

ORDER ZOANTHIDEA

The Zoanthidea, an order of Zoantharia (Hexacorallia), are solitary or colonial anemone-like anthozoans. Like the actinians, zoanthids (with the apparent exception of the imperfectly known *Gerardia*) do not secrete a skeleton but many of them incorporate local sediment into the mesogloea during growth, giving support and protection to the zooids (Figs. 15.1, 2). Alternatively the mesogloea may be considerably thickened to give significant support within a polyp. In *Palythoa* the polyps are almost immersed in the well developed, particle impregnated coenenchyme (Fig. 15.6). Zoanthids are abundant in tropical areas, usually occurring in distinct zones such as back-reef flats, lagoon floors, reef crests and the shallow sublittoral. Within a particular area of a reef, a species may be prolific and occupy up to 90% of the available substrate (Fig. 17.24). Many species have symbiotic zooxanthellae in the endoderm and/or the ectoderm, but their exact role in the zoanthid metabolism is not known. Some (*Isaurus*, *Sphenopus*) are presumed to feed actively at night whereas others (e.g. some *Protopalychtha*) seem to open in response to the intensity of incident light. Asexual replication is very common among reef-dwelling species and may result either in colonies up to 1 metre in diameter or in extensive areas dominated by a single clone. Sexual reproduction is undertaken to a varying degree by all species though no studies have yet been made in the Great Barrier Reef Province. *Epizoanthus* (Fig. 17.23) are single-sexed and are prolific breeders. In shallow water, zoanthid colonies with hermaphrodite zooids have also been found, mesenteries bearing either spermaries and ovarian tissue separately or simultaneously. Zoanthid identification is difficult owing to the plasticity of colony morphology, the lack of a skeleton. However, the synopsis provided below should allow easy identification to genus, though histological sectioning of material is usually necessary. Numbers in parenthesis relate to Figs. 15-17.

SYNOPSIS OF FAMILIES AND GENERA

I. Mesenteries brachycnemic*; imperfect mesenteries comparatively well developed (15.3).

A. With mesogloeaal sphincter ZOANTHIDAE

1. Solitary; siphonoglyph developed into a hyposulcus (15.3) *Sphenopus*

2. Colonial or grouped (rarely solitary); no hyposulcus.

a. Sphincter muscle in two parts (15.4); zooids not sand encrusted *Zoanthus*

b. Sphincter muscle single (15.1,5).

i. Mesenteries meeting in basal part of column as meshwork; not sand encrusted; sphincter muscle well developed, more than 75% width of mesogloea (15.5); usually 40-42 mesenteries; mesogloea with endodermal involutions; zooids markedly asymmetric when contracted *Isaurus*

ii. Mesenteries not meeting as meshwork; sand encrusted

a. Zooids immersed in well developed coenenchyme (15.6;16.6;17); mesenteries few (frequently 15-20) *Palythoa*

b. Zooids more or less separated (16.11-15); mesenteries numerous (often 60 or more). *Protopalychtha*

B. With endodermal sphincter NEOZOANTHIDAE, ***Neozoanthus*

II. Mesenteries macrocnemic*; imperfect mesenteries very small (15.2).

A. With mesogloeaal sphincter EPIZOANTHIDAE

1. With canals and lacunae in the mesogloea *Epizoanthus*

2. No canals and lacunae ***Thoracactus*

B. With endodermal sphincter PARAZOANTHIDAE

1. Without axial skeleton

a. With well developed canal system including "ring canal" *Parazoanthus*

b. Poorly developed canal system and no "ring canal" ***Isozoanthus*

2. With an axial skeleton ***Gerardia*

*Fifth mesentery on each side (starting from dorsal directive) imperfect in brachycnemic and perfect in macrocnemic zooids

**not further discussed here

To date no survey has been made of the Heron Island fauna but a limited amount of information is available on various areas of the Great Barrier Reef province. Carlgren (1937, 1951) described several species of *Palythoa*, *Protopalychtha* (as *Palythoa*) and *Zoanthus* from New South Wales and Queensland, whilst Haddon and Shackleton (1891) described species of *Zoanthus*, *Isaurus*, *Protopalychtha* (as *Gemmaria*), *Palythoa* and *Parazoanthus* from the Torres Straits. Unfortunately these

accounts included very few field data or observations. The following information is intended as a guide to the usual appearance and habitats of the main zoanthid genera in western South Pacific coral reef ecosystems.

