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The Marine Fauna of New Zealand : Bryozoa : Gymnolaemata from the Kermadec Ridge

by

D.P. GORDON

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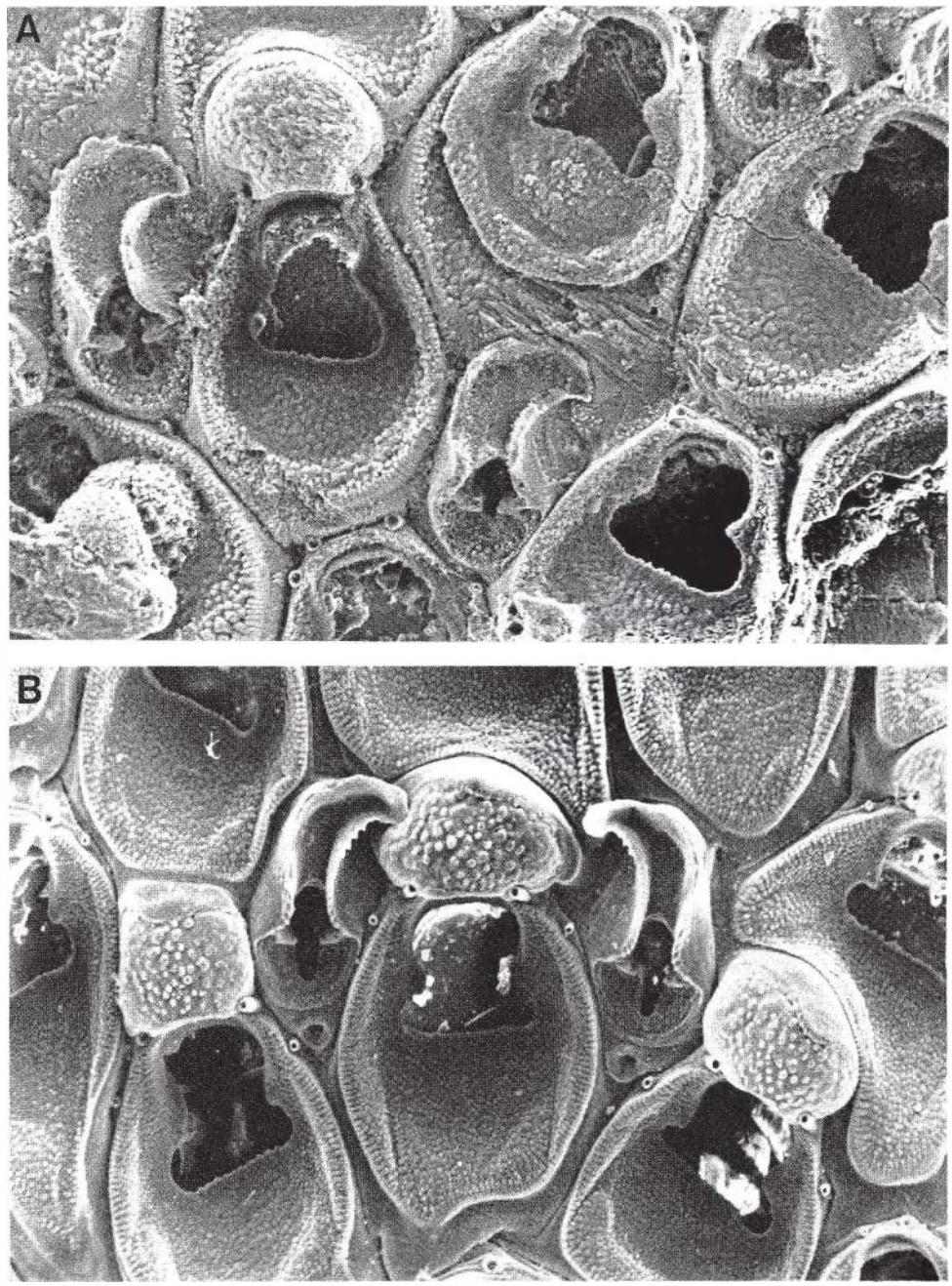
THE MARINE FAUNA OF NEW ZEALAND : BRYOZOA : GYMNOLAEMATA FROM THE KERMADEC RIDGE

Fig. 1



FRONTISPIECE. A,B, *Amphiblestrum hastingsae* Brown, type-species of *Onychoblestrum* n.gen., hitherto known only from the Oligocene of the South Island: A, from Kakanui greensand (MacDonald Limestone) near Oamaru, Lower Oligocene; B, from near Curtis Island, Kermadec Ridge, Recent.

NEW ZEALAND
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

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The Marine Fauna of New Zealand : Bryozoa : Gymnolaemata from the Kermadec Ridge

by

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ABSTRACT

Bryozoans of the orders Ctenostomata and Cheilostomata from the Kermadec Ridge have been studied and 202 species and subspecies described of which 65 are new. Two new families in the Cheilostomata – Quadricellariidae and Petalostegidae – are recognised, based on existing genera. Five new genera – *Onychoblestrum* (Calloporidae), *Brettiella* (Bugulidae), *Briarachnia* (Arachnopusiidae), *Elleschara* (Exochellidae), and *Tenthrenulina* (Microporellidae) – are also described and two new subgenera are introduced.

The genus *Galeopsis* Jullien is herein recognised to be a senior synonym of *Diatosula* Canu & Bassler and *Spiroporina sensu* Brown and assigned to the Celleporidae. *Buffonellaria* Canu & Bassler is also included in this family. *Lepraliella* Levinsen is considered to include *Hippoporella* Canu & Bassler and, with *Cleidochasma* Harmer, is incorporated in the Sertellidae. The genus *Catenicella* de Blainville is shown to be valid over *Vittaticella* Maplestone and *Caloporella* MacGillivray.

Based on the relatively high diversity of Kermadec Ridge material it has seemed appropriate to recognise within the suborder Ascophora a number of superfamilies. These are the Cribrilinoidea, Arachnopusioidea, Umbonuloidea, and Schizoporelloidea (based on the same or similar groupings of other authors) and Catenicelloidea, Hippothoöidea and Celleporoidea (which represent new combinations).

Keywords : Bryozoa, Gymnolaemata, Ctenostomata, Cheilostomata, classification, new superfamilies, new families, new genera, new species, marine fauna, New Zealand, Kermadec Ridge.

INTRODUCTION

The phylum Bryozoa is abundantly represented around the coasts of New Zealand. While numerous species occur intertidally, even larger numbers of species may be found in shallow coastal waters to the edge of the continental shelf. Notwithstanding their commonness, bryozoans are often overlooked or

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ignored by layman and biologist alike, primarily because colonies are generally not conspicuous or spectacular and encrusting forms have a general sameness of appearance, especially when dried.

In species diversity the phylum Bryozoa is of medium size, with over 4,000 extant species and around 15,000 preserved as fossils (Ryland 1970). The phylum's greatest abundance and diversity is found in shallow coastal waters of the western Indo-Pacific (East and South-east Asia to the Indian Ocean) with significant numbers of species having been recorded also from Mexico, Western Europe, south-east Australia and polar regions (Okada and Mawatari 1958; Kluge 1962, 1975; Schopf 1970).

Bryozoans were first described from the New Zealand region as early as 1843 by J.E. Gray of the British Museum (Natural History) in an appendix to Dieffenbach's "Travels in New Zealand". From that time papers on marine Bryozoa have appeared sporadically to the present day, with five larger works contributing most to our present knowledge of the fauna. These are Hutton's (1873, 1904) lists of New Zealand Bryozoa in "Catalogue of the Marine Mollusca of New Zealand" and "Index Faunae Novaezelandiae", Brown's (1952) "The Tertiary Cheilostomatous Polyzoa of New Zealand", Powell's (1967a) account of ascophorans from northern New Zealand (Three Kings area) and Uttley and Bullivant's (1972) account of Chatham Rise cheilostomes. A comprehensive history of bryozoan studies in the New Zealand region is given by Whitten (1979).

No checklist of marine Bryozoa has been published since Hutton's (1904) "Index Faunae Novaezelandiae", but an estimate of the number of species in the New Zealand region can be made by adding the species cited in all publications. Hence, the works of Hutton, Brown, Powell, and Uttley and Bullivant (loc. cit.), after correction for synonymies, account for 268 species. Other publications add 110 species and this memoir a further 112. From my own personal unpublished records and Whitten's (1979) thesis another 182 species may be added, bringing the total number of marine bryozoan species in the New Zealand region to 672. This is conservative, of course. The bryozoan fauna of much of New Zealand, especially the southern submarine plateaus and ridges and the deep sea is poorly known.

This figure of 672 species gives at least an indication of the high diversity of the New Zealand region as compared to other areas of known high diversity. Thus Harmer (1915, 1926, 1934, 1957) dealt with some 510 species and subspecies from the Indonesian region but. using the combined figures of Harmer (loc. cit.) and Okada and Mawatari (1958) for their "Malayan" province, it is possible to compare the number of species for a span of latitude comparable to that of the New Zealand region (about 30°). Adding. then. the 108 new species of Harmer's (1957) work to the 617 species of Okada and Mawatari gives some 725 species for the Philippine-Indonesian area compared to 672 for the New Zealand region. Allowing that both of these figures are conservative, and accounting for an expected lesser diversity in New Zealand's temperate waters, one may predict that the total number of marine bryozoan species in the New Zealand region may be around 800.

This report deals with 202 species and subspecies of gymnolaemates from the Kermadec Ridge, of which 65 species are new. About 33 species of stenolaemate Bryozoa are not included because the paucity of material in some instances precludes proper systematic treatment.

Every species (except for the non-calcareous ctenostomes) is illustrated by one or more scanning electron micrographs. This is highly desirable for, although 126 species have previously been described, the descriptions are scattered throughout the literature and are not always accompanied by good illustrations. For the larger works dealing with New Zealand bryozoans previously mentioned, Hutton included no illustrations; Brown did, but they are rather stylised; and Uttley and Bullivant included only photographs, many of which have little information content. Powell's (1967a) stippled drawings and photographs are generally very good but some are equivocal for positive identifications, especially where a New Zealand species is attributed the name of a common European species and fine details are needed for careful comparison. Many of the Kermadec species here illustrated are common along the coasts of mainland New Zealand and so illustration of them by SEM will be of more general value.

The plates are arranged in the order in which species are dealt with in the text, i.e., in taxonomic sequences approximating trends in morphological complexity (*see* section on Classification). Excellent introductory accounts of bryozoan structure are given by Ryland and Hayward (1977) and Hayward and Ryland (1979) in the *Linnean Society Synopses of the British Fauna*. For this reason a parallel account is not given here.

ENVIRONMENT

The Kermadec Ridge is a narrow north-east-trending zone of continental crust. It lies adjacent to a deep trench exceeding 10.000 m in depth and constitutes an active volcanic arc associated with tectonic processes at

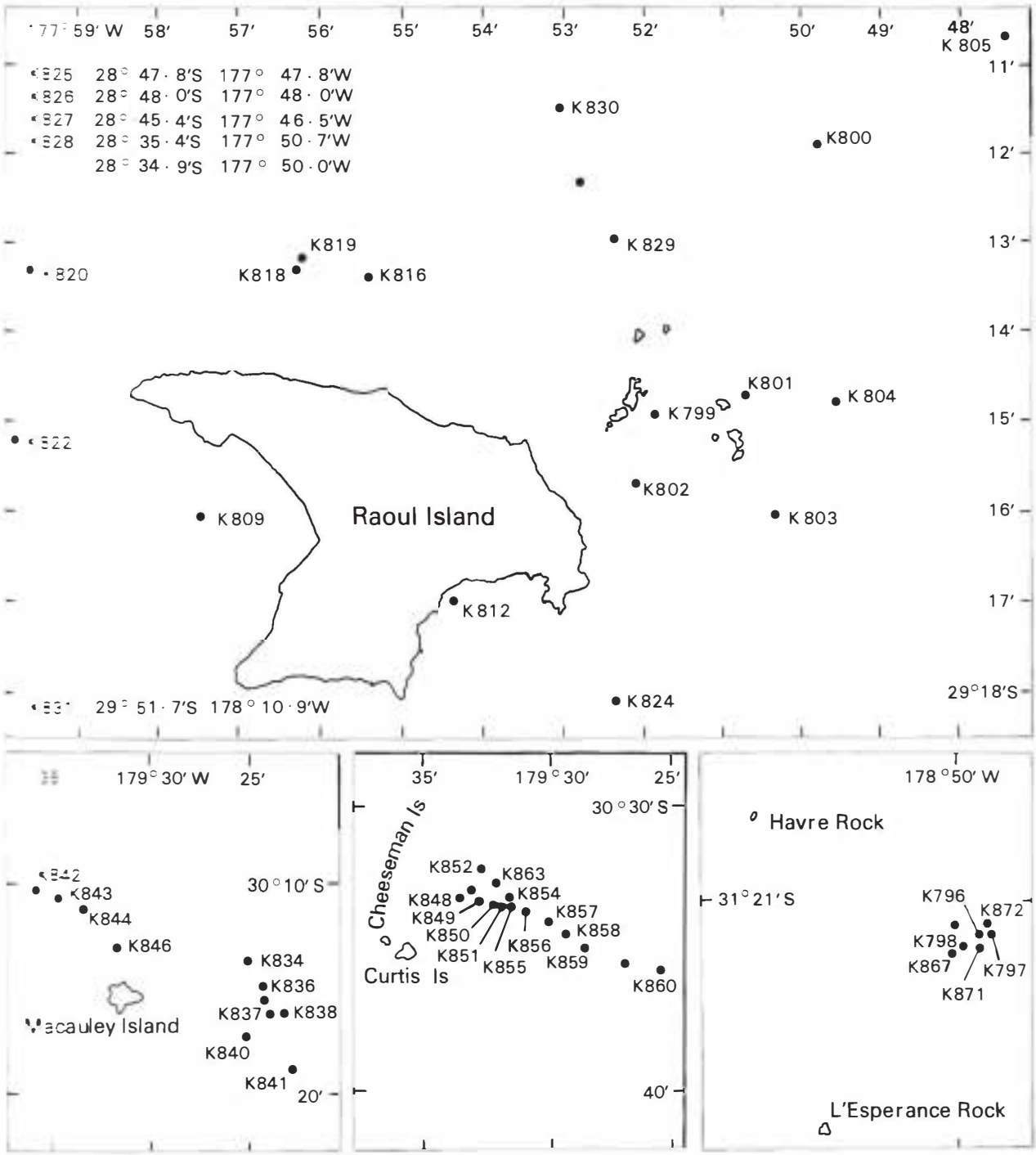

FIG. 1. The Kermadec Islands region, showing the positions of most of the stations from which bryozoans were obtained.

a boundary between the Pacific and Indo-Australian crustal plates (Fleming 1979). Several islands occur along the Ridge (Fig. 1). The largest and most northerly is the Raoul Island stratovolcano, with a recent history of eruptions. Macauley Island, 109 km to the south-east of Raoul Island, is a basalt and pumice tuff summit remnant of a Pleistocene volcano. Curtis and Cheeseman Islands, 35 km further to the south-west, are composed of andesites and tuffs and are active, with a history of uplifting of 18 m over the past 190 years.

The smallest and southernmost island of the group is Esperance Rock, 83 km further to the south-west (Doyle *et al.* 1979).

The seafloor of the Ridge is composed mostly of a clean agglomerate of tuffaceous particles, chiefly pumice, of sand to boulder size, the gravel-sized or larger particles predominating. Clean lava sands and gravels predominate in shallow water around Raoul Island (Marshall 1979). Superimposed on this seafloor material are a variety of additional substrata for bryozoans. These are chiefly mollusc shells, especially valves of scallops (*Pecten raoulensis* Powell; *Aequipecten iredalei* Powell), and ahermatypic corals. Around Raoul Island a number of hermatypic coral species occur and these are also a source of bryozoans. All substrata in the NZOI collections which had been taken by the 1974 "*Challenger* Centenary" cruise to the Kermadec Ridge were examined. About half of the species in this report were obtained from scallop shells, the remainder from other molluscs, corals, polychaete tubes, barnacle plates, other bryozoans, brown and crustose coralline algae, hydroids, brachiopods, andesite pebbles and pumice. The stations sampled from r.v. *Tangaroa* (and small boats) between 18 July and 8 August, 1974 were confined strictly to the Ridge, from the shore to 1185 m depth (Fig.1).

LIST OF STATIONS

N.Z. Oceanographic Institute data are given below in abbreviated form from field notes logged in the Station Register. Records of individual occurrences of animals noted in the field but not relevant to this report have been omitted. The following abbreviations for equipment are used : DCMB – cone dredge with cylindrical steel wire mesh bag with canvas as inner lining; DR – rock dredge, modified to include a flexible chain-linked mid-section, with steel wire mesh bag, for cobbles, pebbles, rock fragments (*see* McDougall 1973); TAM – Agassiz trawl with 4′ netting bag; TAM + tangles – Agassiz trawl with 4′ netting bag, trailing frayed rope; TM – modified Menzies trawl.

New Zealand Oceanographic Institute (NZOI)

K795$_1$ (18 July 1974) 33°02.6′S, 179°34.6′W. DCMB.
Broken coral debris, small mollusc shells, crustaceans, echinoids, polychaetes. Depth 350 m.

K795$_2$ (18 July 1974) 33°03.8′S, 179°34.0′W. TAM.
Many gorgonians, gastropods, echinoderms, barnacles, polychaetes; rocks. Depth 270 m.

K796 (19 July 1974) 31°20.8′S, 178°49.0′W. Esperance Rock. DCMB.
Algal-coated pebbles; molluscs including scallops, echinoderms, barnacles, broken coral fragments. Depth 70 m.

K797 (19 July 1974) 31°20.8′S, 178°49.2′W. Esperance Rock. TAM.
Boulders, cobbles, pebbles; brown algae, molluscs, echinoids. Depth 55–70 m.

K798 (19 July 1974) 31°21.3′S, 178°49.8′W. Esperance Rock.
Shore collections – rocks, barnacles, gastropods. SCUBA collections – barnacles, echinoids. Depth 0–40 m.

K799 (22 July 1974) 29°14.9′S, 177°51.9′W. Raoul Island. DCMB.
Small pebbles encrusted with coralline algae; echinoids, ascidians. Depth 24 m.

K800 (22 July 1974) 29°11.9′S, 177°50.8′W. Raoul Island. DCMB.
Fine sand with pebbles; a few molluscs. Depth 555 m.

K801 (22 July 1974) 29°14.7′S, 177°51.7′W. Raoul Island. SCUBA.
Echinoids, hermatypic corals, molluscs. Depth 18 – 22 m.

K802 (22 July 1974) 29°15.7′S, 177°52.1′W. Raoul Island. DCMB.
Small rounded pebbles coated with coralline algae; broken coral and shell fragments. Depth 35 m.

K803 (22 July 1974) 29°16.0′S, 177°50.3′W. Raoul Island. DCMB.
Coarse pumice sand; a few shells. Depth 140–190 m.

K804 (22 July 1974) 29°14.8′S, 177°49.6′W. Raoul Island. TAM.
Much pumice; echinoids, solitary corals, gastropods, crustaceans. Depth 490–590 m.

K805 (22 July 1974) 29°10.7′S, 177°47.4′W. Raoul Island. TAM.
Pumice, gastropods, brachiopod. Depth 1142–1156 m.

K809 (23 July 1974) 29°16.25′S, 177°54.1′W. Raoul Island. DR.
Corals, algae. Depth 30 m.

K812 (24 July 1974) 29°17.0′S, 177°54.4′W. Raoul Island. SCUBA.
Echinoderms, corals, molluscs. Depth 10–30 m.

K816 (24 July 1974) 29°13.04′S, 177°55.5′W. Raoul Island. TAM.
Coarse dark sand. Brown algae. Echinoids, gastropods. Depth 22–80 m.

K818 (24 July 1974) 29°13.31′S, 177°56.34′W. Raoul Island. DCMB.
Coarse sand and small pebbles. Some molluscs. Depth 95–116 m.

K819 (24 July 1974) 29°13.24′S, 177°56.30′W. Raoul Island. TAM.
Mainly pumice; scallops, other bivalves and gastropods, echinoids. Depth 100–140 m.

K820 (24 July 1974) 29°13.30′S, 177°59.80′W. Raoul Island. TAM.
Pumice and rock pebbles; scallop valves, other bivalves and gastropods, echinoids. Depth 95–122 m.

K822 (24 July 1974) 29°15.2′S, 178°01.5′W. Raoul Island. TAM.
Rocks, medium dark sand; *Xenophora* and echinoids. Depth 64–70 m.

K824 (25 July 1974) 29°18.1′S, 177°52.35′W. Raoul Island. TAM.
Medium fine sand, pumice pebbles; sponge, crustaceans. Depth 600–615 m.

K825 (25 July 1974) 28°47.8′S, 177°47.8′W. DCMB.
Very coarse sand and small angular pebbles; bivalves, brachiopods, echinoids. Depth 145 m.

K826 (25 July 1974) 28°48.0′S, 177°48.0′W. DR.
1. Pumice, pebbles; molluscs, gorgonians. Depth 142–160 m.
2. Rounded rocks; gorgonians, brachiopods, molluscs. Depth 160–210 m.
3. Boulders and smaller rocks, angular and rounded; brachiopods, molluscs, gorgonians. Depth 390–490 m.

K827 (25 July 1974) 28°45.4′S, 177°46.5′W. DR.
Gorgonians, coral, molluscs. Depth 260–318 m.

K828$_1$ (26 July 1974) 28°35.4′S, 177°50.7′W. DR.
Pumice pebbles; coral, brachiopods. Depth 440 m.

K828$_2$ (26 July 1974) 28°34.9′S, 177°50.0′W. DR.
Pumice, pebbles; mollusc shells, brachiopods. Depth 508–510 m.

K829$_1$ (26 July 1974) 29°13.0′S, 177°52.4′W. Raoul Island. DR.
Pumice, pebbles; coral, molluscs. Depth 610–635 m.

K829$_2$ (26 July 1974) 29°12.35′S, 177°52.8′W. Raoul Island. TAM.
Pumice, coral; molluscs, echinoids. Depth 565–590 m.

K830 (27 July 1974) 29°11.5′S, 177°53.05′W. Raoul Island. TAM.
Pumice in boulder to pebble sizes; corals, asteroids. Depth 545–590 m.

K831 (27 July 1974) 29°51.7′S, 178°10.9′W. TAM + tangles. (Repeat of *Challenger* station 170.)
Pumice; echinoids, molluscs. Depth 965–974 m.

K834 (28 July 1974) 30°13.8′S, 178°25.3′W. Macauley Island. Shore collection.
Rocks, sediment, molluscs, etc., from shore and rock pools.

K836$_1$ (28 July 1974) 30°14.9′S, 178°24.4′W. Macauley Island. DR.
Algae. Depth 35–38 m.

K836$_2$ (28 July 1974) 30°15.25′S, 178°24.4′W. Macauley Island. TAM.
Pebbles; kelp, scallops, echinoids. Depth 52 m.

K837 (28 July 1974) 30°15.5′S, 178°24.2′W. Macauley Island. TAM + tangles.
Pebbles; scallops and other molluscs, echinoids. Depth 110–125 m.

K838 (28 July 1974) 30°15.8′S, 178°23.7′W. Macauley Island. TAM + tangles.
Pumice; crabs. Depth 200 m.

K840 (28 July 1974) 30°17.4′S, 178°25.3′W. Macauley Island. TAM + tangles.
Pumice rubble and boulders; *Glycymeris* and other bivalves, gastropods, abundant brachiopods. Depth 398–412 m.

K841 (29 July 1974) 30°18.8′S, 178°22.9′W. Macauley Island. TAM + tangles.
Various coelenterates. Depth 460–500 m.

K842 (29 July 1974) 30°10.2′S, 178°35.9′W. Macauley Island. DR.
Angular pumice and volcanic fragments; bivalves, gorgonians, brachiopods. Depth 325–370 m.

K843 (29 July 1974) 30°10.5′S, 178°34.5′W. Macauley Island. DR.
Pumice rubble and volcanic fragments; gastropods, echinoids. Depth 254–260 m.

K844 (29 July 1974) 30°11.2′S, 178°33.8′W. Macauley Island. DR.
Pumice rubble. Depth 290 m.

K846 (29 July 1974) 30°13.1′S, 178°32.0′W. Macauley Island. DR.
Pumice, solitary corals. Depth 610–640 m.

K848$_1$ (30 July 1974) 30°32.9′S, 178°33.6′W. Curtis Island. DR.
Pumice, and rock pebbles; gastropods. Depth 42–60 m.

K848$_2$ (30 July 1974) 30°32.9′S, 178°33.2′W. Curtis Island. DR.
Boulders, pumice pebbles and rocks; barnacles, algae. Depth 46–50 m.

K849 (30 July 1974) 30°33.0′S, 178°33.0′W. Curtis Island. DR.
Pumice, some rock; bivalves, polychaetes. Depth 250–355 m.

K850 (30 July 1974) 30°33.2′S, 178°32.4′W. Curtis Island. DR.
Pumice pebbles; echinoids, gastropods. Depth 250–310 m.

K851 (30 July 1974) 30°33.3′S, 178°31.8′W. Curtis Island. DR.
Scallops, boulders and pebbles; other molluscs, coral fragments. Depth 104–106 m.

K852 (30 July 1974) 30°32.2′S, 178°33.0′W. Curtis Island. DR.
Evenly sized clean pumice pebbles and small rocks; echinoids. Depth 220 m.

K854 (30 July 1974) 30°33.0′S, 178°31.7′W. Curtis Island. DR.
Small pumice pebbles; gastropods, brachiopods. Depth 135–165 m.

K855 (30 July 1974) 30°33.2′S, 178°31.6′W. Curtis Island. DR.
Pumice; brachiopods, molluscs, hydroids, echinoids. Depth 115–125 m.

K856 (30 July 1974) 30°33.5′S, 178° 31.1′W. Curtis Island. DR.
Worn pumice boulders; bivalves, brachiopods, echinoids. Depth 125–130 m.

K857 (30 July 1974) 30°33.8′S, 178°30.6′W. Curtis Island. DR.
Gorgonians, bivalves, brachiopods, crabs. Depth 165–180 m.

K858 (30 July 1974) 30°34.2′S, 178°29.8′W. Curtis Island. DR.
Volcanic rocks; coral, gastropods, crustaceans. Depth 465–501 m.

K859 (30 July 1974) 30°35.4′S, 178°26.8′W. Curtis Island. DR.
Pebbles; corals, echinoids. Depth 405–443 m.

K860 (30 July 1974) 30°35.8′S, 178°25.7′W. Curtis Island. DR.
Pumice and rock pebbles; gastropods, coral. Depth 605–720 m.

K863 (31 July 1974) 30°32.5′S. 178°32.3′W. Curtis Island. DR.
Clean angular pumice pebbles, rock; polychaetes, gastropods. Depth 325 m.

K867 (1 August 1974) 31°21.4′S. 178°50.6′W. Havre Rock. DR.
Pebbles; bivalves including scallops. Depth 190–240 m.

K871 (2 August 1974) 31°21.25′S, 178°49.25′W. Havre Rock. SCUBA.
Gastropods, barnacles, echinoids. Depth 10–47 m.

K872 (2 August 1974) 31°20.4′S, 178°49.2–7′W. Esperance Rock. DR.
Clean angular pumice; gorgonians, corals, bivalves. Depth 235–280 m.

Comparisons of bryozoans from the above stations were made with mainland species in the author's collections from Leigh, Waitemata and Manukau Harbours, Mount Maunganui, East Cape, Napier, Castlepoint, Wellington, Totaranui, Cape Foulwind, Kaikoura, Birdling's Beach, Portobello, Bluff and Oban. These are mentioned in the text where appropriate.

LIST OF SPECIES DESCRIBED

Class GYMNOLAEMATA
Order CTENOSTOMATA
Suborder STOLONIFERA
Superfamily WALKERIOIDEA
Family MIMOSELLIDAE
Bantariella cookae (Banta)

Superfamily TEREBRIPOROIDEA
Family PENETRANTIIDAE
Penetrantia parva Silén

Suborder CARNOSA
Superfamily ARACHNIDIOIDEA
Family ARACHNIDIIDAE
Nolella stipata Gosse

Superfamily ALCYONIDIOIDEA
Family ALCYONIDIIDAE
Alcyonidium kermadecense n.sp.

Family FLUSTRELLIDRIDAE
Elzerina badia n.sp.

Order CHEILOSTOMATA
Suborder ANASCA
Superfamily MEMBRANIPOROIDEA
Family MEMBRANIPORIDAE
Membranipora tuberculata (Bosc)

Family QUADRICELLARIIDAE n.fam.
Quadricellaria bocki (Silén)

Family FLUSTRIDAE
Gregarinidra serrata (MacGillivray)

Family CALLOPORIDAE
Alderina tuberosa (Canu & Bassler)
Amphiblestrum alcimum n.sp.
Callopora precocialis n.sp.
Crassimarginatella (Crassimarginatella) electra n.sp.
Crassimarginatella (Crassimarginatella) spathulata n.sp.
Crassimarginatella (Crassimarginatella) vincularia n.sp.
Crassimarginatella (Corbulella) corbula (Hincks)

Crassimarginatella (Corbulella) spinosissima n.sp.
Crassimarginatella (Corbulella) translucens (Harmer)
Ellisina sericea (MacGillivray)
Marssonopora kermadecensis n.sp.
Onychoblestrum hastingsae (Brown)
Retevirgula aggregata n.sp.

Family CHAPERIIDAE
Chaperia multispinosa n.sp.
Chaperiopsis (Chaperiopsis) bispinosa n.sp.
Chaperiopsis (Chaperiopsis) boninensis (Silén)
Chaperiopsis (Chaperiopsis) intermediata n.sp.
Chaperiopsis (Chaperiopsis) multifida (Busk)
Chaperiopsis (Chaperiopsis) rubida (Hincks)
Chaperiopsis (Chaperiopsis) spiculata Uttley
Chaperiopsis (Clipeochaperia) funda Uttley & Bullivant
Pyrichaperia pyriformis (Canu & Bassler)

Family HIANTOPORIDAE
Hiantopora jucunda n.sp.

Superfamily AETEOIDEA
Family AETEIDAE
Aetea ?australis Jullien
Aetea ligulata Busk

Superfamily BUGULOIDEA
Family BUGULIDAE
Brettiella ovicellata n.gen., n.sp.
Bugula sp.
Cornucopina geniculata Harmer
Dendrobeania (Luguba) sessilis n.sp.

Family EPISTOMIIDAE
Synnotum aegyptiacum (Audouin)

Family BEANIIDAE
Beania bilaminata (Hincks)
Beania cribrimorpha n.sp.
Beania discodermiae (Ortmann)
Beania elongata (Hincks)
Beania gigantavicularis n.sp.
Beania magellanica (Busk)
Beania plurispinosa Uttley & Bullivant

Family PETALOSTEGIDAE n.fam.
Petalostegus bicornis (Busk)

Family CABEREIDAE
Amastigia antarctica subtropicalis n.ssp.
Caberea darwinii Busk
Caberea enzoi n.sp.
Caberea glabra MacGillivray
Caberea helicina Hastings
Caberea rostrata Busk
Canda pecten scutata Harmer
Emma watersi Hastings
Notoplites longispinosus n.sp.
Scrupocellaria maderensis Busk

Superfamily MICROPOROIDEA
Family MICROPORIDAE
Caleschara levinseni Harmer
Manzonella monopia (Brown)
Micropora ?coriacea inarmata Soule
Micropora elegans Maplestone
Micropora mortenseni Livingstone
Mollia multijuncta (Waters)
Monoporella nodulifera (Hincks)

Family THALAMOPORELLIDAE
Thalamoporella quadrata n.sp.

Family STEGINOPORELLIDAE
Steginoporella magnifica Harmer
Steginoporella neozelanica (Busk)

Family MACROPORIDAE
Macropora grandis (Hutton)

Superfamily CELLARIOIDEA
Family CELLARIIDAE
Cellaria humilis Moyano
Cellaria tenuirostris (Busk)
Mesostomaria strictoramae Canu & Bassler
Stomhypselosaria dupliforma Canu & Bassler

Suborder ASCOPHORA
Superfamily CRIBRILINOIDEA
Family CRIBRILINIDAE
Figularia carinata (Waters)
Figularia pelmatifera n.sp.
Figularia spinea Brown
Membraniporella bifurca Powell
Membraniporella figularioides n.sp.
Puellina (Cribrilaria) biavicularia Kataoka
Puellina (Cribrilaria) innominata (Couch)
Reginella stolonifera n.sp.
Reginella vas (Brown)

Superfamily CATENICELLOIDEA
Family EURYSTOMELLIDAE
Eurystomella crystallina n.sp.
Eurystomella foraminigera (Hincks)

Family CATENICELLIDAE
Catenicella elegans Busk
Catenicella ?venusta MacGillivray

Orthoscuticella ventricosa (Busk)
Pterocella alata (Wyville Thomson)

Superfamily ARACHNOPUSIOIDEA
Family ARACHNOPUSIIDAE
Arachnopusia perforata (Maplestone)
Arachnopusia unicornis (Hutton)
Briarachnia robusta n.gen., n.sp.

Family EXECHONELLIDAE
Exechonella tuberculata (MacGillivray)

Superfamily UMBONULOIDEA
Family EXOCHELLIDAE
Elleschara bensoni (Brown)
Escharoides angela (Hutton)
Escharoides excavata (MacGillivray)
Exochella tricuspis (Hincks)

Family ADEONIDAE
Adeonellopsis yarraensis (Waters)

Superfamily SCHIZOPORELLOIDEA
Family PORINIDAE
Haswellina multiaviculata n.sp.

Family HIPPOPODINIDAE
Codonellina montferrandii (Audouin)
Hippothyris aganactete n.sp.
Hippomenella vellicata (Hutton)
Hippoporina cincta (Hincks)
Hippoporina epaxia n.sp.
Hippoporina rostrata (MacGillivray)

Family GIGANTOPORIDAE
Gigantopora polymorpha (Busk)
Gigantopora proximalis n.sp.
Gigantopora pupa (Jullien)

Family PETRALIELLIDAE
Discopora intermediata n.sp.

Family TEUCHOPORIDAE
Lagenicella exallos n.sp.
Lagenicella lacunosa (Bassler)

Family SCHIZOPORELLIDAE
Arthropoma cecilii (Audouin)
Buffonellodes marsupifera (Busk)
Buffonellodes ridleyi (MacGillivray)
Chiastosella longaevitas Powell
Cribellopora trichotoma (Waters)
Escharina pesanseris (Smitt)
Escharina waiparaensis Brown
Lacerna problematica n.sp.
Metroperiella triangula (Hincks)
Nimba terraenovae (Powell)
Phonicosia circinata (MacGillivray)
Rogicka biserialis (Hincks)
Rogicka oceanica n.sp.
Schizomavella neptuni (Jullien)
Schizomavella punctigera (MacGillivray)
Schizomavella schizoporelloides n.sp.

Family SMITTINIDAE
Emballotheca monomorpha n.sp.
Emballotheca sp.
Hemismittoidea hexaspinosa (Uttley & Bullivant)
Hippomonavella gymnae n.sp.
Parasmittina delicatula (Busk)
Parasmittina serrula Soule & Soule
Parasmittina tropica (Waters)
Parasmittina tubula (Kirkpatrick)
Porella marsupium (MacGillivray)
Porelloides glabra n.sp.
Rhamphostomella rogickae (Brown)
Schizosmittina maplestonei (MacGillivray)
Smittina punctata Powell
Smittina rosacea Powell
Smittina spiraminifera n.sp.
Smittina torques Powell
Smittoidea curtisensis n.sp.
Smittoidea hyalina n.sp.
Smittoidea magna n.sp.
Smittoidea zelandiae (Brown)

Family ESCHARELLIDAE
Escharella incudifera n.sp.

Family CREPIDACANTHIDAE
Crepidacantha bracebridgei Brown
Crepidacantha crinispina Levinsen

Family INVERSIULIDAE
Inversiula fertilis Powell

Family MICROPORELLIDAE
Calloporina angustipora (Hincks)
Calloporina triporosa Powell
Fenestrulina catastictos n.sp.
Fenestrulina disjuncta (Hincks)
Fenestrulina gelasinoides n.sp.
Fenestrulina malusii incompta n.ssp.
Fenestrulina malusii pulchra n.ssp.
Microporella agonistes n.sp.
Microporella ciliata (Pallas)
Microporella discors Uttley & Bullivant
Microporella intermedia Livingstone
Microporella lineata Canu & Bassler

Microporella marsupiata (Busk)
Microporella orientalis Harmer
Tenthrenulina dispar n.gen., n.sp.

Family CALWELLIIDAE
Calwellia sinclairii (Busk)

Superfamily HIPPOTHOÖIDEA
Family HIPPOTHOIDAE
Celleporella delta (Ryland & Gordon)
Hippothoa calciophilia n.sp.
Hippothoa distans MacGillivray
Hippothoa divaricata pacifica n.ssp.
Hippothoa flagellum Manzoni
Hippothoa peristomata n.sp.

Family PASYTHEIDAE
Gemellipora eburnea Smitt

Family CHORIZOPORIDAE
Chorizopora brongniartii (Audouin)
Chorizopora ferocissima n.sp.
Chorizopora spicata n.sp.

Superfamily CELLEPOROIDEA
Family CELLEPORIDAE
Buffonellaria biavicularis (Powell)
Buffonellaria christinelloides n.sp.
Buffonellaria depressa (Philipps)
Buffonellaria regenerata (Powell)
Celleporaria tridenticulata (Busk)
Celleporina costazii (Audouin)
Celleporina spatula (MacGillivray)
Galeopsis pentagonus (d'Orbigny)
Galeopsis polyporus (Brown)
Lagenipora crenulata n.sp.
Lagenipora ferocissima n.sp.
Lagenipora hemiperistomata n.sp.
Lagenipora laevissima n.sp.
Osthimosia bicornis (Busk)
Osthimosia eatonensis (Busk)
Osthimosia imperforata n.sp.
Osthimosia incomposita n.sp.
Osthimosia virgula n.sp.

Family SERTELLIDAE
Brodiella longispinata (Busk)
Cleidochasma porcellanum (Busk)
Lepraliella ?mooraboolensis (MacGillivray)
Lepraliella multidentata (Thornely)
Rhynchozoon angulatum Levinsen
Rhynchozoon crenulatum (Waters)
Rhynchozoon paa Uttley & Bullivant
Rhynchozoon tubulosum (Hincks)
Sertella concinna n.sp.
Sertella malleatia n.sp.

CLASSIFICATION

Introduction

The classification of bryozoans, as in most other groups, is in a continuing state of revision. Differences of opinion over the names and status of taxa occur throughout the hierarchy even to phylum level (cf. Hyman 1959, Ryland 1970, Cuffey 1973, Nielsen 1977), but there seems to be a general consensus among members of the International Bryozoology Association that there are three classes – Stenolaemata, Gymnolaemata, and Phylactolaemata – and, for the gymnolaemates, two orders (both extant, with a fossil record) – Ctenostomata and Cheilostomata. Below ordinal level different rankings and groups have been recognised. Because this memoir deals mainly with bryozoans of the order Cheilostomata, the rest of this section pertains to this order only.

Suprafamilial groupings in the Anasca

Following Levinsen (1909), two suborders have been recognised and widely accepted. These are the Anasca (cheilostomes with a flexible frontal membrane and lacking an enclosed water compensation sac or space) and the Ascophora ("ascus-bearers"). These suborders have been regarded by some as representing grades of organisation rather than proper taxa (Silén 1942a, Ryland 1970, Banta and Carson 1978). I also take this view except that I prefer to continue to use these terms as taxa since they are informative and utilitarian [cf. Ryland and Hayward (1977) and Hayward and Ryland (1979) who used these suborders as the basis for their synopses of British bryozoans].

Within the Anasca several suprafamilial groups were recognised, beginning with Levinsen (1902). These

groups were called by Levinsen (1909) "1st Division : Malacostega", "2nd Division : Coilostega", etc., and the term "Division" persisted as a more or less informal suprafamilial taxon into the 1960s.

Vigneaux (1949), without comment, effected a formalisation of the Divisions by referring to them as superfamilies, with a uniform ending *-acea*. Thus the Malacostega became part of superfamily Membraniporacea, and the Coilostega became the bulk of superfamily Microporacea, and so on. Vigneaux's superfamilies did not all coincide with existing Divisions, however, and some of his groupings were rather heterogeneous.

Although his method had some merit, his usage of the superfamily groupings, and his names, were not immediately followed. This is possibly because, as a new student of the Bryozoa, he attempted a total synthesis in which all genera and families were accounted for. This led, as already indicated, to some heterogeneous arrangements.

Brien (1960) substituted directly the term superfamily for Division, using accepted groupings, with the suffix *-oidea*; thus, Malacostegoidea, Coelostegoidea, etc. Ryland (1970) followed Brien in this, and justified the use of the suffix *-oidea* as being in accordance with Recommendation 29A of the International Code of Zoological Nomenclature (Stoll *et al.* 1961). Cheetham (1963a), however, followed the lead of Vigneaux and used, instead, superfamilies with the suffix *-acea*, although his superfamilies corresponded more directly to accepted Divisions rather than to Vigneaux's groupings. Cheetham, like Vigneaux, based the superfamilies on type genera (of type families). This also is a recommendation of the Code (see Articles 35b, 63). Thus, based on the Code's recommendations, Vigneaux's and Cheetham's use of a type genus in formulating superfamily names is to be preferred over the divisional names of Levinsen (and other authors).

Suprafamilial groupings in the Ascophora

Prior to 1949, groupings of families equivalent to those in the Anasca were unknown for the Ascophora. Boundaries between possible groupings seemed less clear-cut. There were, however, more ascophoran families than anascan (21 : 15 in Levinsen 1909) and thus a large assemblage of families of uncertain relationships remained in the Ascophora while the Anasca appeared neatly divided.

Silén (1942a) proposed a new classification which abolished the terms Anasca and Ascophora, which he regarded as grades of organisation. His classification included eight "Sections" of a combined grouping of the orders Cheilostomata and Ctenostomata called Cheilo-Ctenostomata, of which two, Gymnocystidea and Spinocystidea, comprised the former Ascophora.

Harmer (1957), independently and posthumously, divided the Ascophora into two groups also – the Ascophora Imperfecta and Ascophora Vera. These groups were not coincident with those of Silén.

Silén's Spinocystidea included, *inter alia*, cribrimorphs and catenicellids, with a frontal wall largely or fundamentally of fused spines. The Gymnocystidea comprised most or all of the remaining Ascophora.

Harmer's Ascophora Imperfecta included a number of families which had in common a frontal wall overarching an undifferentiated anascan-type frontal membrane. In this group the operculum is not discrete, its proximal border being freely continuous with the frontal membrane.

The Ascophora Vera comprised ascophorans with a membranous compensation sac of a different origin (from the above) underlying a frontal wall, and with a discrete operculum. *Inter alia*, Harmer included the cribrimorphs in the Anasca and the catenicellids in the Ascophora Vera, and his and Silén's two pairs of groups were thus not fully coincident. This difference notwithstanding, both Silén and Harmer recognised there were different frontal wall ontogenies in the Ascophora.

Ryland (1970) accepted the suborders Anasca and Ascophora but argued that two splinter groups, Gymnocystidea (re-interpreted to be equivalent to Harmer's Ascophora Imperfecta) and Cribrimorpha, were not satisfactorily attached to either and should be treated as suborders. Cheetham (1963a) had also regarded the cribrimorphs as a suborder. Banta (1970) supported Silén's classification but later (Banta and Carson 1978) deferred to a more conventional arrangement, raising, however, the anascan superfamilies to suborders and dispensing with Anasca and Ascophora as formal categories.

As previously mentioned, superfamilies have not generally been recognised in the Ascophora and Vigneaux (1949) was, for a while, the only exception. He recognised five such groupings – Schizoporellacea, Lepraliellacea, Smittinacea, Reteporacea and Galeopsacea, each being based on its respective type-genus. Based on the works of Harmer (1902, 1957) and Silén (1942a) the structure of the ascophoran body wall has since become better understood (Hastings 1949; Cheetham 1968; Banta 1973; Sandberg 1976, 1977) and Vigneaux's groupings have been recognised to be heterogeneous. Notwithstanding, some of Vigneaux's names are available for use.

Cheetham (1968) was the first worker after Vigneaux to utilise ascophoran superfamily names and introduced a new group, the Umbonulacea, which corresponded in part to the Ascophora Imperfecta and the Gymnocystidea *sensu* Ryland (1970). Moyano (1970) followed this lead and introduced another such gymnocystidean superfamily, the Arachnopusiacea.

Justification for ascophoran superfamilies

Are ascophoran superfamilies appropriate? Vig-

neaux (1949) introduced them without comment. Cheetham (1968) and Moyano (1970) justified their single introductions largely with reference to Vigneaux, as well as by morphological criteria.

According to Simpson (1961 : 191) the bases for the recognition of higher taxa include degree of divergence and the multiplicity of lower taxa.

As previously mentioned, the Ascophora *sensu lato* contained more families than the Anasca [21 : 15 in Levinsen 1909; 40 : 30 in Bassler 1953 (cribrimorphs excluded)], and whereas the anascan families were neatly grouped into superfamilies, those of the Ascophora were not, until the works of Vigneaux, Cheetham, and Moyano (loc. cit.). As presently constituted, anascan superfamilies contain from one to about 12 families. On a relative basis, at least, there is a case for splitting the 40+ ascophoran families into smaller entities.

Are there divergent or phenetically separable groups? Recent research on the morphology and ontogeny of cheilostome frontal walls has demonstrated that there are several fundamentally different types within the Ascophora. These have been described by Sandberg (1976, 1977) and Hayward and Ryland (1979) (Fig. 2).

The cribrimorph type of frontal wall is characterised by a shield of gymnocystal spines, with various degrees of fusion, overarching an undifferentiated (or weakly differentiated) anascan-type frontal membrane (Fig. 2A).

The gymnocystal type of frontal wall is interpreted to be a calcification of the original frontal membrane, under which lies a compensation sac. A definitive operculum is present (Fig. 2C).

In the umbonuloid type the frontal wall (with an upper hypostegal coelom) overarches an anascan-type frontal membrane (Fig. 2D).

In the cryptocystidean type there is an interior wall of calcification with a thin epithelium-bounded coelomic space above (hypostegal coelom) and a compensation sac below. A definitive operculum is present (Fig. 2E).

Sandberg (1976, 1977) has shown that there are distinctive skeletal ultrastructural features, correlated with these frontal wall types, enabling recognition of morphologically interior or exterior walls.

On the basis of both numbers of lower taxa (families) and morphological separation, there is a case for the recognition of suprafamilial groups within the Ascophora.

Terminology of superfamily taxa

There is no strict rule concerning the suffix used in the superfamily taxon. According to Simpson (1961 : 33) *-oidea* is used for vertebrates and *-aceae* [sic] for invertebrates. Blackwelder (1967 : 451) remarks that superfamilies "are most commonly used in the Insecta, where they are identifiable by the ending *-oidea*; elsewhere the endings are variable ...". Jeffrey (1977) comments that "The ending *-acea*, although not recommended by the Zoological Code, is also frequently used for the names of superfamilies". Blackwelder (1967) allows for the usage of both endings or any ending that is "not prescribed for taxa at any other level".

The use of either ending is inconsistent, being used at various hierarchical levels, including phylum (Sipunculoidea, Echiuroidea), class (Crinoidea, Echinoidea, etc.; Crustacea, Ascidiacea, etc.), subclass (Nautiloidea, Ammonoidea, etc.; Dendrochirotacea; Apodacea, etc.), and order (Nebaliacea, Tanaidacea, etc.).

In published volumes of the "Treatise on Invertebrate Paleontology" the following endings are used: *-acea, -oidea, -aceae, -ida* and *-icae*, of which *-acea* is the commonest (used for superfamilies of Foraminifera, Brachiopoda, Mollusca (excluding Cephalopoda), Trilobita, Ostracoda, Crinoidea, Archaeocyatha). In the preface to Part T of the Treatise (Echinodermata 2, Vol. 1, 1978) the editors expressed as policy that, *inter alia*, no suprafamilial name be identifical to another such name or name of a genus or family. The ending may be variable.

From all of this it is seen that the construction of the superfamily name allows for subjectivity and non-uniformity. This author personally prefers the use of *-acea* as a suffix but, inasmuch as the Code recommends *-oidea*, herein defers to that recommendation. This is also consistent with the use of *-oidea* for superfamilies in the bryozoan order Ctenostomata (Jebram 1973, d'Hondt 1975a).

The nomenclatural status of existing ascophoran superfamilies

Seven superfamily names have been proposed for combinations of ascophoran families, viz., Schizoporellacea, Lepraliellacea, Smittinacea, Reteporacea, Galeopsacea (Vigneaux 1949), Umbonulacea (Cheetham 1968) and Arachnopusiacea (Moyano 1970). In this memoir seven superfamily groups are recognised for Kermadec Ridge ascophorans (including cribrimorphs). For these groups three of the above names are used (with the suffix modified) : Arachnopusioidea, Umbonuloidea and Schizoporelloidea. The Smittinacea is here included in the Schizoporelloidea while the Lepraliellacea, Reteporacea and Galeopsacea are unable to be used for the following reasons. The genus *Lepraliella* is here included in the family Sertellidae (= Reteporidae). *Galeopsis* is here regarded as a member of the family Celleporidae, which in turn is allied with the Sertellidae in a superfamily Celleporoidea. Since the type of a superfamily is a genus, then both *Lepraliella* and *Galeopsis* are potentially available for superfamily names to be based on them. In this memoir, however,

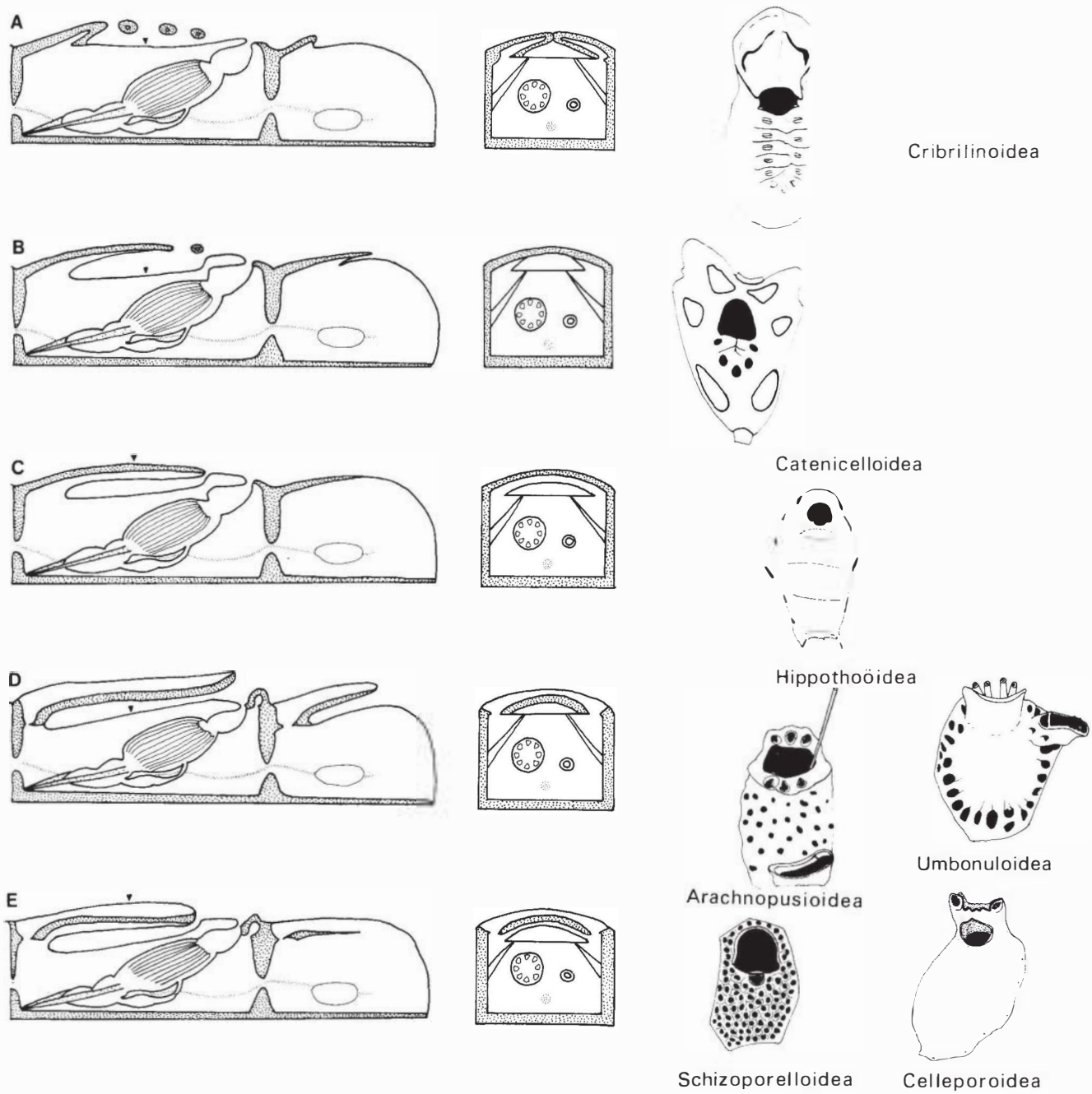

FIG. 2. Different types of frontal wall in the Ascophora : longitudinal sections of zooids with zooidal buds, illustrating the origin of frontal calcification; and fully developed zooids in transverse section. A, spinocystal (cribrimorph) frontal wall, typical of *Figularia* (Cribrilinoidea); B, gymno-spinocystal type of wall, typical of *Orthoscuticella* (Catenicelloidea); C, gymnocystal type of wall, typical of *Celleporella* (Hippothoöidea); D, umbonuloid type of wall, typical of *Escharoides* (Umbonuloidea) and *Arachnopusia* (Arachnopusioidea); E, cryptocystal type of wall, typical of *Cryptosula* (Schizoporelloidea) and *Galeopsis* (Celleporoidea). The superfamilies are those recognised in this Memoir. Arrows in the left hand diagrams indicate homologous surfaces; hatched areas denote calcified layers. (Adapted from Hayward and Ryland 1979.)

families Lepraliellidae and Galeopsidae are not recognised and I here subscribe to the view of Blackwelder (1967 : 452) who writes "Families are often erected without reference to any groupings (such as subfamilies) between them and the genera, but superfamilies are never used unless there are families. Therefore, every superfamily will be based on the same type genus as some family, and the superfamily and family will have names differing only in termination".

Justification for, and diagnoses of, each superfamily are included in the text as each is introduced. Briefly, however, the superfamilies here recognised include :

1. Three groups with fundamentally gymnocystal frontal walls (Cribrilinoidea, Catenicelloidea, Hippothoöidea). The first two are believed to be very closely related, with the genus *Figularia* indicative of this relationship. The affinities of the Hippothoöidea are obscure but in the classification I place this group near the Schizoporelloidea and Celleporoidea.
2. Two groups with umbonuloid frontal wall structure (Arachnopusioidea, Umbonuloidea).
3. Two groups with cryptocystidean wall structure (Schizoporelloidea, Celleporoidea). The Celleporoidea have mostly imperforate frontal walls and tend to be more structurally integrated than members of the Schizoporelloidea.

Families which are regarded as inclusive in each superfamily are listed in the remarks following each introduction, but this treatment does not consider every known ascophoran family. Thus the superfamilies described herein will include families other than those ascribed to them and it is possible that additional superfamilies will also be recognised.

Description of species

Order CTENOSTOMATA Busk, 1852
Suborder STOLONIFERA Ehlers, 1876

Ctenostomes in which the colony is ramifying, adherent, or pendent from the substratum; the zooids arising directly or indirectly (via kenozooids) from stolons, rarely from other autozooids; sometimes crowded, but never box-like when laterally contiguous. The orifice terminal; polypides with or without a gizzard.

Superfamily WALKERIOIDEA Hincks, 1877

Zooids often contracted at the base and somewhat pedicellate, deciduous, mostly arising from kenozooids, rarely directly from stolons; occasionally capable of independent movement owing to a special muscle at the base of the zooid. Brooding of embryos internal or external. Polypide lacking a gizzard.

REMARKS: The name Walkerioidea is a *nomen translatum* of Walkeriidae Hincks, 1877 (as Valkeriidae), and corresponds to most of the Valkeriina of Silén (1942b), and the Valkerioidea of Jebram (1973).

Family MIMOSELLIDAE Hincks, 1877

Zooids contracted basally, sometimes shortly pedicellate, deciduous, arising from short kenozooids that are produced as short branches from the main stolon(s); capable of flexing movements. Embryos brooded internally.

Bantariella Jebram, 1973

Colony adnate, comprising one to several main stolons with clusters of zooids arising at intervals, typically from lateral branches of kenozooids, each kenozooid bearing 1–2 autozooids. Zooids pedicellate basally, deciduous, capable of independent movement. Embryos brooded in the tentacle sheath.

TYPE-SPECIES: *Mimosella cookae* Banta, 1968

REMARKS: Jebram (1973) separated *Bantariella* from *Mimosella* on the basis of the number of autozooids arising from each kenozooid. It is debatable whether this character alone is sufficient for generic separation but it is possible that *Mimosella* may, in any case, be split on the basis of different modes of branching. *Mimosella gracilis* (the type of *Mimosella*) has erect colonies in which the zooids are borne directly on the main stolon or short kenozooids may occur at the bases of zooids. Banta (1968) commented that the species of *Mimosella* fall into two groups, and it seems more appropriate that *Bantariella* should include all of the species in Banta's second group rather than just the two species designated by Jebram.

Bantariella cookae (Banta) (Fig. 3, A–C)

Mimosella cookae Banta, 1968: 245.
Bantariella cookae: Jebram 1973: 40.

MATERIAL EXAMINED: NZOI Stns K816, K819; on a mollusc shell and *Sargassum*.

DISTRIBUTION: Baja California, Mexico.

DESCRIPTION: Colony adnate, comprising one to a few main stolons with up to 20 or more zooids arising in somewhat flabellate clusters at intervals of about 1 mm along each stolon; each zooid produced from a single kenozooid, the kenozooids arranged in two relatively short, proximally curving, roughly pinnate branches which originate opposite each other just before a stolonal septum. Zooids small, about 0.33–0.50 mm long when contracted, with a short basal pedicel that is

narrower than the remainder of the zooid. The basal flexor muscles are paired and occur just above the level of the pedicel; each muscle strand (about five in each of the pairs) unites into a single tendon passing distally on each side.

REMARKS: The Kermadec colonies are here taken to be Banta's (1968) species. The zooids fall in the same size range and each originates from a single kenozooid. There are some differences however. Banta describes the kenozooids as arising from short lateral branches which do not themselves bud autozooids, and an intrastolonal muscle bundle proximal to each septum of the main stolon which was not seen in the Kermadec specimens. Banta also mentions only 2–4 fibrils in each of the basal flexor muscles. An autozooid occasionally arises directly from the main stolon, proximal to a septum, in Kermadec colonies.

Superfamily TEREBRIPOROIDEA d'Orbigny, 1847

Stolonate bryozoans which bore in calcareous substrata. Zooids attached to primary stolons along all or part of their length, with or without secondary stolons inserted at various locations on the body wall, and disposed at varying angles to the surface of the substratum including horizontally and vertically. Brooding internal in autozooids or in brood chambers. Closing apparatus a pleated collar or operculum.

REMARKS: The name Terebriporoidea is a *nomen translatum* of Terebriporidae d'Orbigny, 1847 and corresponds, in part, to the Terebriporina of Soule (*in* Osburn and Soule 1953). Whereas Pohowsky (1978), in his study of boring bryozoa, declined to assign genera to taxa above family rank, I here choose to follow Silén (1946, 1947), Prenant and Bobin (1956) and Jebram (1973) in regarding at least one genus as carnosan and most or all of the remainder as stoloniferan. Soule and Soule (1969, 1975) have given persuasive evidence that one family, the Penetrantiidae, may be cheilostomatous, but until additional supportive data are forthcoming (e.g., from biochemical genetics), I provisionally include the Penetrantiidae in the present superfamily. D'Hondt's (1977) incorporation of a superfamily "Penetrantinoidea Soule" (surely Penetrantioidea is the correct rendition) in the Ctenostomata may be a better solution. [Pohowsky (1978), incidentally, has given considerable weight to the pattern of astogeny and accordingly recognises a larger number of families.]

Family PENETRANTIIDAE Silén, 1946

Colony boring. Zooids pedunculate, vaneless, essentially vertical in the substratum. Peduncle inserted in distal half of zooid. Ovicelled gonozooids typically present. Closing apparatus an operculum.

Penetrantia Silén, 1946

With the characters of the family.

TYPE-SPECIES: *Penetrantia densa* Silén, 1946

REMARKS: One other genus, *Haimeina* Terquem & Piette, 1865, has been assigned to the Penetrantiidae by Pohowsky. It differs from *Penetrantia* in apparently lacking gonozooids.

Penetrantia parva Silén

Penetrantia parva Silén, 1946: 4; Soule & Soule 1969: 3; Pohowsky 1978: 84.

MATERIAL EXAMINED: NZOI: Stns K797, K812, K819, K820, K837. DPG : Colonies from Leigh, Hauraki Gulf.

DISTRIBUTION: Hauraki Gulf; also Oahu, Hawaii.

DESCRIPTION: Colony a ramifying web of stolons, with zooids at intervals; branching irregular. Zooids attached near their distal ends, with secondary connections proximally; 0.23–0.47 mm long, tapering proximally to a point. Operculum smooth externally and internally. Bore-holes circular or with a median proximal cusp. Gonozooid shorter than autozooid and not reaching as far proximally.

REMARKS: Live colonies from Leigh commonly have nine tentacles and occur in the shells of a variety of gastropods, both living and dead. Colonies from the Kermadecs occurred in dead scallop shells.

Suborder CARNOSA Gray, 1841

Ctenostomes in which the colony is encrusting, erect, or ramifying; the zooids typically arising directly from other autozooids, which may be laterally contiguous or disjunct and connected by mural extensions which may occasionally be stolon-like. Zooids box-like and contiguous to subcylindrical and widely separated, the orifice accordingly subterminal or terminal. Polypides without a gizzard.

Superfamily ARACHNIDIOIDEA Hincks, 1880

Colony erect and branching, or adherent upon or boring within the substratum; the zooids disjunct, typically forming a network, often differentiated into an adnate basal part and an erect tubular portion, interconnected by mural prolongations; rarely short true stolonal segments interpolated between the autozooids.

