thickened branches, same corallum as Fig. 910.

Fig. 900▲

Fig. 901▼

Fig. 902▼

Fig. 903▼

Fig. 904▼

Fig. 905▼

Characters

Colonies are thick tables or are bowl- or bracket-shaped, with a central or lateral attachment and may reach 1m or more in height and diameter. Branching is caespitose, the branching pattern as well as colony shape varying greatly. Distal branches are usually 6-12mm diameter.

Radial corallites change in shape and size along branches. 'On upper branchlets they are prominent (up to 3mm long), usually extending at from 45° to 90°. They are usually tubular on branch tips, passing through tubo-nariform to nariform, then rounded to sub-immersed proximally. The prominent radials are sometimes extended by rostrate development. Within the sequence from distal to proximal, radials are usually evenly graded and neatly arranged, but they can be unevenly graded so that branches appear ragged, and downward directed radials can occur anywhere along the branch' (Wallace, 1978). Calices of tubular corallites may also be dimidiate. Septal development is extremely variable, some corallites having only rudimentary septa, others on the same corallum having two well-developed cycles. Axial corallites may be devoid of radial corallites, on one (usually upper) surface. They are usually 2.3-3.0mm diameter, with calices 0.8-1.1mm diameter. Septa are in two cycles up to $\frac{1}{2}$R and $\frac{1}{4}$R, the latter frequently incomplete.

The coenosteum on corallites consists of rows of laterally flattened or forked spinules and is spongy between corallites.

Living colonies are usually dark brown or greenish-brown, sometimes with lighter brown or blue branch tips or dark blue with whitish tips. They usually harbour pairs of the xanthid crab *Trapezia cymodoce* (Herbert), a species usually associated with pocilloporid corals and not *Acropora* (Patton, pers. comm.).

Figs. 906-911 *Acropora divaricata* (× 5)
Figs. 906, 907 From the Murray Islands, same coralla as Figs. 900, 901 (respectively).
Figs. 908, 909 From Britomart Reef, same coralla as Figs. 903, 904 (respectively).
Fig. 910 From Lady Musgrave Reef, same corallum as Fig. 905.
Fig. 911 From Britomart Reef, collecting station 167, showing extreme development of partly naked axial corallites.

Fig 906▼

Fig. 907▼

Fig. 908▲

Fig. 909▲

Fig. 910▼

Fig. 911▼

Habitat preferences and growth form variation

Acropora divaricata is usually abundant on reef slopes where *Acropora* diversity is high and usually also occurs on lagoonal reef patches and fringing reefs. It may be the dominant species in any of these situations. A very wide range of skeletal variation (including branch dimensions and branching patterns, septal development, the abundance of corallites and the development of naked axial corallites and branchlets) commonly occurs within single biotopes and the species seldom develops well-defined, environment-related ecomorphs. One exception is sometimes found in coralla growing on soft substrates, or in turbid water where branchlets become flattened and the colony prostrate (viz. *A. stoddarti* Pillai &

Scheer, 1976). In extreme cases, branchlets become fused into thin plates. Some skeletal developments (e.g. various types of corallite wall-thickening and the development of naked branchlets) appear to be commonly associated with particular populations rather than particular environments. Figs. 905, 910 illustrate extremes in branchlet and corallite

Figs. 912-915 *Acropora divaricata* (× 20)
Fig. 912 From Falcon Island, Palm Islands, collecting station 57.
Figs. 913, 914 From Britomart Reef, collecting stations 168 and 167 (respectively).
Fig. 915 From Fantome Island, Palm Islands.

Fig. 912▲

Fig. 913▲

Fig. 914▼

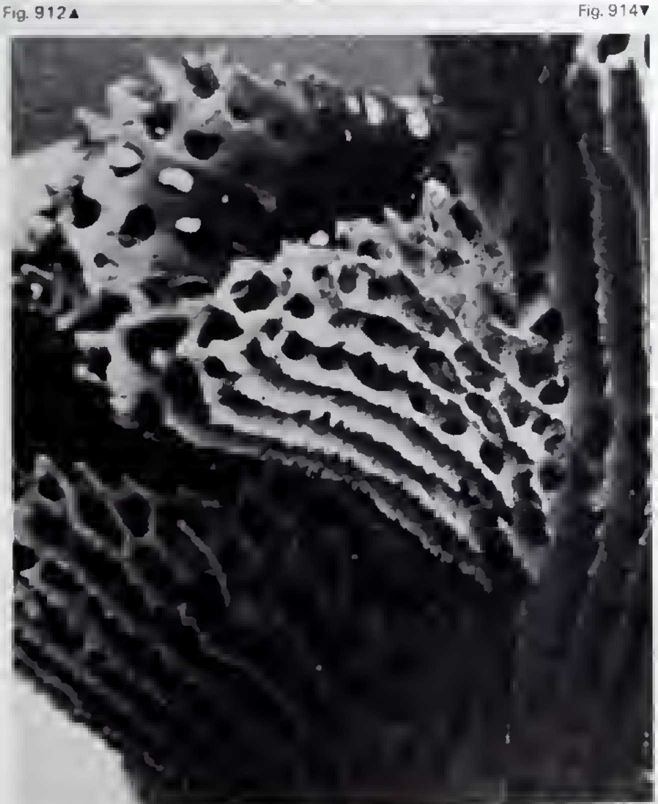


Fig. 915▼

thickening. Such intra-biotope variation was studied extensively in chosen reefs of the northern, central and southern Great Barrier Reef. In each case there was a clear gradation between all coralla from the same site. Nevertheless, this degree of polymorphism warrants further investigation.

Similar species

As noted above (p. 364), *A. divaricata* has affinities with *A. clathrata*, as both species have similar radial corallites and a similar coenosteum. Their differing growth forms, however, make these species readily separable. *Acropora secale* may be confused with *A. divaricata*, but is readily distinguished by having radial corallites of two sizes, the larger having a tubular form.

Distribution

Recorded in the tropical Indo-Pacific west to the Seychelles Islands and east to Fiji.

Acropora solitaryensis n.sp.

Material studied

Murray Islands, Martha Ridgeway Reef, Palm Islands (3 specimens), **Flinders Reef (Moreton Bay)** (15 specimens), **Middleton Reef** (9 specimens), **Solitary Islands** (9 specimens).

These localities include collecting stations 60, 154, 177, 200, 227, 229, 230, 231, 232, 233.

Characters

The following description applies to specimens from reefal areas south of the Great Barrier Reef, as well as to some Great Barrier Reef specimens that doubtfully belong to this species.

Colonies have an *A. divaricata*-like branching pattern, with a strong tendency for basal branches to become fused into a perforated or solid plate. The amount of fusion may vary greatly within biotopes and there is also considerable regional variation (as illustrated).

Radial corallites are tubular appressed on branchlets, becoming immersed on basal branches. Calices are circular to nariform in shape and 1.0-1.3mm diameter. Septal development varies greatly within coralla. Both cycles may be present, up to $\frac{2}{3}$R and $\frac{1}{3}$R, but secondary septa are usually incomplete to absent. Primary septa may be of irregular lengths and directive septa are usually distinguishable or may be prominent. Axial corallites are up to 3mm exsert, 3.4mm diameter and have calices 0.7-1.0mm diameter. Septa are usually in complete cycles of $\frac{1}{2}$R and $\frac{1}{4}$R. All septa are thin plates, which may be irregularly dentate. The coenosteum is usually the same on and between corallites and is covered with rows of fine spinules, which may develop into distinct costae.

Living colonies are dark brown or green in colour.

Habitat preferences and growth form variation

This species is abundant at Flinders Reef near Moreton Bay and the Solitary Islands, but is rare elsewhere. Because of its unusual geographic distribution (paralleled only by that of *A. glauca*), it is readily divisible into five geographic subspecies, which are widely separated, both spatially and environmentally. This study can only indicate that these subspecies appear to form a single species unit, but this needs to be verified experimentally.

Figs. 916-921 *Acropora solitaryensis* (× 0.33)

Figs. 916-918 From North Solitary Island, collecting station 229, Fig. 916, holotype, same corallum as Figs. 922, 928.

Fig. 919 From Flinders Reef (Moreton Bay), same corallum as Fig. 923.

Fig. 920 From Martha Ridgeway Reef, collecting station 154, same corallum as Fig. 924.

Fig. 921 From Middleton Reef, collecting station 233, same corallum as Figs. 925, 929.

Fig. 916▲

Fig. 917▼

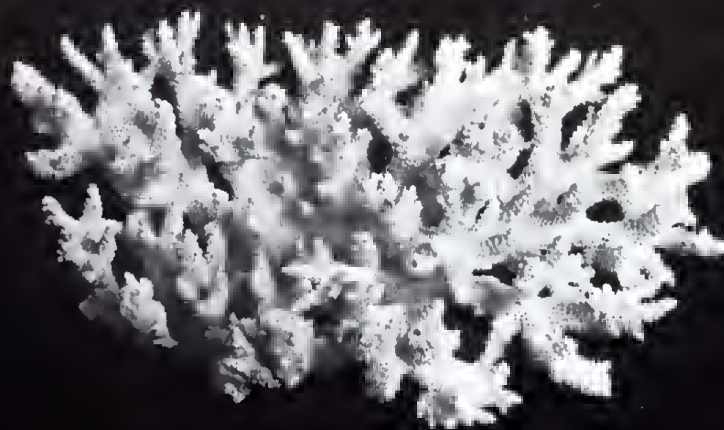
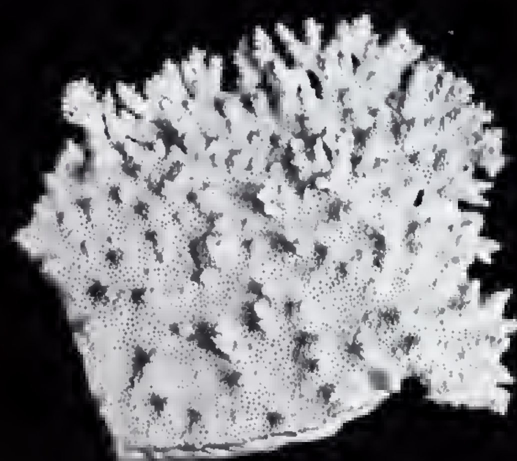


Fig. 918▼

Fig. 919▼

Fig. 920▼

Fig. 921▼



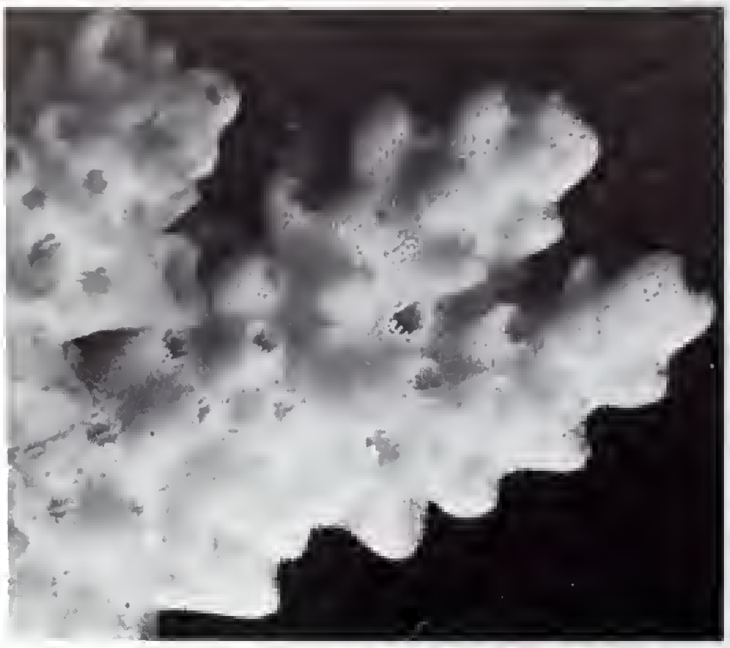


Fig. 922▲

Fig. 923▲

Fig. 924▼

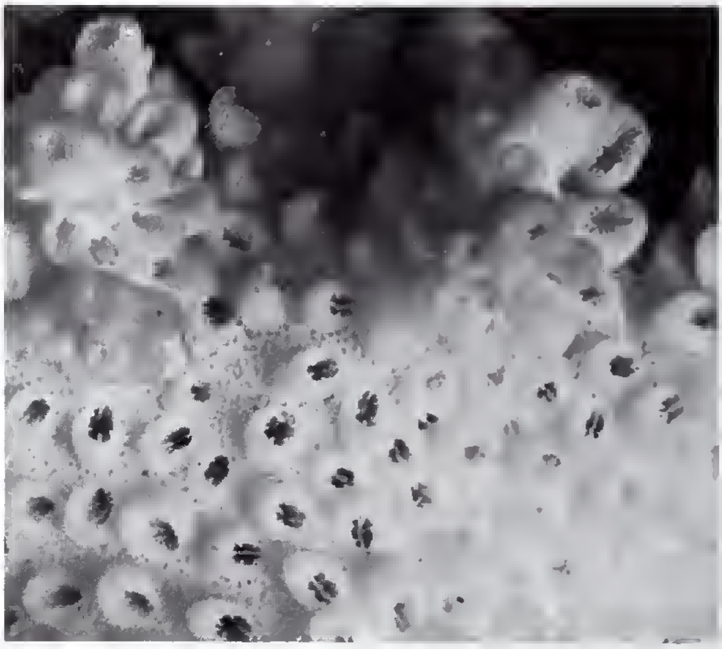


Fig 925▼

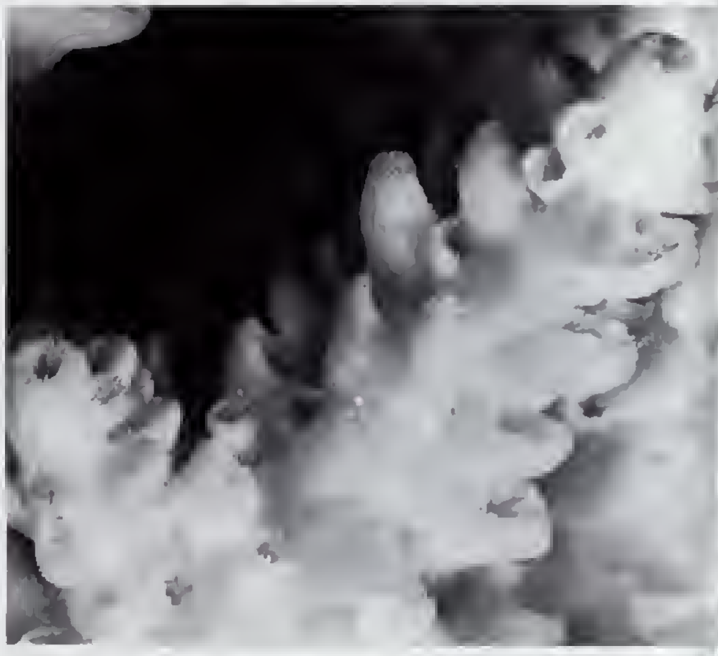


Fig 926▼

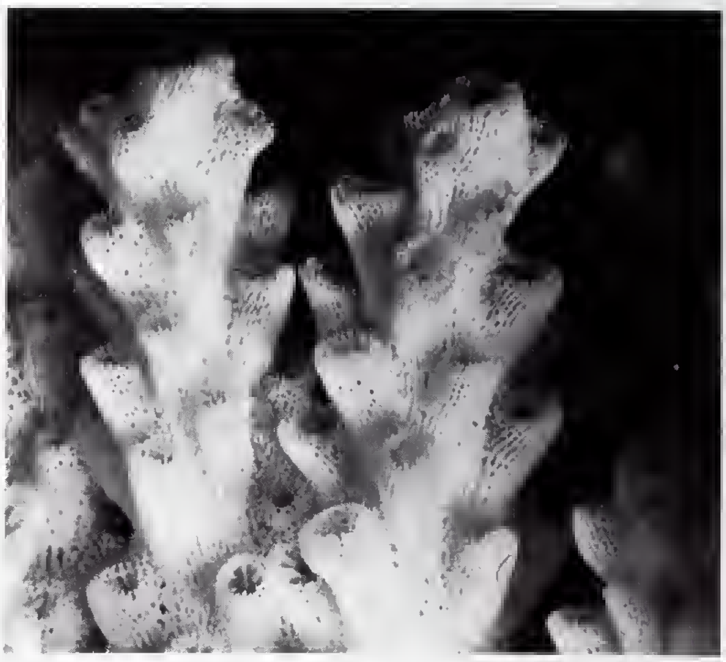


Fig. 927▼

Affinities

Superficially, *A. solitaryensis* does not resemble any other species. Its closest affinities are with *A. divaricata*, which sometimes has a comparable growth form (divaricate branching with flattened basal branches) and similar tubular appressed corallites with nariform openings.

Etymology

Named after the Solitary Islands where this species is most abundant.

Holotype (Fig. 916)

Dimensions: Maximum dimension is 31cm

Locality: North Solitary Island

Depth: 12m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from eastern Australia.

Figs. 922-927 *Acropora solitaryensis* (× 5)
Fig. 922 From North Solitary Island, holotype, same corallum as Figs. 916, 928.
Fig. 923 From Flinders Reef (Moreton Bay), same corallum as Fig. 919.
Fig. 924 From Martha Ridgeway Reef, same corallum as Fig. 920.
Fig. 925 From Middleton Reef, same corallum as Figs, 921, 929.
Figs. 926, 927 Same corallum from Lord Howe Island, collecting station 147.

Figs. 928, 929 *Acropora solitaryensis* (× 20)
Fig. 928 From North Solitary Island, holotype, same corallum as Figs. 916, 922.
Fig. 929 From Middleton Reef, same corallum as Figs. 921, 925.

Fig. 928▼

Fig. 929▼

The *Acropora echinata* group

The five species of this group have in common a hispidose growth form, and all occur together on sandy lagoon floors along with other hispidose species or ecomorphs of species. In all species, radial corallites are pocket-like, appressed tubular and scattered, with a strong tendency (especially in *A. echinata* and *A. subglabra*) to form tubular incipient axial corallites. The coenosteum of all species, both on and between radial corallites, is similar.

Dimensions of the branches and the degree of calcification increase from *A. echinata* (which is extremely slender and brittle) to *A. longicyathus*. In *A. echinata*, the coenostial structure is thin and porous, being formed of costae, broken costae or lines of spinules, linked with synapticulae. *Acropora subglabra* has lines of spinules, with costae rarely formed, except on branch tips. In *A. carduus*, *A. elseyi* and *A. longicyathus*, the linear arrangement of spinules is much less apparent. In all cases where spinules are developed, they are elaborate, with up to twelve points.

Acropora echinata has the most restricted distribution of the four species on the Great Barrier Reef, occurring only in deep water (below 8m) on lagoonal floors, around patch reef bases and on silty, deep reef slope areas. *Acropora longicyathus* and *A. elseyi* are the most broadly distributed and abundant species, occurring on reef slopes below about 5m and in fringing reef assemblages, on reef back margins, and occasionally on reef flats. *Acropora carduus* is also common in these habitats, except the reef flat, while *A. subglabra* is mainly restricted to the same habitats as *A. echinata*.

When all five species occur together, they can easily be identified by their comparative dimensions and by their colours. *A. echinata* is commonly white, with bright blue or purple branchlet tips; *A. subglabra* pale brown, often with yellow branchlet tips; *A. carduus* pale brown, occasionally with blue tips; *A. elseyi* are usually yellow or cream, *A. longicyathus* pale brown or pale greenish-cream.

Acropora (Acropora) echinata (Dana, 1846)

Synonymy

Madrepora echinata Dana, 1846; Brook (1893).

Madrepora durvillei Edwards & Haime, 1860.

Madrepora procumbens Brook, 1891; Brook (1893).

Acropora echinata (Dana); Vaughan (1907); Vaughan (1918); Faustino (1927); Eguchi (1938); Wells (1954); Pillai (1967b); Nemenzo (1967); Pillai & Scheer (1976); Wallace (1978).

Acropora procumbens (Brook); Thiel (1932); Nemenzo (1967); ?Pillai (1967b).

The holotype of *A. durvillei* (MNHN 403) and syntypes of *A. echinata* (MCZ 146 and USNM 275) and *A. procumbens* (BMNH 1862-2-4-33) are all from Fiji, with the latter two species having additional syntypes from other localities.

Material studied

Raine Island (2 specimens), **Franklin Reef, Tijou Reef** (9 specimens), **Lizard Reef, Plug Reef, Magdelaine Cay, Britomart Reef.**

These localities include collecting stations 8, 33, 64, 149, 151, 152, 155, 156, 167, 200.

Characters

Colonies are characteristically hispidose, being composed of sprawling, irregularly dividing, sometimes intertwined primary branches, which are evenly covered on all sides by secondary branchlets. Main branches have uniform diameters of 15-30mm (except at the

Figs. 930, 931 *Acropora echinata* (×0.5)
Fig. 930 From Tijou Reef, collecting station 156, same corallum as Figs. 932, 933.
Fig. 931 From Raine Island, collecting station 151, same corallum as Fig. 934.

Fig. 930▲

Fig. 931▼

colony base, where fusion of branches sometimes occurs) and are frequently up to 0.5m long. Branchlets are mostly composed of a small number of extremely elongate, tubular, incipient axial corallites of very variable lengths, radiating perpendicularly from main branches. Main branches also bear scattered, immersed, radial corallites.

Branchlet axial corallites are up to 12mm exsert, 0.8-1.4mm diameter and have calices 0.7-1.0mm diameter. There is little septal development at the corallite rim. Deep within the

Figs. 932-937 *Acropora echinata* (× 5)

Figs. 932, 933 Same corallum from Tijou Reef and same corallum as Fig. 930.

Fig. 934 From Raine Island, same corallum as Fig. 931.

Figs. 935-937 Same corallum from south of Ribbon Reef, collecting station 64.

Fig. 932▲

Fig. 933▲

Fig. 934▼

Fig. 935▼

Fig. 936▲

Fig. 937▲

calices, septa are in two cycles, the primary septa are $\frac{1}{3}$-$\frac{2}{3}$R, secondary septa are $\frac{1}{3}$R, frequently incomplete. Directive septa are frequently prominent. All septa may be plate-like, with smooth margins, or composed primarily of spines. Immersed corallites on main branches have a reduced septation, except for the directive septa. Axial corallites at the tips of main branches have relatively well-developed septa, usually with both cycles complete.

All tubular corallites have highly perforate walls, with costae and synapticulae forming an open lattice. The coenosteum between corallites is also highly perforate, that on secondary branchlets being composed of costae or rows of simple spinules, that on main branches being a reticulate network of spinules.

Living colonies are cream with blue or purple branchlet or corallite tips. Occasionally, they are entirely blue.

Habitat preferences and growth form variation.

Acropora echinata is usually restricted to protected reef backs, >8m depth and clear water where other hispidose species (*A. subglabra*, *A. carduus* and *A. longicyathus*) are dominant (see p. 374). It sometimes occurs in crevices in more exposed habitats. With rare exceptions, it is uncommon in all biotopes and is usually only found in the Northern Region and in the Swain Reefs of the Great Barrier Reef.

The present series shows little growth form variation. Coralla from the most exposed of all the biotopes where it has been collected have short, relatively thick, frequently dividing branches, while those from deep protected water have long sprawling branches. Corallite shapes are similar in both cases.

Similar species

Both the colour and growth form of *A. echinata* are very distinctive and make this one of the most readily recognised of all *Acropora* species. Nevertheless, it has close affinities with *A. carduus* and especially *A. subglabra*.

The branchlet axial corallites of *A. subglabra* are smaller, taper and are seldom more than 5mm exsert. Septa are relatively poorly developed in *A. subglabra*; the corallites have solid walls which are very unlike the strongly costate lattice-like walls of *A. echinata*.

Fig 938▲

Fig 939▲

Figs. 938, 939 *Acropora echinata* (× 20)
Fig. 938 From south of Ribbon Reef, collecting station 64.
Fig. 939 From Raine Island.

Acropora subglabra does not develop long, sprawling branches like *A. echinata*, but has short, frequently dividing branches. Living *A. subglabra* is brown, often with yellow branchlet tips.

Distribution

Recorded from the Indo-Pacific west to the Maldive Islands and east to the Marshall Islands and Samoa.

Acropora (Acropora) subglabra (Brook, 1891)

Synonymy

Madrepora subglabra Brook, 1891; Brook (1893).

Acropora subglabra (Brook); Thiel (1933); Nemenzo (1967); Wallace (1978).

Acropora spiniformis Eguchi & Shirai, 1977.

Material studied

Admiralty Island, Raine Island, Great Detached Reef (2 specimens), **Tijou Reef** (18 specimens), **Lizard Island, Magdelaine Cay, Flinders Reef (Coral Sea)** (6 specimens).

These localities include collecting stations 1, 100, 152, 155, 156, 200, 226.

Characters

Colonies are hispidose, forming thickets of closely intertwining branches which are usually dead, except for the distal 10-20cm. Branches are indeterminate and divide irregularly, usually at intervals of <5cm. They are evenly surrounded by branchlets

Figs. 940-941 *Acropora subglabra* (× 0.75)
Fig. 940 From Tijou Reef, collecting station 156, same corallum as Figs. 942, 943.
Fig. 941 From Great Detached Reef, collecting station 1, same corallum as Figs. 944, 945.

Fig. 940▲

Fig. 941▼

consisting of groups of tapering incipient axial corallites, with scattered, appressed tubular, radial corallites.

Radial corallites on main branches are tubular, tubular appressed or sub-immersed, with calices 0.5-0.7mm diameter. They have a variable, but usually very reduced septation. Axial corallites of branchlets are up to 5mm exsert, 0.9-1.5mm diameter, with calice diameters of 0.5-0.8mm. Primary septa are poorly developed, $\frac{1}{4}$R or less but may have well-developed directives deep within the calices. Secondary septa are $\frac{1}{4}$R to absent. All septa of axial corallites are primarily composed of rows of spines.

All corallite walls are non-porous and finely costate, the costae bearing fine spines. The coenosteum between corallites becomes a reticulate mixture of irregularly fused costae and spinules.

Living colonies are pale brown in colour, usually with yellow corallite tips.

Figs. 942-945 *Acropora subglabra* (× 5)
Figs. 942, 943 Same corallum from Tijou Reef and same corallum as Fig. 940.
Figs. 944, 945 Same corallum from Great Detached Reef and same corallum as Fig. 941.

Fig. 942▲

Fig. 943▲

Fig. 944▼

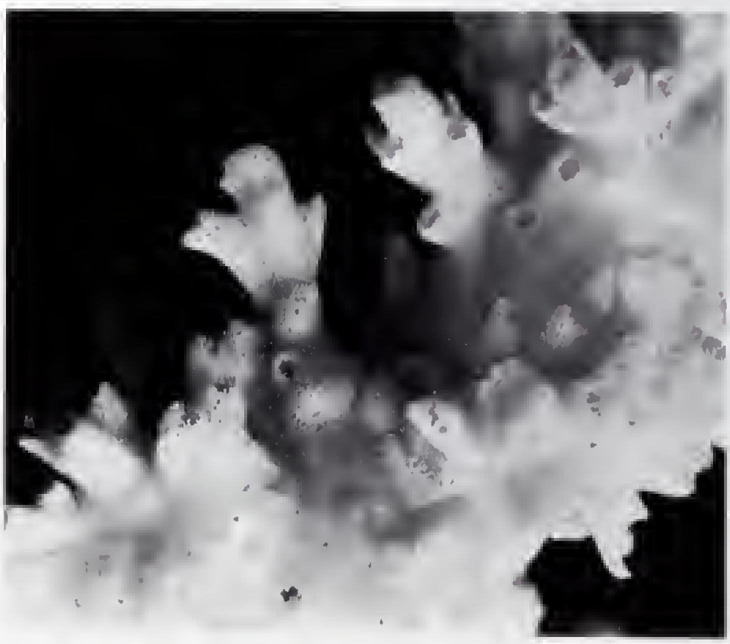


Fig. 94

Habitat preferences and growth form variation

As with other hispidose species, *A. subglabra* is usually restricted to protected back reef areas, usually with a soft substrate (see p. 374), which have clear water and good circulation, but is occasionally found on exposed reef fronts at >10m depth. Like *A. echinata*, it appears to be common only in the Northern Region of the Great Barrier Reef. Coralla from exposed

Figs. 946-949 *Acropora subglabra* (× 20)
Figs. 946, 947 From Tijou Reef, collecting stations 155 and 156 (respectively).
Fig. 948 From Great Detached Reef, collecting station 1.
Fig. 949 From Raine Island, collecting station 152.

Fig 946▲

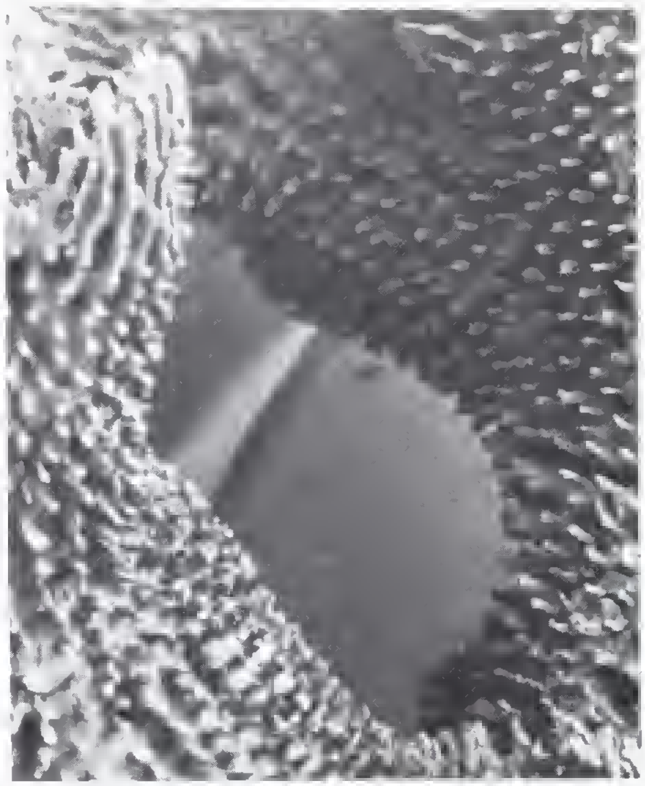


Fig. 947▲

Fig. 948▼

Fig 949▼

reef fronts (Fig. 941) differ from those from protected biotopes in having more frequently dividing branches and shorter, more frequently dividing corallites. Otherwise, there is little variation in the species.

Similar species

Acropora subglabra is close to *A. echinata* in having a similar growth form and has radial corallites of similar shape and approximate size, but otherwise the two species have substantial differences (see p. 377). *Acropora subglabra* is closer to *A. carduus* (see p. 385) and these species may sometimes be difficult to separate.

Distribution

Recorded in the western Pacific, north to the Ryukyu Islands and south to the Great Barrier Reef and Fiji.

Acropora (Acropora) carduus (Dana, 1846)

Synonymy

Madrepora carduus Dana, 1846; Brook (1893).

Madrepora prolixa Verrill, 1866.