Palythoa colonies often dominate the reef flat area immediately behind the reef crest (17.24). The polyps are immersed in particle impregnated coenenchyme (16.16,17) giving an overall buff or pale yellow appearance, although the polyps themselves are often darker. Colonies are often convex in shape and rarely exceed 30 cm diameter. Decalcification is essential before histological examination can be made. *Palythoa* may also occur in permanently submerged areas such as the lagoon floor or in the spur and groove channels of the reef slope.

Protopalythoa (formerly *Gemmaria*), which has sometimes been merged with *Palythoa*, occurs most familiarly as densely packed colonies of non-immersed or unconnected polyps in shallow fore-reef, reef crest or outer reef flat areas (16.11,14,15). Small clumps of polyps and separate individuals of other species (16.12,13) are found sublittorally in inter-reef situations. The polyps are particle-incrusted and the apparent colour is usually that of the oral disc, often dark green or brown; the tentacles may be very short. Decalcification is essential before polyps can be examined histologically. The number of mesenteries is usually high, often exceeding 60. Individual polyps are often incapable of closing completely due to the width of the oral disc. Substantial shallow water reef areas may be dominated by members of this genus and cover may exceed 90%.

Zoanthus also replicates asexually to a considerable degree and may form extremely large colonies (up to 1 m diameter). Species of this genus are found from back reef areas to the shallow sub-littoral, although zonation of different species is evident. *Zoanthus* spp. are almost invariably brightly coloured, disc and tentacles often strongly contrasted (17.19,20). Several different colourmorphs of a species may be found neighbouring each other. Species living in wave exposed situations may form rubbery mats in which the coenenchyme bet-

ween polyps is thick, though obscured from view when the polyps are open. Some back-reef forms are attached below the level of the sand and only the oral disc protrudes when the polyp is open (17.18,19). The disc may be variegated and the mouth is often a different colour from the remainder. No sediment is incorporated during growth, making sectioning comparatively easy. Identification can be confirmed histologically by the presence of a divided sphincter muscle, such as in *Zoanthus pacificus* (15.4).