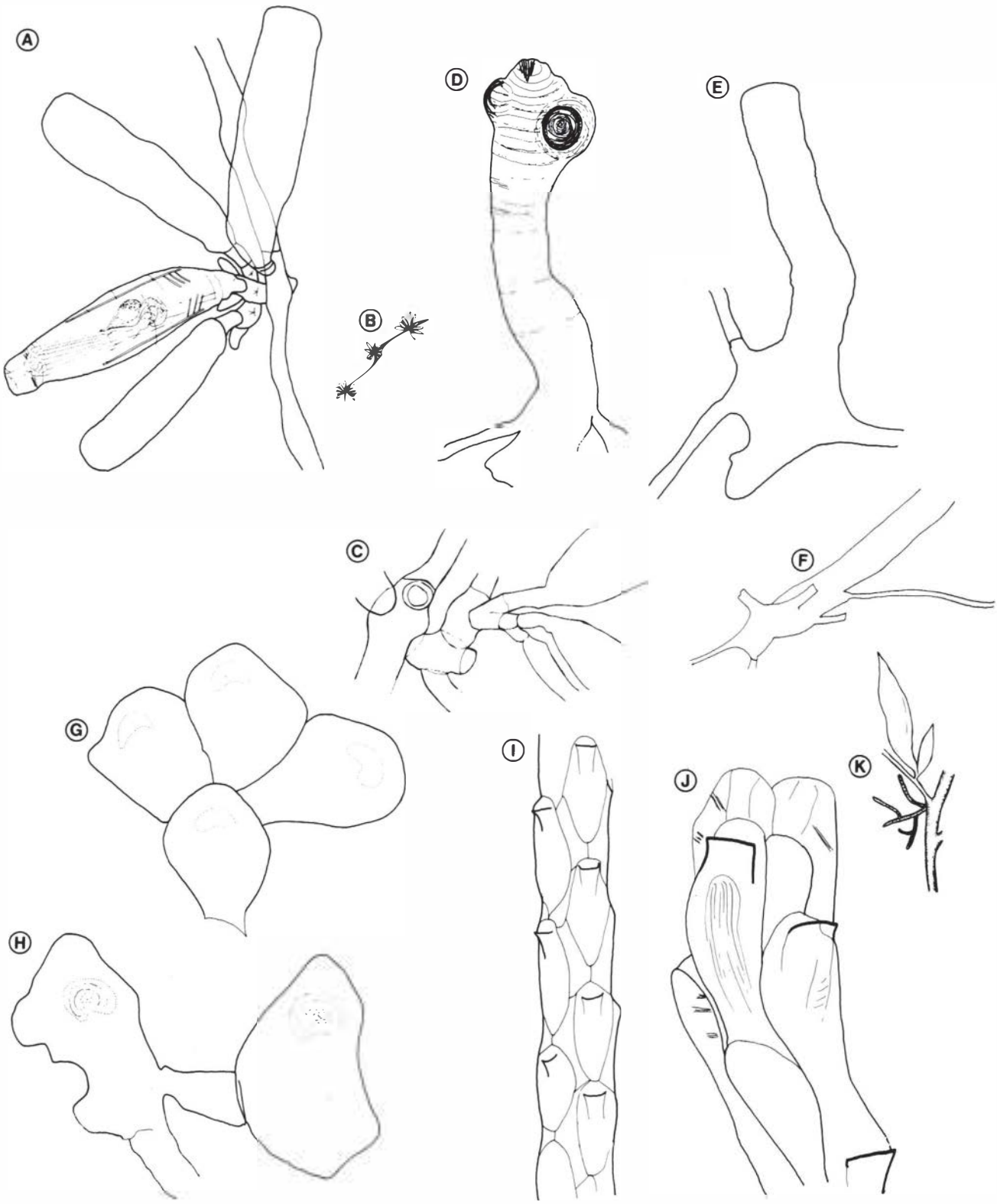

FIG. 3. Ctenostomatous bryozoans from the Kermadec Ridge. A-C, *Bantariella cookae* (Banta): A, zooids from one side of the main stolon; B, disposition of zooids in rosettes at intervals along a stolon; C, origin of zooids from kenozooids. D-F, *Nolella stipata* Gosse: D, with embryos near the orificial region; E, profile showing whole zooid and basal connections; F, basal view of proximal part of a zooid. G,H, *Alcyonidium kermadecense* n.sp.: different arrangements of zooids. I-K, *Elzerina badia* n.sp.: I, a length of stem; J, growing tip; K, colony on *Sargassum* sp.

REMARKS: The name Arachnidioidea is a *nomen translatum* of Arachnidiidae Hincks, 1880a and corresponds to part of the Paludicellea of Allman (1856) *et auct.*

Family ARACHNIDIIDAE Hincks, 1880

Colony erect, branching, or forming an adherent network of disjunct zooids interconnected by narrow connecting processes in which short septate segments may occasionally be interpolated. Encrusting zooids typically with an adnate basal part and erect tubular part (peristome); the bulk of the polypide occurring in whichever of these parts is larger. Body wall hyaline, or opaque and earthy in appearance.

Nolella Gosse, 1855

Encrusting arachnidiids in which the proximal adnate portion of the zooid is little developed and the erect portion is greatly prolonged and tubular. Body wall opaque, earthy, generally only muscles associated with the closing apparatus visible. Interzooidal connectives generally filiform, stolonate, occasionally twice septate.

TYPE-SPECIES: *Nolella stipata* Gosse, 1855

Nolella stipata Gosse (Fig. 3, D–F)

Nolella stipata Gosse, 1855: 35; Osburn & Soule 1953: 737 (*cum syn.*); Ryland 1969: 234.

MATERIAL EXAMINED: NZOI Stn K812.

DISTRIBUTION: Victoria, Indonesia, China Sea, Japan, Sri Lanka, India, East Africa, Red Sea, Mediterranean Sea, western Europe, Maryland to Brazil, British Columbia to Gulf of California.

DESCRIPTION: Colony adnate to the substratum, the proximal parts of zooids typically hidden and only a cluster of tall peristomes visible. Zooids 0.85–1.70 mm tall and around 0.20 mm diameter, mostly comprising a tubular peristome with a tiny adherent portion connected by 2–6 stolon-like processes to other zooids; the peristomes almost wholly opaque with fine transverse striations. Embryos developing distally in the peristomes, causing a conspicuous bulge of the body wall.

REMARKS: The fertile Kermadec colony occurred with a piece of sponge and several polychaete tubes. Decalcification of the tubes was necessary to free the zooids from the substratum in order to see their proximal parts. From its distribution, this colony is obviously conspecific with *Nolella papuensis* (Busk) but, judging from the comments of Harmer (1915), *N. papuensis*, *N. gigantea* (Busk) and *N. stipata* may all be synonymous. I therefore feel inclined to follow the synonymy of Osburn and Soule (1953).

The peristome of this species may attain nearly 4 mm in length according to Harmer (1915).

Superfamily ALCYONIDIOIDEA Johnston, 1838

Colony encrusting, erect, or pendent, often thick, fleshy, as lobes or gelatinous crusts, or finer and branching or stalked. Zooids mostly contiguous, mostly box-like with recognisable lateral, basal and frontal walls, the orifice often subterminal. Different types of kenozooid may occur, but never true stolons. Both cyphonautes and coronate larvae may occur.

REMARKS: The name Alcyonidioidea is a *nomen translatum* of Alcyonidulae Johnston, 1838 and corresponds to the Halcyonelloidea of Johnston (1847) *et auct.* and the Alcyonidioidea of Jebram (1973). It thus includes d'Hondt's (1975a) superfamilies Alcyonidioidea and Flustrellidroidea which he separated primarily on the basis of differences in larval development and the type of larva. Inasmuch as larvae of few of the genera of these superfamilies are described this split seems premature. Cook (1964a) indicated that the types of larva in this superfamily may not be especially useful in classification.

Family ALCYONIDIIDAE Johnston, 1838

Colony encrusting or erect, thin or fleshy. Autozooids often with a short peristome and puckered circular orificial region, mostly contiguous, not generally with kenozooids between them. Kenozooids, where present, non-spinose. Intertentacular organ present or absent.

Alcyonidium Lamouroux, 1813

With the characters of the family.

TYPE-SPECIES: *Alcyonidium diaphanum* Lamouroux, 1813

REMARKS: Jebram (1973) accepts *Lobiancopora* Pergens, 1889 as also belonging to the Alcyonidiidae. It is characterised by colonies with slender erect branches of 2–3 longitudinal series of irregularly disposed zooids.

Alcyonidium kermadecense n.sp. (Fig. 3, G,H)

MATERIAL EXAMINED: NZOI Stn K797.

DISTRIBUTION: Kermadec Islands, 55–70 m.

DESCRIPTION: Colony encrusting, ramifying. Zooids

thin, generally claviform and disposed in uniserial series, but through bifurcations and trifurcations zooids become more crowded and interconnected by short processes; where they become contiguous zooids may be subquadrate in outline; 0.53–1.06 mm long and 0.35–0.60 mm wide. Kenozooids not seen. Orificial region transversely C-shaped at the summit of a short peristome. Frontal wall smooth, yellowish in alcohol.

HOLOTYPE: Four colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–331.

TYPE-LOCALITY: NZOI Stn K797, Esperance Rock, 31°20.8′S, 178°49.2′W, 55 – 70 m.

REMARKS: The colonies of this species occurred on two dead lithothamnion-encrusted mollusc shells which had dried out. They were restored by soaking in an aqueous solution of trisodium phosphate.

A. kermadecense most resembles *A. albidum* Alder, 1856 which occurs, however, from France to Spitzbergen. *A. albidum* has kenozooids, taller peristomes, and a trifoliate puckering of the orifice when the peristomes are retracted. Nothing is presently known of the polypide of *A. kermadecense*.

Family FLUSTRELLIDRIDAE Bassler, 1953

Colony encrusting or erect. Autozooids generally relatively large, the orificial region either papilliform, or with an operculum-like flap formed from the proximal part of a thickened, bilabiate orifice. Kenozooids always present, with a definite position in relation to autozooids; smooth-surfaced or spinose.

Elzerina Lamouroux, 1816

Colony erect, with somewhat cylindrical branches; bases of branches comprise mostly kenozooids; axial kenozooids not present. Orifice labiate. Kenozooids sometimes spinose and when budding the buds are as large as those of autozooids.

TYPE-SPECIES: *Elzerina blainvillii* Lamouroux, 1816

REMARKS: The above diagnosis is based on that of Cook (1964a) who has remarked on the difficulty of recognising clear boundaries between the genera of the Flustrellidridae.

Elzerina badia n.sp. (Fig. 3, I–K)

MATERIAL EXAMINED: NZOI Stn K816; on *Sargassum*.

DISTRIBUTION: Kermadec Islands, 22 m.

DESCRIPTION: Colony erect, irregularly branching dichotomously and somewhat anastomosing, the branches around 0.56 mm diameter, widening to near 0.8 mm near bifurcations, and up to 10 mm long. Autozooids elongate, alternating, arranged in four longitudinal series with slender kenozooids between them, the branches thus roundly quadrangular in cross-section; autozooids range in length from 0.68 – 1.15 mm (average 0.83 mm) and are 0.27–0.33 mm wide (average 0.31 mm); kenozooids are slender, of variable width but not exceeding 0.20 mm, and may be as long as 1.40 mm, but cross walls normally divide them to half this length. Orifice labiate, the proximal lip squared and thickened, the distal lip scarcely so or not at all.

HOLOTYPE: Several colonies attached to *Sargassum*, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–334.

TYPE-LOCALITY: NZOI Stn K816, Raoul Island, 29°13.04′S, 177°55.5′W, 22 – 80 m.

REMARKS: The colonies occurred on *Sargassum*, which also served as a substratum for *Catenicella elegans* Busk and *Bantariella cookae* (Banta). Where free ends of branches come in contact with the algal substratum the apical buds are able to be transformed into flattened, attaching kenozooids.

Order CHEILOSTOMATA Busk, 1852
Suborder ANASCA Levinsen, 1909

Cheilostomes in which all or part of the frontal surface is membranous (and capable of deflexion inwards to evert the tentacles), so that the retracted polypide may be visible through it. The membrane, in which the operculum is set (or in some instances replaces), may be calcified proximally (a gymnocyst), or underlain by a calcareous lamina (a cryptocyst), or overarched by spinose ribs. Erect colonies are frequently jointed.

Superfamily MEMBRANIPOROIDEA Busk, 1854

Colony encrusting or erect. Zooidal frontal area widely membranous or with partial development of a gymnocyst and/or cryptocyst or spines; gymnocyst never occupying more than the proximal half of the frontal area, the cryptocyst generally narrow, occasionally extensive, but never reaching the opercular area. Operculum usually differentiated from the frontal membrane as a C-shaped sclerite, occasionally more structurally discrete.

REMARKS: Vigneaux (1949) introduced a superfamily Membraniporacea based on Membraniporidae Busk, 1854. It is equivalent to the Malacostega of Levinsen (1902, 1909) and is the earliest known cheilostome superfamily in the fossil record, with one species

occurring in Upper Jurassic strata. D'Hondt's (1977) Pseudomalacostega is here included in the Membraniporoidea.

Family MEMBRANIPORIDAE Busk, 1854

Colony encrusting, or erect from an encrusting base. Zooidal frontal membrane covering all or much of the surface, the gymnocyst reduced or absent, the cryptocyst variable in extent, usually little developed. Tubercles may occur at the distal corners of zooids and spines may be present around the opesia. Avicularia rare, basal pore-chambers and ovicells absent. Larvae planktotrophic, of the cyphonautes type.

Membranipora de Blainville, 1830

Colony encrusting, or erect from an encrusting base. Zooids rectangular, simple, the corners provided with tubercles; a cryptocyst occasionally well developed proximally, with internal denticles. Frontal membrane unornamented or with chitinous spinules; operculum bounded by a simple sclerite. Ancestrula double.

TYPE-SPECIES: *Flustra membranacea* Linnaeus, 1767

REMARKS: Although *Membranipora* and the Membraniporidae *s.s.* are generally understood to lack avicularia, the reports of Hastings (1930 : pl.4), Cook (1973), and Jebram and Voigt (1977) of vicarious avicularia in *Membranipora annae* Osburn necessitate an emendation to the diagnosis, above. The ancestrula of *M. annae* has not been seen, however, so its status as a species of *Membranipora s.s.* remains to be firmly established.

Membranipora tuberculata (Bosc) (Plate 1, A)

Flustra tuberculata Bosc, 1802: 118.
Membranipora tuberculata: Busk 1858: 126; Prenant & Bobin 1966: 115 (*cum syn.*); Gregory 1979: 401.

MATERIAL EXAMINED: NZOI Stns K816, K834, K836; on algae.

DISTRIBUTION: All warm seas; Indian Ocean, Pacific Ocean from Japan to Australia and Fiji, British Columbia to Peru; Massachusetts to Patagonia, and Europe to Angola in the Atlantic. Recently recorded from Hauraki Gulf and northern New Zealand.

DESCRIPTION: Colony encrusting. Zooids elongate, 0.47–0.55 × 0.18–0.26 mm, with extensive frontal membrane; operculum as a crescentic chitinised sclerite in the distal part of the membrane. Beneath the frontal membrane proximally is a cryptocystal shelf which is variously developed and from which one or two denticles are directed distally and/or basally. At each proximal corner of the zooid is a gymnocystal tubercle. In the lateral walls, at the level of the distal edge of the cryptocyst, is a hinge-like uncalcified region allowing differential flexing of the colony surface on an undulating algal lamina.

REMARKS: This species was first observed in New Zealand (Gordon 1968) on a floating plastic object at Leigh, in the Hauraki Gulf, where it has subsequently been observed by R.F. Whitten (pers. comm. 1976). More recently it has been collected from the far north of New Zealand on floating plastic pellets (Gregory 1979). Brown (1952) recorded a fossil variety from the Miocene of Southland.

Family QUADRICELLARIIDAE n.fam.

Colony erect, articulated, flexible. Zooids elongate, the gymnocyst little developed, the cryptocyst a moderately developed shelf proximally. Adventitious avicularia present or absent. Ovicells and spines wanting. Ancestrula resembling an autozooid but smaller, erect, on an uncalcified radicular support.

Quadricellaria d'Orbigny, 1851

Colony cellariiform, dichotomously branching, the branches four-sided in cross-section. Zooids with well developed cryptocyst and small proximal gymnocyst. Avicularia, spines and ovicells wanting.

TYPE-SPECIES: *Quadricellaria elegans* d'Orbigny, 1851

REMARKS: Reasons are given below for recognising *Quadricellaria* in Recent seas and establishing a new family.

Quadricellaria bocki (Silén) (Plate 1, B)

Acanthodesia bocki Silén, 1941: 20.
Nelliella bocki: Mawatari 1974: 37.

MATERIAL EXAMINED: NZOI Stn K795; on coral.

DISTRIBUTION: Kermadec Islands; Japan.

DESCRIPTION: Colony of erect, slender, articulated and dichotomously branching segments. Zooids in alternating longitudinal series arranged back to back and presenting four faces outwardly. Branch segments roughly square in cross-section. Zooids elongate, 0.43–0.50 × 0.15–0.18 mm, narrowing proximally, with a small proximal gymnocyst and a substantial cryptocystal shelf beneath the frontal membrane; all frontal surfaces smooth. Joints uncalcified, flexible. Ancestrula the same as other zooids but smaller, erect, on an uncalcified radicular support, producing first a two-sided then a four-sided stem of zooids.

REMARKS: Cook (1968a) has commented on the difficulty of assigning limits to certain of the membraniporine genera. A case in point is the genus *Membranipora*. Before 1900, *Membranipora* included numerous species nowadays assigned to a variety of families in the superfamily Membraniporoidea. Later, because of confusion over the type-species of *Membranipora s.s.*, two genera were erected to accommodate the suite of species with an extensive frontal membrane and lacking avicularia and ovicells. These were *Nichtina* (printer's error for *Nitscheina*) Canu, 1900, based on *Flustra membranacea* Linnaeus, 1767, and *Acanthodesia* Canu & Bassler, 1919 for *Flustra savartii* Audouin, 1826. The latter was characterised by development of a cryptocyst.

These two genera were accepted by Harmer (1926) who described a number of species in the *savartii* group, comprising encrusting as well as erect vincularian and cellariiform modes of growth. *A. savartii* itself was said by Harmer to exhibit "Encrusting, Hemescharan, Escharan, Cellariiform or Vincularian" growth forms. It is possible for some species of cheilostomes to exhibit most of this range of form but not to include the flexible cellariiform type, with chitinous joints. There should have been some misgivings over the inclusion of cellariiform varieties in *Acanthodesia*, but Silén (1941) followed Harmer's example.

Five years after Harmer's (1926) Siboga Report on the anascan bryozoans, Borg (1931) determined that the type-species of *Membranipora* de Blainville was, in fact, *Flustra membranacea*, hence *Nitscheina* became a junior synonym of *Membranipora*. Later, Osburn (1950) and Cook (1968a) concluded, on the basis of the ancestrula and the variability of the cryptocyst, that *Acanthodesia savartii* must also be a *Membranipora*. This still left in doubt the status of the cellariiform varieties which could not reasonably be included in *Membranipora*. Furthermore, some of these varieties possessed avicularia, which are usually absent from *Membranipora* as currently understood. In 1974 Mawatari considered this problem and proposed a new genus, *Nelliella*, for species with cellariiform growth, which may or may not have avicularia.

This appears not to be the full solution to the problem, for Mawatari did not consider a related Recent species from the Caribbean which Canu and Bassler (1928) chose to assign to the otherwise Cretaceous genus *Quadricellaria* d'Orbigny, 1851. Cretaceous *Quadricellaria* evidently had a cellariiform mode of growth, with four-sided branch segments, except that these are said to be rectangular in cross-section rather than uniformly quadrangular. According to Canu and Bassler, Recent *Quadricellaria caraibica* may likewise be rectangular in cross-section, with two of the longitudinal series of zooids narrower than the others. This is sometimes the case in the Kermadec specimens but it is not a consistent feature and is the sort of character one might expect to be influenced by environmental conditions. I concur with Canu and Bassler in accepting *Quadricellaria* for Recent species although it is to be noted that whereas Bassler cited Cretaceous-Recent as the range for *Quadricellaria* in his 1935 index of bryozoan genera, in the 1953 Treatise he cited only Cretaceous.

Nelliella Mawatari, 1974 was based on aviculiferous *Acanthodesia nelliiformis* Harmer, 1926 and the generic diagnosis allowed for species with more than four longitudinal zooidal series and with or without vicarious avicularia. If all the cellariiform species are indeed congeneric, then *Quadricellaria* would have priority over *Nelliella*. I do not believe this to be the case, however, and I here choose to accept *Quadricellaria* for nonaviculiferous, strictly four-sided species, fossil and Recent, retaining *Nelliella* for the remainder of the cellariiform species.

These two genera seem to be intermediate in form between vincularian membraniporids, e.g., *Membranipora limosa* Waters, and cellariiform *Nellia* (Farciminariidae) which has both avicularia (adventitious) and ovicells. In keeping with our present understanding of a restricted family Membraniporidae, I accordingly propose a likewise narrowly restricted Quadricellariidae n.fam. for *Nelliella* and *Quadricellaria*.

Family FLUSTRIDAE Lamouroux, 1821

Colony erect with broad or narrow flattened fronds arising from an encrusting base, or wholly encrusting. Fronds uni- or bilamellar. Zooids not heavily calcified, generally rectangular, with a wholly membranous frontal surface, or short gymnocyst present. Spines present or absent. Avicularia vicarious or interzooidal or absent. Ovicell endozooidal or lacking.

Gregarinidra Barroso, 1949

Colony encrusting or erect from a broadly encrusting base. Zooids rectangular, typically bordered by marginal spines. Avicularia interzooidal, acute. Ovicell endozooidal, immersed beneath a distal zooid or avicularium. Numerous mural pore-chambers present.

TYPE-SPECIES: *Membranipora gregaria* Heller, 1867

Gregarinidra serrata (MacGillivray) (Plate 1, C)

Membranipora serrata MacGillivray, 1869: 131.
Spiralaria serrata: Levinsen 1909: 126; Silén 1941: 57 (*cum syn.*).
Flustra serrata: Livingstone 1929: 51.
Spiralaria denticulata: Gordon 1970: 322.

MATERIAL EXAMINED: NZOI: Stns K797, K798, K799, K801, K803, K812, K818, K819, K820, K837, K851,

K855, K856, K859; on *Pecten* and other molluscan shells. DPG: Colonies from Hauraki Gulf.

DISTRIBUTION: Hauraki Gulf, Auckland Harbour, Foveaux Strait; also Victoria (Australia), Japan.

DESCRIPTION: Colony encrusting (not erect in Kermadec specimens). Zooids elongate, 0.38–0.50 × 0.17–0.28 mm, subrectangular with faintly beaded mural rim. Frontal membrane generally overarched by 6 – 7 pairs of spines of two types – a more or less erect pair of robust suboral spines which flare into 2–3 apical spikes, the other spines directed more horizontally, but at the point where they begin to arch over the frontal membrane there is on each a small outwardly directed spike. A pair of short, unbranched spines occur distal to the orifice. Avicularia terminal or at the bifurcation of zooid rows; quadrangular basally with obliquely directed acute serrated rostrum; the mandible likewise acute; the mandibular pivot incompletely calcified. Ovicell internal, occurring beneath the proximal end of the next zooid distal to the maternal zooid or immersed beneath an avicularium in that position. Very young colonies lack spines and avicularia and resemble a species of *Membranipora*.

REMARKS: In a re-evaluation of the genera of the Flustridae, Moyano (1972) merged part of *Spiralaria* Busk, 1861, including the type-species, *S. florea* Busk, into *Flustra s.l.*, retaining *Membranipora serrata* MacGillivray and related encrusting species in a new genus *Hippoflustra*, based on *Spiralaria incrustans* Silén, 1941. There are some problems with Moyano's conclusions : (1) In his numerical taxonomic analysis he did not actually include *Spiralaria florea* in the list of species from which he constructed his dendrogram. (2) He established *Hippoflustra* primarily on the basis of the encrusting habit of a number of species of *Spiralaria*, but this may be criticised on the grounds that an encrusting versus erect mode of growth is not necessarily hard and fast among bryozoans. Species of *Odontionella*, *Hippomenella* and *Escharina* in the New Zealand fauna may exhibit both encrusting and erect growth forms, and *serrata* itself is not exclusively encrusting. Specimens from Hauraki Gulf can produce erect unilamellar or bilamellar lobes. The bilamellar condition is different from that in other flustrine species. It appears to arise from the chance apposition of unilamellar lobes, such that there is no dorsal connection between zooids nor is there necessarily a common margin to the lobes. (3) Moyano seems to have overlooked *Gregarinidra* Barroso, 1949 (type-species *Membranipora gregaria* Heller, 1867) established for encrusting forms. Although based on a different type-species, *Hippoflustra* Moyano would include the same suite of species as *Gregarinidra* and must therefore be regarded as synonymous. Notwithstanding the inconclusiveness of using erect versus encrusting mode of growth as a reliable criterion in separating genera, there are two notable features in which the type of *Spiralaria*, *S. florea*, differs from other species (including *serrata*) which have been ascribed to this genus. These are the growth form, somewhat resembling an Archimedean screw, and the large, terminal vicarious avicularia at the margins of the spiral. Prenant and Bobin (1966) regarded *Gregarinidra* as inclusive in *Spiralaria* while at the same time establishing a new genus *Hincksinoflustra*, with type-species *Flustra octodon* Busk, which Levinsen (1909) had included in *Spiralaria*. One has the choice of regarding the suite of species in *Spiralaria s.l.* as belonging to one genus (of which *Gregarinidra* and *Hincksinoflustra* could be subgenera) or to three genera. In view of the distinctive features of *S. florea*, I here adopt the latter course.

Family CALLOPORIDAE Norman, 1903

Colony encrusting; or erect, bilamellar or vincularian, from an encrusting base. Zooids with frontal membrane conspicuous in most species, occasionally partly obscured by spines. Gymnocyst and/or cryptocyst present, often very extensive. Avicularia vicarious, adventitious, or absent. Ovicell hyperstomial, often prominent and ornamented with knobs, ridges or avicularia; or reduced in size. Pore-chambers large, basal, or small and mural.

Callopora Gray, 1848

Colony encrusting. Zooidal gymnocyst often well developed, with or without one or more avicularia. Cryptocyst generally reduced. Spines few or many. Ovicell hyperstomial, often with ridges, umbones or a frontal area; not closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Flustra lineata* Linnaeus, 1767

Callopora precocialis n.sp. (Plate 1, D,E)

MATERIAL EXAMINED: NZOI Stns K795$_1$, K827, K867; on molluscan shell fragments.

DISTRIBUTION: Kermadec Islands, 190 – 350 m.

DESCRIPTION: Colony encrusting, small (less than 50 zooids). Zooids oval, 0.27–0.45 × 0.25–0.33 mm; opesia oval, about two-thirds the zooidal length. Cryptocyst narrow, granular, bordered by 15 long, slender, erect spines. Gymnocyst smooth, well developed, about one-third of the zooidal length. Ovicells prominent, smooth or faintly granular, no fenestra or ridges, often with the opening of a pore-chamber distally; not closed by the zooidal operculum. No avicularia. Ancestrula circular, with reduced gymnocyst, bordered by a circlet of about 14–15 spines.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–326.

PARATYPE: NZOI, type number P–566, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn $K795_1$, 33°02.6′S, 179°34.6′W, 350 m.

REMARKS: This small but distinctive species forms tiny colonies of some 30 zooids (in the specimens observed) and begins to incubate larvae in ovicells at the 6–7 zooid stage.

Marssonopora Lang, 1914

Colony encrusting, forming a network of small zooids interconnected by long filiform stolons. Zooids oval, with the opesia occupying much or all of the frontal area. Gymnocyst moderately developed, the cryptocyst negligible. Opesia bordered by spines. Avicularia tiny, occurring at intervals along the stolons. Ovicell recumbent, smooth, no fenestra but may be surmounted by an avicularium. Tiny basal intramural pore-chambers present.

TYPE-SPECIES: *Cellepora dispersa* von Hagenow, 1839

Marssonopora kermadecensis n.sp. (Plate 2, A–C)

MATERIAL EXAMINED: NZOI Stns K800, $K826_3$, K842, K872; on coral.

DISTRIBUTION: Kermadec Islands, 280–555 m.

DESCRIPTION: Colony encrusting, comprising a network of distantly separated, stolonate zooids. Zooids oval, 0.30–0.43 × 0.22–0.25 mm, with extensive opesia. Cryptocyst scarcely evident as a narrow opesial rim, bordered by about nine pairs of spines, erect or curving over the opesia; if most are curved then at least two distal pairs are erect. Gymnocyst reduced or absent, smooth, tapering immediately to a slender caudal stolon. Branching pattern cruciform, with one distal and two distolateral budding sites (conical pore-chambers) in each zooid; this pattern less apparent when colony is on an uneven substratum. Avicularia tiny, situated midway between zooids along the stolons when zooids are in a linear series; if the substratum is uneven this pattern is modified as stolons ramify extensively and an additional stolon may emanate from an avicularium such that an avicularium appears to be situated at the junction of a triad of stolons. Avicularian opesia sloping to the acute rostral apex, the pivot bar complete. Ovicell recumbent but prominent, rounded, not closed by the zooidal operculum; smooth, and lacking a fenestra or prominences; surmounted by an avicularium distally.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–338.

PARATYPE: NZOI, type number P–561, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn $K826_3$, 28°48.0′S, 177°48.0′W, 390–490 m.

REMARKS: The work of Canu and Bassler (1928) describing fossil and Recent bryozoans from the Gulf of Mexico was interesting from the standpoint of extending the stratigraphic ranges of certain genera. Dredged live material included specimens of two genera hitherto known only from Cretaceous strata, viz., *Quadricellaria* d'Orbigny (q.v.) and *Marssonopora* Lang. As in the case of *Quadricellaria,* I concur with Canu and Bassler that the living and fossil species are congeneric. Inexplicably, Bassler (1953) cited the range as Cretaceous only.

The Caribbean *Marssonopora* appears to be different from the Kermadec species. *M. uncifera* Canu & Bassler, 1928 bears only about six pairs of spines whereas *M. kermadecensis* has 9–14 pairs, the zooids tend to be somewhat more pyriform, and the ovicells lack the distal avicularium (although it is to be noted that the retouching of photographs by Canu and Bassler occasionally obscured certain details rather than enhancing them). They also interpreted the avicularia as being non-aviculiferous, i.e., as zooeciules (diminutive zooids, probably lacking a polypide, and of unknown function), since they did not see mandibles or a pivot bar. Their retouched photograph shows, however, acutely pointed triangular structures which are evidently avicularian rostra. The SEM photographs are unequivocal.

This genus has a number of features in common with *Retevirgula,* viz., disjunct zooids, interzooidal avicularia with sloping rostra, and ovicells which may be surmounted by a distal avicularium.

Retevirgula Brown, 1948

Colony thinly encrusting. Zooids united by short connecting tubes or the tubes absent. Opesia extensive, gymnocyst and cryptocyst reduced. Interzooidal avicularia common, sometimes replaced by kenozooids. Ovicell recumbent, smooth-walled or with a fenestra, often surmounted by an avicularium. Basal pore-chambers wanting.

TYPE-SPECIES: *Membranipora acuta* Hincks, 1885

Retevirgula aggregata n.sp. (Plate 2, D)

MATERIAL EXAMINED: NZOI Stns K797, K803, K818, K819, K820, K825, K827, K842, K851, K854, K855, K856, K867; on mollusc shells.

DISTRIBUTION: Kermadec Islands, 55–370 m.

DESCRIPTION: Colony encrusting. Zooids 0.45–0.55 × 0.27–0.33 mm, not connected by tubes but separated by deep grooves. Opesia large, oval, bordered by a narrow granular cryptocyst which is not wider proximally. Gymnocyst small proximally, less than one-quarter the zooidal length. Avicularia small, interzooidal, situated in the angles between autozooids, with tiny pivots, no pivot bar, the avicularian opesia angled outwards; rostrum short, subacute with raised rim. No spines. Ovicell raised, smooth, no fenestra but a hint of an apical umbo on some.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–299.

PARATYPE: NZOI, type number P–559, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: *Retevirgula aggregata* is distinguished from other described species by the absence of connecting tubes and an avicularian pivot bar, both of which Brown (1948) includes in the generic diagnosis. The numerous small interzooidal avicularia with slanted rostra are quite typical, however.

Ellisina Norman, 1903

Colony encrusting. Zooidal frontal membrane extensive, the gymnocyst and cryptocyst little developed. Avicularia interzooidal, distal, acute. Ovicell usually prominent, closed by the zooidal operculum, sometimes surmounted by an avicularium. Basal pore-chambers present.

TYPE-SPECIES: *Membranipora levata* Hincks, 1882

Ellisina sericea (MacGillivray) (Plate 2, E)

Biflustra sericea MacGillivray, 1890a: 107.
Ellisina sericea: Hastings 1945: 91; Uttley 1951: 37.
Tegella pyriformis: Medd 1979: 5.

MATERIAL EXAMINED: NZOI Stns K803, K818, K820, K825, K829, K837, K842, K851, K855, K856, K858, K867, K872.

DISTRIBUTION: Three Kings Islands, Cook Strait, Foveaux Strait; Port Phillip Heads, Victoria.

DESCRIPTION: Colony encrusting. Zooids oval, 0.37–0.48 × 0.25–0.48 mm, with large opesia bordered by a very narrow granular cryptocystal rim. Gymnocyst absent or virtually so, smooth. Avicularia relatively small, interzooidal, occurring distally to each autozooid, even when ovicells are present; the opesia sloping at a uniform angle outwards to an acutely pointed rostrum and bordered proximally by finely granular semicircular cryptocyst; pivot bar incomplete. Ovicell prominent, smooth with median longitudinal crest; recumbent upon the chamber of the avicularium which distally surmounts it.

REMARKS: Hastings (1945) has given a key to some of the southern species of *Ellisina*. *E. sericea* is characterised, *inter alia*, by the longitudinal ovicellular ridge.

Medd (1979), without clear explanation, synonymised *E. sericea* with "*Membranipora pyriformis* Canu & Bassler" [sic] and transferred it to *Tegella* Levinsen. Both of these moves are quite puzzling. First, there is no such combination of Canu and Bassler although there is *Membraniporidra pyriformis* Canu & Bassler, 1920 from the Upper Eocene of North America. Presumably Medd was referring to *Ellisinidra pyriformis* Canu & Bassler, 1923 which Brown (1952) recorded from the Tertiary of New Zealand. *Ellisinidra* is an absolute junior synonym of *Ellisina* as Hastings (1945) has shown. *Ellisina pyriformis* may indeed be a synonym of *E. sericea*, but it must be a junior synonym. Second, *E. sericea* cannot be included in *Tegella*, whose type-species has spines, an ovicell not closed by the operculum, and no pore-chambers.

Crassimarginatella Canu, 1900

Colony encrusting; or erect, bilamellar or vincularian, from an encrusting base. Zooidal cryptocyst moderate or very narrow, the opesia occupying the larger part of the frontal area. Gymnocyst present, conspicuous or much reduced. Avicularia vicarious, with or without a pivot bar. Ovicell generally prominent, with a crescentic frontal area, or small and cap-like; may be closed by the zooidal operculum. Mural septula or basal pore-chambers present.

TYPE-SPECIES: *Membranipora crassimarginata* Hincks, 1880

Subgenus **Crassimarginatella** Canu, 1900

Crassimarginatella with the avicularium lacking spines, the rostral rim entire. Gymnocyst variable in extent, usually reduced. Ovicell prominent, unifenestrate, or small and cap-like.

TYPE-SPECIES: *Membranipora crassimarginata* Hincks, 1880.

Crassimarginatella (Crassimarginatella) electra n.sp. (Plate 3, A)

MATERIAL EXAMINED: NZOI Stns K797, K820, K836, K837, K842, K851, K856, K871, K872; on scallops and other molluscan shells.

DISTRIBUTION: Kermadec Islands, 10–370 m.

DESCRIPTION: Colony encrusting. Zooids 0.42–0.61 × 0.30–0.38 mm, with large oval to pyriform opesia, relatively larger in periancestrular zooids, bordered by narrow granular cryptocyst of uniform width, barely wider proximally if at all. Gymnocyst about one-third the zooidal length, smooth, obscured when ovicells present. Spines slender, 3–4 pairs laterally, one longer slightly larger spine proximal to the opesia; usually only a pair of oral spines and the proximal spine remain in later formed zooids. Ovicell prominent, with a broad quadrate fenestra in ectooecium frontally, this becoming narrowed and crescentic in older zooids as secondary calcification reduces the fenestral area, and the ovicell may acquire an umbo. Avicularia not uncommon, vicarious, as long as autozooids, elongate, rounded proximally; with subacute rostrum two-thirds the total length; rostral walls thin, raised; no pivot bar; narrow granular cryptocyst bordering the opesia; the distal oral shelf almost half the rostral length.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–328.

PARATYPE: NZOI, type number P–568, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K851, Curtis Island, 30°33.3′S, 178°31.8′W, 104–106 m.

REMARKS: Very young colonies resemble a species of *Electra* because of the smooth gymnocyst, prominent median spine, and smaller marginal spines.

Crassimarginatella (Crassimarginatella) spathulata n.sp. (Plate 3, B)

MATERIAL EXAMINED: NZOI Stn $K795_1$.

DISTRIBUTION: Kermadec Islands, 350 m.

DESCRIPTION: Colony encrusting. Zooids 0.62–0.75 × 0.37–0.55 mm, with large oval to subquadrate opesia, bordered by narrow granular cryptocyst often somewhat wider proximally. Gymnocyst smooth, reduced or as much as one-third the zooidal length, and then sometimes obscured by an ovicell. Spines not seen. Ovicell prominent with narrow curved fenestra in ectooecium frontally. Vicarious avicularia occasional, as long as or shorter than autozooids, rounded proximally with a broadly spatulate rostrum; rostrum with thin, raised walls and more than two-thirds the total length; no pivot bar; a narrow granular cryptocyst bordering the tiny opesia; an oral shelf curves around half the rostral length.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–294.

PARATYPE: NZOI, type number P–541, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn $K795_1$, 33°02.6′S, 179°34.6′W, 350 m.

REMARKS: The broadly spatulate avicularium is the most characteristic feature of this species. The Kermadec colony occurred as a raised encrustation. About half the zooids possessed basal pore-chambers from which extended supportive struts. It is not known if this is typical of the species or a local ecological modification.

Crassimarginatella (Crassimarginatella) vincularia n.sp. (Plate 3, C)

MATERIAL EXAMINED: NZOI Stn K840.

DISTRIBUTION: Kermadec Islands, c. 400 m.

DESCRIPTION: Colony vincularian, branching, nonarticulated (presumably arising from an encrusting base), with zooids 0.50–0.62 × 0.32–0.43 mm, arranged in quincunx in six longitudinal rows. Opesia large, oval, bordered by a narrow granular cryptocyst widening proximally. Gymnocyst smooth, reduced or virtually absent. One pair of oral spines, no others seen. Ovicell raised, with crescentic ectooecial fenestra of varying width. Avicularia not seen.

HOLOTYPE: Fragments of colonies, in collection of N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–302.

TYPE-LOCALITY: NZOI Stn K840, Macauley Island, 30°17.4′S, 178°25.3′W, 398–412 m.

REMARKS: Several vincularian specimens were found not attached to a substratum and lacking chitinous parts. Consequently it is not known if there are accessory marginal spines in this species, of the kind which leave no scar in the calcareous wall.

Subgenus **Corbulella** n.subgen.

Crassimarginatella with the avicularia having spines bordering the opesia and a serrated rostral rim. Gymnocyst well developed. Ovicell prominent, with a broad fenestra and thin bordering rim.

TYPE-SPECIES: *Membranipora corbula* Hincks, 1880

Crassimarginatella (Corbulella) corbula (Hincks) (Plate 3, D,E)

Membranipora corbula Hincks, 1880c: 378.
Membranipora lineata: Waters 1887a: 45.
Pyrulella corbula: Harmer 1926: 225; Canu & Bassler 1929a: 100; Sakakura 1935: 7.
Crassimarginatella corbula: Hastings 1945: 71; Brown 1952: 55.

MATERIAL EXAMINED: NZOI Stns K797, K798, K803, K818, K820, K836, K837, K848, K851, K854, K855, K856, K857, K867, K871.

DISTRIBUTION: New Zealand, Australia, Japan. Also known from the Upper Pliocene of Wanganui and Pleistocene of Japan.

DESCRIPTION: Colony encrusting. Zooids 0.42–0.50 × 0.32–0.38 mm, with large oval opesia bordered by very narrow cryptocyst which is finely granular and not usually wider proximally. Gymnocyst small, to one-quarter the total length of the zooid; smooth. Six–nine pairs of spines, the most distal 1–2 pairs stouter, longer and erect, the remaining marginal spines slender, curved over the opesia and usually interdigitating. Ovicells prominent, with a broadly curved fenestra, the distal border of which is typically notched apically, forming a small umbo. Avicularia almost as long as autozooids and slightly broader, the opesia oval but constricted midway by short opposing pivots, a complete pivot bar being absent; the rostrum rounded with a thin raised wall of which the rim is usually minutely toothed; a narrow palatal shelf; the proximal opesia bordered by a narrow cryptocyst and 6–7 slender overarching spines; a smooth gymnocyst proximally, variously developed. Kenozooids occasional, with small oval to circular opesia centrally bordered by a broad granular cryptocyst and a smooth broad gymnocyst.

REMARKS: This species was included by Harmer (1926) in his new genus *Pyrulella* which was characterised primarily by the presence of conspicuous spines bordering the opesia. Hastings (1945) seriously questioned the status of this genus, noting that the type-species *P. pyrula* (Hincks) appeared to be better accommodated in *Valdemunitella* Canu, 1900 and that the other species included by Harmer in *Pyrulella* would be better in *Crassimarginatella*. She also questioned whether *Valdemunitella* itself should be regarded as distinct from *Crassimarginatella*. Brown (1952) also merged *Pyrulella* in *Crassimarginatella* but maintained *Valdemunitella* on the basis of the bifenestrate ovicell. Harmelin (1973), in a study of Mediterranean *Crassimarginatella,* concluded that Hastings was correct and that *Pyrulella,* for example, could not be maintained on the basis of the characters that Harmer recognised, since these (gymnocystal spines bordering the opesia, well developed gymnocyst proximally) are present in some of the species of undisputed *Crassimarginatella*.

It is unfortunate that Harmer selected *Membranipora pyrula* as the type-species of *Pyrulella* for, as evidenced by three species in the present collection, the species Harmer included in *Pyrulella,* other than the type-species, have certain features in common that would otherwise have warranted maintaining *Pyrulella* as a separate taxon. These features pertain primarily to the avicularium, which has a toothed rostral rim and spines bordering the opesia. In addition, the ovicell usually has a thinner border to the fenestra (than in *Crassimarginatella s.s.*) that is often apically peaked, and the gymnocyst is often extensive as Harmer noted.

Inasmuch as the species other than the type of *Pyrulella* have these features, a new name is required. I hereby introduce *Corbulella nom. nov.,* based on *Membranipora corbula* Hincks and including *Membranipora maderensis* Waters, *Crassimarginatella spinosissima* n.sp. (q.v.), *Pyrulella boninensis* Silén and *Allantopora translucens* Harmer. I regard *Corbulella* and *Valdemunitella* as subgenera of *Crassimarginatella*.

Crassimarginatella (Corbulella) spinosissima n.sp.
(Plate 4, A,B)

MATERIAL EXAMINED: NZOI Stn K820.

DISTRIBUTION: Kermadec Islands, 95–122 m.

DESCRIPTION: Colony encrusting, generally as broadly radiating pluriserial bands rather than circular patches. Zooids 0.50–0.70 × 0.30–0.43 mm, with large oval opesia bordered by very narrow cryptocyst which is obscured by a frontal cage of 11–15 pairs of slender gymnocystal spines; these spines arch across the opesia and meet, without fusion, in the mid-line. Oral spines 5–6, erect and somewhat stouter; in ovicelled zooids only one pair of oral spines, tending to bifurcate into two stumpy apical points. Gymnocyst extensive, smooth, one-third to one-half the zooidal length. Ovicells prominent, with a broadly crescentic fenestra exposing smooth endooecium; the distal rim of the fenestra typically notched apically, forming a small umbo. Avicularia as long as autozooids, often broader; the rostral cavity almost as large as the proximal opesia, from which it is delimited by two acute condyles just distal to the mid-point of the combined "opesiae"; the rostrum broadly rounded with a thin raised wall with minutely toothed rim; oral shelf scarcely evident; the proximal opesia bordered by a very narrow cryptocyst overarched by about 22 slender spines; a well developed gymnocyst proximally, smooth, one-third to one-half the length of the avicularium. Kenozooids common, with sub-circular opesia surrounded by broad smooth gymnocyst; no cryptocyst.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–288.

PARATYPES: NZOI, type number P–548, and NMNZ, type number Bry–621, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K820, Raoul Island, 29°13.30'S, 177°59.80'W, 95–122 m.

REMARKS: With its frontal shield of numerous spines this species superficially resembles a species of *Membraniporella* (Cribrilinidae, q.v.).

Crassimarginatella (Corbulella) translucens (Harmer) (Plate 4, C,D)

Allantopora translucens Harmer, 1926: 225.

MATERIAL EXAMINED: NZOI Stns K800, K826$_3$, K858; on coral.

DISTRIBUTION: Indonesia.

DESCRIPTION: Colony encrusting, forming uniserial chains of zooids with a cruciform branching pattern. Zooids 0.75–1.25 × 0.32–0.38 mm; hyaline, elongated, cornute with oval to round opesia less than half the zooidal length. Gymnocyst smooth, long and tapering. Cryptocyst narrow, granular, occasionally scarcely evident, bordered by 5–6 pairs of slender spines curving across the opesia and partly interdigitating. Ovicells fairly prominent, with a broad curved fenestra exposing smooth endooecium; the distal rim of the fenestra not notched or apically extended. Avicularia infrequent, slightly shorter than autozooids but as wide; the rostral space almost as large as the proximal opesia from which it is delimited by two acute condyles just distal to the mid-point of the combined "opesiae"; the rostrum broadly rounded with a thin raised wall with minutely toothed rim; oval shelf scarcely evident; the proximal opesia bordered by a very narrow cryptocyst with about seven slender overarching spines; gymnocyst smooth, shorter than that of autozooids. Kenozooids not uncommon, occurring where normal growth is obstructed; as long as autozooids, with tapering gymnocyst and oval opesia with scarcely evident cryptocyst.

REMARKS: This species was doubtfully assigned to *Allantopora* Lang by Harmer (1926). The occurrence of avicularia in the Kermadec specimens, not seen in Harmer's limited material from Celebes (Sulawesi), now makes a more certain generic assignment possible. The avicularia are unequivocally those of *Corbulella*. Other zooidal features are in harmony with this subgenus, and only the uniserial habit is unusual. It is not uncommon for otherwise crustose genera to include uniserial species, however, and *A. translucens* is here regarded as belonging to *Crassimarginatella (Corbulella)*.

Alderina Norman, 1903

Colony encrusting. Zooidal cryptocyst moderate, the opesia occupying the larger part of the frontal area. Umbones often present on the small gymnocyst. Lateral walls thickened and often crenellate, lateral spines absent. Avicularia absent. Ovicell prominent, with a finely granular frontal area and bounding ridge; not closed by the zooidal operculum. Small basal pore-chambers present.

TYPE-SPECIES: *Membranipora imbellis* Hincks, 1860

Alderina tuberosa (Canu & Bassler) (Plate 4, E,F)

Membraniporidra tuberosa Canu & Bassler, 1929a: 107.
Aplousina nodulosa Uttley, 1949: 183; Uttley & Bullivant 1972: 15.

MATERIAL EXAMINED: NZOI Stns K795, K819, K820, K871; on *Pecten*.

DISTRIBUTION: Cook Strait, Chatham Rise, Foveaux Strait; Philippines. Also known from the Pliocene of Waipukurau.

DESCRIPTION: Colony encrusting. Zooids oval to hexagonal, 0.52–0.83 × 0.37–0.63 mm. Proximal gymnocyst smooth, reduced, with 1–2 smooth tubercles. Cryptocyst coarsely granular, broader proximally. Opesia oval to pyriform, wider proximally. Ovicells subquadrate to subpyramidal, raised though partly immersed, smooth distally and laterally, with a triangular to subquadrangular granular area frontally. No spines or avicularia. Occasional sub-circular kenozooids, smaller than autozooids, with relatively broad granular cryptocyst. Usually one distal pore-chamber and two in each lateral wall.

REMARKS: The genus *Alderina* is not well known from the Pacific. Canu and Bassler (1929a) reported the type-species, *A. imbellis* (Hincks) from the Philippines, but the photograph of their specimen is inconclusive. They also suggested (loc. cit.) that their *Membraniporidra tuberosa* might be an *Alderina* and with this I agree. But for the proximal tuberosities on many zooids it might be conspecific with *A. imbellis*.

With Harmelin's (1973) discovery that Mediterranean colonies of erstwhile *Alderina solidula* (Hincks) may have vicarious avicularia and ought therefore to be classified as a *Crassimarginatella*, the distinctions between these two genera became less certain. *Alderina*, as defined, lacks avicularia, but if a character may be present or absent in different parts of the range of a species, its taxonomic value is diminished. On the basis of the many *Crassimarginatella*-like species in the New Zealand region, the ovicell of *Crassimarginatella s.s.* has a smooth frontal fenestra; that of *Alderina*, based on the type-species and *A. tuberosa*, is granular. On this basis also, *A. solidula* is placed in *Crassimarginatella*, for it has a smooth fenestra. Similarly, Osburn's (1950) *Alderina smitti* from tropical America may not be an *Alderina*. It has a smooth, unsculptured ovicell.

Onychoblestrum n.gen.

Colony encrusting. Zooids with extensive cryptocyst and trifoliate opesia. Avicularia vicarious, typically with pivots and winged mandibles. Ovicell hyperstomial, prominent; not closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Amphiblestrum hastingsae* Brown, 1952

Onychoblestrum hastingsae (Brown) (Fig. 4; Frontis.)

Amphiblestrum hastingsae Brown, 1952: 88.

MATERIAL EXAMINED: NZOI Stns K796, K803, K822, K827, K829, K837, K851, K854, K855, K856, K857, K859, K867.

DISTRIBUTION: Kermadec Islands; also Middle Oligocene of Nelson Province.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.53 × 0.25–0.33 mm, with trifoliate opesia bordered by a concave broad granular area which merges into gymnocyst at the finely crenellate rim. Proximal gymnocyst smooth, little developed. Four tiny spine bases on the distal zooidal rim, the proximal pair especially insignificant. Ovicells prominent, globular, with extensive granular frontal area and smooth narrow band distally, the opening not closed by the zooidal operculum. Avicularia vicarious, about two-thirds the length of autozooids; the rostrum long, curving distally, with thin raised walls and minutely serrated rim; oral shelf reducing the rostral foramen to about one-third the rostral length; proximal opesia roundly V- or U-shaped, with a pair of bordering mandibular pivots; a small, curved granular cryptocyst proximally; mandible paddle- or scimitar-shaped, with triangular base and broad thin lamina with variable chitinous thickening, the lamina either unequally bimembranous, or unimembranous.

REMARKS: The Kermadec colonies are clearly *Amphiblestrum hastingsae* of Brown (1952) but assigning this species to a genus is not a simple matter for it opens up a Pandora's Box of taxonomic difficulty. That it does not belong to *Amphiblestrum* is obvious; *Amphiblestrum* does not have vicarious avicularia, and this is a straight-forward and important distinction. Brown suggested and rejected *Onychocella,* which genus must now be considered.

The family Onychocellidae was established by Jullien (1882) for bryozoans with a relatively large cryptocyst, an opesia of varying shape, vicarious avicularia with large, winged mandibles (so-called onychocellaria) and immersed ovicells. Jullien introduced at the same time, *inter alia,* the genera *Onychocella, Ogiva, Ogivalia, Floridina* and *Smittipora.* Canu and Bassler (1917) added the genera *Rectonychocella, Velumella* and *Diplopholeos* to the Onychocellidae. All of these genera are characterised by a semicircular to trifoliate opesia, the absence of spines, vicarious avicularia and immersed ovicells (or at least the absence of hyperstomial ovicells), and a confirmed lumper might well feel some justification in merging them all into one genus. (Compare the genus *Chaperia s.l.* in which taxonomists, e.g., Brown (1952), have happily included species with or without, in any combination, spines, avicularia (both adventitious and interzooidal) and ovicells!) Much is made, in these genera, of whether or not the opesia has lateral indentations and how big they

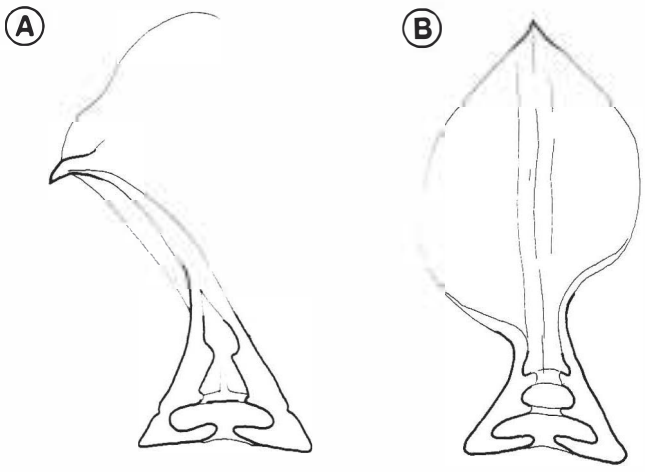

FIG. 4. Avicularian mandibles of *Onychoblestrum hastingsae* (Brown).

are, the shape of the avicularium and its foramen (combined opesia and rostral foramen in the absence of a pivot bar), and whether or not the mandible has one or two membranous expansions. If the same weight were applied to the characters of the avicularium of say, *Crassimarginatella,* that genus also might be divided, for its avicularia come in all shapes and sizes from small and semicircular to large and lanceolate or broadly spatulate, with or without a complete pivot bar, or they may even be absent in some parts of the range of a species. Taking this last feature into consideration, one may therefore question the validity of yet another genus of Canu and Bassler (1917), *Floridinella,* which they described (1920) as : "... a true *Floridina* without onychocellarium ..." and which they therefore put in a different family. One could equally question their 1917 genus *Aechmella,* which they described (1920) as : "... *Floridina* with avicularia replacing the onychocellaria". Since *Aechmella* is entirely fossil, and onychocellaria are typified by winged mandibles, one wonders at this supposed distinction. Again taking the form of the mandible, one could point to a genus like *Escharina* (Ascophora) which has long vibraculoid mandibles, or mandibles resembling the webbed foot of a bird, depending on the species. In other words, how important is the form of the mandible in the Onychocellidae? Harmer (1926) discussed some of these genera and concluded that *Rectonychocella* and *Velumella* should be included in *Smittipora,* which he regarded as distinct from *Onychocella.* Osburn (1950) accepted *Velumella,* whereas Bassler (1953) included (probably following Harmer) *Rectonychocella, Velumella* and *Diplopholeos* in *Smittipora.* A conclusion on the acceptability and scope of *Onychocella, Floridina, Smittipora,* etc., is beyond the scope of this memoir, but I have wished to draw attention to these problems.

Brown's *Amphiblestrum hastingsae* is an Oligocene New Zealand species here established as present in Recent seas on the basis of the Kermadec colonies. Its avicularium would be regarded as an "onychocellarium" (I think this term is unnecessary) for its mandible is winged. The longitudinal sclerite (rachis) is either weakly developed centrally or strongly developed on one side. Brown rejected *Onychocella* for his species on the basis of the hyperstomial ovicells and mandibular pivots, which are lacking in *Onychocella*. There are two genera with comparable ovicells and vicarious avicularia. These are *Rhagasostoma* Koschinsky, 1885 and *Cheethamia* Shaw, 1967. The only apparent difference between these genera is that the avicularia of *Rhagasostoma* are curved whereas those of *Cheethamia* are straight. The slit-like indentations at the corners of the opesia ("opesiules" of authors) are rather more developed in the type of *Rhagasostoma* than in the type of *Cheethamia* but this seems a very minor distinction. They are probably congeneric.

As to the generic allocation of Brown's *Amphiblestrum hastingsae, Rhagasostoma* (Eocene to Miocene) would appear to be the sole candidate. The chief differences between the type-species, *R. hexagonum,* and *A. hastingsae* are the trifoliate opesia and presence of mandibular pivots in the latter. I believe that, together, these differences are significant, and that a new genus is required for forms like *A. hastingsae.* I hereby introduce *Onychoblestrum* gen. nov., differing from *Onychocella* in its hyperstomial ovicells and mandibular pivots and from *Rhagasostoma* in its trifoliate opesiae as well as the pivots. It should be pointed out that Voigt (1975 : 79, footnote) comments as follows : "It must be stressed that the alleged difference between both *Onychocella* ... and *Rhagasostoma* ..., with clearly marked opesiula [sic] slits is only based upon the different stage of calcification of the cryptocyst within the opesial region. The difference of *Onychocella* with endozooecial ovicells and hyperstomial ones in *Rhagasostoma* cannot be maintained and shows many intermediate stages." This hearkens back to my earlier comment about lumping all the genera, but I am not convinced this is appropriate.

There are some species with hyperstomial ovicells and vicarious avicularia which resemble *Onychoblestrum hastingsae.* These are *Amphiblestrum coriense* MacGillivray, 1895 from the Miocene of Victoria, and *Membranipora* (*Amphiblestrum*) *trifolium* Busk var. *propinqua* Waters, 1885 [= *Lepralia trifolium* MacGillivray *non* Wood], Recent, Victoria. Waters mentions it as having "onychocellaria" although MacGillivray's (1879b) illustration does not show winged mandibles.

Osburn (1949) assigned *Ellisina latirostris* Silén, 1941 and *Onychocella luciae* Jullien, 1882 to his 1940 genus *Parellisina,* which is characterised by a typically large opesia, reduced cryptocyst, and vicarious avicularia associated with a distal kenozooid. These two species have somewhat reduced opesiae (although larger than in *O. hastingsae*) and the presence of the kenozooid is either not established or is equivocal. In some ways they are intermediate between *Onychoblestrum* and, say, *Copidozoum* Harmer. *Hincksina onychocelloides* Mawatari, 1956 is another species of uncertain affinities.

Finally, *Onychoblestrum* is here regarded as belonging to the family Calloporidae, inasmuch as the arrangement of the opesia and frontal wall are identical to that in *Amphiblestrum,* and vicarious avicularia are common in this family (cf. *Copidozoum* species). There is, however, an affinity to the Microporidae, as well as to the Onychocellidae. *Manzonella monopia* (q.v.) has almost identical avicularia (cf. Brown 1952 : 89).

Amphiblestrum Gray, 1848

Colony encrusting. Zooids with extensive cryptocyst occupying about one-third of the frontal area; the gymnocyst small, proximal. Opesia oval or trifoliate. Avicularia adventitious, usually on the gymnocyst. Spines few or absent. Ovicell prominent, not closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Membranipora flemingii* Busk, 1854

Amphiblestrum alcimum n.sp. (Plate 5, A)

MATERIAL EXAMINED: NZOI Stns K803, K825, $K826_2$, K827, K842, K854, K855; on mollusc shells.

DISTRIBUTION: Kermadec Islands, 140–370 m.

DESCRIPTION: Colony encrusting. Zooids oval to pyriform, 0.47–0.65 × 0.27–0.50 mm, contiguous, but with grooves between adjacent zooidal walls; the lateral and distal walls with raised rims, giving the frontal surface of zooids a markedly concave appearance. Opesia roughly trifoliate in outline due to constriction, almost midway, by broadly rounded pivotal arches at the opercular hinge-line. The opesia bordered by a uniformly narrow, smooth rim outside of which is a broad granular surface about two-thirds the length of the opesia. The proximal gymnocyst smooth, as long as the opesia or usually shorter, mostly obscured by the avicularium it supports. Avicularium columnar, rather tall; the sharply triangular rostrum slanted transversely upwards; the mandibular pivots blunt; no cross-bar; the proximal opesia bordered by a rounded, finely granular, concave rim. Ovicells prominent; rounded to oval; smooth with a narrow, granular triangular area frontally and encroaching on the gymnocyst of the next distal zooid such that it appears to be surmounted by an avicularium. Two orificial spines in young zooids, deciduous, not seen in older zooids. Occasional kenozooids, with small subcircular opesia and granular cryptocyst.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–287.

PARATYPE: NZOI, type number P–555, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: This species appears to be the same as Hincks's (1880a) "*Membranipora Flemingii* Busk var." from an unknown locality. Inasmuch as *Amphiblestrum flemingii* has paired gymnocystal avicularia, Hincks's comparison would have been better made with *A. minax,* which has a single, columnar, avicularium. *A. alcimum* differs from *A. minax* in having a smooth gymnocyst and a smooth ovicell with a triangular granular area. *A. minax* also has three persistent spines. *A. alcimum* resembles *A. inermis* (Kluge) from the Antarctic which has, however, a broader-based avicularium.

A. minax is the type of *Ramphonotus* Norman, 1894, which differs from *Amphiblestrum s.s.* only in the columnar avicularia. I here follow Ryland and Hayward (1977) in including *Ramphonotus* in *Amphiblestrum. A. alcimum* would otherwise be assignable to *Ramphonotus.*

Family CHAPERIIDAE Jullien, 1888

Colony encrusting; or erect, bilamellar or vincularian, from an encrusting base. Zooids with moderate to large opesia, sometimes obscured by an aviculiferous spinose shield. The cryptocyst generally well developed. Gymnocyst present, or absent, or supporting avicularia which obscure it. Intra-orificial ridges or laminae associated with the insertion of the opercular occlusor muscles well developed to absent. Oral spines present or absent. Avicularia adventitious and/or vicarious, or absent. Ovicell hyperstomial, endozooidal, or absent. Mural septula present.

Chaperia Jullien, 1881

Colony encrusting; or erect, bilamellar or vincularian, from an encrusting base. Cryptocyst extensive, gymnocyst small or absent. Suborificial occlusor laminae conspicuous and well developed. Distal rim of zooid with spines. Avicularia and ovicells absent. Multiporous mural septula present.

TYPE-SPECIES: *Flustra acanthina* Lamouroux, 1825

REMARKS: Brown (1952) has given reasons for the conservation of the name *Chaperia* (and Chaperiidae).

The genus *Chaperia s.l.* comprises around 50 fossil and Recent species. Gordon (1982) evaluated the genera of the Chaperiidae and concluded that the type genus should be restricted to those species lacking both avicularia and ovicells. Those *Chaperia*-like species with both of these features comprise *Chaperiopsis* Uttley, 1949.

Chaperia multispinosa n.sp. (Plate 5, B,C)

MATERIAL EXAMINED: NZOI Stns K795$_1$, K796, K797, K800, K801, K804, K805, K812, K820, K824, K825, K828$_1$, K829, K836, K837, K856, K858, K867; on coral, mollusc shells and sertellid bryozoans.

DISTRIBUTION: Kermadec Islands, 10–1156 m.

DESCRIPTION: Colony encrusting, biseriate or multiseriate; if biseriate, the zooids more elongate, with short opesia about one-third or less the length of the zooid. Biseriate zooids 0.60–0.85 × 0.25–0.35 mm, multiseriate zooids 0.32–0.48 × 0.37–0.48 mm. Cryptocyst granular, extensive in biseriate zooids, but much reduced in multiseriate zooids. Two semicircular rows of spines distally, the lower row of 10 spines set in the horizontal plane, more or less at right angles to the upper row of 16 slightly stouter spines, which stand erect or curve over the frontal wall from the lateral margins. A pair of prominent occlusor laminae inside the orifice, curving parallel to the lateral wall with a clearly defined space between. No ovicells or avicularia.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–275.

TYPE-LOCALITY: NZOI Stn K795$_1$, 33°02.6′S, 179°34.6′W, 350 m.

REMARKS: This distinctive species seems closest to *C. judex* Kirkpatrick, 1888, which also has numerous spines, but these number only about 15–20, are stouter, and occur in one row.

Pyrichaperia Gordon, 1982

Colony encrusting. Zooids robust, with extensive opesia and frontal membrane. Cryptocyst well developed, granular, steeply descending. Gymnocyst mainly lateral, smooth. Occlusor laminae weakly developed. Long stout spines bordering the opesia. No avicularia. Ovicell hyperstomial, prominent, without ridges or a fenestra. Multiporous mural septula present.

TYPE-SPECIES: *Chaperia pyriformis* Canu & Bassler, 1929

Pyrichaperia pyriformis (Canu & Bassler) (Plate 5, D)

Chaperia pyriformis Canu & Bassler, 1929a: 471.

MATERIAL EXAMINED: NZOI Stns K826$_2$, K850, K854.

DISTRIBUTION: Philippines.