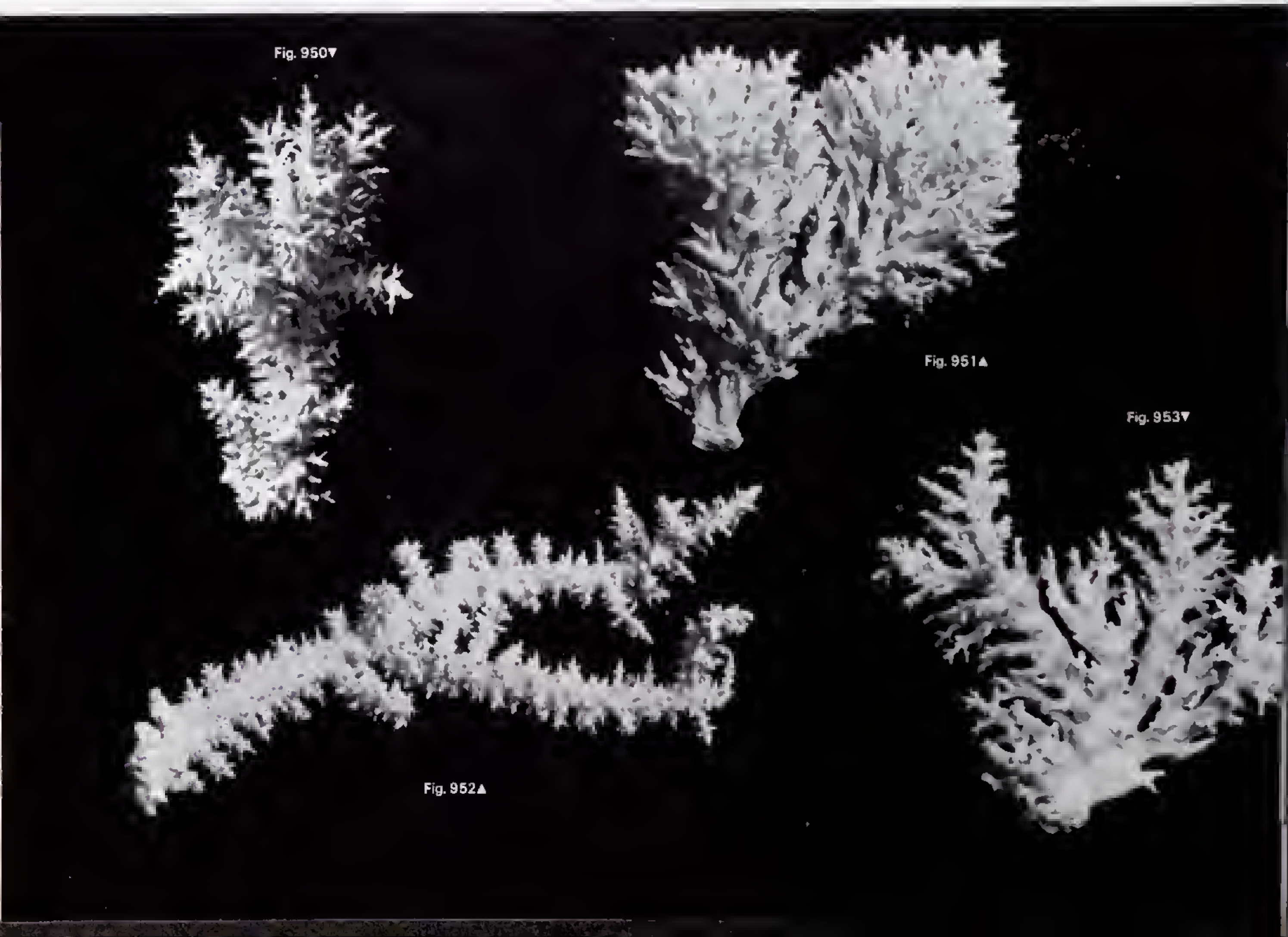
Acropora prolixa (Verrill); Verrill (1902); Hoffmeister (1925); Crossland (1952).

Acropora carduus (Dana); Faustino (1927); Eguchi (1938); Nemenzo (1967); Wallace (1978).

Dana's type specimens (YPM 1999, MCZ 335 and USNM 277) from Fiji are similar to each other and show no significant differences from the present series. Verrill's *A. prolixa* from Japan is based on a syntype series, of which USNM 412 is most clearly representative.

Figs. 950-953 *Acropora carduus* (× 0.5)

Fig. 950 From Lizard Island, collecting station 32, same corallum as Fig. 954.
Fig. 951 From Falcon Island, Palm Islands, collecting station 174, same corallum as Fig. 955.
Fig. 952 From Rib Reef, same corallum as Fig. 956.
Fig. 953 From Esk Island, Palm Islands, collecting station 42.



Material studied

Murray Islands, Bushy Islet, Raine Island (3 specimens), **Great Detached Reef** (3 specimens), **Franklin Reef, Tijou Reef** (25 specimens), **Martins Reef, Lizard Island, Low Isles, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef, Rib Reef** (2 specimens), **Bowl Reef, Myrmidon Reef, Palm Islands** (8 specimens), **Davies Reef.**

These localities include collecting stations 1, 30, 32, 37, 42, 45, 60, 150, 151, 152, 155, 156, 168, 174, 200, 221, 226.

Figs. 954-957 *Acropora carduus* (× 5)

Fig. 954 From Lizard Island, same corallum as Fig. 950.
Fig. 955 From Falcon Island, Palm Islands, same corallum as Fig. 951.
Fig. 956 From Rib Reef, same corallum as Fig. 952.
Fig. 957 From Esk Island, Palm Islands, collecting station 42.

Fig. 954▲

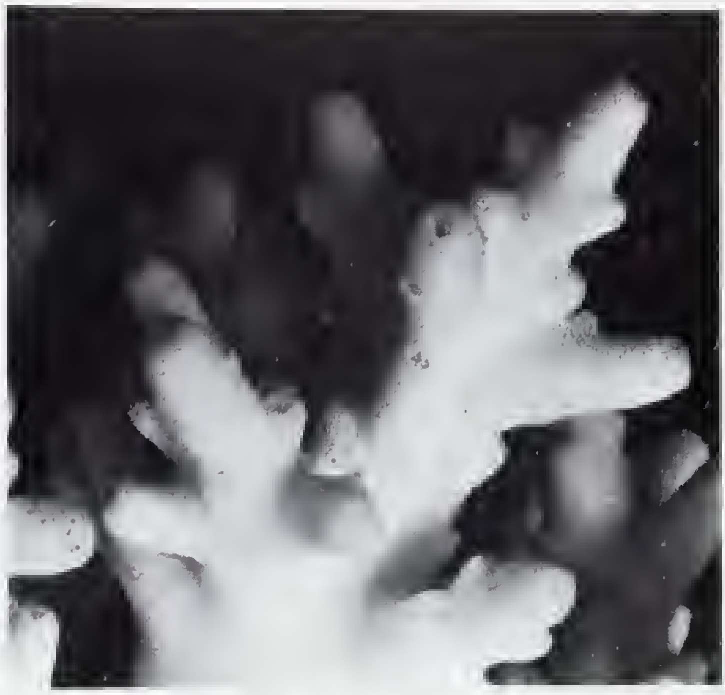


Fig. 955▲

Fig 956▼

Fig. 957▼

Characters

Colonies are compact to open-branching, hispidose, sometimes giving a caespitose appearance. Main branches may be primarily upright or horizontal or a mixture of both. Sub-branches and branchlets are at 45-90° and are evenly spaced. Branchlets are 2-4cm long and are composed of a central axial corallite and a regular series of incipient axial corallites, each with several appressed radial corallites.

'Radial corallites: On branchlets, scattered appressed tubular, sometimes approaching nariform, with round openings. On some colonies radials are crowded, partly appressed

Figs. 958-961 *Acropora carduus*

Figs. 958-960 From Tijou Reef; Figs. 958, 959 from collecting station 155 (× 20 and 200 respectively); Fig. 960 from collecting station 156 (× 20).

Fig. 961 From Franklin Reef, collecting station 150 (× 10).

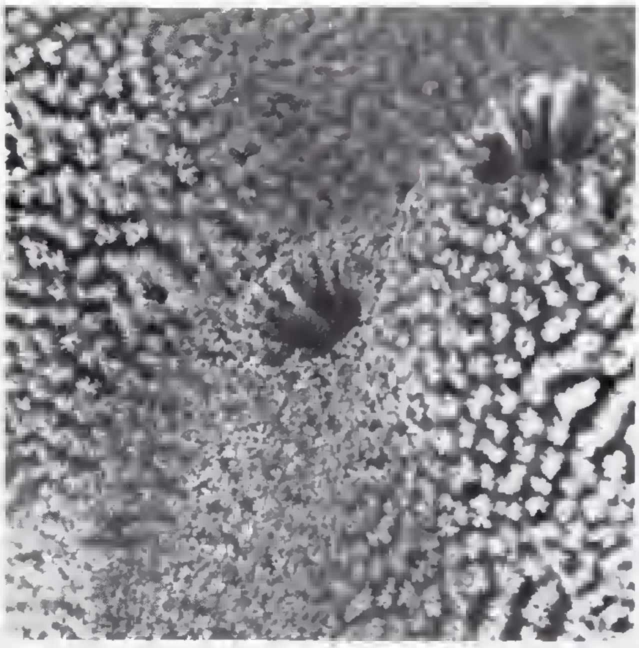


Fig. 958▲

Fig 959▲

Fig 960▼

Fig. 961▼

tubular and extending out from branchlets. On the main branches radials are sub-immersed to immersed, or in some cases tubular appressed. Primary septa are poorly to well-developed to $\frac{1}{2}$R, secondaries are usually absent except in immersed corallites, where a few may be present. Radial corallites are best represented on distal parts of branches. At the base of branches most have developed into long tubular axials' (Wallace, 1978). Axial corallites are tubular, tapering, 1.2-2.0mm diameter with calices 0.5-0.7mm diameter. Primary septa are well developed, up to $\frac{3}{4}$R, secondary septa are absent or up to $\frac{1}{4}$R. Septa have smooth to regularly dentate margins. Directive septa can sometimes be distinguished.

All protuberant corallites have finely costate walls. These are usually solid, but some develop lattice-like perforations near their tips, as described for *A. echinata*. The coenosteum of main branches is primarily costate and covered with rows of spinules, which may be thickened and compacted to form an almost smooth surface. In some coralla, the coenosteum is perforated by irregular elongate fissures.

Living colonies are a uniform pale brown or cream, rarely blue or mauve.

Habitat preferences and growth form variation

Acropora carduus is abundant in deep or protected water around reef backs or on the slopes of fringing reefs or in lagoons. It may have a wide range of growth forms, as illustrated. Colonies from biotopes exposed to strong light usually have a compact bushy appearance and are relatively well calcified, with appressed radial corallites becoming submerged. Colonies from deep water have a lax branching pattern or have primarily horizontal main branches with vertical branchlets on their upper surface, giving a plate-like growth form.

Similar species

Both colony and corallite dimensions are intermediate between those of *A. subglabra* and *A. longicyathus*. *Acropora carduus* differs from *A. subglabra* in having slightly thicker corallites, with more numerous appressed radial corallites around the axial corallites, and in having better developed primary septa, especially in tubular corallites. By these characters, coralla from similar biotopes can be readily distinguished, but identification of these species in heterogeneous collections, without environmental data, can become somewhat arbitrary. *Acropora carduus* is usually readily distinguished from *A. longicyathus*, which has substantially larger corallites and more exsert axial corallites.

Distribution

Recorded in the western Pacific, north to Japan and south to the Great Barrier Reef and Fiji.

Acropora (Acropora) elseyi (Brook, 1892)

Synonymy

Madrepora elseyi Brook, 1892; Brook (1893).

Madrepora exilis Brook, 1892; Brook (1893).

Acropora elseyi (Brook); Crossland (1952) (*pars*); Pillai & Scheer (1976); Wallace (1978).

Acropora exilis (Brook); Crossland (1952); Stephenson & Wells (1955).

Both of Brook's nominal species have type localities on the Great Barrier Reef.

Figs. 962-966 *Acropora elseyi* (× 0.5)

Fig. 962 From Wye Reef, collecting station 163, same corallum as Fig. 967.
Fig. 963 From Britomart Reef, collecting station 168, same corallum as Fig. 968.
Fig. 964 From Houghton Island, collecting station 16, same corallum as Fig. 969.
Figs. 965, 966 From Curacao Island, Palm Islands, collecting station 177; Fig. 965 same corallum as Figs. 970, 971, 976; Fig. 966 same corallum as Fig. 972.

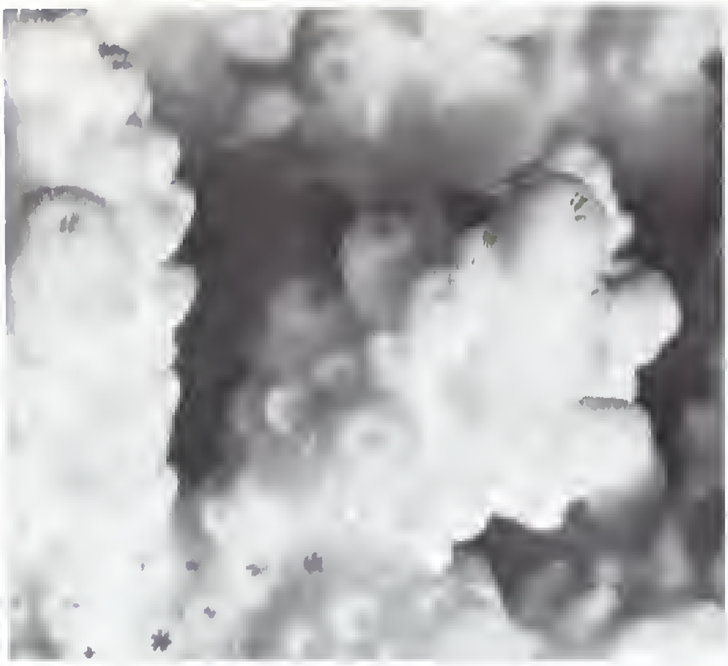

Fig. 962▲


Fig. 963▲


Fig. 964▲

Fig. 965▼

Fig. 966▼



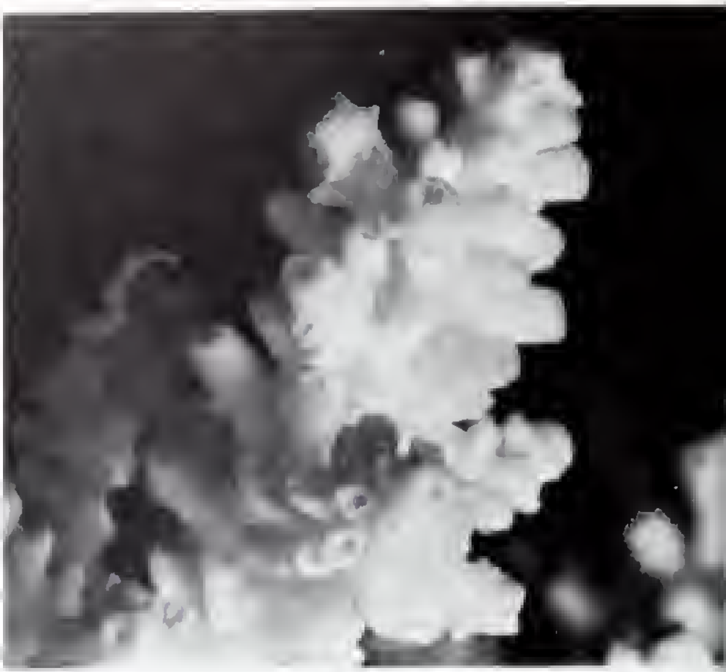


Fig. 967▲ Fig. 969▼ Fig. 968▲ Fig. 970▼

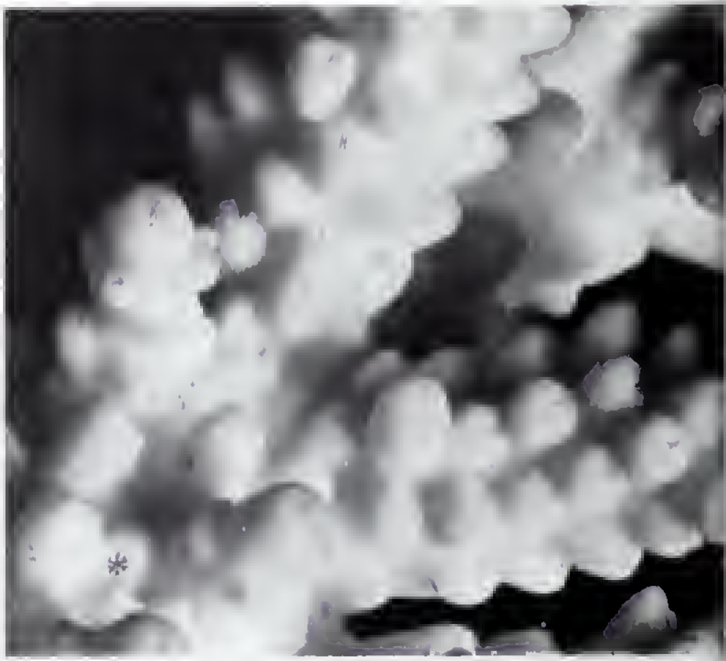
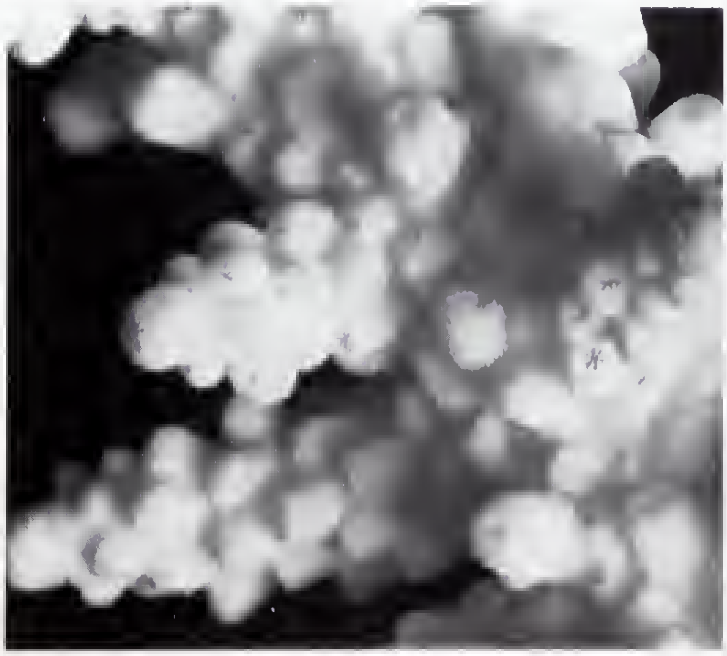


Fig. 971▼ Fig. 972▼



Figs. 967-972 *Acropora elseyi* (× 5)

Fig. 967 From Wye Reef, same corallum as Fig. 962.

Fig. 968 From Britomart Reef, same corallum as Fig. 963.

Fig. 969 From Houghton Island, same corallum as Fig. 964.

Figs. 970-972 From Curacao Island, Palm Islands; Figs. 970, 971 same corallum as Figs. 965, 976; Fig. 972 same corallum as Fig. 966.

Figs. 973-976 *Acropora elseyi*

Fig. 973 From Britomart Reef, collecting station 167 (× 20).

Figs. 974, 975 From the Turtle Islands, collecting station 165 (× 20 and 40 respectively).

Fig. 976 From Curacao Island, Palm Islands, same corallum as Figs. 965, 970, 971 (× 20).

Fig 973▲

Fig. 974▲

Fig. 975▼

Fig. 976▼

Material studied

Pandora Reef (2 specimens), **Great Detached Reef** (2 specimens), **Wye Reef** (2 specimens), **Tijou Reef, Bewick Island** (2 specimens), **Hunters Reef** (6 specimens), **Houghton Island** (2 specimens), **Turtle Islands** (2 specimens), **Willis Islet, Low Isles, Lihou Reefs, Britomart Reef** (10 specimens), **Pandora Reef, Palm Islands** (46 specimens), **Fly Island** (3 specimens), **Chesterfield Reefs** (3 specimens).

These localities include collecting stations 6, 16, 18, 34, 37, 38, 41, 42, 45, 55, 60, 158, 163, 167, 168, 171, 173, 174, 177, 199, 202, 212, 218.

Characters

Colonies are composed of subdividing branches surrounded by branchlets. Some coralla, composed mostly of branchlets, are small and bushy, others are arborescent, with hispidose branchlets. In different coralla, branchlets may be equal or unequal in length, may be straight with a single axial corallite, or strongly subdivided with several auxiliary axial corallites.

Both radial and axial corallites are of very variable lengths. 'Radial corallites: On both main branches and branchlets, radials are tubular with round openings, becoming round tubular distally. Radials are usually evenly distributed on branches, and almost touching, sometimes upper surface of small branchlets is naked of corallites' (Wallace, 1978). Radial and axial corallites have a similar septation, the septa being non-perforate with straight or lobed margins, or rarely, with dentations. Axial corallites are up to 2mm exsert, 1.6-3.2mm diameter, with calices 0.5-1.0mm diameter. Primary septa are well developed, up to $\frac{3}{4}$R, secondary septa are absent or a few present, $<\frac{1}{4}$R. The coenosteum is very finely costate, the costae having fine elaborated spinules.

Living colonies are characteristically yellow or cream with pale branchlet tips.

Habitat preferences and growth form variation

Acropora elseyi is found in lagoons and on reef slopes not exposed to strong wave action, and is common on fringing reefs of continental islands where it may form large monospecific stands. There is little growth form variation within biotopes, but inter-biotope variation can be very marked.

Coralla from outer reef slopes <15m depth usually have a bushy appearance, with little differentiation between branches and branchlets. Corallites are relatively large with wide calices and are closely compacted.

Coralla from deep or partly turbid water, including most of those from continental islands, are arborescent, with infrequently dividing branches. Branchlets are usually short, but may be long enough to give a hispidose appearance. Corallites are usually small, with radial corallites strongly appressed. Septa are usually well developed.

Similar species

Acropora elseyi does not closely resemble any other species; however, it is so polymorphic that it may be confused with *A. longicyathus* underwater. The latter may have a similar growth form, but has much larger corallites, some of which are distinctly tubular and protuberant.

Acropora elseyi and *A. carduus* have similar corallite and branchlet dimensions.

Distribution

Recorded only from the Maldive Islands and eastern Australia.

Figs. 977-980 *Acropora longicyathus* (×0.5)

Fig. 977 From Great Detached Reef, collecting station 1, same corallum as Figs. 981, 982.

Figs. 978, 979 From Britomart Reef, collecting station 167; Fig. 978 same corallum as Figs. 983, 984; Fig. 979 same corallum as Fig. 985.

Fig. 980 From Chesterfield Atoll, collecting station 210, same corallum as Fig. 986.

Fig. 977▲

Fig. 978▼

Fig. 979▲

Fig. 980▼

Acropora longicyathus (Edwards & Haime, 1860)

Synonymy

Madrepora longicyathus Edwards & Haime, 1860; Brook (1893).

Madrepora syringodes Brook, 1892; Brook (1893) not Vaughan (1918).

Acropora longicyathus (Edwards & Haime); Nemenzo (1967); Wallace (1978).

Acropora rosaria (Dana); Crossland (1952, *pars*); Wallace (1978).

The holotype of *A. longicyathus* is probably MNHN 303A or MNHN 409 and Verrill may have deposited a piece of it in the MCZ (MCZ 1080). Of Brook's syntypes of *A. syringodes*, specimen BMNH 1892-6-8-209 is from the Palm Islands, while the other two, which are very similar, are from an unknown locality.

Material studied

Big Mary Reef, Turtle Islands (3 specimens), **Raine Island, Great Detached Reef** (6 specimens), **Bird Island** (2 specimens), **Martha Ridgeway Reef** (2 specimens), **Tijou Reef** (8 specimens), **Houghton Island, Lizard Island** (10 specimens), **Hope Island, Willis Islet** (5 specimens), **Low Isles, Magdelaine Cay** (11 specimens), **Mellish Reef, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (9 specimens), **Rib Reef** (4 specimens), **Davies Reef** (6 specimens), **Myrmidon Reef** (4 specimens), **Palm Islands** (15 specimens), **Marion Reef** (2 specimens), **Darley Reef, Chesterfield Reefs** (9 specimens), **Pompey Reef** (2 specimens), **Redbill Reef, Swain Reef** (2 specimens), **Fitzroy Reef** (16 specimens), **Llewellyn Reef**.

These localities include collecting stations 1, 8, 16, 34, 37, 41, 45, 70, 72, 79, 89, 100, 152, 153, 155, 156, 158, 159, 161, 165, 167, 168, 169, 174, 177, 187, 196, 197, 199, 200, 204, 210, 216, 218, 220, 221, 226.

Characters

Colonies are sub-arborescent to bushy, being composed of straight, bifurcating, non-anastomosing primary branches and secondary branchlets, the latter formed by radiating incipient axial corallites. Coralla from different biotopes have a wide range of growth forms, mostly attributable to differences in the relative lengths of primary branches and branchlets and to the lengths of the corallites. Coralla with relatively long branchlets and protuberant corallites have a thick bushy appearance, whilst those with long main branches and short branchlets are sub-arborescent, frequently with a hispidose appearance.

'Radial corallites: On branchlets, appressed or partly appressed tubular with round openings. When fully appressed, radials are scattered, only a few to each axial corallite; however, branchlets can have radials touching. In the first case radials on main branches are immersed or (more usually) sub-immersed; in the second, main branch radials are usually similar to those of branchlets' (Wallace, 1978). Axial corallites are tubular or rounded tubular, usually with appressed radial corallites near their rim. Sometimes they are up to 10mm exsert or have radial corallites on one side only. 'Outer diameter 2.1 to 2.8mm; inner diameter 0.8 to 1.3mm. Septation: primary cycle present to $\frac{3}{4}$R, secondary cycle present, or at least partly developed up to $\frac{1}{4}$R' (Wallace, 1978).

In several specimens of the present series, the corallite wall and surrounding coenosteum are very clearly distinguished, the former being a fine lattice of septa and synapticulae, the latter a reticulate network supporting regularly arranged spinules with elaborated tips.

Living colonies are mostly a uniform pale to dark brown.

Habitat preferences and growth form variation

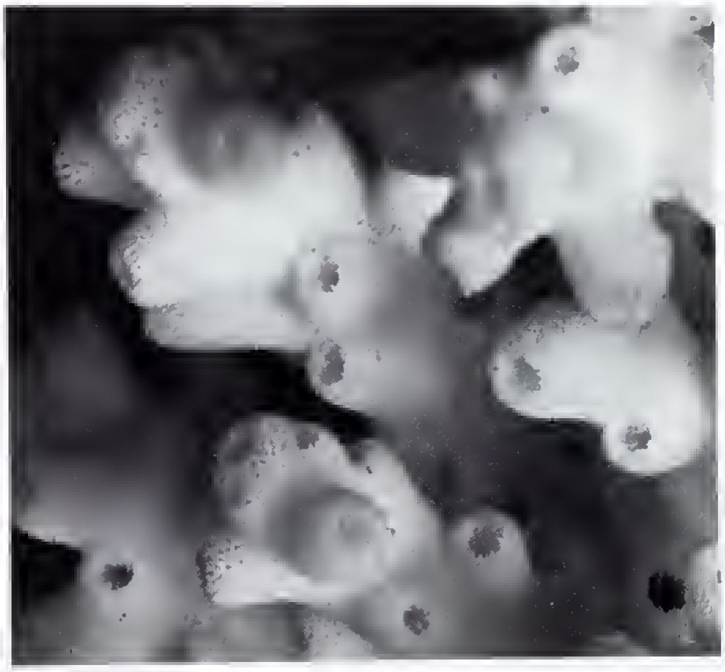
Acropora longicyathus is abundant over a wide range of environments. It may be a dominant species on unconsolidated substrates and is an early coloniser when such substrates become denuded.

981▲

Fig. 983▼

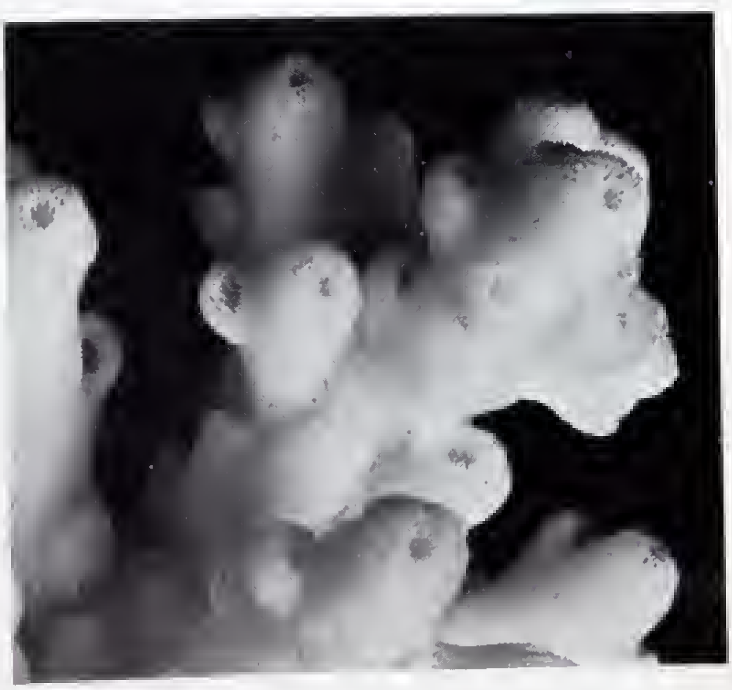
Fig. 982▲

Fig. 984▼



g. 985▼

Fig. 986▼



Figs. 981-986 *Acropora longicyathus* (× 5)

Figs. 981, 982 Same corallum from Great Detached Reef, same corallum as Fig. 977.
Figs. 983, 984 Same corallum from Britomart Reef, same corallum as Fig. 978.
Fig. 985 From Britomart Reef, same corallum as Fig. 979.
Fig. 986 From Chesterfield Atoll, same corallum as Fig. 980.

Figs. 987-990 *Acropora longicyathus* (× 20)

Figs. 987, 988 From Tijou Reef, collecting stations 156 and 8 (respectively).
Fig. 989 From Big Mary Reef, collecting station 187.
Fig. 990 From Curacao Island, Palm Islands, collecting station 177.

Fig. 987▲

Fig 988▲

Fig. 989▼

Fig 990▼

Coralla from shallow, exposed outer slopes have short, thick branches with very short secondary branchlets. Corallites are short, rounded and relatively close.

Coralla from protected reef biotopes have the greatest range in growth form. Branches are up to $\frac{1}{2}$m long, straight and frequently have a uniform hispidose arrangement of secondary branchlets. Only the upper part of such colonies is usually alive. They are easily broken and colony fragmentation appears to be a common method of dispersal, allowing the species rapidly to colonise denuded substrates.

This species is also common on fringing reefs of continental islands. In relatively turbid water, branches are thin, frequently subdivide and have elongate incipient axial corallites giving colonies a bushy appearance.

Affinities

Similarities with *A. carduus* are noted on p. 385 and with *A. elseyi* on p. 390. Some arborescent growth forms of *A. longicyathus* are similar to hispidose growth forms of *A. loripes* (see p. 403).

Distribution

Recorded in the western Pacific, from the Philippines to the Great Barrier Reef.

Acropora (Aeropora) sp. 5

Material studied

Raine Island, Great Detached Reef (5 specimens), **Myrmidon Reef, Dip Reef, Brisk Island, Chesterfield Reefs, Redbill Reef, Fitzroy Reef.**

These locations include collecting stations 1, 152, 153, 169, 197, 200, 218.

Characters

Coralla are digitate to arborescent, with proliferous incipient axial corallites developing into sub-branches at irregular intervals. Radial corallites are short, tubular, thick-walled, 2.4-2.8mm diameter, with calices 1.0-1.2mm diameter. Incipient axial corallites have markedly thicker walls, are 3.2-3.8mm diameter, with similar sized calices. They are up to 6.5mm long towards the base of branches and decrease in length towards branch tips. Radial corallites have two sub-equal, complete septal cycles, $<\frac{1}{3}$R. The primary cycle increases in length in incipient axial corallites, reaching R deep within the corallite. Axial corallites are similar to incipient axial corallites, except that calices are $<$0.9mm diameter. The coenosteum on and between corallites is similar, being medium-coarse to medium-fine and spongy.

Living colonies are uniform cream or blue in colour.

Affinities

The present series attributed to this species is ill defined, having come from widely separated geographic localities and environments. Some coralla are close to *A. longicyathus* and have not been satisfactorily distinguished from *A. longicyathus in situ.*

Figs. 991, 992 *Acropora* sp. 5

Fig. 991 From Myrmidon Reef, same corallum as Fig. 993.
Fig. 992 From Chesterfield Atoll, collecting station 218, same corallum as Fig. 994.

Figs. 993, 994 *Acropora* sp. 5 (× 5)

Fig. 993 From Myrmidon Reef, same corallum as Fig. 991.
Fig. 994 From Chesterfield Atoll, same corallum as Fig. 992.