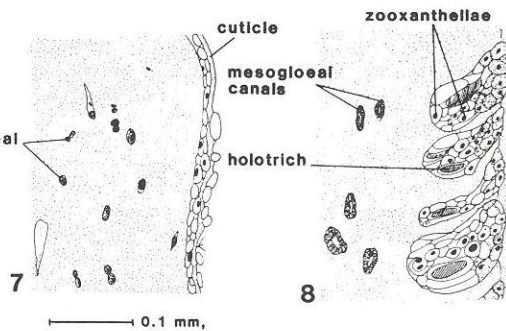
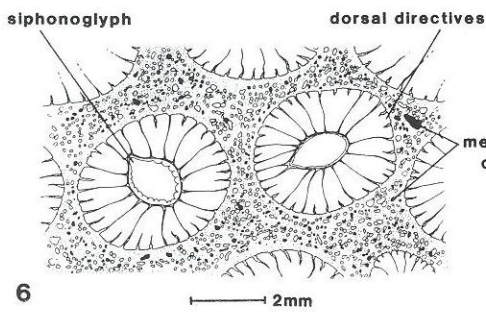
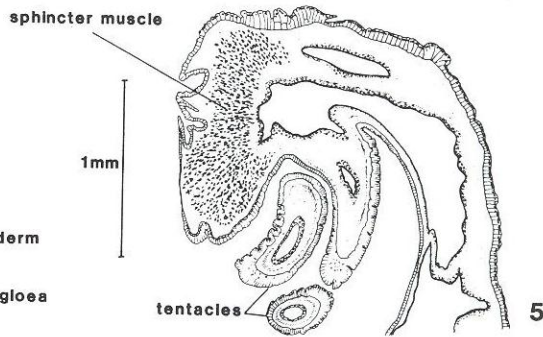
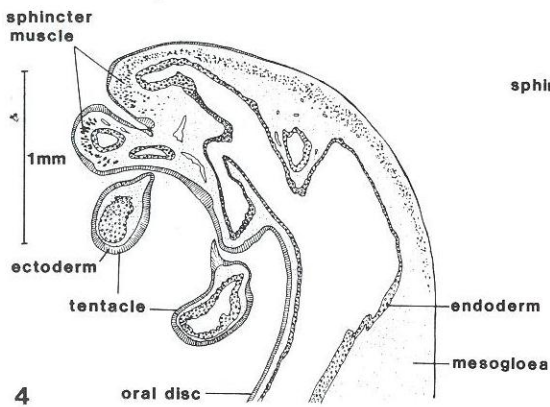
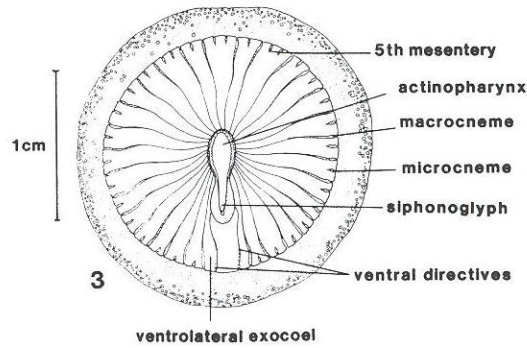
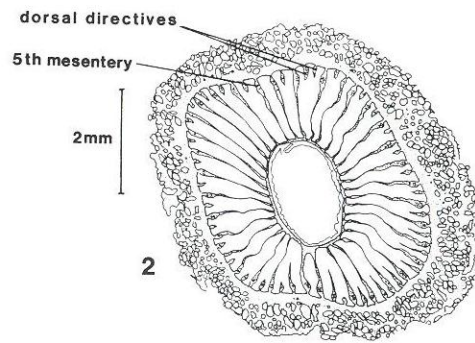
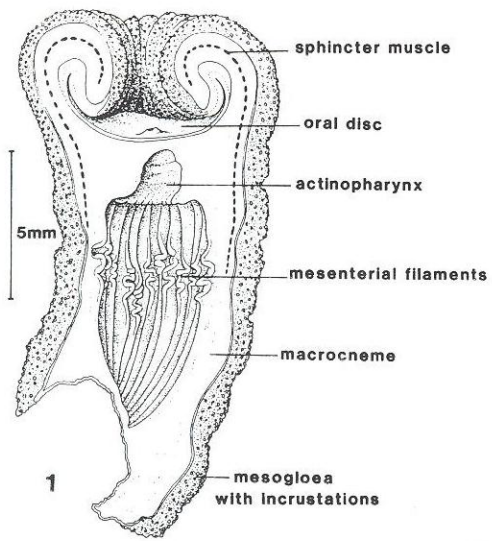
Isaurus is another genus known from the Great Barrier Reef. Unlike the three so far discussed it contains only a few species. The most common of these, *Isaurus tuberculatus* (17.21), is pantropical in distribution and occurs in exposed areas from in front to behind the reef crest. It also extends into the sublittoral where the body form becomes more elongate. In its usual reef crest habitat, polyps open only at night; during the day appearing as small (1-4 cm) asymmetric polyps lying close to the substratum.

Epizoanthus species may be found, usually encrusting sponges and hydroids (17.22,25), though occasionally on bare rock, from the intertidal or reef slope areas. In such cases the colonies are stoloniferous and the individual polyps frequently very small. *Epizoanthus* species do not all contain zooxanthellae: those that do not are encountered in deeper water than the species of genera previously mentioned. When hard substrates become less common, *Epizoanthus* usually live commensally with pagurids (17.23) and form characteristic, easily recognisable carinoecia. These are known from depths of 20-4300m and may be taken during dredging.