DESCRIPTION: Colony encrusting, often growing upon itself and forming many loosely attached layers. Zooids 0.62–0.83 × 0.50–0.70 mm, robust, deep, thick-walled, broader proximally. Opesia large, about three-quarters the zooidal length, bordered by a descending granular, cryptocystal shelf. Occlusor laminae in the strict sense not present but at each part of the distal wall where they would be expected is a shallow concavity with bounding rim. Spines 10, stout, long and erect, emplaced around the rim of the zooid laterally and distally; only eight present in ovicelled zooids. Ovicells prominent, globular; surface finely granular; no fenestra or ridges, although in some cases a distal pair of spines curves across the front side of the ovicell, leaving grooves. The basal surface of each zooid is frequently outpocketed into one or occasionally two tapering struts; collectively, these support the colony somewhat off the substratum such that a zooidal layer is easily detached.

REMARKS: This is a very distinctive species not closely resembling any other. Canu and Bassler (1929a) cite only 4–6 spines in their text, although eight are plainly present in their retouched photograph of this species. They seem to have overlooked the smaller distal-most pair.

Chaperiopsis Uttley, 1949

Colony encrusting; or erect, bilamellar or vincularian, from an encrusting base. Opesia moderately large, the cryptocyst a conspicuous shelf or narrowing to a rim. Gymnocyst negligible or well developed proximally, frequently obscured by avicularian chambers. Occlusor laminae variously developed or negligible. Spines present, bordering the opesia. Avicularia present on the gymnocyst or absent; one often present on the mid-distal wall; vicarious avicularia occasional. Ovicell hyperstomial, usually with a frontal area and ridges; often surmounted by one or more avicularia.

TYPE-SPECIES: *Membranipora galeata* Busk, 1854

Subgenus **Chaperiopsis** Uttley, 1949

Colony encrusting; or erect, bilamellar or vincularian, from an encrusting base. Cryptocyst reduced or well developed, smooth or granular; gymnocyst negligible or partly developed proximally, smooth, frequently obscured by avicularian chambers. Occlusor laminae variously developed or negligible. Spines simple and/or forked. Adventitious avicularia present, borne proximally and/or mid-distally. Vicarious avicularia occasional. Ovicell present, typically with a frontal or proximal fenestra; often surmounted by one or more avicularia. Multiporous mural septula present.

TYPE-SPECIES: *Membranipora galeata* Busk, 1854

Chaperiopsis (Chaperiopsis) bispinosa n.sp.

(Plate 6, A)

MATERIAL EXAMINED: NZOI Stns K819, K837.

DISTRIBUTION: Kermadec Islands, 100–140 m.

DESCRIPTION: Colony encrusting. Zooids oval, 0.37–0.63 × 0.32–0.43 mm, with large opesiae. Cryptocyst narrow, granular. Gymnocyst essentially undeveloped, completely covered by the bases of avicularia. Spines insignificant, a single slender pair distally. Occlusor laminae appear as a narrow shelf around the distal wall, somewhat wider distolaterally. A small avicularium on the distal rim of non-ovicelled zooids, the rostrum shortly acute, distally directed. One or a pair of columnar avicularia proximally; the rostrum short, acute, directed proximally or, if avicularia paired, the rostra diverging obliquely proximally; the avicularian column with a distal spinose projection. Ovicells prominent, somewhat quadrate, smooth, with a narrow triangular fenestra frontally; supporting the avicularia (now sessile) on the distal side; the spinose projections still present, but the rostra diverging obliquely distally instead.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–340.

TYPE-LOCALITY: NZOI Stn K819, Raoul Island, 29°13.24′S, 177°56.30′W, 100–140 m.

REMARKS: This is one of the few species of *Chaperiopsis* with only two spines. It differs from fossil *C. perversa* (Waters, 1882), which has an extensive frontal wall, and from *C. patula* (Hincks, 1881a), which may have from 2–6 spines and no proximal avicularia. *C. bispinosa* is near *C. spiculata* Uttley, 1949 which, however, has four spines and the rostra of the ovicellular avicularia directed obliquely proximally.

Chaperiopsis (Chaperiopsis) boninensis Silén

(Plate 6, B)

Chaperia transversalis var. *boninensis* Silén, 1941: 48.

MATERIAL EXAMINED: NZOI Stns K795, K796, K797, K829, K836, K837, K871.

DISTRIBUTION: Bonin Islands, Japan.

DESCRIPTION: Colony encrusting. Zooids oval to pyriform, 0.50–0.93 × 0.42–0.63 mm, tapering or truncate proximally. Opesia oval to circular, bordered by a granular cryptocyst which is narrow laterally and half the opesial length proximally. Occlusor laminae

variable, either a pair of stout ridges on each distolateral wall with a deep groove behind, or this arrangement less well developed. Gymnocyst smooth, reduced or up to one-third the zooidal length, bearing 0–2 very tall, slender aviculiferous spines on tiny, tapered bases; the rostra distally directed. A small avicularium on the distal zooidal rim; no pivot bar; the rostrum acute, directed distally. Five stout spines around the oral rim; the three distal spines simple or with short apical bifurcations; the proximal pair robust, thrice branched, cervicorn. Ovicells globular, prominent, with a transverse groove frontally.

REMARKS: Silén (1941) described this species as a variety of *C. transversalis* Canu & Bassler, 1929a which, however, has larger zooids and sessile proximal avicularia. The Kermadec specimens have five oral spines whereas Silén's evidently had only four. *Chaperiopsis boninensis* superficially resembles *C. cervicornis* (Busk) and *C. colensoi* (Brown). *C. cervicornis* differs in that the cryptocyst is smooth and gymnocystal avicularia are lacking. *C. colensoi* has four oral spines, and, on the ovicell, a triangular fenestra and a pair of sessile avicularia, the rostra converging proximally. There is some resemblance to *C. furcata* and *C. multifida* (*see* Kluge 1914) which have four less robust oral spines.

Chaperiopsis (Chaperiopsis) intermediata n.sp.
(Plate 6, C)

MATERIAL EXAMINED: NZOI Stns K803, K825, $K826_{2,3}$, K837, K855, K857, K858, K867; on mollusc shells.

DISTRIBUTION: Kermadec Islands, 110–501 m.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.50 × 0.32–0.38 mm, with transversely oval opesia bordered by narrow granular cryptocyst and thin raised rim around the distal half. Gymnocyst smooth, about the same length as the opesia but obscured by a columnar avicularium. Spines four, a robust, flattened, proximal pair and a small, erect, distal pair, the former arching across the front of the zooid and fusing in the mid-line, with some overlap, to form a complete orificial bar; the centre of this bar fused to the apex of a large columnar avicularium which arches distally across the opesia from the proximal gymnocyst; spinose processes occur on each side of the avicularian column; thus the whole complex of orificial bar and spinose column effectively hides and shields the opesia. The rostrum of the columnar avicularium raised at an angle away from the opesia, long, acute, directed distally. A small avicularium present in the centre of the distal rim of the zooid, the acute rostrum distally directed. The occlusor arch moderately developed around the distal zooidal wall, the proximal ends truncate. Ovicell somewhat recumbent, appearing more so in older zooids, with a crescentic fenestra frontally that becomes displaced distally with increasing calcification; when ovicells are present the columnar avicularium is replaced by two small such avicularia which are both produced across the opesia to fuse with the orificial bar, their rostra acute, converging obliquely distally.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–341.

PARATYPE: NZOI, type number P–570, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K825, 28°47.8′S, 177°47.8′W, 145 m.

REMARKS: In the proximally directed large avicularium *C. intermediata* is like *C. tropica* (Waters, 1909), but that species lacks the fusion of spines. The frontal development is an extension of the arrangement of spines and avicularia seen in *C. spiculata*, in which the robust orificial spines cross the opesia but do not fuse, and the avicularian column is less developed. A further development of the arrangement in *C. intermediata* is seen in *Chaperiopsis* (*Clipeochaperia*) *funda*, which has a true frontal shield.

Chaperiopsis (Chaperiopsis) multifida (Busk)
(Plate 6, D,E)

Membranipora galeata var. b. *multifida* Busk, 1884: 64.
Chaperia multifida: Kluge 1914: 673; Brown, 1952: 108.

MATERIAL EXAMINED: NZOI Stns K803, K825, $K826_3$, K857.

DISTRIBUTION: Cape of Good Hope, St Helena Island; also Pliocene of Hawkes Bay.

DESCRIPTION: Colony encrusting. Zooids broadly pyriform, 0.50–0.60 × 0.47–0.60 mm, truncate proximally. Opesia large, circular, bordered by a smooth narrow cryptocyst bounded on each side by a thin raised mural rim. Gymnocyst reduced, smooth. Spines four, on the distal rim, the distal pair bifid, the proximal pair twice bifid with four tines. Occlusor laminae not developed, but there is a concavity with bounding rim on each distolateral wall. A small avicularium on the distal rim between the bases of the distal pair of spines, the rostrum acute, distally directed. A single large columnar avicularium on the proximal gymnocyst; the rostrum long, acute, finely toothed and proximally directed; no pivot bar; the foramen about half the rostral length. Vicarious avicularia rare, almost half the length of autozooids; the rostrum tapering but not acute; the foramen slightly more than half the avicularian length; no pivot bar, but a pair of prominent pivots. Ovicells not seen.

REMARKS: The Kermadec specimens are here placed in *Chaperiopsis multifida* (Busk) on the basis of Kluge's (1914) and Marcus's (1938) descriptions. There are, however, some differences between the Kermadec

specimens and *C. multifida s.s.* In the latter, the most distal pair of spines is not forked, the proximal avicularium is frequently paired, and the rostrum is not prolonged or toothed; neither has a vicarious avicularium been described. Whether or not these differences warrant the erection of a new species or subspecies for the Kermadec specimens is debatable.

Chaperiopsis (Chaperiopsis) rubida (Hincks)
(Plate 7, A)

Membranipora rubida Hincks, 1881a: 147; Hamilton 1898: 195.
Chaperia rubida: Brown 1952: 103; Gordon 1970: 323; Ryland 1975: 386.

MATERIAL EXAMINED: NZOI: K Stn unknown. British Museum (Natural History): 97.5.1.531 from unnamed New Zealand locality. DPG: Colony from Leigh.

DISTRIBUTION: Kermadec Ridge, Hauraki Gulf.

DESCRIPTION: Colony encrusting. Zooids 0.29–0.44 × 0.27–0.41 mm, with large, rounded opesiae. Cryptocyst granular to almost smooth, widest proximolaterally. Gymnocyst smooth, reduced, supporting broad-based avicularian column(s). Oral spines four, straight, the proximal pair stouter. Occlusor laminae clearly visible. A small mid-distal avicularium present, distally directed. One or two columnar avicularia proximal to the opesia, bearing 1–2 pairs of forward-projecting spikes, the apical rostrum directed obliquely distally, proximally, or laterally; or these avicularia replaced by a single large avicularium lacking spikes and on a shorter column, directed obliquely distally to left or right. Ovicell smooth-surfaced; with a narrow, transversely elongate fenestra and surmounted by 1–2 avicularia.

REMARKS: Examination of British Museum (Natural History) material shows that consistent differences exist between this species and *C. spiculata* Uttley, 1949, in which the large avicularia are spicate and directed proximally, the proximal pair of oral spines is curved, and the fenestra is larger. Thus, figure 3A in Gordon 1982 is not of *C. rubida*, as labelled, but of *C. spiculata*.

Chaperiopsis (Chaperiopsis) spiculata Uttley
(Plate 7, B)

Chaperiopsis spiculata Uttley, 1949: 188; Uttley & Bullivant 1972: 18.
Chaperia galeata (part): Livingstone 1929: 100.

MATERIAL EXAMINED: NZOI Stns K797, K803, K804, K818, K820, K827, K829, K837, K840, K843, K844, K851, K855, K856, K872.

DISTRIBUTION: Little Barrier Island, Napier, Foveaux Strait, Chatham Islands.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.50 × 0.25–0.43 mm, with large, rounded opesiae. Cryptocyst narrow, granular. Gymnocyst smooth, reduced, obscured by bases of avicularia. Occlusor laminae not well developed, occurring as a narrow continuous shelf arching around the distal and distolateral walls, with associated concavities for muscle attachment. Spines four, the proximal pair stouter and longer, arching across the opesia to meet without fusion. An avicularium on the distal rim, typically squat, occasionally columnar; the rostrum acute, distally directed. One or, less frequently, two columnar avicularia proximal to the opesia, the apex of the column with a spiculate projection distally; the rostrum long, acute, directed proximally; if paired, the rostra shorter, diverging obliquely proximally. Ovicells somewhat quadrate, smooth, with a bordered crescentic or triangular fenestra frontally, and the paired columnar avicularia distally, their rostra directed obliquely proximally.

REMARKS: In its arrangement of spines and avicularia, *C. spiculata* approaches *C. intermediata* n.sp.

Subgenus **Clipeochaperia** Uttley & Bullivant, 1972

Colony encrusting or with erect lobes. Opesia obscured by a frontal shield formed by 1–4 avicularium-bearing processes based on the proximal gymnocyst and fusing distally with a pair of oral spines; the processes forming the shield separated by perforations. Occlusor laminae not well developed. The oral rim grooved. Vicarious avicularia present. Ovicell with a foramen.

TYPE-SPECIES: *Clipeochaperia funda* Uttley & Bullivant, 1972

REMARKS: Uttley and Bullivant (1972 : 22) have pointed out the superficial morphological resemblance between the frontal shield of *Clipeochaperia* and that of certain species of *Arachnopusia* (q.v.).

Chaperiopsis (Clipeochaperia) funda Uttley & Bullivant
(Plate 7, C)

Clipeochaperia funda Uttley & Bullivant, 1972: 19.

MATERIAL EXAMINED: NZOI Stns K837, K851.

DISTRIBUTION: Chatham Rise, Otago Shelf.

DESCRIPTION: Colony encrusting, small. Zooids 0.30–0.43 × 0.25–0.30 mm, with opesia completely hidden by a frontal calcareous shield formed basically from three, sometimes four, avicularium-bearing processes arising from wide bases on the gymnocyst; these processes fuse at intervals with each other by cross-connections and at their apices, which jointly merge with an orificial bar; 2–3 rows of lacunae between the cross-connections indicate the boundaries of the 3–4

fused processes. If three avicularia, their acute rostra are directed away from the centre of the zooid, if four the rostra of the proximal pair converge obliquely proximally relative to one another. Cryptocyst smooth, narrow. Gymnocyst reduced, obscured by the avicularian processes. A pair of small, erect orificial spines; a small avicularium with acute, distally directed rostrum just distal to these spines. Occlusor arch weakly developed. The distal oral rim beaded. The ovicell partly immersed by calcification of surrounding zooids, smooth, with narrow crescentic or triangular fenestra frequently reduced by secondary calcification to 1–2 small pores. Vicarious avicularia not uncommon at the colony margin, two-thirds the length of autozooids; no pivot bar; a long acute rostrum, and crescentic, granular cryptocyst.

REMARKS: The frontal shield of *Chaperiopsis funda* can be seen as an elaboration of the arrangement seen in *C. intermediata*, with fusion of an orificial bar and avicularian process. In *C. funda* more avicularia contribute to the shield, which is more complete. *Chaperia frontalis* Osburn, 1950 evidently belongs to subgenus *Clipeochaperia.* It resembles *C. funda* in its small white colonies, as opposed to the common purple colouration of dried colonies of many species of *Chaperiopsis s.s.* with a frontal shield. In the development of its shield it is in many ways an intermediate between *C. intermediata* and *C. funda.*

Family HIANTOPORIDAE Gregory, 1893

Colony encrusting. Zooids contiguous or interconnected by short tubes, supported off the substratum by basal processes. One or more spinose processes from the lateral walls partly or wholly overarching the opesia; aviculiferous processes larger than the others. Ovicell hyperstomial with an ectooecial fenestra. Multiporous pore-chambers present.

REMARKS: Gregory (1893) first introduced this family-group taxon (as Hiantoporinae).

Hiantopora MacGillivray, 1887

Characters as for the family.

TYPE-SPECIES: *Lepralia ferox* MacGillivray, 1868

REMARKS: *Hiantopora* appears to have close affinities with the Chaperiidae.

Hiantopora jucunda n.sp. (Plate 7, D,E)

MATERIAL EXAMINED: NZOI Stns K797, K827, K837, K867; on mollusc shells.

DISTRIBUTION: Kermadec Islands, 55–318 m.

DESCRIPTION: Colony encrusting. Zooids 0.42–0.60 × 0.35–0.50 mm, with opesia completely hidden by a huge, broad-based aviculiferous spine which may arise from either side of the zooid. It appears first as an oval spine base, then extends across the opesia, differentiating into an avicularium as it broadens; the distal edge straight, serving as a proximal rim to the orifice; the sloping proximal surface curved, with rows of pores and spinules. The avicularian rostrum semi-erect, with an acute tip. Orificial spines four, long, the proximal pair stouter. Ovicells rather prominent, smooth, the ectooecium with an angular proximal rim, exposing a narrowly triangular band of endooecium.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–323.

PARATYPE: NZOI, type number P–552, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K827, 28°45.4′S, 177°46.5′W, 260–318 m.

REMARKS: *Hiantopora jucunda* is closest to *H. ferox* (MacGillivray, 1869) which has, however, more of the opesia exposed and bordered by irregular denticulations.

Superfamily AETEOIDEA Smitt, 1867, *nom. transl.*

Colony adnate, creeping. Zooids tubular, each comprising an adnate proximal portion and an erect distal portion. The adherent parts of zooids arranged in uniserial branches, with slender stolonal sections alternating with dilated sections; the adherent parts may all represent the proximal portions of autozooids, or kenozooids may be interpolated in the series. The erect tubular portions of autozooids are finely ringed or punctate, and terminate in a somewhat dilated distal region with frontal membrane and operculum. No spines, avicularia or ovicells. Embryos brooded in evanescent ovisacs external to the orificial region. Ancestrula a smaller version of an autozooid.

REMARKS: The name Aeteoidea is a *nomen translatum* of Aeteidae Smitt, 1867 and corresponds to the Inovicellata of Jullien (1888).

Family AETEIDAE Smitt, 1867

Characters as for the superfamily. The affinities of this family have long been debated (*see* Mawatari 1973a). It is usually placed first among the anascan families. Inasmuch as the single included genus has weakly calcified tubular zooids with an extensive frontal membrane, I prefer to place this superfamily near the other anascan groups with similar characteristics, i.e., Scruparioidea and Buguloidea.

Aetea Smitt, 1867

Characters as for the family.

TYPE-SPECIES: *Sertularia anguina* Linnaeus, 1758

Aetea ?australis Jullien (Plate 8, A–D)

cf. *Aetea australis* Jullien, 1888: 26.

MATERIAL EXAMINED: NZOI: Stns K798, K799, K801, K812, K816, K820, K822, K833, K848, K855; on algae, hydroids, bryozoans, stones or mollusc shells. DPG: Colonies on algae, rocks or *Perna* from Hauraki Gulf, Waitemata Harbour, Whatipu, Castlepoint, Totaranui, Kaikoura, Cape Foulwind, Stewart Island.

DISTRIBUTION: Throughout New Zealand; also magellanic South America and Western Australia.

DESCRIPTION: Colony encrusting, forming branching uniserial series of zooids; each zooid comprising an adnate basal portion which is wider, at its dilatation, than the erect tubular portion that arises from it. The tubular portion 0.38–0.62 mm long, about 0.55 mm in diameter, the distal part (0.06–0.09 × 0.15–0.23 mm) rather wider than the tubular part, not parallel-sided, and somewhat truncate distally; the distal third of the erect portion straight or quite flexed. Adnate and distal portions finely punctate, the tubular part finely ringed.

REMARKS: The species of *Aetea* are relatively few, but identifying them with certainty, on a worldwide basis, is not straightforward. The commonest species, as presently recognised, are either highly variable or they are complexes of more than one species (*see* Simma-Krieg 1969). In the New Zealand region a ringed species occurs very commonly, which was earlier recorded by Gordon (1967, 1970) as *Aetea anguina* (L.). Ryland (1975) has noted that the New Zealand form differs from typical *anguina, inter alia,* in lacking the broadly spatulate "head" of the tubular portion which, in *A. anguina,* occupies relatively less of the total length of the erect portion of the zooid. The New Zealand form differs also from *Aetea sica* (Couch), another northern species, in overall size, attaining, on average, only half the height of typical British *A. sica*. The "head" is somewhat more inflated than in *A. sica* and is commonly deflexed. Marcus (1937) notes that the ratio between length and width of the opesia is a useful distinction between *A. anguina* (1 : 1.7 to 1 : 2) and *A. sica* (1 : 2.6 to 1 : 4). In the Kermadec specimens the ratio is from 1 : 2.2 to 1 : 2.8, which is almost intermediate. This ratio in species of *Aetea,* however, may not be significant. In a single colony of *Aetea* cf. *ligulata* from Stewart Island the ratio is quite variable. This colony occurs on the outer and inner surface of a brachiopod valve. The erect portions of the outer zooids are relatively short whereas those of the inner zooids attain 2 mm in length. The length of the opesia varies by a factor of two whereas the width remains the same. On the inner surface of the same valve the peristomes of a cyclostome bryozoan are also greatly elongated, reflecting a growth response to reduced water flow over the concave interior surface of the dead brachiopod valve.

The New Zealand form also does not correspond exactly to European *A. anguina* or *A. sica* in the form of the zooids, although the tentacle numbers are similar, being 11–13 (average 12) in Hauraki Gulf specimens and 12 in British *A. anguina.* Reported tentacle numbers for *A. sica* vary from 9–16. Embryo colour differs, however, being pink in specimens from Auckland (personal observation) and golden yellow in British *A. anguina* and *A. sica* (Ryland and Hayward 1977).

The strong possibility exists that the New Zealand form corresponds to Jullien's *A. australis,* which he reported from magellanic South America and Western Australia. His description agrees very closely with the Kermadec specimens but he did not illustrate the species or provide measurements. Inasmuch as the New Zealand form agrees more closely with the description of *A. australis* than with northern *A. anguina* or *A. sica,* Jullien's name is provisionally used here.

It may also be noted that *A. sica* of Rogick and Croasdale (1949), from Woods Hole, may be the same as the New Zealand form. Their illustration is almost identical and they reported pink embryos.

Aetea azorensis Calvet *in* Jullien & Calvet, 1903 is another species with a similar form. Prenant and Bobin (1966) regarded it as conspecific with *A. sica* and in this they are probably correct. *Aetea annulata* Kluge, 1914 from Simon's Bay, South Africa resembles *A. ?australis* closely, except that Kluge shows the adnate part of the zooid as ringed rather than punctate.

Aetea ligulata Busk (Plate 8, E,F)

Aetea ligulata Busk, 1852a: 30; Prenant & Bobin 1966: 89 (*cum syn.*).

MATERIAL EXAMINED: NZOI: Stns K795, K819, K820; on *Pecten* valves. DPG : One colony from Hauraki Gulf.

DISTRIBUTION: Northern New Zealand; also North America from British Columbia to California, Brazil to Patagonia, Caribbean, Red Sea, and possibly the Mediterranean.

DESCRIPTION: Colony encrusting. Zooids in branching uniserial series, each zooid comprising an adnate basal portion, relatively long, and an erect (0.61–1.10 mm) tubular portion with a distal membranous area frontally (0.08–0.10 × 0.23–0.38 mm) with terminal operculum. The adnate portion is filiform and stolon-like proximally. Both erect and adnate portions are finely punctate throughout, while the erect portion usually has broad, smoothly rounded, horizontal corrugations.

REMARKS: Except for the corrugations of the erect tubular portion, colonies from the Kermadecs resemble *Aetea truncata* (Landsborough). In one colony tall tubular sections are corrugated while short ones are not. Hastings (1943 : 475) has noted that confusion of the two species is possible. Kermadec colonies, while mostly characterised by obvious corrugations, do not agree in all respects with some overseas records. Busk (1852a) and Marcus (1937) show a constriction near the base of the opesia. Mawatari (1973a) shows a rather expanded distal region relative to the diameter of the tubular part. New Zealand specimens lack the constriction and the expanded opesia.

Superfamily BUGULOIDEA Gray, 1848, *nom. transl.*

Colony erect, flexible, often jointed, or loosely encrusting, attached by rhizoids. Zooids typically not heavily calcified. Spines common or absent, sometimes modified into scutes overarching the typically extensive opesia. Avicularia sessile and/or pedunculate. Vibracula present in some genera. Ovicell hyperstomial, endozooidal or absent, or special gonozooids occur.

REMARKS: The name Buguloidea is a *nomen translatum* of Bugulidae Gray, 1848 and corresponds to the Scrupocellariacea of Cheetham (1963a) and the Cellularina (*partim*) of Smitt (1868). The name Scrupocellarioidea is not used here since the family name Scrupocellariidae Levinsen, 1909 was preceded by Cabereidae Busk, 1852b.

Family BUGULIDAE Gray, 1848

Colony encrusting or, more commonly, erect and branched, unjointed, unilaminar, attached by rhizoids. Zooids long, parallel-sided, with much of the frontal surface membranous. Avicularia typically present, of the pedunculate bird's head type. Marginal spines frequently present. Ovicell hyperstomial with membranous ectooecium, usually prominent, sometimes small, cap-like.

REMARKS: The Bugulidae is here considered to include the Bicellariellidae Levinsen, 1909. That family, as then constituted, was rather heterogeneous and many of the genera included by Levinsen and others have since been assigned to other families. Modern definitions characterise the Bicellariellidae as having somewhat turbinate zooids, tapering proximally and flaring distally, while the Bugulidae have zooids which are rather more parallel-sided (cf. Bassler 1953, Ryland and Hayward 1977). Concomitant with these features, the frontal membrane and opesia are said to be restricted to the distal part of the zooid in the Bicellariellidae while they account for most of the frontal area of zooids in the Bugulidae. Both families typically have zooids with pedunculate avicularia and independent hyperstomial ovicells with a membranous ectooecium.

Many genera may confidently be assigned to these families as presently understood. For example, *Bicellariella* Levinsen. *Bicellarina* Levinsen, *Cornucopina* Levinsen and *Calyptozoum* Harmer concur in numerous features and can be allied as one grouping. Similarly, *Bugula* Oken. *Camptoplites* Harmer, *Dendrobeania* Levinsen. *Kinetoskias* Danielssen, *Semikinetoskias* Silén. and *Sessibugula* Osburn are another grouping which are clearly of allied species. The presence of sessile avicularia is not regarded as being incompatible with the concept of the Bugulidae and *Himantozoum* Harmer, *Bugularia* Levinsen and *Klugella* Hastings can be allied with these genera.

A number of genera, however, are less clear-cut in their relationships. Either they are on the fringe of either of these families or they may be allied with both, being morphologically intermediate between them. For example, in his discussion of *Caulibugula* Verrill, Harmer (1926 : 457) commented whether "the two series of species should not be placed in *Bicellariella* and *Bugula* respectively". He further noted (1926 : 458) that, in *Caulibugula dendrograpta* (Waters), a "gradual transition, from a *Bicellariella*-like zooecium to one of a *Bugula*-like type, is shown ..., sometimes within the limits of a single fan ...".

Some uniserial genera (*Cornynoporella* Hincks, *Bugulella* Verrill, *Leiosalpinx* Hayward & Cook) have been included in the Bicellariellidae whereas one may justifiably argue for their inclusion in the Bugulidae. *Corynoporella,* for example, has essentially buguloid zooids, and a morphological form more or less identical to that of *Dendrobeania fruticosa* (Packard) *frigida* (Waters) (*see* Kluge 1962). *Corynoporella japonica* Mawatari, 1957 in fact, would appear to be a junior synonym of *D. fruticosa frigida*. There are close relationships among these genera – Harmer (1926) suggested that *Corynoporella* may be a junior synonym of *Bugulella*. *Bugulella* includes species with sessile or pedunculate avicularia. The zooids, while tapering considerably proximally, are nonetheless buguloid in form, lacking the constrictions and oblique distal flaring of *Bicellariella*. *Leiosalpinx* lacks ovicells and avicularia, but seems to be an extreme example of the tubular form that characterises this group of bryozoans. *Brettia* Dyster possibly belongs with this group as well. Its zooids, as depicted in George Busk's original drawings in Dyster (1858), bear a considerable resemblance to those of some species of *Bugulella*.

I see no clear-cut difference between the Bugulidae and Bicellariellidae and believe the two families should be merged. Levinsen (1909), Harmer (1926), Hastings (1943) and others regarded the suite of genera as unifamilial (as Bicellariellidae). As Bassler (1953) pointed out, the name Bugulidae has priority.

Maintaining one family more readily justifies the

accommodation of such forms as *Dimetopia* Busk, with its opposite and decussate zooids and lack of avicularia, and *Bobinella* d'Hondt, which d'Hondt (1981) declined to place in a family.

Bugula Oken, 1815

Colony erect, growing from an upright ancestrula, branching, attached by rhizoids. Zooids arranged in two or more series, alternating, the end walls forked. Opesia and frontal membrane extensive, the orifice closed by a sphincter. One or more spines usually confined to the distal corners. Pedunculate avicularia typically present. Ovicell hyperstomial, globular or small, cap-like. Multiporous septula present.

TYPE-SPECIES: *Sertularia neritina* Linnaeus, 1758

Bugula sp. (Plate 9, A,B)

MATERIAL EXAMINED: NZOI Stn K795; on a mollusc valve.

DISTRIBUTION: Kermadec Islands, between 270 and 350 m.

DESCRIPTION: Colony erect, biserial. Zooids elongate, 0.47–0.50 × 0.18 mm, with rectangular opesiae. Gymnocyst long, tubular. No spines. Avicularia not seen. Ancestrula erect, funnel-shaped with flat, sloping frontal area bordered by about eight tiny spine bases; ancestrula and first two zooids supported by stout rhizoids.

REMARKS: Only the one small ancestrulate colony was found. In shape, the zooids are reminiscent of those of *B. johnstonae* (Gray), but the lack of clearly diagnostic features (avicularia, ovicells, type of bifurcation) precludes positive identification.

Cornucopina Levinsen, 1909

Colony erect, branching, delicate; the branch axis biserial, exceedingly slender, comprising the tubular proximal portions of zooids of which the distal part is widely expanded at an angle to the axis. Distal spines present, extremely long and slender. Avicularia variable, often greatly elongated, even gigantic. Ovicell hyperstomial, conspicuous. Multiporous septula present.

TYPE-SPECIES: *Bicellaria grandis* Busk, 1852

Cornucopina geniculata Harmer (Plate 9, C)

Cornucopina geniculata Harmer, 1926: 246.

MATERIAL EXAMINED: NZOI Stn K795.

DISTRIBUTION: Northern Sulawesi (Celebes), 1165–1264 m.

DESCRIPTION: Colony erect, branching, lightly calcified, delicate, to 30 mm high, the branch axis of descending rhizoids and the narrow, tubular proximal portions of zooids. Zooids 0.76–0.90 × 0.25–0.39 mm, smooth, the dorsal wall arched concavely. Opesia roundly triangular with very narrow gymnocystal rim which is slightly raised all around, especially at the inner distal corner; from the outer distal corner a spine-bearing process supporting 5–6 extremely long curving spines along its length; 2–4 additional long spines from the distal dorsal wall of the zooid. Avicularia short, claviform, borne frontally proximal to the opesia. Ovicells not seen in this specimen.

REMARKS: Only a single colony was found in the Kermadec samples, attached to a mollusc valve. Although agreeing with Harmer's description and illustrations in other respects, none of the avicularia in the Kermadec colony are geniculate.

Dendrobeania Levinsen, 1909

Colony erect, repent or rarely encrusting, unilamellar, branching; attached by rhizoids. Zooids typically bi- to multiserial, never wholly uniserial; elongate, with a proximal gymnocyst typically supporting a pedunculate avicularium frontally or laterally. Spines present laterally and at distal corners. Ovicell hyperstomial, subglobular.

TYPE-SPECIES: *Flustra murrayana* Bean *in* Johnston, 1847

Subgenus **Luguba** n.subgen.

Encrusting *Dendrobeania* with numerous marginal spines and long distal spines. Avicularium borne laterally on the gymnocyst. Bifurcations producing two zooids on one side, a single zooid on the other.

TYPE-SPECIES: *Dendrobeania* (*Luguba*) *sessilis* n.sp.

Dendrobeania (Luguba) sessilis n.sp. (Fig. 5; Plate 9, D,E)

MATERIAL EXAMINED: NZOI Stns K797, K820, K837, K855; on mollusc shells and encrusting bryozoans.

DISTRIBUTION: Kermadec Islands, 55–125 m.

DESCRIPTION: Colony encrusting, small; branches biserial. Zooids elongate, 0.32–0.48 × 0.20–0.25 mm, the opesia oval to subrectangular, generally twice as long as the smooth gymnocyst. At each outer distal corner three long stout spines, the more frontal pair joined basally and arranged at right angles to each

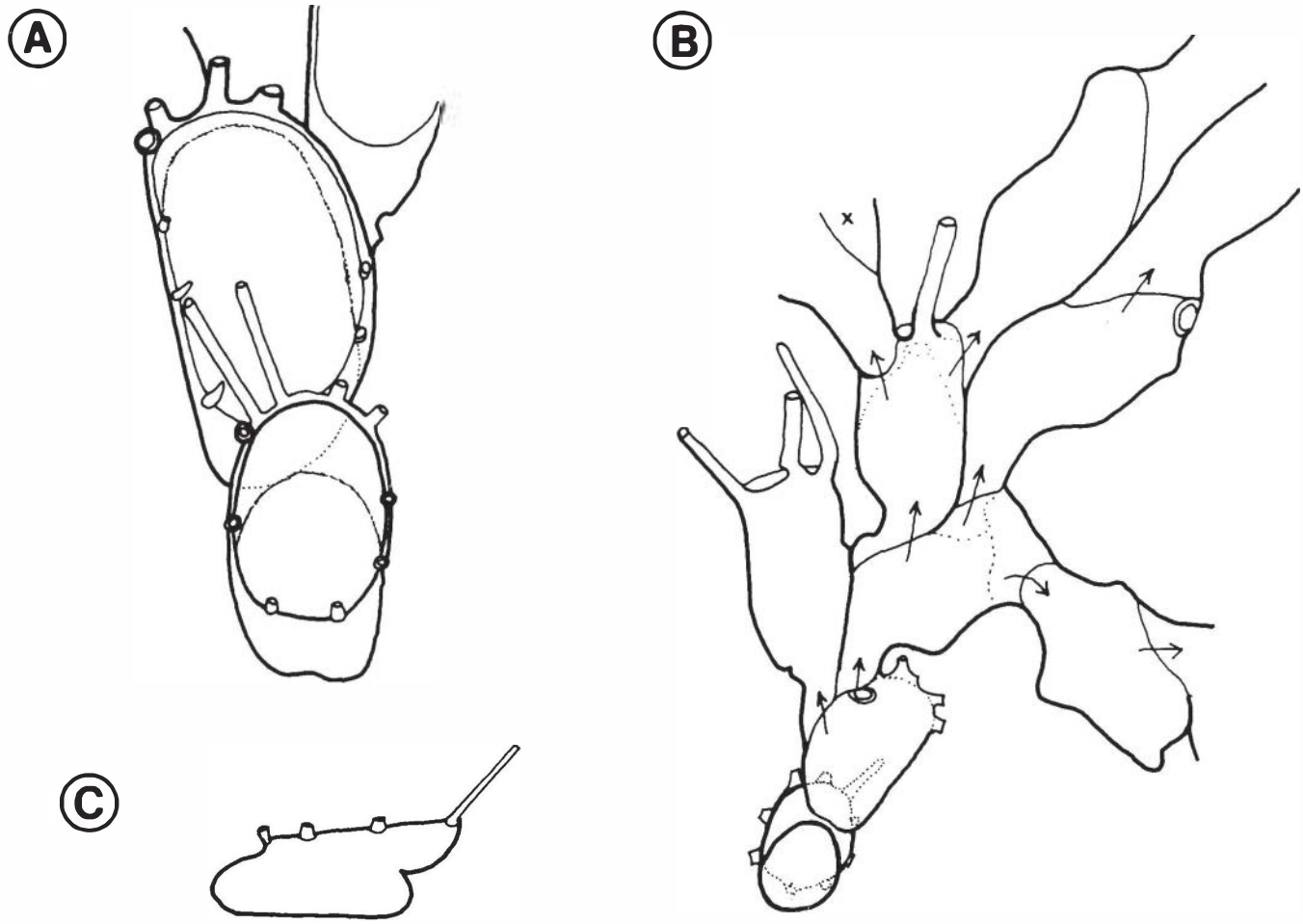

FIG. 5. *Dendrobeania (Luguba) sessilis* n.sp. A, ancestrula and first zooid; B, dorsal view of part of a young ancestrulate colony showing budding directions (zooid marked "X" was ovicellate); C, ancestrula in profile.

other; this pair of spines only, at the inner distal corner; 1–2 median distal spines, directed distally; four pairs of lateral spines arching across the opesia, somewhat interdigitating. A single pedunculate bird's head avicularium on the outer opesial rim. Ovicells globular, prominent, arising from the full width of the distal zooidal rim. Ancestrula recumbent, with 10 spines; a pair of these at one distal corner fused basally and arranged at right angles to each other; the first zooid arising from the distal wall, itself giving rise to two zooids, one of which initiates the first bifurcation, producing a single zooid on one side and two zooids on the other; the single zooid immediately producing two daughter zooids, commencing a biserial branch; this type of bifurcation repeated again immediately, establishing another biserial branch; these biserial branches fairly long, not later seen to bifurcate (in the limited Kermadec material); from each basal wall of zooids at proximal parts of a colony a rhizoid arises, with fimbriate attachment disc; later zooids cemented directly to the substratum.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–286.

PARATYPE: NZOI, type number P–553, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: This unusual species shares the characters of at least three genera. It resembles *Bugula* Oken but differs from that genus in its sessile habit, in the possession of many marginal spines, and in the unusual type of birfucation. *Sessibugula* Osburn, a monotypic genus from the Central American region, is likewise sessile, but it differs in its multiserial habit, its extensive gymnocyst bearing up to two avicularia frontally, and in lacking rhizoids. *Dendrobeania* is closest to the present species. Species of this genus may be erect or recumbent, although not truly encrusting, and biserial to multiserial, with the avicularium situated mostly frontally on the gymnocyst. *D. sessilis* lacks the

characteristic arrangement of conspicuous distolateral communication pores such as are present in the type-species (cf. Ryland and Hayward 1977 : 175), having instead a row of pores on the distal and inner distolateral walls and 1–2 larger pores in an apparent pore plate on the opposite corner, from which a rhizoid originates. This arrangement is variable, however.

D. sessilis is precocious, ovicells appearing in a colony with as few as seven or eight zooids budded from the ancestrula.

Dendrobeania is known from the North Atlantic Ocean, and from the Pacific coast of North America from Alaska to California. This is the first record of the genus from the Southern Hemisphere and the Western Pacific Ocean. On the basis of the encrusting and strictly biserial mode of growth, the type of bifurcation, interzooidal communication organs, and the position of the avicularium, a new subgenus, *Luguba*, is proposed for the Kermadec species.

Brettiella n.gen.

Colony repent, supported by rhizoids, uniserial, branching. Zooids claviform, with oval opesia and tubular proximal portion. No operculum. No spines or avicularia. Ovicell globular, prominent. Pore-chambers present, with relatively large-pored septula.

TYPE-SPECIES: *Brettiella ovicellata* n.sp.

Brettiella ovicellata n.sp. (Fig. 6; Plate 10, A–D)

MATERIAL EXAMINED: NZOI Stns K799, K812.

DISTRIBUTION: Kermadec Islands, 10–30 m.

DESCRIPTION: Colony repent, pinkish-red (in alcohol), supported off the substratum by occasional rhizoids with terminal holdfasts; the rhizoids issuing from the basal walls of zooids. Zooids long, 0.42–0.48 × 0.16–0.18 mm, claviform, the distal half with an extensive oval opesia and frontal membrane, bordered by a distinct rim; no operculum; the proximal half narrow, tubular. Each zooid arises distobasally from its parent. Branches generally originate alternately to left and right of the main axis, the most proximal zooid of a branch arising laterobasally near the distal end of the parent zooid. Ovicell arising from a corner of the orificial rim, both ooecial layers calcified. Ancestrula not seen.

HOLOTYPE: Colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–339.

PARATYPE: NZOI, type number P–575, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K812, Raoul Island, 29°17.0′S, 177°54.4′W, 10–30 m.

REMARKS: As Hayward and Cook (1979) noted, *Brettia* Dyster, as presently constituted, embraces several species whose only common feature is an erect or semi-erect uniserial habit. They established *Leiosalpinx* for one of these forms which differs significantly from *Brettia pellucida* (the type-species of *Brettia*) and it seems necessary here to establish another for the "*Brettia*-like" species from Raoul Island. *Brettiella* differs from *Brettia s.s.* in the lack of spines and from both *Brettia* and *Leiosalpinx* in the more buguloid form and in the possession of ovicells. It differs from *Bugulella* Verrill in its lack of avicularia and in the distolateral origin of the ovicell instead of from the whole distal border.

Family EPISTOMIIDAE Gregory, 1893

Colony erect, branching, attached by rhizoids. Zooids in pairs; the frontal surface largely membranous. Avicularia sessile and/or pedunculate. No spines. Embryos brooded in gonozooids or large hyperstomial ovicells.

Synnotum Pieper, 1881

Colony erect or repent, articulated, branching. Zooids paired, each zooid of a pair facing obliquely away from the other. Avicularia sessile and pedunculate. Gonozooids swollen, in the place of autozooids.

TYPE-SPECIES: *Loricaria aegyptiaca* Audouin, 1826

Synnotum aegyptiacum (Audouin) (Plate 10, E,F)

Loricaria aegyptiaca Audouin, 1826: 243.
Synnotum aviculare Hincks, 1886: 257.
Synnotum aegyptiacum: Harmer 1926: 398 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K820, K826$_2$, K854, K891.

DISTRIBUTION: Three Kings Islands; also Victoria, New South Wales, Indonesia, Timor, Singapore, Japan, Indian Ocean, Red Sea, Mediterranean Sea, Brazil, Florida, California.

DESCRIPTION: Colony erect or repent, branching, supported by rootlets. Zooids 0.30–0.33 × 0.07–0.08 mm, arranged in single pairs constituting internodes, with uncalcified joints; both members of a pair facing obliquely laterally with a membrane covering the whole frontal area, the opercular sclerite completely distal. Walls smooth with a short-stalked avicularium between the two zooids frontally, adjacent to the orifice, and a sessile avicularium in the same position basally. Reproductive zooids not seen.

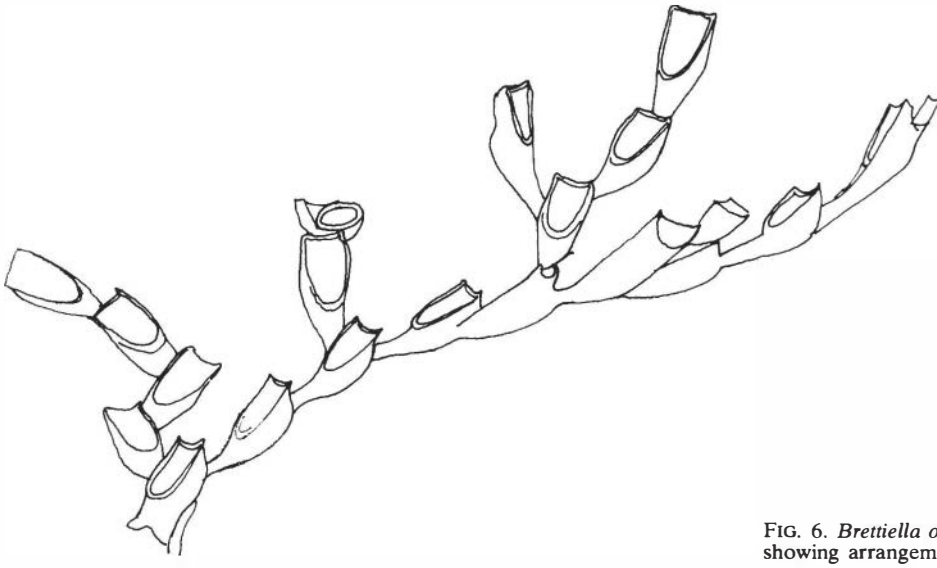

FIG. 6. *Brettiella ovicellata* n.gen., n.sp. Portion of a colony showing arrangement of zooids.

REMARKS: As described by Harmer (1926), reproductive zooids comprise swollen zooids (gonoecia) in the place of regular zooids. Harmer noted that the frontal membrane may become calcified in some sections of branches, or in whole, small colonies. This is the case in the Kermadec specimens, where the two forms occur together. The calcified form appears rather different, and was named as a separate species, *Gemellaria macrostoma* Ortmann, 1890, as Harmer pointed out.

Family BEANIIDAE Canu & Bassler, 1927

Colony encrusting or erect, mostly loosely adherent, closely unilamellar (or bilamellar if erect) or the zooids widely separated. Zooids weakly calcified, the frontal surface widely membranous, each zooid connected to neighbours by tubular extensions – these very short or long and stolonal. Spines and pedunculate avicularia commonly present. Ovicells present or absent.

Beania Johnston, 1840

Colony typically unilamellar, mostly loosely adherent, ramifying or reticulate, rarely erect, bilamellar and foliaceous; the zooids quincuncially or irregularly arranged, contiguous or distant, joined by tubular extensions from proximobasal walls; multiporous septula present. Rhizoids with fimbriate attachment discs attach the colony to the substratum. Frontal membrane extensive, incorporating an operculum, usually bordered by spines. Pedunculate avicularia commonly present. Ovicell endozooidal, appearing as a bulge of the distobasal wall, or absent.

TYPE-SPECIES: *Beania mirabilis* Johnston, 1840

Beania bilaminata (Hincks) (Plate 11, A,B)

Flustra papyracea: Hutton 1873: 93; 1880: 187.
Diachoris bilaminata Hincks, 1881a: 157.
Beania bilaminata: Jelly 1889: 15; Hutton 1891: 103; Hamilton 1898: 194; Waters 1906: 15; Livingstone 1929: 59.

MATERIAL EXAMINED: NZOI: Stn K837. DPG: Colonies from Leigh, Mana Island.

DISTRIBUTION: Cape Maria van Diemen, Mokohinau Islands, Leigh, Napier, Wanganui, Mana Island, French Pass.

DESCRIPTION: Colony erect, frondose, bilamellar (not seen in the juvenile Kermadec specimens), initially encrusting. Zooids relatively large, 0.77–0.88 × 0.37–0.40 mm, closely contiguous, and overlapping each other distally such that the six basal connecting tubes between zooids are not visible frontally. Thin-walled, no spines, but the rim projected at each distal corner into a short prolongation.

REMARKS: Only two small dried colonies were found on a shell from the Kermadecs. One consisted of seven zooids, the other eight. They were unilamellar and without avicularia (normally long and pedunculate). Notwithstanding the paucity of diagnostic features, the zooids are otherwise identical to those of large bilamellar colonies I have examined from Hauraki Gulf and Mana Island.

Beania cribrimorpha n.sp. (Plate 11, C)

MATERIAL EXAMINED: NZOI Stn K837.

DISTRIBUTION: Kermadec Islands, about 117 m.

DESCRIPTION: Colony encrusting. Zooids oval, 0.47–0.55 × 0.28–0.38 mm, closely contiguous such that the

reticulate nature of the zooidal connections is not apparent frontally; each zooid connected to neighbouring zooids by six tubes. Six to nine somewhat flattened tubular spines on each side, extending across the front of the zooid and interdigitating without fusion; some proximal spines forked; two additional pairs of erect oral spines. Avicularia and ovicells absent.

HOLOTYPE: A portion of a colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–325.

TYPE-LOCALITY: NZOI Stn K837, Macauley Island, 30°15.5'S, 178°24.2'W, 110–125 m.

REMARKS: This species bears a superficial resemblance to the groups of bryozoans which have a frontal shield. It is evidently nearest the austral species *Beania costata* (Busk) which, however, has longer, fusiform zooids, not closely contiguous, and with avicularia.

Beania discodermiae (Ortmann) (Plate 11, D,E)

Diachoseris discodermiae Ortmann, 1890: 26.
Beania discodermiae: Harmer 1926: 415; Hastings 1943: 410.

MATERIAL EXAMINED: NZOI Stns K797, K837.

DISTRIBUTION: Three Kings Islands; also Japan, Malaysia.

DESCRIPTION: Colony loosely encrusting. Zooids oval, 0.45–0.50 × 0.17–0.23 mm, clearly separated by connecting tubes, six being shared by each zooid with its neighbours. About 13 pairs of spines, the oral spines erect, not long, the lateral pairs curving somewhat over the frontal area, not reaching the mid-line. No basal spines. Avicularia paired or single, adjacent to the orifice; of the bird's head type. No ovicells.

REMARKS: Two small colonies were found on the irregular, convex surface of a worn *Pecten* valve, appearing superficially like a uniserial species. One broken group of zooids, however, shows the normal quincuncial pattern. The zooids are not as widely separated as Ortmann's illustration shows and the distal spines are longer, but they otherwise conform to his description. *Diachoris spinigera* MacGillivray, 1860 bears some resemblance to the present form, but the distal spines are even longer, the zooids are more overlapping distally, and the avicularia are fewer and larger.

Beania elongata (Hincks) (Plate 11, F)

Diachoris elongata Hincks, 1885: 244.
Beania elongata: Jelly 1889: 16; Hutton 1891: 103; Hamilton 1898: 194.

MATERIAL EXAMINED: NZOI Stn K836.

DISTRIBUTION: Kermadec Islands and unspecified New Zealand localities.

DESCRIPTION: Colony encrusting. Zooids 0.67–0.75 × 0.25 mm, with six connecting tubes. Eight to nine pairs of spines, the two distal pairs semi-erect, the remainder arching across the frontal area, partly interdigitating. No basal spines. Avicularia stalked, with a rather cup-shaped distal portion, the rostrum short with curved tip. No apparent ovicells.

REMARKS: Although the single Kermadec colony has slightly more and stouter spines than Hincks (1885) indicated, the distinctive avicularium is quite diagnostic. In this feature *B. elongata* resembles *B. petiolata* Harmer, 1926 which, however, has less robust, relatively smaller avicularia and more disjunct zooids. In addition, several spines may arise from each location along the lateral walls.

Beania gigantavicularis n.sp. (Fig. 7; Plate 11, G)

MATERIAL EXAMINED: NZOI Stn K858; on a mollusc valve.

DISTRIBUTION: Kermadec Islands, between 465 and 501 m.

DESCRIPTION: Colony (evidently) encrusting. Zooids large, 1.12 × 0.50 mm, asymmetrical, very lightly

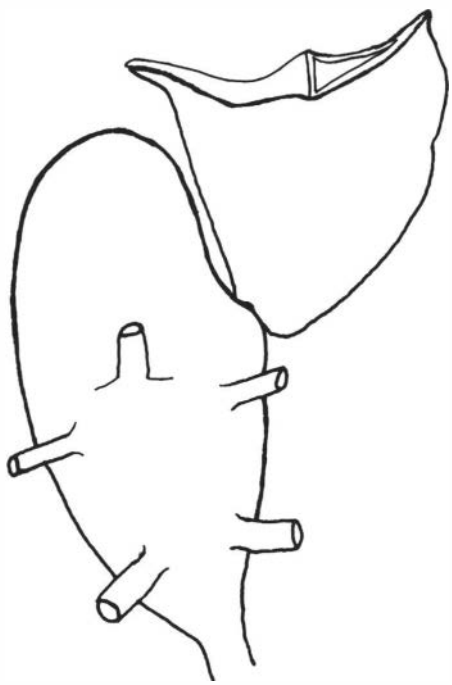

FIG. 7. *Beania gigantavicularis* n.sp. Dorsal view of an autozooid and avicularium showing disposition of connecting tubes.

calcified. Tubular connections six, on the proximal half of the basal wall, slender relative to the size of the zooid. No spines. Avicularia huge (0.65 × 0.55 mm), as long as the parent autozooid is wide, or more so, and as deep-bodied as the parent zooid's length; the rostrum and mandible triangular proximally, prolonged into a hastate point apically; the avicularium arising from a shoulder of the lateral wall on one side of the parent zooid about one-third its length from the distal border, thus the distal third of the zooid narrower than the remainder.

HOLOTYPE: Zooids, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–332.

TYPE-LOCALITY: NZOI Stn K858, Curtis Island, 30°34.2′S, 178°29.8′W, 465–501 m.

REMARKS: Although I am hesitant to establish a new species on the basis of such limited material (only five, detached, zooids were found), yet the giant avicularia are unique and this form is thus well characterised. The only other asymmetrical species is *B. asymmetrica* Harmer, 1926, but that is neither as large as the present species, nor are the avicularia as long or deep-bodied. It also has basal spines, which *B. gigantavicularis* lacks.

Beania magellanica (Busk) (Plate 11, H)

Diachoris magellanica Busk, 1852a: 54; Hincks 1885: 246; Hutton 1873: 94; Hutton 1880: 188.
Beania magellanica: Jelly 1889: 16; Hutton 1891: 103; Hamilton 1898: 194; Harmer 1926: 412; Prenant & Bobin 1966: 555 (*cum syn.*).

MATERIAL EXAMINED: NZOI: Stns K801, K819, K820, K837. DPG: Colonies from Hauraki Gulf, Banks Peninsula and Foveaux Strait.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Cook Strait, Banks Peninsula, Bluff, Stewart Island; also magellanic South America, Kerguelen, Victoria, New South Wales, South Africa, Mauritius, Torres Strait, Japan, Mediterranean, Cape Verde Islands.

DESCRIPTION: Colony loosely encrusting. Zooids 0.85–0.95 × 0.35–0.43 mm, elongate-ovoid with parallel sides, each connected by six tubes, the zooids quite disjunct and the tubes clearly visible. Avicularia elongate, paired or single, directed distally, the palatal surface horizontal; mandibles hastate. No spines or ovicells.

REMARKS: Colonies from Leigh are orange-coloured in life.

Beania plurispinosa Uttley & Bullivant (Plate 12, A–C)

Beania hirtissima var. *conferta*: Waters 1889a: 4.
Beania hirtissima: Gordon 1967: 55; Gordon 1970: 323.
Beania plurispinosa Uttley & Bullivant, 1972: 28.

MATERIAL EXAMINED: NZOI: Stns K799, K820, K837, K848, K851. DPG: Colonies from Leigh, Auckland, Kaikoura, Portobello.

DISTRIBUTION: Whangarei Heads, Leigh, Auckland Harbour, Whatipu, Mount Maunganui, Napier, Kaikoura, Portobello, Chatham Rise; also Port Jackson (New South Wales).

DESCRIPTION: Colony loosely encrusting. Zooids 0.63–0.75 × 0.27–0.33 mm, laterally contiguous, prostrate proximally, suberect and overlapping distally, excessively spiny; each zooid connected by six tubes proximally; the lateral margins curving inwards, forming a constriction just proximal to the orificial region. Distal rim supporting about nine long spines in a semicircular row distal to the constriction, with two additional rows of more slender spines beneath; eight slender spines on each lateral rim proximal to the constriction, and around 30 additional spines, not in rows, scattered over the basal surface. No avicularia. Ovicells relatively large, appearing, in cleaned zooids, as egg-shaped concavities in the basal wall distal to the constriction – in this position each ovicell is recumbent on the next distal zooid. From the basal wall of some zooids an anchoring rhizoid with terminal holdfast.

REMARKS: Some small colonies from the Kermadecs, with less closely contiguous zooids, have somewhat fewer spines basally and longer, more slender spines as a consequence of the more reticulate nature of the colony. These are evidently features of youthful colonies which have not yet formed a crust. Mature Hauraki Gulf specimens, on the other hand, have fewer basal spines than those from the Kermadec or Chatham Islands. Waters (1889a) illustrated zooids of this species from Port Jackson, New South Wales, but this record has previously been overlooked.

Family PETALOSTEGIDAE n. fam.

Colony erect, uniserial and branching, delicate. Zooids elongate, with long, tubular proximal portion, the opesia distal. Frontal membrane overarched by flattened spines. Avicularia sessile. Ovicell hyperstomial. Elongate and spine-like kenozooids occur, the former with tiny opesiae.

Petalostegus Levinsen, 1909

With the characters of the family.

TYPE-SPECIES: *Catenaria bicornis* Busk, 1884

Petalostegus bicornis (Busk) (Plate 12, D,E)

Catenaria bicornis Busk, 1884: 14.
Petalostegus bicornis: Levinsen 1909: 114; Harmer 1957: 642.

MATERIAL EXAMINED: NZOI Stn K827.

DISTRIBUTION: Molluccas, Society Islands, South Africa.

DESCRIPTION: Colony erect. Zooids borne one atop another such that the main axis is more or less straight, but if laterally borne zooids are present, then the pattern is one of zig-zag branching. Zooids elongate, 0.61–0.71 × 0.24–0.30 mm, with a long, tubular, proximal portion supporting the main body of the zooid, which is dorso-ventrally flattened with the frontal area overarched by five flattened spines forming a shield; the spines fuse at intervals, leaving lacunae. A pair of sessile avicularia at the distal corners, facing laterally. A budding site in the mid-line terminally and another at an angular projection of the zooidal dilatation. Incompletely developed zooids occur at intervals, with a small circular opesia, and from these arise long, slender spines. Ovicells not seen.

REMARKS: This interesting genus was regarded by Harmer (1926, 1957) as allied to the Alysidiidae, in which family he, Powell (1967a), and Hayward and Cook (1979) included it. The similarity with this family is based on the similar style of growth, with tapering autozooids and spine-like kenozooids, but the alysidiids are characterised by having a cryptocyst (absent from *Petalostegus*) and lacking avicularia. Levinsen (1909), who named the genus, placed it in the Bicellariellidae, and in this he was followed by Canu and Bassler (1927a, 1929a), Bassler (1953), and Larwood (1969). The affinities of *Petalostegus* certainly seem to lie with the buguloidean bryozoans although the spines of the frontal shield are reminiscent of the scutal spines in the Cabereidae. In both families *Petalostegus* is somewhat of an odd man out, however, and I believe there is a case for a monotypic family, Petalostegidae nov. *Petalostegus spinosus* Powell, 1967a, from seven miles off Cape Maria van Diemen, is said to have only four spines in the frontal shield and a narrower orifice. The ovicells of this species also differ in having frontal and basal spinose processes.

Family CABEREIDAE Busk, 1852

Colony erect, unilamellar, branching, the zooids usually in two series, sometimes more; attached by rhizoids issuing from a septulum or a vibracular chamber; jointed. Zooids generally well calcified except for the membranous frontal area. Cryptocyst typically narrow, gymnocyst often well developed. Distal spines typically present and a flattened scute usually over the frontal area. Adventitious avicularia typical, and vibracula may occur basally. Ovicell hyperstomial, with or without pores or a fenestra.

Scrupocellaria van Beneden, 1845

Colony bushy or repent, branched, anchored by rhizoids. Branches comprise alternating zooids in two series; dividing regularly at intervals, each ramus jointed at its inception. Zooids with oval frontal membrane and well developed gymnocyst. Spines usually present distally and a scutum typically overarches the frontal membrane. Sessile avicularia occur laterally as angular prominences, and sometimes occur frontally. Vibracula typically basolateral and/or in the axils of bifurcations. Ovicell hyperstomial, with or without pores or a fenestra. Ancestrula vase-like, attached to the substratum by rhizoids.

TYPE-SPECIES: *Sertularia scruposa* Linnaeus, 1758

Scrupocellaria maderensis Busk (Plate 12, F,G)

Scrupocellaria maderensis Busk, 1860: 280; Harmer 1926: 372 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K799, K809, K812, K872.

DISTRIBUTION: Loyalty Islands, Timor, Indonesia, China Sea, Japan, Sri Lanka, Madagascar, Madeira, Cape Verde Islands.

DESCRIPTION: Colony erect, biserial, branching. Zooids 0.30–0.33 × 0.17–0.20 mm, with smooth proximal gymnocyst and relatively narrow, smooth cryptocyst which may be beaded on its inner edge. Scutal spine arising at a distal corner of the opesia, which it mostly covers, the proximal lobe broad and rounded. Outer orificial spines 2–3; inner spines two, mostly short. Lateral avicularia on each zooid large, aquiline, giving the branch a serrated outline; the rostral rim minutely denticulate. Frontal avicularia occasional, somewhat columnar, arising proximal to the cryptocystal rim and directed toward the scutal peduncle of the neighbouring zooid. A small avicularium surmounting each ovicell, the rostrum directed obliquely distally. Ovicells smooth with small circular fenestra. Axial vibracula two; other vibracula projecting a little laterally, and visible from the frontal surface, triangular in shape, with obliquely directed groove; setae short, curving across the width of the branch; a rhizoid foramen in the proximal wall of each vibraculum but rhizoids mostly present at base of branch.

REMARKS: The Kermadec specimens have a somewhat narrower cryptocyst and smaller ovicellular fenestra than Harmer's (1926) material from Indonesia, but they are identical in other features.

Amastigia Busk, 1852

Colony erect, the branches typically pluriserial and the frontal surface convex, such that marginal zooids face laterally outwards; the basal surface more or less flat, the zooids of the median row(s) as a rule partly or wholly excluded from it. Spines, scutum, frontal and marginal avicularia present or wanting. Basal heterozooids avicularia (occasionally vibraculoid) or vibracula, giving off rhizoids (which may also arise from marginal zooids) which descend the axis. Ovicell with or without a frontal fenestra.

TYPE-SPECIES: *Amastigia nuda* Busk, 1852

Amastigia antarctica subtropicalis n.ssp. (Plate 13, A)

MATERIAL EXAMINED: NZOI Stn K852; on a pebble.

DISTRIBUTION: Kermadec Islands, 220 m.

DESCRIPTION: Colony erect (c. 35 mm), branching, but not articulated at bifurcations; supported by rhizoids arising proximally from zooids at various levels higher up the branches. Zooids 0.60–0.75 × 0.18–0.23 mm, in six longitudinal rows, arranged quincuncially. Extensive smooth gymnocyst which is not often seen, being usually obscured by the ovicell of the proximal zooid; frontal area slightly longer than gymnocyst. Cryptocyst narrow, granular; no scutal or other spines. Ovicells abundant, flattened, with calcified ectooecium restricted to a narrow band laterally and distally. A pair of avicularia on the distal summit of the ovicell of median zooids, squat, diverging obliquely distally from each other; pivot bar incomplete; rostrum and mandible triangular. A single avicularium on the gymnocyst of lateral zooids in the same position, of the same shape, but the rostrum directed obliquely proximally. Dorsal avicularia larger, with broader and longer mandible, not setiform but fitting the shape of the rostrum; the opesia orientated longitudinally but the proximal half of the rostrum deflected obliquely toward the branch axis. An avicularium of the same type at the bifurcation, the rostrum more narrowly convex and straight. Rootlets emerging from a pore in the side of many dorsal avicularia, descending to the base of the colony. The dorsal surface of branches made up of the two lateral rows of zooids only.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–333.

PARATYPE: NZOI, type number P–543, part of holotype colony.

TYPE-LOCALITY: NZOI Stn K852, Curtis Island, 30°32.2′S, 178°33.0′W, 220 m.

REMARKS: *A. antarctica* (Kluge, 1914) is one of three species of *Amastigia* lacking scutal and other spines, and the Kermadec specimen is evidently closely related to the Antarctic form. Kluge's illustration shows narrower rostra on the dorsal avicularia and narrower frontal avicularia, and Hastings's (1943) illustration shows the pair of avicularia surmounting the ovicell as more distant from each other. In all other features the Kermadec specimen agrees with the descriptions of these authors and of Harmer (1923). In *A. pateriformis* (Busk), the frontal avicularia are larger, unpaired, and set more transversely. *A. biserialis* Osburn is, by contrast, a biseriate species.

Amastigia has been described as circum-Antarctic in distribution, reaching as far north as Victoria in shallow water and Valparaiso in deep water. The Kermadec specimen represents the northernmost record of this genus. *A. antarctica s.s.* is otherwise known only from the Antarctic.