Fig. 991▲

Fig. 992▼

993▲

Fig. 994▲

The *Acropora loripes* group

This group includes a very wide gradation of growth forms, which are nevertheless clearly related. All have an essentially similar very fine coenosteum, giving a smooth appearance similar to the coenosteum of the Dendrophylliidae. The coenosteum is most similar to that of the *A. longicyathus* group.

Acropora loripes is much more abundant than the other species and also much more polymorphic, forming hispidose or corymbose colonies or plates. All the other species of this group may closely resemble some part of this range; in some cases, the resemblance is greater than different colonies of *A. loripes* have to each other.

All species of this group are at their maximum abundance in habitats having clear water with good circulation and protection from strong wave action. All species are therefore found in areas of high *Acropora* diversity, especially lower outer reef slopes or shallow reef back margins.

Acropora (Acropora) loripes (Brook, 1892)

Synonymy

Madrepora loripes Brook, 1892; Brook (1893).

Acropora squarrosa (Ehrenberg); Vaughan (1918); Wallace (1978); not Ehrenberg (1834).

Acropora murrayensis Vaughan, 1918; Nemenzo (1967).

Acropora cancellata (Brook); Crossland (1952); not Brook (1893).

?*Acropora lianae* Nemenzo, 1967.

Acropora loripes Brook from the Great Barrier Reef (BMNH 1892-6-8-219) is identical to coralla of the present series, as is Vaughan's type of *A. murrayensis* (USNM unnumbered), Crossland's *A. cancellata* (Brook) and Vaughan's (1918) and Wallace's

Figs. 995-1001 *Acropora loripes* (× 0.5)
Figs. 995-999 From Britomart Reef, collecting station 167, same coralla as Figs. 1002-1006 (respectively).
Fig. 1000 From Great Detached Reef, collecting station 1, same corallum as Fig. 1007.
Fig. 1001 From Wye Reef, collecting station 163, same corallum as Fig. 1008.

Fig. 995▲

Fig. 996▼

Fig. 997▼

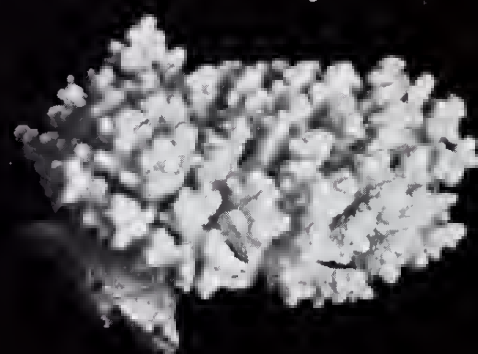


Fig. 998▼

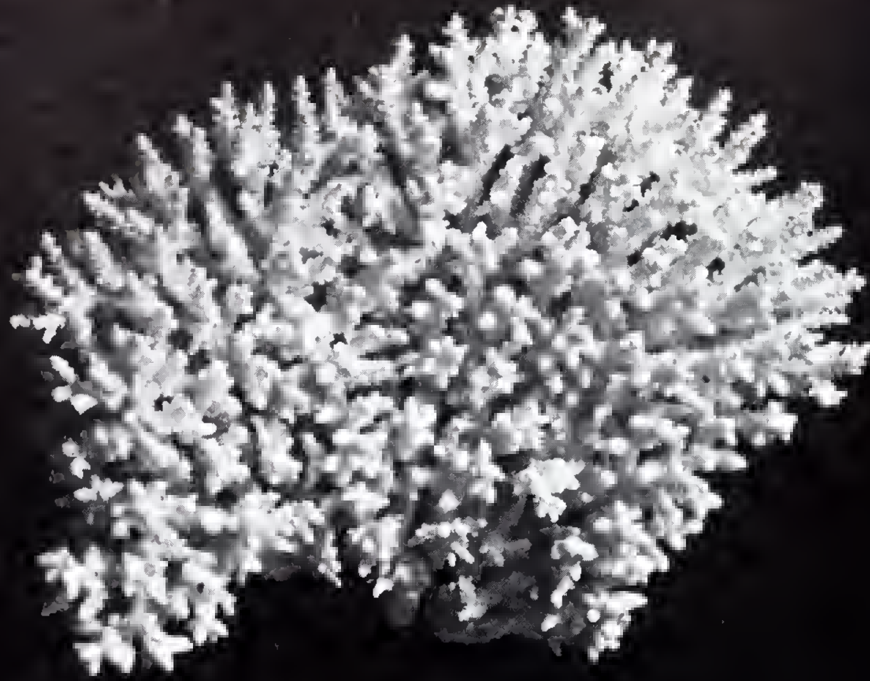


Fig. 999▲

Fig. 1000▲

Fig. 1001▲

(1978) *A. squarrosa*, the latter being an extensive series. *Heteropora squarrosa* Ehrenberg (ZMB 872 ?type) from the Red Sea is a completely different species, with affinities with the *A. nasuta* group, along with *A. decurrens* (Ehrenberg, 1834) (BM 867) and *A. vagabonda* (Klunzinger, 1879 (BM 2145)). The only records of *A. loripes* occurring outside the Great Barrier Reef are those of Nemenzo (1967) from the Philippines, and it is possible that his *A. lianae* is a related species rather than a synonym.

Material studied

Darnley Island, Little Mary Reef (2 specimens), **Arden Island, Sue Island, Turtle Islands, Raine Island** (4 specimens), **Great Detached Reef** (15 specimens), **Sir Charles Hardy Islands** (2 specimens), **Martha Ridgeway Reef** (4 specimens), **Wye Reef** (3 specimens), **Franklin Reef** (19 specimens), **Tijou Reef** (14 specimens), **Corbett Reef, Bewick Island, Howick Island** (7 specimens), **Houghton Island, Lizard Island** (5 specimens), **Hope Island, Willis Islet** (2 specimens), **Magdelaine Cay** (4 specimens), **Mellish Reef** (2 specimens), **Flinders Reef (Coral Sea)** (4 specimens), **Britomart Reef** (52 specimens), **Myrmidon Reef** (6 specimens), **Palm**

Figs. 1002-1009 *Acropora loripes* (× 5)

Figs. 1002-1006 From Britomart Reef, same coralla as Figs. 995-999 (respectively).
Fig. 1007 From Great Detached Reef, same corallum as Fig. 1000.
Fig. 1008 From Wye Reef, same corallum as Fig. 1001.
Fig. 1009 From Raine Island, collecting station 152, showing extreme fusion of branchlets.

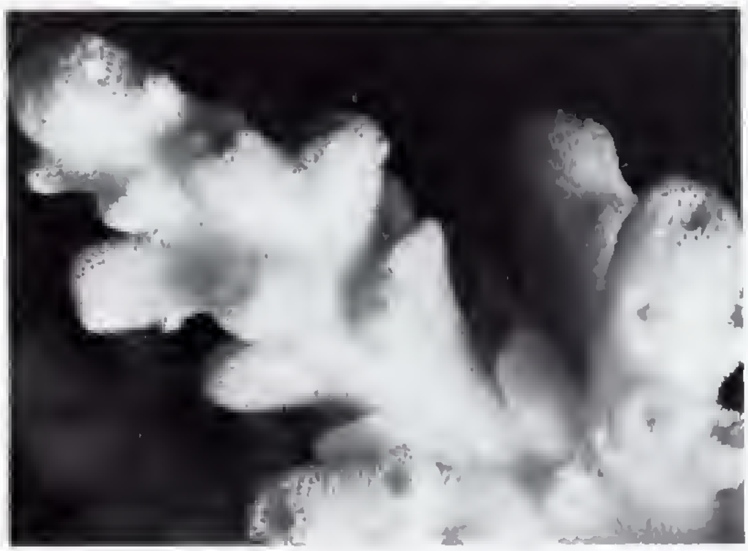


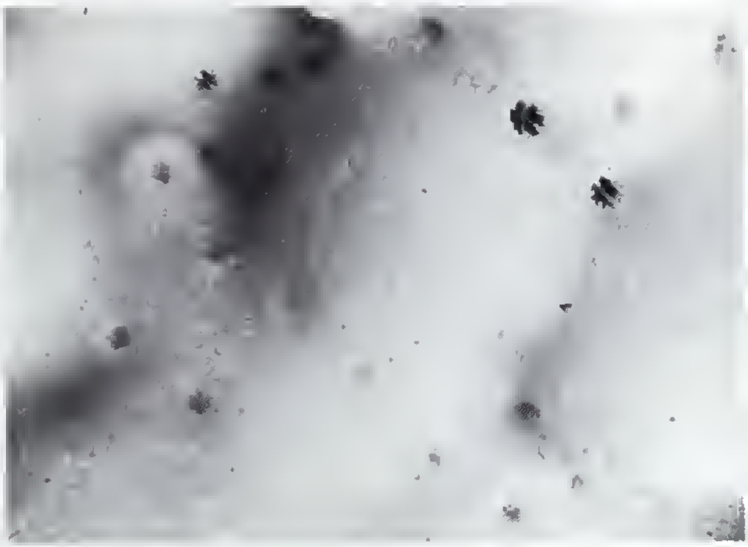
Fig. 1002▲

Fig. 1003▲

Fig. 1004▼

Fig. 10

1006▲ Fig. 1008▼ Fig. 1007▲ Fig. 1009▼



Islands (4 specimens), **Darley Reef, Chesterfield Reefs** (4 specimens), **Bushy Island-Redbill Reef** (7 specimens), **Polmaise Reef, Fitzroy Reef** (14 specimens), **Llewellyn Reef**.

These localities include collecting stations 1, 2, 5, 8, 31, 32, 41, 42, 43, 80, 100, 149, 150, 151, 152, 153, 154, 155, 156, 158, 162, 163, 164, 165, 167, 169, 175, 179, 182, 183, 185, 186, 190, 192, 197, 198, 199, 200, 208, 209, 211, 212, 214, 220, 221, 226.

Characters

Acropora loripes shows a very wide range of variation, both in skeletal detail and colony shape. This is primarily due to: (1) a very wide intra-biotope range of growth forms; (2) the development of groups of axial corallites on branch ends and (3) the length and degree of dominance of secondary axial corallites.

Colonies are hispidose, corymbose, or plate-like, with a central to lateral attachment. Plate-like colonies may have single, protuberant axial corallites structurally similar to those of caespitose coralla or may have thick, globular branch ends composed of several immersed corallites. Secondary axial corallites, which radiate from branches, may be long and have large numbers of radial corallites, giving coralla a bushy appearance, or may be poorly developed or absent, giving coralla a corymbose appearance.

Axial corallites may be up to 3.0mm exsert; radial corallites may develop only on the lower side of axials, leaving the upper side naked for lengths of up to 12mm. Such half-naked corallites are usually secondary (asymmetrical) axials and occur in both corymbose and plate-like coralla. They are usually 4-7mm diameter. Some coralla have secondarily thickened axial or incipient axial corallites, which become globular as described above, with branch ends 7-10mm thick. All axial corallites have openings <1mm diameter (those on globular branch ends 0.5-0.7mm). Primary septa are $<\frac{3}{4}$R, secondary septa are $\frac{1}{4}$R to absent; occasionally, there is a rudimentary third cycle. These septa are not strongly dentate and are seldom perforated. Radial corallites on main branches are immersed or sub-immersed; those surrounding axial corallites are tubular appressed or nariform. Primary septa are $<\frac{1}{2}$R, frequently incomplete, sometimes with distinct directives; secondary septa are usually absent. There are no costae, the coenosteum surface, around and between the corallites, is composed of flattened spinules, with elaborated tips arranged in regular rows.

Living colonies are mostly pale blues and browns.

Habitat preferences and growth form variation

Acropora loripes occurs in a wide range of environments, but is particularly abundant on reef outer slopes. Most of the variation described above can occur on outer slopes at 10-20m depth. Coralla from shallower water exposed to strong wave action are thick, heavily calcified plates up to 50cm diameter, with short vertical branchlets. There is little development of incipient axial corallites. Coralla from protected water have tapering hispidose branches. The development of globular branch ends is not clearly correlated with physical environmental factors and may be a response to biological influences such as repeated fish grazing.

Similar species

The wide skeletal variability of *A. loripes* allows it to be confused with several other species, notably *A. granulosa* and *A. longicyathus*. *Acropora granulosa* and *A. loripes* are both common on lower reef slopes, where both may have similar plate-like growth forms. *Acropora granulosa* is distinguished by its smaller tapering corallites, which are not clearly axial or radial (see p. 407). There is no tendency to form globular branch ends in *A. granulosa* and only plate-like growth forms are developed.

Figs. 1010, 1011 *Acropora loripes* (× 20)
Fig. 1010 From Tijou Reef, collecting station 8.
Fig. 1011 From Sue Island, collecting station 182.

Fig 1010▼

Fig. 1011▼

Acropora longicyathus from reef slopes may be very similar to caespitose *A. loripes*. The former is usually distinguished by having thinner branches and shorter branchlets, giving a more arborescent appearance. Axial corallites of *A. loripes* are usually more clearly distinguished from radials and radial corallites tend to have more nariform openings. *In situ*, *A. longicyathus* colonies usually have a very uniform appearance, whereas those of *A. loripes* are much more variable. The present series, however, contains some specimens which cannot be assigned to either species with certainty.

Affinities between *A. loripes* and *A. willisae* are noted below (p. 414).

Distribution

Recorded only from the Philippines and the Great Barrier Reef.

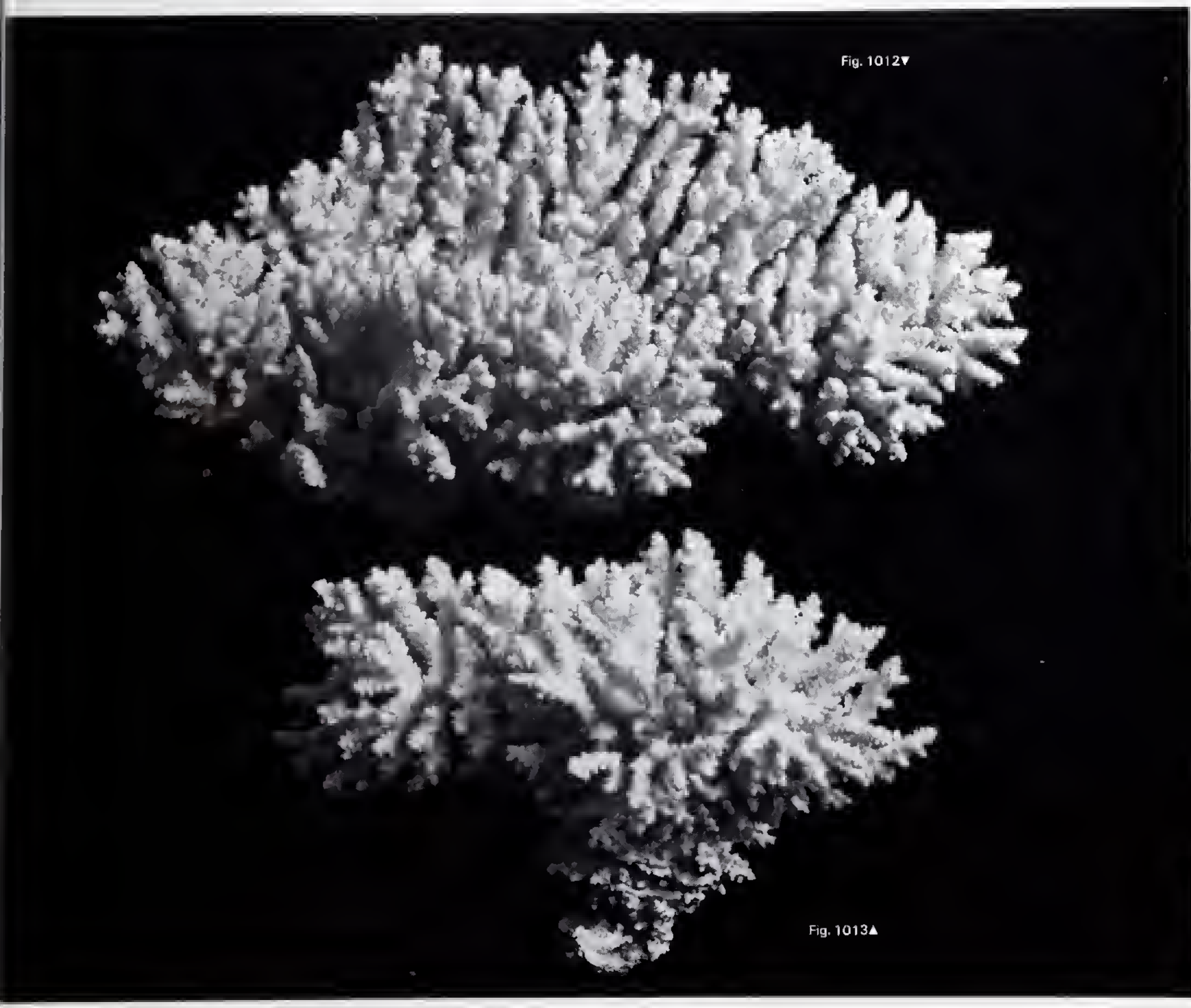
Acropora (Acropora) chesterfieldensis n.sp.

Material studied

Magdelaine Cay (4 specimens), **Mellish Reef** (2 specimens), **Marion Reef, Chesterfield Reefs** (11 specimens).

These localities include collecting stations 34, 200, 205, 207, 210, 212, 214, 215, 218.

Figs. 1012, 1013 *Acropora chesterfieldensis* from Chesterfield Atoll, collecting station 212; Fig. 1012 holotype, same corallum as Figs. 1014, 1016; Fig. 1013, same corallum as Figs. 1015, 1017.



Characters

Coralla are corymbose, caespitose or caespito-corymbose. Branches are terete, 8-12mm diameter and divide irregularly. Axial corallites are 1.0-3.0mm diameter, with calice diameters of 0.7-1.0mm. Radial corallites are dimidiate, with a tendency to become tubular. They are uniform in appearance, with thick non-costate walls and calice diameters of approximately 0.8mm. Axial corallites usually have two complete septal cycles, $\frac{1}{2}$R and $\frac{1}{4}$R, while those of radial corallites are incomplete, $\frac{1}{4}$R and $<\frac{1}{4}$R. All septa are dentate, smaller septa more so than larger ones. One or both directive septa can usually be distinguished. The coenosteum is non-costate, consisting primarily of a reticulate network, with spinules forming an even surface.

Habitat preferences

This species has not been found on the Great Barrier Reef, the present series coming entirely from reefs and atolls of the central Coral Sea. All coralla came from partly exposed reef slopes with clear water.

Similar species

The size and structure of corallites is very similar to those of *A. loripes.* In both species, septal development is similar and the uniform appearance of the non-costate coenosteum on and between corallites is the same. *Acropora loripes* differs primarily in its tendency to have tubular corallites, with one side devoid of radial corallites. Their growth forms are different, the present species tending to become corymbose, while *A. loripes* adopts various growth forms from hispidose to plates.

Etymology

Named after the Chesterfield Reefs, where this species is common.

Holotype (Fig. 1012)

Dimensions: 33 × 23cm

Locality: Chesterfield Reefs lagoon

Depth: 8m

Figs. 1014, 1015 *Acropora chesterfieldensis* from Chesterfield Atoll, came coralla as Figs. 1012, 1016 (holotype) and Figs. 1013, 1017 (respectively) (× 5).

Fig. 1014▼

Fig. 1015

Fig. 1016▲

Fig. 1017▲

Figs. 1016, 1017 *Acropora chesterfieldensis* from Chesterfield Atoll, same coralla as Figs. 1012, 1014 (holotype) and Figs. 1013, 1015 (respectively).

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Coral Sea.

Acropora (Acropora) granulosa (Edwards & Haime, 1860)

Synonymy

Madrepora granulosa Edwards & Haime, 1860; Brook (1893).

Madrepora speciosa Quelch, 1886; Brook (1893).

Madrepora clavigera Brook, 1892; Brook (1893).

Madrepora rayneri Brook, 1892; Brook (1893).

Acropora clavigera (Brook); Crossland (1952).

Acropora rayneri (Brook); Wells (1954).

Acropora granulosa (Edwards & Haime); Wallace (1978).

Edwards and Haime's holotype from Bourbon Island (MNHN 328a) has large axial corallites, approximately 3mm diameter and is close to many specimens of the present series, as are the type specimens of Brook. Quelch's *A. speciosa* from Tahiti is at an extremity of the range of the present series.

Figs. 1018-1020 *Acropora granulosa* (× 20)

Fig. 1018 From Franklin Reef, collecting station 149.

Figs. 1019, 1020 From Britomart Reef, collecting station 167, same coralla as Figs. 1022, 1023 (respectively).

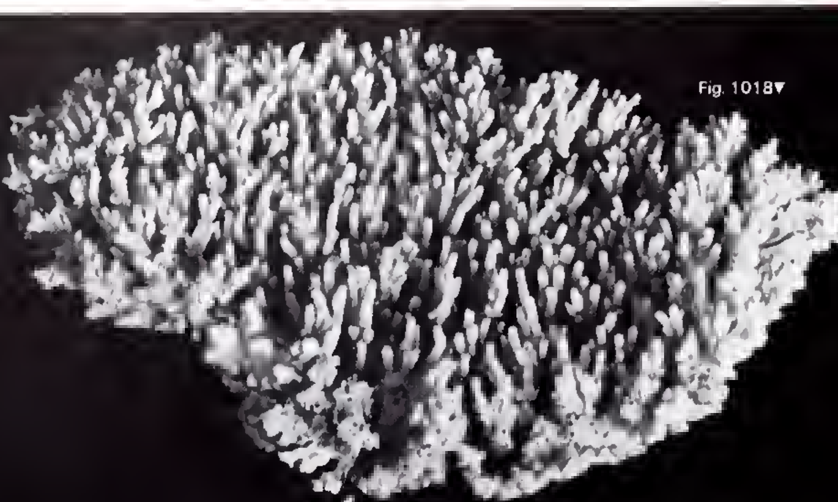


Fig. 1018▼

Fig. 1019▼

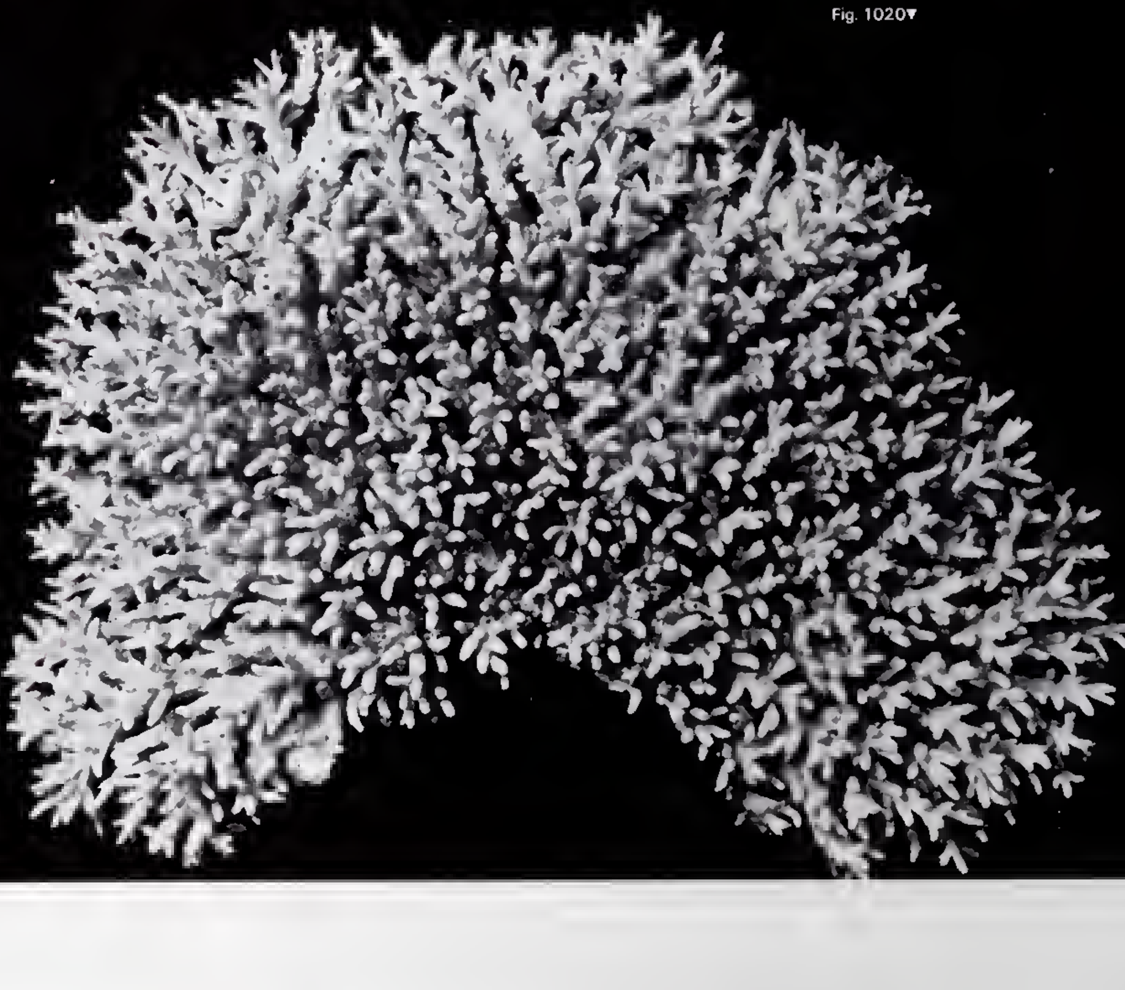


Fig. 1020▼

Material studied

Arden Island, Murray Islands, Raine Island (2 specimens), **Wye Reef, Franklin Reef** (8 specimens), **Tijou Reef, Low Isles, Mellish Reef, Flinders Reef (Coral Sea)** (2 specimens), **Britomart Reef** (18 specimens), **Myrmidon Reef, Palm Islands** (5 specimens), **Fitzroy Reef, Lady Musgrave Reef** (2 specimens).

These localities include collecting stations 34, 45, 57, 60, 90, 149, 152, 155, 163, 167, 181, 194, 195, 197, 208, 220, 226.

Characters

Colonies are almost always semi-circular, horizontal plates, < 1m diameter, with a side attachment. Regularly spaced, radiating, horizontal, anastomosing branches support short, subdividing branchlets. Each branchlet is composed of one or more axial corallites, which

Figs. 1021-1024 *Acropora granulosa* (× 5)
Fig. 1021 From Franklin Reef, same corallum as Fig. 1018.
Figs. 1022-1024 From Britomart Reef, collecting station 167; Figs. 1022, 1023, same coralla as Figs. 1019, 1020 (respectively).

. 1021▲

Fig. 1022▲

Fig. 1023▼

Fig. 1024▼

may be only arbitrarily distinguished from incipient axial corallites. Axial corallites are tubular, up to 15mm exsert, 1.2-3.5mm diameter, with calices usually <1mm diameter. First cycle septa are up to $\frac{3}{4}$R, the second cycle varies from $\frac{1}{3}$R to absent. There are two sorts of radial corallites on the branchlets; the first are incipient axial corallites, the second are tubular appressed or nariform. Corallites on main branches are mostly sub-immersed. They have primary septa up to $\frac{3}{4}$R, usually with conspicuous directives and a reduced or absent secondary cycle. Septa are usually unperforated and have blunt, regular dentations. Most elongate corallites occupying radial positions with respect to an axial corallite develop secondary radial corallites and may then become incipient axial corallites. The colony surface is thus dominated by these tubular corallites. The coenosteum is primarily composed of very fine costae ornamented with fine, regularly spaced spinules.

Living colonies have a very wide range of colours. Uniform cream, grey or pale blue are the most common.

Habitat preferences and skeletal variation

As noted by Wallace (1978), *A. granulosa* is seldom found in shallow water but is relatively common on lower reef slopes. Most of the variation illustrated can be found within a single biotope and thus does not appear to be environmentally controlled. This species seldom occurs in biotopes exposed to strong wave action or where the water is turbid.

Similar species

Acropora granulosa is very close to *A. loripes* (see p. 402) and also *A. caroliniana*. The latter has longer branches and larger, more exsert axial corallites. This distinction sometimes becomes arbitrary.

Distribution

Widely distributed in the tropical Indo-Pacific, west to La Réunion and east to Tahiti.

Figs. 1025, 1026 *Acropora granulosa* from Tijou Reef, collecting stations 156 and 155 (respectively) (× 20).

Fig. 1025▼

Fig. 1026▼

Acropora (Acropora) caroliniana Nemenzo, 1976

Synonymy

Acropora caroliniana Nemenzo, 1976.

Material studied

Tijou Reef (5 specimens), **Lizard Island, Britomart Reef** (8 specimens), **Redbill Reef, Fitzroy Reef** (3 specimens).

These localities include collecting stations 155, 156, 167, 169, 197.

Characters

Colonies are side-attached, thick plates up to 50cm diameter, composed of horizontal primary branches and proliferous oblique branchlets and incipient axial corallites. The upper surfaces of the proliferations are mostly devoid of radial corallites. Radial corallites on horizontal and oblique branches are appressed tubular to sub-immersed and crowded. On the proliferations, they are scattered appressed tubular. Primary septa are $<\frac{1}{4}$R, secondary cycle septa are absent or a few are just visible in sub-immersed corallites. Axial corallites of oblique branches are tapered or blunt-ended, 2.1-2.9mm diameter, with calices of 0.6-0.9mm diameter. Primary septa are $<\frac{3}{4}$R; secondary septa are absent or a few are just visible. The coenosteum both on and between radial corallites is a dense arrangement of elaborated spinules.

Living colonies are whitish-brown or pale blue.

Habitat preferences and growth form variation

This species has been recorded in high diversity *Acropora* assemblages, both on the reef front and on back reef coral knolls, mainly at depths of 10-20m. The present series shows little variety. In some specimens, the incipient branchlets are arched so that the calices of axial corallites are directed downwards.

Affinities

Radial and axial corallites and the coenosteum of *A. caroliniana* resemble those of *A. granulosa*, except that axial corallites are more exsert and arched. Branchlets are longer, giving *A. caroliniana* its characteristic growth form. It frequently occurs with *A. granulosa* and may be only arbitrarily distinguished from it.

Distribution

Recorded only from the Great Barrier Reef and the Philippines.

Figs. 1027, 1028 *Acropora caroliniana* (× 0.5)

Fig. 1027 From Fitzroy Island, collecting station 197, same corallum as Fig. 1029.

Fig. 1028 From Lizard Island, same corallum as Fig. 1030.

Fig. 1027▲

Fig. 1028▲

Figs. 1029-1032 *Acropora caroliniana* (× 5)
Fig. 1029 From Fitzroy Island, same corallum as Fig. 1027.
Fig. 1030 From Lizard Island, same corallum as Fig. 1028.
Figs. 1031, 1032 Same corallum from Britomart Reef, collecting station 167.

Fig. 1029▲

Fig. 1030▲

Fig. 1031▼

Fig. 1032▼

Fig 1033▲

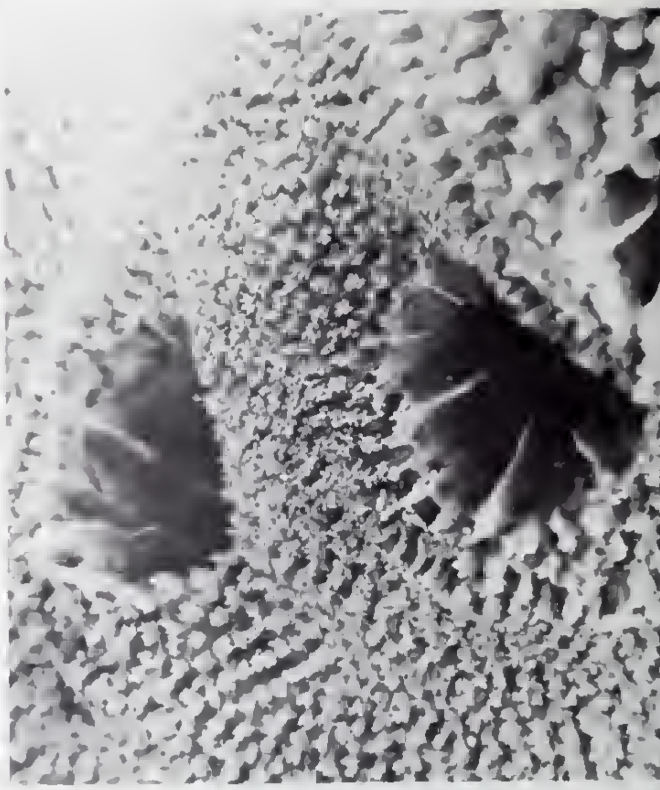


Fig. 1034▲

Figs. 1033, 1034 *Acropora caroliniana* (× 20)
Fig. 1033 From Rib Reef.
Fig. 1034 From Franklin Reef, collecting station 150.