The remaining zoanthid genera are less obvious in reef areas and consequently records are scarce. *Sphenopus* (16.9,10) is a truly solitary form and is known from sandy inter-reef areas near Magnetic Island (and also from Moreton Bay). It seems likely that it will be present throughout much of the Great Barrier Reef province. *Parazoanthus* species are known from tropical areas but the polyps and entire colonies are small, occurring mainly on sponges and gorgonians sublittorally (17.26).

Fig.15, ZCANTHIDEA: 1, Semidiagrammatic longitudinal section through polyp of *Protopalythoa australiensis* to show basic zoanthid structure; 2, Transverse section through a typical macrocyclic zoanthid; 3, T.S. through *Sphenopus marsupialis* showing the brachynermic arrangement of mesenteries and the large siphonoglyph; 4, L.S. through part of crown of *Zoanthus pacificus*, showing the characteristic, divided mesogloal sphincter; 5, L.S. through part of crown of *Isaurus tuberculatus* showing the well developed, undivided mesogloal sphincter; 6, T.S. through *Palythoa caesia*. The polyps are sectioned at the level of the actinopharynx and show the brachynermic mesentery arrangement. Mesogloal canals are distributed throughout the common mesogloea; 7, Section through the continuous ectoderm of *Zoanthus pacificus*, showing the outer cuticle with adherent foreign particles; 8, Section through the divided ectoderm of *Isaurus tuberculatus*, showing pigmented peripheral cells, zooxanthellae and nematocysts (holotrichs) within each unit of the ectoderm.

Mesogloea is indicated by light stipple.
Scale lines refer to fixed material.



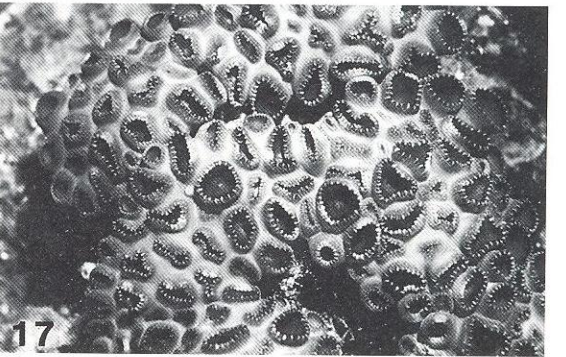
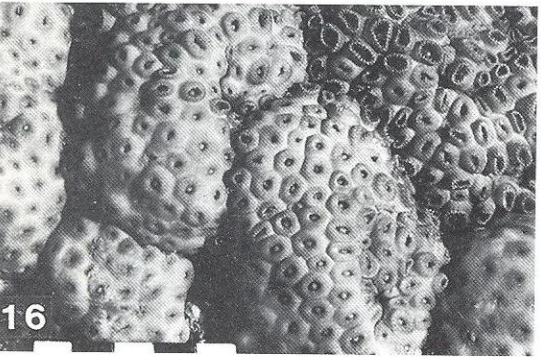
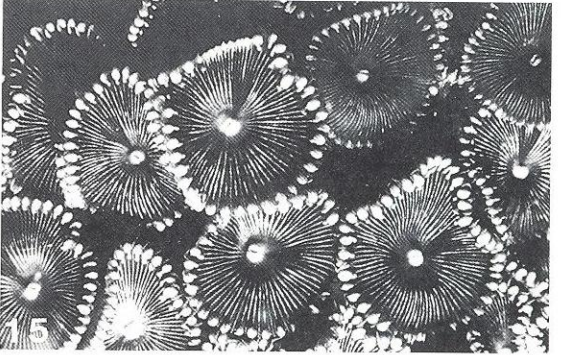
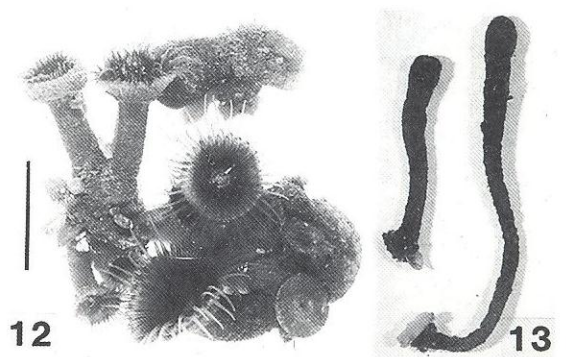
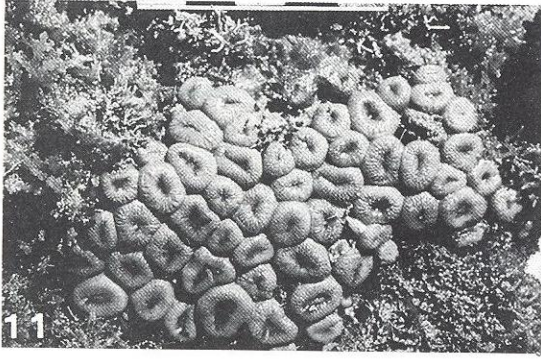
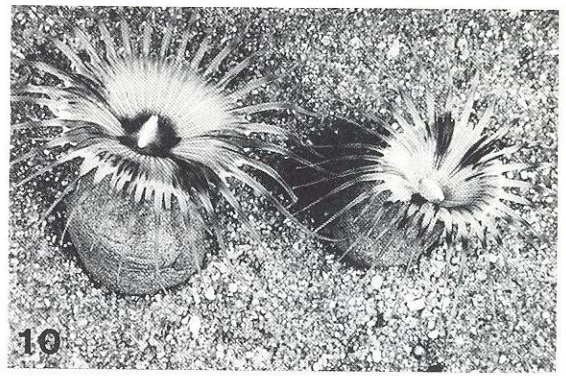
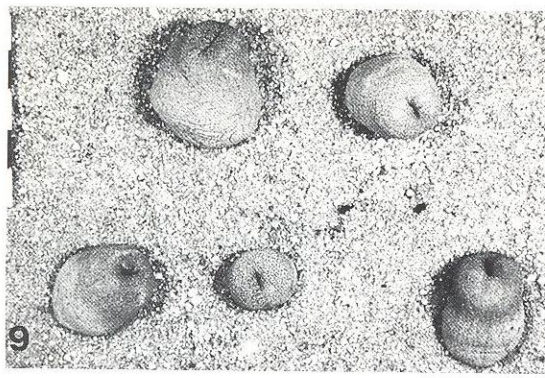