Emma Gray, 1843

Colony erect, with tightly inrolled branches arising from zooids frontally; supported by rhizoids. Zooids arranged biserially in short internodes of two or three, rarely uniserial. Opesia bordered by a well developed cryptocyst and often overarched by a small scutum. Distal spines present, long and conspicuous. Avicularia sessile, usually present laterally, rare frontally. Ovicell hyperstomial, with or without a fenestra.

TYPE-SPECIES: *Emma crystallina* Gray, 1843

Emma watersi Hastings (Plate 13, B)

Menipea cervicornis var.: Waters 1887b: 88.
Emma cervicornis var. *watersi* Hastings, 1939: 326.

MATERIAL EXAMINED: NZOI Stn K812.

DISTRIBUTION: Victoria, New South Wales.

DESCRIPTION: Colony erect, the branches biserial, comprising internodes of two or three zooids, linked by chitinous joints; the branches inwardly curled, forming tight compact growths. Zooids 0.36–0.43 × 0.20–0.21 mm, in twos except when fertile or at bifurcations, with narrow, tubular proximal portion and distal dilatation. Cryptocyst narrow distally, encircling the opesia, granular, wide proximally. A slender cervicorn scutum from the inner corner of the cryptocystal rim. Spines of two sizes, comprising 2–3 long stout spines (exceeding the length of the zooid) from the distal border, plus 2–3 diminutive spines, in the same series or inset, but proximal; the total number of spines not exceeding six. Lateral avicularia wanting. Frontal avicularia often on the median zooid at a bifurcation. Ovicells, if present, one per internode on a lateral zooid, immersed in the median zooid; smooth, with a small oval fenestra in the ectooecium proximally. New branches arise occasion-

ally from the frontal wall of a lateral zooid at a bifurcation. Rhizoids arise from any zooid, dorsally or distally.

REMARKS: Hastings (1939) regarded *E. watersi* as a variety of *E. cervicornis* MacGillivray because of the cervicorn scutum but, as she also noted, *E. watersi* differs in the complete absence of lateral avicularia and in its smaller zooids with a longer tubular proximal part. I regard her variety *watersi* as worthy of specific status. Hastings recorded this species from the Kermadec Islands also, as well as from south-eastern Australia.

Notoplites Harmer, 1923

Colony erect, branching, anchored by supporting rhizoids which descend the main axis or cross to join other branches. Branches typically biserial, the zooids alternating. Bifurcations regular, the rami jointed basally. Zooids elongate, narrower proximally, with an oval frontal membrane. Distal spines (sometimes very long) and a scutum, may occur. Avicularia sessile, present laterally and often frontally. Basal avicularia, approaching a vibraculoid form, often in the vicinity of bifurcations. Ovicell hyperstomial, with a frontal fenestra.

TYPE-SPECIES: *Notoplites rostratus* Harmer, 1926

Notoplites longispinosus n.sp. (Fig. 8; Plate 13, C)

MATERIAL EXAMINED: NZOI Stn K795.

DISTRIBUTION: Kermadec Islands between 270 and 350 m.

DESCRIPTION: Colony erect, branches biserial except where median zooids may be interpolated between 2–3 pairs of zooids preceding a bifurcation. Zooids elongate, 0.35–0.53 × 0.11–0.16 mm, alternating, with tubular gymnocystal proximal portion and smooth, narrow, vertical-walled cryptocyst obscured by an oval scutum completely shielding the opesia; the lumen of the scutum small, cigar-shaped. A long peduncular spine on each lateral zooid and four additional spines from the outer distal corner, exceeding three times the length of a parent zooid and at first directed laterally, perpendicular to the branch axis, before curving outwards frontally and then upwards parallel to the axis. The median zooids with the peduncular spine and 1–2 small spines on the opposing corner of the orifice. Frontal avicularia single or paired on the gymnocyst, the palatal surface somewhat perpendicular to the branch axis, facing distally or obliquely so; the rostrum with a recurved acute tip; commoner on median zooids. Lateral avicularia similar, small, set at a higher level adjacent to the opesia. Frontal and lateral avicularia not seen together on the same zooid. Dorsal avicularia present in a longitudinal series on zooids approaching a bifurcation, directed proximally, or obliquely so, with broad palatal surface tapered proximally; mandibles not seen. Supportive rhizoids from basal walls of zooids descending proximally. Ovicells not seen.

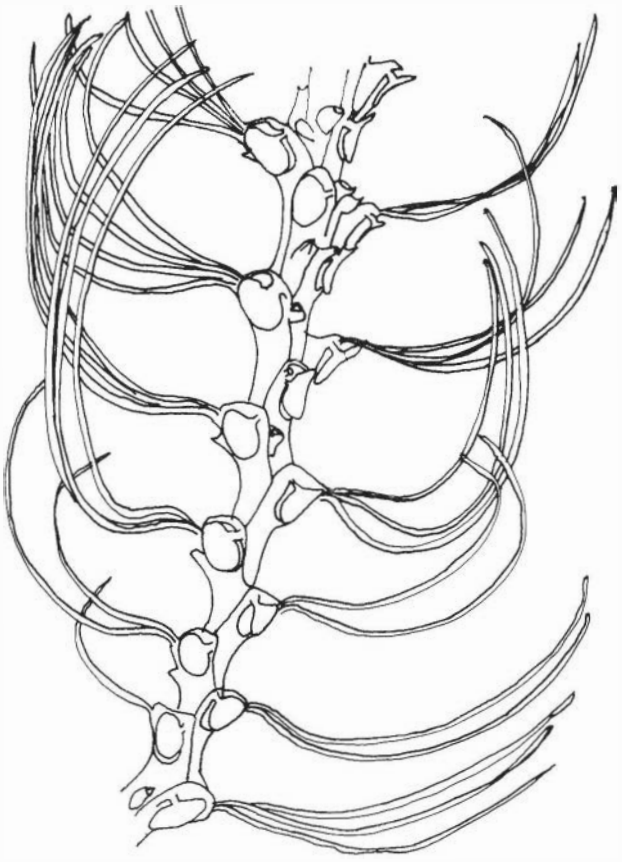

FIG. 8. *Notoplites longispinosus* n.sp. Portion of colony showing disposition of spines.

HOLOTYPE: Portions of a colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–305.

TYPE-LOCALITY: NZOI Stn K795.

REMARKS: Many species of *Notoplites* lack the full complement of characters which are found in the type-species *N. rostratus* Harmer, 1926. Of those that have all the characters, four Antarctic species have, in addition, an internal spine projecting beneath the operculum of each zooid. *N. longispinosus* lacks this feature but has all the others. Of the remaining species with all other characters, *N. avicularіae* (Yanagi & Okada, 1918) is distinguished by scuta with extensively branched lumina and *N. marsupiatus* (Jullien, 1883) by scuta almost completely covering the opesiae.

Only a few small branches were found of the present species.

Canda Lamouroux, 1816

Colony erect, the branches generally in a single plane, typically united by rhizoids forming cross connections. Zooids arranged in two series, facing obliquely outwards from a median keel. Frontal area very extensive, the proximal gymnocyst absent. Cryptocyst well developed. Distal spines present, small; scutum usually present. Avicularia sessile, frontal only, or wanting. Vibracula passing obliquely across the basal surface, the setae curved; giving off rhizoids proximally from the chambers. Ovicells large, with a large fenestra, usually occurring in groups on a branch, often crowned with an avicularium.

TYPE-SPECIES: *Canda arachnoides* Lamouroux, 1816

Canda pecten scutata Harmer (Plate 13, D,E)

Canda retiformis Philipps, 1900: 441 (*pars*).
Canda pecten scutata Harmer, 1926: 389.

MATERIAL EXAMINED: NZOI Stns K799, K809, K833, K836.

DISTRIBUTION: Loyalty Islands, West Irian, China Sea.

DESCRIPTION: Colony erect, to 20 mm high, branches biserial, the zooids facing obliquely outward, their inner margins thus projecting, giving a keeled effect to the branches. Zooids 0.37–0.40 × 0.15–0.16 mm, rectangular, with parallel-sided walls. Cryptocyst smooth, very wide proximally, narrow on one side laterally, widening proximally on the side away from the branch axis. Opesia tapering acutely proximally, the margin granular. A spine either side of the orifice, sometimes two spines on the inner margin. Scutum with narrow processes. Avicularia large, occurring singly or paired on each branch above a bifurcation; the rostrum angled obliquely proximally toward the branch angle, tapering, often markedly dentate with uncinate tip; the rostral rim convex overall. A smaller, vestigial avicularium distal to each ovicell. Ovicells with a broad frontal area of exposed endooecium, occurring not on every zooid of a branch but in groups of only three or more. Vibracula orientated obliquely proximally towards the branch axis, alternating, with wide grooves and curving setae that flex back across the front of the zooids; a pair of vibracula at each bifurcation; rootlets emerge from vibracular chambers to anchor the colony or form cross-connections with neighbouring branches.

REMARKS: The fenestrae of the ovicells are larger in the Kermadec specimens than Harmer (1926) described in this subspecies, which he named as a variety of Thornely's (1907) species.

Caberea Lamouroux, 1816

Colony erect, dichotomously branched, generally stiff and fan-shaped, anchored by clustered rhizoids. Zooids in two or more series, alternating. Apparently unjointed, but the chitinous connections covered by calcification. The oval frontal area typically overarched by a scutum. Cryptocyst and gymnocyst variable in extent, sometimes well developed. Distal spines present, sometimes inconspicuous. Avicularia sessile; small laterally; often larger, or occasionally giant, avicularia occur sporadically frontally. Basal vibracula well developed, covering much of the surface, each with a long, oblique setal groove; seta long, generally barbed. Rhizoids issue from the proximal ends of many vibracular chambers, descending towards the base of the colony. Ovicell hyperstomial, usually with a broad frontal exposure of ectooecium.

TYPE-SPECIES: *Caberea dichotoma* Lamouroux, 1816

Caberea darwinii Busk (Plate 14, A)

Caberea darwinii Busk, 1884: 29 (*pars.*); Hastings 1943: 374 (*cum syn.*).

MATERIAL EXAMINED: NZOI: K Stn unknown. DPG: Colonies from Kaikoura and Stewart Island.

DISTRIBUTION: Three Kings Islands, Kaikoura, Stewart Island, Auckland Island; also Ross Sea, southern South America, South Georgia, Tristan da Cunha, Marion and Prince Edward Islands, Kerguelen.

DESCRIPTION: Colony erect, 10 mm high, branches biserial, non-articulated. Zooids 0.25–0.30 × 0.16–0.20 mm, with short smooth gymnocyst up to half the length of the frontal area. Cryptocyst well developed, wider proximally, smooth. Scutum moderately broad, with rounded proximal lobes; the distal lobe short, small and pointed, or rounded to truncate, or absent. Much of the opesia sometimes visible. Scutum abuts against a rounded process from the opposite corner of the orifice. A pair of spines on each side of the orifice, of which the innermost one may be missing when an ovicell is present. Frontal avicularia small with little variation in size, proximally directed except when adjacent to an ovicell. Lateral avicularia with rostrum almost horizontal (i.e., at right angles to the branch axis). Ovicells flattened, ectooecium a narrow bordering rim. Vibracula contiguous for half their length, the grooves converging, the setae barbed on one side; rootlet holes present.

REMARKS: Hastings (1943) observed that this widespread species may be somewhat variable. The cryptocyst in the Kermadec form is smooth compared to the granular cryptocyst in South Island specimens.

Caberea enzoi n.sp. (Plate 14, B)

MATERIAL EXAMINED: NZOI Stn K827.

DISTRIBUTION: Kermadec Islands.

DESCRIPTION: Colony erect, 10–20 mm high; branches biserial, non-articulated, relatively narrow. Zooids elongate, 0.50–0.60 × 0.20 mm, with smooth gymnocyst as long as or longer than the frontal area. Gymnocyst often obscured by an ovicell and one or two avicularia. Cryptocyst granular, narrow laterally, wider proximally. A scutum over most of the opesia, with round distal lobe and very short, mostly blunt proximal lobe. Orificial rim incomplete proximally, but a small peg-like process present behind the scutum at the level of the peduncular spine. Usually two spines on each side of the orifice, the innermost one lacking when ovicells present. A small avicularium proximal to the cryptocyst on the branch axis, adjacent to, or replaced by, a larger avicularium; the rostrum of both types almost at right angles to the branch axis and with an upturned tip; the smaller avicularium orientated obliquely proximally or almost transversely, except when ovicells are present, in which case it is directed distally. An additional avicularium laterally, dorsal to the outermost pair of orificial spines. Ovicell flattened, broad, with ectooecial rim distally and laterally. Dorsal vibracula not contiguous distally but their grooves converging proximally.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–304.

TYPE-LOCALITY: NZOI Stn K827, 28°45.4′S, 177°46.5′W, 260–318 m.

REMARKS: This species is in the *C. darwinii* group which lacks a calcareous bar across the orifice. The distinctive features of *C. enzoi* are the very long gymnocyst and sometimes relatively large gymnocystal avicularia.

Caberea glabra MacGillivray (Plate 14, C,D)

Caberea glabra MacGillivray, 1886c: 129; MacGillivray 1887b: 142; Hastings 1943: 382.

MATERIAL EXAMINED: NZOI K Stn unknown.

DISTRIBUTION: Three Kings Islands; also Victoria, Tasmania, Brazil.

DESCRIPTION: Colony erect, 10–20 mm high; branching, biserial, non-articulated. Zooids 0.32–0.43 × 0.17–0.20 mm. Cryptocyst narrow, a little wider proximally, smooth or very faintly granular. Scutum covering most of the opesia, broadly lobed and rounded proximally, truncate distally. A pair of spines either side of the orifice, of which the innermost one is missing if ovicells are present, and the outermost one often long. The peduncular spine (by the peduncle of the scutum) absent, or short and scarcely developed or, at regular intervals, stout and extremely long, curving outwards frontally, giving the colony a "hairy" appearance to the naked eye. Frontal avicularia situated on the gymnocyst just proximal to the peduncle of an adjacent scutum; they thus lie in the mid-line as a longitudinal series of obliquely orientated avicularia alternating with larger avicularia directed frontally; the size of the peduncular spine independent of the size of the adjacent avicularium. Ovicells flattened, broad, the ectooecium confined to the distal and lateral walls. Small lateral avicularia at the level of the peduncle. Vibracula contiguous for their whole length, the distal half of the setae barbed on one side.

REMARKS: Neither MacGillivray (1886c) nor Hastings (1943) comment on the alternating size and orientation of the frontal avicularia and it is difficult to interpret MacGillivray's (1887b) illustration with certainty in regard to this feature. Hastings was uncertain whether or not *C. glabra* might represent part of the range of variation of *C. darwinii*. In specimens from near Three Kings Islands, collected by R.R.S. *Discovery*, Hastings observed scuta with truncate distal lobes and giant frontal avicularia. The latter feature is not present in Kermadec material. If this material is truly *C. glabra*, then on the basis of the arrangement of the frontal avicularia and vibracula and the stout peduncular spines, this species is certainly distinct from *C. darwinii*.

Caberea helicina Hastings (Plate 14, E)

Caberea darwinii: MacGillivray 1886c: 129; MacGillivray 1887b: 141.
Caberea helicina Hastings, 1943: 368.

MATERIAL EXAMINED: NZOI Stn K855.

DISTRIBUTION: Three Kings Islands; also Victoria, Tasmania, New South Wales.

DESCRIPTION: Colony erect, branches biserial, non-articulated. Zooids 0.50 × 0.25 mm, with smooth gymnocyst as long as or shorter than the frontal area. Cryptocyst well developed, very broad proximally, smooth or faintly granular with a distinctly dentate inner margin. Scutum covering most of the opesia, with a small, pointed distal lobe, and broader rounded proximal lobe recurving to a point. Three spines at the outer corner of the orifice, two at the inner corner. Frontal avicularia small, on the gymnocyst adjacent to a neighbouring zooid. Vibracula covering much of the basal surface. Ovicells not seen.

REMARKS: Australian material of this species typically has two outer spines, whereas New Zealand specimens may have three according to Hastings (1943).

Caberea rostrata Busk (Plate 14, F)

Caberea rostrata Busk, 1884: 28; Livingstone 1929: 54; Hastings 1943: 389; Gordon 1967: 55.

MATERIAL EXAMINED: NZOI K Stn unknown.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, off Mahia Peninsula, New Plymouth; also Tristan da Cunha.

DESCRIPTION: Colony erect, branches biserial, non-articulated, relatively narrow. Zooids 0.37–0.50 × 0.17–0.20 mm, with smooth gymnocyst about as long as the frontal area. Cryptocyst smooth, narrow, somewhat wider proximally. Scutum irregularly shaped, lobes reduced. A pair of spines each side of the orifice, the innermost spine lacking when ovicells present. Frontal avicularia small, generally proximally directed, of reverse orientation when ovicells present. Giant avicularia present below bifurcations, orientated at right angles to the branch axis; narrower at the base, the rostral tip upturned. Ovicells flattened, the ectooecium restricted to a marginal rim. Small lateral avicularia at the level of the orifice. Vibracula not contiguous for most of their length, their grooves converging; rootlet pores below the outer distal ends of vibracular chambers.

REMARKS: This species is readily distinguished by the reduced scutum, widely open opesia, and lack of a bar across the front of the orifice.

Superfamily MICROPOROIDEA Gray, 1848

Colony encrusting; or erect, frondose, articulated or vincularian. Zooidal gymnocyst generally absent, the entire frontal surface covered by a membrane overlying an extensive cryptocyst. The opesia reduced, sometimes approximating only the dimensions of the operculum, and the cryptocyst indented or perforated by lacunae (opesiules) occupied by the parietal muscles which depress the frontal membrane; these lacunae sometimes with calcified walls forming shafts or partitions descending to the basal wall. Oral spines rare. Avicularia adventitious, interzooidal, or vicarious. Ovicell hyperstomial, subimmersed, or absent. Basal pore-chambers or mural septula present.

REMARKS: Vigneaux (1949) first introduced a superfamily Microporacea based on Microporidae Gray, 1848. It is equivalent to the Coilostega of Levinsen (1902, 1909, *partim*) [emended to Coelostega by Harmer (1926)] and includes part of the Steganoporellacea [sic] *sensu* Vigneaux (*see* Cheetham 1963a).

Family MICROPORIDAE Gray, 1848

Colony encrusting; or erect, articulated or flustrine. Cryptocyst extensive, frequently extending as far as the operculum; opesia correspondingly reduced. Opesiules present when opesia is restricted to opercular area. Oral spines rare. Avicularia adventitious, interzooidal, or vicarious. Ovicell recumbent, or immersed, or absent. Pore-chambers or mural septula present.

Micropora Gray, 1848

Colony encrusting. Zooids with lateral walls raised somewhat above the level of the cryptocyst, which is granular, minutely perforated, with opesiules near the orifice. Oral spines rare. Avicularia adventitious, or interzooidal, or absent. Ovicell recumbent, or immersed, or absent; closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Flustra coriacea* Johnston, 1847

Micropora ?coriacea inarmata Soule (Plate 15, A,E)

Micropora coriacea inarmata Soule, 1959: 29.

MATERIAL EXAMINED: NZOI Stns K803, K827, K829, K840, K851, K854, K855, K856, K857, K867; on mollusc shells.

DISTRIBUTION: Kermadec Islands, 104–635 m; also Gulf of California.

DESCRIPTION: Colony encrusting. Zooids 0.60–0.80 × 0.35–0.75 mm, with extensive cryptocyst beneath the frontal membrane; the surface of the cryptocyst granular, with about 45–55 small pores. A pair of opesiules proximal to the corners of the orifices descending between lateral and frontal walls; a pair of tiny pores, the same size as or larger than the frontal pseudopores, occur in the position of accessory opesiules. Avicularia absent. Ovicell somewhat raised, with mostly smooth surface. A non-ovicellate biserial colony lacking avicularia and with fewer frontal pseudopores occurred at Stn K840 (Pl. 15, E). This novel form appears to belong to this species.

REMARKS: Soule (1959) regarded *inarmata* as a non-aviculiferous form of *M. coriacea* (Johnston). Although *M. coriacea s.s.* is now recognised as lacking avicularia also, there are nonetheless some minor differences between the European species and Soule's subspecies. These pertain to the sculpturing of the ovicell and degree of granulation of the lateral margins. *M. coriacea* has been accorded a wide temperate distribution. but the exact status of geographic variants needs to be better established.

Micropora elegans Maplestone (Plate 15, B)

Micropora elegans Maplestone, 1901a: 205; Brown 1958: 41.

MATERIAL EXAMINED: NZOI Stns K797, K798, K840, K844.

DISTRIBUTION: Kermadec Islands; also Upper Eocene of Victoria.

DESCRIPTION: Colony encrusting. Zooids 0.35–0.53 × 0.17–0.43 mm, with extensive cryptocyst beneath the frontal membrane; the surface of the cryptocyst granular, with about 30 small pores (20–40 according to the area of the cryptocyst). A pair of opesiules proximal to the corners of the orifice descending between the lateral and frontal walls; no additional opesiules. Small interzooidal avicularia distal to many zooids; the rostrum sloping, directed obliquely distally; the pivot bar thin, complete. Ovicell recumbent, not much raised, with uniformly granular surface except for a smooth proximal border.

REMARKS: The genus *Micropora* is well-known in the New Zealand region but, as is true of many overseas records, most reports of specimens of *Micropora* have referred to them as *M. coriacea* (Johnston). It is apparent that a number of forms are represented in New Zealand, however, and since almost all previous records are of aviculiferous specimens then probably none of them refer to true *M. coriacea* since, as has been recently recognised (Hastings 1966, Ryland and Hayward 1977), *M. coriacea s.s.* lacks avicularia.

The Kermadec specimens are closest to *M. elegans* Maplestone, otherwise known only from the Upper Eocene of Victoria. They agree in the small opesiules, avicularia, and finely granular ovicells and, rather than erect a new species solely on the basis of the discrepancy in geological distribution, I here provisionally refer them to Maplestone's species.

The Kermadec specimens are also near *M. rimulata* (Canu & Bassler, 1929a) from the Philippines. That species, however, has larger zooids with dimorphic orifices (larger in ovicelled zooids) and the avicularium is directed obliquely proximally. *M. elegans* differs from the other Kermadec species in the lack of accessory opesiules.

Micropora mortenseni Livingstone (Plate 15, C,D)

Micropora mortenseni Livingstone, 1929: 61; Gordon 1972b: 457; Ryland 1975: 386.
Micropora coriacea: Uttley & Bullivant 1972: 24.

MATERIAL EXAMINED: NZOI: Stns K797, K837, K851, K856, K867, K871. DPG: Specimens from Hauraki Gulf.

DISTRIBUTION: Hauraki Gulf, Chatham Islands.

DESCRIPTION: Colony encrusting. Zooids 0.37-0.70 × 0.30–0.43 mm, with 20–35 cryptocystal pores. The opesiules just proximal to the corners of the orifice, each connected by a short groove to a subjacent accessory opesiule which is narrowly crescentic, or a transverse slit, and finely toothed. A smooth umbo at the proximal end of each zooid. Interzooidal avicularia with sloping rostra directed obliquely distally. Ovicell recumbent, moderately raised, smooth or finely granular with a smooth triangular area frontally.

REMARKS: Uttley and Bullivant (1972) included this species in *M. coriacea* but, as previously mentioned, that species lacks avicularia. Furthermore, as Livingstone (1929) pointed out, the usually crescentic accessory opesiules are an important distinction. *Micropora lunipunctata* Maplestone, 1901a, from the Upper Eocene of Victoria, also has crescentic accessory opesiules, and avicularia, although the zooids are rather elongate by comparison. It is possibly conspecific and therefore a senior synonym.

Monoporella Hincks, 1881

Colony encrusting. Cryptocyst granular, perforated, raised medially, with a pair of small opesiules proximal to the orifice. Opesia reduced, exactly coincident with the operculum. Oral spines present. No avicularia. Ovicell large, porous, closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Haploporella nodulifera* Hincks, 1881

Monoporella nodulifera (Hincks) (Plate 16, A,B)

Haploporella nodulifera Hincks, 1881b: 10.
Monoporella nodulifera: Hincks 1881b: 135; Harmer 1926: 310; Hayward 1974: 374.
Monoporella fimbriata carinifera Canu & Bassler, 1929a: 157.

MATERIAL EXAMINED: NZOI Stns K797, K799, K801, K802.

DISTRIBUTION: Bass Strait, Torres Strait, Molluccas, Philippines, China Sea, Mediterranean, Cape Verde Islands.

DESCRIPTION: Colony encrusting. Zooids subhexagonal, 0.62–0.75 × 0.37–0.70 mm, with a cryptocystal wall covering the whole opesia as far as the operculum. This wall concave except for a median crest and proximally; granular, with numerous small perforations either side of the crest and a small round opesiule on each side below the corners of the orificial rim. Cryptocyst covered in life by a darkly pigmented frontal membrane. Orifice semicircular with straight proximal rim. Operculum black, the proximal edge concave. Spines 3–5, distal to the orifice, blackish-brown. No avicularia. Ovicells huge, raised, covering most of the next distal zooid; finely granular, usually

with fine longitudinal grooves and several basal indentations distally, corresponding with pores in the wall; a large lateral foramen on each side adjacent to the cryptocystal concavity of a neighbouring zooid.

REMARKS: The Kermadec specimens agree in most features with Harmer's (1926) and Hayward's (1974) descriptions of *M. nodulifera* from the China Sea and Aegean Sea respectively. The Kermadec specimens lack a pitted, partly calcified operculum, however. The lateral foramina in the ovicells have not been widely reported.

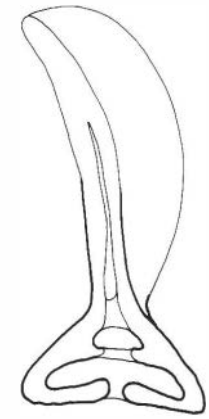

FIG. 9. Avicularian mandible of *Manzonella monopia* (Brown).

Manzonella Jullien, 1888

Colony encrusting. Cryptocyst granular, imperforate except for one to several pairs of opesiules. Opesia reduced, coincident with the operculum. Oral spines may be present. Avicularia vicarious, scimitar- or dagger-shaped. Ovicell hyperstomial, not closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Membranipora exilis* Manzoni, 1869

Manzonella monopia (Brown) (Fig. 9; Plate 16, C)

Opaeophora lepida var. *monopia* Brown, 1952: 131.
Opaeophora monopia: Uttley & Bullivant 1972: 25.

MATERIAL EXAMINED: NZOI Stns K795, $K826_3$, K827, $K828_1$, K840, K842.

DISTRIBUTION: Chatham Rise; also Pliocene of Wanganui.

DESCRIPTION: Colony encrusting. Zooids 0.42–0.58 × 0.25–0.40 mm, with extensive granular cryptocyst which is mostly concave except for the proximal part and a median ridge. A round opesiule in each cryptocystal depression. A pair of small spines distal to the orifice. Ovicells globular, prominent, with granular surface. Avicularia interzooidal, with scimitar-shaped rostra; the pivot bar incomplete, but mandibular pivots occur as prominent ridges, constricting the narrow club-shaped opesia; opesia bordered by a semicircular granular cryptocyst.

REMARKS: Brown (1948) erected this genus to replace *Foraminella* Levinsen, 1909 which was preoccupied. He did not comment on *Manzonella* Jullien, 1888, based on *Membranipora exilis* Manzoni, 1869 from the Pliocene of Italy. According to Bassler (1953 : 174), *Opaeophora* differs from *Manzonella* in the possession of a series of small opesiules as opposed to just a few. The type of *Opaeophora, O. lepida* (Hincks, 1881b), has this series, but Brown's (1952) variety *monopia* possesses only a pair of opesiules. Uttley and Bullivant (1972) rightly regarded var. *monopia* as congeneric with *O. lepida* for, in all other features (especially the avicularia) but the opesiules, they agree. They also regarded var. *monopia* as worthy of specific status. With this I concur. In *O. monopia* however, the distinction which Bassler saw between the two genera disappears. Thus, based on the number of opesiules, *Opaeophora* must be regarded as synonymous with *Manzonella*. The only other apparent difference lies in the avicularia. Based on Manzoni's illustration, the avicularian rim in *Manzonella* is dagger-shaped, with a straight, tapering rostrum, whereas in *Opaeophora* it is scimitar-shaped, broader, and curved. I do not regard this as sufficient distinction to maintain the two genera and here regard *Opaeophora* Brown as a junior synonym of *Manzonella* Jullien.

Mollia Lamouroux, 1821

Colony encrusting, the zooids contiguous or separated by short tubes. Cryptocyst occupying half the frontal area, the opesia (with distal operculum) the remainder. No opesiules. Spines and avicularia absent. Ovicell immersed. Basal pore-chambers present.

TYPE-SPECIES: *Eschara patellaria* Moll, 1803

Mollia multijuncta (Waters) (Plate 16, D)

Diachoris patellaria var. *multijuncta* Waters, 1879: 120.
Membranipora patellaria: MacGillivray 1882: 119.
Amphiblestrum patellarium: MacGillivray 1886a: 70.
Mollia rosselii var. *multijuncta*: Ryland & Hayward 1977: 116.

MATERIAL EXAMINED: NZOI Stns K796, K797, K798, K818, K819, K820, K836, K837, K851, K854.

DISTRIBUTION: Victoria, Mediterranean, southern Britain.

DESCRIPTION: Colony encrusting. Zooids 0.30–0.43 × 0.20–0.28 mm, not contiguous, but united by connecting tubes in a quincuncial arrangement such that each zooid shares a total of 12–13 tubes with adjacent zooids. Extensive frontal membrane beneath

which is a granular cryptocyst and somewhat trifoliate opesia less than half the cryptocystal length. The basal surface with 35–50 short, scattered attachment processes. Ovicells immersed, but large and convex such that the next distal zooid sometimes develops as a kenozooid for lack of space; surface granular. No avicularia or spines.

REMARKS: *Mollia patellaria* (Moll, 1803) also has disjunct zooids but they are connected to each other by one tube only, such that each zooid shares a total of only six tubes when arranged in perfect quincunx. The taxon *multijuncta* has been regarded as a variety of *M. rosselii* (Audouin, 1826), but that species is non-disjunct and has small cap-like ovicells.

Caleschara MacGillivray, 1880

Colony encrusting or erect. Zooidal cryptocyst extensive, granular, the distal edge of the proximal half as a convex median process which is free, or uniting with the lateral cryptocyst leaving opesiules; the opesia correspondingly either trifoliate or semicircular. Spines and avicularia wanting. Ovicell immersed. Uniporous mural septula present.

TYPE-SPECIES: *Eschara denticulata* MacGillivray, 1868

Caleschara levinseni Harmer (Plate 16, E)

Caleschara levinseni Harmer, 1926: 221.

MATERIAL EXAMINED: NZOI Stns K825, $K826_2$.

DISTRIBUTION: Japan, Philippines, Singapore, Seychelles.

DESCRIPTION: Colony encrusting. Zooids 0.62–0.75 × 0.42–0.53 mm, with membrane covering the whole frontal area; beneath this an extensive cryptocystal shelf, concave, granular. Opesia trifoliate with irregular lateral edges. No avicularia or spines. Ovicells immersed, convex, relatively smooth and large, the opesia in the fertile zooids larger than in autozooids.

REMARKS: *Caleschara laxa* Canu & Bassler, 1929 appears to be junior synonym.

Family THALAMOPORELLIDAE Levinsen, 1909

Colony encrusting or erect. Zooids with extensive depressed cryptocyst and small distal opesia almost entirely coincident with the operculum. One or a pair of large opesiules, and corresponding lateral or median polypide tube present. Internal free spicules usual. Gymnocyst absent. Avicularia vicarious, not resembling autozooids. Ovicell large or absent. Multiporous mural septula present.

Thalamoporella Hincks, 1887

Colony encrusting or erect. Zooids with extensive depressed cryptocyst and small distal opesia almost entirely coincident with the operculum. A pair of opesiules proximal to the orifice. Spicules typically common. Avicularia vicarious, lacking a pivot bar. Ovicell large, comprising two halves with a median groove. Multiporous mural septula present.

TYPE-SPECIES: *Flustra rozieri* Audouin, 1826

Thalamoporella quadrata n.sp. (Plate 17, A)

MATERIAL EXAMINED: NZOI Stns K799, K809, K812; on mollusc shells.

DISTRIBUTION: Kermadec Islands, 10–30 m.

DESCRIPTION: Colony encrusting. Zooids rectangular, 0.72–0.90 × 0.23–0.48 mm. Cryptocyst extensive, granular with minute pores, sloping gently concavely from the proximal border to the opesiules; the opesiules variable in size and shape, descending to the basal walls and open distally, beneath the cryptocyst. The combined orifice and opesia sinusoid, the sinus generally somewhat straight proximally; with tiny, fragile uncinate condyles. Ovicelled zooids shorter than autozooids, with relatively wider opesiules and the polypide tube between them more deeply set; the combined opesia and orifice longer than wide, with a broadly U-shaped sinus and stronger condyles; the ovicell as long as the zooid, huge, smooth, with a broadly acute opening proximally and a median suture visible as a thin line. Avicularia vicarious with a moderately large, granular cryptocyst to one-half the length of the avicularium; the rostrum long, straight, acute, with raised slightly biconcave rim; the rostral foramen narrowly triangular; the proximal opesia typically quadrate in outline or proximally rounded; no pivot bar; a pair of transversely set ridge-like pivots. Spicules not seen.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–320.

PARATYPE: NZOI, type number P–563, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K799, Raoul Island, 29°14.9′S, 177°51.9′W, 24 m.

REMARKS: There are around 30 described species and "varieties" of *Thalamoporella.* While these have been mostly well characterised, the extent of polymorphism among species does blur taxonomic boundaries, and the precise rank of many of the taxa is not certain. In the features of the autozooid and ovicelled zooids the present species is allied to the *gothica, granulata* and *rozieri* groups with a sinusoid opesia. Many of the former "varieties" of these species have been raised to

specific rank by other authors and, following their practice of assigning weight to the characters of the avicularium, the present form appears distinctive enough to be regarded as a new species. *T. stapifera* Levinsen, 1909 appears allied, but the avicularium has a larger, rounded proximal opesia and rounded rostral apex. *T. californica* Levinsen, 1909 similarly has a larger proximal opesia and the sides of the rostrum are biconvex.

Family STEGINOPORELLIDAE Hincks, 1884

Colony encrusting; or erect, frondose or vincularian. Zooids sometimes dimorphic (A and B zooids). Cryptocyst well developed, usually with a median process and descending to the basal wall, leaving a calcified tubular passage for the movement of the polypide; or median process absent or polypide tube lateral. Gymnocyst present or, more commonly, absent. Avicularia (B zooids), when present, resemble autozooids but are larger with larger mandibles. Ovicell wanting. Multiporous mural septula present.

Steginoporella Smitt, 1873

Colony encrusting; or erect, frondose or vincularian. Zooids often dimorphic (A and B zooids). Cryptocyst well developed, with a median process and descending to the basal wall, leaving a calcified polypide tube under the median process. Gymnocyst absent. Avicularia (B zooids), when present, occur as enlarged zooids complete with polypide, the mandible structurally different from opercula of ordinary zooids. Ovicell wanting. Multiporous mural septula present.

TYPE-SPECIES: *Membranipora magnilabris* Busk, 1854

Steginoporella magnifica Harmer (Plate 17, B)

Membranipora magnilabris: Hutton 1873: 96.
Steganoporella neozelanica: Hincks 1882a: 119.
Steganoporella neozelanica var. *magnifica* Harmer, 1900: 264 (*cum syn.*); Brown 1952: 123; Livingstone 1929: 66; Uttley & Bullivant 1972: 25.
Steganoporella neozelanica var. *typica*: Gordon 1967: 52.
Steginoporella neozelanica var. *magnifica*: Ryland 1975: 386.

MATERIAL EXAMINED: NZOI: Stns K795, K797, K820, K822, K844, K850, K851, K855, K857, K867. DPG: Specimens from Auckland and Hauraki Gulf.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Chatham Rise; also Pliocene of Wanganui and Napier; Tonga.

DESCRIPTION: Colony encrusting, forming unilaminar sheets or multilayered encrustations of superposed zooids. Zooids large, 0.87–1.13 × 0.70–0.88 mm, with opaque frontal membrane. Cryptocyst extensive, with small scattered pores, concave for almost half the zooidal length then descending abruptly to the basal wall where it leaves a calcified tubular passage in the mid-line for the emergence of the polypide. At the point where the cryptocyst descends arises a vertically orientated median process; between this and the descending part of the cryptocyst is a pit; the median process has lateral "wings" which project towards the lateral opercular condyles. Operculum with thickened rim and a few marginal denticles, rarely with reticulate chitinous thickening in the centre.

REMARKS: Harmer (1900) regarded this species as only a variety of *S. neozelanica* (Busk), although with some doubt. There are consistent differences between the two forms, however, in the operculum, and the form of the colony and the median process. These warrant, as Pouyet and David (1979) have suggested, elevating the variety to full specific status. There is great variation in the size of the zooids in the Kermadec specimens. Some colonies have considerably smaller zooids than normal, but apart from size, other features are in accordance with the typical characters. Colour in life (based on Hauraki Gulf specimens) is a pale brownish-yellow.

Steginoporella neozelanica (Busk) (Plate 17, C)

Vincularia neozelanica Busk, 1861: 155; Hutton 1880: 189.
Steganoporella neozelanica: Hincks 1882a: 119; Waters 1887a: 50; Hutton 1891: 104.
Steganoporella neozelanica forma *typica*: Livingstone 1929: 65.

MATERIAL EXAMINED: NZOI: Stns K796, K820, K849, K851, K856, K857. DPG: Specimens from Bay of Islands, Poor Knights Islands, Hauraki Gulf.

DISTRIBUTION: Bay of Islands, Poor Knights Islands, Hauraki Gulf, Napier, Wanganui.

DESCRIPTION: Colony erect, comprising stalks up to 80 mm long supported by bundles of stolon-like supportive rhizoids. Zooids 0.57–0.83 × 0.40–0.65 mm, in alternating longitudinal rows. Cryptocyst extensive, concave, granular, the central depressed area perforate; the median process, which forms part of the distal cryptocystal rim, fused with the lateral condyles. Operculum with a few marginal denticles, and slender chitinous ribboning in the centre.

REMARKS: This distinctive endemic species is brownish-orange in life with brighter orange growing tips. Its zooids have a relatively longer, less concave cryptocyst than in *S. magnifica*, with more numerous pores, and the median process is more widely expanded, fusing laterally with the condyles.

Family MACROPORIDAE Uttley, 1949

Colony encrusting or erect, foliaceous. Zooids typically dimorphic, large, the frontal wall convex,

cryptocystal, with scattered pores serving as opesiules. Opesia completely reduced, wholly coinciding with the orifice. Operculum thick, calcareous, semicircular. A second type of orifice may occur, which is wider and sinuate distally. Small oral spines present or absent. Ovicell huge, as large as or larger than autozooids, recumbent upon other zooids, kenozooids or the substratum; closed by the zooidal operculum. Basal pore-chambers present.

REMARKS: Uttley (1949) ascribed the authorship of this family to Canu and Bassler (1920), but they had merely made an informal suggestion that a family might be necessary. Bassler (1953) himself ascribed this family to Uttley (1949).

Macropora MacGillivray, 1895

Characters as for the family.

TYPE-SPECIES: *Macropora centralis* MacGillivray, 1895

Macropora grandis (Hutton) (Plate 17, D–F)

Lepralia grandis Hutton, 1873: 98.
Lepralia urceolata: Hutton 1873: 97.
Monoporella crassatina Waters, 1887a: 49; Hamilton 1898: 195, 198.
Monoporella crastatina [sic]: Hutton 1891: 104.
[?] *Macropora centralis* MacGillivray, 1895: 55; Canu & Bassler 1929a: 161.
Monoporella crustatina [sic]: Hutton 1904: 297.
Macroporina grandis: Uttley 1949: 178.
Macroporella waimatukuensis var. *trisinuata* Uttley, 1949: 180.
Macropora grandis: Brown 1952: 135; Gordon 1970: 313; Uttley & Bullivant 1972: 25.

MATERIAL EXAMINED: NZOI: Stns K797, K798, K801, K818, K819, K820, K837, K842, K851, K855, K856, K867. DPG: Colonies from Hauraki Gulf, Whangarei.

DISTRIBUTION: Whangarei, Hauraki Gulf, Wellington, Chatham Islands; also ?Victoria, ?Philippines.

DESCRIPTION: Colony encrusting, dark brownish-black in colour. Zooids large, 0.92–1.45 × 0.90–1.23 mm, subhexagonal with convex cryptocystal wall; this granular with 40–50 pores, rising to orificial area at highest point of zooid. Operculum thick, calcareous, granular, with straight proximal rim. Spines 2–4, short, fragile. A substantial oral shelf supporting the distal rim of the operculum. A different type of orifice in some zooids, larger and sinuate distally, with 5–6 short fragile spines. No avicularia. Ovicells huge, almost always completely obscuring the next distal zooid which is reduced to a flattened kenozooidal chamber beneath the ovicell; ovicell granular with irregular lines of pores radiating from the apex.

REMARKS: This genus has long posed a number of problems. For example, how does the hydrostatic mechanism work? Typical opesiules are not apparent and there is no orificial sinus leading to a compensation sac. Preliminary anatomical studies, made on preserved material, indicate that muscle strands pass through the cryptocystal pores to the overlying membrane. Although these pores are small relative to the size of the zooid, they are at least the diameter of opesiules in some smaller microporoidean bryozoans, so it seems probable that at least some of them function in this way. Although the cryptocyst is convex the pores are typically set in a slight depression, the combined volume of which may correspond to the volume of a lophophore.

The function of the zooids with sinuate orifices is not clear. Brown (1952) regarded them as avicularia as evidently did Uttley (1949), who called them "B" zooids, after the terminology of Harmer (1900) with regard to *Steginoporella* species. Although they are provided with a polypide, they may indeed be incipient avicularia, but again, more detailed studies are needed.

The ovicells are remarkable for their size, although this is not unique among cheilostomes. Uttley (1949) introduced the term "vicarious ovicell" for these structures, as taking the place of an autozooid in a series. Brown (1958) has noted that in some other species of *Macropora* the ovicell is actually recumbent, resting on a distal zooid which retains its orifice. This is occasionally the situation in Kermadec colonies, but for the most part there is no room for the full potential of the distal zooid to develop and it remains hidden beneath the ovicell as a kenozooid. Brown (1952 : 138) observed, however, that this kenozooid can be absent and that the ovicell apparently rests directly on the substratum. I have confirmed this observation in colonies from Leigh, Hauraki Gulf, where ovicells of live colonies can be seen developing at the colony edge. In this instance, the terminology of Uttley would not be inappropriate, since the ovicells indeed replace an autozooid in a series. Brown (1952 : 134) wondered if the ovicell were a modified gonozooecium, and I (1970 : 313) followed him in this in calling it a gonoecium. I now believe that the ovicell of *Macropora* should be regarded as a modified recumbent type. It is sealed by the zooidal operculum, which has two positions of closure. When flat it seals the autozooidal orifice; when partly raised it seals the ovicellular orifice.

M. grandis seems to be somewhat polymorphic, especially in the form of the "B" zooids, and I am not convinced that some of Uttley's (1949) taxa deserve specific rank.

Superfamily CELLARIOIDEA Lamouroux, 1821

Colony erect, articulated or non-jointed; or encrusting. Cryptocyst depressed, well developed, the opesia restricted to the orifice only. No spines. Avicularia vicarious or adventitious or absent. Ovicell concealed, opening by an independent orifice (endotoichal).

REMARKS: The name Cellarioidea is a *nomen translatum* of Cellariidae Lamouroux, 1821 and is equivalent to the Pseudostega of Levinsen (1909). Brown (1952) included the family Aspidostomatidae, with erect or encrusting species, in this group.

Family CELLARIIDAE Lamouroux, 1821

Colony erect, jointed or unjointed. Zooids typically diamond-shaped or hexagonal, facing from all sides of internodes or branches. Lateral walls of zooids raised, forming a rim delimiting the frontal area. Cryptocyst depressed, imperforate. Orifice more or less semicircular, the proximal rim straight or convex, usually with condyles laterally. Avicularia vicarious or absent. Ovicell endotoichal, usually inconspicuous.

Cellaria Ellis & Solander, 1786

Cellariids with typically jointed, occasionally unjointed colonies. Orifice with condyles. Avicularia vicarious, lacking pivot bar. Ovicell generally inconspicuous.

TYPE-SPECIES: *Farcimia sinuosa* Hassall, 1840

Cellaria humilis Moyano (Plate 18, A)

Cellaria humilis Moyano, 1983: 7.

MATERIAL EXAMINED: NZOI Stn $K795_1$.

DISTRIBUTION: South Central Chile.

DESCRIPTION: Colony erect, extremely slender, presumably branching but non-articulated. Zooids arranged back to back in alternating pairs, each pair aligned at right angles to the one above and below. Zooids 0.35–0.43 × 0.12–0.15 mm, of the typical hexagonal pattern, though somewhat rounded distally; mostly smooth. Cryptocystal rim teardrop-shaped, the ridges converging proximally without meeting. Combined orifice and opesia subterminal with a convex proximal rim. Avicularia occasional, small, distal to an autozooid. Ovicells not seen.

REMARKS: Several non-branching fragments of this species were encountered. It is characterised by the alternating pairs of zooids, uncommon in *Cellaria*, the very small size of both zooids and branches, and the overall smooth surface. As Moyano (1983) noted, the small size of the avicularium also distinguishes this from other austral species.

Cellaria tenuirostris (Busk) (Plate 18, B)

Salicornaria tenuirostris Busk, 1852a: 17 (*pars*).
Cellaria tenuirostris: MacGillivray 1880: 50; Hamilton 1898: 194; Livingstone 1929: 71; Hastings 1947: 226; Brown 1952: 159; Macken 1958: 104; Uttley & Bullivant 1972: 26.

MATERIAL EXAMINED: NZOI: Stns K851, K855, K867. DPG: Colonies from Hauraki Gulf.

DISTRIBUTION: Hauraki Gulf, Cook Strait, Chatham Islands; also Bass Strait, New South Wales, Bonin Islands (SE of Japan). Middle Oligocene of Nelson Province, Middle Miocene of Southland, Pliocene and Miocene of Victoria, Middle to Upper Pliocene of Wanganui.

DESCRIPTION: Colony erect, branching, articulated. Zooids arranged in up to 12 longitudinal series in the branch segments; the branch segments straight or curved, of variable diameter, about 10 mm long, tapering proximally. Zooids 0.37–0.50 × 0.22–0.30 mm, hexagonal in outline, arranged in transverse series, granular; the frontal area bordered by the teardrop-shaped cryptocystal rim, the proximal ends of which converge without meeting. Combined orifice and opesia at the lowest part of the cryptocyst though raised slightly above it, the rim smooth, convex proximally with a condyle at each proximal corner. Avicularia vicarious, with long acute rostrum. Ovicells completely immersed, with a narrow semicircular opening in the cryptocyst distal to the orifice. The colony is supported by a basal bundle of rhizoids as well as occasional rhizoids issuing from modified autozooids in higher branches.

REMARKS: *C. tenuirostris* is the commonest cellariid in northern New Zealand coastal waters.

Stomhypselosaria Canu & Bassler, 1927

Erect, unjointed cellariids, dichotomously branching, more or less cylindrical. Orifice with or without proximolateral indentations or minute condyles. No avicularia. Ovicell apparent as a frontal bulge, with a cowl-like distal rim.

TYPE-SPECIES: *Stomhypselosaria condylata* Canu & Bassler, 1927

REMARKS: Cook (in litt. 1980) has remarked that *S. condylata* is congeneric with *Cryptostomaria* Canu & Bassler, 1927a, but that *S. dupliforma* is not. British Museum material of purported *Stomhypselosaria condylata*, *S. dupliforma* and *Cryptostomaria crassatina* all belongs to *S. dupliforma*. This latter species occurs in Kermadec Ridge samples. Until the genera and species of Cellariidae of Canu and Bassler have been restudied, *S. dupliforma* is here retained in "*Stomhypselosaria*". There is not another genus to which I can confidently assign it at present.

Stomhypselosaria dupliformа Canu & Bassler
(Plate 18, C–E)

Stomhypselosaria dupliformа Canu & Bassler, 1929a: 175.

MATERIAL EXAMINED: NZOI Stn K851.

DISTRIBUTION: Kermadec Islands, about 105 m.

DESCRIPTION: Colony erect, slender, branching but non-articulated, more or less quadrangular in cross-section. Zooids arranged back to back in alternating pairs, each pair more or less at right angles to the pair above and below. Zooids 0.67–0.88 × 0.25–0.38 mm, diamond-shaped in outline, granular, with high-sided walls forming a longitudinally elongate rim around the frontal area. Cryptocyst sloping distally inward to the combined orifice and opesia, which is situated about two-thirds along the length of the zooid, then sloping distally outward to the rim; the opesia with a narrow smooth rim, straight proximally and slightly raised above the deepest level of the cryptocyst; lateral indentations at the proximal corners of the opesia barely developed in some zooids. Zooidal boundaries delineated at the surface by minutely beaded, slightly raised, lines. Avicularia absent. Ovicells bulging slightly, with a cowl-like distal rim.

REMARKS: *Stomhypselosaria dupliformа* differs from the type-species, *S. condylata*, in its rather more rectangular cryptocyst and its narrower branches. The ancestrula has a relatively small orifice and a rootlet pore. Its pointed proximal end terminates in an affixed chitinous section.

Mesostomaria Canu & Bassler, 1927

Erect, unjointed cellariids, dichotomously branching, more or less cylindrical. Orifice near the centre of the cryptocyst, lacking condyles. Avicularia wanting. Ovicell with transversely elongate opening.

TYPE-SPECIES: *Mesostomaria strictoramae* Canu & Bassler, 1927.

Mesostomaria strictoramae Canu & Bassler
(Plate 18, F)

Mesostomaria strictoramae: Canu & Bassler 1929a: 176.

MATERIAL EXAMINED: NZOI Stn K795.

DISTRIBUTION: Sabah; SW Philippines.

DESCRIPTION: Colony erect, branching but non-articulated, roughly circular in cross-section. Zooids alternating, in eight longitudinal rows in older parts; 0.47–0.60 × 0.40–0.50 mm, diamond- to teardrop-shaped depending on amount of attenuation of distal and proximal ends, or subhexagonal. Surface granular. Within the outline of the diamond the frontal cryptocystal wall is peripherally raised delimiting a subcircular frontal area. Combined orifice and opesia just a little distal to the centre of, and raised above, the cryptocystal concavity in which it lies; the proximal opesial rim straight or barely concave; no condyles. Zooidal boundaries delineated on the surface by minutely beaded, slightly raised lines. Avicularia absent. Ovicell as a bulge just distal to the orifice, within the cryptocystal rim, the opening transversely elongate.

REMARKS: Canu and Bassler (1927a) introduced the genus *Mesostomaria* for Recent colonies of this species from Sabah (north-east Malaysia) and the south-west Philippines, but they noted, with their diagnosis, that the genus ranged from the Miocene. They explained this distribution in time in a later publication (1929a) when they included some species of Busk and MacGillivray which had been assigned by them to *Salicornaria* (i.e., *Cellaria*) and *Melicerita*. Canu and Bassler (1929a : 175, 176) indicated inclusion of these species in *Mesostomaria* in such a way as to imply to some modern authors (although they clearly had not meant to do so) that *Cellaria* Ellis & Solander, 1786 and *Melicerita* Milne-Edwards, 1836a were junior synonyms or subgenera of *Mesostomaria*. For this reason, and because of obvious relatedness, Brown (1952 : 164, 165) included *Mesostomaria* in *Melicerita*.

Notwithstanding the many similar features of these two genera, I choose here to use *Mesostomaria*, which differs from *Melicerita* in being circular in cross-section and not flattened, in lacking orificial condyles, and in the apparent absence of avicularia. On the basis of these characters, *Mesostomaria* includes the type, *M. strictoramae*, and *Salicornaria magnifica* Busk, 1884. Busk's illustration of the latter species gives the impression of only four or six longitudinal series of zooids, fewer than in *M. strictoramae*. The Kermadec specimen (on which the above description is based) comprises one fragment 6 mm long, with two bifurcations, and appears to possess fewer rows of zooids than the specimens illustrated by Canu and Bassler. In their figure 7, however, one branch is narrower than the others and is like the Kermadec specimen in appearance.

Suborder ASCOPHORA Levinsen, 1909

Cheilostomes in which the frontal surface appears fully calcified (though often punctate). In two types of frontal wall the frontal membrane remains more or less intact, either beneath a shield of fused flattened spines (cribriline) or an overarching wall complex (umbonuloid). In a third type there is an interior partition above which is a thin coelomic space (cryptocystidean or lepralioid). In the latter, and in a

fourth type in which the frontal membrane is itself wholly calcified (gymnocystal), an underlying compensation sac (ascus) occurs. The operculum in the first two types is incorporated in the frontal membrane as a flap; in the latter two types it is a more discrete structure, often with proximal tab(s) corresponding to the entrance to the ascus. Zooidal margins are sometimes obscured as calcification proceeds.

Superfamily CRIBRILINOIDEA Hincks, 1879, *nom. transl.*

Colony encrusting or erect. Frontal surface a shield formed from a series of flattened spines (costae) arched over the frontal membrane and fused along the mid-line. These usually hollow spines may contain lumen pores and are fused laterally to a greater or lesser extent, the intercostal spaces allowing passage of water between the shield and the underlying frontal membrane. Avicularia and/or spines present or absent. Ovicell hyperstomial. Pore-chambers and/or mural septula present.

REMARKS: The name Cribrilinoidea is a *nomen translatum* of Cribrilinidae Hincks, 1879 and corresponds to the Acanthostega of Levinsen (1902, 1909), the "Cribrimorphs" of Lang (1916), and the Costulacea of Vigneaux (1949).

Family CRIBRILINIDAE Hincks, 1879

Characters as for the superfamily.

Membraniporella Smitt, 1873

Encrusting. Multiserial or uniserial. Frontal shield of flattened spines, closely contiguous or widely separated but always fused at or near the mid-line. Oral spines present. Ovicell with endooecium exposed, closed by zooidal operculum. Avicularia, when present, adventitious. Mural septula or basal pore-chambers.

TYPE-SPECIES: *Lepralia nitida* Johnston, 1838.

REMARKS: The relationships among the named species of *Membraniporella* are unclear. Cook (1967) has commented on the large range of variation in this genus. Only the type-species, *M. nitida* (Johnston, 1838), and *M. agassizii* Smitt, 1873 have avicularia and only *M. nitida* is known to have basal pore-chambers, the other species possessing lateral septula. There is some variation in ovicells also. *M. nitida* is described as having an ovicell which is "coarse grained with a reticulated surface" (Ryland and Hayward 1977) and evidently without a frontal fenestra. An electron micrograph of this species (*see* Harmelin 1978 : 181), however, shows clearly that the exposed surface of the ovicell is endooecium and that the ectooecium is present, but only as a little-developed peripheral band. On this basis the ovicells of *M. nitida* are not so different from those of *M. distans* MacGillivray, 1883a or *M. figularioides* n.sp. (q.v.). *Membraniporella* has generally been regarded as allied to the Cribrilinidae, although Levinsen (1909) suggested an evident relationship with the Calloporidae. Ryland and Hayward (1977) placed *Membraniporella* in the Calloporidae, pointing out the obvious similarity between *M. nitida* and *Callopora rylandi* Bobin & Prenant. *C. rylandi* has a frontal shield of spines fused in the mid-line. New Zealand *Membraniporella,* on the other hand, is clearly allied to *Figularia spinea* in the structure of the frontal shield. *F. spinea* itself is somewhat intermediate, in its shield, between *Membraniporella* and the species of *Figularia* with a reduced shield of costae with lumen pores. Thus, on the basis of comparison with certain figulariae, some *Membraniporella* species seem better retained in the Cribrilinidae.

Further discussion of these relationships is given in the remarks about the genus *Figularia.*

Membraniporella bifurca Powell (Plate 19, A)

Membraniporella bifurca Powell, 1967a: 219.

MATERIAL EXAMINED: NZOI Stns K795, K820, K837, K841, K851, K855, K856, K858, K872.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf.

DESCRIPTION: Colony encrusting, uniserial to aggregated. Zooids ovoid, 0.52–0.65 × 0.25–0.28 mm, tapering proximally. About 12 pairs of costal spines, each with apical cervicorn branching in the horizontal plane, somewhat interdigitating and fusing irregularly in the mid-line. Gymnocyst smooth. Oral spines 5–6, the proximal pair forked, the others much less so; only the proximal pair present on ovicelled zooids. Ovicells with roughly triangular endooecial area bounded by an ectooecial rim usually mucronate apically. No avicularia.

REMARKS: Powell's (1967a) specimens from near Three Kings Islands had only four oral spines, a wider gymnocyst, and kenozooids.

Membraniporella figularioides n.sp. (Plate 19, B,C)

MATERIAL EXAMINED: NZOI Stns K795, K803, K820, K825, $K826_{2,3}$, K827, K837, K843, K855, K856, K857, K867.

DISTRIBUTION: Kermadec Islands, 95–490 m.

DESCRIPTION: Colony encrusting. Zooids 0.42–0.53 × 0.23–0.50 mm, contiguous, with extensive frontal shield and narrow peripheral gymnocyst. Shield of 11–14 pairs

of closely contiguous costae which fuse in the mid-line, without bifurcating, forming a narrow carina; the distal pair wider than the rest, forming an orificial bar, i.e., a proximal rim to the orifice. Four oral spines, these flaring apically, tending to divide into short tines; two spines on ovicelled zooids. Ovicell prominent, smooth-walled, with a large area of endooecium bounded distally by a raised rounded or crested ectooecial rim. Avicularia tiny, borne proximolaterally on the gymnocyst. Kenozooids smooth-walled with circular or oval opesia. Mural septula present.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–300.

PARATYPE: NZOI, type number P–556, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: This species appears most like *M. distans* MacGillivray, 1883a, which has a similar exposure of endooecium in the ovicell. The costal spines of *M. distans,* however, are typically bifurcated towards the mid-line and have larger lacunae between them.

Figularia Jullien, 1886

Colony encrusting. Costal shield extensive, or considerably reduced with concomitant enlargement of the gymnocyst; the costae contiguous or apart, fused in the mid-line, often with lumen pores. Oral spines sometimes present. Avicularia vicarious. Ovicells typically bifenestrate. Mural septula present.

TYPE-SPECIES: *Lepralia figularis* Johnston, 1847

REMARKS: The type-species, *Lepralia figularis* Johnston, 1847, is characterised by bifenestrate ovicells, costae with lumen pores, no oral spines, and vicarious avicularia. The majority of the species of *Figularia* share these characteristics, although the range of variation in the genus is very great. Thus lumen pores, for example, are conspicuously developed in *F. quaylei* Powell, 1967b, whereas in *F. spinea* Brown, 1952 they are completely absent. In both of these species the costal field is extensive, occupying most of the frontal area, whereas in *F. hilli* Osburn, 1950 the costal area is rather reduced. Because of the range of variation, species representing the extremes are morphologically so distinct that they could be considered to be in different genera. When all the named species are compared, however, it is seen that the morphological extremes are united by intermediate forms.

Brown's *F. spinea* resembles the type-species in its bifenestrate ovicells and vicarious avicularia. It differs from the type-species in having oral spines and a bigger costal field and in lacking lumen pores. In the former features it also resembles *Crassimarginatella* (*Valdemunitella*) *pyrula* (Hincks, 1881b), as Brown (loc. cit.) pointed out. *C. pyrula* lacks a shield of fused spines, however. Thus the Cribrilinidae seems closely related to the Calloporidae, as evidenced by the following pairs of species:
Membraniporella nitida and *Callopora rylandi;*
Membraniporella figularioides and *Crassimarginatella* (*Corbulella*) *spinosissima;*
Figularia spinea and *Crassimarginatella* (*Valdemunitella*) *pyrula.*

As mentioned earlier, some *Membraniporella* species are better included in the Cribrilinidae on the basis of a close morphological similarity to forms like *Figularia spinea,* with a similar costal shield. The question then arises: is *F. spinea* definitely a *Figularia* (i.e., a cribrilinid)? A case could be made for separating forms with costal lumen pores and lacking oral spines from those like *F. spinea* with spines and no lumen pores but, as already mentioned, there are morphological intermediates. *F. triangula* Powell, 1967a, for example, lacks both spines and lumen pores and has a reduced costal shield. At present it is difficult to define positively the boundaries between the two families on the basis of these intermediate forms, which clearly need more study, especially as live material becomes available.

Figularia carinata (Waters) (Plate 19, D)

Cribrilina figularis: Waters 1887a: 53; Hamilton 1898: 196, 198.
Figulina carinata Waters, 1923: 569.
Figularia carinata: Brown 1952: 185; Macken 1958: 105; Powell 1967a: 227.

MATERIAL EXAMINED: NZOI Stns K818, K836, K851, K854, K856, K857, K859, K867.

DISTRIBUTION: Three Kings Islands, Cook Strait, Foveaux Strait; also Pliocene of North Island.

DESCRIPTION: Colony encrusting. Zooids large, 0.57–0.65 × 0.30–0.45 mm, with extensive smooth gymnocyst. Costal shield of 5–6 pairs of flattened spines, closely appressed with only grooves between them; each spine with a prominent slit-like lumen pore. Orifice somewhat quadrate, with lateral condyles, sinuate proximally; no oral spines. Ovicell mitriform, flattened and inclined frontally, carinate distally, with a narrow, sinuate ectooecial fenestra either side of the mid-line. Orifice of ovicelled zooids wider than that of ordinary zooids. Avicularia not seen.

REMARKS: Powell (1967a) described vicarious avicularia in material from near Three Kings Islands. They are elongate with a spatulate rostrum and narrowly triangular foramen and complete pivot bar.

Figularia pelmatifera n.sp. (Plate 19, E)

MATERIAL EXAMINED: NZOI Stns K818, K819, K820, K827, K844, K854, K867.

DISTRIBUTION: Kermadec Islands, 95–318 m.

DESCRIPTION: Colony encrusting. Zooids oval to rectangular, 0.45–0.65 × 0.32–0.40 mm, with smooth gymnocyst laterally and proximally. Costal shield of 24–30 spines, fusing in the mid-line without forming a carina; each costa with a small oval lumen pore near, but set back from, the mid-line. Orifice rounded with broad shallow sinus; small lateral condyles. Orifice of ovicelled zooids not as wide and slightly longer than that of ordinary zooids. Ovicells wider than long with conspicuous drop-shaped fenestrae separated by a median suture; no carina. Avicularia not seen.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–276.

PARATYPE: NZOI, type number P–558, from NZOI Stn K854.

TYPE-LOCALITY: NZOI Stn K820, Raoul Island, 29°13.30′S, 177°59.80′W, 95–122 m.

REMARKS: This species is characterised by numerous costae. In this feature and in its ovicells it resembles *F. tenuicosta* (MacGillivray, 1895) from the Middle Miocene of Victoria. In that species, however, there are no lumen pores and the orifice of ovicelled zooids has a convex proximal rim. Zooids of *F. pelmatifera* are of approximately the same dimensions as those of *F. mernae* Uttley & Bullivant, 1972, which has far fewer costae. Both of these species are smaller than *F. carinata* (Waters).

Figularia spinea Brown (Plate 19, F,G)

Membraniporella nitida: Hutton 1873: 97.
Figularia philomela: Livingstone 1929: 73.
Figularia spinea Brown, 1952: 181; Powell 1967a: 224.
Figularia huttoni Brown, 1952: 183; Uttley & Bullivant 1972: 16.

MATERIAL EXAMINED: NZOI Stns K829, K854, K855, K856, K857, K867.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Cook Strait, Chatham Islands, Stewart Island; also Middle Miocene of South Island, Middle Pliocene of North Island.