Acropora (Acropora) willisae n.sp.

Material studied

Sir Charles Hardy Islands, Britomart Reef (6 specimens), **Fitzroy Reef.**
These localities include collecting stations 167, 168, 179, 190.

Characters

All coralla of the present series are corymbose plates, <40cm diameter, with short branchlets bearing proliferous incipient axial corallites. Radial corallites near branchlet tips are tubular appressed, with nariform openings < 1.4mm diameter. Septa are bilaterally symmetrically arranged, with one or two prominent directives, and the remaining first cycle $<\frac{1}{4}$R. Second cycle septa are mostly absent or consist of rows of fine spines. Radial corallites near the base of branchlets are immersed. Axial corallites are <5mm exsert, < 2.6mm diameter, with calice diameters of approximately 1mm. Septa are in two sub-equal cycles, $<\frac{1}{3}$R, or the second cycle is very reduced. All corallites are finely costate, the costae bearing fine spines. Costae may be linked with synapticulae, forming a fine lattice. The coenosteum between corallites is spongy, and bears fine spinules. It may be very coarse.

Living colonies are pale cream or brown in colour.

Habitat preferences and growth form variation

Acropora willisae is an uncommon species, but it occupies a wide range of environments, from lower reef slopes to lagoons. Most coralla of the present series from lower reef slopes closely resemble the holotype, while those from very shallow, protected biotopes have very compacted branchlets, with proliferous incipient axial corallites and a coarse coenosteum.

Figs. 1035-1037 *Acropora willisae* (× 0.5)
Fig. 1035 From Britomart Reef, collecting station 168, holotype, same corallum as Figs. 1038, 1041, 1042.
Figs. 1036, 1037 From Fitzroy Reef, collecting station 190; Fig. 1036, same corallum as Figs. 1039, 1043, 1044.

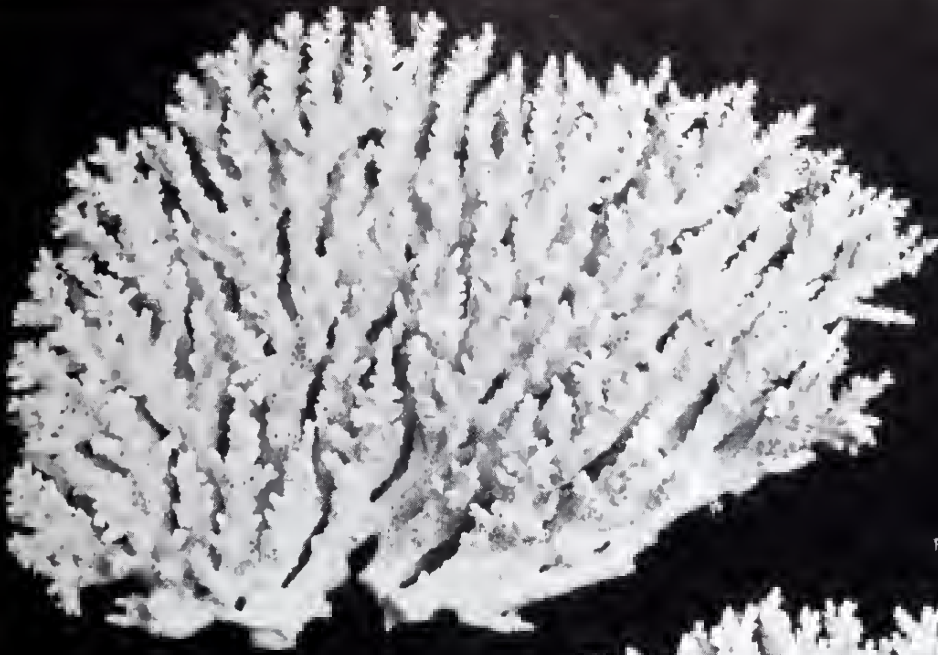
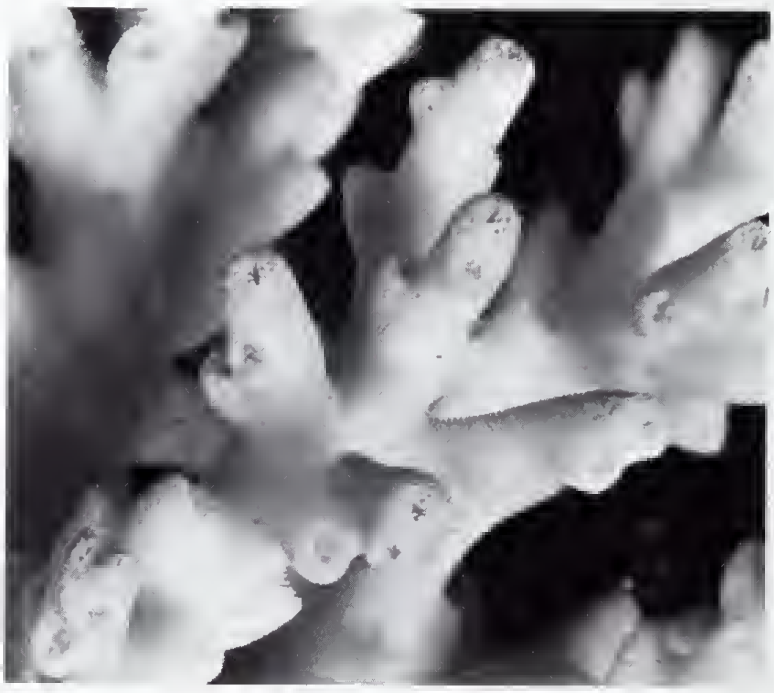


Fig. 1035▲

Fig. 1036▼

Fig. 1037▼

Fig. 1038▲ Fig 1040▼ Fig.



Figs. 1038–1040 *Acropora willisae* (× 5)
Fig. 1038 From Britomart Reef, holotype, same corallum as Figs. 1035, 1041, 1042.
Fig. 1039 From Fitzroy Reef, same corallum as Figs. 1036, 1043, 1044.
Fig. 1040 From Britomart Reef.

Similar species

Acropora willisae clearly belongs with the *A. loripes* group. The proliferous, tubular, incipient axial corallites resemble those of *A. loripes*, *A. granulosa* and *A. chesterfieldensis*. However, they do not have thick walls as do those of *A. loripes* and are not exsert as are those of *A. granulosa*. Although *A. granulosa* has essentially similar corallites, these species are readily distinguished by their differing growth forms, which are corymbose to caespito-corymbose in *A. granulosa*.

Fig. 1041▲

Fig. 1044▼

Fig. 1042▲

Fig. 1043▼

Figs. 1041-1044 *Acropora willisae* (× 20)

Figs. 1041, 1042 Same corallum from Britomart Reef and same corallum as Figs. 1035, 1038, holotype.

Figs. 1043, 1044 Same corallum from Fitzroy Reef and same corallum as Figs. 1036, 1039.

Etymology

Named after Bette Willis, in recognition of her assistance in field work for *Scleractinia of Eastern Australia.*

Holotype (Fig. 1035)

Dimensions: A flat plate 25.2 × 17.3cm

Locality: Britomart Reef

Depth: 15m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Great Barrier Reef.

The *Acropora florida* group

The two distinct species of this group are associated because of their similar colony shapes and branching patterns (with short, evenly sized and spaced secondary branchlets), as well as similarities in the size and shape of their radial corallites. Both species occur in a wide variety of habitats and are frequently found together.

Acropora (Acropora) florida (Dana, 1846)

Synonymy

Madrepora florida Dana, 1846; not Brook (1893).

Madrepora gravida Dana, 1846; Brook (1893).

Madrepora compressa Bassett-Smith 1890; Brook (1893).

Madrepora ornata Brook, 1891.

Madrepora affinis Brook, 1893.

Acropora affinis (Brook); Crossland (1952); Nemenzo (1967); Zou (1975).

Acropora gravida (Dana); Nemenzo (1967); Scheer & Pillai (1974).

Acropora florida (Dana); Wallace (1978).

The type localities of both nominal species of Brook are east Australian, that of *A. florida* is Fiji, while that of *A. gravida* is unrecorded.

Material studied

Bramble Cay, Sue Island, Raine Island, Great Detached Reef, Sir Charles Hardy Islands (2 specimens), **Martha Ridgeway Reef, Wye Reef, Cat Reef, Tijou Reef, Howick Island** (2 specimens), **Houghton Island** (3 specimens), **Yonge Reef, Lizard Island, Plug Reef, Low Isles** (3 specimens), **Britomart Reef** (2 specimens), **Palm Islands** (13 specimens), **Keeper Reef, Gould Reef, Table Top Reef** (2 specimens), **Fitzroy Reef, Lady Musgrave Reef.**

These localities include collecting stations 1, 9, 16, 17, 34, 37, 55, 60, 64, 89, 128, 148, 151, 159, 160, 163, 167, 175, 179, 190, 195, 200.

Characters

Colonies are hispidose, with anastomosing main branches. Main branches may be up to 25cm thick and are covered with short, secondary branchlets. Branchlets are usually equally distributed on vertical branches and shorter to suppressed on the undersurface of oblique and horizontal branches.

Radial corallites on branch tips and branchlets are 'evenly sized and distributed, appressed tubular with round opening, with walls which may flare slightly. Septation:

Figs. 1045-1047 *Acropora florida* (× 0.5)

Fig. 1045 From between Orpheus and Fantome Islands, Palm Islands, collecting station 60, same corallum as Figs. 1048, 1049, 1053.

Fig. 1046 From Yonge Reef, collecting station 9, same corallum as Figs. 1050, 1054.

Fig. 1047 From Gould Reef, same corallum as Figs. 1051, 1055.

Fig. 1045▲

Fig. 1046▲

Fig. 1047▼

primary septa present, up to $\frac{1}{2}$R, some to all secondaries present, up to $\frac{1}{4}$R' (Wallace, 1978). On main branches between branchlets, radial corallites are sub-immersed to immersed. Axial corallites are 2.0-3.0mm diameter, with calices 0.8-1.4mm diameter. 'Septation: primary septa present, up to $\frac{2}{3}$R; secondary septa usually all developed, or at least 3 present, up to $\frac{1}{2}$R' (Wallace, 1978).

The coenosteum on radial corallites is costate, or broken costate. Between corallites, the coenosteum is broken costate or reticulate, with scattered, slightly elaborated spinules.

Living colonies are usually pinkish-brown or yellow-brown, occasionally green.

Figs. 1048-1051 *Acropora florida* (× 5)

Figs. 1048, 1049 Same corallum from between Orpheus and Fantome Islands, Palm Islands, same corallum as Figs. 1045, 1053.

Fig. 1050 From Yonge Reef, same corallum as Figs. 1046, 1054.

Fig. 1051 From Gould Reef, same corallum as Figs. 1047, 1055.

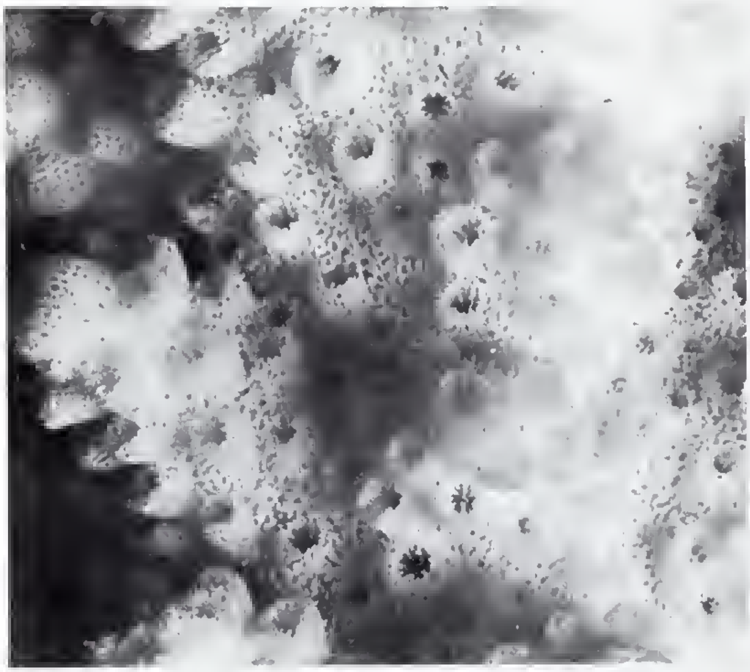


Fig. 1048▲

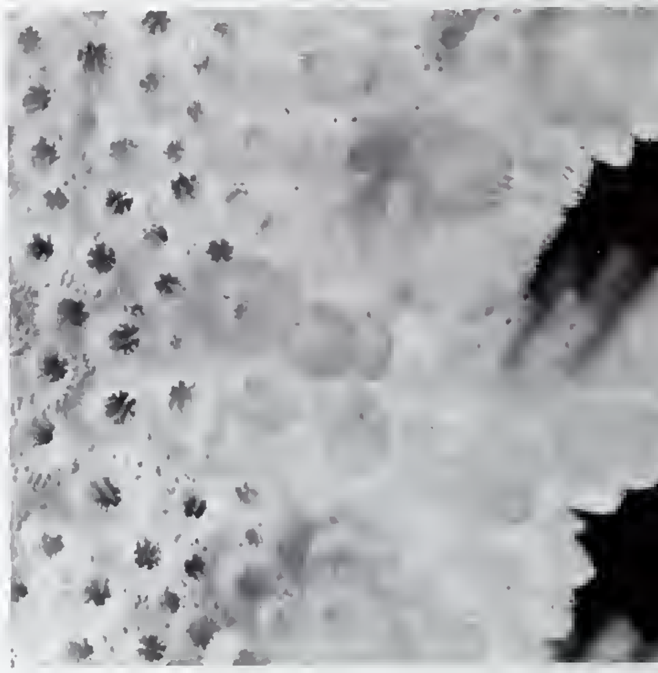
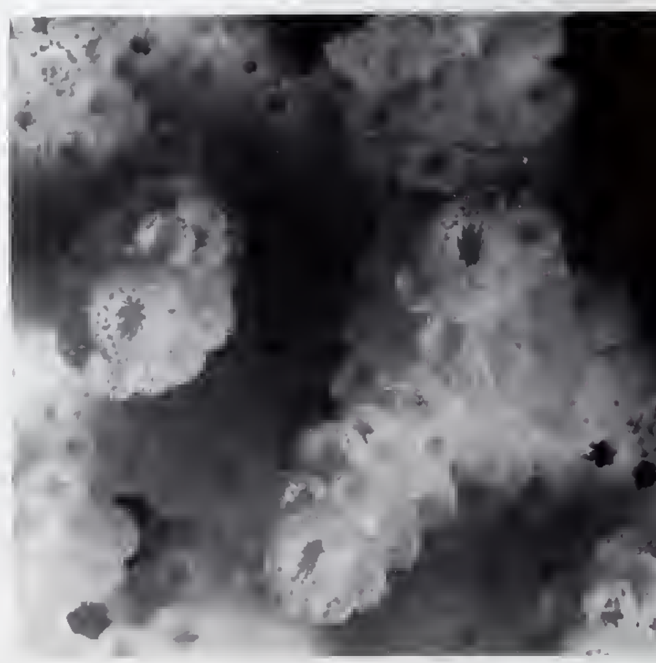


Fig. 1049▲

Fig. 1050▼



F

Habitat preferences and growth form variation

Acropora florida may occur in any assemblage where *Acropora* predominates. Colonies on protected fringing reefs or reef back margins may attain a very great size, with thick

Figs. 1052-1055 *Acropora florida* (× 20)

Fig. 1052 From Orpheus Island, Palm Islands.

Fig. 1053 From between Orpheus and Fantome Islands, Palm Islands, same corallum as Figs. 1045, 1048, 1049.

Fig. 1054 From Yonge Reef, same corallum as Figs. 1046, 1050.

Fig. 1055 From Gould Reef, same corallum as Figs. 1047, 1051.

Fig. 1052▲

Fig. 1053▲

Fig. 1054▼

Fig. 1055▼

branches, circular in transverse section. Colonies on exposed reef fronts have smaller, frequently flattened branches and relatively prominent branchlets.

Similar species

Acropora florida is closest to *A. sarmentosa* (see p. 423). Otherwise, it does not resemble any other species.

Distribution

Widely distributed in the tropical Indo-Pacific, west to the Maldive Islands and east to the Marshall Islands.

Acropora (Acropora) sarmentosa (Brook, 1892)

Synonymy

Madrepora sarmentosa Brook, 1892; Brook (1893).

Acropora sarmentosa (Brook); Nemenzo (1967); Wallace (1978); not Vaughan (1918).

Acropora rosaria (Dana); Crossland (1952, *pars*).

Acropora vermiculata Nemenzo, 1967.

Brook (1893, p. 128) divided his *A. sarmentosa* into two varieties, both of which are the present species, with their type localities on the Great Barrier Reef. Crossland's (1952) '*A. rosaria* form 1' is *A. sarmentosa.*

Acropora sarmentosa and *A. florida* both have characters in common with *A. mirabilis* Quelch (1886). Quelch (p. 147) noted that his single specimen (from Banda, BMNH 1885-2-1-4) possessed two characters not previously recorded in *Acropora*: exsert directive septa and the presence of a third septal cycle. Both characters have since been observed by Brook (1893) and in the present study in other *Acropora* species, but they serve to distinguish *A. mirabilis* from both *A. sarmentosa* and *A. florida.*

Material studied

Little Mary Reef, Turtle Islands, Bushy Islet, Great Detached Reef (3 specimens), **Bird Island, Sir Charles Hardy Islands** (7 specimens), **Martha Ridgeway Reef** (4 specimens), **Wye Reef** (2 specimens), **Cat Reef, Franklin Reef, Tijou Reef** (2 specimens), **Corbett Reef, Bewick Island, Lizard Island** (2 specimens), **Low Isles, Magdelaine Cay** (4 specimens), **Flinders Reef (Coral Sea)** (7 specimens), **Britomart Reef** (24 specimens), **Palm Islands** (10 specimens), **Lodestone Reef, Chesterfield Reefs** (4 specimens), **Fitzroy Reef** (16 specimens), **Lady Musgrave Reef** (2 specimens), **Flinders Reef (Moreton Bay)** (8 specimens), **Elizabeth Reef** (2 specimens).

These localities include collecting stations 1, 6, 8, 18, 37, 42, 45, 55, 60, 100, 148, 149, 153, 159, 161, 163, 164, 165, 167, 168, 179, 185, 190, 191, 193, 194, 197, 200, 212, 216, 226, 227, 229, 238.

Characters

Colonies are composed of flattened, side-attached branches, with hispidose to corymbose branching, sometimes divided into plate-like units up to 30cm diameter. Branchlets are 5-10mm diameter and have short tubular appressed radial corallites, 2.6-3.6mm diameter, with round calices 2.1-2.8mm diameter. The walls of radial corallites are rounded and thickened or thin and slightly flaring. Septa are in two cycles, the first up to $\frac{2}{3}$R, the second, usually incomplete $<\frac{1}{4}$R. Axial corallites are 3.0-4.0mm diameter, with calices 1.0-2.0mm diameter. Septa are in two cycles, the first $<\frac{3}{4}$R, the second $<\frac{1}{2}$R, usually incomplete. The coenosteum consists of 'spines which may be laterally flattened or

Figs. 1056, 1057 *Acropora sarmentosa* (× 0.5)
Fig. 1056 From Wye Reef collecting station 163, same corallum as Fig. 1058.
Fig. 1057 From Orpheus Island, Palm Islands, collecting station 91, same corallum as Fig. 1059.

Fig. 1056▼

Fig. 1057▼

slightly elaborated are arranged evenly both on radials and between: sometimes radial walls are costate' (Wallace, 1978).

Living colonies are usually a dull greenish-grey or brown, with pale brown or pink tips to branchlets.

Habitat preferences and growth form variation

There is little skeletal variation in *A. sarmentosa*, although it occupies most reef associations where *Acropora* predominate. It is common on shallow, exposed, upper reef

Figs. 1058-1061 *Acropora sarmentosa* (× 5)

Fig. 1058 From Wye Reef, same corallum as Fig. 1056.
Fig. 1059 From Orpheus Island, Palm Islands, same corallum as Fig. 1057.
Fig. 1060 From Flinders Reef (Moreton Bay).
Fig. 1061 From Fitzroy Reef, collecting station 191.

Fig. 1058▲

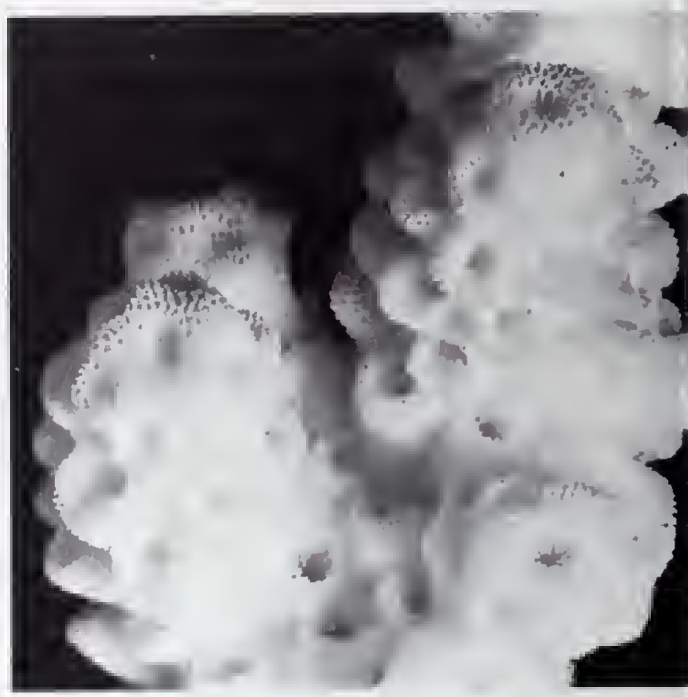


Fig. 1059▲

Fig. 1060▼

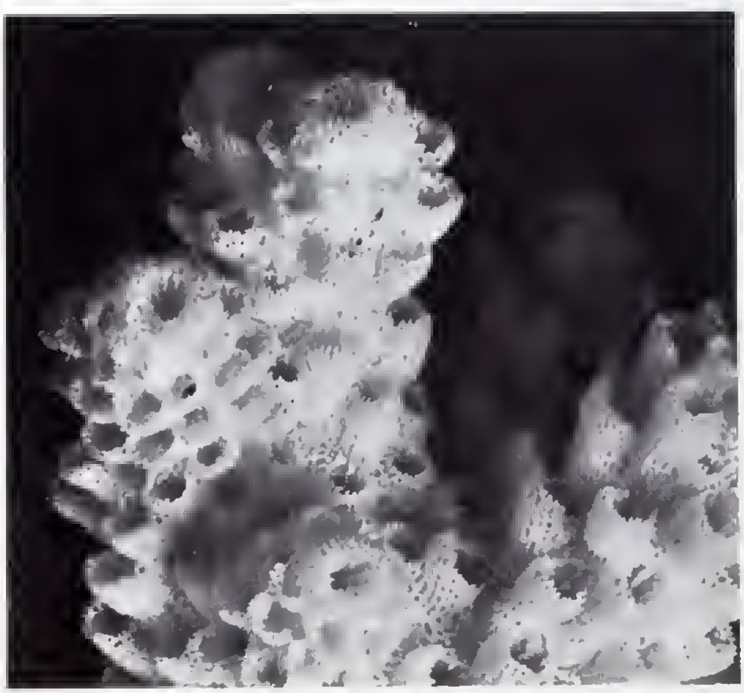
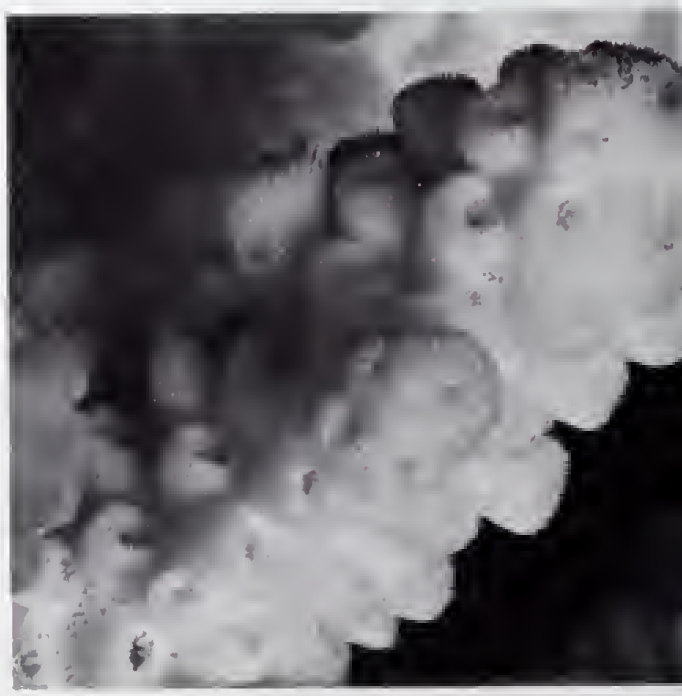


Fig.



slopes, where colonies consist of thick horizontal branches with short branchlets. With increasing depth, radial corallites become more scattered and thinner walled.

Affinities

As previously noted, *A. sarmentosa* shows similarities with *A. florida*, and sometimes the two may have the same colouration, but is readily distinguished by its characteristic growth form and the large and more rounded axial corallites.

Distribution

Recorded from the Philippines, the Great Barrier Reef and Fiji.

Figs. 1062, 1063 Same corallum of *Acropora* sp. 6 from Rib Reef (× 0.5 and 5 respectively).

Fig. 1062▼

1063▼

Acropora (Acropora) sp. 6

Material studied

Britomart Reef, Rib Reef.

These localities include collecting station 167.

Characters

The two coralla of this species in the present collection are both arborescent, composed of sturdy, upright branches with proliferous sub-branches. Radial corallites are immersed to 2.5mm exsert, the latter being tubular, with rounded calices 0.9-1.1mm diameter. Septa are irregular in size and shape, in two cycles up to $\frac{3}{4}$R and $\frac{1}{4}$R, the secondary cycle incomplete to absent. One or both directive septa are usually distinctive. Incipient axial corallites are proliferous. Axial corallites are $<$4.6mm diameter, with calices 1.5mm diameter. Septa are plate-like, sub-equal to $\frac{1}{2}$R and $\frac{1}{4}$R. Corallites are costate, separated by coarse coenosteum.

Affinities

In overall appearance, *Acropora* sp. 6 has some resemblance to *A. lutkeni*. Fine structures suggest affinities with *A. florida* and *A. sarmentosa*.

GENUS *ASTREOPORA* DE BLAINVILLE, 1830

Type species

Astraea myriophthalma Lamarck, 1816 (genolectotype, Edwards & Haime, 1850).

Characters of the genus

'Massive or subramose, no axial corallites. Coenosteum reticular, formed by outwardly inclined trabeculae, with spinose surface. Corallite walls solid' (Wells, 1956).

History

Bernard (1896) gives a full historical account of *Astreopora*, based on a re-appraisal of all type specimens of earlier authors. He noted (p. 76) that *Astreopora* 'calls for little introductory comment', but that *Astreopora* 'very naturally follows the two genera *Madrepora* [i.e. *Acropora*] and *Turbinaria* . . . as the three form a well-demarcated group'. He thus continued the association of *Astreopora* with *Turbinaria*, which caused confusion of two species of *Turbinaria* (*T. stellulata* and *T. fungiformis*) with *Astreopora* by early authors.

Bernard (1896) synonymised Lamarck's *A. myriophthalma* and *A. pulvinaria* and accepted Verrill's (1873) *A. profunda* and *A. expansa* Brüggemann, 1877b. To these four species, he added ten more, as listed below. However, as with all the genera Bernard revised, his treatment of *Astreopora* is more a catalogue of described specimens than a systematic description of species.

Yabe and Sugiyama (1941), Wells (1954) and Lamberts (1982) have each made re-evaluations of *Astreopora* species based on field study and examination of available type specimens. Lambert's study remains the only revision of the genus without geographic restriction.

Nominal species

There are five pre-Bernard nominal species. Three are of Lamarck from unknown localities: *A. myriophthalma*, *A. punctifera* and *A. pulvinaria*. One is from Verrill, *A. profunda* from Fiji (YPM 4245) (a new name for Dana's *A. pulvinaria*). (Verrill also labelled type specimen YPM 5691 *A. echinata* (from East Indies) and type specimens YPM 5689 (from Mauritius) and YPM 5690 (from an unknown locality) *A. scabra*, but appears not to have described them.) The fifth species is *A. expansa* Brüggemann (BMNH 1858-12-17-6) from an unknown locality.

Bernard, 1896 described ten new species from collections in the British Museum: *A. horizontalis* (BMNH 1882-10-17-163) from the Seychelles Islands, *A. incrustans* (BMNH 1893-7-1-18) from an unknown locality, *A. arenaria* (BMNH 1849-9-28-5) from the Red Sea, *A. ehrenbergi* (BMNH 1886-10-5-33) from the Red Sea, *A. listeri* (BMNH 1891-3-6-20) from Tonga, *A. gracilis* (BMNH 1884-11-22-32) from the Solomon Islands, *A. hirsuta* (BMNH 1892-12-1-157) from the Great Barrier Reef, *A. ocellata* (BMNH 1892-12-1-150) from the Great Barrier Reef, *A. ovalis* (BMNH 1843-3-6-121) from an unknown locality and *A. kenti* (BMNH 1895-7-22-1) from Western Australia.

Since Bernard, there have been nine additional species described from the tropical western Pacific. Five are from the Marshall Islands: *A. tabulata* Gardiner, 1898 (also from Fiji), *A. elliptica* and *A. tayami* Yabe & Sugiyama, 1941, *A. suggesta* and *A. tabulata* Wells, 1954 (the latter being pre-occupied). (Ma (1959) also lists *A. pokakuensis* Yabe & Sugiyama from the Marshall Islands, but this appears to be undescribed.) Three species of Lamberts' are from west of the Marshall Islands: *A. cucullata* Lamberts, 1980 from Samoa, *A. randalli* Lamberts, 1980 from Guam and *A. scabra* Lamberts, 1982 also from Guam. The ninth species, *A. stellae* Nemenzo, 1964, is from the Philippines.

East Australian Astreopora

Four species are listed by Bernard from the Great Barrier Reef; *A. punctifera* and *A. profunda* of Lamarck and his new species; *A. hirsuta* and *A. ocellata*. Vaughan (1918) records only two species, *A. ocellata* and *A. myriophthalma* and Crossland (1952) and Stephenson and Wells (1955) recorded only one, *A. myriophthalma*.

In the course of the present study, very few reefs have been found when *Astreopora* is abundant. Where it is abundant (on the Great Barrier Reef), *A. myriophthalma* is always the dominant and usually the only species present. No single biotope has been found where more than two species could be separated *in situ*. *Astreopora* is more abundant in the Coral Sea allowing several collections to be made where two species could be distinguished *in situ*.

Astreopora myriophthalma (Lamarck, 1816)

Synonymy

Astraea myriophthalma Lamarck, 1816.

Astraea pulvinaria Lamarck, 1816.

Astreopora myriophthalma (Lamarck); Edwards & Haime (1860); Klunzinger (1879); Bernard (1896); Vaughan (1918); Matthai (1923), Umbgrove (1940); Yabe & Sugiyama (1941); Wells (1950, 1954); Crossland (1952); Stephenson & Wells (1955), Searle (1956); Nemenzo (1964).

Astreopora profunda Verrill, 1873; Bernard (1896); Hoffmeister (1925); Yabe & Sugiyama (1941).

?*Astreopora incrustans* Bernard, 1896.

Astreopora arenaria Bernard, 1896.

Astreopora ehrenbergi Bernard, 1896.