Fig.16. ZOANTHIDEA: 9, *Sphenopus mareupialis* (scale = 5cm); 10, *Sphenopus*, upper two from 9, open at night; 11, *Protopalychtha australiensis* (scale = 5cm); 12, *Protopalychtha* sp. clusters on forams *Marginopora* (scale = 25mm); 13, *Protopalychtha* sp. (length of shorter zooid = 25mm); 14, *Protopalychtha* sp., clone with polyps contracted (photo width = 85mm); 15, *Protopalychtha* as 14, polyps open under water; 16, *Palythoa caesia* (scale = 5cm); 17, *Palythoa caesia* as 16, polyps open under water. With one exception (14,15, not yet recorded from Australian waters) the species figured occur on the Great Barrier Reef and probably in the Capricorn and Bunker Groups. Specimens photographed are from Magnetic Island (9,12,13), Cape Ferguson (11), Fiji (14-17).

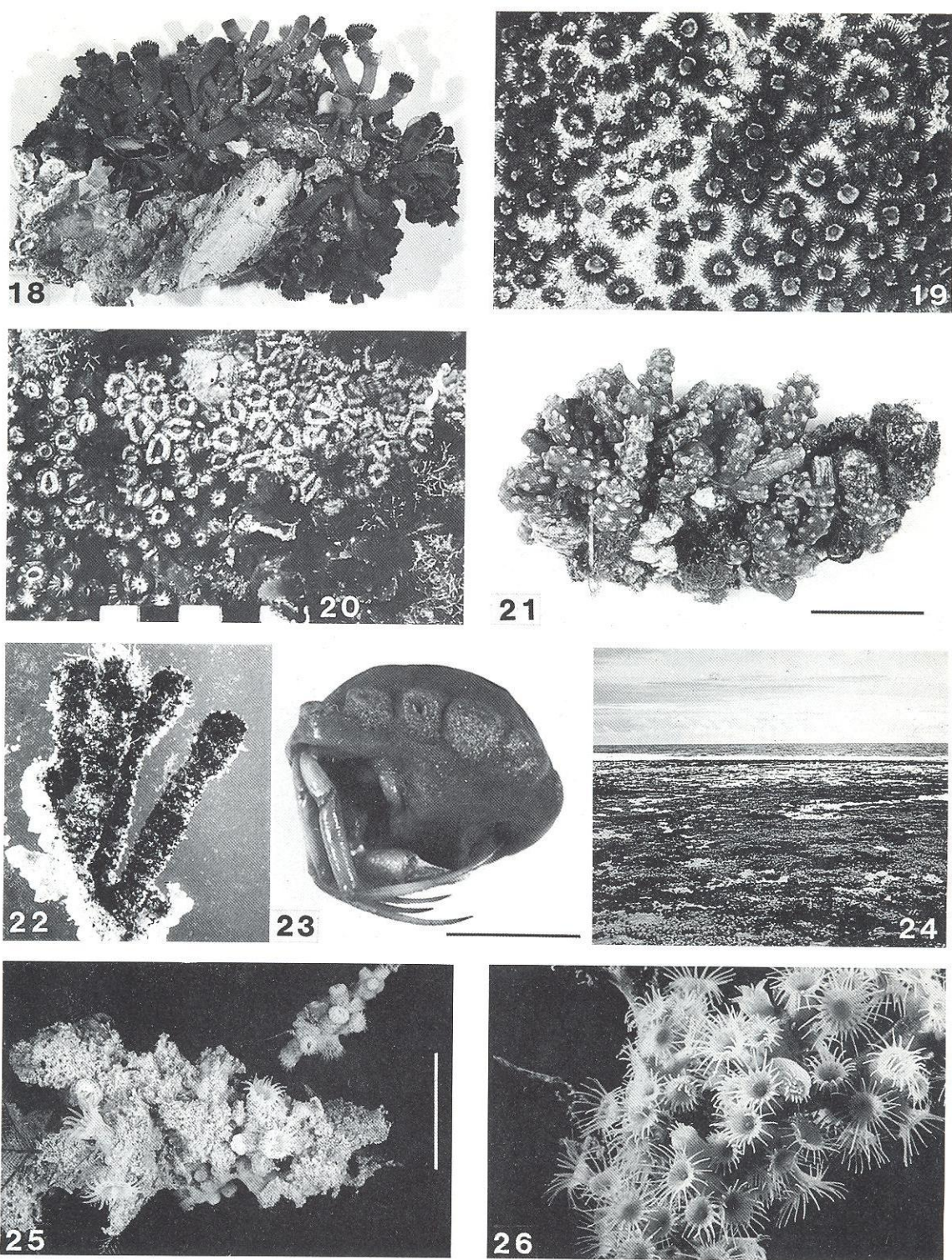


Fig.17, ZOANTHIDEA: 18, *Zoanthus* sp. as 19; 19, *Zoanthus* as 18, discs opening through intertidal sand; 20, *Zoanthus pacificus* (scale bar = 5cm); 21, *Isaurus tuberculatus* (scale bar = 25mm); 22, *Epizoanthus* sp. on intertidal sponge (length of R Zooid = 11mm); 23, *Epizoanthus* sp. carcioecium with *Parapagurus pilosimanus* (scale bar = 20mm); 24, Reef flat with *Palythoa caesia*; 25, *Epizoanthus* on *Lytocarpus philippinus* (scale bar = 10mm); 26, *Parazoanthus axinellae*. *Parazoanthus axinellae* (26) is from Europe and is reproduced here to show generic characteristics. With one exception (18,19 not yet recorded in Australian waters), the other species figured occur in the Great Barrier Reef and probably in the Bunker and Capricorn Groups. Specimens photographed are from Fiji (19-21, 24), Cape Ferguson (22), Danger Point (23), Magnetic I. (25).