DESCRIPTION: Colony encrusting. Zooids 0.57–0.65 × 0.35–0.43 mm, with smooth gymnocyst which is narrow to moderately wide proximally and narrow laterally. Costal spines 14–21, unbranched, fusing in the mid-line with a faint carina. Oral spines six in ordinary zooids, two in ovicelled zooids. Ovicells prominent, smooth, ectooecium bifenestrate with a median suture. Avicularia vicarious, with extensive gymnocyst; rostral rim thin, raised, minutely serrated, long and rounded distally with parallel or slightly concave sides; the combined foramina oval, constricted medially by prominent pivots.

REMARKS: This species is evidently very variable. Some Kermadec specimens had fewer, more widely spaced costae. Powell (1967a) has given evidence to include *F. huttoni* Brown, 1952 in the range of variation of *F. spinea,* for the two species overlap in the characters of the frontal shield (numbers and closeness of the costal spines). Brown also described *F. spinea* as having 4–6 oral spines and *F. huttoni* as having two. *F. huttoni* of Uttley and Bullivant (1972) from the Chatham Islands had four spines and the costal shield of *F. spinea,* but also had avicularia, which Brown did not describe. A population at Leigh is characterised by only two spines but has the frontal shield of *F. spinea*. Avicularia were not seen in that form. Superficially, the Leigh material seems quite distinct from Powell's (1966a) *F. spinea* from Stewart Island but, in view of the overlap in characters, I here concur with Powell in merging the two species. The Kermadec specimens are also distinguishable on the basis of the orifice, which has a concave proximal rim and lacks condyles, although in some zooids the bases of tiny spines may simulate condyles.

Reginella Jullien, 1886

Colony encrusting with the zooids contiguous or distant, or suberect and conical. Frontal shield of pinnate costae with narrow, slit-like intercostal lacunae between the pinnae arranged in straight rows across the zooid, often traversing the mid-line without interruption. A stout orificial bar with or without avicularia. Oral spines or processes present or absent. Ovicell recumbent, with or without pores and/or fenestra(e). Small basal pore-chambers or mural septula present.

TYPE-SPECIES: *Cribrilina furcata* Hincks, 1882

Reginella stolonifera n.sp. (Plate 20, A–C)

MATERIAL EXAMINED: NZOI Stn K795.

DISTRIBUTION: Kermadec Islands, between 270 and 350 m.

DESCRIPTION: Colony encrusting, uniserial. Zooids pyriform, 0.42–0.53 × 0.23–0.33 mm, tapering proximally to a stolon-like cauda shorter than the zooidal dilatation or somewhat longer. Frontal shield of 6–8 pairs of pinnate costae, upwardly turned at their tapered ends in the mid-line, leaving an irregularly double carina; no lumen pores; the distal pair of costae modified as an orificial bar with something of the appearance of two cock's-combs. Oral spines five, flattened, also resembling cock's-combs; only two oral spines in ovicelled zooids. Ovicell recumbent, smooth except for two narrow lateral ectooecial slits and a pore; a basal pore-chamber opening distally. No avicularia or kenozooids seen. Pore-chambers small, one each side of the dilatation, giving rise to the caudae of lateral zooidal branches.

HOLOTYPE: Zooids, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–319.

TYPE-LOCALITY: NZOI Stn K795.

REMARKS: In the possession of stolons *R. stolonifera* differs from typical *Reginella* species. However, the frontal shield is, but for the carina, more or less identical to that of *Reginella vas* (q.v.) and the Kermadec specimens are thus considered most appropriately placed in *Reginella.*

Reginella is said to lack pore-chambers (Osburn 1950 : 179) but Powell (1967a) noted them in *R. vas* and tiny pore-chambers are present in *R. stolonifera* near the basal wall. In *R. vas* they tend to be elongate and very narrow, and in *R. stolonifera* might be regarded as mural chambers with rather larger septula than usual. Harmelin (1973) has shown the variability of these structures in *Crassimarginatella* and Cook (1967 : 329) has questioned their taxonomic value in other bryozoans.

Cribrilina alcicornis Jullien from Western Europe is a species with disjunct, often uniserially disposed zooids. Hastings (1964) considered it to belong to *Reginella.* It has longer oral spines than *R. stolonifera* as well as interzooidal avicularia like those of Australian *R. doliaris* (Maplestone). Harmelin (1978) rejected this assignment in favour of the traditional one, but *C. alcicornis,* although not fully comfortable in either genus, seems closer to *Reginella* than to *Cribrilina.*

Reginella vas (Brown) (Plate 20, D,E)

Cribrilina vas Brown, 1954a: 424.
Reginella vas: Brown 1958: 53; Powell 1967a: 221.

MATERIAL EXAMINED: NZOI Stns K855, K856, K867.

DISTRIBUTION: Three Kings Islands (Pliocene and Recent), Poor Knights Islands.

DESCRIPTION: Colony encrusting, uniserial. Zooids elongate, 0.60–1.28 × 0.37–0.50 mm, with 13–15 pairs of costal spines fusing neatly in the mid-line with no trace of a carina, forming a smoothly contoured shield. All but the orificial pair of costae pinnate, each pinna fusing with a pinna from an adjacent costa, leaving transverse rows of tiny longitudinal slits; the orificial pair forming a stout, raised bar supporting a transversely orientated avicularium on each side, with 1–2 large perforations either side of the mid-line, and with pinnae on the proximal side only. The orifice vertically inclined, with a three-pronged process in the middle of the distal rim. Ovicells recumbent, the opening hidden by the orificial bar, with a rounded fenestra bordered by a raised ectooecial rim; the opening of a basal pore-chamber conspicuous distally.

REMARKS: In life this species is red-coloured and often growing on cyclostomatous bryozoans. Kermadec specimens occurred on erect *Steginoporella neozelanica* and shell debris. Brown (1958) noted small lumen pores in the costae of related *R. maplestonei* Brown from the Oligocene of Victoria. There is no trace of lumen pores in *R. vas.*

Puellina Jullien, 1886

Colony encrusting. Gymnocyst extensive proximally or much reduced. Frontal shield of pinnate costae with intercostal pores. Chitinous setiform papillae (evaginations of the frontal membrane) often protrude through the most peripheral intercostal pores and are especially developed distally. Intracostal lumen pores absent. Orifice with completely calcified rim; often a lacuna simulating an ascopore just proximal to the orifice. Oral spines and pore-chambers present. Ovicell hyperstomial, imperforate or with small pores. Interzooidal avicularia present or absent.

TYPE-SPECIES: *Lepralia gattyae* Landsborough, 1852

REMARKS: The genus *Cribrilaria* Canu & Bassler, 1929b, which was separated from *Puellina,* has avicularia and a much reduced gymnocyst and lacks ovicellular pores. Almost all modern authors have maintained the two genera but, insofar as both share significant morphological features like pinnate costae, setiform papillae and often a suboral lacuna simulating an ascopore, I here consider that the similarities are far more noteworthy than the differences and regard *Cribrilaria* as no more than a subgenus of *Puellina.*

Subgenus **Cribrilaria** Canu & Bassler, 1929

Puellina with reduced gymnocyst and lacking ovicellular pores. Large interzooidal avicularia present.

TYPE-SPECIES: *Eschara radiata* Moll, 1803

Puellina (Cribrilaria) biavicularia Kataoka (Plate 21, A)

Cribrilaria biavicularia Kataoka, 1961: 242.

MATERIAL EXAMINED: NZOI Stns $K826_2$, K829, K854, K855, K856, K867.

DISTRIBUTION: Pleistocene of Japan.

DESCRIPTION: Colony encrusting. Zooids 0.27–0.48 × 0.25–0.40 mm, with frontal shield of 12–13 costae like those in *P.(C.) innominata* (q.v.), but the suboral umbonate process scarcely developed. Oral spines five in ordinary zooids, four in ovicelled zooids. Ovicell smooth with a slight median carina. Avicularia usually paired, adjacent to orifice, adventitious; the rostrum long, narrow, acute, often finely serrated; no pivot bar;

when paired the rostra converging obliquely distally; often 2–3 avicularian cystids, by regeneration, on one peduncle. Kenozooids, when present, with reduced costal shield and often an avicularium.

REMARKS: The most distinctive characteristic of this species is the presence of paired adventitious avicularia. I regard these as homologous with the interzooidal avicularia of other species of this genus in which the avicularia also arise from pore-chambers, but whereas they occupy a portion of the substratum between zooids, in this species they arise directly upward from the pore-chambers. Hayward and Ryland (1979) describe the avicularia of subgenus *Cribrilaria* as vicarious, i.e., in place of an autozooid, but this is hardly ever the case.

Puellina (Cribrilaria) innominata (Couch)
(Plate 21, B,C)

Lepralia innominata Couch, 1844: 114.
Cribrilina radiata: MacGillivray 1889b: 317.
Cribrilaria radiata: Powell 1967a: 223.
Cribrilaria innominata: Harmelin 1970: 84 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K795, K797, K798, K801, K803, K816, K818, K819, K820, K825, $K826_{1,2,3}$, K827, K829, K831, K837, K840, K842, K844, K851, K854, K855, K856, K857, K867, K871, K872.

DISTRIBUTION: Three Kings Islands; also Victoria, Philippines, India, Mediterranean, Britain, Madeira, Gulf of Mexico, California.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.43 × 0.27–0.40 mm, with shield of 15–17 pinnate costae, tapering from the periphery to approximately the centre of the shield, thus the shield subcircular in shape with the general appearance of radiating spokes; the thicker talon of each costa with 1–2 frontally developed tubercles. Orifice semicircular with calcified, straight proximal rim; immediately proximal to this an orificial bar formed from a modified additional pair of costae, raised in the mid-line into a double umbo, above a prominent lacuna. Adjacent to the talon of each of these orificial costae and arising from the first intercostal lacuna is a long chitinous setiform structure, directed obliquely distally. Oral spines five in ordinary zooids, four in ovicelled zooids. Ovicells somewhat raised, smooth with an apical prominence and/or suture. Interzooidal avicularia smaller than autozooids, usually with an extensive smooth gymnocyst; long acute rostrum sometimes minutely serrated and slightly upturned; no pivot bar.

REMARKS: Harmelin (1970, 1978) has done much to clarify the species of subgenus *Cribrilaria*. *P.(C.) innominata* is generally regarded as cosmopolitan but was not known from New Zealand until Powell (1967a) recorded it in *Discovery* material from Three Kings Islands [as *Cribrilaria radiata* (Moll)]. Powell noted the occurrence of as many as seven oral spines in this species. Harmelin (1970) never noted any variation in the number from five in Mediterranean material. By comparison, *P.(C.) radiata* typically has four, occasionally five, oral spines.

The function of the chitinous setiform papillae adjacent to the orifice is unknown. Some authors have taken these to be avicularian mandibles, but in cleaned zooids their point of origin is indistinguishable from a regular intercostal lacuna. Perhaps they are (associated with) sense organs as Smitt (1873 : 22) suggested. Osburn (1950: 186), however, wrote that he observed a small chamber and muscles in a *Cribrilaria* species. This report seems puzzling.

Even less obvious than the setiform papillae is a tiny chitinous papilla in each of the succeeding outermost intercostal lacunae. They are shown by Harmer (1902 : pl. 15, fig. 7) in *P.(C.) innominata* and by Harmelin (1970 : pl. 2, fig. 5) in purported *P. setosa* (Waters).

With the closure of the (generally) larger lacunae of the frontal shield by the chitinous papillae, the remainder, which are presumably open, permit the flow of water under the shield. Interestingly, Harmer (1902 : 328) suggested that the suboral pore was analogous to an ascopore. It is certainly not closed by a covering membrane and may indeed function in this way. Only sections of well-preserved material will settle the exact functions and relationships of the frontal wall and associated structures in *Puellina* and other cribrilinids.

Superfamily CATENICELLOIDEA Busk, 1852, *nom. transl.*

Colony encrusting or discoidal, or erect, segmented and articulated. Frontal wall smooth, typically mostly gymnocystal, imperforate or, more commonly, with few to several large perforations or a diminutive costal shield present; elongate frontally facing pore-chambers present or absent. Poster of orifice broad, almost straight, or more concave and a sinus or ascopore sometimes present; the proximal rim often having the appearance of being formed from the fusion of a pair of costae. Articulated oral spines absent. Avicularia adventitious or vicarious or absent. Ovicell typically fenestrate, and/or with small pores. Pore-chambers or mural septula present.

REMARKS: The name Catenicelloidea is a *nomen translatum* of Catenicellidae Busk, 1852b. It is here taken to also include the families Ditaxiporinidae Cheetham, 1963b and Eurystomellidae Levinsen, 1909.

Although the form of the colony differs markedly between some of these families, they are nonetheless united by the presence of mostly gymnocystal frontal walls which have the appearance of being morphologi-

cally derivable from a costal shield. Such a shield is present in at least some of the Catenicellidae, while in most eurystomellid and euthyroidid species the proximal rim of the orifice appears to be an orificial bar formed by the fusion of a pair of costae. Brown (1952 : 287) pointed out the resemblance of *Eurystomella* to *Figularia* (Cribrilinidae). Significantly, Banta and Wass (1979 : 22) also pointed out the cribrilinid features of certain catenicellids. For these reasons the Catenicelloidea is here placed near Cribrilinoidea.

Cook and Chimonides (1981) have shown that *Selenariopsis* Maplestone, 1913 (= *Australiana* Powell, 1966b) must be included in the Eurystomellidae, hence the addition of the discoidal colony form to the diagnosis of the superfamily.

Family EURYSTOMELLIDAE Levinsen, 1909

Zooidal frontal wall gymnocystal, smooth, imperforate or with few conspicuous pores. Orifice wider than long with a broad, narrow poster. No oral spines or avicularia. Ovicell subimmersed or recumbent, with a large central foramen. Small basal or mural pore-chambers present. Ancestrula tatiform.

Eurystomella Levinsen, 1909

Characters as for the family.

TYPE-SPECIES: *Lepralia foraminigera* Hincks, 1883

Eurystomella crystallina n.sp. (Plate 21, D,E)

MATERIAL EXAMINED: NZOI Stn $K795_1$; on coral.

DISTRIBUTION: Kermadec Islands, 350 m.

DESCRIPTION: Colony encrusting, uni- to biserial. Zooids 0.52–0.75 × 0.32–0.40 mm, hyaline, glistening; frontal wall smooth, imperforate. Orifice a high-arched semicircle with a pair of very small proximolateral excavations; the proximal rim slightly elevated, with a faint median suture. No spines or avicularia. Ovicell smooth, recumbent, with a conspicuous foramen. Small mural pore-chambers present.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–336.

PARATYPE: NZOI, type number P–549, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn $K795_1$, 33°02.6′S, 179°34.6′W, 350 m.

REMARKS: *Eurystomella crystallina* is readily distinguishable by its uni- to biserial colonies from the two other known species of this genus. Both of these, *E. foraminigera* (Hincks) (q.v.) and *E. bilabiata* (Hincks) (Pacific coast of North America) are red in colour but it is not known if *E. crystallina*, transparent and hyaline when preserved or dry, is also coloured in life. *E. crystallina* resembles *E. bilabiata* in the absence of frontal foramina and basal pore-chambers. *E. bilabiata* is pluriserial, with a relatively broader orifice and a frontal umbo.

Eurystomella foraminigera (Hincks) (Plate 2l, F)

Lepralia foraminigera Hincks, 1883: 200.
Eurystomella foraminigera: Levinsen 1909: 89, 314; Brown 1952: 286 (*cum syn.*); Powell 1967a: 310; Uttley & Bullivant 1972: 47.

MATERIAL EXAMINED: NZOI: Stn K837. DPG: Colonies from Leigh, Auckland, Manukau Heads, Mount Maunganui, Napier, Totaranui.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Auckland and Manukau Harbours, Mount Maunganui, Napier, Cook Strait, Totaranui, Chatham Rise, Otago Peninsula.

DESCRIPTION: Colony encrusting. Zooids 0.48–0.75 × 0.27–0.63 mm, with smooth frontal walls perforated by 2–6 large foramina. Orifice semicircular with a pair of excavations at the proximolateral corners, the proximal rim more or less straight. No spines. Ovicells subimmersed, smooth, with a large central foramen.

REMARKS: Live colonies from Auckland are dark reddish pink in colour with white tentacles. The number of frontal foramina is variable. In the single Kermadec colony two is the rule while in Hauraki Gulf colonies 3–6 are common. According to Levinsen (1909) the "oecium is enclosed in a kenozooecium".

The Kermadec colony constitutes the northern-most record of this distinctive neozelanic species.

Family CATENICELLIDAE Busk, 1852

Colony erect, flexible, jointed, attached to the substratum by rhizoids, internodes comprising one or a few zooids. Zooids with variable frontal walls, usually with perforations, the orifices dimorphic, being larger in ovicelled zooids. Avicularia present or absent. Pore-chambers present, variable, sometimes very large; uniporous septula present in distal walls.

REMARKS: The family name Vittaticellidae was introduced by Harmer (1957) to replace the Catenicellidae of various authors. The name Catenicellidae had itself first been used by Busk (1852b) in his account of bryozoans collected by the "Rattlesnake", being based on the genus *Catenicella* de Blainville, 1830. Banta and Wass (1979) have questioned Harmer's reasons for rejecting the name Catenicellidae, and these reasons I now wish to discuss.

De Blainville introduced *Catenicella* for a species which he named *savignyi* and which he had not personally seen, basing it on illustrations of Savigny (1809–29) who had not succeeded in describing the bryozoans he illustrated. These were later described by Audouin (1826) who incorporated Savigny's plates. De Blainville's (1834) comment on *Catenicella* reads : "Nous avons trouvé ce genre, indiqué par Savigny dans les planches ... sous le nom de *Catenaria,* que nous avons modifié en celui de *Catenicella.*" As Norman (1909) pointed out, Savigny did not label the species in the plate as *Catenaria* but "Catenaires", and Norman believed that de Blainville was the first to latinize the name to *Catenaria.* Lamouroux (1824 : 176), in fact, was the first to do this, and it is possible that de Blainville followed him in using *Catenaria,* but then modified it to *Catenicella* without stating why. Levinsen (1909) argued that since Savigny used, in numerous other plates, French plural forms of otherwise existing Latin generic names, then *Catenaria* was what Savigny intended. This was not, *per se,* a formal introduction by Savigny, however, and in any case the name *Catenaria* was already preoccupied by *Catenaria* Goeze, 1800 : 207, a cestode worm, as Strand (1928) discovered.

Thus the introduction of the name *Catenicella* by de Blainville was (wittingly or unwittingly) valid. In Audouin's formal descriptions of the species in Savigny's plates, the "Catenaires" are named *Eucratea contei* and *Eucratea lafontii,* both of which were later understood not to belong to *Eucratea* Lamouroux, 1812. In introducing the name *Catenicella,* de Blainville specifically referred to and partly reproduced Savigny's figure 1 of plate 13, depicting the species to which Audouin gave the name *contei,* which name de Blainville evidently overlooked. Thus de Blainville's *savignyi* is a junior synonym of *contei,* which is clearly the type of *Catenicella.*

Not having seen actual specimens, however, de Blainville thought that *C. contei* greatly resembled Lamouroux's *Hippothoa divaricata* (an encrusting species) and accordingly described *Catenicella* as encrusting when it is, in fact, erect. De Blainville was wrong, of course, in assuming a relationship with *Hippothoa,* but I do not accept Harmer's (1957) argument that because of this misunderstanding *Catenicella* is a junior synonym of *Hippothoa.* [It is possible that Harmer is correct when he interprets de Blainville as taking *Catenicella contei* and *Hippothoa divaricata* to be conspecific, based on de Blainville's comment that the one "correspond exactement" with the other, for Johnston (1847 : 457) wrote of him : "Notwithstanding, however, Blainville's unquestionable merits, his very defective acquaintance with species will ever prevent him becoming a first-rate systematist: he may sketch the outline, the details he cannot supply, and his attempt has exposed him to numerous errors: he is too fond of generalizations where his facts are few and specifical; he wants the necessary neatness and brevity of definition, and he evinces everywhere such a total disregard to the old nomenclature that his system is not likely to become popular, or to be generally adopted."] Even if de Blainville did believe the two were conspecific (and I believe it is impossible to be certain that he did), the fact that he was wrong still leaves *Catenicella contei* available as a valid combination, and the family name Catenicellidae, which precedes Vittaticellidae, can stand.

The issue is further complicated, however (though it does not affect the standing of *Catenicella contei*), inasmuch as MacGillivray chose to restrict *Catenicella* to the fenestrate group of species and erected a new genus, *Caloporella,* for the vittate group of species. In this he evidently overlooked the fact that *contei* is itself a vittate species, nor did he specify a type. Maplestone (1901b) then established *Vittaticella* to replace *Caloporella,* believing it to be essentially preoccupied by a genus of Ulrich (1882) because of the similarity of spelling. Ulrich's genus (a trepostome bryozoan) was spelt *Calloporella.* As Harmer correctly observed, this does not negate the use of *Caloporella,* which is thus potentially available were it not for the fact that vittate species are already accommodated in *Catenicella.*

Maplestone had also neglected to specify a type-species and in 1935 Bassler, even though aware that *Caloporella* was not strictly preoccupied by *Calloporella,* nonetheless chose *insignis* (the species first listed under *Caloporella* by MacGillivray) as type of both *Caloporella* and *Vittaticella* and rejected the former genus in favour of the latter. Canu and Bassler (1929a) had previously regarded *contei* as the type of *Vittaticella.* Stach (1935) independently chose *Catenicella elegans* Busk as the type of *Vittaticella.* He followed Maplestone in regard to *Caloporella.*

Thus there were two suggested type-species for the same genus. Harmer's "solution", since he had already rejected *Catenicella,* was to accept *insignis* as the type of *Caloporella* and *elegans* as the type of *Vittaticella,* because *insignis,* being fossil and possibly based on two species (*see* MacGillivray 1895 : plate 2, figs 13, 14) was not conclusively congeneric with *Vittaticella elegans* even though both were vittate.

Whatever the status of *Caloporella insignis, Vittaticella* Maplestone cannot stand, on two counts. First, Maplestone had erected *Vittaticella* to replace *Caloporella.* As we have seen, his reason for doing this was not valid. Second, if we accept Stach's type-species for *Vittaticella,* then *Vittaticella* must be merged into *Catenicella* for *contei* and *elegans* are congeneric. Stach believed they were not congeneric because in *contei* the ovicell pertains to the proximal zooid of a trizooidal segment whereas in *elegans* it pertains to the same zooid of a bizooidal segment. Inasmuch as the fertile segments of the catenicellid *Pterocella alata,* for example, may be uni-, bi-, or trizooidal, this seems an insignificant distinction.

From all of this I conclude that:
1. *Catenicella* de Blainville, based on *Eucratea contei* Audouin, is a valid genus and that Harmer lacked conclusive grounds for regarding it as a junior synonym of *Hippothoa* Lamouroux.
2. *Vittaticella* Maplestone is unnecessary on two counts, viz., (i) that *Caloporella* MacGillivray is not preoccupied by *Calloporella* Ulrich; (ii) on the basis of the type-species chosen by Stach it is congeneric with *Catenicella*.
3. *Caloporella insignis* MacGillivray needs reinvestigation. It may also be congeneric with *Catenicella*.
4. Catenicellidae stands as a family name.

Catenicella de Blainville, 1830

Sterile internodes unizooidal, bizooidal at bifurcations. Fertile internodes trizooidal at bifurcations, bizooidal between them, the ovicell pertaining to the proximal zooid. Zooidal frontal wall smooth, with a pair of narrow longitudinal pore-chambers (vittae). Orifice with condyles and a concave proximal rim; no spines but the distolateral corners protruding typically as avicularian processes. Paired smaller pore-chambers distally and on the frontal side of the distolateral processes.

TYPE-SPECIES: *Eucratea contei* Audouin, 1826

Catenicella elegans Busk (Plate 22, A,B)

Catenicella elegans Busk, 1852b: 361; MacGillivray 1879a: 23; Busk 1884: 12; Marcus 1923: 431.
Catenaria elegans: Levinsen 1909: 255.
Vittaticella elegans: Maplestone 1901b: 203; Correa 1947: 1 (*cum syn.*); Powell 1967a: 237; Uttley & Bullivant 1972: 53.

MATERIAL EXAMINED: NZOI: Stns K809, K812, K816, K821, K834. DPG: Colonies from Hauraki Gulf, Kaikoura, Banks Peninsula, Bluff, Stewart Island.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Cook Strait, Chatham Rise, Kaikoura, Banks Peninsula, Bluff, Stewart Island; also southern Australia, Chile, southern California, Japan, Brazil, Bermuda.

DESCRIPTION: Colony erect, branching, with jointed segments of 1–2 zooids. Unizooidal segments elongate, 0.32–0.38 × 0.20 mm, tapering proximally, with the rather straight distal profile interrupted by the base of the chitinous articulation. Frontal wall smooth, with a conspicuous pair of long narrow frontolateral pore-chambers (vittae), in which communication pores can be seen in the interior wall. Another much smaller pair of chambers situated proximolaterally to the orifice (infrascapular), and a distal (suprascapular) pair facing distally; between the supra- and infrascapular chambers is an aviculiferous prominence. Orifice with a concave proximal rim. Fertile segments bizooidal, the distolateral prominences nonaviculiferous and produced distally as curved spine-like extensions. Ovicell with 1–2 median foramina and shallow scattered pores either side.

REMARKS: This is the most widespread of all Recent catenicellid species.

Catenicella ?venusta MacGillivray (Plate 22, C)

cf. *Catenicella venusta* MacGillivray, 1887c: 35.

MATERIAL EXAMINED: NZOI Stn K801.

DISTRIBUTION: Victoria.

DESCRIPTION: Colony erect, branching, with jointed segments of 1–2 zooids. Unizooidal segments elongate, 0.46 × 0.18 mm, tapering proximally, with prolonged almost spine-like distolateral corners. Frontal wall smooth, almost porcellanous, with a pair of long narrow vittae with visible communication pores; an additional pair of chambers extending into the distolateral processes; another smaller pair distally. Orifice with slightly concave proximal rim. Fertile segments not seen.

REMARKS: In the absence of fertile segments the identity of the fragmentary branches from the Kermadecs is uncertain. MacGillivray (1887c, 1887d) shows the long lateral processes, though not the associated chambers, and comments that one process is frequently enlarged and aviculiferous, which was not seen in the present material.

Pterocella Levinsen, 1909

Sterile internodes uni- or bizooidal, bizooidal at bifurcations. Fertile internodes trizooidal at bifurcations, the ovicell pertaining to the proximal zooid of a triplet, unizooidal between bifurcations. Zooidal frontal wall smooth, with a small suborificial costal field and a semicircle of large infracostal windows at the periphery of the field. Orifice with condyles, the concave proximal rim formed by the first pair of costae. Aviculiferous distolateral processes present. Widely open pore-chambers present, paired, situated proximally, and lateral and distal to the orifice.

TYPE-SPECIES: *Catenicella alata* Wyville Thomson, 1858

Pterocella alata (Wyville Thomson) (Plate 22, D,E)

Catenicella alata Wyville Thomson, 1858: 137.
Pterocella alata: Levinsen 1909: 246; Powell 1967a: 244 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stn K821.

Sig. 5*

DISTRIBUTION: Three Kings Islands, New Plymouth, Napier, Cook Strait, Foveaux Strait; also New South Wales, Victoria, Tasmania.

DESCRIPTION: Colony erect, branching, comprising jointed segments of 1–3 zooids. Single zooids 0.57–0.68 × 0.40–0.53 mm, shield-shaped, with projecting distolateral corners and tapering proximally. Frontal wall smooth, perforated by a V-shaped field of five conspicuous rounded pores. Orifice arched, with a more or less straight proximal rim formed from a pair of fused flattened costae; between these and the five frontal pores are 2–3 additional fused tiny costae and associated intercostal lacunae. Pore-chambers six, frontally facing, the distal suprascapular pair triangular, a lateral-oral pair subtriangular, a proximal pair elongate-oval. Avicularia lacking in unizooidal segments but present just distal to median pore-chamber of a bizooidal segment. Zooidal basal wall markedly convex, keeled and finely striated longitudinally. Fertile segments uni- to trizooidal, the fertile orifice transversely wide, the ovicell much broader than long, with a wide, medially constricted porous area.

REMARKS: The branching pattern and frontal wall development of this species have been discussed by Wass (1977) and Banta and Wass (1979) respectively.

Orthoscuticella Wass & Yoo, 1976

Sterile internodes unizooidal, bizooidal at bifurcations. Fertile internodes unizooidal. Zooidal frontal wall typically with a number of conspicuous infracostal windows; costal field absent or a vestigial pair of costae present, contributing to the proximal rim of the orifice, with a median suboral "ascopore". Orifice with minute condyles, the proximal rim straight, convex or concave. Avicularian processes usually well developed. Paired distal, mid-lateral and proximolateral pore-chambers typically present, the proximal pair occasionally greatly expanded at the expense of the mid-lateral pair.

TYPE-SPECIES: *Catenicella lorica* Busk, 1852

Orthoscuticella ventricosa (Busk) (Plate 22, F)

Catenicella ventricosa Busk, 1852b: 357.
Scuticella ventricosa: Levinsen 1909: 227; Powell 1967a: 239 (*cum. syn.*); Uttley & Bullivant 1972: 53.

MATERIAL EXAMINED: NZOI Stn K851.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Napier, Cook Strait, Chatham Rise, Otago Peninsula, Foveaux Strait.

DESCRIPTION: Colony erect, branching, comprising segments of 1–2 zooids. Single zooids 0.57–0.70 × 0.32–0.38 mm, shield-shaped, tapering proximally. Frontal wall smooth, perforated by a V-shaped field of seven large drop-shaped pores. Orifice semicircular with more or less straight proximal rim. A median suboral suture indicates that the proximal rim is formed from two fused indistinct flattened costae. Pore-chambers six, large; a distal suprascapular pair occur one each side of the articulation; just proximal to one or both of these chambers is a small avicularium, the corner of the zooid much projected, this projection lacking if an avicularium is lacking; on each lateral wall two additional pore-chambers, the infrascapular chamber half or less of the length of the more proximal chamber; small communication pores are visible in the interior walls of each chamber; in bizooidal segments the arrangement of pore-chambers is modified. Zooidal basal wall convex, smoothly rounded. Fertile zooids lacking in Kermadec material – as described by other authors they are large, globular, with wide orifices, seven frontal infracostal pores, large lateral chambers, a pair of small distal chambers and distal avicularia. Anchoring rhizoids issue from the suprascapular chambers.

REMARKS: The branching pattern and frontal wall development of this species have been discussed by Wass (1977) and Banta and Wass (1979) respectively.

Superfamily ARACHNOPUSIOIDEA Jullien, 1888

Colony encrusting to erect, uni- or bilamellar. Frontal surface a porous wall entirely covering the underlying frontal membrane (umbonuloid); the pores often relatively large, irregularly disposed. Oral spines or peristome present or absent. Avicularia adventitious and/or vicarious or interzooidal or absent. Ovicell prominent or recumbent or absent. Basal pore-chambers and/or multiporous mural septula present.

REMARKS: Moyano (1970) introduced a superfamily Arachnopusiacea based on Arachnopusiidae Jullien, 1888. It is here taken to also include, *inter alia*, the family Exechonellidae. The genus *Hiantopora*, often included in discussions of umbonuloid genera, is here excluded and placed instead near the Chaperiidae, in the Membraniporoidea.

Family ARACHNOPUSIIDAE Jullien, 1888

Colony encrusting to erect, uni- or bilamellar. Frontal wall perforated with few or numerous relatively large pores, often with secondary layers of calcification. Oral spines present. Avicularia adventitious and/or interzooidal or vicarious. Ovicell prominent or recumbent. Basal pore-chambers and/or mural septula present.

Arachnopusia Jullien, 1888

Colony encrusting to erect, uni- to bilamellar. Frontal wall perforated by numerous relatively large pores. The orifice typically with a single long spine emerging from one side. Adventitious avicularia often on the frontal wall and/or adjacent to the orifice. Interzooidal avicularia present or absent. Oviceil recumbent, usually with a frontal exposure of endooecium. Multiporous mural septula present.

TYPE-SPECIES: *Lepralia monoceros* Busk, 1854.

Arachnopusia perforata (Maplestone) (Plate 23, A)

Hiantopora perforata Maplestone, 1909: 271.
Arachnopusia perforata: Uttley & Bullivant 1972: 24.

MATERIAL EXAMINED: NZOI Stns K795, K826$_3$, K842, K858, K859, K872.

DISTRIBUTION: Chatham Rise, western Tasman Sea.

DESCRIPTION: Colony encrusting. Zooids 0.67–0.83 × 0.27–0.63 mm, somewhat rectangular. Opesia completely obscured by frontal shield with 18–32 perforations. Peristome with proximal rim bearing 1–4 small avicularia, their rostra acute, distally directed; if only one avicularium then this in the mid-line; a similar distal rim (not in ovicelled zooids) with the same number of avicularia, their rostra proximally directed. An elongate spatulate avicularium immediately distal to the orifice of most zooids, with rounded, raised rostral tip and slender, complete crossbar; usually directed laterally, occasionally obliquely proximally. Vicarious avicularia rare, less than half the length of autozooids, with thin pivot bar and short, acute rostrum. A single spine emerging from one side of the orifice. Ovicells globular, smooth, the ectooecium with an angular proximal rim, exposing a narrowly triangular endooecium. Strut-like extensions of the basal wall may occur depending on the substratum.

REMARKS: The specimens from the Kermadec Ridge have more perforations in the frontal shield and more peristomial avicularia than Maplestone's (1909) specimens from the western Tasman Sea and those of Uttley and Bullivant (1972) from the Chatham Rise. These authors did not observe vicarious avicularia either. Notwithstanding these differences, the elongate avicularia and peristomial rim are characteristic of *A. perforata*.

Arachnopusia unicornis (Hutton) (Plate 23, B)

Eschara unicornis Hutton, 1873: 99.
Arachnopusia unicornis: Brown 1952: 175 (*cum syn.*); Brown 1954a: 424; Macken 1958: 104; Uttley & Bullivant 1972: 22.

MATERIAL EXAMINED: NZOI: Stn K848. DPG: Specimens from Hauraki Gulf, Bay of Plenty, Foveaux Strait.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Auckland Harbour, Mount Maunganui, Cook Strait, Chatham Islands, Foveaux Strait.

DESCRIPTION: Colony encrusting. Zooids 0.70–0.75 × 0.25–0.38 mm, not clearly delimited from each other frontally owing to imperfect boundaries between adjacent frontal shields; the shields perforated by four or more small or large foramina usually irregularly placed. Up to four small frontal avicularia placed proximally on the frontal shield, with short acute rostra directed proximally or obliquely so. One of these often replaced by a larger avicularium up to half the zooidal length, with complete pivot bar and relatively longer blunter rostrum. One to two small avicularia on the proximal rim of the orifice. A long stout spine emerging from one side of the orifice. The oral arch granular. Ovicells with separate operculum; with smooth surface and angular proximal rim; often obscured by secondary calcification of part of the aviculiferous frontal shield of the next distal zooid.

REMARKS: Uttley and Bullivant (1972) have commented on the variability of this species, and have even noted the presence of rare vicarious avicularia, not seen by me in Kermadec and mainland New Zealand specimens.

Briarachnia n.gen.

Colony encrusting. Zooids with frontal wall coarsely perforated. Oral spines present. Adventitious avicularia present, adjacent to the orifice. No other avicularia. Ovicell recumbent, with a narrow exposure of endooecium. Mural septula present.

TYPE-SPECIES: *Briarachnia robusta* n.sp.

Briarachnia robusta n.sp. (Plate 23, C)

MATERIAL EXAMINED: NZOI Stns K795, K826$_3$, K827, K840, K842, K872; on pebbles.

DISTRIBUTION: Kermadec Islands, 260–490 m.

DESCRIPTION: Colony encrusting. Zooids large, 0.80–1.12 × 0.65–0.80 mm, robust, contiguous or often disjunct and uniserial. Frontal wall a shield with large pores not evidently derivable from spines; the pores and ribs not in regular rows. Orificial bar smooth with a median tubercle distally or frontally directed. An avicularium either side of the orifice on a short columnar process. A pair of oral spines on each side, one spine sometimes missing and only one pair present in ovicelled zooids. Ovicells globular, smooth, with a frontal sculpturing in the form of an hour-glass or merely triangular. Septula present in lateral walls.

Ancestrula half the size of adult zooids, tatiform, with ten spines and narrow granular cryptocyst.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–312.

PARATYPE: NZOI, type number P–557, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K840, Macauley Island, 30°17.4′S, 178°25.3′W, 398–412 m.

REMARKS: It has seemed necessary to erect a new genus for this rather robust species. In its frontal wall with underlying membrane it appears nearest *Arachnopusia* which, however, has a spine emerging from the orifice on one side, typically a beaded oral arch, and a number of frontal avicularia. Only one zooid of *B. robusta* in the present specimens gives any indication of the development of the frontal shield. In this zooid the shield is complete but thin and weakly calcified, most especially at the orificial rim, indicating that this develops last.

Family EXECHONELLIDAE Harmer, 1957

Colony encrusting. Zooids with evenly perforated frontal wall and long or short tubular peristome. Oral spines wanting. Avicularia, where present, adventitious, frontal. Ovicells usually lacking; where present, small, distal to the peristome. Mural septula present.

Exechonella Duvergier, 1924

Colony encrusting. Zooidal frontal wall with numerous perforations; these relatively large and often rimmed in developing zooids. Peristome generally tubular, tall, imperforate. Avicularia, spines and ovicells wanting. Multiporous mural septula present.

TYPE-SPECIES: *Cyclicopora? grandis* Duvergier, 1921

Exechonella tuberculata (MacGillivray) (Plate 23, D)

Lagenipora tuberculata MacGillivray, 1883a: 132.
Coleopora erinacea Canu & Bassler, 1929a: 268.
Exechonella tuberculata: Harmer 1957: 653 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K798, K851, K855, K856.

DISTRIBUTION: Victoria, Indonesia, Philippines, Sri Lanka, Madagascar, Red Sea.

DESCRIPTION: Colony encrusting. Zooids 0.92–1.15 × 0.55–0.70 mm, robust, semi-erect, comprising a bulbous proximal portion and erect, tubular distal peristome. Frontal wall coarse with numerous pores, these moderately large in young zooids and surrounded by a circular, somewhat projecting rim; the surface between pores at first smooth, later granular and the pore diameter becoming reduced by secondary calcification. Peristome finely granular, not perforated. Primary orifice subcircular, no condyles. No ovicells, spines or avicularia. Mural septula present.

REMARKS: The frontal wall of this species develops as Cook (1967) described it except that in Kermadec specimens the peristome is fairly well developed before the completion of the frontal wall.

Superfamily UMBONULOIDEA Canu, 1904

Colony encrusting or erect. Zooidal frontal wall lacking pseudopores centrally but with marginal areolae, completely overarching the underlying frontal membrane. Secondary orifice with or without spiramina or oral spines. Avicularia adventitious and/or vicarious or absent. Ovicell hyperstomial or recumbent, often immersed in secondary calcification, or enlarged as a gonooecium or absent. Basal pore-chambers or mural septula present.

REMARKS: Cheetham (1966) introduced a superfamily Umbonulacea based on Umbonulidae Canu, 1904. The diagnosis above is emended to tentatively include the Adeonidae, which may have gonooecia.

Family EXOCHELLIDAE Bassler, 1935

Colony encrusting or erect. Marginal pores of frontal wall generally conspicuous. Orifice with one or more supraopercular denticles proximally. Oral spines present. Avicularia often bilateral or may be absent. Ovicell hyperstomial or recumbent, sometimes subimmersed in secondary calcification, imperforate or with marginal pores only. Basal pore-chambers or mural septula present.

Exochella Jullien, 1888

Colony encrusting. Frontal wall with conspicuous marginal areolae. Proximal border of peristome with denticles that may fuse to form one or more spiramina. Oral spines present. Avicularia well developed, usually paired. Ovicell recumbent.

TYPE-SPECIES: *Mucronella tricuspis* Hincks, 1881

REMARKS: There has been some disagreement over the nature of the frontal wall in *Exochella*. Brown (1952) believed it to be umbonuloid, and he was followed in this by Cheetham (1966). Powell (1967a) on the other hand, believed *Exochella* to possess a true compensation sac on the basis of Rogick's (1956a) description of purported *E. longirostris* Jullien. She observed and illustrated a scar left on the underside of the frontal

wall where the presumed compensation sac was attached to the frontal wall. This scar is present in *E. tricuspis* (Pl. 24, B) and is here taken to be the equivalent of the "ring" or ridge-like thickening marking the boundary between the calcareous roof (frontal wall) and membranous floor (frontal membrane) of the compensation sac (epistegal space of some authors) that was described in *Umbonula* by Tavener-Smith and Williams (1970). Parallel fibrous ultrastructure of the lower surface of the frontal wall confirms this interpretation (*see* Sandberg 1976, 1977), which means that *Exochella* is correctly allied to *Escharoides* and *Umbonula*. By comparison, the compensation space in *Exochella* is relatively smaller than in the other two genera.

Exochella tricuspis (Hincks) (Plate 24, A–C)

Mucronella tricuspis Hincks, 1881b: 125.
Exochella tricuspis: Levinsen 1909: 320; Brown 1952: 289; Macken 1958: 105; Powell 1967a: 312; Uttley & Bullivant 1972: 45.
Exochella longirostris: Gordon 1967: 58.

MATERIAL EXAMINED: NZOI Stns K797, K818, K819, K820, K837, K871.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Napier, Cook Strait, Chatham Rise, Foveaux Strait; also Miocene and Pliocene of North Island; Victoria, Bass Strait, Prince Edward Island (Indian Ocean), Cape of Good Hope.

DESCRIPTION: Colony encrusting. Zooids small, 0.27–0.38 × 0.17–0.23 mm, roughly rectangular, with smooth frontal wall bordered by 5–6 areolae on each side. From areolae proximal to the orifice a pair of avicularia arise, one either side (although sometimes only one is present), the rostrum acute, directed laterally, or obliquely so, with a complete pivot bar. Oral spines three in young zooids. Primary orifice, as such, somewhat oval and not well defined, obscured by a peristome; a pair of indentations in the form of a rounded W appear in the developing peristome; these are then sealed off distally by fusion of the incurved edges of the indentations, leaving a pair of peristomial spiramina in the form of narrow shafts leading to the compensation space beneath. Ovicell at first recumbent on the distal zooid, later completely immersed by frontal calcification of that zooid and detectable only as a bulge of the frontal wall.

REMARKS: There is some confusion over whether *E. tricuspis* includes *E. longirostris* Jullien, 1888 from magellanic South America. Jullien's illustrations certainly closely resemble *E. tricuspis*. Levinsen (1909) illustrated what he believed to be distinguishable colonies of both species. They differed in details of the peristome and the number of oral spines. Brown (1952), on the basis of Levinsen's drawings and descriptions, considered the difference sufficient to maintain the two species. Rogick (1956a) redescribed *E. longirostris* from the Antarctic but she expressed doubt as to whether she, Levinsen, and Jullien were dealing with the same species. Powell (1967a) accepted the distinctness of the two species but Uttley and Bullivant (1972), comparing Chatham Island material with Levinsen's drawings, considered *E. longirostris* as a junior synonym. A variety of *E. tricuspis* has been recorded from Japan (Ortmann 1890), and *E. longirostris* has been recorded from the Quaternary of both Japan (Sakakura 1935) and Louisiana (Cheetham and Sandberg 1964). It is clear from the distributional records and the taxonomic uncertainty that a re-examination of both types is in order but, in any case, the standing of *E. tricuspis* remains unchanged.

Because Uttley and Bullivant (1972) interpreted the central cusp dividing the peristomial spiramina to be a lyrula (cf. Levinsen 1909: pl. 17, figs 6b, 7b), they advocated a relationship with the lyrulate ascophoran families, especially Escharellidae [which family they wrongly ascribed to Brown (1952) instead of Levinsen (1909)]. Uttley and Bullivant also wrongly followed Rogick (1956b) in treating *Escharella* Gray as a junior synonym of *Mucronella* Hincks, overlooking Ryland's (1963) discussion which established *Escharella* over *Mucronella*. Inexplicably, having rejected *Escharella* in favour of *Mucronella*, they placed *Exochella* in the Escharellidae and *Mucronella* in the Smittinidae even though Levinsen had established the Mucronellidae in 1902 and Smittinidae in 1909, not regarding the two families as synonymous.

Escharoides Milne-Edwards, 1836

Colony encrusting. Frontal wall with conspicuous marginal areolae. Proximal border of orifice with denticles and/or spout-like peristome. Oral spines present. Avicularia often paired, lateral to the orifice. Ovicell usually prominent. Ancestrula tatiform.

TYPE-SPECIES: *Cellepora coccinea* Abildgaard, 1806

Escharoides angela (Hutton) (Plate 24, D)

Lepralia angela Hutton, 1873: 96.
Lepralia variolosa: Hutton 1873: 97; Hutton 1880: 191.
Mucronella praestans Hincks, 1882b: 168.
Escharoides praestans: Levinsen 1909: 318; Marcus 1921a: 98.
Escharoides angela: Brown 1952: 298; Gordon 1967: 58.

MATERIAL EXAMINED: NZOI: Stns K797, K836, K848. DPG: Colonies from Auckland and Hauraki Gulf, Napier, Nelson, Kaikoura.

DISTRIBUTION: Hauraki Gulf, Waitemata Harbour, Whatipu, Mount Maunganui, Napier, Castlepoint, Totaranui, Nelson, Kaikoura, Chatham Islands, Auckland Islands; also Miocene of Southland, Pliocene of Hawkes Bay.

DESCRIPTION: Colony encrusting. Zooids 0.55–1.13 × 0.50-0.78 mm, with smooth or faintly granular frontal wall rising distally into a large scoop-like peristome. Eleven to 12 pairs of conspicuous marginal areolae. Avicularia single or paired, small or prominent, somewhat spatulate, occasionally with serrated rim and with complete pivot bar. Oral spines four, most prominent in young zooids. Ovicells (not seen in Kermadec specimens) somewhat immersed in distal zooids, with radiating areolae.

REMARKS: This species and *E. excavata*, both orange-coloured in life, are common components of the intertidal fauna of mainland New Zealand. *E. angela* is a strictly endemic species found previously from Hauraki Gulf to Auckland Island. The Kermadec record considerably extends the local range of this species.

Escharoides excavata (MacGillivray) (Plate 24, E)

Lepralia excavata MacGillivray, 1860: 166.
Escharoides sauroglossa Levinsen, 1909: 319.
Peristomella excavata: Livingstone 1929: 85.
[?] *Smittina foliaceana* Okada & Mawatari, 1938: 458.
Escharoides excavata: Brown 1952: 301; Powell 1967a: 231 (*cum syn.*).

MATERIAL EXAMINED: NZOI: Stns K798, K799, K820, $K826_2$, K837, K850, K851, K854, K855, K856, K857, K863, K867. DPG: Colonies from Hauraki Gulf and Kaikoura.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Cook Strait, Kaikoura; also Pliocene and Pleistocene of North Island; Miocene of Victoria and South Australia; Recent of Victoria, New South Wales, Great Barrier Reef, Japan, Galapagos Islands, Gulf of California.

DESCRIPTION: Colony encrusting. Zooids 0.62–1.25 × 0.65-0.88 mm; frontal wall smooth or faintly granular with the peristome generally not much raised. Peristome with a prominent denticle projecting from within the proximal sinus; often a smaller pair of denticles from the sides at the same level. Oral spines four. Avicularia usually paired, one smaller than the other, generally with acute rostra but sometimes ligulate. Ovicells recumbent on distal zooids, with marginal areolae.

REMARKS: The characters of the peristome most readily distinguish this species from *E. angela*.

Elleschara n.gen.

Colony encrusting. Zooidal frontal wall umbonuloid, imperforate centrally, with numerous marginal pores. Orifice surrounded by a peristome in which spines are incorporated; a median descending peristomial ridge simulating a lyrula. No avicularia. Ovicell prominent, imperforate. Numerous basal pore-chambers present.

TYPE-SPECIES: "*Lepralia*" *bensoni* Brown, 1954

REMARKS: A new genus is necessary for bryozoans resembling *Escharella* and having an umbonuloid frontal wall. As noted by Cook (1977), the type-species of *Escharella* [*E. immersa* (Hassall)] has, instead, a cryptocystidean wall.

Elleschara bensoni (Brown) (Plate 24, F)

"*Lepralia*" *bensoni* Brown, 1954a: 429.
Escharella bensoni: Powell 1967a: 314.

MATERIAL EXAMINED: NZOI Stns K803, K820, K829, K837, K871.

DISTRIBUTION: Three Kings Islands (Pliocene to Recent).

DESCRIPTION: Colony encrusting. Zooids elongate, 0.50–1.00 × 0.32–0.58 mm, the frontal wall lightly rugose, bordered by a row of 12–15 pores along each margin; sometimes an additional shorter row of pores near the distal end of the wall, which rises to a moderately tall peristome with four tall spines on each side, and a median convexity of the mid-proximal rim which simulates a narrow lyrula when viewed from above; it is formed by an inrolling of the proximolateral margins of the developing peristome, which then fuse; this median convexity descends, as do the spine bases, part way down the peristome as a longitudinal ridge. There is no true lyrula associated with the primary orifice, which is ill-defined. Ovicells prominent, subglobular, fairly smooth, often with a small frontal projection; the eight spines persist in ovicelled zooids. No avicularia. Numerous small basal pore-chambers present.

REMARKS: As Powell (1967a) noted, the operculum in *Elleschara bensoni* is scarcely differentiated from the frontal membrane, which extends broadly under the frontal wall. In other words, the frontal wall is umbonuloid. In the structure of the peristome *E. bensoni* is reminiscent of *Exochella tricuspis*. Powell, in fact, placed the Exochellidae near the Escharellidae and Uttley and Bullivant (1972) actually included *Exochella* in the Escharellidae [which family they wrongly attributed to Brown (1952) instead of Levinsen (1909)].

Escharella thompsoni Kluge, from the Arctic, also has an umbonuloid frontal wall (Cook 1977). It may not be congeneric with *Elleschara bensoni*, however, for it has a true lyrula and a small median avicularium in a peristomial sinus.

Family ADEONIDAE Busk, 1884

Frontal wall development umbonuloid. Operculum not sinuate. Marginal pores present. Frontal spiramina

evanescent or permanent, single or multiporous. Avicularia usually present, adventitious and vicarious. Sexual polymorphs sometimes present; brooding internal.

REMARKS: The Adeonidae is here tentatively included in the Umbonuloidea because of the nature of the frontal wall. Cook (1973) has shown how the development of the walls in the Adeonidae and Adeonellidae strongly indicates the non-relatedness of these two families, the latter being cryptocystidean.

Adeonellopsis MacGillivray, 1886

Colony encrusting; or erect, bilamellar, foliaceous or branching. Spiramen single or multiporous. Adventitious avicularia paired or single, vicarious avicularia often present. Often polymorphic, with brooding zooids. Numerous small basal pore-chambers present.

TYPE-SPECIES: *Adeonellopsis foliacea* MacGillivray, 1886

Adeonellopsis yarraensis (Waters) (Plate 24, G)

Eschara lichenoides Busk, 1854: 90 (*partim*).
Microporella yarraensis Waters, 1881: 331.
Adeonella tuberculata Busk, 1884: 180; Ortmann 1890: 53.
Adeonellopsis pentapora Canu & Bassler, 1929a: 382.
Adeonellopsis yarraensis: Harmer 1957: 799; Cook 1973: 252; Wass & Yoo 1975: 810.
?*Adeonellopsis yarraensis*: Powell 1967a: 337.

MATERIAL EXAMINED: NZOI: Stns K796, K837, K851. DPG: Colonies from Otago Shelf.

DISTRIBUTION: Three Kings Islands, Otago Shelf; also Lower Miocene of Auckland. Queensland, New South Wales; also Upper Oligocene to Lower Miocene of Victoria, Lower Miocene to Upper Pliocene of South Australia and Pleistocene of Tasmania. Philippines, Japan.

DESCRIPTION: Colony erect, comprising a dichotomously branching, flattened but biconvex axis about 2–3 mm wide, the branches in various planes. Zooids 0.40–0.63 × 0.22–0.35 mm, roughly diamond-shaped, with four sides when regularly arranged. Frontal wall minutely granular, usually with a rounded prominence either side of the middle of the zooid, and marginal pores. Orifice transversely oval to subcircular. Often a pair of small avicularia at the proximolateral corners, or a single avicularium nearer the mid-line; the rostra shortly acute, directed obliquely distally, no pivot bar. Immediately subjacent to the avicularia is a concavity which is a compound spiramen, comprising 3–4 toothed spiramina grouped together; in older zooids the orifice, avicularium and spiramina are sunken in a common depression, occurring as a deep wide groove in the mid-line. An additional small avicularium on the frontal wall proximally. Vicarious avicularia, somewhat smaller than autozooids and interspersed among them, occur on colony margins; the rostrum acutely triangular, no pivot bar. Twelve to 13 small basal pore-chambers present. Gonozooids not seen.

REMARKS: This appears to be Waters's (1881) species, originally described as a fossil from south-west Victoria. The similarities between the fossil and Recent material lie in the suboral avicularia, rounded prominences, proximal avicularium, and deep groove containing the spiramina. As Powell (1967a) points out, however, the fossil colonies have more rounded axes and the frontal groove in Waters's illustration shows it is further removed from the orifice than in Recent colonies. Harmer (1957) accepted Waters's name for Recent colonies from Japan, Australia, and the Philippines and Powell (1967a), with reservations, followed him in this.

Waters (1881) included in the same paper another *Adeonellopsis* (as *Microporella clavata*) based on *Flustrella clavata* Stoliczka, 1865. On the basis of Waters's illustrations Harmer tentatively included *F. clavata* in the synonymy of *A. yarraensis.* Brown (1956, 1958) examined Stoliczka's type material and determined that *clavata* and *yarraensis* are not related, and that Waters's *clavata* is not the same as Stoliczka's *clavata.* [Brown did not suggest a genus for Stoliczka's species and, in his two works, the text is contradictory concerning the orientation of the orifice. Stoliczka's drawings, in my opinion, bear a marked resemblance to *Galeopsis* (q.v.).] If Recent colonies of *A. yarraensis* turn out to be not conspecific with the Tertiary form, then Busk's (1884 : 180) name *tuberculata* will take priority. It should be noted, however, that Wass and Yoo (1975) recorded *A. yarraensis* from late Pleistocene sediments west of Tasmania, which would seem to support a lengthy geological history for this species.

Neither Harmer (1957) nor Powell (1967a) observed gonozooids in *A. yarraensis,* although Cook (1973) saw them near colony margins.

Superfamily SCHIZOPORELLOIDEA Jullien, 1883

Colony encrusting or erect. Zooids typically with a cryptocystidean frontal wall, commonly evenly perforated or at least with marginal pores. Orifice commonly sinusoid, or the proximal margin lyrulate; occasionally semicircular, in which case an ascopore is present. Oral spines present or absent. Avicularia adventitious, interzooidal, vicarious, or absent. Ovicell commonly hyperstomial, prominent or recumbent, occasionally immersed or absent. Pore-chambers or mural septula present.

REMARKS: Vigneaux (1949) first introduced this superfamily (as Schizoporellacea) as a *nomen trans-*

latum of Schizoporellidae Jullien, 1883. It is the largest of the ascophoran superfamilies and contains a number of morphologically diverse forms. As here interpreted, the Schizoporelloidea also includes, *inter alia,* the families Porinidae d'Orbigny, Hippopodinidae Levinsen, Gigantoporidae Bassler, Teuchoporidae Neviani, Crepidacanthidae Levinsen, Smittinidae Levinsen, Escharellidae Levinsen, Microporellidae Hincks, and Calwelliidae MacGillivray. Representatives of these families occur in the Kermadec samples.

Not all of these families are included with certainty. The affinities of the Porinidae, for example, are not clear. The Microporellidae are evidently related to the Schizoporellidae based on the resemblance of *Calloporina* Neviani to *Chiastosella* Canu & Bassler (*see* Brown 1952, 1954b). The Calwelliidae, in turn, seem allied to the Schizoporelloidea through the Microporellidae, especially *Fenestrulina* Jullien which *Calwellia* resembles in having a crescentic ascopore and distal pore-chambers.

The genus *Buffonellodes* Strand is provisionally included in the Schizoporellidae on the basis of an apparent relatedness to *Lacerna* Jullien. Two species, however, including the type, *B. rimosa* (Jullien), have only tiny marginal perforations and the frontal wall appears superficially gymnocystal. The slit-like openings of pore-chambers are very reminiscent of those in *Lepraliella*.

Although Vigneaux (loc. cit.) recognised a superfamily Smittinacea, this is here considered unnecessary. Some non-lyrulate smittinids resemble *Schizomavella,* for example, and apart from the lyrula the smittinids have most of the typical morphological features of schizoporellids.

Family PORINIDAE d'Orbigny, 1852

Colony typically erect, arising from an encrusting base. Zooidal frontal wall with scattered or regularly distributed pores. Primary orifice orbicular with a weakly defined poster or definite sinus, hidden by a well developed aviculiferous peristome. A short frontal spiramen present. Ovicells deeply immersed.

Haswellina Livingstone, 1928

Colony erect. Zooidal frontal wall with numerous pores. Primary orifice with a weakly defined poster or definite sinus. Usually paired avicularia on the peristomial rim. Spiramen proximally at the base of the peristome. Ovicell deeply immersed.

TYPE-SPECIES: *Myriozoum australiensis* Haswell, 1881

REMARKS: There has been much controversy over the validity of the name *Haswellina.* As Uttley (1956) pointed out, it has been assumed that the type-species of *Haswellina* Livingstone, 1928 and of *Spiroporina* Stoliczka, 1865 were conspecific and that the former must be suppressed in favour of the latter. Uttley correctly pointed out that the type of *Spiroporina, S. vertebralis,* is clearly a species of *Porina* d'Orbigny, 1852, for the ring of pores (chambers of avicularia) in the peristomial rim are absolutely typical of that genus. Thus *Spiroporina* is a subjective junior synonym of *Porina*. Brown (1952), who had accepted that the type-species of *Spiroporina* and *Haswellina* were conspecific, later (1958) changed his mind and also regarded *S. vertebralis* as a *Porina*.

The type-species of *Haswellina,* chosen by Canu and Bassler (1917) to be *H. australiensis* (Haswell), has only paired peristomial avicularia, and an orifice with a definite sinus, whereas the orifice of *Spiroporina vertebralis* [= *Porina gracilis* (Lamarck)] has only a weakly defined poster. Whereas Uttley assigned *Haswellina* to the Schizoporellidae, I believe it is probably more appropriately placed in the Porinidae, though distinct from *Porina*.

Harmer (1957), who had accepted *Spiroporina,* erected a new family Spiroporinidae, which included *Tessaradoma* Norman. On the other hand he included *Cylindroporella* Hincks in the Porinidae. By contrast, Hayward and Ryland (1979) included both *Tessaradoma* and *Cylindroporella* in the Tessaradomidae Jullien. Inasmuch as Harmer's species belong to *Haswellina,* one has the choice of assigning them to the Porinidae or the Tessaradomidae if the two families are to be kept separate. As mentioned above, I choose the first course. In any case, these families are evidently closely related by the possession of a frontal spiramen, a circular peristome with a deeply immersed primary orifice, and imperforate, mostly immersed ovicells opening into the peristome. [Despite Uttley's (1956) statement to the contrary, *Porina gracilis* has a spiramen, not an ascopore, as can be seen from Levinsen's (1909: pl. 16, fig. 1a) illustration of a longitudinal section through a branch. Levinsen identified his specimens as "*Haswellina coronata* Reuss" but, according to Stach (1936b), Levinsen had *P. gracilis* (the type-species of *Porina*).]

Haswellina multiaviculata n.sp. (Plate 25, A)

MATERIAL EXAMINED: NZOI Stn K840.

DISTRIBUTION: Kermadec Islands, 398–412 m.

DESCRIPTION: Colony erect, dichotomously branching, about 1 mm in diameter, more or less circular in cross-section. Zooidal boundaries indistinct; zooids 0.52–0.68 × 0.42–0.50 mm, the frontal wall with numerous pores. Primary orifice orbicular with a weakly defined poster, immersed at the bottom of a circular peristome. Peristomes moderately thick, somewhat projecting, arranged roughly in oblique whorls or spirals up the branch, also with pores. Numerous small oval avicularia, with complete pivot bars, scattered on the

frontal surface of each zooid including the peristome, with 1–2 on the rim of the peristome; larger avicularia with acute rostra also present frontally; usually in presumed interzooidal areas. A small tubular spiramen, about the diameter of an oval avicularium, in the mid-line proximal to the base of the peristome. Ovicell peristomial, appearing as a prominent bulge distal to the secondary orifice.

HOLOTYPE: Part of a colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–273.

TYPE-LOCALITY: NZOI Stn K840, Macauley Island, 30°17.4'S, 178°25.3'W, 398–412 m.

REMARKS: *H. multiaviculata* differs considerably from the type-species, *H. australiensis*, in that its zooids are arranged in oblique series rather than in horizontal whorls, the frontal walls have fewer pores and more avicularia, and the poster of the primary orifice is weakly defined. In most of these features it resembles *H. brevitubulata* (Harmer) which, however, lacks acute-mandibled avicularia.

Family HIPPOPODINIDAE Levinsen, 1909

Zooidal frontal wall cryptocystidean, more or less evenly perforated. Orifice generally broadly arched, with lateral condyles, the proximal rim shallowly concave or convex or nearly straight, never with a median U-shaped sinus. Avicularia adventitious, usually suboral or lateral-oral. Ovicells hyperstomial or endozooidal.

REMARKS: I include in this family the genus *Hippoporina* Neviani and related genera which are often placed in the family Hippoporinidae. The use of the family name Hippoporinidae has an interesting history. Authorship of this family name has often been ascribed to Bassler (1935), e.g., by Brown (1952), Bassler (1953), and Hayward and Ryland (1979). Actually, Bassler (1935 : 33) had used the name Hippoporininae (as a subfamily of the Schizoporellidae) informally as an apparent *nomen translatum* of a group name "Hippoporae", used by Canu and Bassler (1917 : 41). Unfortunately, Canu and Bassler's understanding of the genus *Hippoporina* (upon which the names Hippoporininae/ Hippoporinidae were based) was in error, as Harmer (1957) pointed out, being based on an invalid designation of a type-species. Harmer followed Waters (1918a) in using *Hippoporina* for the group of species with an evenly porous frontal wall with the type *H. pertusa* (Esper). For *Hippoporina sensu* Canu and Bassler, with a different type of frontal wall, Harmer (1957) introduced the name *Cleidochasma*. This genus became the type of a new family Cheidochasmatidae Cheetham & Sandberg, 1964. This family name effectively replaced Hippoporinidae *nov.* of Osburn (1952), based as it was on *Hippoporina sensu* Canu and Bassler.

The name Hippoporinidae, however, has also been used to include *Hippoporina sensu* Waters and Harmer (and related genera). Since the Hippoporininae of Bassler was replaced by the Cleidochasmatidae who, then, effectively authored a family Hippoporinidae based on the correct type genus and species? Apparently Brown (1952) was the first to do so. Interestingly, although Brown (1952 : 267) used the name as a *nomen translatum* of Bassler (1935), Lagaaij (1952 : 78) understood that Brown was, in effect, introducing a new family for he cited it as "Hippoporinidae Brown, in the press". Brown's (1952) introduction also preceded Bassler's (1953) use of the name Hippoporinidae based on *Hippoporina pertusa*.

Thus, Brown (1952) is here taken to be the author of the Hippoporinidae. It is however, worth considering whether this family is necessary. Both Harmer (1957) and Cheetham and Sandberg (1964) included *Hippoporina sensu* Waters in the family Hippopodinidae Levinsen (1909) [and Brown (1952) included *Hippopodina* in his Hippoporinidae!]. Lagaaij (1952) accepted both families. The chief purported difference between them is in the position of the ovicell but, as Brown pointed out, the significance of this is doubtful. Since Hippopodinidae Levinsen preceded Hippoporinidae Brown, and the type-genera have similar frontal walls and orifices, I here follow Harmer and Cheetham and Sandberg in placing *Hippoporina* (and related genera) in the Hippopodinidae.