?*Astreopora ovalis* Bernard, 1896.

?*Astreopora kenti* Bernard, 1896.

Astreopora elliptica Yabe & Sugiyama, 1941.

Astreopora stellae Nemenzo, 1964.

Lamarck's type of *A. myriophthalma*, figured by Lamberts (1982) is beach worn, but its identity seems well established. Three type specimens of Lamarck's *A. pulvinaria* differ

Fig. 1064 *Astreopora myriophthalma* from the Murray Islands, collecting station 135, same corallum as Fig. 1065 (× 0.5).

Fig 1064▼

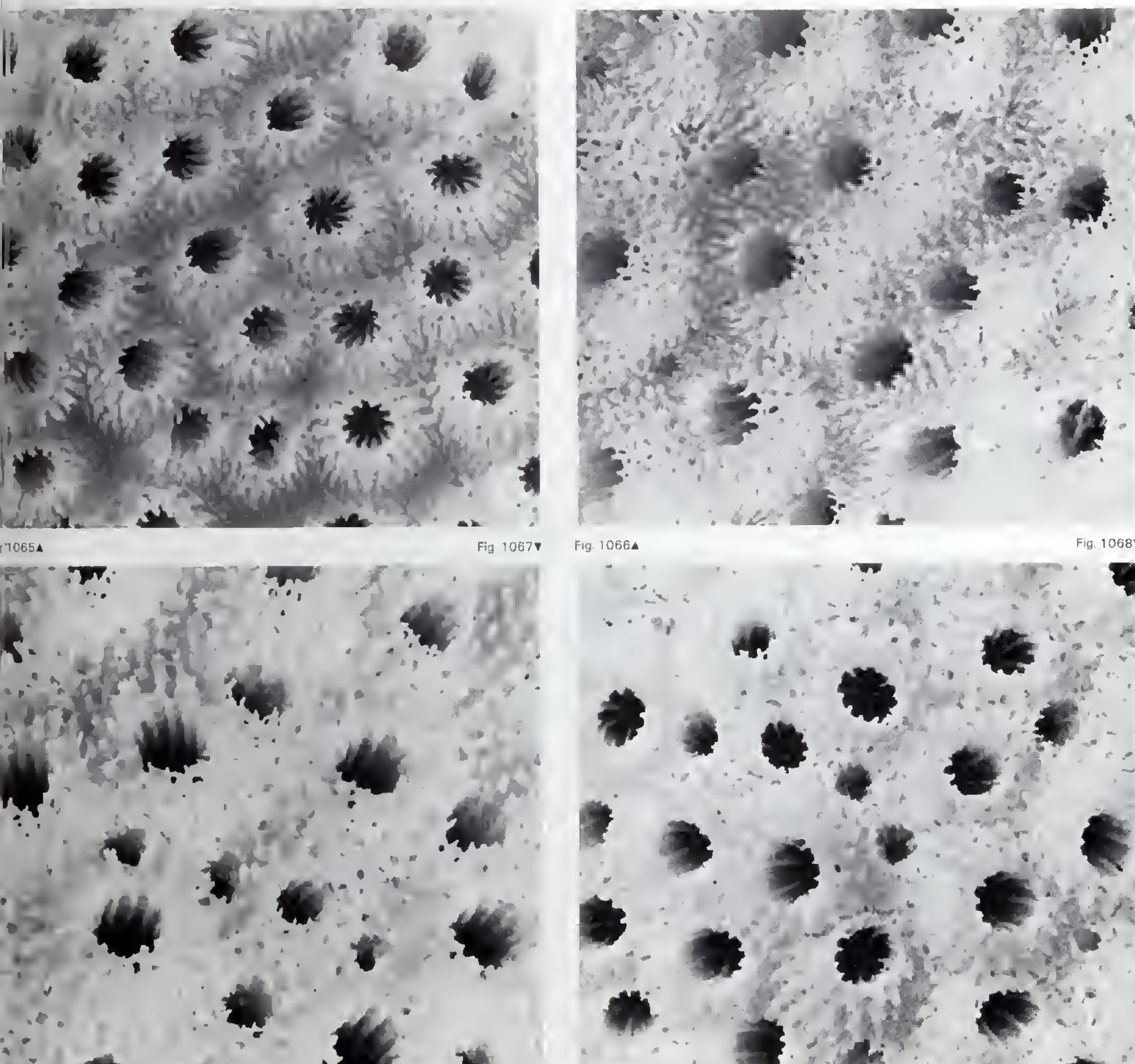
substantially from each other, but all may be thc present species, as recognised by Lamarck and subsequent authors.

Two specimens in the present series correspond closely with Yabe & Sugiyama's description of *A. elliptica* from the Marshall Islands, and Wells (1954) also concluded that *A. elliptica* and *A. myriophthalma* are synonyms, while Lamberts (in press) separates them.

Astreopora incrustans Bernard is the name previously attributed to *A. moretonensis* by Wells (1955) and probably by Yabe & Sugiyama (1941) (see p. 435). Bernard's type

Figs. 1065-1068 *Astreopora myriophthalma* (× 5)

Fig. 1065 From the Murray Islands, same corallum as Fig. 1064.
Fig. 1066 From the Murray Islands, collecting station 27.
Fig. 1067 From the Swain Reefs, collecting station 69.
Fig. 1068 From Great Detached Reef, collecting station 5.



(BMNH 1893-7-1-18), however, is from an unknown locality and appears to be *A. myriophthalma* from turbid water.

Type specimens of *A. arenaria* and *A. ehrenbergi*, both from the Red Sea, differ slightly from any coralla of the present series and *A. arenaria* closely resembles *A. incrustans*. Their inclusion in the present synonymy follows Lamberts (in press).

Type specimens of *A. kenti* from Western Australia and *A. ovalis* from an unknown locality are very similar to each other; the latter is slightly less calcified and has more uniform corallites. They can only provisionally be attributed to *A. myriophthalma*.

Several specimens of the present series closely correspond to *A. elliptica* and these intergrade with *A. myriophthalma* without elliptical corallites collected from the same biotope. Lamberts (in press) considers these species to be distinct.

Material studied

Big Mary Reef (4 specimens), **Murray Islands, Raine Island** (3 specimens), **Great Detached Reef** (6 specimens), **Martha Ridgeway Reef, Tijou Reef, Houghton Island** (3 specimens), **Lizard Island, Eyrie Reef, Willis Islet** (2 specimens), **Magdelaine Cay** (4 specimens), **Lihou Reefs** (3 specimens), **Mellish Reef** (16 specimens), **Flinders Reef (Coral Sea), Britomart Reef** (2 specimens), **Davis Reef, Palm Islands** (13 specimens), **Marion Reef** (34 specimens), **Chesterfield Reefs** (16 specimens), **Pompey Reef, Bushy Island-Redbill Reef, Swain Reef** (5 specimens), **Fitzroy Reef, Llewellyn Reef** (2 specimens).

These localities include collecting stations 1, 5, 8, 16, 19, 27, 34, 37, 41, 45, 58, 60, 69, 75, 76, 79, 81, 112, 151, 154, 167, 187, 191, 192, 199, 200, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 215, 216, 226.

Previous records from eastern Australia

Murray Islands, Vaughan (1918); Ribbon Reef, Crossland (1952); Low Isles, Stephenson & Wells (1955).

Characters

Colonies are massive, either hemispherical or flattened, usually with an even surface. Unattached spherical coralliths of *A. myriophthalma* are also found on coarse rubble. Corallites are evenly spaced and slightly conical in shape. Calices are usually round, rarely elliptical, 1.8-2.8mm diameter. These corallites are often interspersed (and intergrade) with smaller, immersed corallites and in some coralla the latter may be the more numerous. Primary septa reach $\frac{3}{4}$R deep within the corallite and usually have smooth margins. Occasionally, they develop dentations which may fuse at the corallite axis. Secondary septa are short and tertiary septa are not developed. The coenosteum is covered with short spinules with elaborated tips. Spinules on the corallites may be aligned down the trabeculae, giving a slightly costate appearance. Corallite rims are usually surrounded by projecting spinules corresponding with the trabeculae.

Living colonies are cream, brown or yellow and may be mottled.

Habitat preferences and skeletal variation

Astreopora myriophthalma is by far the most common *Astreopora* on the Great Barrier Reef; it is found in most reef biotopes but is seldom very abundant. Coralla from upper reef slopes are heavily calcified, usually have corallites of varying sizes and these often have a costate appearance. Coralla from lower reef slopes have more uniform corallites and a coenosteum that becomes progressively more spongy or flaky and less spinulate with increasing depth.

Affinities

Astreopora myriophthalma is distinguished from *A.* sp. 1 in having a massive, rather than plate-like, growth form and the latter is usually distinguished by the costate appearance of its corallites. Distinctions between *A. myriophthalma* and *A. listeri* are noted below (p. 432).

Distribution

Widely distributed in the tropical Indo-Pacific, from the Red Sea to the south Pacific islands.

Astreopora sp. 1

Material studied

Turtle Islands, Houghton Island, Mellish Reef (16 specimens), **Myrmidon Reef, Palm Islands, Chesterfield Reefs** (2 specimens), **Wistari Reef.**

These localities include collecting stations 16, 59, 165, 208, 209, 216, 221.

Characters

Colonies are encrusting, rarely submassive, commonly forming flat plates with some development of an epitheca, but not forming rootlets. Corallites are evenly spaced and are conical, 2mm exsert, with bases < 5mm diameter. Calices are circular, 1.2-2.0mm diameter. Septa are in two cycles, sub-equal, approximately $\frac{1}{4}$R near the corallite rim, with primary septa reaching $\frac{2}{3}$R deep within the corallite or, rarely, fusing. The coenosteum between corallites is coarse, spongy and covered with spinules with elaborated tips. Corallite walls are usually costate, with spinules aligned in 12 distinct rows.

Affinities

This species is primarily characterised by its flattened growth form, regular arrangement of corallites, generally weakly-developed primary septa and costate corallite walls. This combination of characters does not appear to correspond with any described species, but this remains to be verified before the species is named. It most closely resembles *A. listeri* Bernard of Wells (1954), except that primary septa are less well developed. Distinctions from *A. myriophthalma* are noted above (p. 428).

Distribution

Known only from eastern Australia.

Fig. 1069 *Astropora* sp. 1 from Mellish Reef, collecting station 208, same corallum as Fig. 1070 (× 0.5).

Fig. 1069▼

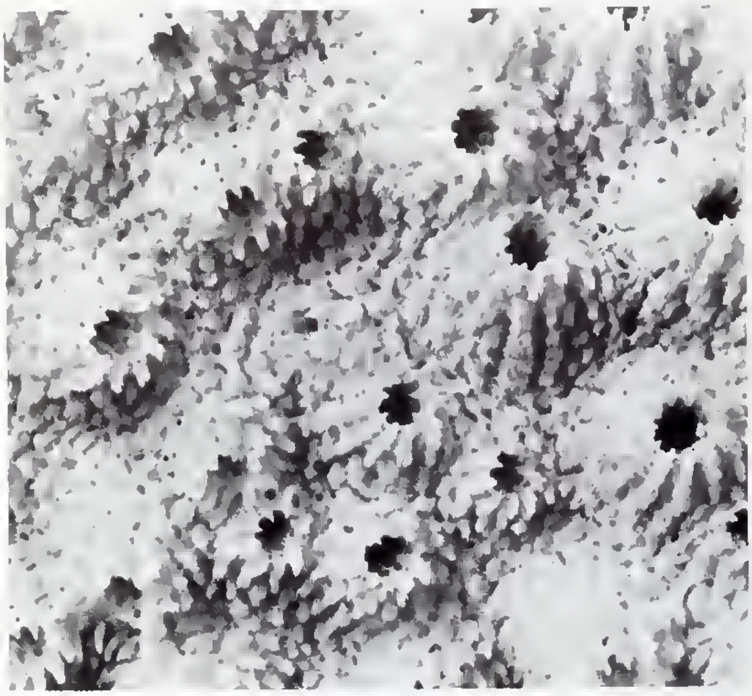
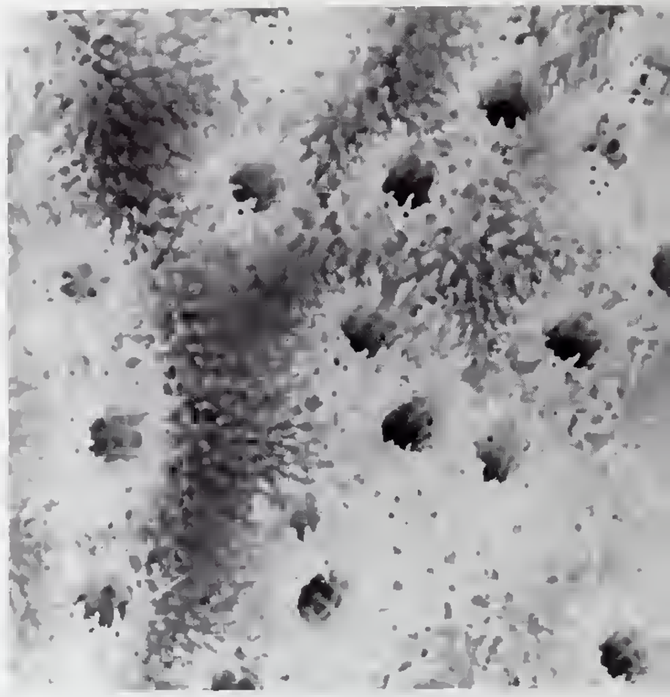


Fig. 1070▲



Figs. 1070, 1071 *Astreopora* sp. 1 (× 5)

Fig. 1070 From Mellish Reef, same corallum as Fig. 1069.

Fig. 1071 From the Turtle Islands, collecting station 165.

Astreopora listeri Bernard, 1896

Synonymy

Astreopora listeri Bernard, 1896; Wells (1954), Scheer & Pillai (1974).

Astreopora hirsuta Bernard, 1896.

?*Astreopora horizontalis* Bernard, 1896.

Type specimens of *A. listeri* from Tonga (BMNH 1891-3-6-20) and *A. hirsuta* from the Great Barrier Reef (BMNH 1892-12-1-157) are very similar. Bernard (p. 91) notes a

Fig. 1072 *Astreopora listeri* from the Palm Islands, same corallum as Fig. 1073 (× 0.5).

Fig. 1072▼

similarity between his *A. listeri* and Lamarck's *A. pulvinaria*, an observation not supported by the present study (see p. 426).

Astreopora horizontalis from the Seychelles Islands (BMNH 1882-10-17-163) has small corallites (calices average 1.8mm diameter) and a hirsute coenosteum. It corresponds closely with several coralla in the present series and is a turbid water ecomorph, probably of *A. listeri*, but possibly of *A. myriophthalma*.

Figs. 1073-1076 *Astreopora listeri* (× 5)

Fig. 1073 From the Palm Islands, same corallum as Fig. 1072.
Fig. 1074 From Britomart Reef, collecting station 167.
Fig. 1075 From Myrmidon Reef, collecting station 221.
Fig. 1076 From Magdelaine Cay, collecting station 200.

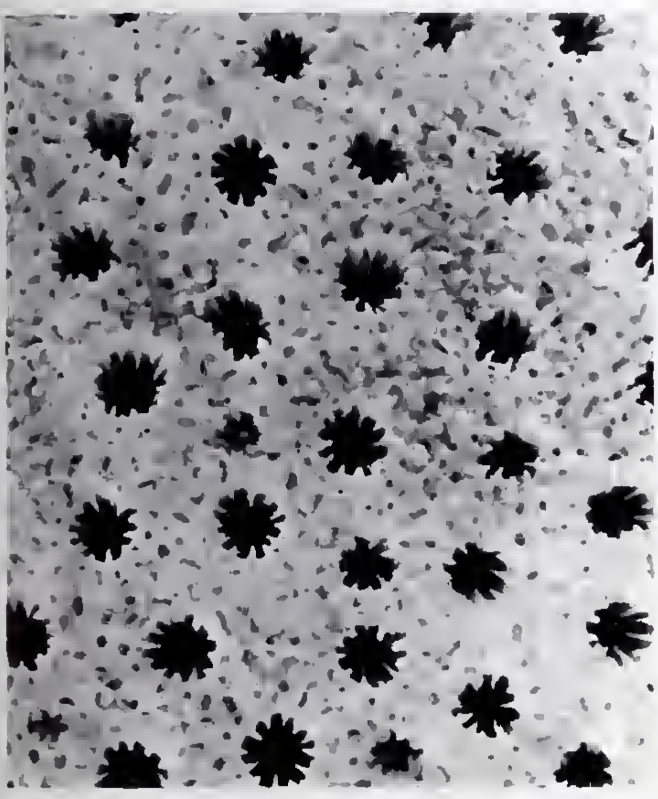
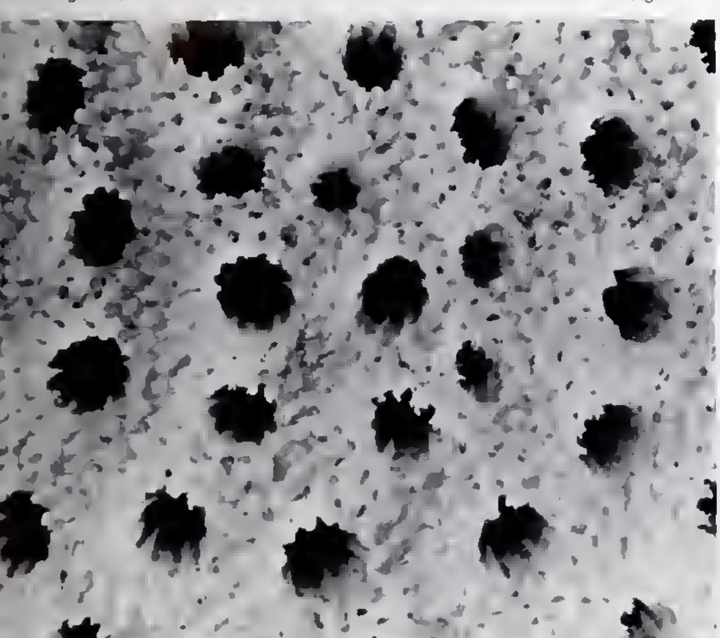


Fig. 1073▲

Fig 1075▼



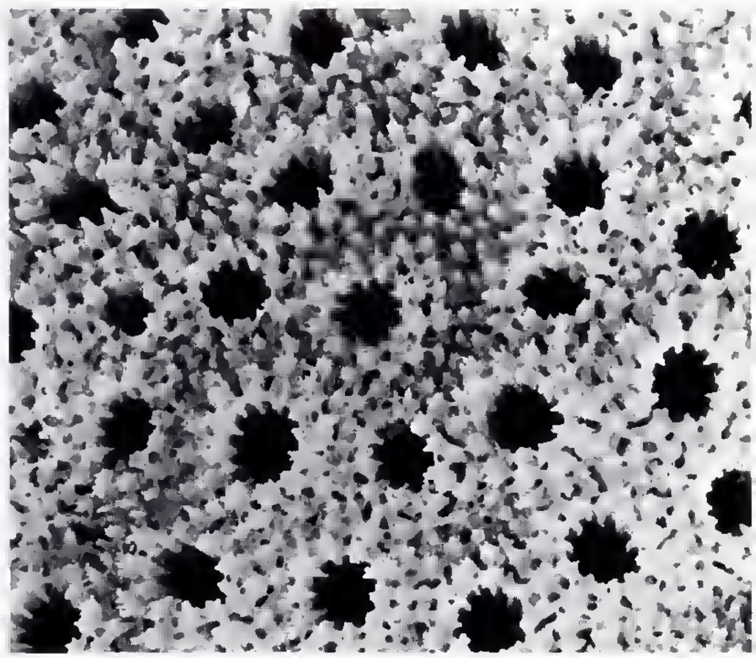
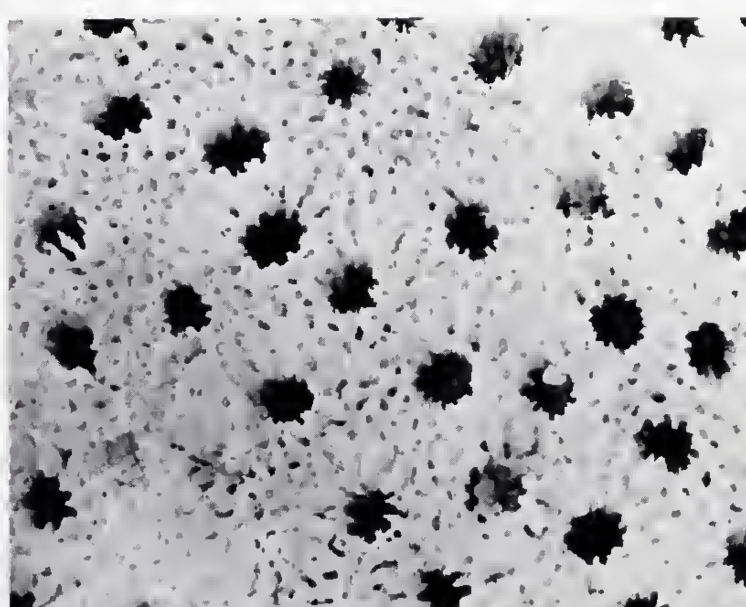


Fig. 1074▲

Fig. 1076▼



Material studied

Big Mary Reef, Murray Islands, Tijou Reef (2 specimens), **Corbett Reef** (2 specimens), **Jewell Reef, Houghton Island** (2 specimens), **Magdelaine Cay, Mellish Reef** (2 specimens), **Britomart Reef** (2 specimens), **Myrmidon Reef** (4 specimens), **Palm Islands** (4 specimens), **Marion Reef** (2 specimens), **Chesterfield Reefs** (4 specimens), **Pompey Reef, Bushy Island-Redbill Reef** (4 specimens), **Swain Reefs, Flinders Reef (Moreton Bay), Middleton Reef** (2 specimens), **Elizabeth Reef.**

These localities include collecting stations 8, 16, 27, 38, 40, 45, 68, 72, 80, 93, 112, 164, 168, 187, 200, 205, 206, 208, 216, 220, 221, 227, 233, 240.

Previous records from eastern Australia

Not previously recorded.

Characters

Colonies are massive, either hemispherical or flattened. Corallites are immersed, evenly spaced, crowded, with circular calices 1.8-2.3mm diameter. The rim of calices is composed of spinules with elaborated tips, which are higher than the coenosteum spinules and are the ends of the corallite trabeculae. Primary septa are well developed and taper from the calice rim to $\frac{3}{4}$R deep within the corallite, where some may fuse. They usually have straight margins but elongate dentations may be developed. Secondary septa remain $<\frac{1}{3}$R and in some coralla, a few third cycle septa may occur. The coenosteum is coarse, with an even cover of thick spinules with elaborated tips, giving a hirsute appearance recognisable *in situ.*

Habitat preferences and skeletal variation

Astreopora listeri is frequently found in intertidal pools, where coralla are usually composed of concentric overgrowths, sometimes forming 'micro-atolls'. Corallites are crowded and all skeletal structures are fine, with septa very well developed. In biotopes characterised by strong wave action, coenostial spinules are particularly well developed, giving coralla a hirsute appearance. Corallites are relatively small in coralla from lower reef slopes and have relatively poorly developed septa and coenostial spinules.

Affinities

Astreopora listeri has the same growth form and similar corallite sizes as *A. myriophthalma*, but is readily distinguished from *A. myriophthalma* in having immersed corallites and a coenosteum covered with closely compacted spinules, giving an hirsute appearance.

Distribution

Widely distributed in the tropical Indo-Pacific, from the Nicobar to the Marshall Islands.

Astreopora gracilis Bernard, 1896

Synonymy

Astreopora gracilis Bernard, 1896; Yabe & Sugiyama (1941); ?Wells (1954).

Astreopora tabulata Gardiner, 1898.

Astreopora tayami Yabe & Sugiyama (1941) may also be a synonym of *A. gracilis*, as it has irregular corallites, but the holotype has not been re-examined.

Fig. 1077 *Astreopora gracilis* from Houghton Island, collecting station 16, same corallum as Fig. 1078 (× 1.0).

Fig. 1077▲

Material studied

Big Mary Reef, Turtle Islands, Tijou Reef (2 specimens), **Houghton Island, Mellish Reef, Flinders Reef (Coral Sea), Palm Islands** (2 specimens), **Marion Reef, Chesterfield Reefs** (2 specimens), **Lady Musgrave Reef.**

These localities include collecting stations 8, 16, 45, 57, 165, 187, 194, 205, 208, 210, 216, 226.

Previous records from eastern Australia

Not previously recorded.

Characters

As noted below, coralla in the present series attributed to this species make a small heterogeneous group which intergrades with *A. myriophthalma.* All are sub-massive specimens, primarily characterised by their irregular corallites and smooth coenosteum. Corallites in each corallum have calices 1.4-1.8mm diameter, which are usually round and which face different directions. They are immersed to conical in shape, the latter usually being inclined on the corallum surface. Primary septa are $\frac{1}{2}$-$\frac{3}{4}$R and may have dentations forming a rudimentary columella tangle deep within the corallite. Secondary septa are short and most coralla have some corallites with some tertiary septa at the calice rim. The coenosteum is uniform, being composed of short, even, tightly compacted spinules with highly elaborated tips, giving a smooth appearance.

Living colonies are pale cream or brown in colour.

Habitat preferences and skeletal variation

Astreopora gracilis appears to be uncommon on the Great Barrier Reef, but more abundant in the Coral Sea. Some coralla have strongly inclined corallites intermixed with immersed corallites, others have more uniform outward facing corallites. There appears to be no correlation between corallite shape and septal development.

Affinities

This species has not been satisfactory distinguished from *A. myriophthalma in situ.* The present series is characterised by having corallites of irregular sizes, with some exsert corallites inclined on the corallum surface and by having a smooth coenosteum composed of compacted spinules.

Figs. 1078-1081 *Astreopora gracilis* (× 5)
Fig. 1078 From Houghton Island, same corallum as Fig. 1077.
Figs. 1079, 1080 From Chesterfield Atoll, collecting station 210.
Fig. 1081 From Marion Reef, collecting station 205.

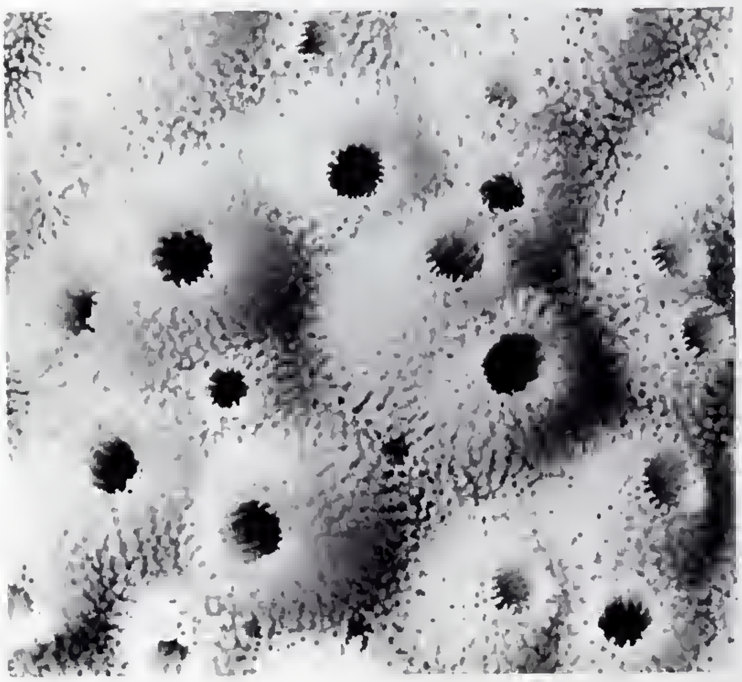


Fig. 1078▲

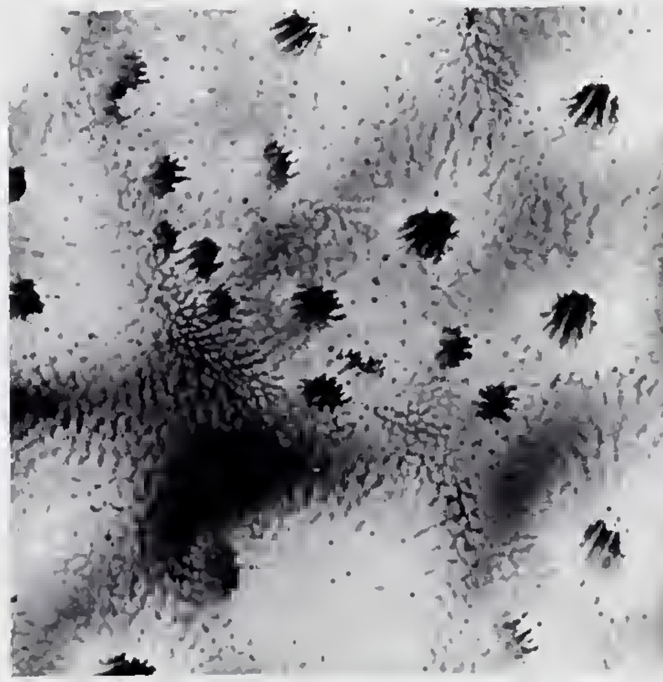


Fig. 1079▲

Fig. 1080▼

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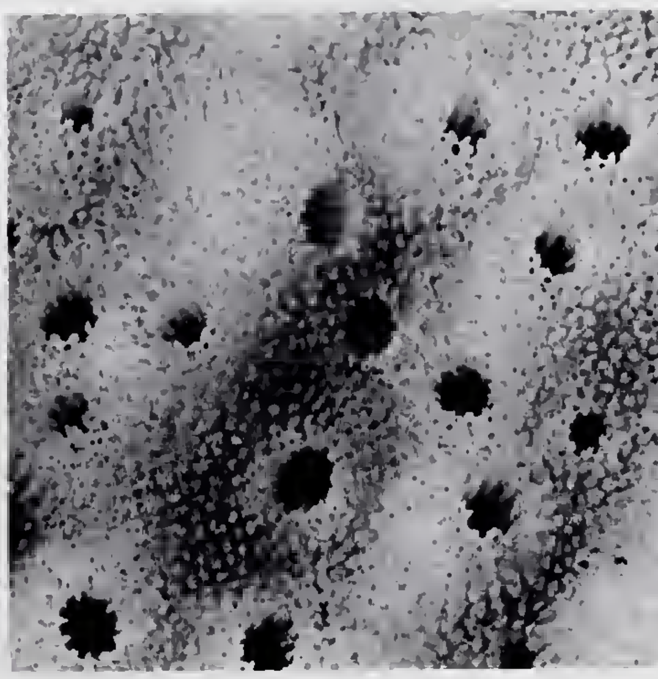


Distribution

Occurs from NW Australia and throughout the central Indo-Pacific, as far east as the Marshall Islands.

Astreopora moretonensis n.sp.

Synonymy

Astreopora incrustans Bernard, 1896; ?Yabe & Sugiyama (1941); Wells (1955); not Bernard (1897).

Material studied

Flinders Reef (Coral Sea), Wistari Reef (3 specimens), **Lady Musgrave Reef, Flinders Reef (Moreton Bay), Middleton Reef** (11 specimens), **Lord Howe Island** (4 specimens).

These localities include collecting stations 194, 226, 227, 230, 231, 233.

Previous records from eastern Australia

Moreton Bay, Wells (1955b) (as *A. incrustans*); Lord Howe Island (as *A.* cf. *listeri*) Veron & Done (1979).