Hippoporina Neviani, 1895

Colony encrusting, or erect from an encrusting base. Frontal wall evenly perforated. Adventitious avicularia often present. Ovicell hyperstomial, perforated. Multiporous septula present. Spines present only on the ancestrula.

TYPE-SPECIES: *Cellepora pertusa* Esper, 1796

Hippoporina cincta (Hincks) (Plate 25, B)

Lepralia cincta Hincks, 1885: 254.
Hippoporina cincta: Powell 1967a: 303 (*cum. syn.*).

MATERIAL EXAMINED: NZOI Stns K803, K818, K819, K820, K827, K829, K837, K851, K854, K855, K856, K857, K859, K867.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Napier, Cook Strait.

DESCRIPTION: Colony encrusting. Zooids somewhat elongate, 0.50–0.65 × 0.32–0.53 mm, the frontal wall evenly perforated and initially fairly smooth-surfaced between the pores, but in older zooids raised secondary thickening between the pores is slightly granular and the frontal wall appears much coarser. Orifice

constricted by prominent condyles into two subequal parts, the broad deep poster somewhat smaller than the anter. A suboral aviculiferous umbo present; the short, acutely triangular rostrum directed at an angle frontally. Ovicells prominent, perforated, usually divided frontally into three sections by thin lines of calcification; the primary orifice hidden by a peristome, the secondary orifice much wider, transversely narrow, bounded by the rim of the ovicell distally and a greater development of the suboral umbo proximally, which includes a pair of slightly larger avicularia in addition to the smaller median one.

REMARKS: Powell (1967a) and other workers have commented on the usually purplish-red colouration of dried colonies. Live colonies from Leigh are, in fact, a striking greenish-yellow colouration which turns to purple when they die. Opercula are dark brown to black.

Hippoporina epaxia n.sp. (Plate 25, C,D)

MATERIAL EXAMINED: NZOI Stns K801, K828$_1$, K855, K856.

DISTRIBUTION: Kermadec Islands, 18–440 m.

DESCRIPTION: Colony encrusting, biserial, and erect and quadriserial with zooids alternating. Frontal walls 0.87–1.13 × 0.50–0.83 mm, with scattered pores; clearly delimited from neighbouring zooids by smooth raised margins, curving outwards distally then steeply descending to the frontal wall of the next distal zooid, giving the erect branches a serrated outline to the naked eye. Orifice with a deep wide poster, though not as wide as the anter; the condyles fairly prominent, directed at an angle proximally. Avicularia absent. Ovicells commonly seen on encrusting as well as erect parts, prominent, evenly and densely perforated; able to be closed by the zooidal operculum.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–280.

PARATYPE: NZOI, type number P–564, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K801, Raoul Island, 29°14.7′S, 177°51.7′W, 18–22 m.

REMARKS: This species resembles *Hippoporina burlingtoniensis* (Waters, 1882) from the Oligocene of South Island and Miocene of Victoria (*see* Brown 1952) which is, however, hexaserial with non-projecting zooids and a distinct pair of accessory frontal projections proximally. It also superficially closely resembles *Schizoporella orbiculifera* Canu & Bassler, 1935, another Victorian Miocene species which, however, has a schizoporellid orifice with a distinct sinus, as well as adventitious avicularia.

Hippoporina rostrata (MacGillivray) (Plate 25, E)

Schizoporella rostrata MacGillivray, 1887f: 179; MacGillivray 1889b: 311; Powell 1967a: 262.
Lepralia lancifera Hincks, 1891: 296.
Hippoporina lancifera: Macken 1958: 105; Uttley & Bullivant 1972: 43.

MATERIAL EXAMINED: NZOI Stns K819, K820.

DISTRIBUTION: Three Kings Islands, Manukau Heads, Cook Strait, Chatham Rise; also Victoria (Australia), South Africa.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.65 × 0.37–0.50 mm, subquadrate to elongate-hexagonal. Frontal wall steeply rising to a very prominent aviculiferous suboral umbo; initially faintly textured with six pores in two rows in the proximal half and 4–5 pores on each margin, becoming coarse and granular and the pores widening with secondary calcification. Avicularium with complete pivot bar and relatively long acute rostrum; sometimes an adjacent avicularium at one corner of the orifice. Orifice wider than long with a broad, relatively shallow poster and moderately stout rounded condyles. Ovicells (not encountered in the Kermadec colonies) raised, with about 15 or fewer (depending on secondary calcification) conspicuous pores, with slight development of a peristome at the proximal corners. With increasing calcification, accessory avicularia may occur in frontal positions, with various orientations.

REMARKS: The ovicells are described from colonies collected by me from extreme low tide at Whatipu, Manukau Heads in 1977. Live colonies are dark brownish-black, as Hincks (1891) described for his presumably dried South African material (as *Lepralia lancifera*).

Codonellina Bassler, 1934

Colony encrusting. Zooidal frontal wall closely and regularly perforated. Orifice with broad deep poster and lateral condyles. No oral spines. Avicularium adventitious, usually suboral, small and acute or longer and spatulate. Ovicell prominent, hyperstomial, with frontal pores; closed by the zooidal operculum. Multiporous septula present.

TYPE-SPECIES: *Lepralia galeata* Busk, 1854

REMARKS: The genus *Codonellina* Bassler, 1934 (to replace *Codonella* Canu & Bassler, 1927b, preoccupied) was established for species with a broad poster in combination with a median avicularium and porous frontal wall and ovicell (Bassler 1953). Since the frontal and ovicellular characteristics are common to other genera (e.g., *Hippoporina, Schizomavella*) the form of the orifice becomes an important distinguishing characteristic. On this basis *Codonellina* seems clearly

to be a hippopodinid yet, surprisingly, Canu and Bassler assigned this genus to the Smittinidae, a family of mostly lyrulate genera. Other authors have followed their assignment. Osburn (1952 : 422) commented that: "The general appearance is that of a member of the Schizoporellidae, but the delicate nature of the operculum, without sclerites, and the suboral avicularium which communicates with an areolar pore on each side, appear to ally it to the Smittinidae."

The avicularium of *Codonellina* is not necessarily characteristic of the Smittinidae. Kermadec specimens of *C. montferrandii* (Audouin) have one short communication from the base of the avicularium to a small pore midway between the orifice and the lateral wall. A similar arrangement occurs in *Hippoporina cincta*. Harmer (1957) placed *Codonellina* in the Schizoporellidae, but it is not wholly appropriate there either. Although spatulate avicularia occur, *Codonellina* ought, based on the combined characters of frontal wall, ovicell, and orifice, to be placed in the Hippopodinidae, close to *Hippoporina*.

Codonellina montferrandii (Audouin) (Plate 26, A)

Flustra montferrandii Audouin, 1826: 240.
Codonellina montferrandii: Harmer 1957: 1049 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K837, K851, K863.

DISTRIBUTION: Victoria, Queensland, Indonesia, Philippines, Japan, East Africa, Red Sea, Mediterranean Sea, Hawaii, Galapagos Islands.

DESCRIPTION: Colony encrusting. Zooids 0.52–0.83 × 0.42–0.50 mm, with a granular frontal wall evenly perforated by numerous small pores. Orifice with a broad deep poster delimited from the anter only by projecting lateral condyles. No oral spines. A median suboral avicularium on a low eminence of the frontal wall; the rostrum acute, directed proximally or somewhat obliquely frontally; with a thin, complete pivot bar. Ovicell prominent, thin-walled, with scattered pores of various sizes, the frontal calcification of the distal zooid just encroaching around its base, forming a low rim.

REMARKS: The genus *Metroperiella* Canu & Bassler, 1917 is very similar to *Codonellina*, with an orifice, however, that is intermediate in form between those of the Hippopodinidae and Schizoporellidae. In general, the pyriform orifice of *Metroperiella* is distinctive but, unfortunately, the type-species, *M. lepralioides* (Calvet), has a broad, deep poster instead. Hayward (1974) has pointed out that the similarity between *M. lepralioides* and *C. montferrandii* is very great and that the two species may be conspecific. It is to be noted, however, that the opercula appear not to be identical [cf. pl. 16, fig. 8b of Jullien and Calvet (1903) with pl. 69, fig. 25 of Harmer (1957)]. Calvet also illustrates a rather granular ovicell with tiny pores whereas, at least in Kermadec material, the ovicell is essentially smooth with relatively larger pores. It is clear that Calvet's species needs to be re-examined.

Hippomenella Canu & Bassler, 1917

Colony erect or encrusting. Frontal wall with numerous marginal pores and a central imperforate area. Orifice high-arched, longer than wide, with a wide shallow poster. Oral spines present. Avicularia adventitious, small, usually adjacent to the orifice. Ovicell hyperstomial, prominent, finely perforated. Multiporous mural septula present.

TYPE-SPECIES: *Lepralia mucronelliformis* Waters, 1899

REMARKS: The frontal wall of this genus is cryptocystidean not umbonuloid as Cheetham (1966) inferred.

Hippomenella vellicata (Hutton) (Plate 26, B)

Lepralia vellicata Hutton, 1873: 98.
Hippomenella vellicata: Brown 1952: 278 (*cum syn.*); Powell 1967a: 305; Uttley & Bullivant 1972: 44.

MATERIAL EXAMINED: NZOI: Stns K795, $K826_2$, K851. DPG: Colonies from Hauraki Gulf and Otago Shelf.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Cook Strait, Otago Shelf; also Miocene of Southland. Pliocene of Wanganui and Napier. Juan Fernandez Island.

DESCRIPTION: Colony encrusting (Kermadec specimens) to bilamellar and erect, forming massive colonies. Zooids relatively large, 0.52–1.28 × 0.77–1.08 mm, square to subrectangular; the frontal wall flat or little convex, with 2–3 rows of pores laterally and proximally and a smooth or lightly textured (coarse in ephebic zooids) imperforate central area proximal to the orifice. Orifice long, narrower proximally, with rather straight or slightly concave proximal rim and downcurved lateral condyles. Oral spines six. Avicularia paired, placed distally either side of the orifice; often 1–3 additional small avicularia frontally, often considerably raised; the rostrum rounded; a thin, complete pivot bar. Ovicells not seen.

REMARKS: As described by Powell (1967a) from Three Kings Islands material, the ovicells are prominent, evenly perforated, with two associated oral spines. Brown (1952) noted as many as six subsidiary adventitious avicularia. Marcus's (1921a) record of this species from Juan Fernandez Island seems to be correct, judging from his illustration.

Hippothyris Osburn, 1952

Colony encrusting, zooids large. Zooidal frontal wall with several rows of marginal pores, imperforate centrally. Orifice subquadrate with straight to slightly concave poster and small condyles in the proximal corners. Avicularium small, placed by the proximal rim of the orifice. Ovicell hyperstomial, perforate, not closed by zooidal operculum. Multiporous mural septula present.

TYPE-SPECIES: *Hippothyris emplastra* Osburn, 1952

Hippothyris aganactete n.sp. (Plate 26, C)

MATERIAL EXAMINED: NZOI Stns K830, K842, K850, K872.

DISTRIBUTION: Kermadec Islands, 235–590 m.

DESCRIPTION: Colony encrusting, with superposed layers. Zooids large, 1.12–1.46 × 0.77–1.03 mm, relatively thin-walled, hyaline, with distinct boundaries. Frontal wall initially smooth or faintly textured with 2–3 rows of pores laterally and proximally, leaving an imperforate central area; later with scattered irregular tubercles of secondary calcification, the pores becoming rimmed and a little wider. Orifice roundly subquadrate with a broad, very shallow poster and small proximally angled condyles in the corners. Avicularium single, small, at either proximal corner of the orifice; the rostrum acute; a thin, complete pivot bar. Ovicells prominent, subglobular, thin-walled, with numerous frontal pores. Ancestrula with complete orifice and condyles, with three oral spines and relatively small frontal wall; in over-all size, less than half the dimensions of later zooids; periancestrular zooids may have two oral spines, later zooids none. Multiporous septula present low on vertical walls.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–281.

PARATYPE: NZOI, type number P–569, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K830, Raoul Island, 29°11.5′S, 177°53.05′W, 545–590 m.

REMARKS: Osburn (1952) established *Hippothyris* for a single species, *H. emplastra,* characterised by a "pleurocyst with several rows of pores and a comparatively small imperforate central area"; with "poster wide and shallow", orifice without spines, small suboral avicularium and globular perforate ovicell not closed by the zooidal operculum. The Kermadec colonies agree in all of these features as well as in having large zooids and multiporous septula. Interestingly, Osburn noted the occurrence of the two colonies of the type-species on a siliceous sponge. The Kermadec colonies were found exclusively on pumice, a siliceous rock.

In *Hippothyris emplastra,* the central imperforate area is raised and sculptured by fine reticulation, the suboral avicularium is median, and there is slight development of a peristome. The Kermadec colonies, here considered as belonging to *Hippothyris,* constitute the second known species in this genus. The orifice and ovicell are like those of *Hippomonavella.*

Family GIGANTOPORIDAE Bassler, 1935

Colony encrusting or erect. Zooidal frontal wall evenly perforated. Orifice with shallow rounded poster and condyles. Paired avicularia typically present, connected by a bridge-like peristomial process across the orifice leaving a subcircular proximal spiramen. Ovicells hyperstomial or completely immersed.

REMARKS: Brown (1952) gives the best recent account of this family (though as subfamily Gigantoporinae of the family Schizoporellidae) and the status of some of the genera. The Gigantoporidae are here considered to be very closely related to the Hippopodinidae, especially to *Cosciniopsis,* and may not be worthy of full familial status. Only the genus *Gigantopora* is here included. The genus *Galeopsis* (type-species *G. rabidus* Jullien), with a smooth, imperforate frontal wall and schizoporelloid orifice is unrelated and belongs to a different family (the Celleporidae, q.v.).

Gigantopora Ridley, 1881

Colony encrusting; or erect, foliaceous or vincularian. Frontal wall with numerous closely spaced pores and granular surface. Orifice with shallow poster and small condyles in the proximal corners. Peristomial spiramen of varying size, the associated bridge bearing avicularia. Ovicells hyperstomial, perforated, or fully immersed. Uniporous septula present low on vertical walls.

TYPE-SPECIES: *Gigantopora lyncoides* Ridley, 1881

Gigantopora polymorpha (Busk) (Plate 26, D)

Gephyrophora polymorpha Busk, 1884: 167.
Gigantopora polymorpha: Brown 1952: 208 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns $K826_3$, $K828_1$, K840.

DISTRIBUTION: South Africa. Also, Middle Oligocene of Nelson, New Zealand.

DESCRIPTION: Colony encrusting, forming linear, pluriserial branching series of zooids. Zooids large, 1.00–1.55 × 0.82–1.03 mm, the frontal wall with about 70 pores, sometimes with small tubercles on the ridges between the pores. Primary orifice somewhat longer

than wide, with broad, rounded poster delineated from the anter by small condyles; partially obscured by development of a high aviculiferous peristomial bridge which leaves a large, oval, non-projecting spiramen; the bridge over the spiramen somewhat granular. Avicularia acute, directed transversely upward toward each other, but separated by a straight, narrow length of bridge usually wider than the spiramen. Ovicells not seen.

REMARKS: This appears to be the encrusting form of *G. polymorpha*, a South African species which Brown (1952) recorded from the Middle Oligocene of New Zealand, and not otherwise known from this region. Neither Brown's fossil material from the Tarakohe Quarry nor the Kermadec specimens correspond to any of the five species of Canu and Bassler (1935) from the Miocene of Victoria. Brown was able to examine South African material and was assured of their conspecificity with the New Zealand fossils, which the Kermadec colonies resemble, although the peristomial bridge in these zooids is slightly higher.

Gigantopora proximalis n.sp. (Plate 26, E)

MATERIAL EXAMINED: NZOI Stns K822, K842.

DISTRIBUTION: Kermadec Islands, 64–70 m.

DESCRIPTION: Colony encrusting. Zooids relatively small, 0.48–0.63 × 0.27–0.43 mm; the frontal wall relatively coarse, with about 60 pores. Primary orifice somewhat longer than wide. Peristomial bridge with the associated avicularia more lateral to the orifice and directed proximally instead of transversely; the bridge over the spiramen smooth, imperforate. Spiramen wide, transversely oval, with a smooth, projecting rim. Ovicells hyperstomial, subimmersed but prominent, perforated regularly by pseudopores.

HOLOTYPE: Colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–291.

TYPE-LOCALITY: NZOI Stn K822, Raoul Island, 29°15.2′S, 178°01.5′W, 64–70 m.

REMARKS: The characteristic feature of this species is the rather proximally directed peristomial avicularia. The zooids are also rather smaller than in *G. polymorpha* and *G. pupa*.

Gigantopora pupa (Jullien) (Plate 26, F)

Galeopsis pupa Jullien *in* Jullien & Calvet, 1903: 95; Canu & Bassler 1929a: 272.
Galeopsis brevicapitata Canu & Bassler, 1929a: 273.
Gigantopora pupa: Harmer 1957: 880.

MATERIAL EXAMINED: NZOI Stns K820, K837, K851, K855, K858, K867.

DISTRIBUTION: Torres Strait, Tuamotu Archipelago, Philippines.

DESCRIPTION: Colony encrusting. Zooids large, 0.60–0.98 × 0.52–0.98 mm, the frontal wall not as coarse as in *G. polymorpha*, with smaller, more numerous (about 150) pores. The bridge over the spiramen smooth, imperforate. Peristomial avicularia as in *G. polymorpha*. Primary orifice as wide as long or slightly wider, with broad shallow poster. Ovicells immersed in a distal swelling behind the orifice, comprising a thin, globular, calcareous ooecium, separated by a space from the overlying tremocystal frontal wall; not closed by the zooidal operculum but opening into the distal wall of the peristome.

REMARKS: The arrangement of the ovicell is unusual. Inasmuch as it is separated by transverse walls from both maternal and distal zooids, it could be taken as a modified endotoichal type. Waters (1889b: pl. 2, figs 22, 23) showed a cross-section through zooids of *G. polymorpha,* in which the transverse maternal wall, ooecium and ovicellular opening appear as in *G. pupa*, but he did not show a transverse wall distal to the ovicell, i.e., it occurs immersed in the distal zooid. Busk (1884 : 168), however, noted that : "each zooecium is seen to be divided into two compartments" and that into the distal "space ... the subjacent ooecium intrudes, and may often be seen in the form of a spherical vesicle". It has been assumed by other authors that Busk and Waters had the same species (although Waters showed a much thicker peristomial bridge) and if so then Busk's interpretation of the arrangement of the ovicell is correct and Waters's is not. *G. proximalis* n.sp. has a subimmersed hyperstomial ovicell, resting partly on the distal zooid, though not closed by the zooidal operculum. On this basis the ovicell in *G. pupa* may be regarded perhaps as an extreme example of this type, in which the proximal part of the distal zooid's frontal wall lying beneath the ooecium lies, by contrast, in a vertical plane to become a transverse wall distal to the ooecium instead of basal to it.

Family PETRALIELLIDAE Harmer, 1957

Colony encrusting or erect, unilamellar. Zooids generally large, the frontal wall regularly perforated with numerous pores. Often a suboral mucro, with or without avicularia; oral spines and condyles present or absent. Avicularia adventitious only, usually associated with the orifice and/or frontal. Ovicell recumbent, with numerous small frontal pores. Basal wall usually smooth, with one or more pore-chambers giving rise to supportive rhizoids. Septula mainly multiporous.

REMARKS: Cook (1973 : 260; in litt. 1980) has observed that the frontal wall of some petraliellids is not umbonuloid as previously considered.

Discopora Lamarck, 1816

Colony encrusting or erect, unilamellar. Frontal wall evenly perforated. Orifice with aviculiferous suboral mucro associated with either a lyrula or an asymmetrical peristomial sinus. Other small or larger avicularia often present. Oral spines present or absent. Ovicell recumbent, porous. Supportive rhizoids from basal pore-chambers and multiporous septula present.

TYPE-SPECIES: *Discopora verrucosa* Lamarck, 1816

Discopora intermediata n.sp. (Plate 27, A)

MATERIAL EXAMINED: NZOI Stn K795.

DISTRIBUTION: Kermadec Islands, between 270 and 350 m.

DESCRIPTION: Colony encrusting, raised off the substratum by anchoring rhizoids, lobate and somewhat scalloped. Zooids 0.62–0.83 × 0.50–0.68 mm, rectangular, with 25–40 pores in the frontal wall. An irregular low peristome, smooth, with a pair of lateral avicularia, a median avicularium, and 3–4 small tuberosities; the lateral avicularia oval, with a subcentral crossbar; the median avicularium longer, inclined transversely, obscuring the proximal rim of the orifice. Orifice with condyles, no lyrula, the proximal rim generally straight or slightly concave. No oral spines. Ovicells not seen. Dorsal surface smooth with a single rootlet foramen and multiporous septulum distally.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–316.

PARATYPE: NZOI, type number P–539, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K795.

REMARKS: The generic placement of this species poses a slight difficulty. Stach (1936a) distinguished two genera, *Mucropetraliella* (= *Discopora* Lamarck) and *Sinupetraliella,* the former with a lyrula and the latter with a peristomial sinus. *D. intermediata* lacks both a lyrula and a sinus, and one orificial condyle is larger than the other. In appearance the orifice is intermediate between those of *Discopora canui* Hastings, 1949 [= *Petraliella verrucosa* Canu & Bassler, 1929, placed in *Mucropetraliella* by Stach (1936a) and Harmer (1957)] and *Sinupetraliella affinis* Harmer, 1957. Inasmuch as a lyrula may occasionally be lacking in normally lyrulate genera of the Smittinidae [cf. *Smittina* and *Parasmittina* in Powell (1967a)], and Harmer (1957) described a lyrula in *Sinupetraliella gigantea* (Canu & Bassler), the absence of a lyrula in *D. intermediata* does not preclude placing this species in *Discopora*. Furthermore, I see no reason for maintaining *Sinupetraliella* as a separate genus. I believe it should be merged in *Discopora,* though possibly kept as a subgenus.

Family TEUCHOPORIDAE Neviani, 1895

Zooidal frontal wall cryptocystidean, evenly perforated or with marginal pores only. Primary orifice enclosed by a deep peristome; with or without lyrula and condyles. Avicularia adventitious, small, commonly absent. Ovicell prominent, perforated frontally. Basal pore-chambers or multiporous septula present.

REMARKS: Harmer (1957 : 896) indicated the priority of the name Teuchoporidae over Phylactellidae Canu & Bassler, 1917.

Lagenicella Cheetham & Sandberg, 1964

Colony erect or encrusting. Zooidal frontal wall regularly perforated. Primary orifice subcircular, unmodified or with broad rounded poster and small condyles. Peristome tall, imperforate. Secondary orifice entire or with irregular projections. Avicularia small, a pair on the lateral margins of the secondary orifice or absent; additional adventitious avicularia may be present frontally. Ovicells peristomial, distal, with a perforated frontal area. Multiporous mural septula present.

TYPE-SPECIES: *Lagenipora marginata* Canu & Bassler, 1930

Lagenicella exallos n.sp. (Plate 27, B)

MATERIAL EXAMINED: NZOI Stn K801.

DISTRIBUTION: Kermadec Islands, 18–22 m.

DESCRIPTION: Colony encrusting. Zooids 0.52–0.58 × 0.45–0.55 mm, robust, heavily calcified, the frontal wall evenly perforated with numerous pores. Primary orifice partly hidden by a tall peristome, a little wider than high, the anter semicircular, the poster broad and deep, the condyles small and angular. Peristome horseshoe-shaped in cross-section, open distally, tall, thick, smooth, supporting a small avicularium on the summit of each lateral rim and occasionally a third avicularium on the proximal rim; the rostra subacute, directed upward at an angle proximally (laterally or lateroproximally in the case of the proximal avicularium), the pivot bar thin, complete; 0–2 shortly columnar avicularia borne on the frontal wall. Ovicell moderately prominent, thin-walled, with numerous pores not confined to a special area or bounded by a common rim. Multiporous mural septula present low on vertical walls.

HOLOTYPE: Part of colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–337.

PARATYPE: NZOI, type number P–546, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K801, Raoul Island, 29°14.7′S, 177°51.7′W, 18–22 m.

REMARKS: This species is somewhat puzzling. It differs from *Lagenicella s.s.*, as defined by Cheetham and Sandberg (1964), in lacking a truly tubular peristome, in having frontal avicularia and a hippopodinid-type primary orifice with well developed condyles, and in lacking a common rim around the porous area of the ovicell. Notwithstanding these discrepancies, *L. lacunosa* (Bassler, 1934) has a similar orifice, *L. mexicana* (Osburn, 1952) has a reduced peristome, and in Canu and Bassler's (1930) photograph of *L. marginata*, the type-species, apparent avicularian chambers are evident on the frontal wall. In the sum of its characters, the Kermadec material seems most appropriate in *Lagenicella*. *Teuchopora* Neviani seems to be related but avicularia are not known in that genus (Poluzzi 1977).

Lagenicella lacunosa (Bassler) (Plate 27, C)

Lagenipora verrucosa Canu & Bassler, 1930: 35 (preoccupied).
Lagenipora lacunosa Bassler, 1934: 35; Osburn 1952: 490.

MATERIAL EXAMINED: NZOI Stns K797, K856.

DISTRIBUTION: Peru, Ecuador, Galapagos Islands, Gulf of California, Southern California.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.65 × 0.30–0.38 mm, in linear branching series. Frontal wall coarse, perforated with large pseudopores; rising to a relatively smooth tubular peristome which bulges in the angle between the frontal wall and its base. Primary orifice obscured by the peristome, orbicular, with a broad sinus-like poster delineated from the anter by a pair of small rounded condyles. Avicularia and mature ovicells not seen.

REMARKS: Only one damaged colony occurred in the Kermadec collections, encrusting *Steginoporella neozelanica*. The peristomes were all partly broken and associated avicularia were not seen. An incipient distal ovicell was present. The photograph of this species in Canu and Bassler (1930: pl. 6, fig. 1) shows clearly the coarsely perforated frontal wall and proximal bulge of the peristome which appears to be characteristic of this species. Osburn's (1952) illustration, by contrast, does not show frontal pores of the same size.

Family SCHIZOPORELLIDAE Jullien, 1883

Frontal wall evenly perforated, or with marginal pores only, or imperforate. Primary orifice with a large anter and a small sinus. Ovicell mostly hyperstomial. Avicularia present or absent. Multiporous septula or pore-chambers present.

Schizomavella Canu & Bassler, 1917

Frontal wall with evenly distributed perforations over the whole surface or the central area imperforate. Primary orifice with a sinus and oral spines. Avicularia often suboral, sometimes lateral to the orifice. Enlarged adventitious avicularia sometimes present. Ovicell with irregular perforations; closed by the zooidal operculum. Mural septula present.

TYPE-SPECIES: *Lepralia auriculata* Hassall, 1842

Schizomavella neptuni (Jullien) (Plate 27, D)

Schizoporella neptuni Jullien, 1883: 511.

MATERIAL EXAMINED: NZOI Stn K844.

DISTRIBUTION: Iberian Peninsula.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.63 × 0.40–0.68 mm. Frontal wall only slightly convex, evenly rugose, evidently without perforations, with relatively small marginal areolae. Orifice with anter as wide as long and somewhat cleithridiate sinus and stout ledge-like condyles. Oral spines 10. Adventitious avicularia of two types – small triangular avicularia, often paired, one either side of the orifice directed obliquely laterally, or one lateral and the other suboral, directed obliquely proximally, or only the suboral one present; occasionally a large spatulate avicularium on one side of the frontal wall. Ovicell prominent, with numerous pores.

REMARKS: Only one ovicellate colony of this distinctive species was seen. It matches so closely Jullien's (1883) description and illustration of his *Schizoporella neptuni* from deep water north of the Iberian Peninsula that, in spite of the unusual distribution, I prefer to assign the Kermadec specimen to this species rather than erect a new one. Jullien does not mention large spatulate avicularia, but in view of their sporadic occurrence, this does not preclude conspecificity. The numerous oral spines and relative smallness of the orifice in relation to the overall size of the zooid led Jullien to suggest that a new genus, based on these characters, might need to be erected. This suggestion antedated the introduction of *Schizomavella* by Canu and Bassler (1917), but *S. neptuni* is in many ways very different also from *Schizomavella s.s.* *Schizoporella triaviculata* Calvet *in* Jullien & Calvet, 1903 appears to be a closely related species.

Schizomavella punctigera (MacGillivray) (Plate 28, A,B)

Schizoporella punctigera MacGillivray, 1883a: 133; Livingstone 1929: 78; Powell 1967a: 269.
?*Arthropoma punctigerum*: Harmer 1957: 1005.
Lacerna auriculata: Uttley & Bullivant 1972: 38 (*partim*).
Lacerna minuta Uttley & Bullivant, 1972: 40.

MATERIAL EXAMINED: NZOI: Stns K795, K796, K797, K801, K812, K837, K842, K851, K871; NZOI P–168 (paratype of *Lacerna minuta*). DPG: Colonies from Hauraki Gulf, Stewart Island.

DISTRIBUTION: Hauraki Gulf, Chatham Rise, Stewart Island; also SE Australia, ?Indonesia.

DESCRIPTION: Colony encrusting. Zooids 0.33–0.53 × 0.30–0.38 mm, rather quadrangular or rectangular and tapering. Frontal wall rugose, quite convex, rising to a suboral avicularian umbo. Frontal pores few or absent, but conspicuous lateral areolae. Orifice with U-shaped sinus, definite shoulders (the proximal rim) and rather well developed ledge-like condyles. Oral spines 4–6. Suboral avicularium almost perpendicular to the frontal surface, though this is variable; small, with acute rostrum and complete pivot bar with small ligula. Ovicell fairly prominent though becoming immersed, by secondary calcification, in the frontal wall of the distal zooid; the orifice not dimorphic; a number of pores in the proximal half frontally.

REMARKS: *S. punctigera* is very close to European *S. auriculata* and Uttley and Bullivant (1972) actually synonymised the two species. Livingstone (1929) and Powell (1967a) regarded them as distinct although closely related. Powell, however, examined a British Museum specimen of purported *S. auriculata,* from Guernsey, which had a roundly *triangular* orifice. Hastings (1932 : 415–16) also noted that British Museum specimens had this type of orifice, which is, however, characteristic of *Metroperiella,* not *Schizomavella auctt. S. auriculata,* however, is the type-species of *Schizomavella.* Hayward and Ryland (1979) have fully described and illustrated British *S. auriculata* without a roundly triangular orifice. The identity of the British Museum material that Powell examined remains to be determined.

Uttley and Bullivant, as mentioned, considered *S. punctigera* to be conspecific with *S. auriculata,* which they referred, however, to the genus *Lacerna*. This was based on a wrong understanding of *Lacerna,* as I point out in a discussion of this genus (*see* p.88). In any case, *auriculata* is the type of *Schizomavella*.

Through the courtesy of Dr P.J. Hayward (University College of Swansea) I have been able to examine British *S. auriculata* (Pl. 28, C,D). Although similar, it differs from *S. punctigera* in the following characters : spines 3–4, a single row of ovicellular pores, palate of avicularium with a beaded edge, condyles more sharply defined, sinus shallower. Taken together, these characters support maintaining *S. punctigera* as a separate species (or subspecies).

Schizomavella schizoporelloides n.sp. (Plate 28, E)

MATERIAL EXAMINED: NZOI Stns K798, K801, K812.

DISTRIBUTION: Kermadec Islands, intertidal to 40 m.

DESCRIPTION: Colony encrusting. Zooids 0.25–0.58 × 0.18–0.30 mm, rectangular to quadrate. Frontal wall imperforate with marginal areolae, finely granular in young zooids, somewhat rugose in older zooids. Orifice with straight or convex proximal rim with variable sinus, usually moderately narrow but sometimes rather wider and shallower; sloping ledge-like condyles. Distal oral spines 2–6, usually only three. Avicularia paired, but often single or absent, either side of the orifice at the level of, and parallel to, the distal wall; with rounded rostral rim which is often minutely serrated, and thin, complete pivot bar. No suboral avicularium. Ovicell prominent with 12 or more conspicuous pores on the proximal half frontally, the distal half becoming partly immersed by secondary calcification.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–309.

PARATYPE: NZOI, type number P–565, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K812, Raoul Island, 29°17.0′S, 177°54.4′W, 10–30 m.

REMARKS: With paired lateral avicularia this species at first resembles a typical *Schizoporella.* The imperforate frontal wall and the form of the ovicell are more characteristic of *Schizomavella,* however.

Metroperiella Canu & Bassler, 1917

Colony encrusting. Zooids with frontal wall evenly perforated. A nearly median suboral avicularium usually present. Primary orifice with a pyriform, or rounded, wide sinus. No oral spines. Ovicells evenly perforated with small pores; often with dimorphic orifices.

TYPE-SPECIES: *Schizoporella lepralioides* Calvet *in* Jullien & Calvet, 1903

Metroperiella triangula (Hincks) (Plate 28, F)

Schizoporella triangula Hincks, 1881b: 12; MacGillivray 1887b: 146.

MATERIAL EXAMINED: NZOI Stns K803, K854, K856.

DISTRIBUTION: Victoria, Bass Strait.

DESCRIPTION: Colony encrusting. Zooids moderately large, 0.52–0.88 × 0.35–0.58 mm, hyaline, rather flat-surfaced though rising somewhat to the suboral avicularium; boundaries marked by thin, slightly raised rims. Frontal wall perforated by 30–40 pores but otherwise fairly smooth in young zooids; 3–6 small marginal areolae. Orifice, including sinus, roundly triangular or pyriform, the anter subcircular, the poster widely open, flanked by small shoulders delimiting the proximal rim and a pair of proximally curving condyles. No oral spines. A median suboral avicularium with triangular opesial and rostral halves almost equally acute, the pivot bar complete. Ovicells prominent, uniformly perforated, with pores as large as those of the frontal wall; the orifice broader than in autozooids, with slightly wider sinus.

REMARKS: Only one colony, bearing a newly formed ovicell, occurred in the dredge samples. The nodules and processes of older, more calcified ovicells, as described by Hincks, were thus not seen.

This is one of a number of Australasian species (*see* Hastings 1932, Powell 1967a) characterised by pyriform, dimorphic orifices, evenly perforated frontal walls, and the absence of oral spines. Accordingly, they are here placed in the genus *Metroperiella* Canu & Bassler, 1917, which has been regarded by many authors (including Canu and Bassler 1929a!) as a junior synonym (or subgenus) of *Schizomavella*. I agree with Harmer (1957) that there is a case for accepting *Metroperiella* as a full genus, but, as noted in the discussion under *Codonellina* (*see* p.77), the type-species needs re-examining, for the possibility exists that it may be a junior synonym of *Codonellina montferrandi,* as Hayward (1974) suspects. If it is, a new generic name is required. Whether or not they are conspecific, the type of *Metroperiella* does not have one of the otherwise characteristic features of this genus (based on other species assigned by Canu and Bassler to *Metroperiella*), namely, the dimorphic orifices, the orifice of ovicelled zooids being wider than that of ordinary zooids.

According to Harmer (1957) : "*Metroperiella* seems to be allied to *Codonellina*". One must ask how important is the shape of the orifice. That of *Codonellina* is hippopodinid while that of *Metroperiella* approaches the schizoporellid orifice. *Metroperiella* is here placed in the Schizoporellidae because of its obvious affinities with *Schizomavella* but it otherwise appears to bridge the gap between the two families.

Chiastosella Canu & Bassler *in* Bassler, 1934

Colony encrusting or foliaceous. Frontal wall evenly perforated with simple, rarely stellate, pores, and with marginal areolae. Orifice with sinus, and condyles on proximal shoulders. Oral spines present. Avicularia single or paired, directed laterally or obliquely distally, sometimes wanting. Ovicells hyperstomial, somewhat immersed, the ectooecium areolated, the endooecium exposed as a pitted triangular or crescentic area.

TYPE-SPECIES: *Schizoporella daedala* MacGillivray, 1882

Chiastosella longaevitas Powell (Plate 28, G)

Chiastosella porosa: Brown 1952: 221; Brown 1954a: 427.
Chiastosella longaevitas Powell, 1967a: 281.

MATERIAL EXAMINED: NZOI Stns K795, K825, K826$_{1,2}$, K829, K837, K851, K854, K855, K856, K857, K859, K863, K867.

DISTRIBUTION: Three Kings Islands (Middle Pliocene to Recent), Middle Miocene of Southland, Middle Oligocene of Nelson.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.93 × 0.50–0.68 mm, fairly robust, with densely perforated frontal wall of up to 46 pseudopores. Orifice subcircular with transversely oval sinus bordered by a pair of incurved denticles; on the shoulders of the orifice a pair of longitudinally grooved condylate ridges. Distal oral spines 6–7, stout. Avicularia typically single, often paired on zooids where there is an ovicell proximally; situated midway or slightly more distally on one side of the frontal wall, directed laterally or obliquely distally; long and narrow, the rim raised distally and finely serrated; often protruding over adjacent zooids; the pivot bar thin, complete. Ovicells recumbent with smooth broad ectooecium frontally perforated by a few proximolateral pores, and with a crescentic area of endooecium distally, minutely pitted.

REMARKS: The Kermadec colonies are difficult to place. They probably belong to *C. longaevitas* Powell, 1967a, which was established on the basis of both Recent and Pliocene specimens from the Three Kings Islands. The Pliocene specimens had been assigned by Brown (1954a) to *C. porosa* Canu & Bassler, 1935, following his earlier (1952) finding of apparent *C. porosa* in Tertiary rocks from both North and South Islands. Powell included all of Brown's fossil New Zealand material in *C. longaevitas*. *C. longaevitas* is said to differ from *C. porosa* (a Victorian Tertiary species) in the wider arching of the orifice, and in having stellate pseudopores and single, obliquely distally directed avicularia. Powell also noted 4–6 oral spines whereas Canu and Bassler cited only four. All of these features are subject to variation, however. For example, although the Kermadec colonies lack stellate pseudopores, this does not preclude conspecificity with *C. longaevitas*. *C. splendida* (Livingstone) from Hauraki Gulf, which normally has markedly stellate pores, may have only simple pores in parts of some colonies. The orifices of the Kermadec colonies resemble those of *C. longaevitas* more than of *C. porosa,* but it should be noted that if the denticles

bordering the sinus were to be worn off (as during fossilisation perhaps) then the sinus would resemble that of *C. porosa*.

I here include the Kermadec specimens in *C. longaevitas* on the basis of the number of oral spines, the frequently distal orientation of the avicularia, the shape of the orifice and sinus, and the presence in some colonies of a prominent suboral peristome. Notwithstanding this assignment, I believe that all specimens ascribed to these two species should be re-examined and that *C. longaevitas* may yet be found to be conspecific with *C. porosa*.

Escharina Milne-Edwards, 1836

Colony encrusting to erect. Frontal wall evenly perforated with small pores and/or with marginal areolae. Orifice with narrow sinus, and often oral spines. Avicularia adventitious or interzooidal, developed from pore-chambers, the mandible varied. Ovicell hyperstomial or deeply immersed. Basal pore-chambers present.

TYPE-SPECIES: *Eschara vulgaris* Moll, 1803

Escharina pesanseris (Smitt) (Plate 29, A,B)

Hippothoa pes anseris Smitt, 1873: 43.
Escharina pesanseris: Harmer 1957: 998; Powell 1967a: 274.

MATERIAL EXAMINED: NZOI Stn K855.

DISTRIBUTION: Three Kings Islands; also Indonesia, Central America, Gulf of Mexico.

DESCRIPTION: Colony encrusting. Zooids 0.70–0.85 × 0.58–0.83 mm, the frontal wall at first relatively smooth-surfaced though evenly perforated with tiny pores, later with small, scattered tubercles. Orifice much longer than wide with parallel sides and straight proximal rim interrupted by a narrow U-shaped sinus; condyles flat, inconspicuous. A smooth, moderately prominent peristome. Oral spines 8–9. A pair of avicularia, each adjacent to the orifice, with complete pivot bar and flaring mandible shaped like the webbed foot of a duck. Ovicells smooth, with a sharp angle between frontal and distal surfaces, wider than long; only six oral spines on ovicelled zooids.

REMARKS: This distinctive tropical species was first recorded from the New Zealand region by Powell (1967a).

Escharina waiparaensis Brown (Plate 29, C)

Escharina waiparaensis Brown, 1952: 229; Brown 1954a: 427; Powell 1967a: 275; Uttley & Bullivant 1972: 43.

MATERIAL EXAMINED: NZOI Stns K795, K872.

DISTRIBUTION: Three Kings Islands, Chatham Rise; also Miocene of Southland, Pliocene of Hawkes Bay.

DESCRIPTION: Colony encrusting or producing erect vincularian stalks from the encrusting part. Zooids 0.67–1.13 × 0.50–0.93 mm, with rather flattened frontal wall covered with tiny tubercles amongst which are small pores. Orifice rounded, generally wider than long, with short, rounded or somewhat squared narrow sinus; the proximal rim straight either side of the sinus, supporting flattened condyles. Four oral spines distally, sometimes the more delicate proximal pair missing. A pair of oral avicularia at the level of the sinus, each adjacent to the zooidal margin; with complete pivot bar; mandibles not seen. Ovicells not seen.

REMARKS: Powell (1967a) observed that the mandibles are setiform and the ovicells are completely immersed.

Nimba Jullien *in* Jullien & Calvet, 1903

Colony encrusting, uniserial. Zooids tapering proximally, frontal wall with small marginal pores. Orifice with sinus, and usually bordered by a raised peristome. Avicularia rare, adventitious. Ovicells hyperstomial, not closed by the zooidal operculum.

TYPE-SPECIES: *Nimba praetexta* Jullien *in* Jullien & Calvet, 1903.

Nimba terraenovae (Powell) (Plate 29, D,E)

Schizoporella terraenovae Powell, 1967a: 268.

MATERIAL EXAMINED: NZOI Stns $K826_3$, K840, K842, K851, K855, K856, K857, K867, K872.

DISTRIBUTION: Three Kings Islands.

DESCRIPTION: Colony encrusting, uniserial. Zooids 0.35–0.53 × 0.17–0.23 mm, arranged in linear chains. Frontal wall convex, roughly semicircular in cross-section, smooth with faint texturing or, more usually, with numerous small tubercles arranged over the middle part of the wall; often with a thin marginal lamina with a few widely spaced pores. Orifice about as wide as long, with a median sinus flanked by relatively prominent smooth condyles which extend from the proximal corners of the orifice to the edge of the sinus (or slightly beyond). Oral spines five. Avicularia rare, elongate-oval in outline, placed on one side of the frontal wall, extending from a marginal pore to the mid-line; the rostral area at the end of the avicularium near the mid-line and directed obliquely proximally outward; the pivot bar thin, complete. Ovicell prominent, globular, rarely smooth, commonly covered with numerous tubercles, no spines; the fertile orifices completely surrounded by a transversely oval tubular peristome; the inner distal surface sculptured

by two semicircular patches of longitudinal striations; the ovicell opening not closed by the zooidal operculum. Ancestrula sac-like, smooth and wide proximally with a longitudinally oval opesia bordered by spines; the first daughter zooid produced distally and the next zooid capable of producing ovicells.

REMARKS: The monotypic genera *Nimba* and *Nimbella* were introduced by Jullien (*in* Jullien and Calvet 1903) for two uniserial species from the Azores. They were very similar, both having granular frontal walls bordered by marginal pores. Since ovicells were not found in *Nimbella*, the chief difference between them was in the form of the orifice, *Nimbella* having a beaded vestibular arch and a lateroproximal indentation in the proximal rim either side of the median sinus. *Nimba* lacked both of these features. On the basis of the beaded arch *Nimbella* was assigned by Jullien to the Sertellidae and *Nimba* to the Schizoporellidae. Both are little known genera.

The Kermadec specimens evidently belong to *Nimba*, although there are some discrepancies. Neither oral spines nor avicularia were recorded for *Nimba praetexta*, the type-species, and according to Jullien the ovicell opening may be closed by the zooidal operculum, which is not the case in *N. terraenovae*. There is no other genus to which the Kermadec colonies may be assigned, however, and notwithstanding the apparent discrepancies, they appear very near to *N. praetexta*. The marginal pores in *N. terraenovae* are the openings of simple mural chambers and probably are present in *N. praetexta* as well, but were referred to by Jullien as areolae.

The question arises as to which family *Nimba* belongs. D'Hondt (1975), without comment, assigned *N. praetexta* to the Phylactellidae [probably following Bassler (1953)]. Brown (1954c) suggested that *Nimba* and *Nimbella* might be placed together in a separate family. There are similarities with the Phylactellidae in the prominent peristome, and apparent absence, in *N. praetexta*, of avicularia. On the other hand, the schizoporelloid orifice is not typical of that family. I believe that *Nimba* is better accommodated in the Schizoporellidae close to *Escharina*. *Escharina alderi* (Busk), for example, is uniserial, with imperforate ovicells and rare avicularia. Other species of *Escharina* have oral spines and a peristome (which, however, is never tubular). *Nimba terraenovae* would be inappropriately placed in *Escharina s.l.* as it lacks true areolae. *Escharina* has both areolae and basal pore-chambers, and the ovicell is closed by the zooidal operculum.

The Kermadec specimens evidently belong to Powell's species. His description of a zooid with a proximally placed avicularium is absolutely typical. His illustration of the ovicell with two lateroproximal "oral spines mounted on convex eminences" is atypical, however.

Arthropoma Levinsen, 1909

Colony encrusting. Zooids with frontal walls evenly perforated by numerous simple pores. Orifice with narrow U-shaped sinus. No oral spines. Operculum articulated. Avicularia rare, vicarious. Ovicells prominent, smooth, imperforate; closed by the zooidal operculum. Multiporous mural septula present.

TYPE-SPECIES: *Flustra cecilii* Audouin, 1826

REMARKS: According to Levinsen (1909) and Harmer (1957) a characteristic feature of the genus is the articulation of the operculum at the junction of the broad anter and the narrow sinus. This feature occurs in the species *Lepralia circinata* MacGillivray which both Levinsen and Harmer referred to *Arthropoma*, although Harmer (1954 : 1004) noted that *circinata* is variable and not all of the specimens he examined had the articulation. On p.87 I give reasons for placing *circinata* in *Phonicosia* Jullien.

Arthropoma cecilii (Audouin) (Plate 30, A)

Flustra cecilii Audouin, 1826: 239.
Arthropoma cecili [sic]: Levinsen 1909: 332.
Arthropoma cecilii: Harmer 1957: 1001 (*cum syn.*); Wass & Yoo 1975: 811, 825; Hayward & Ryland 1979: 190.

MATERIAL EXAMINED: NZOI Stns K797, K818, K820, K825, K837, K850, K854, K855, K856, K867.

DISTRIBUTION: Victoria, Tasmania (Late Miocene to Recent), Queensland, Indonesia, Philippines, Japan, China Sea, Andamans, Sri Lanka, Zanzibar, Madagascar, Red Sea, Adriatic Sea, southern Britain, Spain, Morocco, West Africa, South Africa, Brazil, California, Galapagos Islands, British Columbia.

DESCRIPTION: Colony encrusting. Zooids 0.55–0.78 × 0.37–0.65 mm, with frontal wall evenly perforated by small pseudopores. Orifice with broad, straight proximal rim supporting thin flat condyles; with deep narrow sinus. Ovicells globular, smooth, imperforate basally or with 1–2 minute pits. No oral spines.

REMARKS: *A. cecilii* occasionally has large-mandibled vicarious avicularia (Kirkpatrick 1890a, Harmer 1957). These were not seen in the abundant Kermadec material.

Rogicka Uttley & Bullivant, 1972

Colony encrusting. Zooids with convex frontal walls evenly perforated by numerous simple or minutely cribellate pores. Orifice bordered by numerous close-set slender spines. Operculum non-articulated. No avicularia. Ovicells prominent, smooth or evenly perforated; closed by the zooidal operculum. Multiporous mural septula present.

TYPE-SPECIES: *Schizoporella biserialis* Hincks, 1885

REMARKS: The exact status of this genus is open to question. *Rogicka biserialis* is obviously related to *Arthropoma cecilii* (Audouin) for, although *A. cecilii* lacks spines on autozooids, they occur on the rare vicarious avicularia. Furthermore, *A. cecilii* also has an imperforate ovicell, and the tendency (in *R. biserialis*) to form disjunct or linear colonies is a feature of variable significance among bryozoan genera. The frontal walls of the two species are also very similar. For these reasons I was at first inclined to merge *Rogicka* in *Arthropoma,* in spite of the lack of an articulated operculum which is characteristic of *Arthropoma*. However, another Kermadec species, *R. oceanica* n.sp. (q.v.), has significant features in common with *R. biserialis* that supports retaining *Rogicka* as a separate genus; viz., numerous close-set oral spines, similar orificial condyles, and minutely cribellate pores. These pores have not been recorded before in *R. biserialis* and I myself have seen them only in Kermadec colonies. They are not present in *R. biserialis* from Napier. In the sum of their characters *R. biserialis* and *R. oceanica* n.sp. resemble each other more closely than they resemble *A. cecilii* and *Rogicka* is here retained as a full genus.

Rogicka biserialis (Hincks) (Plate 30, B)

Schizoporella biserialis Hincks, 1885: 250; Hamilton 1898: 196.
Arthropoma biseriale: Powell 1967a: 259.
Rogicka biserialis: Uttley & Bullivant 1972: 38.

MATERIAL EXAMINED: NZOI Stns K818, K819, K820, K827, K837, K851, K855, K856, K872.

DISTRIBUTION: Three Kings Islands, Napier; also New South Wales.

DESCRIPTION: Colony encrusting. Zooids 0.65–1.15 × 0.40–0.55 mm, fully contiguous or disjunct to uniserial; with convex frontal walls evenly perforated by numerous pores which are either simple or minutely cribellate and with or without raised rims; when in linear chains the frontal wall steeply dipping at the sides, the lateral walls reduced, and often somewhat caudate proximally. Orifice with a U-shaped sinus and straight proximal shoulders supporting triangular condyles at the corners. Oral spines in one to several series, with about 14–16 in the first series and up to 25 or more additional spines beneath. Operculum not articulated. No avicularia. Ovicells prominent, smooth, with a row of basal pores. Multiporous septula in side walls.

REMARKS: Powell (1967a) recorded up to 50 additional spines in Three Kings Islands material. The commonest arrangement in Kermadec specimens is two series of spines roughly perpendicular to each other, the inner series erect and the outer series distally directed.

Uttley and Bullivant (1972) erected a new genus, *Rogicka,* based on this species. The distinctive features of the genus were said to be : "... the double row of spines, the imperforate ovicell and the reduction in contact between zooecia". One might also add the non-articulated operculum. The standing of this genus is discussed above and an emended diagnosis is given, based on the following species.

Rogicka oceanica n.sp. (Plate 30, C,D)

[?] *Dakaria biserialis* Osburn, 1952: 329.

MATERIAL EXAMINED: NZOI Stns $K826_3$, K837.

DISTRIBUTION: Kermadec Islands, 110–490 m; ?Costa Rica and Galapagos Islands.

DESCRIPTION: Colony encrusting. Zooids 0.55–0.75 × 0.32–0.50 mm, contiguous; somewhat inflated frontal walls, often wider proximally, the surface generally minutely granular and densely pitted, the pits appearing under high magnification as pores with a minutely meshed cribellate septum; in young zooids the pores are simple; no larger pores or marginal areolae. Orifice with evenly rounded anter and rounded V- to U-shaped sinus; the condyles angled, set in the corners of the orifice. Oral spines about 14, slender, set closely together around the orificial rim. No avicularia. Ovicells prominent, perforated like the frontal walls with minutely cribellate pores; able to be closed by the zooidal operculum; oral spines absent or a tiny pair at the proximal corners.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–322.

PARATYPE: NZOI, type number P–550, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K837, Macauley Island, 30°15.5′S, 178°24.2′W, 110–125 m.

REMARKS: This species is very similar to *Dakaria biserialis* Osburn, 1952. The chief distinction is in the double row of spines recorded by Osburn but not present in the Kermadec colonies. Osburn did not observe cribellate pores, but these could easily be overlooked. Whether or not Osburn's material is conspecific a new name is needed. His species is neither *R. biserialis* nor is it appropriate in *Dakaria,* of which the type-species, *D. chevreuxi* Jullien, has prominent peristomial lappets and evidently lacks ovicells.

Phonicosia Jullien, 1888

Colony encrusting. Zooids with frontal pores mainly near the margins and near the orifice. Oral spines present. Operculum with or without articulation. Avicularia adventitious. Ovicells prominent, smooth,

imperforate frontally; not closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Phonicosia jousseaumei* Jullien, 1888

REMARKS: Levinsen (1909) assigned *Lepralia circinata* MacGillivray, 1869 to his new genus *Arthropoma* (q.v.) on the basis of similarities in the orifice and ovicell and especially the articulated operculum (cf. Busk 1884 : 166). Harmer (1957 : 1001), and other authors before and since, followed Levinsen in this, but Harmer commented that *Phonicosia* Jullien, 1888 (based on magellanic *P. jousseaumei)* might be a senior synonym of *Arthropoma,* since Jullien (*in* Jullien and Calvet 1903) referred *Flustra cecilii* Audouin, 1826 to *Phonicosia.* Waters (1904 : 50) had also suggested a relationship. *P. jousseaumei* resembles non-aviculiferous *L. circinata* and Powell (1967a) suggested that the two names may refer to the same species. Harmer deferred using *Phonicosia,* stating : "In the absence of information with regard to the operculum of *Phonicosia* I provisionally accept Levinsen's genus."

A simple solution is to accept both genera, which I do here. *Arthropoma* is firmly based on *Flustra cecilii.* Whether or not *Phonicosia jousseaumei* and *Lepralia circinata* are conspecific, they are almost certainly congeneric, and the name *circinata* remains whatever the outcome of re-examining Jullien's material. The major differences between the two genera (based on Kermadec material) are:

Arthropoma – avicularia (when present) vicarious, frontal pores evenly distributed over the frontal wall, ovicell closed by the zooidal operculum, no oral spines, multiporous mural septula;

Phonicosia – avicularia (when present) adventitious, frontal pores not evenly distributed, ovicell not closed by the zooidal operculum, oral spines and basal pore-chambers present.

This diagnosis ascribes avicularia to *P. jousseaumei.* Jullien did not observe these but, as Powell noted, they are often lacking in *L. circinata* throughout its range.

Phonicosia circinata (MacGillivray) (Plate 30, E,F)

Lepralia circinata MacGillivray, 1869: 134.
Schizoporella circinata: Hincks 1885: 253; Waters 1887a: 64; Hamilton 1898: 196.
Arthropoma circinata: Levinsen 1909: 332; Brown 1952: 233; Uttley & Bullivant 1972: 37.
Arthropoma circinatum: Harmer 1957: 1003; Powell 1967a: 256.

MATERIAL EXAMINED: NZOI Stns K797, K818, K819, K820, K822, K825, K826$_2$, K829, K837, K850, K851, K855, K856, K857, K867, K871.

DISTRIBUTION: North Island (Pliocene to Recent), Three Kings Islands, Hauraki Gulf, Napier, Chatham Rise; also Victoria, Indonesia, Funafuti, Sri Lanka, Japan, Tristan da Cunha.

DESCRIPTION: Colony encrusting. Zooids 0.42–0.58 × 0.25–0.38 mm, with a convex frontal wall bordered by a row of closed pores with up to two rows adjacent to the orifice. Orifice with U-shaped sinus and articulated operculum. Oral spines six in ordinary zooids, four in ovicelled zooids. A prominent crescentic ridge proximal to the orifice. A large frontal avicularium on most zooids, directed proximally, extending from the suboral ridge to the proximal end of the zooid; the rostral rim slightly biconvex, usually with a rounded tip; no pivot bar but a pair of mandibular pivots. Ovicells globular, smooth or faintly textured, imperforate frontally but with small basal pores.

REMARKS: This is a very variable species. MacGillivray's (1869) Victorian material lacked avicularia, whereas they are common in New Zealand and Kermadec specimens. There is another morphotype common at the Kermadecs, which is characterised by the following differences – a suboral umbo instead of a crescentic ridge; more pores adjacent to the orifice; avicularium with open rostral tip, slightly biconcave rim and complete pivot bar.

In Powell's (1967a) material from Three Kings Islands there was a different association of characters – the crescentic suboral ridge was associated with avicularia open at the rostral apex but with mandibular pivots. His form B lacked a mucro of any sort and had biconcave avicularian rostra with closed apices and complete pivot bar. Harmer (1957) mentioned other variations, including a non-articulated operculum in some specimens. It seems apparent that only one polymorphic species is involved, although the extremes of variation, taken alone, could easily be regarded as separate species, as others have intimated.

Cribellopora Gautier, 1957

Colony encrusting. Zooids with scattered cribellate pores frontally. Orifice with sinus. Oral spines few, evanescent. No avicularia. Ovicells hyperstomial, smooth or with cribellate or simple pores. Multiporous mural septula present.

TYPE-SPECIES: *Schizoporella trichotoma* Waters, 1918

Cribellopora trichotoma (Waters) (Plate 31, A)

Schizoporella trichotoma Waters, 1918b: 19.
Cribellopora simplex Gautier, 1957: 211.
Cribellopora trichotoma: Gautier 1962: 154.

MATERIAL EXAMINED: NZOI Stns K801, K844, K851, K872.

DISTRIBUTION: Galapagos Islands, Gulf of California, Gulf of Mexico, Brazil, Cape Verde Islands, Mediterranean.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.48 ×

0.27–0.43 mm, with otherwise smooth frontal wall perforated by conspicuous cribellate pores; these being compound pores with 2–5 lacunae depending on the number of radii. Orifice with a shallow rounded sinus and flattened condyles. Occasionally a low suboral ridge. A single, delicate oral spine mid-distally or displaced to one side, or absent. No avicularia. Large, convex, multiporous septula low on side walls. Ovicells recumbent, with smooth, raised central area bordered by a row of cribellate pores.

REMARKS: This species is very similar to *Cribellopora divisopora* Powell, 1967 (Three Kings Islands to Bluff), which has, however, slightly deeper orifices and only simple ovicellular pores.

Lacerna Jullien, 1888

Colony encrusting. Zooids with convex frontal walls smooth centrally and bordered by marginal pores, which also occur adjacent to the orifice. Orifice with rounded sinus, inconspicuous condyles, and a few oral spines. No avicularia. Ovicells prominent, smooth frontally with small basal pores.

TYPE-SPECIES: *Lacerna hosteensis* Jullien, 1888

REMARKS: The genera *Lacerna, Buffonella, Phonicosia* and *Aimulosia* were introduced simultaneously by Jullien (1888). *Buffonella,* preoccupied, was subsequently renamed *Buffonellodes* (Strand 1928). Although the type-species of each genus was illustrated, a clear understanding of their diagnostic characters has been lacking, partly because of the similarity of structures in each, and because no-one has re-examined Jullien's types. *Phonicosia* has already been discussed (*see* p.87). A discussion of the other three genera now follows.

The type-species of *Lacerna, L. hosteensis,* was re-illustrated by Waters (1904) who recorded the presence of pore-chambers and a tatiform ancestrula. Waters's material certainly appears to have been conspecific, although he noted that the frontal wall of his material was slightly rugose, and his colonies occurred on stones and shell rather than on algae. He also showed a frontal suboral papilla in his material which was not present in Jullien's. Jullien, however, had sent to Waters a purported specimen of *L. hosteensis* for comparison. Lopez Gappa (1977) redescribed *L. hosteensis* from Tierra del Fuego. His material is clearly identical to Jullien's and his excellent illustration shows the features which are here taken to be characteristic of the genus, i.e., marginal pores, central imperforate area, oral spines, and lack of avicularia.

Canu and Bassler (1920) defined *Lacerna* without mentioning avicularia in the generic diagnosis. Notwithstanding, they included many aviculiferous species in *Lacerna* in the same work. This approach caused a subsequent misunderstanding of the genus. Osburn (1952) followed Canu and Bassler, as did Uttley and Bullivant (1972). Harmer (1957) regarded *Lacerna* and *Buffonellodes* as more or less synonymous, stating that the only difference of importance was the presence or absence of frontal pores. He overlooked the lack of avicularia in the type-species of *Lacerna,* however. Uttley and Bullivant, without comment, accepted *Lacerna* and *Buffonellodes,* including aviculiferous species in both, evidently relying on the presence or absence of areolae as the chief distinguishing feature. In this they possibly followed Bassler (1953) who diagnosed *Lacerna* as having a : "... pleurocyst with areolae ... no avicularia" and *Buffonellodes* with : "... frontal and ovicell an olocyst ... and small avicularium in front". Even if Uttley and Bullivant did not follow Bassler in this there is still another apparent inconsistency in their account, for they recorded from the Chatham Islands both *B. ridleyi* (MacGillivray) and *B. rimosa* (Jullien), the type-species (Pl. 31, B,C). *B. ridleyi* has marginal pores (MacGillivray 1883b : 191) and, following Waters (1904), *B. rimosa* has usually been regarded as a junior synonym of *B. ridleyi* (Harmer 1957 : 996; Lopez Gappa 1978 : 56). Unfortunately, Uttley and Bullivant did not explain either of these inconsistencies.

An examination of their paratype and other slides of Chatham Rise material throws considerable light on this problem. With the exception of *Lacerna improvisa,* which lacks ovicells, their *Lacerna* species have suboral avicularia and ovicells with frontal perforations and belong to *Schizomavella.* Their two *Buffonellodes* species are most interesting and, in the absence of good redescriptions of Jullien's material, appear to be accurately assigned. Thus *B. ridleyi* and *B. rimosa* are seen to be distinct. *B. ridleyi* has more elongated zooids with marginal pores and no oral spines, whereas *B. rimosa* has four oral spines and is completely imperforate.

I conclude that *Lacerna* and *Buffonellodes* are distinct genera and my diagnoses summarise what I believe to be the distinctive features of each.

The status of *Aimulosia* is less certain. Brown (1952 : 312) determined that the type-species, *A. australis,* is not conspecific with *Porella marsupium* (MacGillivray) [as Waters (1904) asserted]. From Brown's description of the orifice it seems apparent also that the diagnosis of Osburn (1952 : 352) cannot refer to Jullien's genus. Based on Jullien's illustration, *Aimulosia* seems very close to *Buffonellodes. B. marsupifera* (Busk), for example, has a "deep, squared sinus" like that mentioned by Brown.

Lacerna problematica n.sp. (Plate 31, D)

MATERIAL EXAMINED: NZOI Stns K826$_2$, K829, K837, K842, K851, K855, K872.

DISTRIBUTION: Kermadec Islands, 104–635 m.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.68 × 0.32–0.55 mm, fully contiguous. Frontal wall smooth, convex, with pores only marginally and adjacent to the orifice. Orifice with rounded V- to U-shaped sinus and more or less straight proximal shoulders supporting flat or angled condyles. Oral spines three, small, one mid-distally and an evanescent lateral pair. No avicularia. Ovicells rather globular, though longer than wide, smooth, with a basal row of pores. Multiporous mural septula present in lateral walls.

HOLOTYPE: Specimen, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–321.

PARATYPE: NZOI, type number P–542, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: This species shares the characters of *Arthropoma*, *Cribellopora* and *Phonicosia*. It has the non-porous central frontal area of *Phonicosia* but lacks avicularia. The orifice is very like that of *Cribellopora* in which a single mid-distal spine is common, but cribellate pores are lacking. *L. problematica* resembles *Schizoporella vandiemenensis* Powell, 1967a which, however, has four oral spines, no pores adjacent to the orifice, a peristomial rim, and a granular frontal wall.

On the basis of the combined characters, the Kermadec species is evidently a *Lacerna*, in spite of the lack of pore-chambers that Waters (1904) reported in the type-species.