Characters

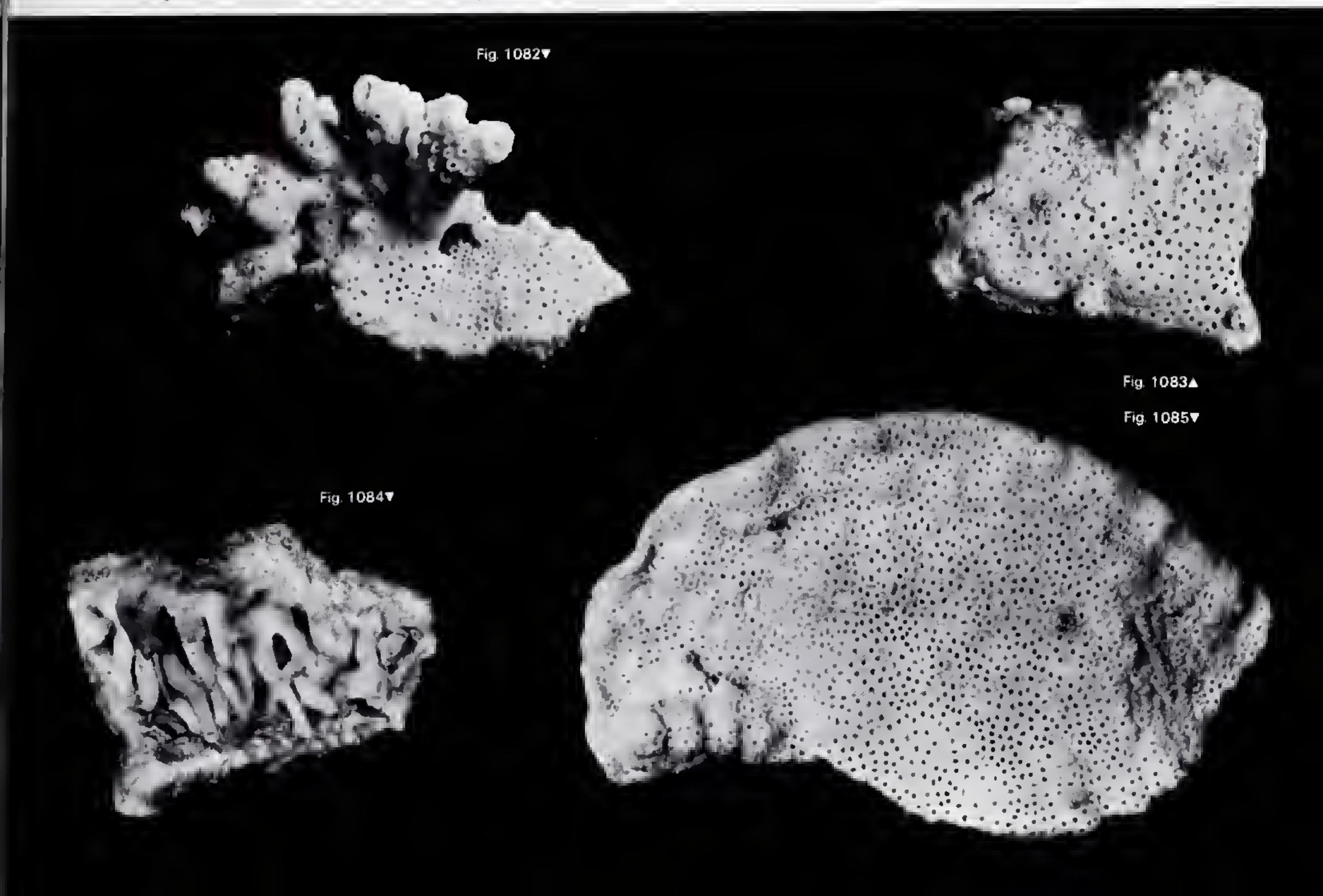
Colonies are encrusting to sub-massive, sometimes forming irregular tubes or columns. The epitheca is weakly developed or absent. Colonies may grow rootlets up to 4cm long, similar in structure to those of *Turbinaria radicalis.* Corallites are round, with calices 2.0-2.4mm diameter. They may be immersed or, especially in sub-massive coralla, conical in shape, up to 7mm in diameter at their base. Septa are in two complete cycles, with secondary

Figs. 1082-1085 *Astreopora moretonensis* (× 0.5)

Fig. 1082 Holotype from Middleton Reef, collecting station 231, same corallum as Figs. 1086, 1087.

Figs. 1083, 1084 Same corallum from Middleton, collecting station 233 and same corallum as Fig. 1088; Fig. 1084 shows rootlets growing from the under surface.

Fig. 1085 From Lord Howe Island, same corallum as Fig. 1089.



septa $< \frac{1}{4}$R. Primary septa are usually sub-equal in immersed corallites; however, they vary greatly in development and some or all may reach R deep within the corallite and fuse, or some may develop elongate dentations which may fuse. The coenosteum is coarse and spongy and is covered with spinules which have elaborated tips. Spinules may be aligned down the trabeculae of exsert corallites.

Living colonies are cream or brown in colour.

Habitat preferences and skeletal variation

Astreopora moretonensis is relatively abundant on the outer reef slopes of Elizabeth and Middleton Reefs but is very rare elsewhere. A single colony of the species recorded at Lord

Figs. 1086-1089 *Astreopora moretonensis* (× 5)
Figs. 1086, 1087 Same corallum from Middleton Reef, holotype, and same corallum as Fig. 1082.
Fig. 1088 From Middleton Reef, same corallum as Figs. 1083, 1084.
Fig. 1089 From Lord Howe Island, same corallum as Fig. 1085.

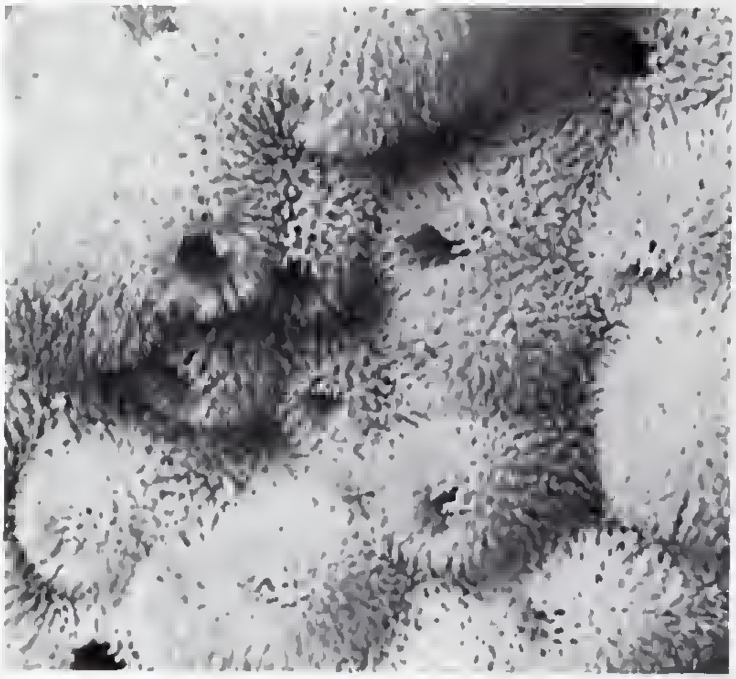


Fig 1086▲

Fig 1087▲

Fig 1088▼

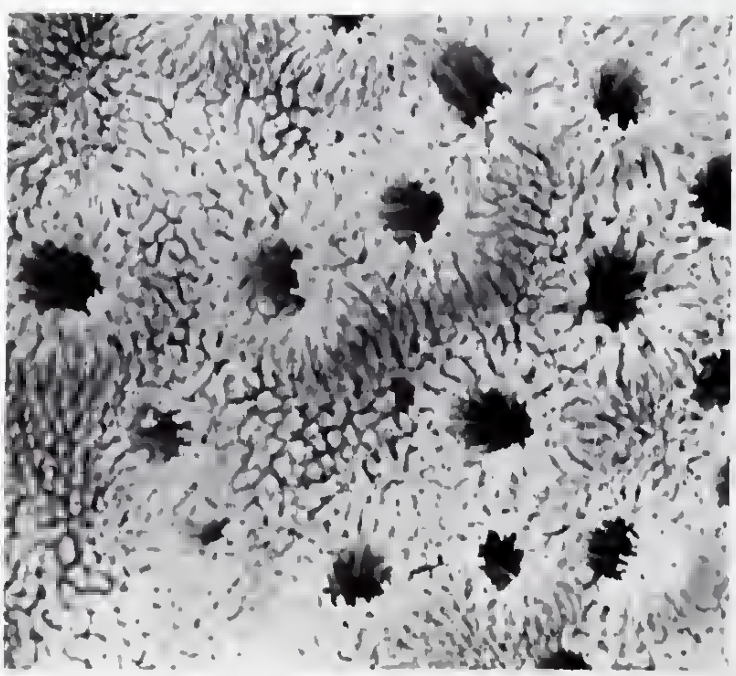
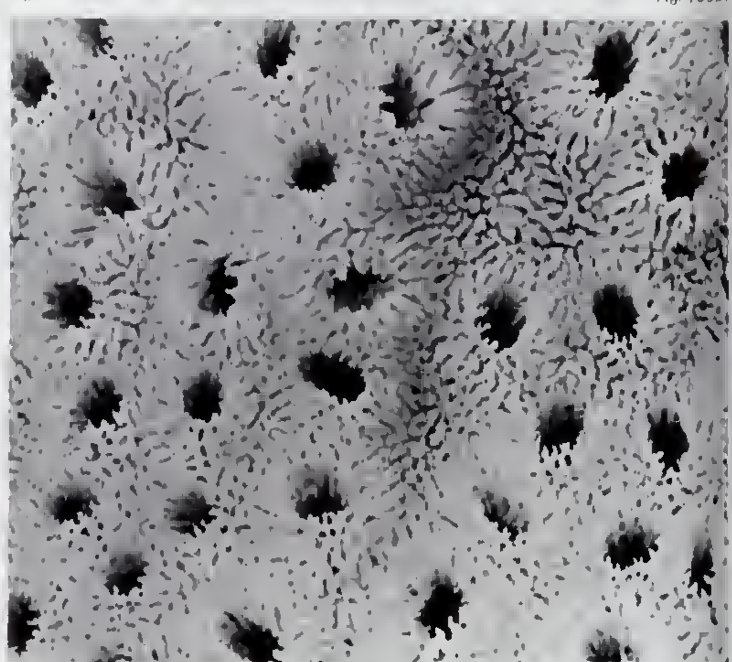


Fig. 1089▼



Howe Island (Veron & Done, 1979, as *A.* cf. *listeri*) was 1 m diameter and consisted of a series of irregularly connected plates. Usually colonies are smaller than this and consist of single plates. Corallites on flat plates differ from those on sub-massive parts of coralla as noted above, the two forms sometimes appearing to be different species unless present together in the one corallum.

Affinities

Astreopora moretonensis does not closely resemble any other species, although larger, more exsert corallites may superficially resemble those of *A. ocellata*.

Etymology

Named after Moreton Bay where this species was first recorded by Wells (1955b).

Holotype (Fig. 1082)

Dimensions: Maximum dimension is 15.5cm

Locality: Middleton Reef

Depth: 12m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Recorded only from temperate eastern Australia.

Astreopora cucullata Lamberts, 1980

Synonymy

?*Astreopora cucullata* Lamberts, 1980.

Most coralla attributed to this species compare well with Lamberts' (1980) description of two coralla of *A. cucullata* (one from Samoa, one from the Marshall Islands), except that corallites are larger in most, but not in all, specimens.

Fig. 1090 *Astreopora cucullata* from Marion reef, collecting station 205, same corallum as Fig. 1091 (× 0.5).

Fig 1090▼

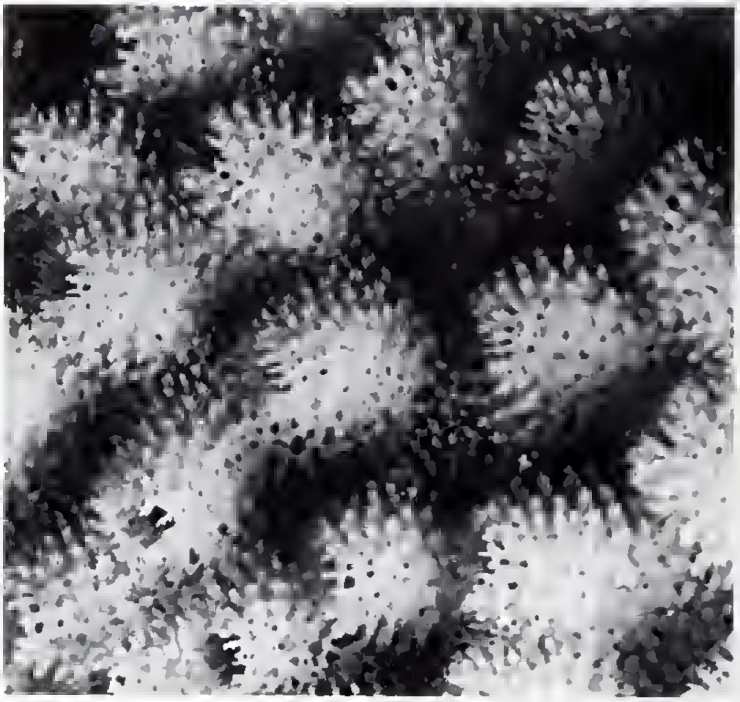
Material studied

Magdelaine Cay (2 specimens), **Mellish Reef** (2 specimens), **Flinders Reef (Coral Sea), Marion Reef** (3 specimens), **Chesterfield Reefs** (4 specimens), **Wistari Reef, Fitzroy Reef, Middleton Reef** (8 specimens), **Elizabeth Reef.**

These localities include collecting stations 190, 200, 205, 207, 210, 216, 226, 231, 233, 238.

Figs. 1091-1094 *Astreopora cucullata* (× 5)

Fig. 1091 From Marion Reef, same corallum as Fig. 1090.
Fig. 1092 From Wistari Reef.
Fig. 1093 From Elizabeth Reef, collecting station 238.
Fig. 1094 From Middleton Reef, collecting station 231.



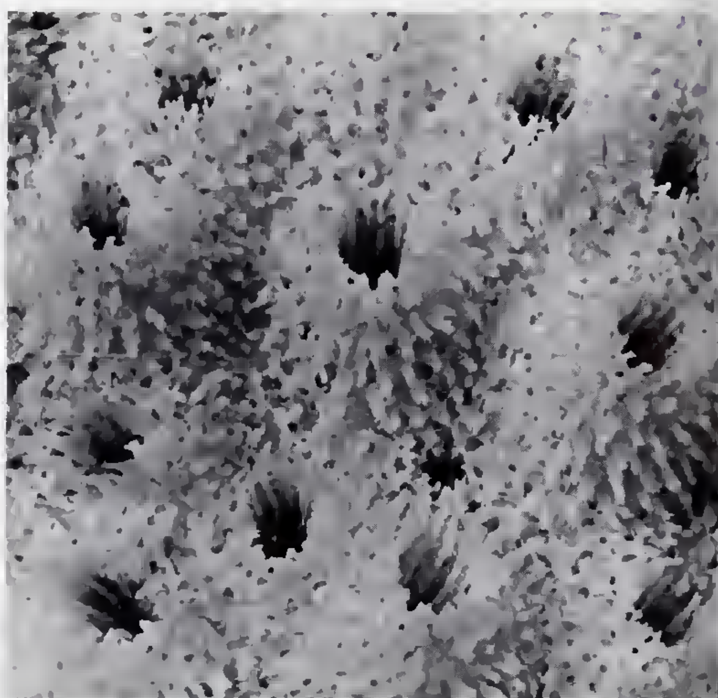
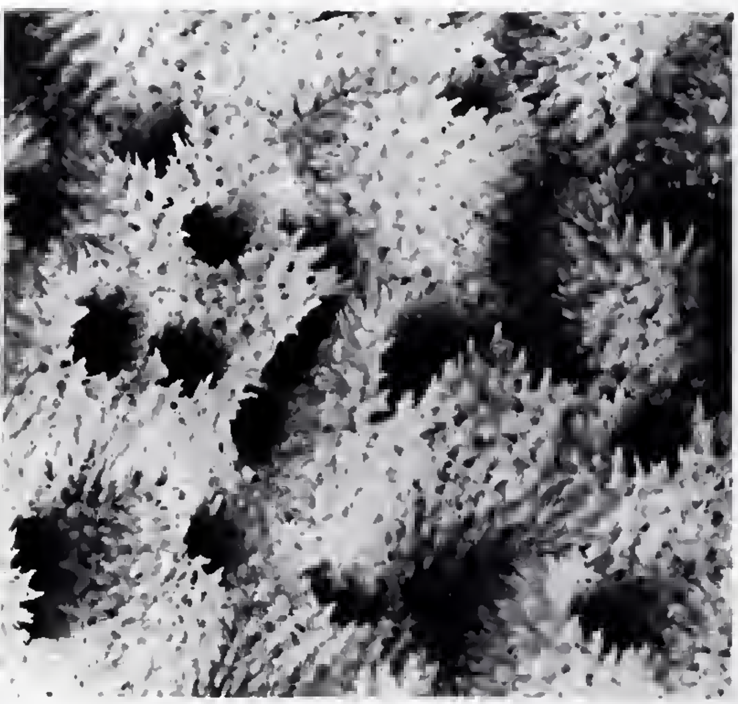
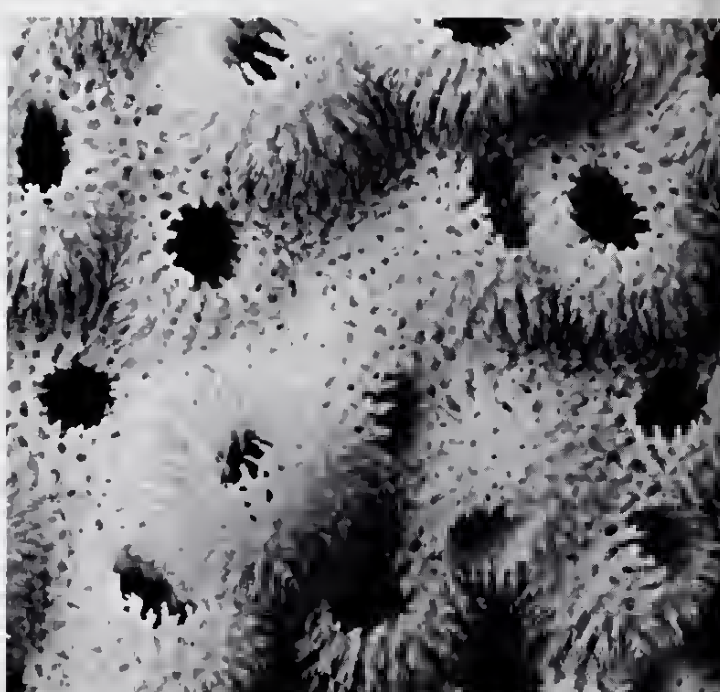


Fig. 1091▲ Fig. 1093▼ Fig 1092▲ Fig. 1094▼





Previous records from eastern Australia

Not previously recorded.

Characters

Colonies are thick, sub-massive to encrusting plates, with a well-developed epitheca and sometimes with short rootlets. Corallites vary in size and shape from being immersed on concave surfaces to exsert on convex ones. The latter are usually inclined in irregular directions, but tend to face the corallum margin. Upper corallite walls are well developed (up to 6mm long), tending to overgrow the calices, which are consequently oval or distorted in shape. Calices average 1.4-2.8mm diameter in different coralla. Primary and secondary septa are sub-equal at the corallite rim. Primary septa slope irregularly towards the corallite centre and usually some fuse; secondary septa remain short. Small tertiary septa are sometimes seen in large corallites. The coenosteum is coarse and spongy with large, usually flattened spinules, which have highly elaborated tips.

Living colonies are cream or pale brown in colour.

Habitat preferences and skeletal variation

Coralla attributed to this species have been collected from a wide geographic range and also from a wide depth range. However, *A.* cf. *cucullata* never appears to be abundant. Coralla from shallow water have smaller corallites than those from deep water and coralla with the largest corallites come from the species' southern geographic limit.

Affinities

Coralla of *A. cucullata* have been collected at various times from the same biotopes as *A. moretonensis*, *A. listeri* and *A. myriophthalma* and are readily distinguished from these species in having corallites inclined on the corallum surface and elaborated coenostial spinules, giving a feathery appearance to the rim of the calices. In heterogeneous collections, however, this species may be only arbitrarily separable from *A. myriophthalma*, especially if coralla are sub-massive and only develop inclined corallites towards the corallum margin.

Distribution

Previously recorded from Samoa and the Marshall Islands (Lamberts, 1980).

Astreopora ocellata Bernard, 1896

Synonymy

Astreopora ocellata Bernard, 1896; Vaughan (1918), Yabe & Sugiyama (1941); Wells (1954).

This species was described from a single specimen from the northern Great Barrier Reef. Vaughan (1918) described two more specimens from the same area, noting the septal pattern which characterises the species.

Material studied

Murray Islands, Corbett Reef, Yonge Reef, Mellish Reef, Bowl Reef, Gould Reef, Masthead Reef, Elizabeth Reef.

These localities include collecting stations 4, 9, 114, 164, 208, 239.

Previous records from eastern Australia

Murray Islands, Vaughan (1918).

Characters

Colonies are massive, usually dome-shaped or flattened. Calices are usually compacted and are primarily characterised by their large size and thick, rounded walls. Small immersed corallites usually occur between large corallites where surface space permits. Calices are round, up to 3.8mm diameter. Primary septa taper from the calice rim to $\frac{3}{4}$R deep within the

Fig. 1095▲

Fig. 1095 *Astreopora ocellata* from the Murray Islands, same corallum as Fig. 1096 (× 0.33).

Figs. 1096-1097 *Astreopora ocellata* (× 5)
Fig. 1096 From the Murray Islands, same corallum as Fig. 1095.
Fig. 1097 From Bowl Reef, collecting station 4.

Fig. 1096▼

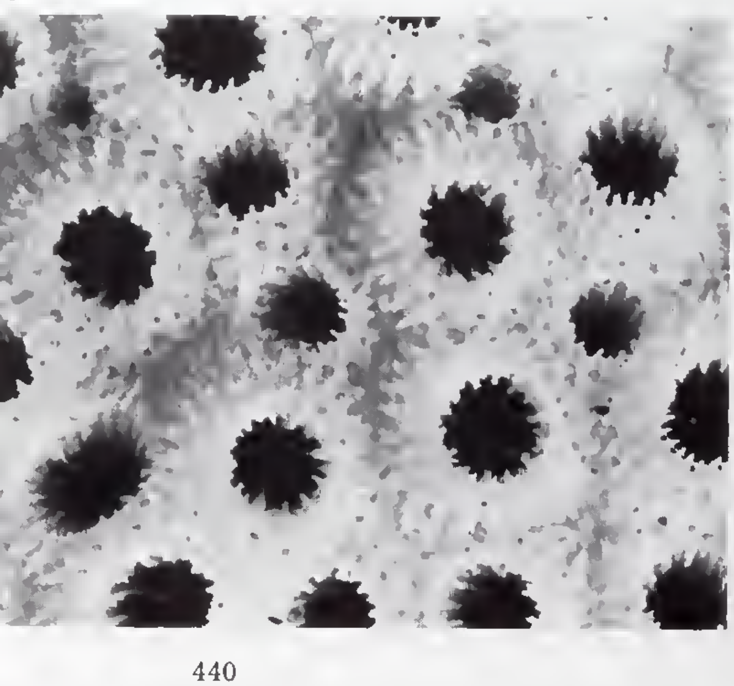
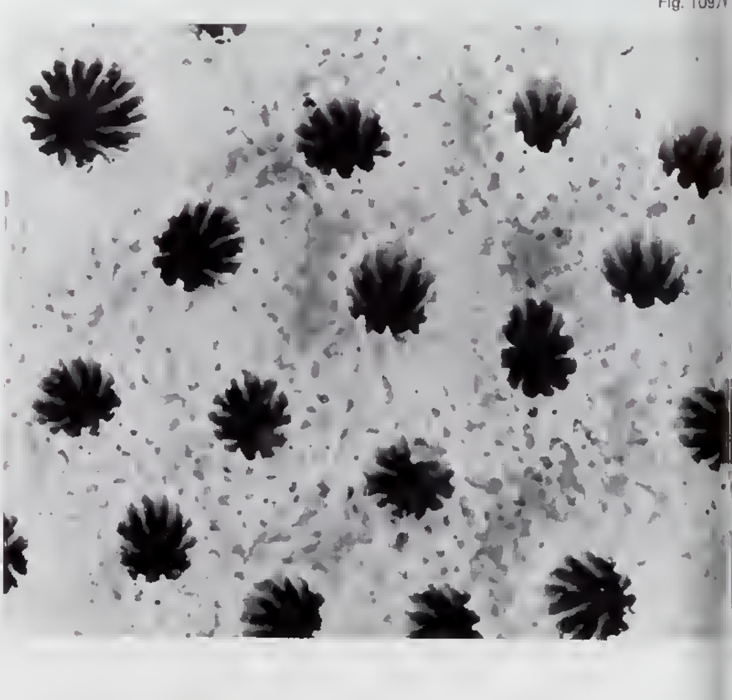


Fig. 1097▼



corallites, where they frequently develop irregular elongate dentations, which occasionally form a rudimentary columella tangle hardly visible from the surface. Secondary septa are short and at least some tertiary septa can be distinguished. Some corallites have a complete tertiary cycle. The coenosteum is coarse and spongy, with short, widely spaced spinules.

Living colonies are cream or yellow in colour.

Habitat preferences and skeletal variations

Most coralla in the present series are from shallow water and the species most commonly occurs on upper reef slopes exposed to strong wave action.

Several coralla have one or more lobes of small immersed corallites, which overgrow the rest of the corallum. In some cases, these lobes are larger than the original corallum and appear to be neoplasms which, if not recognised as such, appear to be another species, as they have none of the skeletal characters of the original corallum.

Affinities

Astreopora ocellata has larger calices and a better-developed septation than any other east Australian *Astreopora*, except *A. macrostoma*, which is readily distinguished in having much larger corallites, which are strongly inclined on the corallum surface, not outwardly facing, with rounded walls equally developed on all sides.

Distribution

Recorded from the Great Barrier Reef, the Caroline and Marshall Islands and Palau.

Astreopora macrostoma n.sp.

Material studied

Chesterfield Reefs (6 specimens).

This locality includes collecting station 210.

Fig. 1098 *Astreopora macrostoma* from Chesterfield Atoll, collecting station 210, holotype, same corallum as Fig. 1099 (× 0.33).

Fig. 1098▼

Characters

Colonies are sub-massive or form thick, irregular plates. The epitheca is well developed and short rootlets may be formed. Corallites are relatively widely spaced on convex surfaces and crowded on concave surfaces, where they may be completely immersed. Otherwise, they are conical or curved, almost tubular in shape, and face different directions. They are very large, being up to 12mm thick at the base and up to 12.5mm exsert. Calices are irregular in shape; they may be circular, up to 3.3mm diameter or oval to slit-like. Small corallites may occur on or between these large ones.

In the upper part of calices, septa are sub-equal, short, usually wedge-shaped, the back of each wedge being a trabecular column which projects above the level of the calice and has an elaborated tip. Secondary septa remain short, primary septa slope towards the axis of the corallite and fuse 5-7mm deep within the corallite. All septa have smooth margins.

The coenosteum is very coarse. It is spongy, with large spinules having very elaborate tips. Spinules may be aligned in costae-like rows down the sides of corallites.

Affinities

Astreopora macrostoma is the most readily recognised east Australian *Astreopora,* being distinguished from all other species in the size of all skeletal characters.

Etymology

So named because of the size of the corallites.

Holotype (Fig. 1098)

Dimensions: An almost circular plate, maximum diameter 39cm

Locality: Chesterfield Reefs

Depth: 14m

Collector: J. E. N. Veron

Holotype: Queensland Museum, Australia

Paratypes

British Museum (Natural History)

Australian Institute of Marine Science.

Distribution

Known only from the Chesterfield Reefs.

Figs. 1099,1100 *Astreopora macrostoma* (× 5)
Fig. 1099 From Chesterfield Atoll, holotype, same corallum as Fig. 1098.
Fig. 1100 From Chesterfield Atoll, collecting station 210.

Fig. 1099▼

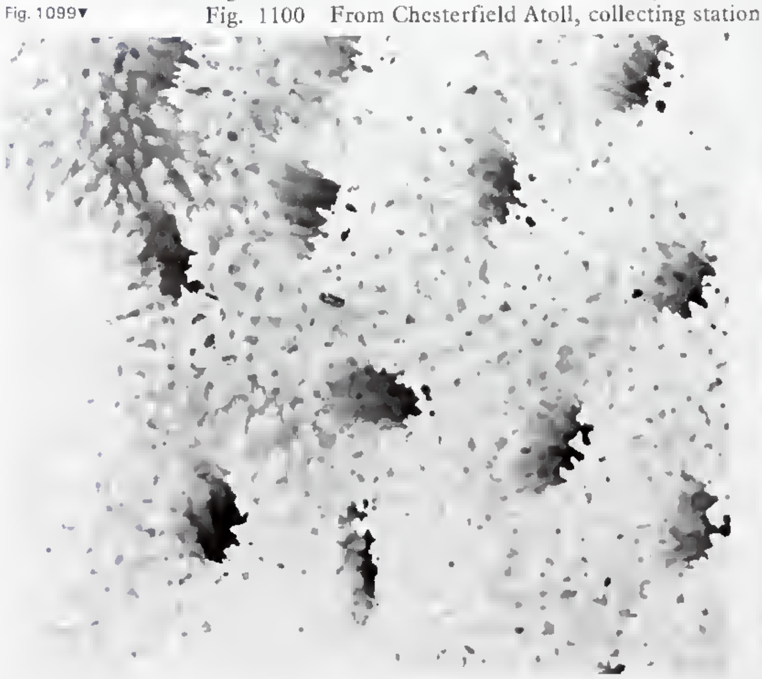


Fig. 1100

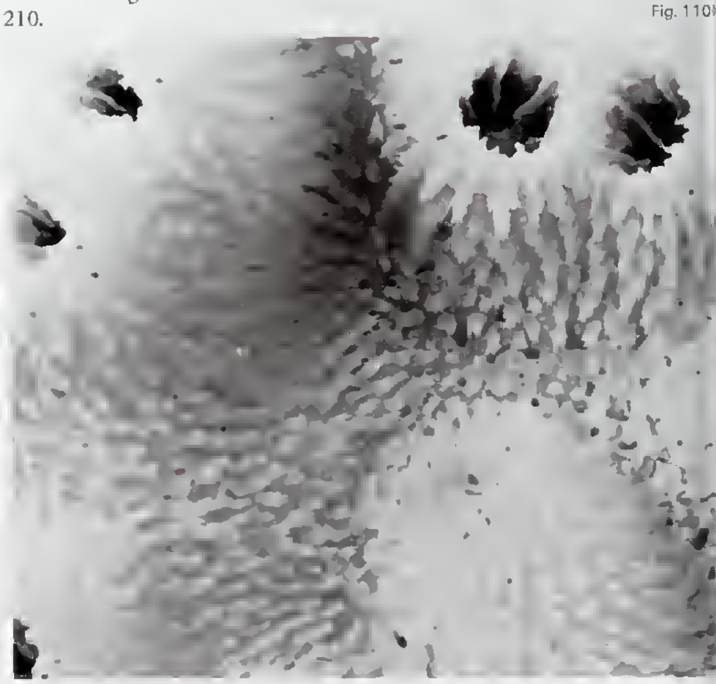


Fig. 1101 *Montipora monasteriata* at Broadhurst Reef.

Fig. 1102 *Montipora monasteriata* at Orpheus Island, Palm Islands showing fused tuberculae usually found at the colony margin.

Fig. 1103 *Montipora tuberculosa* at Braodhurst Reef.

Fig. 1104 Two overlapping colonies of *M. tuberculosa* at Orpheus Island, Palm Islands.

Fig. 1105 *Montipora tuberculosa* at Davies Reef with polyps extended.

Fig. 1106 *Montipora hoffmeisteri* at Broadhurst Reef.

Fig. 1107 *Montipora hoffmeisteri* at Rib Reef.

Fig. 1108 *Montipora floweri* at Broadhurst Reef.

Fig. 1109 *Montipora millepora* (above) and *M. turgescens* (below) at Rib Reef.

Fig. 1110 *Montipora* sp.2 at Llewellyn Reef.

Fig. 1111 *Montipora spongodes* at Davies Reef.

Fig. 1112 *Montipora spongodes* at Lord Howe Island (photo: J. Barnett).

Fig. 1113 *Montipora spumosa* at Broadhurst Reef.

Fig. 1114 *Montipora undata* at Davies Reef.