Buffonellodes Strand, 1928

Colony encrusting. Zooids with smooth frontal walls that are imperforate or with small marginal pores. Orifice with U-shaped sinus; with or without oral spines. A prominent suboral umbo supports a small avicularium with a complete pivot bar. Ovicells prominent, smooth and imperforate. Small mural or basal pore-chambers present, with slit-like openings.

TYPE-SPECIES: *Buffonella rimosa* Jullien, 1888

Buffonellodes marsupifera (Busk) (Plate 31, E)

Schizoporella marsupifera Busk, 1884: 165.

MATERIAL EXAMINED: NZOI Stns K818, K819, K820, $K826_3$, K837, K851, K855, K857, K867.

DISTRIBUTION: Marion Island in the South Indian Ocean.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.50 × 0.40–0.55 mm, hyaline to opaque, with a smooth, shiny appearance to the frontal wall in spite of the minute, scattered tubercles; imperforate. A prominent avicularian umbo proximal to the orifice, with rounded rostrum inclined frontally; the pivot bar complete. Orifice with rather wide, deep sinus and squared, prominent condyles, the proximal end of the sinus completely obscured by the base of the umbo; a low peristomial rim on each side. No oral spines, except rarely a distal pair on young zooids at colony margins. Ovicells smooth, fairly prominent, often with an apical papilla.

REMARKS: Brown (1952 : 384) remarked that part of Busk's (1884 : 166) material from 150 fathoms off New Zealand was identical to *Schizoporella ridleyi* MacGillivray, in which case Busk's species is known only from Marion Island. The present species, however, is in close agreement with Busk's description and illustration except that Busk observed minute tubercles on the ovicells, which also have a finely beaded margin.

B. marsupifera is closely related to *B. rimosa*, from which it differs in the number of oral spines and in having the sinus obscured.

Schizoporella imperforata Powell, 1967a appears to be *B. rimosa*.

Buffonellodes ridleyi (MacGillivray) (Plate 31, F)

Schizoporella Ridleyi MacGillivray, 1883b: 191; MacGillivray 1887b: 148.
Schizoporella rhomboidalis Powell, 1967a: 266.
Buffonellodes ridleyi: Uttley & Bullivant 1972: 42.

MATERIAL EXAMINED: NZOI Stns K803, K818, K819, K837, K851, K856, K867, K872.

DISTRIBUTION: Three Kings Islands, Chatham Rise; also Victoria.

DESCRIPTION: Colony encrusting. Zooids 0.52–0.58 × 0.17–0.30 mm; frontal wall smooth with marginal areolar pores, rising to rounded suboral prominence bearing an avicularium; this short, inclined frontally, ovoid in shape, with the rostrum transversely oval, slightly wider than the opesial part; the pivot bar complete. One or two pores at the base of the avicularian prominence frontally. Orifice with straight proximal rim, U-shaped sinus, and narrow, straight condyles; orifice wider in ovicelled zooids. No oral spines. Ovicell smooth, more or less globular or slightly longer than wide; closed by the zooidal operculum.

REMARKS: This species agrees in all respects with MacGillivray's (1883b, 1887b) descriptions, except for the radial grooving of his older zooids. MacGillivray included in the synonymy of this species *Schizoporella marsupium* Ridley, 1881 from the Strait of Magellan. This was not *Lepralia marsupium* MacGillivray, 1869 nor, in fact, can it have been *Buffonellodes ridleyi*, for Ridley mentioned oral spines, which this species lacks.

B. ridleyi differs from the type-species, *B. rimosa*, in having marginal pores.

Family SMITTINIDAE Levinsen, 1909

Frontal wall evenly perforated or with marginal areolae only. Primary orifice with lyrula and/or condyles; peristome typically developed, with or without oral spines. Ovicell usually prominent, perforate or imperforate. Avicularia frequently suboral; often large spatulate adventitious avicularia, rarely vicarious. Pore-chambers or mural septula present.

Smittina Norman, 1903

Frontal wall uniformly porous. Orifice with lyrula and condyles; peristome usually present, with or without oral spines. Usually a median suboral avicularium, occasionally large spatulate avicularia. Ovicell punctured by numerous pores. Mural septula present.

TYPE-SPECIES: *Lepralia landsborovii* Johnston, 1847

REMARKS: *Grayporella* Annoscia, 1969, based on *Millepora cervicornis* Pallas, 1766, is a synonym of *Smittina* (*see* Cook 1968b : 210).

Smittina punctata Powell (Plate 32, A)

Smittina punctata Powell, 1967a: 324.

MATERIAL EXAMINED: NZOI Stns K837, K856.

DISTRIBUTION: Three Kings Islands.

DESCRIPTION: Colony encrusting. Zooids elongate to subhexagonal, 0.45–0.70 × 0.27–0.45 mm, with slightly raised margins. Frontal wall with 60–70 small pores, which may become occluded in older zooids. Primary orifice not obscured, with narrow, slightly alate lyrula flanked by rounded condyles. No avicularia. Thin, slightly raised peristome encircling the orifice. Ovicells subimmersed, somewhat flattened frontally with broad circular area with 15–25 perforations; encircled by a thin, imperforate layer of secondary calcification. Mural septula present.

REMARKS: The distinctive features of this species are the total lack of avicularia and the circular perforated area of the ovicell. The absence of avicularia in otherwise *Smittina*-like species was cited as a characteristic of the genus *Prenantia* Gautier, 1962 by Hayward and Ryland (1979), who noted also that in the type-species, *P. cheilostoma,* the ovicell opening is closed by the zooidal operculum and that basal pore-chambers are present. They thus tentatively included in *Prenantia* an aviculiferous species (*P. bella* (Busk)) with these two features. Although opercula are lacking in the Kermadec specimens, the arrangement of the primary orifice and ovicellular opening appears to be typical of *Smittina*. Mural septula are also present and *punctata* is thus retained here in *Smittina*.

Smittina rosacea Powell (Plate 32, B)

Smittina rosacea Powell, 1967a: 323.

MATERIAL EXAMINED: NZOI Stns K837, K871.

DISTRIBUTION: Three Kings Islands.

DESCRIPTION: Colony encrusting. Zooids somewhat elongate, 0.52–0.70 × 0.25–0.46 mm, with slightly raised thickened rims between them. Frontal wall rather flat, with numerous small pores; in older zooids a secondary layer over the frontal wall has larger, fewer pores, with a coarser appearance. Primary orifice mostly visible, with a moderately broad alate lyrula and rounded condyles. Peristome low, not very wide, open proximally with a small avicularium in the opening. Avicularium narrow, parallel-sided, directed proximally, with thin complete pivot bar. Ovicells subimmersed, scarcely raised above the level of the frontal wall and somewhat flattened frontally, with scattered pores and a marginal band of encroaching secondary calcification; not closed by the zooidal operculum. Septula present low on the lateral walls.

REMARKS: This species is distinguished from *S. torques,* a similar species, by the parallel-sided suboral avicularium and lack of a broad peristomial area.

Smittina spiraminifera n.sp. (Plate 32, C,D)

MATERIAL EXAMINED: NZOI Stns K820, $K826_1$.

DISTRIBUTION: Kermadec Islands, 95–160 m.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.73 × 0.27–0.63 mm, separated by thin, slightly raised margins. Frontal wall with around 60 pores and with smooth, imperforate peristomial collar completely surrounding the orifice. Peristome moderately tall and tubular; a spiramen on the proximal side and part way up the peristome. Primary orifice seen only in marginal zooids or where the peristome is broken; with a narrow, non-alate lyrula and small, flanking thorn-shaped condyles. Suboral avicularium within peristome adjacent to the spiramen, directed proximally; parallel-sided for part of its length, wider and rounded at the rostral tip. Ovicells raised, sub-globose, with around 20–25 small perforations. Mural septula present.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–307.

TYPE-LOCALITY: NZOI Stn $K826_1$, 28°48.0′S, 177°48.0′W. 142–160 m.

REMARKS: *S. spiraminifera* is distinguished from *S. purpurea* (Hincks), which also has a spiramen, by the

larger size of its zooids, the taller peristome, narrower lyrula, and avicularium completely surrounded by the peristome.

Smittina torques Powell (Plate 32, E)

Smittina torques Powell, 1967a: 325; Gordon 1970: 323; Ryland 1975: 388.

MATERIAL EXAMINED: NZOI Stns K820, K837, K851, K855.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf.

DESCRIPTION: Colony encrusting. Zooids elongate to subrectangular, 0.40–0.75 × 0.20–0.33 mm, with a coarsely perforate frontal wall with 30–40 pores. A rather broad, imperforate but tubercular, inflated peristomial collar proximal and lateral to the orifice. Primary orifice with a broad alate lyrula and acute triangular condyles at the same level. A median oral avicularium in the secondary orifice obscuring the base of the lyrula, the toothed spatulate rostrum directed proximally upward; with semicircular opesia and complete pivot bar. No other avicularia. Ovicells subimmersed, with 9–14 perforations, opening deeply into the peristome above the zooidal operculum. Mural septula present.

REMARKS: This species was first described by Powell (1967a) from the Three Kings Islands. It is also known from Leigh in the Hauraki Gulf (Ryland 1975), where live colonies are coloured orange. The chief distinguishing characteristics are the broad peristomial collar, and toothed spatulate avicularium in the secondary orifice.

Powell (1967a) referred to 6–8 pore-chambers in the distal wall. These are not the relatively large basal chambers normally implied by the use of this term, but the smaller mural type.

Emballotheca Levinsen, 1909

Colony encrusting or erect. Zooidal frontal wall evenly perforated. Orifice with convex proximal rim or lyrula, and lateral condyles; often dimorphic, the orifice of ovicelled zooids being larger. Ovicells porous, hyperstomial, prominent or subimmersed. Avicularia adventitious, spatulate, infrequent. Basal pore-chambers and/or mural septula present.

TYPE-SPECIES: *Eschara quadrata* MacGillivray, 1880

REMARKS: The generic diagnosis is based on Rogick's (1955) emended definition.

Soule and Soule (1973) introduced *Pleurocodonellina* for a single species with a pleurocystal frontal wall and a broad non-lyrulate poster. The type-species, *P. lahainae,* also has acute or spatulate frontal avicularia and the ovicell is closed by the zooidal operculum. But for the pleurocyst and the lack of a median convexity in the proximal rim of the orifice, *Pleurocodonellina* resembles *Emballotheca*. Both of these genera are somewhat on the fringe of the Smittinidae but are probably best included in this family than in any other.

Emballotheca monomorpha n.sp. (Plate 33, A)

MATERIAL EXAMINED: NZOI Stns K800, $K826_3$, K836, K858, K860.

DISTRIBUTION: Kermadec Islands, 38–720 m.

DESCRIPTION: Colony encrusting. Zooids moderately large, 0.75–1.33 × 0.65–0.78 mm, with distinct boundaries. Frontal wall little convex, evenly perforated with numerous small pores. Orifice wider than long, the proximal rim either almost straight or with a small median convexity resembling an incipient lyrula. Lateral condyles relatively small, subacute. No peristome or oral spines. An avicularian chamber immediately subjacent to the orifice in some zooids, the chamber broadly expanded and smooth-surfaced proximally, with the avicularium proper proximal to this; the rostrum long, broadly spatulate, orientated proximally or obliquely so; a thin, complete pivot bar. Ovicells raised, subglobular, with 40–50 small pores; the orifice not wider than in autozooids.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–284.

TYPE-LOCALITY: NZOI Stn K828, 28°35.4′S, 177°50.7′W, 440 m.

REMARKS: Whereas Harmer (1957) comments on dimorphic orifices as particularly characteristic of *Emballotheca,* Rogick's (1955) diagnosis allows for species without this feature. *Emballotheca monomorpha* resembles *E. buskii* Rogick, 1955 (for *Mucronella quadrata* Busk, not MacGillivray, preempting *E. pacifica,* Harmer, 1957), but in that species the avicularia originate from the zooidal margin, not suborally.

Emballotheca sp. (Plate 33, B)

MATERIAL EXAMINED: NZOI Stns $K828_{1,2}$.

DISTRIBUTION: Kermadec Islands, 440–510 m.

DESCRIPTION: Colony encrusting. Zooids fairly large, 0.75–0.98 × 0.50–0.75 mm. Frontal wall evenly perforated with numerous small pores. Orifice wider than long with a low median convexity in the proximal rim; condyles rounded. Peristome moderately developed, forming a smooth rim completely around non-ovicelled orifices, usually slightly sinuate proximally. No oral spines. Avicularia unknown. Ovicells only partly developed in Kermadec colonies, but orifices not dimorphic.

REMARKS: Like the preceding species, *Emballotheca* sp. lacks dimorphic orifices, and is distinguished from that species in having a peristome and in evidently lacking avicularia. It resembles *Lepralia graysoni*, MacGillivray, 1895, a Tertiary Victorian species which also evidently lacks both avicularia and dimorphic orifices. MacGillivray does not show a peristome, however, and the ovicells are large. Ovicells are only partially developed in the Kermadec colonies and their final size is unknown.

Schizosmittina Vigneaux, 1949

Colony encrusting to bilamellar. Zooids with evenly perforated frontal wall. Primary orifice with a distinct sinus and usually an adjacent suboral avicularium. Ovicell hyperstomial, perforated, not closed by the zooidal operculum.

TYPE-SPECIES: *Schizosmittina planovicellata* Vigneaux, 1949

REMARKS: This genus was established by Vigneaux (1949) for an apparent species of smittinid from the Miocene of France with a sinus instead of a lyrula and with an evenly perforated frontal wall. No other species of this genus are known to exist, but a Miocene-Recent Australasian species, *Lepralia maplestonei* MacGillivray, 1879a, may be a *Schizosmittina*. There has been some confusion over the generic assignment of this species. Because of the absence of a lyrula and the presence of a sinus, it was regarded by Hincks (1883), Jelly (1889), and MacGillivray (1890a, b) as a *Schizoporella*. Brown (1952) and Uttley and Bullivant (1972) assigned it to *Schizomavella*. Marcus (1921b), Vigeland (1952), and Powell (1967a) noted its affinities with the Smittinidae, however, and actually placed it in *Smittina*. Inasmuch as the orifice is not typical of *Smittina s.s.*, however, it should be placed elsewhere in the Smittinidae. *Schizosmittina* Vigneaux, 1949 appears to be the most suitable genus, although vicarious avicularia are not known in the type-species. *Alismittina* Soule & Soule, 1964 was established for a *Smittoidea*-like species with vicarious avicularia, but it is lyrulate with only marginal areolae.

The difficulty of assigning *Lepralia maplestonei* to an appropriate genus is paralleled by another smittinid, *Smittia signata* Waters, which Cheetham and Sandberg (1964) tentatively assigned to *Rimulostoma* Vigneaux.

Schizosmittina maplestonei (MacGillivray)
(Plate 33, C–F)

Lepralia maplestonei MacGillivray, 1879a: 24.
Schizoporella cinctipora Hincks, 1883: 200.
[?] *Schizoporella speciosa* MacGillivray, 1890a: 108.
Smittina maplestonei: Powell 1967a: 319 (*cum syn.*).
Schizomavella cinctipora: Uttley & Bullivant 1972: 41.

MATERIAL EXAMINED: NZOI: Stns K797, K798, K836, K848, K855, K871. DPG: Colonies from Hauraki Gulf, Totaranui, Kaikoura, Portobello, Bluff, Stewart Island.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Napier (Pliocene to Recent), Wanganui, Cook Strait, Chatham Rise, Totaranui, Kaikoura, Portobello, Bluff, Southland (Middle Miocene to Recent), Stewart Island, Auckland Island, Campbell Island; also Victoria, South Australia, Western Australia.

DESCRIPTION: Colony encrusting. Young zooids 0.42–0.63 × 0.30–0.38 mm, with somewhat flattened frontal walls and distinct boundaries marked by slightly raised rims; 50–70 small pores in the frontal walls and 2–4 marginal areolae on each side. Combined orifice longer than wide, the primary orifice sloping distally downward. Lyrula absent; a deep, almost circular sinus in the slightly convex proximal rim, which supports on each side an elongate corrugated condyle. Oral spines 1–4, evanescent, rare, even on marginal zooids. Peristome little developed, not raised above the level of the frontal wall initially, then acquiring, by advancement of secondary calcification from adjacent distal and distolateral zooids, smooth, raised and thickened margins. Ovicells flattened, subimmersed, with perforated frontal wall. Vicarious avicularia rare, large, with rounded rostrum and complete pivot bar. Mural septula present, low on the side walls.

REMARKS: Older zooids in Kermadec colonies were not heavily thickened. By contrast, in colonies from Hauraki Gulf, older zooids are seen to be markedly different from the younger zooids and the transition between old and young [or, more exactly, ephebic (with "adult" morphology) and neanic (with youthful morphology) irrespective of actual age (Ryland 1976)] in a single colony can be so abrupt that, should portions of a colony with youthful and adult morphologies be separated, they could be taken to be different species. This has in fact happened, for according to both MacGillivray (1890a) and Powell (1967a) *Schizoporella cinctipora* Hincks, 1883 and *S. lucida* Hincks, 1885 are synonymous. From Hincks's descriptions and drawings of these two species it is evident that the former was based on zooids with relatively youthful morphology and the latter on those with ephebic morphology.

I have seen both morphologies in a single colony from Leigh. The ephebic morphology is based on secondary calcification over the primary surface. The secondary layer has fewer, larger pores and the secondary orifice has prominent tuberosities around it. Ovicells appear immersed, with a few large frontal perforations, and are also encircled by tuberosities. The ovicell opening is not closed by the zooidal operculum.

Adventitious avicularia are of two kinds. A small suboral avicularium occurs proximolaterally (or proximally) to the sinus of the primary orifice of most ephebic zooids. It is directed obliquely proximally, is

wider distally, and has a complete pivot bar. A second type occurs on the frontal wall. It is much larger, also rounded, but the rostral apex is not quite as wide as the pivot bar. Adventitious avicularia were not seen in the Kermadec colonies.

A colony that I collected from Stewart island has a wider orificial sinus and a suboral avicularium directed obliquely distally. The condyles are narrower and not corrugated. It appears to be a morphotype of *S. maplestonei*. Powell (1967a) remarked that *Schizoporella speciosa* MacGillivray, 1890a was based on the wider sinus and that since there was no other apparent distinction between this form and *S. maplestonei s.s.* they ought to be considered synonymous. The orientation of the avicularium, however, suggests a distinction of possibly specific importance.

Hippomonavella Canu & Bassler *in* Bassler, 1934

Colony encrusting. Zooidal frontal wall imperforate centrally, with marginal areolae. Orifice with a gently concave proximal rim, lateral condyles, and no lyrula. No peristome or oral spines. Avicularia suboral or lacking. Ovicells hyperstomial, perforated. Mural septula present.

TYPE-SPECIES: *Lepralia praeclara* MacGillivray, 1895

Hippomonavella gymnae n.sp. (Plate 34, A)

MATERIAL EXAMINED: NZOI Stns K826$_1$ or $_2$, K834, K842.

DISTRIBUTION: Kermadec Islands, intertidal to 370 m.

DESCRIPTION: Colony encrusting. Zooids 0.80–0.90 × 0.50–0.70 mm, hyaline with a slightly convex, evenly textured frontal wall with about ten small areolae along each margin. Orifice roundly quadrate or slightly wider than long, no lyrula, the proximal rim shallowly concave, flanked by a pair of down-curved condyles. No oral spines. Avicularia unknown. Ovicells raised, subglobular, smooth-surfaced; with 15–20 small pores and bordered by a thin narrow band of encroaching secondary calcification; evidently closed by the zooidal operculum. Mural septula in vertical walls.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–290.

PARATYPE NZOI, type number P–562, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K826$_1$ or $_2$, 28°48.0′S, 177°48.0′W.

REMARKS: The genus *Hippomonavella* was established by Canu and Bassler (*in* Bassler 1934) for a Victorian Miocene fossil, *Lepralia praeclara* MacGillivray, 1895. The original diagnosis of this species included the following characters : "... surface smooth and hyaline; thyrostome [= orifice] large, expanded and rounded above, the lower lip slightly hollowed and having a small sharp denticle at each angle; ... Oecia large, prominent, flattened in front, the circumference smooth, the central part with numerous small concentrically arranged pores." The Kermadec colonies concur in almost all respects with the description except that the frontal wall is lightly textured and the ovicells are relatively slightly smaller. *H. praeclara* also has a suboral avicularium "situated mesially or to one side". Oddly, Bassler's diagnosis of the genus differed in two details from MacGillivray's description, stating that the condyles were "median" and that the suboral avicularium was placed "on the median axis" only. MacGillivray's illustration (reproduced by Bassler 1953 : 205) is clear on these points. The Kermadec colonies lack avicularia but, as noted, agree in all other respects.

Osburn (1952) placed two Recent species from the Pacific coast of North America in *Hippomonavella*, but these do not resemble the type-species as closely as do the Kermadec colonies. In the details of the orifice and the ovicell *Hippomonavella* resembles *Hippothyris* Osburn and *Emballotheca* Levinsen. *Pleurocodonellina* Soule & Soule is also very closely related, as they (1973) observed.

Smittoidea Osburn, 1952

Colony encrusting. Zooidal frontal wall imperforate centrally, with marginal areolae. Primary orifice with lyrula and condyles. Avicularia adventitious, usually situated medially on the frontal wall proximal to the orifice. Ovicell hyperstomial, evenly perforated; not closed by the zooidal operculum. Mural septula present.

TYPE-SPECIES: *Smittoidea prolifica* Osburn, 1952

Smittoidea curtisensis n.sp. (Plate 34, B)

MATERIAL EXAMINED: NZOI Stns K826$_3$, K837, K851.

DISTRIBUTION: Kermadec Islands, 104–490 m.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.63 × 0.32–0.53 mm, wider distally, tapering proximally. Frontal wall convex, rising to a high peristome, slightly rugose, with 6–7 areolae near each margin. Primary orifice deep, obscured by the peristome; lyrula relatively low, squared, non-alate, moderately broad, flanked by recurved thorn-like condyles. Secondary orifice rounded or high-arched, with deep, fairly wide U-shaped sinus and squared shoulders, or the shoulders lacking; the distal corners of this peristomial sinus simulating condyles in frontal view but appearing as thin lamellae descending with the sinus. A long acute

avicularium, generally in the mid-line at the base of the peristome or a little proximal to it, either straight and directed proximally or curving somewhat obliquely. Ovicells subimmersed, somewhat flattened frontally, with around 30 pores and a thick marginal layer of encroaching secondary calcification.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–313.

PARATYPE: NZOI, type number P–554, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K851, Curtis Island, 30°33.3′S, 178°31.8′W, 104–106 m.

REMARKS: This species superficially resembles *Parasmittina serrula* Soule & Soule (q.v.) and certain specimens of Harmer (1957) which he ascribed to *Smittina* (= *Smittoidea*) *levis* (Kirkpatrick). It is distinguished from both of these species in external form and internal details of the peristome. *S. curtisensis* also resembles *S. hyalina* n.sp., but has a higher peristome and lacks oral spines.

Smittoidea hyalina n.sp. (Plate 34, C)

MATERIAL EXAMINED: NZOI Stns K827, K828, K851, K856.

DISTRIBUTION: Kermadec Islands, 104–490 m.

DESCRIPTION: Colony encrusting, hyaline. Zooids 0.65–1.00 × 0.37–0.58 mm, with smooth or slightly textured frontal walls with 7–8 areolae along each margin; zooidal boundaries marked by thin raised rims. Primary orifice fairly deep, with a scarcely broad alate lyrula and small thorn-like condyles. Oral spines 2–3. Secondary orifice rimmed by a raised, oval to triangular, broad-based peristome. A moderately long, narrow avicularium in the mid-line below the peristome, with acute rostrum and thin, complete pivot bar; a pore either side of the distal end of the avicularium in the base of the peristome. Ovicells subimmersed, a little flattened frontally, with 55–60 pores.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–308.

TYPE-LOCALITY: NZOI Stn K827, 28°45.4′S, 177°46.5′W, 260–318 m.

REMARKS: This species seems close to part of Harmer's (1957) *Smittina levis* (Kirkpatrick) from Indonesia. Harmer's account is puzzling, however. He ascribes the Indonesian material to Kirkpatrick's species, which came from Torres Strait, but Harmer's specimens appear to differ from Kirkpatrick's (1890b) description. The Torres Strait material appears to have an imperforate ovicell (it is described as "smooth" and illustrated without pores); the distal margin of the primary orifice is described as having a "well-developed horizontal pectinate ridge"; and the median avicularium is shown as relatively large and somewhat removed from the secondary orifice. Harmer described his specimens as having a tubercular surface, and included in the synonymy of the purported *S. levis* three taxa described and illustrated by Canu and Bassler (1929a) which have a decidedly granular surface. Kirkpatrick, however, described the zooids as smooth, and this feature is reflected in the specific epithet. What is puzzling is that Harmer, working at the British Museum, had access to Kirkpatrick's type, which resides there. In his remarks on the species Harmer discusses none of the characteristic features that Kirkpatrick described.

The specimen shown in Harmer's pl. 53, fig. 1 may be conspecific with the Kermadec colonies though there are some minor differences in the form of the secondary orifice and the length of the avicularium. I consider neither Harmer's specimens nor the Kermadec specimens to be equivalent to Kirkpatrick's species.

Smittoidea magna n.sp. (Plate 34, D)

[?] *Smittoidea ?hexagonalis*: Hayward & Cook 1979: 89.

MATERIAL EXAMINED: NZOI Stn unknown.

DISTRIBUTION: Kermadec Ridge; ?also eastern South Africa.

DESCRIPTION: Colony encrusting. Zooids large, 1.00–1.28 × 0.77–1.05 mm; frontal walls almost flat, only slightly textured, with about 12 areolar pores on each side. Primary orifice visible, with a moderately broad non-alate lyrula and sharp thorn-like condyles. Peristome a narrow low rim completely encircling the orifice. In the mid-line just proximal to the peristome a relatively small rounded avicularium with thin, complete pivot bar. Ovicells not immersed, subglobular, with up to 50 small pores frontally.

HOLOTYPE: A portion of a colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–324.

TYPE-LOCALITY: Kermadec Ridge.

REMARKS: This exceptionally large *Smittoidea* is distinguished by its relatively thin, almost hyaline, walls and loosely encrusting habit. A number of zooids had a single, relatively large, hole in their frontal wall resembling the bore-hole of a predatory organism.

Hayward and Cook (1979) indicated the presence of oral spines in their material from South Africa, which they noted resembled *Smittia hexagonalis* O'Donoghue. The zooids of their species were not as large as those of the Kermadec colony.

Smittoidea zelandiae (Brown) (Plate 34, E)

Smittinella zelandiae Brown, 1952: 335.

MATERIAL EXAMINED: NZOI: Stns K799, K801, K804, $K826_3$, K840, K842, K858, K871, K872. NZGS: Slide of G.H. Uttley labelled *Smittinella zealandiae* Brown, Waipukurau Limestone.

DISTRIBUTION: Kermadec Islands; also Middle Oligocene of Nelson, Pliocene of Wanganui and Hawkes Bay.

DESCRIPTION: Colony encrusting. Zooids elongate, 0.42–0.50 × 0.23–0.38 mm, with somewhat rugose frontal wall bordered by up to 11 areolar pores on each side. Primary orifice with a moderately broad non-alate lyrula and thorn-like, slightly recurved condyles. Secondary orifice tapering proximally, flanked by a low, rounded peristome which is interrupted proximally by a median frontal avicularium; this small, oval in shape, directed proximally; with thin, complete pivot bar. No other avicularia. Oral spines 4–5, absent from ovicelled zooids. Ovicells subimmersed, the frontal area perforated by around 30 pores and bordered by a narrow margin of secondary calcification from adjacent zooids. Certain colonies from the Kermadecs had a slightly more pyriform orifice and larger areolae.

REMARKS: In Brown's (1952) fossil material the avicularian cavity was partially infilled and the pivot bar was lacking and he interpreted the cavity to be a spiramen ("... sinus of secondary orifice completely occluded by coalescence of lateral denticles."). Examination of a slide of this species from the N.Z. Geological Survey shows some zooids with exposed, broken avicularian chambers. This Pliocene material is more or less identical to the Kermadec colonies. Brown (1952) had recorded a geochronological range from Middle Oligocene to Upper Pliocene. With the finding of this species at the Kermadecs the range is extended to the present.

S. zelandiae, like *S. hyalina* and *S. curtisensis,* resembles a form ascribed to *S. levis* (Kirkpatrick) by Harmer (1957 : pl. 63, fig. 2) and is probably conspecific with it. It differs from *S. levis s.s.* in lacking long acute avicularian mandibles. It is likewise similar to *S. ornatipectoralis* Rogick, 1956b from the Antarctic, which has longer avicularia, fewer ovicellular pores, and a secondary orifice wider than long. Ortmann's (1890 : pl. 3, fig. 23) *Smittia landsborovii* (Johnston) is probably conspecific with *S. zelandiae.* True *S. landsborovii,* the type of *Smittina,* differs from *Smittoidea, inter alia,* in having pores evenly distributed over the frontal surface.

Parasmittina Osburn, 1952

Colony encrusting to bilamellar. Zooidal frontal wall imperforate centrally, with marginal areolae. Primary orifice with lyrula and condyles. Avicularia present, typically situated lateral to the orifice; additional larger adventitious avicularia often present. Ovicell prominent, usually with few, large perforations. Small basal pore-chambers present.

TYPE-SPECIES: *Lepralia jeffreysi* Norman, 1876

Parasmittina delicatula (Busk) (Plate 35, A)

Hemeschara fairchildi Hutton, 1873: 100 (*partim*).
Mucronella delicatula Busk, 1884: 156.
Smittia unispinosa Waters, 1889a: 15; Hutton 1891: 105; Hamilton 1898: 195.
Smittina unispinosa: Livingstone 1929: 90; Brown 1952: 327.
Smittina aviculata Mawatari, 1952: 240.
[?] *Smittina fistulata* Harmer, 1957: 925 (*partim*).
Parasmittina unispinosa: Powell 1967a: 330.
Parasmittina delicatula: Soule & Soule 1973: 401.

MATERIAL EXAMINED: NZOI: Stn K851. DPG: Colonies from Whangarei Heads and Leigh.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Wanganui (Upper Pliocene to Recent), Cook Strait; also Victoria, New South Wales, Hawaii, Japan.

DESCRIPTION: Colony encrusting to semi-erect and bilamellar. Zooids 0.48–0.78 × 0.32–0.53 mm, elongate-rectangular to shorter and subquadrate. Frontal wall in marginal zooids almost smooth to faintly textured, distinctly granular in mature zooids, bordered by 7–9 areolae along each margin. Primary orifice readily visible, the lyrula non-alate, moderately broad, flanked by a pair of recurved, thorn-like condyles. Peristome a thin rim completely encircling the primary orifice, generally produced into a rounded or angular lappet on each side. Oral spines 0–1, inside the distal peristomial rim in the mid-line. Avicularia varied: generally small, elongate-oval in shape, directed proximally, with rounded rostrum and thin, complete pivot bar; or large and spatulate, as long as the parent zooid, with extensive palatal surface and relatively small pyriform to triangular rostral opesia, with complete pivot bar or only a pair of pivots, with the central part wanting; avicularia of intermediate length also occur. Ovicells moderately large, the distal side covered in encroaching secondary calcification which may project a little proximally, the proximofrontal surface perforated by around 20 pores which may have minute projecting rims.

REMARKS: *Parasmittina delicatula* is a well characterised species in New Zealand usually known as *P. unispinosa.* Thanks to the work of Soule and Soule (1973), who acquired further information on Busk's (1884) species and illustrated additional material with scanning electron micrographs, it is now evident that *P. unispinosa* (Waters, 1899a) is a junior synonym. They had noted the similarities among Busk's and Waters's species and their *P. decorata.*

All three are characterised by a single oral spine (occasionally 2–3 or none at all), oral lappets, an identical primary orifice, and variable avicularia. They distinguished their *P. decorata* on the basis of more numerous avicularia, much larger more globose ovicells and a strictly encrusting mode of growth. Busk's species was commonly found as unilaminar tubular colonies arising from an encrusting base. At Whangarei I have encountered extensive sheets of this species (as *P. unispinosa*), white to pale pink in colour, covering the whole undersides of some low tidal boulders, with zooids ranging from ordered and relatively large and elongate to more irregularly orientated and celleporiform, with erect fronds and occasional incipient tubular portions. It is a very variable species in terms of growth form and in numbers, shapes, and disposition of avicularia. Whangarei colonies had, in addition to large and small spatulate types, raised acute-mandibled avicularia like those shown by Soule and Soule in *P. delicatula* (Busk). I thus regard *P. unispinosa* as a junior synonym of *P. delicatula*.

Parasmittina decorata Soule & Soule is unusual in its much larger ovicells, but otherwise would seem to fall into the range of variation of *P. delicatula* as now understood. It could be regarded as a subspecies of *P. delicatula* but Soule and Soule were able to compare both forms and regarded them as distinct.

As the Soules point out, part of *Smittina fistulata* Harmer, 1957 is very probably *P. delicatula*. Patricia Cook of the British Museum, at their request, compared the types of Busk's and Harmer's species and noticed only minor differences in the orificial condyles and relative numbers of spatulate avicularia.

Smittina aviculata Mawatari, 1952 is certainly conspecific with *P. delicatula*. Mawatari's clear illustrations show all of the diagnostic features that are found in New Zealand specimens.

Parasmittina serrula Soule & Soule (Plate 35, B,C)

Parasmittina serrula Soule & Soule, 1973: 386.

MATERIAL EXAMINED: NZOI Stns K797, K820, K822, K827, K837, K855, K857.

DISTRIBUTION: Hawaiian Islands.

DESCRIPTION: Colony encrusting. Zooids relatively small, 0.35–0.48 × 0.20–0.30 mm. Frontal wall covered with small tubercles and bordered by 9–13 areolae on each side. Primary orifice with narrow non-alate lyrula and angular condyles, partly obscured by the raised peristome, which is highest proximolaterally, the rim dipping on each side distally, the distal part being bordered by four prominent spines; the peristome with a descending proximal sinus flanked by sometimes very tall, narrow peristomial processes. One or a pair of lateral-oral avicularia, directed obliquely proximally; long, narrow, often with only one rim developed and lying on one side, with one or both rims finely serrated, and a thin, complete pivot bar; occasionally an avicularium is much larger and swollen at its proximal end. Ovicells raised, subglobular, with about 15 pores; sometimes partly immersed with a thin border of secondary calcification.

REMARKS: The Kermadec specimens agree closely with the description of Soule and Soule's (1973) Hawaiian material. They noted that the oral spines may number 3–6, but in all other details they appear identical.

Parasmittina tropica (Waters) (Plate 35, D)

Smittia tropica Waters, 1909: 174.
Smittina tropica: Harmer 1957: 934.
Parasmittina tropica: Cook 1968b: 215; Hayward 1974: 384.

MATERIAL EXAMINED: NZOI Stn K851.

DISTRIBUTION: Queensland, Indonesia, Philippines, Sri Lanka, Red Sea, Aegean Sea, West Africa.

DESCRIPTION: Colony encrusting. Zooids 0.57–1.00 × 0.42–0.75 mm. Frontal wall covered with small tubercles and bordered by 9–13 areolae along each margin. Primary orifice with narrow non-alate lyrula and angular condyles. A pair of oral spines visible in a few marginal zooids. Secondary orifice bounded by a thin, raised peristome which is level all round except for a proximal sinus, or is occasionally higher distally. Avicularia short to relatively long, almost parallel-sided but tending to taper to an acute point; occasionally one of these replaced by a huge subspatulate avicularium occupying much of one side of the frontal wall and thin scattered oval avicularia proximally on the frontal wall and/or distolateral to the orifice. Ovicells raised though partly subimmersed, with a number of small pores.

REMARKS: This seems to be a variable species. The Kermadec colonies agree in most respects with Hayward's (1974) description of specimens from the Aegean Sea. The type-locality is the Sudanese Red Sea and Harmer (1957) described material from Indonesia and other localities. Harmer's specimens were varied and may not all be conspecific but, in the paired oral spines, peristomial sinus, narrow non-alate lyrula and lateral-oral avicularia, much of his material agrees with the Kermadec colonies. He also depicts (pl. 64, fig. 28) a large avicularium with a subspatulate rostrum.

Parasmittina tubula (Kirkpatrick) (Plate 35, E)

Smittia tubula Kirkpatrick, 1888: 79; Thornely 1905: 123.
Smittina tubula: Harmer 1957: 940.

MATERIAL EXAMINED: NZOI Stn K855.

DISTRIBUTION: Sri Lanka, Mauritius, Madagascar.

DESCRIPTION: Colony encrusting. Zooids 0.25–0.40 × 0.20–0.33 mm, somewhat quadrate or subhexagonal, not elongate. Frontal wall lightly rugose, with 6–7 areolae along each margin, rising to the peristome which is also rugose. Primary orifice somewhat obscured by the peristome, with extremely broad non-alate lyrula flanked by blunt condyles, the sinuses between the lyrula and condyles much reduced. Secondary orifice delimited by six spine bases distally and peristomial rim laterally and proximally; a U-shaped peristomial sinus present. Avicularia lateral-oral, paired or single, ascending the peristome but not reaching the rim, which is also not extended into lappets; the rostrum tapering, subacute; a thin, complete pivot bar. Ovicells subimmersed, rounded, with about 20 small, slightly rimmed pores; one pair of oral spines in ovicelled zooids.

REMARKS: Soule and Soule (1973 : 410) discussed a number of species of *Parasmittina* with ascending lateral-oral avicularia. They did not, however, mention *P. tubula*, which differs from the other species in having six spines associated with the peristome (two in ovicelled zooids), and relatively small peristomial avicularia, of equal size and orientation when paired, and not attaining the rim of the peristome. Harmer's (1957) illustration of Kirkpatrick's species shows the peristomial sinus, six spines and one ascending avicularium, and Kirkpatrick's (1888) description mentions, in addition, a broad lyrula. Thornely (1905), who reported Kirkpatrick's species from Sri Lanka, mentioned the two oral spines in ovicelled zooids. The only discrepancies between Kirkpatrick's description and specimens of Harmer, Thornely, and from the Kermadecs are that Kirkpatrick did not mention condyles, and he described the lateral-oral avicularia as having rounded, instead of acute, rostra.

Hemismittoidea Soule & Soule, 1973

Colony encrusting. Zooidal frontal wall imperforate centrally, with marginal areolae. Primary orifice with lyrula and condyles. Secondary orifice with spines and a distinct proximal sinus. A single submedian avicularium arising from a distolateral areola and a median peristomial pore. Ovicells hyperstomial with frontal pores; not closed by the zooidal operculum. Uniporous septula present low on vertical walls.

TYPE-SPECIES: *Hemismittoidea corallinea* Soule & Soule, 1973

REMARKS: Soule and Soule (1973) established the genus *Hemismittoidea* for *Smittoidea*-like bryozoans in which the avicularium arises from one of the distolateral areolae and a median peristomial pore above or below the lyrula. In *Smittoidea s.s.* the avicularium arises equally from a distolateral pore on each side and the median pore is evidently typically lacking. Whether or not this feature is sufficient basis for separating a full genus is debatable.

Hemismittoidea hexaspinosa (Uttley & Bullivant)
(Plate 35, F)

Parasmittina hexaspinosa Uttley & Bullivant, 1972: 32.

MATERIAL EXAMINED: NZOI: Stns K795, K796, K797, K801, K812, K818, K820, K829, K837, K851, K855, K856, K858. Also NZOI specimen P–163, paratype slide of *Parasmittina hexaspinosa*.

DISTRIBUTION: Chatham Rise.

DESCRIPTION: Colony encrusting. Zooids relatively small, 0.27–0.48 × 0.18–0.35 mm, the frontal wall lightly rugose, with 4–6 relatively large areolae along each margin. Primary orifice somewhat obscured by a peristome, with a fairly broad non-alate to slightly alate lyrula, and curved condyles which are set slightly distal to the edge of the lyrula. Peristome with relatively narrow rounded sinus, distally constricted, with seven oral spines, of which one or both of the proximal pair may become covered by secondary calcification. A single lateral-oral avicularium immediately adjacent to the peristomial sinus, directed obliquely proximally towards the zooidal margin; with relatively long tapering rostrum; the rim acute and finely serrated; the pivot bar thin, curved, complete, with small ligula. Ovicells subimmersed, with around 30 small pores and a thin peripheral band of encroaching secondary calcification.

REMARKS: The type-species, *H. corallinea*, from Hawaii, is very close to *H. hexaspinosa* and may possibly be conspecific. The differences are fairly minor. *H. corallinea* has more areolae on each side, the peristomial sinus is slightly wider, the avicularia are shorter, and the ovicellular pores become occluded. In the dimensions of the sinus and avicularium and in the number of spines the type material of *H. hexaspinosa* seems closer to *H. corallinea* than to the Kermadec specimens, but it has the smaller number of areolae. It also lacks the ligula on the avicularian pivot bar, which both *H. corallinea* and the Kermadec specimens have.

Rhamphostomella van Lorenz, 1886

Colony encrusting to bilamellar. Zooidal frontal wall smooth centrally with marginal areolae or with pores encroaching frontally with secondary calcification; sometimes marginal ribbing between the areolae. Primary orifice with or without a lyrula; no condyles. Peristome present or absent; if present, divided by a proximal sinus into two usually unequal lobes, one of which supports an avicularium. Ovicell perforate or imperforate. Mural septula present.

TYPE-SPECIES: *Rhamphostomella costata* van Lorenz, 1886

REMARKS: Kluge (1962, 1975) established a family Rhamphostomellidae for *Rhamphostomella* van Lorenz and *Escharopsis* Verrill, evidently separated from the Smittinidae primarily on the basis of the asymmetrical aviculiferous peristome. This is not the place to discuss the relationships of *Escharopsis* but, insofar as *Rhamphostomella* is concerned, its affinities are clearly smittinid, as traditionally recognised, and I here retain it in this family.

Rhamphostomella rogickae (Brown) (Plate 36, A)

Smittina rogickae Brown, 1958: 73.
Rhamphostomella biperforata Powell, 1967a: 332.

MATERIAL EXAMINED: NZOI Stns K798, K803, K819, K820, K829, K837, K850, K851, K854, K855, K856, K857, K867.

DISTRIBUTION: Three Kings Islands, outer Hauraki Gulf; also Oligocene of south-west Victoria.

DESCRIPTION: Colony encrusting. Zooids 0.35–0.50 × 0.22–0.30 mm, with smooth or slightly textured frontal wall bordered by 4–7 areolae along each margin. Primary orifice with a broad alate lyrula, no condyles, and an entire or finely serrated distal rim. Oral spines 2–3 in young zooids, soon becoming immersed in older or ovicelled zooids. Primary orifice partly obscured by a raised peristome with a deep asymmetrical sinus. An avicularium at the inner edge of the sinus, orientated at an angle transversely; with relatively long, acute rostrum and narrow pivot bar. Ovicells subimmersed, smooth, with two conspicuous foramina.

REMARKS: Powell (1967a) commented that his *Rhamphostomella biperforata* was "... strikingly similar ..." to *Smittina rogickae* Brown, 1958 and that the only apparent differences between them were a finely serrated distal orificial margin and the absence of oral spines in Brown's species. Since the serrated margin is present in many zooids of the Kermadec colonies and spines are not necessarily well preseved in fossil material, I am inclined to regard the two as conspecific.

Porella Gray, 1848

Colony encrusting or erect. Zooidal frontal wall with marginal pores only. Primary orifice with lyrula and condyles variously developed, occasionally absent. Oral spines typically absent. Avicularium suboral, usually within a peristome. Vicarious avicularia absent. Ovicell prominent or becoming immersed, usually imperforate or a single small pore; not closed by the zooidal operculum. Basal pore-chambers present.

TYPE-SPECIES: *Millepora compressa* J. Sowerby, 1805

Porella marsupium (MacGillivray) (Plate 36, B)

Lepralia marsupium MacGillivray, 1869: 136; MacGillivray 1879a: 22.
Porella marsupium: Hamilton 1898: 195; Brown 1952: 312; Powell 1967a: 333 (*cum syn.*); Uttley & Bullivant 1972: 32.

MATERIAL EXAMINED: NZOI: Stns K797, K837. DPG: Colonies from Hauraki Gulf, Castlepoint, Otago Harbour.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Cook Strait, Castlepoint, Chatham Rise, Otago Harbour; also Miocene of Southland, Pliocene of Hawkes Bay and Wanganui, Miocene to Recent of Victoria.

DESCRIPTION: Colony encrusting. Zooids 0.47–0.53 × 0.16–0.28 mm, rather quadrate and relatively short, with convex frontal wall rising fairly steeply as it merges into a prominent avicularian chamber. Primary orifice not much obscured by peristome, with broad, low non-alate lyrula and no condyles. Suboral avicularium small but surmounting a prominent chamber up to more than half the area of the frontal wall; with rounded rostrum and complete pivot bar. Ovicells prominent, subglobular, only a little larger than the swollen avicularian chamber; smooth, imperforate.

REMARKS: The supposed relationship of this species with *Aimulosia australis* Jullien has already been discussed (*see* p.88). Powell (1967a) has discussed other species ascribed to *P. marsupium*.

Porelloides Hayward, 1979

Colony erect, with frontal and basal surfaces, attached by an encrusting basal portion, or strictly encrusting. Zooidal frontal wall with marginal pores only. Primary orifice with lyrula and no condyles. Peristome incorporating a suboral avicularium. Ovicell imperforate; not closed by zooidal operculum. Vertical walls deep with multiporous mural septula.

TYPE-SPECIES: *Cellepora laevis* Fleming, 1828

Porelloides glabra n.sp. (Plate 36, C,D)

MATERIAL EXAMINED: NZOI Stn K840.

DISTRIBUTION: Kermadec Islands, 398–412 m.

DESCRIPTION: Colony erect, circular in cross-section, bifurcating. Zooids 0.52–0.58 × 0.35 mm, usually alternating, sometimes at the same level; in three irregular longitudinal series, facing frontally or laterofrontally, the abaxial surface smooth, comprising basal and lateral walls of the autozooids. Frontal walls very smooth, with small marginal pores. Primary orifice deep, with a broad lyrula and no condyles. A small suboral avicularium with spatulate rostrum present in

the secondary orifice. Ovicells not seen. Small multiporous mural septula present.

HOLOTYPE: Part of a colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–314.

TYPE-LOCALITY: NZOI Stn K840, Macauley Island, 30°17.4′S, 178°25.3′W, 398–412 m.

REMARKS: The generic placing of this species is difficult. There are now a number of genera ascribed to the Smittinidae and the exact boundaries of some of them have yet to be clearly established. The absence of ovicells from the single specimen of *P. glabra* is a disadvantage in this regard. The genus *Bryocryptella* Cossman, 1906 (for *Cryptella* Jullien, 1903, preoccupied), based on *B. torquata* (Jullien), is characterised by erect colonies with two surfaces, and zooids with a suboral avicularium and only marginal pores. The type-species lacks a lyrula, however. Hayward and Ryland (1978 : 153) tentatively assigned a lyrulate species to *Bryocryptella* and Hayward (1979) erected a new genus, *Porelloides,* which is lyrulate with no condyles and has many of the characteristics of *Bryocryptella*. The two genera are very close and seem to be distinguished chiefly on the basis of the lyrula. The type of *Porelloides, P. laevis,* also has basal and abaxial kenozooids but the other species ascribed by Hayward to this genus, *P. struma* (Norman), lacks them. They are also absent from *P. glabra*. Ovicells in the type-species of both genera are imperforate. *Smittina landsborovii* subsp. *wiebachi* d'Hondt, which Hayward and Ryland (1978) provisionally ascribed to *Bryocryptella,* is the odd one out. It is lyrulate, like *Porelloides,* and has perforated ovicells. While the significance of the type of pore-chamber in a genus is not finally known, it may be noted that *Porelloides laevis* and *P. glabra* have mural septula whereas *B. wiebachi* has regular pore-chambers. The type of chamber in *B. torquata* is not known.

Family ESCHARELLIDAE Levinsen, 1909

Zooidal frontal wall with marginal pores only. Primary orifice typically with lyrula and condyles; enclosed by a well developed peristome and with conspicuous oral spines. No avicularia. Ovicell prominent, imperforate. Basal pore-chambers present.

Escharella Gray, 1848

Colony encrusting or bilamellar. Zooidal frontal wall imperforate with marginal areolae. Primary orifice with well developed lyrula, condyles small or absent. Peristome and oral spines well developed. No avicularia. Ovicell not closed by the zooidal operculum. Numerous small basal pore-chambers present.

TYPE-SPECIES: *Lepralia immersa* Fleming, 1828

Escharella incudifera n.sp. (Plate 36, E,F)

MATERIAL EXAMINED: NZOI Stn K851.

DISTRIBUTION: Kermadec Islands, 104–106 m.

DESCRIPTION: Colony encrusting. Zooids elongate, 0.95–1.35 × 0.45–0.90 mm; the frontal wall finely textured, with 12–16 pores along each margin and a few scattered pores frontally at the proximal end; rising to a prominent peristome. A semicircle of six oral spines on the distal rim of the peristome, the proximal rim with a sharp-edged raised lip, often in the form of a cock's comb. Primary orifice with a prominent alate lyrula flanked by deep sinuses; no condyles. Ovicells prominent, subglobular, imperforate, with a thin smooth rim proximally and 1–2 pairs of oral spines, of which one or both spines of a pair may be fused. Numerous simple mural pores present.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–310.

PARATYPE: NZOI, type number P – 545, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K851, Curtis Island, 30°33.3′S, 178°31.8′W, 104–106 m.

REMARKS: This species is unusual in lacking basal pore-chambers. The mural pores may be interpreted to represent the location of basal chambers which occur, instead, in a mural position. *E. incudifera* superficially resembles *Elleschara bensoni* (Brown) which has, however, an umbonuloid frontal wall, and in which a descending peristomial ridge merely simulates a lyrula.

Family CREPIDACANTHIDAE Levinsen, 1909

Colony encrusting. Zooidal frontal wall with marginal pores only and peripheral spines. Orifice trifoliate or approaching the hippopodinid condition. Avicularia small, paired, adjacent to the orifice; with setiform mandibles. Ovicells hyperstomial, with frontal pores. Small basal pore-chambers present. Ancestrula tatiform.

Crepidacantha Levinsen, 1909

Characters as for the family.

TYPE-SPECIES: *Crepidacantha crinispina* Levinsen, 1909

Crepidacantha bracebridgei Brown (Plate 37, A)

Crepidacantha bracebridgei Brown, 1954c: 255; Powell 1967a: 343.

MATERIAL EXAMINED: NZOI Stns K796, K803, K820,

Sig. 7*

K825, K827, K829, K836, K837, K838, K843, K844, K848, K850, K851, K855, K857, K866.

DISTRIBUTION: Colony encrusting. Zooids of variable size, 0.50–0.75 × 0.37–0.60 mm, with a fine-grained frontal surface bordered on each side and proximally by a row of small pores, and distally and distolaterally by many long, slender recumbent spines which emerge from just above or adjacent to the pores. Orifice trifoliate, with anter longer than wide and tapering, the poster with two rounded concavities and median rim curved or almost straight. Often a prominent suboral umbo. A pair of small avicularia adjacent to the orifice usually level with the junction between anter and poster, with long setiform mandibles directed proximally. Ovicell recumbent, smooth, with round or narrowly oval flat perforated area apically.

REMARKS: Some colonies from the Kermadecs have larger zooids, with a slightly raised rim around the orifice. The punctured area of the ovicell is limited proximally by a blunt mucro and has more pores. These colonies are identical to those described by Powell (1967a) from Three Kings Islands. There are intermediates between the two forms which otherwise conform to Brown's (1954c) description.

Crepidacantha crinispina Levinsen (Plate 37, B)

Crepidacantha poissoni [sic] var. *crinispina* Levinsen, 1909: 266.
Crepidacantha crinispina: Powell 1967a: 342 (*cum syn.*);
Gordon 1967: 61; Uttley & Bullivant 1972: 48.

MATERIAL EXAMINED: NZOI: Stns K795, K796, K797, K801, K803, K812, K818, K819, K822, K826$_2$, K827, K833, K837, K842, K850, K851, K854, K855, K856, K857, K859, K863, K867, K871. DPG: Colonies from Hauraki Gulf, Auckland Harbour, Nelson, Totaranui.

DISTRIBUTION: Three Kings Islands, Leigh, Auckland, Totaranui, Nelson, Cook Strait, Chatham Islands; also Victoria, New Caledonia, Indonesia, Thailand, Philippines.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.50 × 0.25–0.43 mm, with a fine-grained surface, marginal pores, and long slender spines considerably overlapping the frontal walls of distal zooids. Orifices trifoliate with anter usually as wide as long, the proximal lip of the poster somewhat convex. A pair of small oral avicularia adjacent to the corners of the poster, the mandibles long and setiform, directed proximally. Ovicells recumbent on the frontal wall of the distal zooid, smooth or with a faint longitudinal ridge, and a transversely crescentic furrow apically that is divided by septa into a string of pores.

REMARKS: *C. crinispina* is evidently variable in size. A form with larger zooids, but with otherwise identical morphology, also occurs at the Kermadecs. *C. crinispina* in life has unpigmented whitish-appearing colonies and is a common intertidal species around the North Island.

Family INVERSIULIDAE Vigneaux, 1949

Zooidal frontal wall with numerous tubercles and small pores. Orifice reversed, the operculum opening distally, with straight distal rim and concave proximal rim. No condyles or oral spines. A suboral ascopore present. Avicularia paired, at the corners of the orifice. Embryos brooded in ordinary zooids or modified brooding zooids. Numerous small basal pore-chambers present.

Inversiula Jullien, 1888

Characters as for the family.

TYPE-SPECIES: *Inversiula nutrix* Jullien, 1888

Inversiula fertilis Powell (Plate 37, C)

Inversiula fertilis Powell, 1967a: 340.

MATERIAL EXAMINED: NZOI: Stns K796, K797, K799, K820, K851. DPG: Colonies from Whangarei Heads and Leigh.

DISTRIBUTION: Three Kings Islands, Whangarei Heads, Leigh.

DESCRIPTION: Colony encrusting. Zooids subhexagonal, 0.37–0.63 × 0.37–0.50 mm; the frontal wall rather flat though irregularly surfaced, with flat-topped tubercles intersected by shallow perforated grooves, the pores non-stellate. Orifice inverted, somewhat variable in shape; the operculum opening distally, the proximal rim wider and slightly concave, the distal rim short, usually straight, the whole rim smooth. Ascopore longitudinally oval, toothed, placed a short distance proximal to the orifice. A pair of avicularia at the proximolateral corners, oval in shape; the short rounded rostrum as long as the opesia; no pivot bar. Brooding internal in modified zooids (not seen by me). Up to 16 narrow, buttressed pore-chambers in the distal half of the zooid.

REMARKS: Living colonies of this species from Hauraki Gulf, as well as dried colonies, are coloured a distinctive chestnut brown.

Family MICROPORELLIDAE Hincks, 1879

Colony encrusting or erect. Zooidal frontal wall regularly and evenly perforated or with only marginal pores. Orifice semicircular, the ascus opening via an ascopore proximal to the orifice. Oral spines and avicularia present or absent. Ovicell hyperstomial. Basal pore-chambers present.

Microporella Hincks, 1877

Colony encrusting. Frontal pores simple. Orifice with entire or serrated proximal rim. Ascopore simple or cribellate. Oral spines and avicularia present. Ovicell prominent, often subimmersed. Basal pore-chambers well developed.

TYPE-SPECIES: *Eschara ciliata* Pallas, 1766

Microporella agonistes n.sp. (Plate 37, D,E)

MATERIAL EXAMINED: NZOI Stns K820, K837.

DISTRIBUTION: Kermadec Islands, 95–125 m.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.50 × 0.20–0.33 mm; the frontal wall granular with the pores appearing relatively large. Orifice with a smooth proximal rim and four oral spines. Ascopore separated from the orifice by a smooth furrow, the pore small, crescentic, toothed. Avicularia relatively large, emplaced immediately subjacent to the orifice and/or ascopore, extending from the mid-line of the zooid to the margin or almost so; the rostrum shortly triangular, the apex raised and protruding somewhat; the frontal part of the avicularian cystid which merges into the frontal wall imperforate; the whole avicularium (opesia, rostrum, front wall) occupying from one-quarter to one-third of the area of the zooidal frontal surface; mandibles not seen. Ovicells prominent, somewhat subimmersed; coarsely granular, with a number of pores in the distal half, generally smaller than the pores of the frontal wall; proximally personate, the lappets not meeting. Two to three basal pore-chambers distally.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–327.

TYPE-LOCALITY: NZOI Stn K820, Raoul Island, 29°13.30′S, 177°59.80′W, 95–122 m.

REMARKS: This species is distinguished by its small size, and the avicularia which are very large in proportion to the area of the frontal wall. In this latter feature *M. agonistes* resembles *M. normani* Canu & Bassler, 1928 from the Pliocene of Panama, but the frontal wall of that species has more numerous perforations.

Microporella ciliata (Pallas) (Plate 37, F)

Eschara ciliata Pallas, 1766: 38.
Microporella ciliata: Hincks 1880a: 206; Hayward & Ryland 1979: 222.

MATERIAL EXAMINED: NZOI Stn K818.

DISTRIBUTION: Philippines, Oregon to Galapagos Islands, Europe, Britain, Mediterranean Sea.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.50 × 0.20–0.35 mm, with evenly perforated granular frontal walls. Orifice wider than long with a smooth proximal rim. Oral spines six. Ascopore separated from the orifice by a furrow, the pore finely toothed or smooth, surrounded by a low rim which may be slightly higher proximally. Avicularia single, rarely paired, emplaced proximal to the ascopore near the margin of the zooid at its widest point or a little distal to this; of variable size but never large, directed laterally or obliquely distally; mandibles not seen. Ovicells not present.

REMARKS: Although ovicells and mandibles were missing from the single Kermadec specimen, it agrees with typical European *M. ciliata*. *M. ciliata* has been reported as having a world-wide distribution, including New Zealand, but some of the New Zealand records need confirmation. Powell's (1967a) illustrations of purported *M. ciliata* from the Three Kings Islands, for example, show relatively large avicularia much closer to the ascopore than in European material (cf. Marcus 1940; Hayward and Ryland 1979 : 223). Powell's specimens thus resemble those attributed by him to *M. intermedia* Livingstone, but lack the finely serrated proximal orificial rim of that species. The record of Canu and Bassler (1929a) from the Philippines appears correct (based on their photographs), and that also of Osburn (1952) from the west coast of North America, so the reported distribution in the Pacific is probably correct. The most comprehensive recent synonymy is that of Wiesbord (1967).

Microporella discors Uttley & Bullivant (Plate 38, A,B)

Microporella hyadesi: Powell 1967a: 295; Gordon 1970: 323.
Microporella discors Uttley & Bullivant, 1972: 45.

MATERIAL EXAMINED: NZOI Stn K837; also NZOI specimen P–170, paratype slide of *Microporella discors*.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Chatham Rise.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.63 × 0.35–0.50 mm, with evenly perforated granular frontal walls. Orifice wider than long with minutely serrated proximal rim. Oral spines 2–4. Ascopore crescentic, reticulate. Avicularia single, emplaced near the margin about level with the ascopore; the rostrum triangular

and shortly spout-like; the pivot bar complete; mandibles long and setiform, of equal width throughout. Ovicells prominent, granular, with or without marginal lappets which may or may not fuse together proximally, just distal to the ascopore.

REMARKS: Powell (1967a) regarded specimens from Three Kings Islands as *M. hyadesi* (Jullien), a Patagonian and Falkland Islands species. Both Jullien (1888) and Waters (1905), however, recorded a merely dentate ascopore, not reticulate, and noted that oral spines were absent. Waters also illustrated the mandible, which is very short with basal alae, not setiform. Brown (1952) recorded *M. hyadesi* from the New Zealand Tertiary, but in view of the diversity and variability of species of *Microporella* a re-examination of the fossil material seems warranted.

Microporella intermedia Livingstone (Plate 38, C,D)

Microporella (Ellipsopora) flabellaris var. *intermedia* Livingstone, 1929: 88.
Microporella ciliata var. *intermedia*: Powell 1967a: 290.

MATERIAL EXAMINED: NZOI Stn K818.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf.

DESCRIPTION: Colony encrusting. Zooids 0.36–0.43 × 0.30–0.38 mm, with a coarsely granular frontal wall evenly perforated with small pores. Orifice semicircular, wider than long, with a finely corrugated proximal rim. Oral spines four, slender, evanescent. Ascopore almost immediately proximal to the orificial rim, relatively small, crescentic, very minutely toothed or smooth. Avicularia single, relatively large, emplaced subjacent to the ascopore; the rostrum shortly spout-like and extending laterally to the zooidal boundary or almost so; the pivot bar stout. Ovicell prominent, coarsely granular like the frontal wall, with inconspicuous marginal pores; proximal lappets sometimes present, extended to the avicularium on one side and proximal to the ascopore on the other.

REMARKS: Recognition and identification of the different forms of *Microporella* is difficult, as Osburn (1952) also noted. In addition to *M. intermedia*, *M. hyadesi* (Jullien), *M. ordo* Brown and *M. discors* Uttley & Bullivant (q.v.) have a finely corrugated orificial rim, as evidently does a form of *M. orientalis* Harmer (1957 : pl. 62, fig. 27). Livingstone (1929) specifically stated that the proximal rim of the orifice of *M. intermedia* was entire, but Powell (1967a), on the basis of Three Kings Islands material and a re-examination of Livingstone's types, asserted that it is corrugated. The Kermadec specimens closely match Powell's description and illustration except that Powell depicts the ascopore and avicularium as further from the orifice. Inasmuch as *M. hyadesi* lacks oral spines and *M. ordo* and *M. discors* have a reticulate ascopore, the Kermadec specimens evidently belong to Livingstone's var. *intermedia*, which I here regard as probably worthy of specific rank. As Powell pointed out, the purported resemblance to *M. flabellaris* (Busk), a South African species, was in error since Livingstone's *M. flabellaris s.s.* was *M. ordo* Brown.

M. intermedia differs from *M. ciliata* in having a corrugated orificial rim and larger, more distal avicularia.

Microporella lineata Canu & Bassler (Plate 39, A)

Microporella lineata Canu & Bassler, 1929a: 332.

MATERIAL EXAMINED: NZOI Stns K795, K803, $K826_{2,3}$, K827, K840, K841, K857, K859, K872.

DISTRIBUTION: Philippines.

DESCRIPTION: Colony encrusting. Zooids elongate, 0.50–0.75 × 0.20–0.33 mm, in branching uniserial chains, or rarely 2–3 zooids wide. Frontal wall finely granular with numerous small pores. Orifice semicircular, the proximal rim entire. Oral spines 4–6. Ascopore circular to subreniform, smooth or minutely dentate, with a low surrounding rim. Avicularia single, relatively small, emplaced proximal to the ascopore near the zooidal margin; shortly triangular overall, with a rounded base; the very thin pivot bar often broken in dried specimens; mandibles of moderate length, setiform. Ovicell prominent, very granular, with smooth wide proximal rim, and two oral spines.

REMARKS: *M. lineata* is characterised by the linear mode of growth and usually circular ascopore. The Kermadec colonies constitute the second record of this species.

Microporella scandens MacGillivray, 1885 is uniserial but, from MacGillivray's illustration, is smooth and imperforate. Brown (1954b) relegated it to *Calloporina*. Powell (1967a : 376) suggested that it may be a *Calwellia*, although articulated oral spines are not normally present in that genus.

Microporella marsupiata (Busk) (Plate 39, B)

Lepralia marsupiata Busk, 1860: 284.
Microporella coronata: Marcus 1938: 235.
Microporella marsupiata: Gautier 1962: 175; Hayward & Ryland 1979: 220.

MATERIAL EXAMINED: NZOI Stns K797, K798, K799, K809, K836, K848, K871.