Fig. 1115 Encrusting *M. danae* at Broadhurst Reef.

Fig. 1116 Columnar *M. danae* at Pandora Reef.

Fig. 1117 *Montipora danae* at the Swain Reefs (photo: L. Zell).

Fig. 1118 *Montipora danae* at Flinders Reef (Coral Sea).

Fig. 1119 *Montipora verrucosa* at Rib Reef.

Fig. 1120 *Montipora incrassata* at Broadhurst Reef.

Fig. 1121 *Montipora incrassata* at Davies Reef.

Fig. 1122 *Montipora foveolata* at Flinders Reef (Coral Sea).

Fig. 1123 *Montipora foveolata* at Mellish Reef.

Fig. 1124 *Montipora venosa* at Pandora Reef.

Fig. 1125 *Montipora digitata* at Orpheus Island, Palm Islands.

Fig. 1126 *Montipora hispida* at Curacao Island, Palm Islands.

Fig. 1127 *Montipora efflorescens* at Heron Island.

Fig. 1128 *Montipora nodosa* at Rib Reef.

Fig. 1129 *Montipora grisea* (right) and *M. hoffmeisteri* (left) at Rib Reef.

Fig. 1130 *Montipora stellata* at Pandora Reef.

Fig. 1131 *Montipora stellata* at Orpheus Island, Palm Islands.

Fig. 1132 *Montipora informis* at Bushy Island showing a common surface configuration.

Fig. 1133 *Montipora informis* at Davies Reef.

Fig. 1134 *Montipora foliosa* at Davies Reef.

Fig. 1135 *Montipora foliosa* at Orpheus Island, Palm Islands.

Fig. 1136 *Montipora aequituberculata* at Heron Island.

Fig. 1137 *Montipora aequituberculata* at Broadhurst Reef.

Fig. 1138 *Montipora aequituberculata* at Davies Reef.

Fig. 1139 *Anacropora matthaii* at Fantome Island, Palm Islands (photo: L. Zell).

Fig. 1140 *Anacropora forbesi* at Big Mary Reef.

Fig. 1141 *Anacropora puertogalerae* at Pandora Reef.

Fig. 1142 *Anacropora reticulata* at Orpheus Island, Palm Islands.

Fig. 1143 *Acropora palifera* at Tijou Reef showing ridge-like growth forms characteristic of exposed upper reef slopes (photo: T. Done).

Fig. 1144 *Acropora palifera* at Tijou Reef lagoon.

Fig. 1145 *Acropora palifera* at Britomart Reef.

Fig. 1146 *Acropora palifera* at Madelaine Cay showing an arborescent growth form characteristic of protected reef lagoons.

Fig. 1147 *Acropora cuneata* at Tijou Reef.

Fig. 1148 *Acropora brueggemanni* at Heron Island.

Fig. 1149 *Acropora brueggemanni* (in front) and *A. palifera* (behind) at Bird Island.

Fig. 1150 *Acropora humilis* at Broadhurst Reef.

Fig. 1151 *Acropora humilis* (left) and *A. gemmifera* (right) at Broadhurst Reef.

Fig. 1152 *Acropora gemmifera* at Myrmidon Reef.

Fig. 1153 *Acropora gemmifera* at Broadhurst Reef.

Fig. 1154 *Acropora gemmifera* (purple and cream, left and right) with *A. monticulosa* (purple, centre) *A. humilis* (bottom, left) and *A. lutkeni* (top, left).

Fig. 1155 *Acropora monticulosa* at Myrmidon Reef.

Fig. 1156 *Acropora monticulosa* at the upper reef slope, Myrmidon Reef.

Fig. 1157 *Acropora samoensis* at Middleton Reef.

Fig. 1158 *Acropora samoensis* at the Chesterfield Reefs.

Fig. 1159 *Acropora digitifera* at Magdelaine Reef.

Fig. 1160 *Acropora digitifera* (right) and *A. gemmifera* (upper left) at Magdelaine Reef.

Fig. 1161 *Acropora multiacuta* at Broadhurst Reef.

Fig. 1162 *Acropora multiacuta* at Davies Reef.

Fig. 1163 *Acropora bushyensis* at Bushy Island.

Figs. 1164, 1165 *Acropora verweyi* at Myrmidon Reef showing characteristic yellow axial corallites.

Figs. 1166-1168 *Acropora lovelli* at Middleton Reef.

Fig. 1169 *Acropora glauca* at Elizabeth Reef.

Fig. 1170 *Acropora glauca* at Lord Howe Island (photo: L. Zell).

Fig. 1171 *Acropora robusta* at the outer reef flat, Broadhurst Reef.

Fig. 1172 *Acropora robusta* at Little Mary Reef.

Fig. 1173 *Acropora robusta* at Arden Island showing a common colouration.

Figs. 1174, 1175 *Acropora danai* at Davies Reef.

Fig. 1176 *Acropora danai* at Britomart Reef.

Fig. 1177 *Acropora palmerae* at Myrmidon Reef (photo: T. Done).

Fig. 1178 *Acropora nobilis* at Broadhurst Reef.

Figs. 1179, 1180 *Acropora nobilis* at Tijou Reef.

Fig. 1181 *Acropora nobilis* (cream) and *A. formosa* (purple) at Broadhurst Reef.

Fig. 1182 *Acropora polystoma* at Tijou Reef.

Fig. 1183 *Acropora listeri* at Tijou Reef.

Fig. 1184 *Acropora listeri* at Magdelaine Cay.

Fig. 1185 *Acropora grandis* at Broadhurst Reef.

Fig. 1186 *Acropora grandis* at Chesterfield Reefs.

Fig. 1187 *Acropora formosa* at Bushy Island-Redbill Reef.

Fig. 1188 *Acropora formosa* at Broadhurst Reef.

Fig. 1189 *Acropora formosa* at Llewellyn Reef.

Fig. 1190 *Acropora acuminata* at Flinders Reef (Coral Sea).

Fig. 1191 *Acropora acuminata* at the Chesterfield Reefs.

Fig. 1192 *Acropora valenciennesi* at Davies Reef.

Fig. 1193 *Acropora valenciennesi* at Broadhurst Reef.

Fig. 1194 *Acropora valenciennesi* (above) and *A. divaricata* (below) at Tijou Reef.

Figs. 1195, 1196 *Acropora microphthalma* at Rib Reef.

Fig. 1197 *Acropora kirstyae* at the Palm Islands.

Fig. 1198 *Acropora horrida* at Lizard Island.

Fig. 1199 *Acropora horrida* at Britomart Reef.

Fig. 1200 *Acropora horrida* (purple) and *A. yongei* (cream) and *A. nobilis* (cream, thick branches) at Broadhurst Reef.

Fig. 1201 *Acropora tortuosa* at Elizabeth Reef.

Fig. 1202 *Acropora vaughani* at Little Mary Reef.

Fig. 1203 *Acropora austera* at Keeper Reef.

Fig. 1204 *Acropora austera* at Rib Reef.

Fig. 1205 *Acropora aspera* at Britomart Reef.

Fig. 1206 *Acropora aspera* at Broadhurst Reef.

Fig. 1207 *Acropora pulchra* at the Palm Islands.

Fig. 1208 *Acropora millepora* at Tijou Reef.

Fig. 1209 *Acropora millepora* at Fitzroy Reef.

Fig. 1210 *Acropora millepora* at Broadhurst Reef.

Fig. 1211 *Acropora tenuis* at the Sir Charles Hardy Islands.

Fig. 1212 *Acropora tenuis* at Keeper Reef.

Fig. 1213 *Acropora tenuis* at Broadhurst Reef.

Fig. 1214 *Acropora selago* at Keeper Reef.

Fig. 1215 *Acropora donei* at Myrmidon Reef.

Fig. 1216 *Acropora dendrum* at Britomart Reef.

Fig. 1217 *Acropora dendrum* at Fitzroy Reef.

Fig. 1218 *Acropora yongei* at Britomart Reef.

Fig. 1219 *Acropora yongei* at Fitzroy Reef.

Fig. 1220 *Acropora cytherea* (left, above and below), *A. hyacinthus* (right) and *A. florida* (bottom right) at Broadhurst Reef.

Figs. 1221, 1222 *Acropora cytherea* at Broadhurst Reef.

Fig. 1223 *Acropora microclados* at Myrmidon Reef.

Fig. 1224 *Acropora microclados* at Broadhurst Reef.

Fig. 1225 *Acropora paniculata* at Mellish Reef.

Fig. 1226 *Acropora paniculata* at Davies Reef.

Fig. 1227 *Acropora hyacinthus* at Broadhurst Reef.

Fig. 1228 *Acropora hyacinthus* at Rib Reef (plate-like colonies only).

Fig. 1229 *Acropora hyacinthus*, intermixed with *A. florida*, at Davies Reef.

Fig. 1230 *Acropora anthocercis* at the exposed upper reef slope of Tijou Reef.

Fig. 1231 *Acropora anthocercis* at Fitzroy Reef.

Fig. 1232 *Acropora anthocercis* at Broadhurst Reef.

Figs. 1233, 1234 *Acropora latistella* at Rib Reef.

Fig. 1235 *Acropora subulata* at Rib Reef.

Fig. 1236 *Acropora nana* at Rib Reef.

Fig. 1237 *Acropora aculeus* at Myrmidon Reef.

Fig. 1238 *Acropora aculeus* at Britomart Reef.

Fig. 1239 *Acropora aculeus* at Davies Reef.

Fig. 1240 *Acropora cerealis* at Fitzroy Reef.

Fig. 1241 *Acropora cerealis* at Flinders Reef (Coral Sea).

Fig. 1242 *Acropora nasuta* at Osmond Reef.

Fig. 1243 *Acropora nasuta* at Lizard Island.

Fig. 1244 *Acropora valida* at Broadhurst Reef.

Fig. 1245 *Acropora valida* at Willis Island.

Fig. 1246 *Acropora valida* at Elizabeth Reef.

Fig. 1247 *Acropora valida* at the Chesterfield Reefs.

Fig. 1248 *Acropora secale* at Keeper Reef.

Figs. 1249, 1250 *Acropora secale* at Broadhurst Reef.

Fig. 1251 *Acropora lutkeni* (left) and *A. austera* (top and right) at Tijou Reef.

Fig. 1252 *Acropora lutkeni* at Cat Reef.

Fig. 1253 *Acropora lutkeni* at Tijou Reef.

Fig. 1254 *Acropora clathrata* at Britomart Reef.

Fig. 1255 *Acropora clathrata* at Magdelaine Cay.

Fig. 1256 *Acropora clathrata* at Tijou Reef.

Fig. 1257 *Acropora divaricata* at the Palm Islands.

Fig. 1258 *Acropora divaricata* at Keeper Reef.

Fig. 1259 *Acropora divaricata* at Davies Reef.

Fig. 1260 *Acropora solitaryensis* at Flinders Reef (Moreton Bay).

Fig. 1261 *Acropora echinata at* Tijou Reef.

Fig. 1262 *Acropora echinata* at Cat Reef.

Fig. 1263 *Acropora subglabra* at Tijou Reef.

Fig. 1264 *Acropora subglabra* (below) and *A. carduus* (above) at Tijou Reef.

Fig. 1265 *Acropora elseyi* at Broadhurst Reef.

Fig. 1266 *Acropora elseyi* at Britomart Reef.
Fig. 1267 *Acropora elseyi* at the Howick Islands.
Fig. 1268 *Acropora elseyi* at Flinders Reef (Coral Sea).
Fig. 1269 *Acropora longicyathus* at Heron Island.
Fig. 1270 *Acropora longicyathus* at Broadhurst Reef.
Fig. 1271 *Acropora loripes* at Tijou Reef.
Fig. 1272 *Acropora loripes* at Yorke Island.
Fig. 1273 *Acropora loripes* at Broadhurst Reef.
Fig. 1274 *Acropora chesterfieldensis* at the Chesterfield Reefs.
Figs. 1275, 1276 *Acropora granulosa* at Broadhurst Reef.
Fig. 1277 *Acropora granulosa* at Upolu Reef (photo: V. Harriott).
Fig. 1278 *Acropora caroliniana* at Cat Reef.
Fig. 1279 *Acropora willisae* at Mellish Reef.
Figs. 1280, 1281 *Acropora florida* at Tijou Reef.
Fig. 1282 *Acropora florida* at Broadhurst Reef.
Fig. 1283 *Acropora sarmentosa* at Fitzroy Island.
Fig. 1284 *Acropora sarmentosa* at Broadhurst Reef.
Fig. 1285 *Acropora sarmentosa* (left) and *A. samoensis* (right) at Osmond Reef.
Fig. 1286 *Acropora sarmentosa* (right) and *A. millepora* (left) at the Sir Charles Hardy Islands.
Fig. 1287 *Astreopora myriophthalma* at Davies Reef.
Fig. 1288 *Astreopora myriophthalma* at Heron Island.
Fig. 1289 *Astreopora myriophthalma* (left) and *A. listeri* (right) at Myrmidon Reef.
Fig. 1290 *Astreopora listeri* (left) and *A. moretonensis* (right) at Middleton Reef.
Fig. 1291 *Astreopora moretonensis* at Middleton Reef.
Fig. 1292 *Astreopora moretonensis* at Lord Howe Island (photo: L. Zell).


Fig. 1101▲


Fig. 1102▲


Fig. 1103▲


Fig. 1104▲

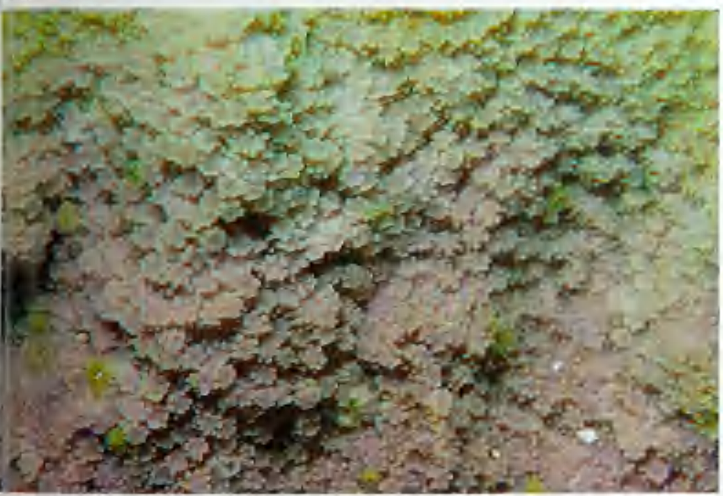

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Fig. 1107▲


Fig. 1108▲

Fig. 1109▲

Fig. 1110▲

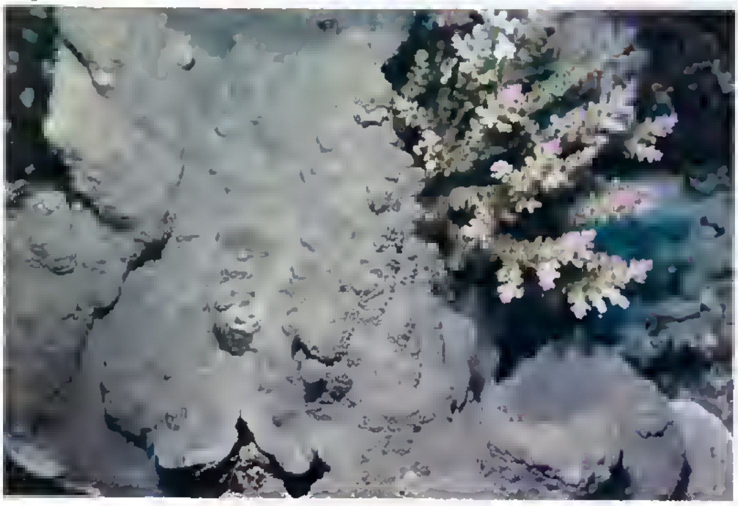
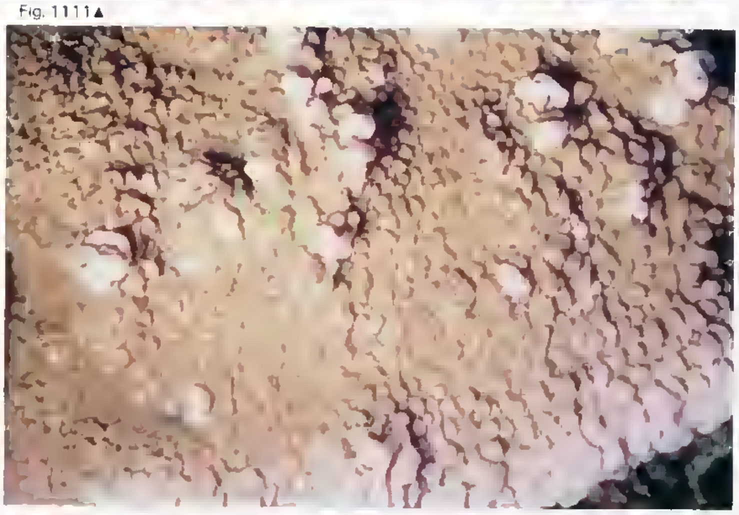


Fig. 1111▲

Fig. 1112▲



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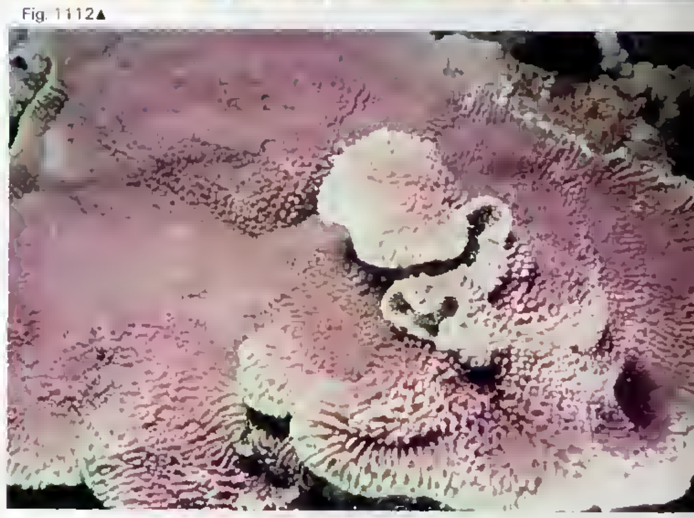

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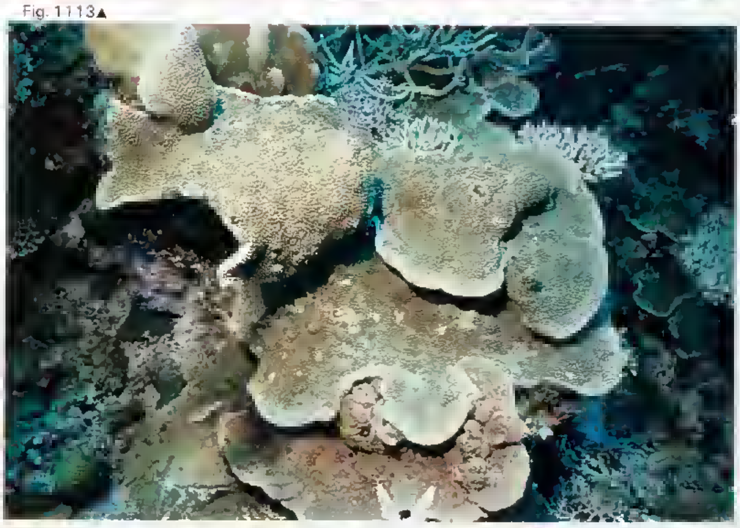

Fig. 1115▲

Fig. 1116▲


F.j. 1117▲


Fig. 1118▲

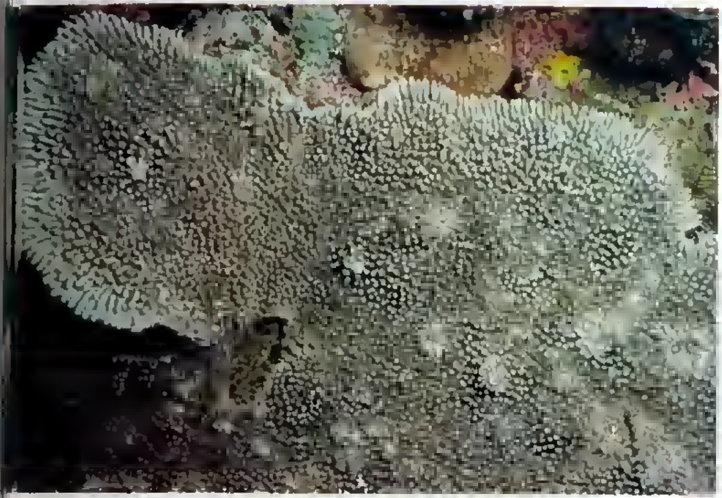
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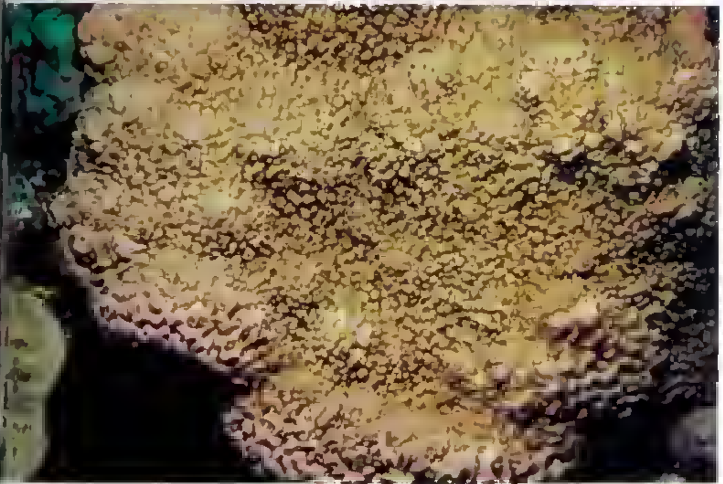
Fig. 1120▲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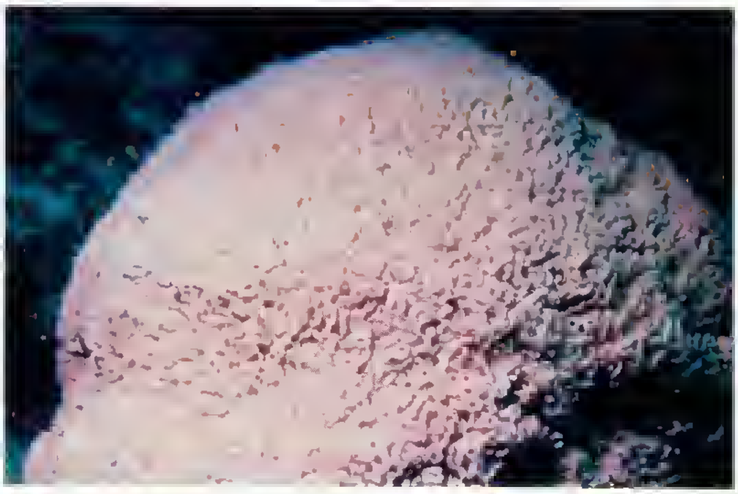
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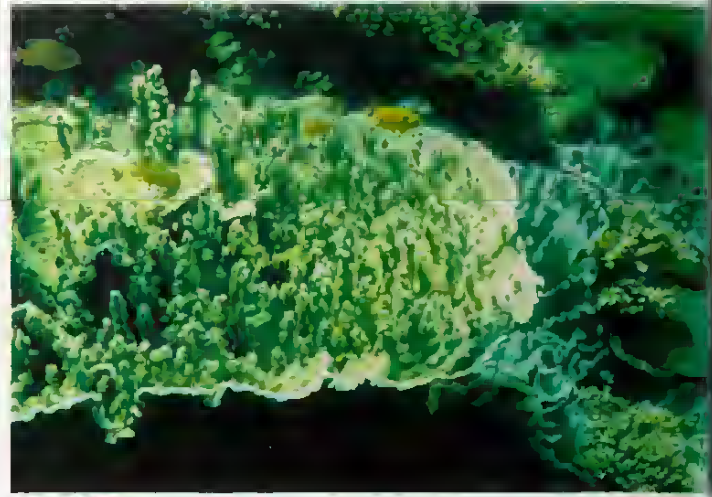
Fig. 1123▲


Fig. 1124▲


Fig. 1125▲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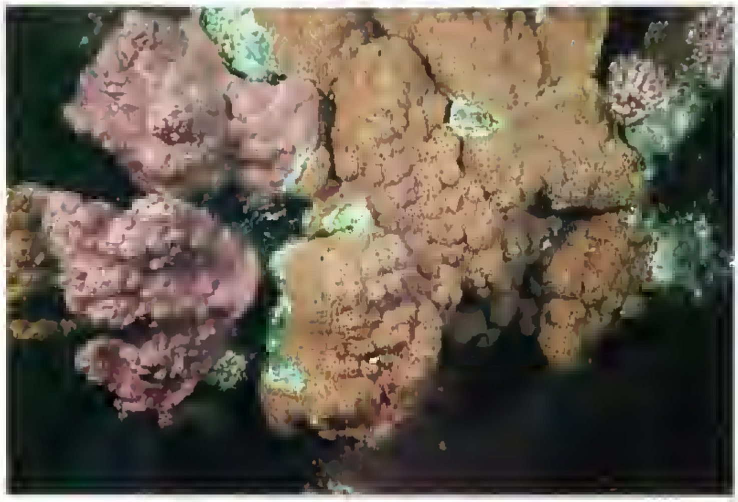
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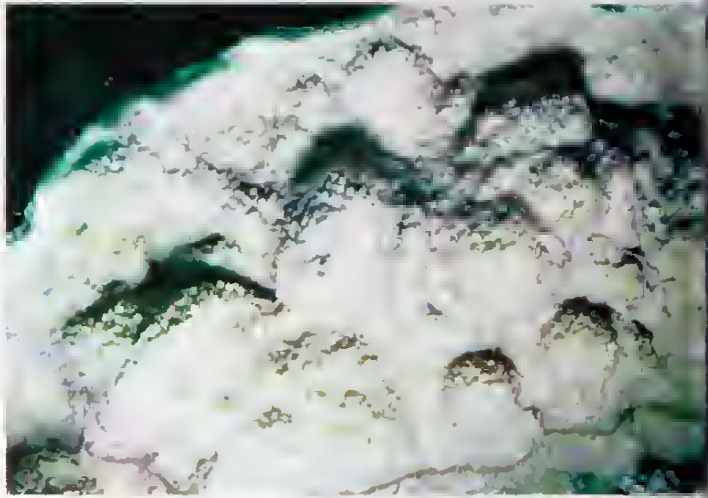
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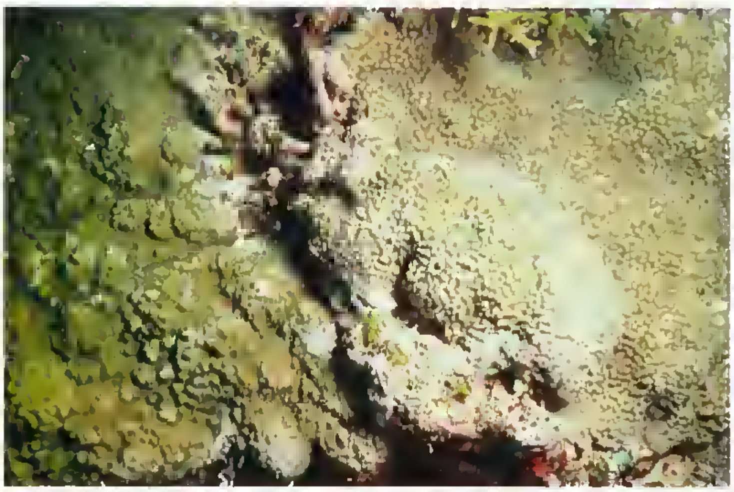
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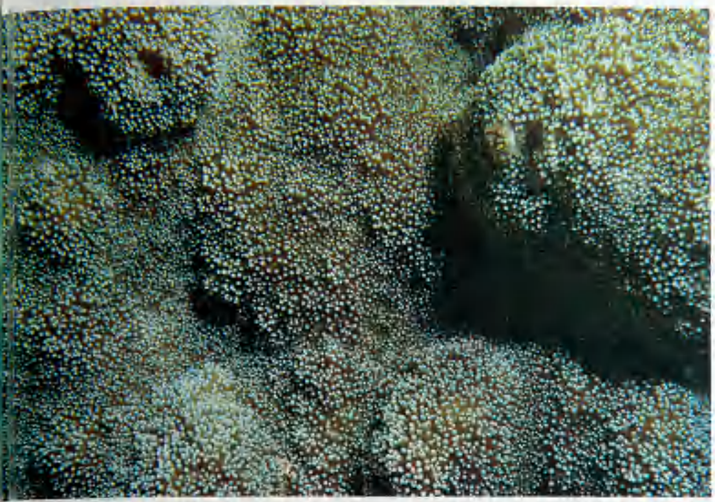
Fig. 1130▲


Fig. 1131▲


Fig. 1132▲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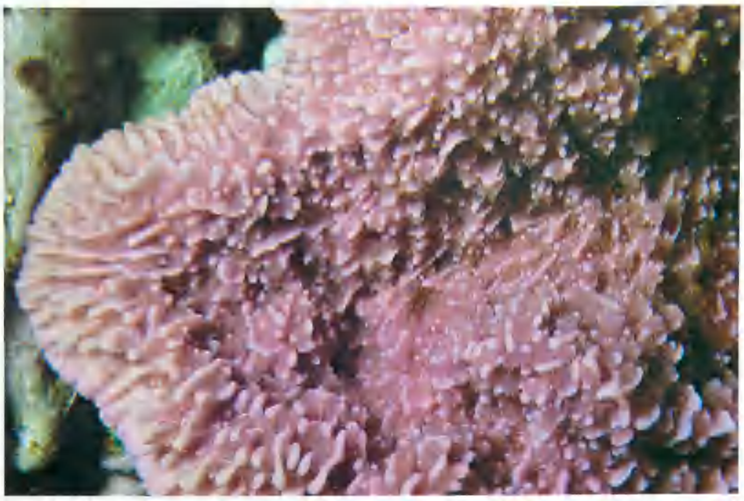
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Fig. 1135▲


Fig. 1136▲

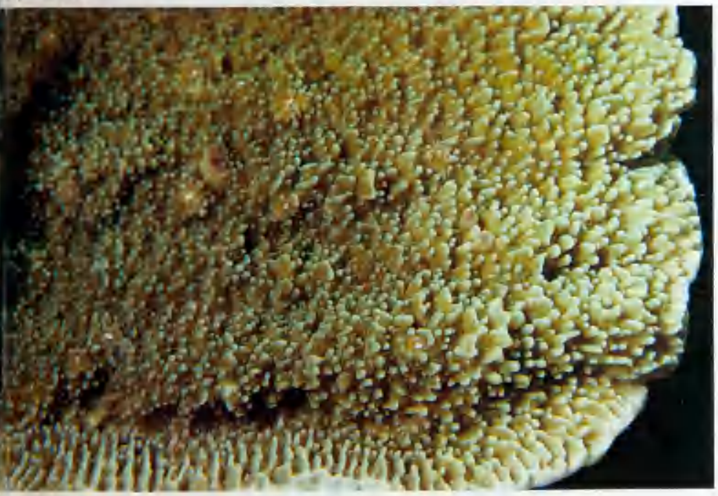
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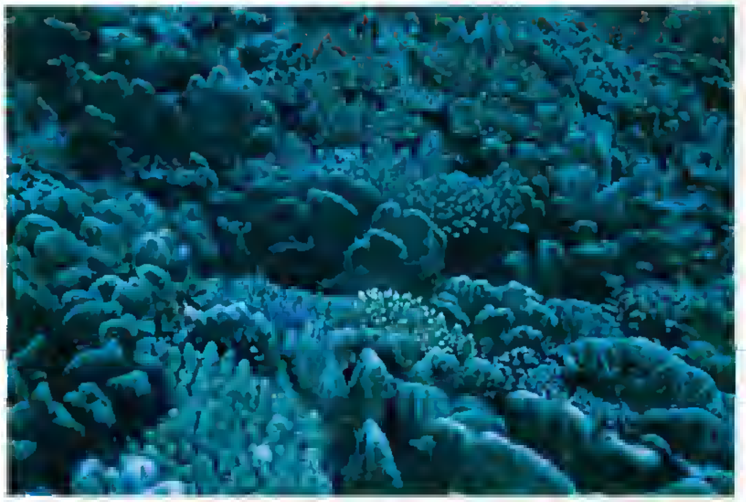
Fig. 1138▲


Fig. 1139▲


Fig. 1140▲


Fig. 1141▲


Fig. 1142▲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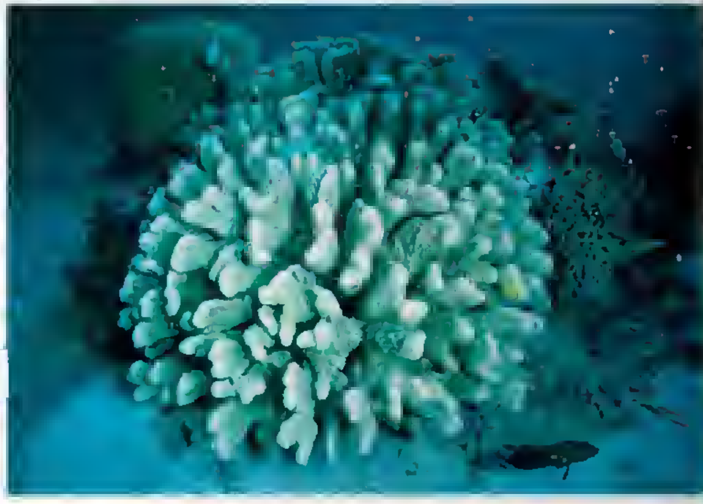
Fig. 1144▲


Fig. 1145▲


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Fig. 1150▲


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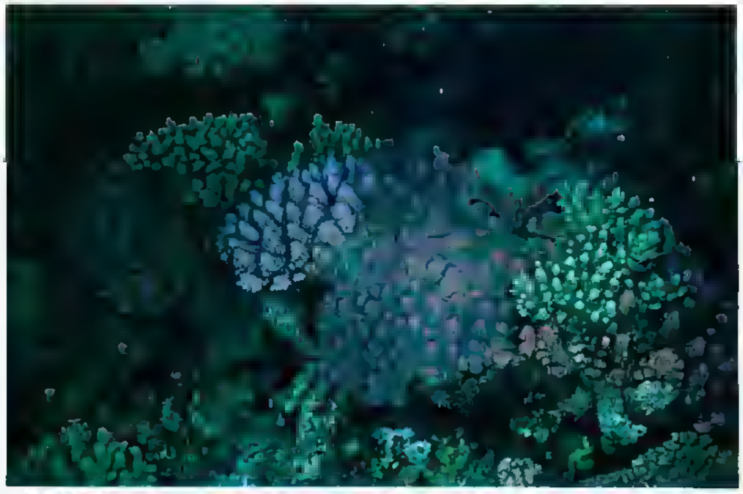
Fig. 1153▲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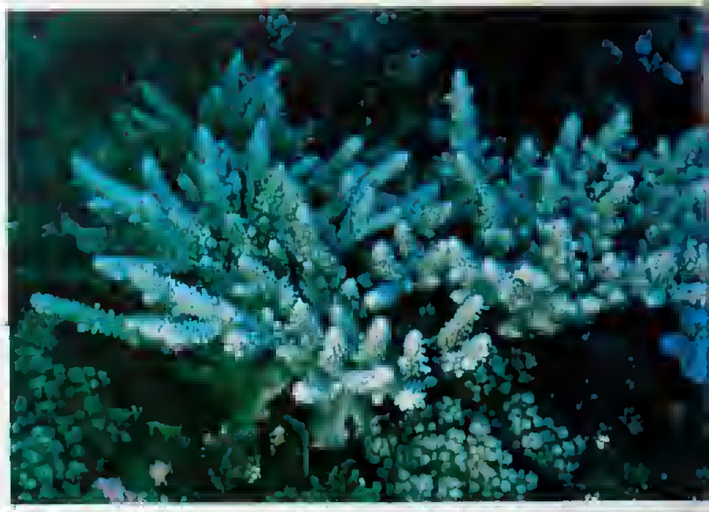
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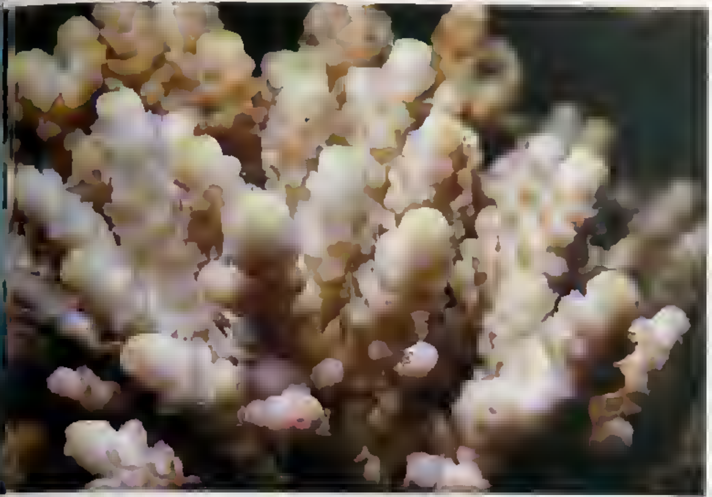
Fig. 1163▲


Fig. 1164▲



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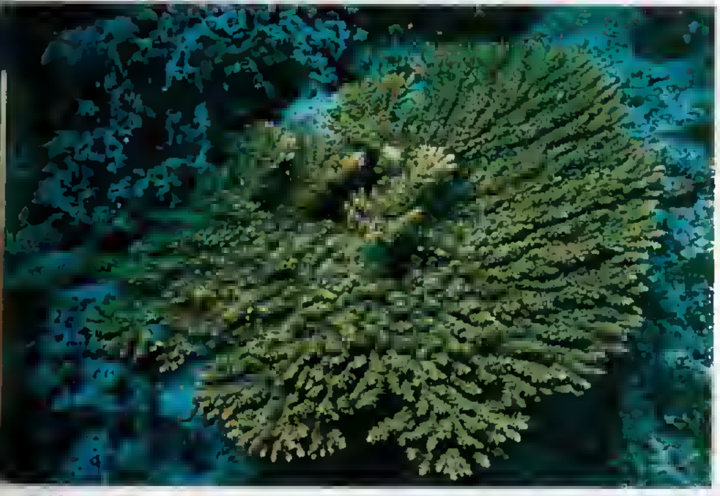

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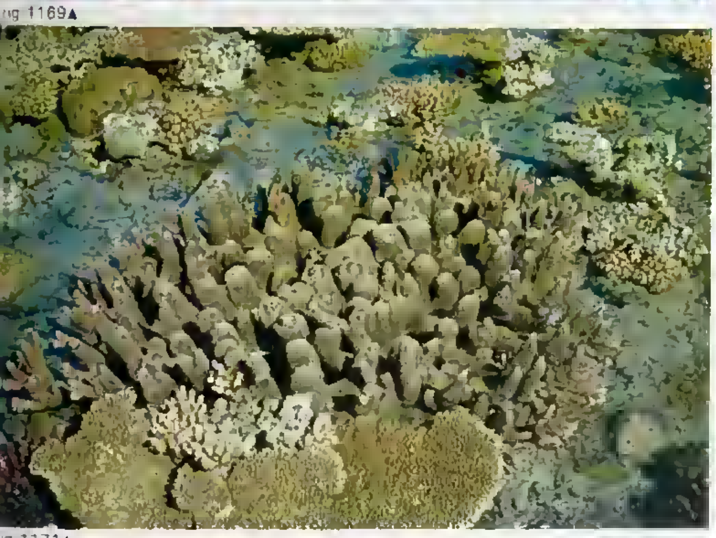
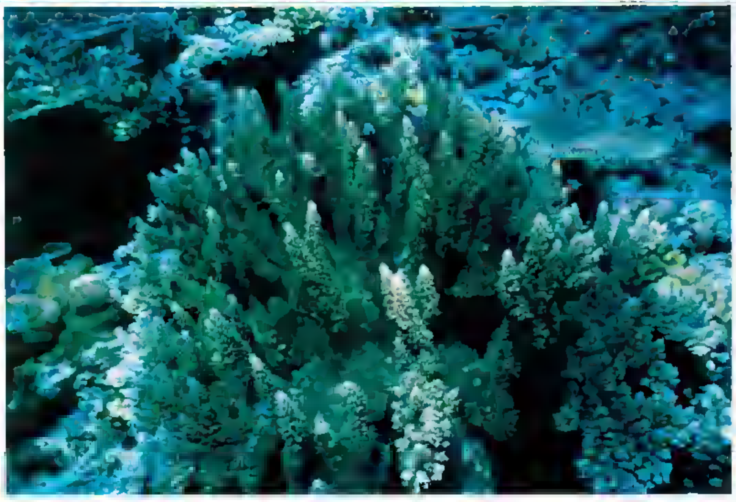


Fig. 1171▲

Fig. 1172▲


Fig. 1173▲


Fig. 1174▲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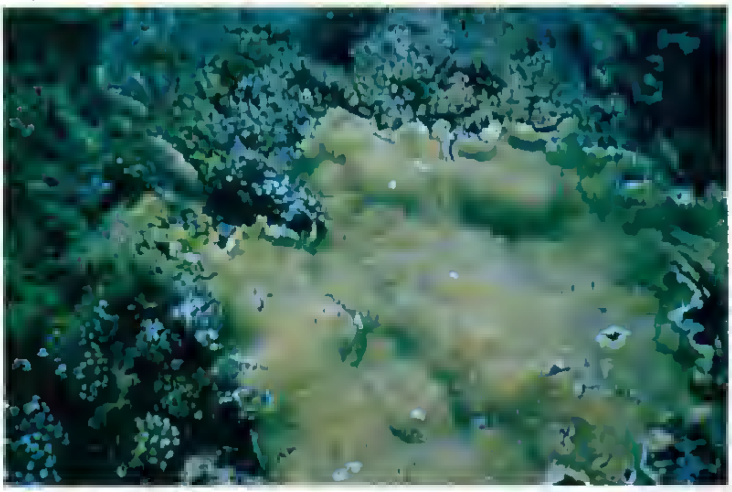
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Fig. 1179▲


Fig. 1180▲

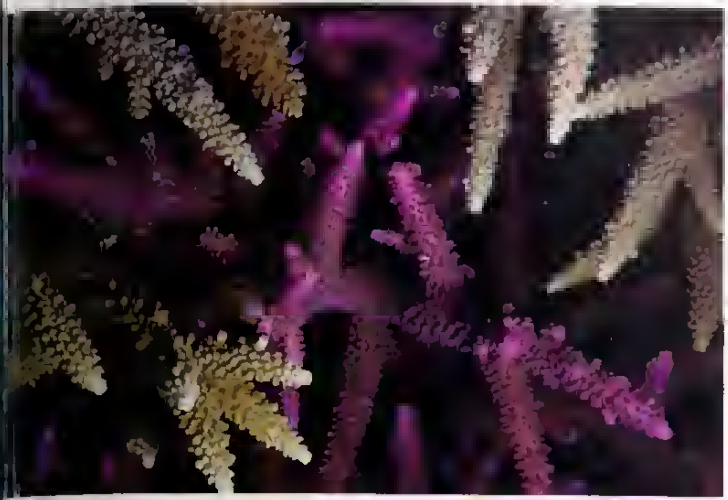
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Fig. 1184▲


Fig. 1185▲


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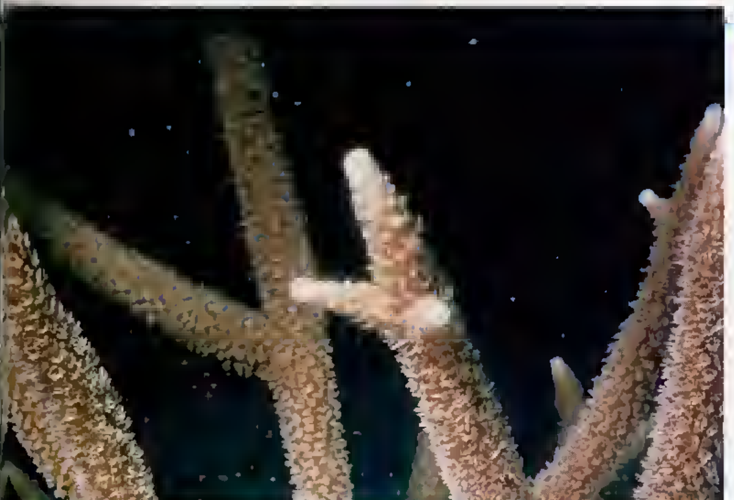
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Fig. 1189▲


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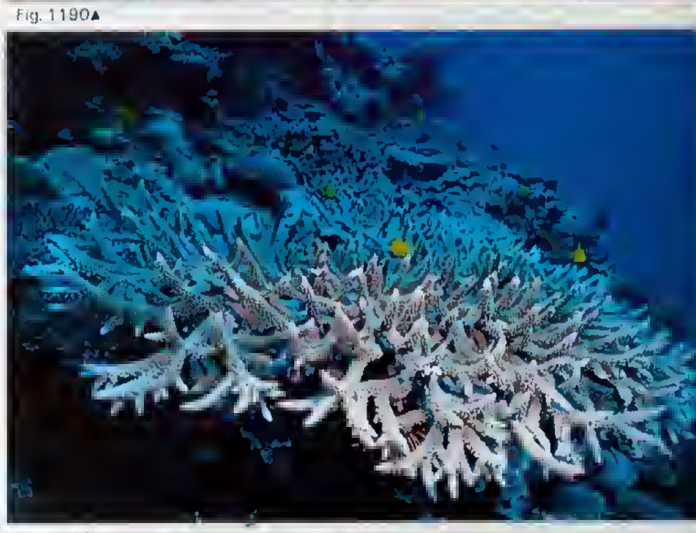
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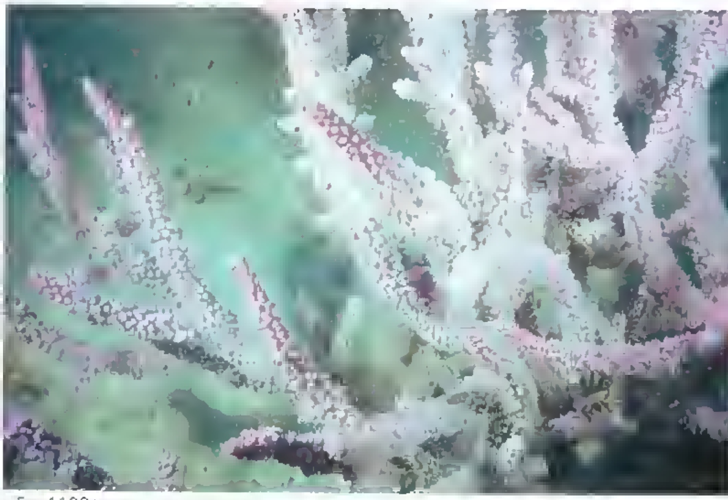
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Fig. 1200▲


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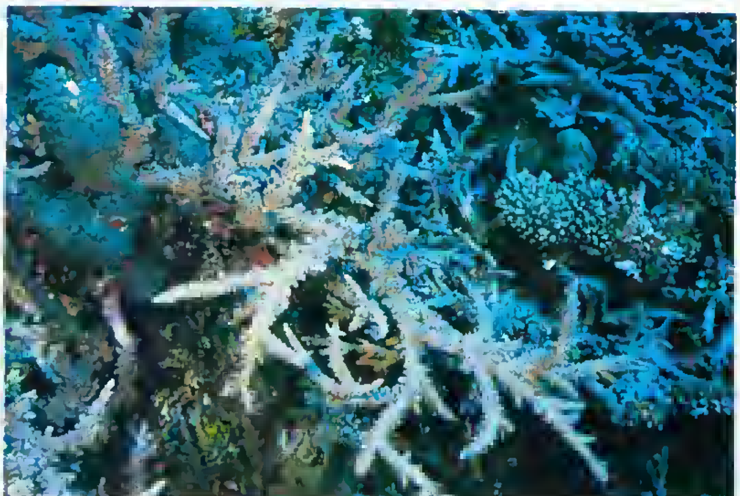
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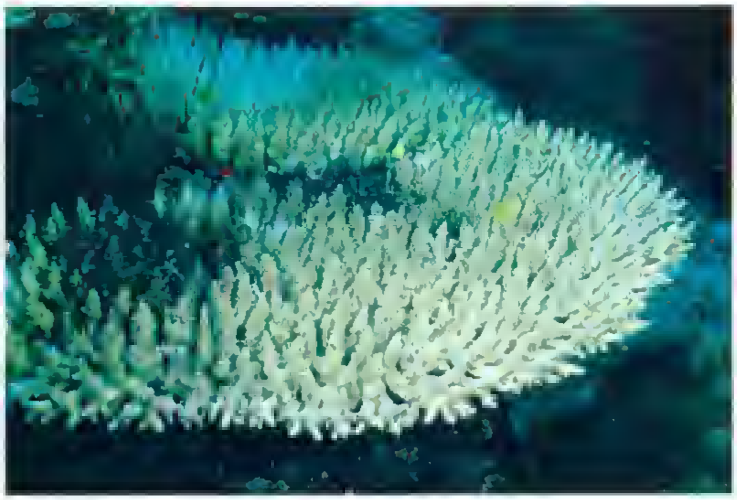
Fig. 1215▲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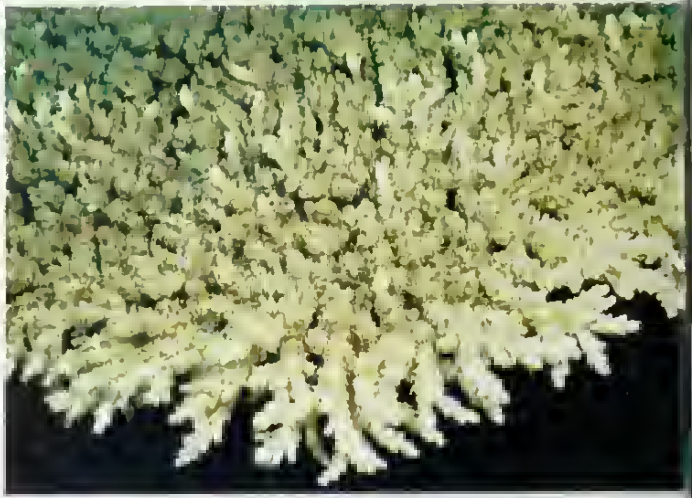
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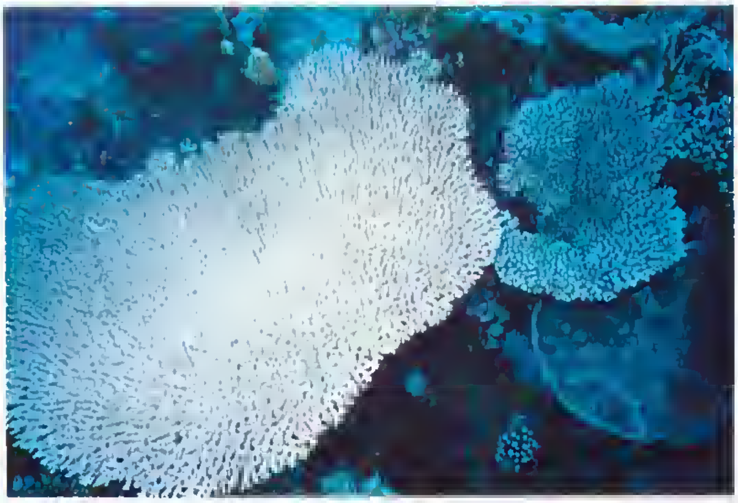
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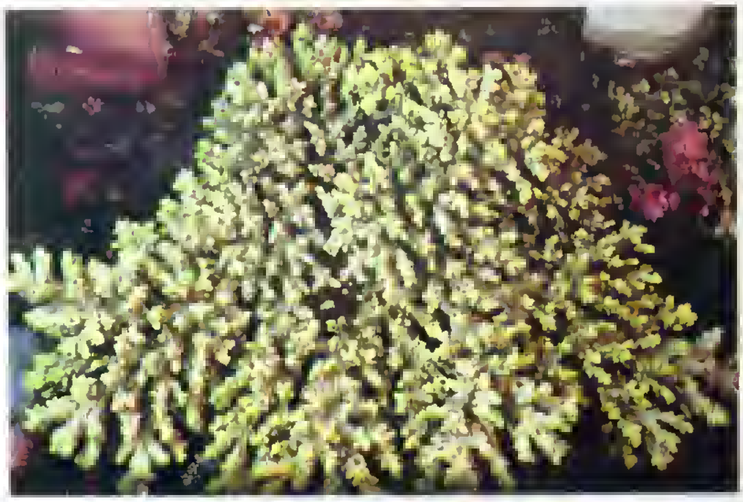
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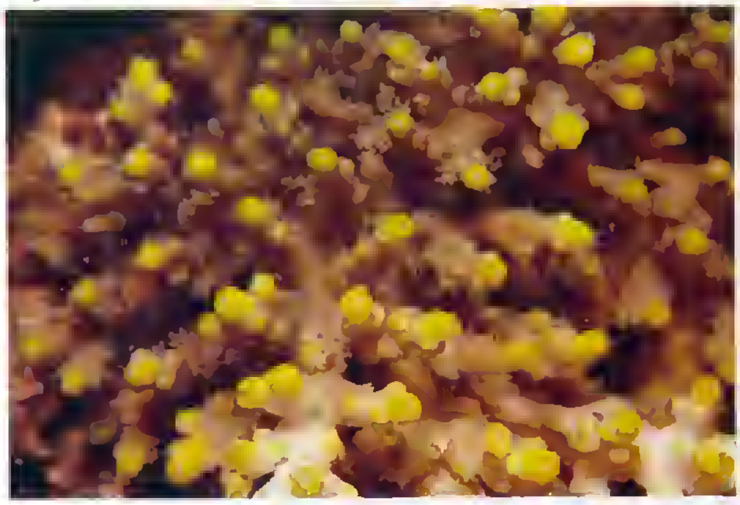
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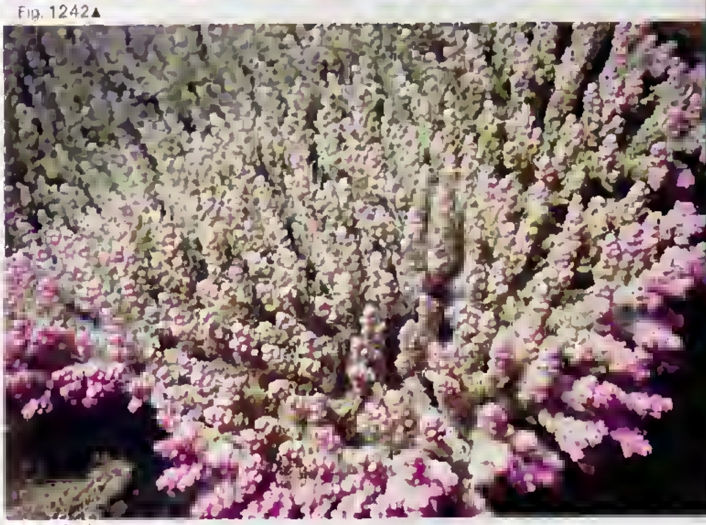
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Fig. 1254▲

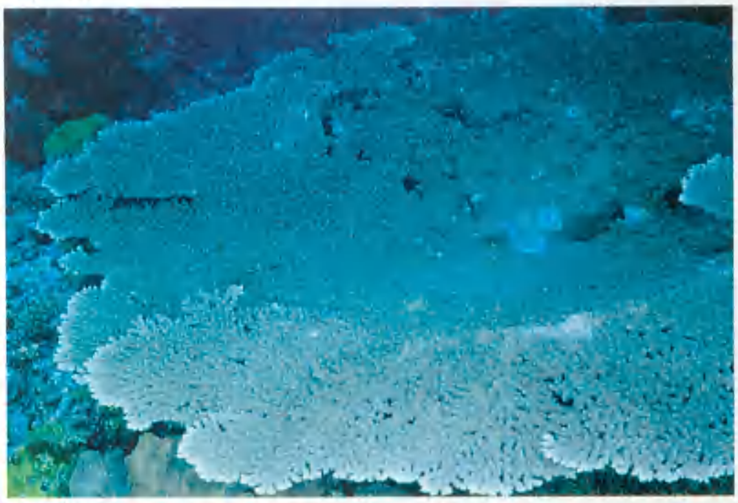
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Fig. 1263▲

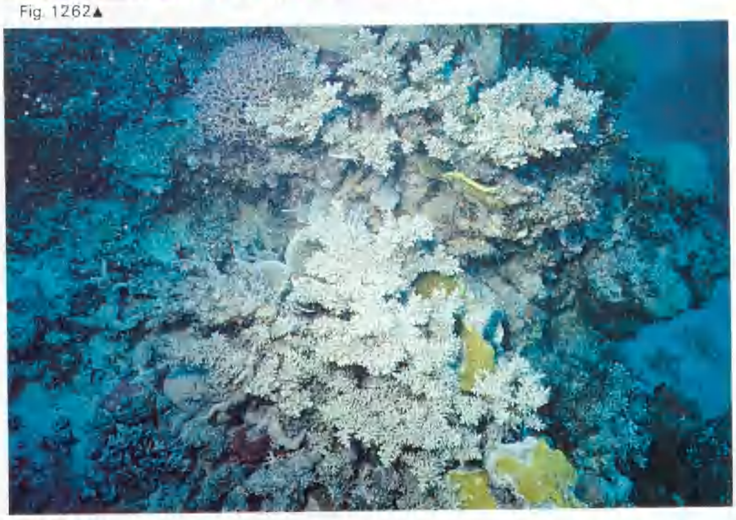
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Fig 1270▲


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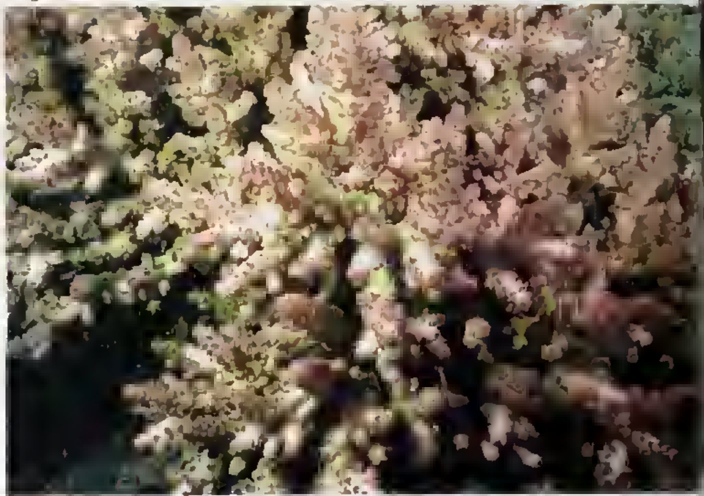
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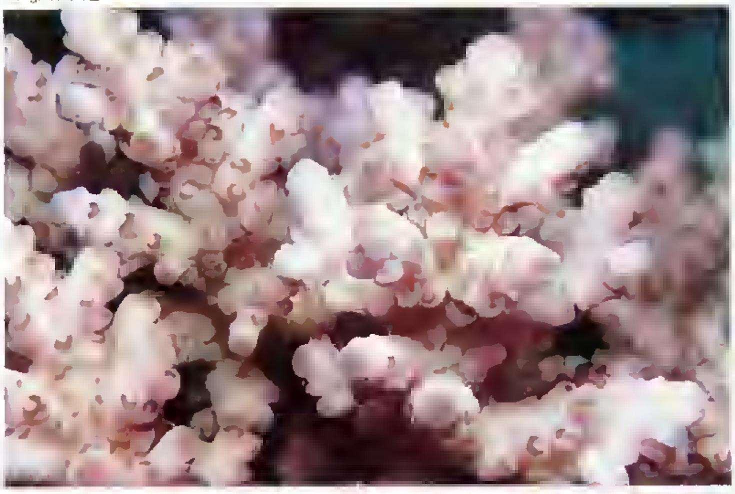
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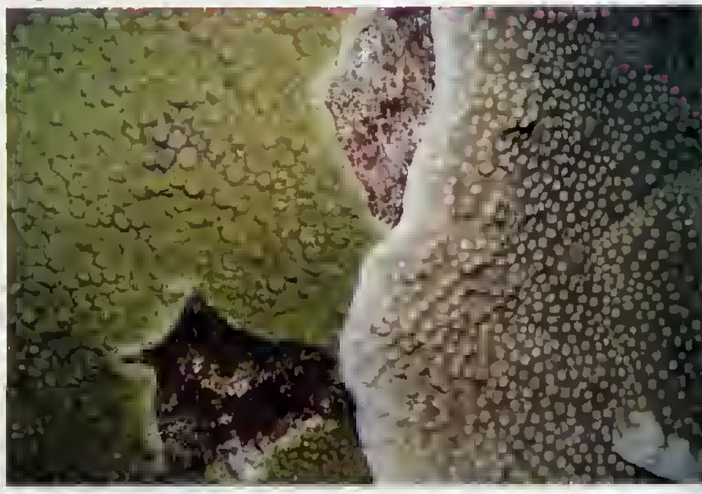

Fig. 1290▲

Fig. 1291▲

Fig. 1292▲

IV
Acknowledgments

The authors gratefully acknowledge the assistance of Mr Ed Lovell in all aspects of this study including field and laboratory work, computer data processing, electron microscopy and, unless otherwise indicated, all underwater photography.

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Addendum

Registration numbers of type specimens of species described in *Scleractinia of Eastern Australia* and deposited in the Queensland Museum (QM) and the British Museum (Natural History) (BMNH) are as follows.

	Holotype BMNH	Paratype QM
Part I		
Madracis kirbyi	1975.8.28.1	G 8980
Part II		
Favia maxima	1977.1.1.1	GL 4141
Favia lizardensis	1977.1.1.2	GL 4142
Favites rotundata	1977.1.1.6	GL 4143
Favites bennettae	1977.1.1.3	GL 4144
Australogyra zelli (=*Platygyra zelli*)	1977.1.1.4	GL 4145
Leptastrea bewickensis	1977.1.1.5	GL 4146
Part III		
Coscinaraea wellsi	(USNM 44818)	
Coscinaraea crassa	1983.9.27.1	GL 4147
Clavarina triangularis	1983.9.27.2	GL 4148
Echinophyllia orpheensis	1983.9.27.3	GL 4149
Echinophyllia echinoporoides	1983.9.27.4	GL 4150
Euphyllia divisa	1983.9.27.5	GL 4151
Euphyllia ancora	1983.9.27.6	GL 4152
Part IV		
Goniopora norfolkensis	1983.9.27.7	GL 4153
Goniopora pandoraensis	1983.9.27.8	GL 4154
Goniopora eclipsensis	1983.9.27.9	GL 4155
Goniopora palmensis	1983.9.27.10	GL 4156
Alveopora marionensis	1983.9.27.11	GL 4157
Acanthastrea lordhowensis	1983.9.27.12	
Part V	**QM**	**BMNH**
Montipora turtlensis	GL 4158	1983.9.27.13
Montipora corbettensis	GL 4159	1983.9.27.14
Anacropora reticulata	GL 4160	1983.9.27.15
Acropora bushyensis	GL 4161	1983.9.27.16
Acropora verweyi	GL 4162	1983.9.27.17
Acropora lovelli	GL 4163	1983.9.27.18

	QM	BMNH
Acropora kirstyae	GL4164	1983.9.27.19
Acropora donei	GL4165	1983.9.27.20
Acropora yongei	GL4166	1983.9.27.21
Acropora azurea	GL4167	1983.9.27.22
Acropora solitaryensis	GL4168	1983.9.27.23
Acropora chesterfieldensis	GL4169	1983.9.27.24
Acropora willisae	GL4170	1983.9.27.25
Astreopora moretonensis	GL4171	1983.9.27.26
Astreopora macrostoma	GL4172	1983.9.27.27

V
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Montipora and *Acropora* nominal species are listed in Tables 1 (p. 9) and 2 (p. 134) respectively.