DISTRIBUTION: Mediterranean Sea, Madeira, Cape Verde Islands, SW English Channel, Gulf of Guinea, Saint Helena.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.50 × 0.27–0.40 mm, with distinctly granular frontal wall with numerous small pores. Orifice semicircular with entire

proximal rim. Six to seven prominent oral spines with dark-brown chitinous bases, the most proximal pair of spines or the next distal pair occasionally forked. Ascopore crescentic, toothed, with a prominent surrounding rim which is highest proximally. Avicularia not large, usually paired, emplaced at the level of the ascopore, directed obliquely distally; the cystid thin-walled, rounded proximally, bluntly triangular distally; pivot bar complete; mandible not seen. Ovicell prominent though subimmersed, granular, usually with a smooth proximofrontal rim, and associated with 1–2 pairs of oral spines.

REMARKS: Although this species has very distinctive characteristics (brown spine bases, paired avicularia at the level of the ascopore), there is some uncertainty about its identity. Three species of *Microporella* have been reported to have brown or black spine bases. These have been referred to *M. coronata* (Audouin), *M. marsupiata* (Busk) and *M. flabelligera* Levinsen. Audouin's species was described and illustrated from Red Sea material lacking ovicells, and in the same work another species with ovicells was described and named *M. umbracula*. Busk (1854), Norman (1909), Hastings (1930), and Harmer (1957) regarded these two species of Audouin as the same. Most authors have used the name *M. coronata*, presumably because it preceded *umbracula* in Audouin's text, but Harmer argued that *umbracula* is the more preferable name since its ovicells were illustrated.

None of the above-mentioned authors noted dark spine bases in *M. coronata/umbracula* but Osburn (1952), who recorded both *M. coronata* and *M. marsupiata* from the coasts of Mexico, noted dark spine bases in both species and Redier (1971) recorded them in purported *M. coronata* from the Mururoa Atoll. Thus there is some inconsistency in the descriptions of *M. coronata auctt.*

M. flabelligera Levinsen, 1909 was based on material from "Syracuse" (presumably in Sicily). Like *M. marsupiata* from Madeira, it has up to six dark-based spines of which the proximal pair are forked. The avicularia are also paired and proximolateral to the orifice. The major apparent difference is in the ascopore, which is circular, though toothed, and further from the orifice. Harmer (1957) suggested that Levinsen's species may be distinct but it seems to me that the similarities to *M. marsupiata* are greater than the differences.

In view of the uncertain characterisation of *M. coronata/ umbracula*, and the clear correlation of characters of the Kermadec colonies with Busk's species, I here assign these colonies to that species. Cook (1968b) noted up to seven spines in West African *M. marsupiata* and Marcus (1938) showed seven dark-based spines in his *M. coronata* from Saint Helena. Whereas most authors have noted up to six spines, seven are commoner in the Kermadec colonies. Marcus also observed four spines on ovicelled zooids which further agrees with the Kermadec specimens.

Microporella orientalis Harmer (Plate 39, C)

Microporella orientalis Harmer, 1957: 962 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K797, K801, K803, K818, K819, K820, K822, K825, $K826_2$, K837, K848, K851, K855, K856, K857.

DISTRIBUTION: Victoria, Queensland, Loyalty Islands, Indonesia, Philippines, Red Sea.

DESCRIPTION: Colony encrusting. Zooids 0.45–0.63 × 0.25–0.50 mm, with granular, evenly perforated frontal walls except around the orifice where it is generally smooth. Orifice with smooth proximal rim and 4–6 oral spines. Ascopore crescentic, finely toothed, separated from the orifice by a smooth or sparingly granulated area; surrounded, in the Kermadec specimens, by a smooth rim, usually higher proximally, which may be little developed or large and conspicuous forming a broad saucer-shaped structure. Avicularia single, adjacent to the ascopore near the zooidal margin or much further proximally; not large, shortly triangular, directed laterally or obliquely distally; mandibles moderately long, setiform, with a pair of basal hooks. Ovicells fairly prominent, granular, with scattered small pores and a smooth proximal area which extends a little frontally; often with oral lappets which may curve round proximally, fusing into a high arch sometimes above, but never enclosing, the ascopore.

REMARKS: The Kermadec specimens are difficult to place but appear to be *M. orientalis* Harmer. The features in common are the personate ovicell, the position of the avicularium, and basally hooked mandibles. The saucer-like expansion of the ascoporal rim in the Kermadec colonies was not noted by Harmer in his unfortunately brief description of Indonesian material, but his figure 38 on plate 62 shows the typical form of the rim when it is little developed. Canu and Bassler (1929a : 331) noted the development of the ascoporal rim in their *M. ciliata* (= *M. orientalis*). Harmer also noted, though he did not illustrate it this way, "two lateral lobes of the ovicell, resulting in the formation of a narrow bridge raised above the level of the ascopore". This character is in accord with the Kermadec specimens and distinguishes this species from the personate form of *M. ciliata* in which the persona encloses the ascopore.

Brown (1952) recorded from the New Zealand Tertiary a personate form which he referred to as *Microporella ciliata* var. *diademata* [based on *Flustra diademata* Lamouroux, 1821] and with which he synonymised *Lepralia personata* Busk, 1854. Both *L. personata* and *M. ciliata* var. *diademata* were described from the same geographical area. Busk (pl. 90, fig. 3) depicted *L. personata* with long setiform mandibles lacking hooks, which evidently distinguishes this form from *M. orientalis*. Uttley and Bullivant (1972) described Chatham Rise colonies with the combination of long setiform mandibles and basal hooks and

synonymised *M. orientalis* with *M. ciliata* var. *diademata* which they then raised to specific rank. I have examined one of their slides in the NZOI collections and the single colony on it appears not to be conspecific with the Kermadec specimens. It has rather larger avicularian cystids with slightly bulbous proximal walls and although the mandibles are basally hooked they are longer and stouter. A complete peristomial bridge is not present in the two ovicells of this colony, which very closely resembles *Lepralia ciliata* MacGillivray from Victoria (*see* MacGillivray 1879b: pl. 37, fig. la–b), which Harmer included in the synonymy of *M. orientalis* but which seems on the fringe of that species.

Interestingly, Busk's (1854) illustrations of *L. personata* (i.e., *M. diademata*) show a pair of oral spines just inside the sides of the ovicellular lappets (persona). These spines are present in the Kermadec specimens. Harmer did not depict them in his *M. orientalis* but they could be easily overlooked. Whether or not *M. orientalis* and *M. diademata* are conspecific would need to be established on the basis of a comparison of type specimens but, as Brown (1952) noted, the type of *M. diademata* is missing. Although on the basis of drawings they appear similar, as Uttley and Bullivant (1972) noted, Harmer did not include Falkland Island *M. personata* (i.e., *M. diademata*) in the synonymy of *M. orientalis*. Furthermore, *M. diademata* has never been reported to have a flaring ascoporal rim. In passing, it may be noted that Powell's (1967c) record of *M. orientalis* from the Red Sea may be in error. He observed fusion of the persona "below" the ascopore. This may be following Harmer (1957) who, although describing it as above the ascopore, included *Microporella ciliata* var. *personata* MacGillivray, the illustration of which shows it as below (i.e., proximally) (*see* MacGillivray 1889a: pl. 175, fig. 9). This seems to be true personate *ciliata*.

Finally, *M. orientalis* resembles *M. gibbulosa* Canu & Bassler, 1930 from the Galapagos Islands, which Harmer (loc. cit.) did not discuss and which, from the photographs, appears to have a rim or umbo associated with the ascopore and a persona fusing distal to the ascopore. Osburn (1952), however, who reported this species from the same geographical area, neither illustrated nor commented on either of these features.

Calloporina Neviani, 1895

Zooidal frontal wall with conspicuous marginal areolae, mostly imperforate centrally. Orifice high-arched, the proximal rim entire, with small condyles in the corners. Ascopore prominent, some distance proximal to the orifice. Oral spines present. Avicularia sessile, often paired, rarely absent. Ovicell with a pitted, crescentic exposure of endooecium. Basal pore-chambers present.

TYPE-SPECIES: *Cellepora decorata* Reuss, 1848

Calloporina angustipora (Hincks) (Plate 40, A)

Microporella diadema form *angustipora* Hincks, 1885: 249.
Calloporina diadema var. *angustipora*: Brown 1952: 263.
Calloporina angustipora: Brown 1954b: 561; Powell 1967a: 300 (*cum syn.*); Uttley & Bullivant 1972: 46.

MATERIAL EXAMINED: NZOI: Stn K871. DPG: Colonies from Leigh, Manukau Heads, Mount Maunganui, and Otago Peninsula.

DISTRIBUTION: Three Kings Islands, Leigh, Manukau Heads, Mount Maunganui, Napier (Pliocene to Recent), Wanganui (Upper Pliocene to Recent), Otago Peninsula.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.50 × 0.30–0.38 mm, roughly diamond-shaped, widest in the middle. Frontal wall non-convex, smooth-surfaced centrally with 8–9 conspicuous areolae along each margin; occasionally a small central prominence. Between the prominence and the orifice a smooth-rimmed, longitudinally oriented slit-like ascopore. Orifice a high-arched semicircle with straight proximal rim, with small condyles in the corners. Oral spines 7–8; 2–4 spines present in ovicelled orifices. One or a pair of avicularia just proximal to the widest part of the zooid, directed laterally; with acute rostrum and complete pivot bar. Ovicells subimmersed, smooth and rather flattened frontally, with a distal crescentic area of endooecium which is bordered and minutely cratered.

REMARKS: Live colonies from Hauraki Gulf are a conspicuous pink colour and generally have six oral spines. Powell (1967a) noted up to eight spines in Three Kings Islands material. As Brown (1952, 1954b) noted, the unusual sculpturing of the ovicells of species of *Calloporina* is also characteristic of *Chiastosella*, in the Schizoporellidae. Species of both genera known to me are also generally brightly coloured, which is not generally true of *Microporella* and *Fenestrulina* (Microporellidae). [A possible exception is *Fenestrulina infundibulipora* Canu & Bassler, 1929a. One of the colonies was described by these authors as "an intense beautiful red".] Powell (loc. cit.) noted wide variation in frontal wall porosity in *Calloporina* and implied that it would be presently inappropriate to remove the genus from the Microporellidae. With this I agree, but wish to emphasise, as do Brown and Powell, the very close relationship between *Calloporina* and *Chiastosella*.

Calloporina triporosa Powell (Plate 40, B)

Calloporina triporosa Powell, 1967a: 302.

MATERIAL EXAMINED: NZOI: Stns K797, K818, K819, K820. K836, K837. DPG: Colonies from Leigh.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf.

DESCRIPTION: Colony encrusting. Zooids 0.45–0.65 × 0.37-0.50 mm, somewhat hexagonal in outline, widest in the middle. Frontal wall with smooth-surfaced irregular contours usually in the form of a U-shaped ridge, the arms directed distally and the bottom of the U as a mid-central crest; between the arms of the ridge a rimmed circular ascopore; about 5–8 areolae along each margin. Avicularia single or paired, at the level of the ascopore; narrow, elongate, directed distally with a slight curvature of the outer rim towards the orifice; the rim entire or finely serrated; the pivot bar complete. Orifice high-arched, with minute squared condyles in the proximal corners. Oral spines six. Ovicell subimmersed, with a low frontal crest proximally and a pitted crescentic area of endooecium.

REMARKS: This species is very close to *Calloporina sculpta* Canu & Bassler, 1929a from the Philippines. As Powell (1967a) points out, their photograph (retouched, however) shows the openings of many basal pore-chambers whereas there are only three distal chambers in Powell's Three Kings Islands material. In Kermadec colonies three large distal chambers are common but four or five chambers may occur, and internal irregularities of the chambers, when seen in transparency, can give the illusion of a number of pores. Canu and Bassler showed up to eight or nine chamber openings. The avicularia of *C. sculpta* are also directed away from the orifice whereas in *C. triporosa* they are parallel to the orifice or with a slight inward curvature.

C. biavicularia Kataoka, 1961 is very close to Powell's species, differing, if at all, only in the number of oral spines. Kataoka observed that spines numbered "generally eight". Powell described 6–7 in *C. triporosa*. Kataoka did not state the number of pore-chambers in *C. biavicularia*, however.

Tenthrenulina n.gen.

Colony encrusting. Zooidal frontal wall regularly perforated with deep non-stellate pores. Orifice semicircular, wider than long. No oral spines or avicularia. Ascopore immediately suboral, crescentic, minutely toothed. Ovicell subimmersed, flush with the zooidal surface, with conspicuous radial ribbing. Basal pore-chambers present.

TYPE-SPECIES: *Tenthrenulina dispar* n.sp.

Tenthrenulina dispar n.sp. (Plate 40, C)

MATERIAL EXAMINED: NZOI Stns K796, K797.

DISTRIBUTION: Kermadec Islands, 55–70 m.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.78 × 0.27–0.63 mm, with distinct boundaries marked by thin rim(s) in interzooidal furrows. Frontal wall honeycombed with numerous, evenly distributed, simple deep pores. Orifice wider than long with the proximal rim at two levels – a slightly convex outer rim, and a ledge-like inner rim which is slightly concave and thickened at the corners. An ascoporal tubercle in a furrow immediately proximal to the orifice; the pore crescentic and minutely toothed. No oral spines or avicularia. Ovicell subimmersed, the frontal surface conspicuously ribbed, not raised above the surface of the zooidal frontal wall; with a horseshoe-shaped margin.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–301.

PARATYPES: NZOI, type number P–540; NMNZ, type number Bry.620; from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K796, Esperance Rock, 31°20.8′S, 178°49.0′W, 70 m.

REMARKS: *Tenthrenulina* seems most nearly related to *Fenestrulina*, which also lacks avicularia. The chief distinguishing features are the unusual honeycomb type of frontal wall, immediately suboral ascopore, and flattened ovicell. All colonies were found encrusting crustose coralline algae.

Fenestrulina Jullien, 1888

Colony encrusting or erect and flustrine. Zooidal frontal wall with scattered complex pores. Orifice semicircular, the proximal rim entire; ascopore distinct, some distance from the orifice. With or without oral spines. No avicularia. Ovicell prominent, hyperstomial, with basal pores. Large basal pore-chambers present.

TYPE-SPECIES: *Cellepora malusii* Audouin, 1826

Fenestrulina catastictos n.sp. (Plate 40, D,E)

MATERIAL EXAMINED: NZOI Stns K797, K799, K801, K812, K818, K819, K836, K837, K859, K871.

DISTRIBUTION: Kermadec Islands, 10–443 m.

DESCRIPTION: Colony encrusting. Zooids 0.47–0.78 × 0.27–0.55 mm, with frontal wall decorated with about 60 pores, which are completely open in only the youngest zooids at the growing edge and closed in all other zooids, appearing as white spots. A toothed crescentic ascopore in the centre of the frontal wall in a concave button-like eminence of varying size, usually small. Orifice semicircular, as wide as long or usually wider. No oral spines. A row of pores distal to the orifice. Ovicell prominent, with a smooth, rather angular crest frontally and a broad distal area (occasionally ribbed) with the texture of the frontal pores. Three large basal pore-chambers in the distal half of each zooid.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–289.

PARATYPE: NZOI, type number P–551, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K812, Raoul Island, 29°17.0′S, 177°54.4′W, 10–30 m.

REMARKS: This species is characterised by the large number of frontal pores. *F. reticulata* Powell, 1967a has oral spines and a coarse, reticulated frontal wall. *F. infundibulipora* Canu & Bassler, 1929a is similar but has a circular ascopore.

F. catastictos occurs on mollusc shells.

Fenestrulina disjuncta (Hincks) (Plate 41, A,B)

Microporella Malusii form *disjuncta* Hincks, 1885: 249.
[?] *Fenestrulina malusii* var. *thyreophora*: Gordon 1972a: 342; Gordon 1972b: 453.

MATERIAL EXAMINED: NZOI Stns K797, K799, K818, K819, K820, K829, K833, K837, K842, K851, K855, K856, K857, K859, K871.

DISTRIBUTION: Kermadec Islands and an unspecified New Zealand locality (Hincks).

DESCRIPTION: Colony encrusting. Zooids 0.35–0.63 × 0.17–0.30 mm, hyaline, with narrow grooves between them, occasionally with small lacunae at the corners (the disjunct condition of Hincks), depending on the substratum. Frontal walls smooth, with a central crescentic ascopore toothed throughout or only proximally and surrounded by a slight rim. Pores with a pitted reticulum, confined to the extreme margins of the zooids or there lacking, continuing as a single row between ascopore and orifice. Oral spines 4–6, the proximal pair often forked; a pair of oral spines remaining in ovicelled zooids. Ovicell prominent, smooth with marginal pores, or the surface with brain-like grooves and ridges.

REMARKS: Three species and one variety of *Fenestrulina* have been described from New Zealand waters. Busk (1857) described *Fenestrulina thyreophora* (as a *Lepralia*) from colonies epizoitic on *Calwellia sinclairii* (Busk) (described by Busk in the same paper). It was characterised by a line in the frontal calcification dividing the frontal wall into proximal and distal parts, the distal part being "scutiform" in Busk's terminology and containing the ascopore and marginal pores. There were no oral spines and the ovicell was said to be "faintly punctuated".

In 1873 Hutton recorded *Fenestrulina malusii* (as a *Lepralia*) in New Zealand, evidently on the basis of the description and illustrations in Busk's (1854) Catalogue. Two of Busk's illustrations (pl. 103, figs 4, 5) were drawn from New Zealand material (footnote by A.B. Hastings, *in* Harmer 1957 : 966). The specimen illustrated in his figure 4 represents the subspecies *F.m. pulchra* (q.v.). The one shown in figure 5 has only two spines, both forked. Its identity is uncertain.

Hincks (1885) described *Fenestrulina malusii* form *disjuncta* (as *Microporella*) from an unspecified New Zealand locality. It was characterised by slightly disjunct zooids with smooth frontal walls and oral spines, of which the proximal pair were forked. He did not mention frontal pores nor did he illustrate them. Finally, Powell (1967a) described a new species, *F. reticulata*, from the Three Kings Islands.

The Kermadec specimens with six oral spines appear to belong to *F. malusii disjuncta*. The proximal pair are often forked and the frontal pores are sometimes obliterated laterally and reduced to a suboral groove distal to the ascopore. Brown (1952) included *F. malusii* var. *thyreophora* Busk in the range of variation of *F. malusii s.l.* as did Hincks (1880a) and Powell (1967a), who also included *F. m.* f. *disjuncta*. From the specimens available to me it seems that *disjuncta* may be regarded as a full species. The chief distinguishing features are the proximally forked spines and the occurrence of oral spines in ovicelled zooids. The hyaline frontal wall seems distinctive also.

It is very likely that the form from Hauraki Gulf ascribed by me to "*Fenestrulina malusii* var. *thyreophora*" (Gordon 1970, 1972a, b) belongs to *F. disjuncta*. It is also characterised by oral spines in ovicelled zooids and hyaline frontal walls. There are, however, prominent ridges on the ovicell and the centre of the frontal wall, the proximal pair of spines is not forked, and there are sometimes two rows of pores between the ascopore and orifice.

The present status of Busk's *F. m.* var. *thyreophora* is uncertain. I have not seen unequivocal material belonging to that variety.

Fenestrulina gelasinoides n.sp. (Plate 41, C)

MATERIAL EXAMINED: NZOI Stn K855.

DISTRIBUTION: Kermadec Islands, 115–125 m.

DESCRIPTION: Colony encrusting. Zooids 0.50–0.63 × 0.37–0.53 mm, somewhat hexagonal in shape, with distinct grooves between them. Frontal walls closely dimpled with small depressions, with occluded pores in a single row around each zooidal margin and 1–2 rows between ascopore and orifice. Orifice semicircular, as wide as long. Oral spines four. Ascopore crescentic, barely toothed, surrounded by a low rim. Ovicell dimpled like the frontal wall, the surface resembling that of a golf ball; the basal pores very small and inconspicuous; a pair of spine bases present on the rim of the ovicelled orifice.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–303.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: The unusual dimpled surface of the frontal wall and ovicell distinguishes *F. gelasinoides* from other species.

Fenestrulina malusii incompta n.ssp. (Plate 41, D)

MATERIAL EXAMINED: NZOI Stn K855.

DISTRIBUTION: Kermadec Islands, 115–125 m.

DESCRIPTION: Colony encrusting. Zooids 0.62–0.75 × 0.47–0.68 mm, with smooth, almost imperforate frontal walls; the pores small, barely developed along the zooidal margins, and only 3–4 between orifice and ascopore. Orifice semicircular, almost as long as wide, with four distal spines; ascopore crescentic, toothed, with a raised rim. Ovicell prominent, more or less smooth, with numerous basal pores. Three large basal pore-chambers in the distal half of each zooid.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–315.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: This subspecies differs from both *F. malusii s.s.* and *F. malusii pulchra* n.ssp. in having far fewer, smaller pores. The pores, although small, are of the type found in *F. m. pulchra* (q.v.). *F. m. incompta* occurred on a shell and a dead bryozoan at the Kermadec Islands.

Fenestrulina malusii pulchra n.ssp. (Plate 41, E)

Lepralia Malusii: Busk 1854: 83 (*partim*).
Fenestrulina malusii: Powell 1967a: 296 (*partim*); Gordon 1967: 59; Uttley & Bullivant 1972: 47.

MATERIAL EXAMINED: NZOI: Stn K855. DPG: Colonies from Leigh, Auckland, and Wellington.

DISTRIBUTION: Kermadec Islands, 115–125 m; Three Kings Islands, Leigh, Auckland, Wellington, Chatham Rise.

DESCRIPTION: Colony encrusting, white. Zooids 0.40–0.55 × 0.27–0.38 mm, ovoid to subhexagonal, separated by distinct grooves. Frontal wall convex, smooth and porcellanous; with two rows of pores between orifice and ascopore, and a row around the zooidal periphery including distal to the orifice; each pore relatively large and occluded by a finely punctured reticulum. Orifice semicircular, wider than long. Oral spines absent. Ascopore about mid-frontal, on the highest point of the zooid; crescentic, thin, non-dentate, with a thickened raised rim. Ovicell prominent, smooth, with conspicuous marginal pores separated by short trabeculae. Three large basal pore-chambers in the distal half of each zooid. Ancestrula like adult zooids, with an ascopore and lacking spines.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–277.

PARATYPES: NZOI, type number P–577, from same locality as holotype; P–578, from NZOI Stn K855.

TYPE-LOCALITY: Lyall Bay, Wellington, July 1980, D.P. Gordon.

REMARKS: Thanks to the assistance of Dr P.J. Hayward (University College of Swansea) I have been able to examine colonies of *Fenestrulina malusii s.s.* (Pl. 41, F) from Britain and the Aegean Sea. They differ from the above New Zealand (including Kermadec) form in having oral spines, a toothed ascopore, and smaller, simpler pores with a few dividing radii. The ancestrula is tatiform.

F. malusii pulchra typically occurs on algae.

Family CALWELLIIDAE MacGillivray, 1887

Colony erect, lightly calcified. Zooids with smooth frontal wall, few perforations. Orifice semicircular; an ascopore typically present frontally. No avicularia. Ovicell hyperstomial. Basal pore-chambers or mural septula present.

Calwellia Wyville Thomson, 1858

Colony erect, bifurcating. Zooids in pairs, joined back to back, at right angles to the plane of the next distal pair; or arranged singly. Orifice semicircular; ascopore crescentic, suboral. Frontal wall with two perforations between orifice and ascopore. Pore-chambers typically visible distal to the orifice; uniporous septula also present.

TYPE-SPECIES: *Calwellia bicornis* Wyville Thomson, 1858

REMARKS: Harmer (1957) has commented on the validity and use of the generic name.

Calwellia sinclairii (Busk) (Plate 41, G)

Onchopora sinclairii Busk, 1857: 172; Busk 1884: 103.
Onchopora sinclairi [sic]: Levinsen 1909: 260.
Calwellia sinclairii: Waters 1889b: 17; Uttley & Bullivant 1972: 53.

MATERIAL EXAMINED: NZOI Stns K820, K822, K837.

DISTRIBUTION: Northland, Chatham Rise, Akaroa; also Australia, and Marion, Heard, and Kerguelen Islands.

DESCRIPTION: Colony erect, 2 cm high, dichotomously branched. Zooids elongate, 0.57–0.75 × 0.23–0.26 mm, arranged back to back in overlapping alternating pairs. Frontal wall smooth and imperforate except for a crescentic toothed ascopore and six elongate pore-chambers around the semicircular orifice, of which two occur between ascopore and orifice; between pairs of pore-chambers a much smaller circular pore. No oral spines or processes. Ovicells not seen in Kermadec colonies but in other New Zealand specimens are large and prominent with radial furrows. Zooids at bifurcations medially constricted.

REMARKS: Busk (1857) noted that colonies attained 4 cm in height and (1884) that they occurred to depths of 3600 metres.

Superfamily HIPPOTHOÖIDEA Fischer, 1866, *nom. transl.*

Colony encrusting, or erect from a creeping base. Zooidal frontal wall gymnocystal, typically smooth, hyaline, sometimes with small punctae and/or tubercles. Orifice sinusoid or semicircular; articulated oral spines absent, except in some ancestrulae. Avicularia present or absent, commonly interzooidal, rarely vicarious, never adventitious; or zooeciules may occur, sometimes resembling avicularia, occurring semi-adventitiously when zooids crowded together. Ovicell hyperstomial, closed by the zooidal operculum, or absent. Basal pore-chambers and simple porous septula present.

REMARKS: The name Hippothoöidea is a *nomen translatum* of Hippothoidae Fischer, 1866 and is here taken to include, *inter alia,* the families Pasytheidae Davis and Chorizoporidae Vigneaux. It is characterised chiefly by the occurrence of a gymnocystal frontal wall although, strictly speaking, a gymnocyst has been formally demonstrated only in the Hippothoidae (Banta 1973, Sandberg 1977). Hayward and Ryland (1979) cited the wall of *Chorizopora* to be gymnocystal, evidently because of the morphological resemblance of the thin hyaline walls of *Chorizopora* to those of hippothoids. Their attribution is supported here by the observation of parallel fibrous ultrastructure in the exterior frontal wall in Kermadec *Chorizopora brongniartii* (cf. Sandberg 1976).

I have not been able to detect this type of ultrastructure in *Gemellipora eburnea* (Pasytheidae) and its inclusion in this superfamily is based on the markedly hippothoiform nature of the encrusting zooids with their thin transparent walls.

The frontal wall of the genus *Haplopoma* Levinsen, which has been variously ascribed to the Hippothoidae or the Microporellidae, needs to be examined. It appears to be gymnocystal in nature.

Finally, the Hippothoöidea is placed between the Schizoporelloidea and Celleporoidea because of the schizoporellid types of orifice seen in the Hippothoidae and Pasytheidae and the typically smooth, mostly frontally imperforate walls like those of the otherwise cryptocystidean Celleporoidea. It is unlikely that the Hippothoöidea have affinities with the only other gymnocystal ascophorans, the Catenicelloidea.

Family HIPPOTHOIDAE Fischer, 1866

Colony encrusting or erect. Frontal wall gymnocystal, thin, imperforate or with scattered fine pores. Orifice with a proximal sinus, and without spines. Avicularia uncommon, vicarious or interzooidal, never adventitious. Pore-chambers within the wall or tubular. Ovicell prominent, perforate or imperforate; gonads in autozooids and/or special sexual polymorphs.

Hippothoa Lamouroux, 1821

Colony adnate, with branching uniserial chains of zooids. Polymorphs include feeding autozooids, female zooids bearing ovicells, and minute zooeciules (of unknown function). Autozooids clavate, with a stolon-like proximal portion. Frontal wall smooth, non-porous. Orifice with sinus and paired condyles; that of female zooids similar to that of autozooids. Pore-chambers small, conical, in the base of lateral walls, not tubular. Ancestrula kenozooidal or tatiform.

TYPE-SPECIES: *Hippothoa divaricata* Lamouroux, 1821

Hippothoa calciophilia n.sp.

(Fig. 10, A; Plate 42, A–C)

[?] *Hippothoa divaricata*: Canu & Bassler 1928: 77.
[?] *Hippothoa flagellum*: Osburn 1952: 278.
[?] *Hippothoa distans*: Soule 1961: 3; Soule & Soule 1964: 14.
Hippothoa distans: Hastings 1979: 550 (*partim*).

MATERIAL EXAMINED: NZOI: Stns K812, K848, K871. Australian Museum: Specimen U2778 from Great Barrier Reef.

DISTRIBUTION: Kermadec Islands, 10–60 m; also Great Barrier Reef, ?Baja California, Panama to Peru, Galapagos Islands, Bahamas.

DESCRIPTION: Colony encrusting, uniserial. Autozooids smooth-walled or with fine transverse striations and often a faint carina; cauda relatively short though stolon-like; dilatation 0.37–0.40 × 0.17–0.20 mm. Orifice longer than wide, sloping distally downward; sinus a flaring U-shape; condyles small. Ovicelled zooids as large as autozooids, 0.42–0.48 × 0.17–0.23 mm; combined orifice as wide as long, relatively wider than in autozooids, with a slightly broader sinus, and small condyles; ovicell smooth, faintly carinate,

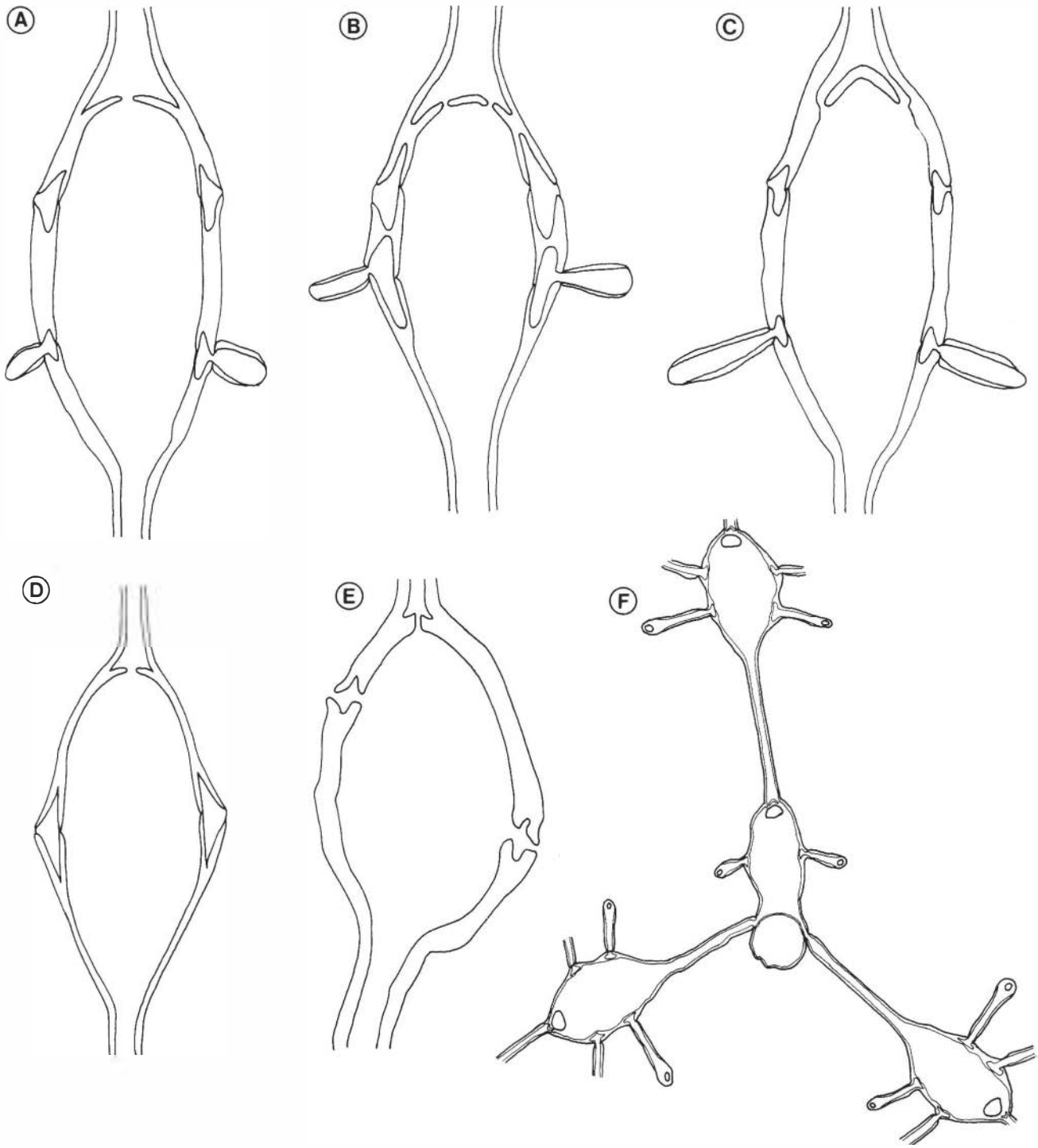

FIG. 10. A-E, basal views of autozooids of *Hippothoa* species, showing relative positions of communication pore areas: A, *H. calciophilia* n.sp.; B, *H. distans* MacGillivray; C, *H. divaricata pacifica* n.ssp.; D, *H. flagellum* Manzoni; E, *H. peristomata* n.sp. (Not all to same scale). F, early astogeny of *H. divaricata pacifica*.

imperforate or with a tiny apical pit, often with a thin marginal lamina. Zooeciules not common, often single. Small lateral pore-chambers conical, 1–2 on each side, widely separated; the distal communication via a single median pore in the transverse wall. Ancestrula kenozooidal.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–306.

PARATYPES: NZOI, type number P–560; NMNZ type number Bry.622; from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K812, Raoul Island, 29°17.0′S, 177°54.4′W, 10–30 m.

REMARKS: This species resembles *H. distans* MacGillivray in the closer, somewhat irregular spacing of zooids than is seen in Kermadec *H. divaricata pacifica* n.ssp. for example. The most distinctive differences between *H. calciophilia* and *H. distans* pertain to the distribution of communication pores and whether or not the ovicell is apically sculptured. There are two distal communication pores in *H. distans,* one in *H. calciophilia,* and the lateral pore-chambers are adjacent in the former, separated in the latter. The ovicell of *H. calciophilia* lacks the distinctive apical pores of *H. distans.*

H. calciophilia zooids externally resemble those of *H. divaricata* rather closely. Kermadec colonies of *H. divaricata pacifica* are distinguished by the greater distances between zooids, bimucronate ovicellular apex, greater development of a carina and more numerous zooeciules. Each of these characters is individually variable but the sum of them is distinctive enough when adjacent colonies of both species are compared. One internal character however, provides a sure and reliable basis for distinction – there are two distal communication pores in *H. d. pacifica,* one in *H. calciophilia.*

Hastings (1979) referred to this species when she remarked on two externally similar forms which may both have been referred to *H. distans* by previous authors. The characteristic features of both have already been described. In addition, *H. calciophilia* is so far known only from calcareous substrata (barnacle plates at the Kermadecs, oyster valves on Great Barrier Reef), whereas *H. distans* is common on algae (and bryozoans). *H. divaricata* occurs on stones, bryozoans, and molluscan and brachiopod valves.

H. calciophilia may be the species attributed to *H. flagellum* Manzoni by Osburn (1952 : 278, 529). His illustration shows frontal striae on the autozooids and a marginal lamina around the ovicelled zooid. The orifice of the latter is certainly not that of typical *H. flagellum.* This appears also to be the species referred to as *H. divaricata* by Canu and Bassler (1928: pl. 28) and to *H. distans* by Soule (1961) and Soule and Soule (1964).

Hippothoa distans MacGillivray

(Fig. 10, B; Plate 42, D–H)

Hippothoa distans MacGillivray, 1869: 30; Brown 1952: 203 (*partim*); Harmer 1957: 951; Hastings 1979: 550; Gordon & Hastings 1979: 426; Morris 1980: 26.
Hippothoa aruensis Morris, 1980: 25.

MATERIAL EXAMINED: NZOI: Stns K797, K799, K812, K836, K848, K866. National Museum of Victoria: Specimens 64171 (lectotype of *H. distans*) and 64166 (paralectotype). Australian Museum: U491.

DISTRIBUTION: Victoria, New South Wales, Indonesia, Timor.

DESCRIPTION: Colony encrusting, uniserial. Autozooids smooth-walled, elongate, partly parallel-sided, drawn out proximally into a caudal stolon; dilatation 0.25–0.35 × 0.13–0.18 mm. Orifice inclined distally downward, as wide as long, with rounded V-shaped sinus and small condyles. Ovicelled zooid broader than autozooid, 0.32–0.48 × 0.15–0.18 mm, with short curving cauda; ovicell wider than long, smooth except for an oval depression apically containing 2–4 small pores; combined orifice broader than long, wider than the autozooidal orifice but otherwise very similar. Zooeciules usually paired on both autozooids and female zooids, with oval orifice lacking condyles. Lateral pore-chambers conical, paired; two communication pores distally. Ancestrula tatiform, as Morris (1980) first noted.

REMARKS: The identity and characteristics of *H. distans* have only recently been evaluated (Hastings 1979). For almost a century this species and *H. flagellum* Manzoni have been regarded as synonymous. Hastings (1979) has explained the confusion and redescribed *H. distans.* She noted, however, that one area of uncertainty remained inasmuch as her synonymy probably included two externally similar forms. I have examined these two forms, both of which are represented in the Kermadec samples, and have concluded, as Hastings suspected, that they are separate species. The segregated species (*H. calciophilia* n.sp.) is described above.

The distinctive external features of *H. distans* include: parallel-sidedness of autozooids; female zooids larger than autozooids; the porous area of the ovicell; giant avicularia (not seen in the Kermadec colonies); and tatiform ancestrula. Pore-chambers and distal pores are shown in Fig. 10B. *H. distans* commonly occurs on algae. Harmer (1957) found colonies encrusting other bryozoans.

Morris (1980) introduced a new species, *Hippothoa aruensis,* characterised, *inter alia,* by a pitted apical area on the ovicell. This is absolutely characteristic of *H. distans.*

Hippothoa divaricata pacifica n.ssp.
(Fig. 10, C,F; Plate 43, A,B)

Hippothoa divaricata: Ryland & Gordon 1977: 20 (*partim*).

MATERIAL EXAMINED: NZOI: Stns K795, K797, K801, K816, K818, K819, K820, K837, K840, K841, K851, K855, K856, K867, K872. DPG: Colonies from Hauraki Gulf.

DISTRIBUTION: Kermadec Islands, 18–500 m; and Leigh, N.Z.

DESCRIPTION: Colony encrusting, uniserial, branching cruciform. Autozooids elongate-oval, smooth, with a median carina and stolon-like caudal portion; dilatation 0.27–0.33 × 0.15–0.20 mm. Orifice inclined distally downward, longer than wide, with flaring U-shaped sinus and small condyles. Ovicelled zooids approaching autozooids in size, carinate, with shorter caudae; orifice as in autozooids; ovicell smooth, umbonate, with 1–2 tiny apical pores. Zooeciules elongate, with oval orifices lacking condyles; usually paired. Lateral pore-chambers conical, paired on each side; two distal communication pores. Ancestrula kenozooidal, 0.18 mm diameter.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–282.

PARATYPE: NZOI, type number P–567, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: *Hippothoa divaricata* has been redescribed by Ryland and Gordon (1977). The Kermadec specimens have the characteristic carina and distal communications of Northern Hemisphere colonies but differ in the more elongate zooeciules, narrower caudae, fewer more conical pore-chambers, and wider orificial sinus. The ancestrula has not previously been described, but is kenozooidal as in *H. flagellum* Manzoni and *H. calciophilia* n.sp. (q.v.). Early astogeny is interesting – the ancestrula itself buds only one zooid, lacking a cauda, which arises directly from a distal chamber. From this daughter zooid the caudae of two other zooids are budded, one from each extreme proximal corner by the ancestrula, at an angle of 120° in a reverse proximal direction. Thus each of the first three zooids diverges from the other two at an angle of 120°, immediately establishing the potential for maximum spread of the colony. Each of the daughter zooids has zooeciules and proceeds to bud further zooids in the usual manner.

Typical *H. divaricata* seems to be Atlantic in distribution although there are conflicting reports. The Kermadec form also occurs in the Hauraki Gulf.

Hippothoa flagellum Manzoni
(Fig. 10, D; Plate 43, C,D)

Hippothoa flagellum Manzoni, 1870: 328.
Hippothoa flagellum: Ryland & Gordon 1977: 22 (*cum syn.*).
[?] *Hippothoa watersi* Morris, 1980: 31.

MATERIAL EXAMINED: NZOI: Stns K795, K796, K803, $K826_2$, K828, $K828_1$, K829, K837, K840, K841, K850, K851, K854, K855, K856, K858, K859, K867. National Museum of Victoria: Specimens 46837, 65954. DPG: Colonies from Hauraki Gulf and Fiordland.

DISTRIBUTION: Hauraki Gulf, Fiordland; also Victoria, Mediterranean Sea, Britain, Norway, Azores, Cape Hatteras to Brazil, West Africa.

DESCRIPTION: Colony encrusting, uniserial. Autozooids small, smooth-walled, tapering proximally into a long filiform stolon; dilatation 0.22–0.30 × 0.15 mm. Orifice more or less horizontal, at the highest part of the zooid; longer than wide, with U-shaped sinus and small condyles. Ovicelled zooids shorter overall than autozooids, but the ovicell may be as wide; ovicell smooth, imperforate except for an occasional tiny apical pit; combined orifice a wide oval with shallow sinus and small condyles. Zooeciules rare, elongate, only from autozooids. A single conical pore-chamber on each side of an autozooid, and a median distal pore in the transverse wall. Ancestrula kenozooidal.

REMARKS: This species was redescribed by Ryland and Gordon (1977). It is among the smallest of the known species of *Hippothoa* and encrusts shells and bryozoans at the Kermadecs and New Zealand. Powell's (1967a) *H. distans* MacGillivray from Three Kings Islands appears to be *H. flagellum* but he shows a corrugated carina and transverse striae. *H. watersi* Morris, 1980 also appears to be *H. flagellum*. I have seen only the one form in New Zealand waters and the arrangement of pore-chambers is as in British material. Morris unfortunately did not describe the pore-chambers, but noted correctly that the orifice varies somewhat in shape.

Hippothoa peristomata n.sp.
(Fig. 10, E; Plate 43, E–G)

MATERIAL EXAMINED: NZOI Stn unknown.

DISTRIBUTION: Kermadec Ridge.

DESCRIPTION: Colony encrusting, uniserial. Autozooid somewhat pyriform, wider in the proximal half of the expanded portion, which measures 0.30–0.43 × 0.20–0.25 mm, with a long stolonal caudal portion. Frontal wall smooth, rising to a high orificial region, the rim of which is more or less horizontal and almost at right angles to the vertical distal wall; the raised part simulates a peristome in profile but the primary orifice

is, in fact, only just inset and the true peristome constitutes a relatively low rim. Orifice roundly triangular in outline, wider distally, tapering to a shallow sinus flanked by small rounded condyles; a pair of low tubercles proximal to the sinus. Ovicelled zooids smaller overall than autozooids, widest at the ovicell; combined orifice widely oval with a shallow U-shaped sinus, small condyles, and a pair of low tubercles proximally; ovicell smooth, non-porous, but with a minute apical nick. Zooeciules not seen. Occasional kenozooids interpolated vicariously along a stolon in place of autozooids. Pore-chambers small, rounded, usually one each side; the distal communication a single median pore. Ancestrula not seen.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–330.

TYPE-LOCALITY: Kermadec Ridge.

REMARKS: This distinctive species differs from *H. flagellum*, which it most resembles, in its robustness and much larger size and in the high orificial region with suborificial tubercles.

Celleporella Gray, 1848

Colony crustose, rarely uniserial. Zooids with smooth imperforate frontal wall, the cauda short or wholly truncated. Orifice sinusoid, lacking spines. No avicularia. No zooeciules, supposed male zooids usually present. Ovicelled zooids typically with wider orifices lacking condyles; ovicell usually perforate. Pore-chambers tubular, rarely otherwise. Ancestrula schizoporelloid, rarely tatiform.

TYPE-SPECIES: *Cellepora hyalina* Linnaeus, 1767

Celleporella delta (Ryland & Gordon) (Plate 43, H)

Lepralia hyalina var. D. Hutton, 1873: 93; Hutton 1880: 193.
Schizoporella hyalina var. *tuberculata*: Hamilton 1898: 196.
Hippothoa delta Ryland & Gordon, 1977: 32.
Celleporella delta: Gordon & Hastings 1979: 577.

MATERIAL EXAMINED: NZOI: Stns K816, K836. DPG: Colonies from Leigh, Auckland, Castlepoint, Wellington, Kaikoura, Otago Harbour, Bluff, Halfmoon Bay.

DISTRIBUTION: Bay of Islands, Poor Knights Islands, Hauraki Gulf, Auckland, Castlepoint, Wellington, Chatham Islands, Kaikoura, Otago Harbour, Bluff, Stewart Island, Auckland Island.

DESCRIPTION: Colony encrusting. Zooids elongate, 0.37–0.55 × 0.13–0.18 mm, contiguous or somewhat discrete, interconnected by short tubes; the frontal wall mostly smooth or with fine transverse striations and 2–3 low umbones along the mid-line. Orifice inclined distally downward, slightly longer than wide, with a U-shaped sinus and usually notched or bicuspid condyles. A pair of prominent tubercles distal to each orifice. Ovicelled zooids 0.42–0.58 × 0.20–0.25 mm, as long overall as autozooids or slightly longer; combined orifice wide, the proximal rim converging from each side into a V-shaped sinus; ovicell smooth, perforated by 5–6 pores, or these occluded. Presumed male zooids 0.30–0.45 × 0.11–0.18 mm, usually narrower than autozooids and almost as long; a small orifice with narrow U-shaped sinus and unicuspid condyles. Ancestrula smooth, unornamented.

REMARKS: Ryland and Gordon (1977) gave a full description of this widespread New Zealand species. The Kermadec specimens agree in all features, including the ancestrula and early astogeny, except that the zooids are noticeably more discrete in parts of some colonies. This species occurs on algae.

Family PASYTHEIDAE Davis, 1934

Colony of flexible jointed branches arising from ramifying encrusting or stolonate portions. Zooids slender, elongate, with small scattered pores; arranged in pairs or triplets. Orifice with broad shallow poster. Spines, avicularia and ovicells absent.

Gemellipora Smitt, 1873

Colony erect, jointed, arising from uniserial chains of zooids and/or stolons; erect portions comprising zooids back to back in pairs, the orifices facing alternately in different directions. Orifice with broad shallow poster. Frontal wall smooth with small scattered pores. Kenozooids absent.

TYPE-SPECIES: *Gemellipora eburnea* Smitt, 1873

Gemellipora eburnea Smitt (Plate 44, A,B)

Gemellipora eburnea Smitt, 1873: 35, 75; Harmer 1957: 994 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stn K827.

DISTRIBUTION: Amphi-Atlantic from temperate to tropical latitudes, Hawaii and Indonesia.

DESCRIPTION: Colony of repent basal parts and erect branching parts; basal zooids in irregular uniserial chains, of varying length, usually very elongated and attenuated proximally, or the proximal portion drawn out into a stolon of indefinite length. Frontal wall quite smooth or often with fine transverse striations, and with a few small scattered pores which are frequently occluded. Orifice with shallow poster and small condylate excavations at the proximolateral corners.

Erect parts of the colony comprise regularly pinnate jointed branches. Zooids 0.50–0.63 × 0.17–0.20 mm, arranged in segments of two pairs, each pair back to back but slightly offset from one another and more or less at right angles to the other pair. Each zooid smooth-walled, elongate, with frontal pores and orifice as in basal zooids. Lateral branches arise from the lower pair of zooids in each segment, the articulations comprising a pair of parallel, thick-walled chitinous tubes.

REMARKS: This species has been recorded from moderately shallow to very deep water (> 3000 m). The Kermadec colony (from 318 m) comprises the southernmost Pacific record.

Family CHORIZOPORIDAE Vigneaux, 1949

Colony encrusting. Frontal wall gymnocystal, imperforate or with minute pores. Orifice semicircular. Avicularia interzooidal. Ovicell hyperstomial, imperforate; closed by the zooidal operculum. Pore-chambers tubular. Small kenozooids present.

Chorizopora Hincks, 1879

Characters as for the family.

TYPE-SPECIES: *Flustra brongniartii* Audouin, 1826

Chorizopora brongniartii (Audouin) (Plate 44, C)

Flustra brongniartii Audouin, 1826: 240.
Chorizopora brongniartii: Hincks 1880a: 224; Hamilton 1898: 195; Harmer 1957: 948; Powell 1967a: 252.

MATERIAL EXAMINED: NZOI: Stns K796, K797, K818, K820, K837, K851, K854, K855, K856, K857, K859, K867. DPG: Colonies from Fiordland.

DISTRIBUTION: Three Kings Islands, Dunedin, Fiordland; also Victoria, Philippines, China, Burma, Sri Lanka, Red Sea, Mediterranean Sea, Britain, South Africa, Galapagos Islands.

DESCRIPTION: Colony encrusting, thin, translucent. Zooids 0.37–0.43 × 0.27–0.30 mm, reticulated, connected by short tubes. Frontal wall smooth, hyaline, sometimes with fine transverse markings and a suboral papilla. Orifice semicircular, wider than long, with straight proximal rim. No spines except on ancestrula. Ovicelled zooids like autozooids but with a slightly larger orifice. Ovicell smoothly contoured or slightly carinate; with a small distal avicularium distally directed, the rostrum acute and pivot bar complete. Kenozooids small, numerous, between autozooids; with tiny subcircular opesiae. Small avicularia frequently occur in the place of kenozooids.

REMARKS: The Kermadec specimens agree with descriptions of Atlantic and European material. They lack the laterofrontal pores that Harmer (1957) illustrated in apparent *C. brongniartii* from Indonesia.

Chorizopora ferocissima n.sp. (Plate 44, D)

MATERIAL EXAMINED: NZOI Stns K796, K836, K857.

DISTRIBUTION: Kermadec Islands, 35–125 m.

DESCRIPTION: Colony encrusting. Zooids 0.27–0.53 × 0.20–0.33 mm, connected by short tubes; with very few interzooidal kenozooids or avicularia except distally. Frontal wall with 17–22 robust spines resembling thorns, and 6–10 tiny pores, often at the bases of spines. Orifice semicircular, wider than long; a pair of stout oral spines, each with a tiny distally directed tine. Ovicell very short, partly obscured by a distal avicularium, smooth; orifice of ovicelled zooids larger than in autozooids. Avicularia with relatively long, acute rostrum with serrated rim; pivot bar incomplete. Kenozooids rare, also bearing a few robust spines.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–318.

PARATYPE: NZOI, type number P – 544, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn K796, Esperance Rock, 31°20.8′S, 178°49.0′W, 70 m.

REMARKS: This species seems very close to *C. spinosa* (Kirkpatrick, 1890), for which there appear to be some inconsistencies between Kirkpatrick's (1890b) description and that of Harmer (1957). Kirkpatrick mentions two pairs of oral spines of which one pair is forked and neither his description nor his illustration indicate frontal spines. Harmer, on the other hand, describing "Siboga" material and having seen the type of *C. spinosa,* mentions only one pair of oral spines, each trifurcate, and "numerous minute frontal papillae". One of the zooids in his illustration shows five papillae and the apparent bases of 29 others. Harmer also depicts somewhat triangular orifices. The Kermadec specimens differ from *C. spinosa* in the oral spines, the number and size of the frontal spines, and the orifice. They resemble *C. spinosa,* however, in the inconspicuous ovicells and relatively long avicularian rostra.

Chorizopora spicata n.sp. (Plate 44, E–G)

MATERIAL EXAMINED: NZOI Stns K825, K827, K837, K842, K844, K851, K856, K867.

DISTRIBUTION: Kermadec Islands, 104–370 m.

DESCRIPTION: Colony encrusting, thin. Zooids 0.27–0.48 × 0.22–0.28 mm, reticulate; with numerous interzooidal kenozooids and avicularia. Frontal wall

with up to 50 fragile needle-like spines, these mostly deciduous, leaving the frontal wall with numerous small papillae. Orifice slightly longer than wide and wider distally than proximally; no additional spines. Ovicell long, smooth, carinate; with a short distal avicularium distally directed, with complete pivot bar. Ovicellular orifice wider than long. Kenozooids with tiny opesial opening; many replaced by avicularia.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–311.

TYPE-LOCALITY: NZOI Stn K827, 28°45.4′S, 177°46.5′W, 260–318 m.

REMARKS: This species resembles *C. papillata* Powell, 1967a in the long ovicells and small avicularia, but the autozooidal orifices of that species are much wider than long and the frontal spines far less numerous (about 11) than in *C. spicata.*

Superfamily CELLEPOROIDEA Lamouroux, 1821, *nom. transl.*

Colony encrusting, discoidal, or erect from an encrusting base. Zooidal frontal wall cryptocystidean, typically smooth, opaque, with only small marginal pores. Primary orifice frequently obscured by development of a peristome; mostly with proximal sinus and condyles; sometimes a beaded distal arch. Oral spines present or absent. Avicularia adventitious, often associated with the peristome, and/or vicarious or interzooidal; rarely absent from mature colonies. Ovicell prominent or recumbent, sometimes immersed in secondary calcification; never closed by the zooidal operculum. Basal pore-chambers or mural septula present.

REMARKS: The name Celleporoidea is a *nomen translatum* of Celleporidae Lamouroux, 1821, and is here taken to include, *inter alia,* the Sertellidae Jullien. Vigneaux's (1949) introduction of a superfamily Lepraliellacea is not followed here as the genus *Lepraliella* Levinsen is included in the Sertellidae.

Banta (1973) reported the presence of a hypostegal coelom in the Sertellidae and Celleporidae (as Celleporinidae), which allows the above characterisation of this superfamily as cryptocystidean.

Family CELLEPORIDAE Lamouroux, 1821

Colony encrusting to erect, vincularian or nodular and massive. Zooids closely packed, usually recumbent or semi-erect with irregular orientation. Frontal wall typically smooth with only marginal pores. Adventitious avicularia typically adjacent to the orifice and often associated with a peristome. Vicarious and/or interzooidal spatulate avicularia often present. Ovicell hyperstomial, with a frontal area and/or pores; not closed by the zooidal operculum.

Celleporina Gray, 1848

Colony encrusting, pisiform or nodular, typically multilaminar. Orifice with a sinus, with 1–2 peristomial avicularia. No oral spines. Additional spatulate avicularia present or absent. Ovicell prominent, with a perforated ooecial exposure (tabula). Small basal pore-chambers present.

TYPE-SPECIES: *Lepralia hassallii* Johnston, 1847

Celleporina costazii (Audouin) (Plate 45, A)

Cellepora costazii Audouin, 1826: 237.
Celleporina costazii: Harmer 1957: 901 (*cum syn.*); Long & Rucker 1969: 68; Moyano 1973: 13; Wass & Yoo 1975: 811, 824.

MATERIAL EXAMINED: NZOI Stn K798.

DISTRIBUTION: Red Sea, Sri Lanka, Timor, Indonesia, Easter Island; also Tertiary of Tasmania.

DESCRIPTION: Colony in the form of small knob-shaped growths often as high as wide, with vertical or concave sides, to 8 mm wide and 5 mm high, flat-topped or depressed in the centre. Zooids 0.37–0.63 × 0.27–0.43 mm, semi-erect, crowded, smooth-walled with small marginal pores. Primary orifice with deep V-shaped sinus obscured by a high peristome, lower proximally, with a pair of lateral avicularia with short, roundly acute rostra and complete pivot bar. Occasional vicarious avicularia, spatulate, with a small opesia; directed proximally or into the centre of the colony. Ovicell recumbent, prominent, with a broad flat tabula of 18–21 ectooecial ribs.

REMARKS: Harmer (1957) sorted out the previous confusion surrounding this species and redescribed it.

Celleporina spatula (MacGillivray) (Plate 45, B)

Cellepora costazii: MacGillivray 1885: 114.
Cellepora costazii var. *spatula* MacGillivray, 1887d: 185.
Lagenipora costazii var. *spatula*: Marcus 1921b: 113.
Celleporina spatula: Powell 1967a: 311 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K801, K829, K865.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Auckland Island; also Victoria.

DESCRIPTION: Colony encrusting to semi-erect, forming ramose nodular growths 2–3 cm broad and/or high. Zooids 0.27–0.50 × 0.17–0.23 mm, recumbent to erect, depending on the size of the colony and their position in it. Frontal wall smooth to rugose with marginal pores only. Primary orifice only partly surrounded by a low

peristome, high suborally, with a single avicularium just to one side of the mid-line; orificial sinus variable, deeply V-shaped to U-shaped, occupying most of the proximal rim; with squared or sloping condyles at the corners. Avicularium oval in shape, with a thin, complete pivot bar. Ovicell with rounded conspicuous frontal tabula with perforations. Large spatulate avicularia of various sizes, generally wider distally, with long rostra, the pivot bar complete.

REMARKS: MacGillivray's (1887d) illustration differs in a minor way from the present specimens – he shows smoother frontal walls lacking marginal pores.

Celleporaria Lamouroux, 1821

Colony encrusting to erect and massive, usually plurilaminar. Zooids suberect to erect, smooth, with a few marginal pores. Orifice non-sinuate, with or without denticles and oral spines. Suboral and vicarious avicularia present. Ovicells hyperstomial, imperforate.

TYPE-SPECIES: *Cellepora cristata* Lamarck, 1816

REMARKS: As Harmer (1957) noted, *Celleporaria* was based on three species of Lamarck (1816) without indication of a type. Bassler (1935) subsequently indicated *C. cristata* as type-species but commented that it was "unrecognizable". For this reason, Harmer selected *C. oculata*. Pouyet (1978) re-examined Lamarck's types, including the three named by Lamouroux, redescribing and illustrating them. *C. cristata* is no longer "unrecognisable" and Bassler's choice must, in any case, stand.

Cook (1973 : 260; in litt. 1980) has observed that the frontal wall of some *Celleporaria* species is not umbonuloid as previously considered. For this reason *Celleporaria* is here returned to the family Celleporidae.

Celleporaria tridenticulata (Busk) (Plate 45, C–E)

Cellepora tridenticulata Busk, 1881: 347; Waters 1887a: 68.
Exochella dubia Livingstone, 1929: 86.
Holoporella albirostris: Livingstone 1929: 94 (*pars*).
Holoporella tridenticulata: Brown 1952: 365; Uttley & Bullivant 1972: 52.
Celleporaria tridenticulata: Harmer 1957: 670; Powell 1967a: 236; Wass & Yoo 1975: 811, 825.

MATERIAL EXAMINED: NZOI Stns K795, K797, K837, K867; also D112 from the Campbell Plateau.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Chatham Rise, Mernoo Bank, Campbell Plateau; also Miocene of Southland, Pliocene of Hawkes Bay. Miocene of Tasmania and Victoria; Pleistocene of Japan; Recent of Tasmania, Victoria, Great Barrier Reef, Torres Strait, Indonesia, Sri Lanka, Andaman Islands, India, Mauritius, Japan, Galapagos Islands.

DESCRIPTION: Colony encrusting. Zooids 0.57–0.70 × 0.42–0.53 mm, recumbent at the growing edge to erect or semi-erect in older parts of the colony. Frontal wall smooth with 3–6 scattered marginal pores, rising to a median suboral umbo which is not produced into a spine and has a small apical avicularium facing distally outward; the rostrum rounded, minutely serrated; the pivot bar complete. Orifice as long as wide, the proximal rim with three conspicuous processes (teeth). Five oral spines in marginal zooids, their bases overgrown in older zooids. Vicarious avicularia somewhat spatulate with complete pivot bar, small proximal opesia, the large rostral opesia and rostral palate of equal area. Ovicells not seen.

REMARKS: The oral spines are more numerous than have been usually recorded in this species. Harmer (1957) noted there were two, rarely three, spines in Indonesian specimens. Livingstone's (1929) colonies (as *Exochella dubia*) from Three Kings Islands had three spines. Harmer recorded no variation in the three extra-opercular teeth from the proximal rim of the orifice. Powell (1967a) however, noted that Livingstone's (1929) material from Colville Channel (as *Holoporella albirostris*) had four incipiently developed teeth and, in addition, four oral spines. These features are reminiscent of a colony from the Kermadec Islands with seven very small denticles, of which one is notched, perhaps representing two instead of one; these denticles are arranged vaguely, then, as four pairs. There are 2–4 oral spines. The orifice of this variety appears at first quite different from that of regular *C. tridenticulata* in the lack of the three conspicuous teeth, but the frontal wall and suboral umbo are otherwise identical in the two forms. Vicarious avicularia were not seen in the variety.

Uttley and Bullivant (1972) mention that discoidal or lunulitiform, non-rooted colonies of *C. tridenticulata* occur from 180–550 m on the Chatham Rise and Mernoo Bank. I have noted these also in NZOI collections from Campbell Plateau.

Ovicells have been described by Harmer (1957).

Galeopsis Jullien *in* Jullien & Calvet, 1903

Colony erect or encrusting. Zooidal frontal wall typically smooth, with a few scattered marginal and/or frontal pores. Primary orifice with distinct sinus. A peristome with paired avicularia often forming a preorificial spiramen. Ovicell usually subimmersed in secondary calcification, with a tabula and sometimes a slight labellum; not closed by the zooidal operculum. Basal kenozooids not uncommon. Mural septula present.

TYPE-SPECIES: *Galeopsis rabidus* Jullien *in* Jullien & Calvet, 1903.

REMARKS: The species here ascribed to this genus

Sig. 8*

have, in the past, been placed in other genera. Busk (1884), for example, included *G. pentagonus* in his new genus *Haswellia* (as *H. auriculata*). Brown (1952) mistakenly rejected the amended name *Haswellina* (*see* discussion on p.74) in favour of *Spiroporina* but showed that Busk's species had previously been named as *Vincularia pentagona* by d'Orbigny (1847). Harmer (1957) subsequently separated the smooth-walled species of *Spiroporina* into his new genus *Buchneria,* based on *Palmicellaria dofleini* Buchner, 1924. *B. dofleini* and *B. sinuata* Harmer differ, however, from the species previously assigned to *Spiroporina,* which have paired peristomial avicularia often incorporated into a spiramen, and a perforated ovicellular tabula. Canu and Bassler (1927a) had already cited this latter feature as a characteristic of their new genus *Diatosula.* Unfortunately, they based *Diatosula* on Calvet's (*in* Jullien and Calvet 1903) *Myriozoum marionense* Busk, which is not, in fact, Busk's (1884) species. *Diatosula* has been used by other authors (e.g., Osburn 1952) and would be an otherwise acceptable genus, for its species differ, as noted, from *Buchneria s.s.* The type of *Diatosula* would need to be renamed or otherwise stabilised, except that it is almost certainly a junior synonym of *Galeopsis* Jullien.

There has been much confusion concerning the status of *Galeopsis,* for Jullien established this genus on the basis of two species, one of which (*G. pupa*) was later discovered to belong to *Gigantopora* Ridley, 1881. Canu and Bassler (1917) chose Jullien's first named species, *Galeopsis rabidus,* as the type of the genus, and for a number of years (1920, 1929a) treated *Galeopsis* and *Gigantopora* as separate genera. In 1935, Bassler synonymised *Galeopsis* with *Gigantopora* and changed the family name, Galeopsidae, to Gigantoporidae. He was followed in this by Harmer (1957). Brown (1952) recognised, however, that *G. rabidus* and *G. pupa* were not congeneric. Whereas *G. pupa* was a typical *Gigantopora, G. rabidus* had a smooth, imperforate frontal wall and a schizoporelloid orifice. Brown did not suggest any particular family for *G. rabidus* but his text indicates that he may have considered it as appropriate in the Gigantoporidae or Schizoporellidae.

No-one has previously suggested, however, that *Galeopsis* is synonymous with *Diatosula* or that the smooth-walled species that Brown included in *Spiroporina* and for which Harmer suggested *Buchneria* belong to *Galeopsis.* This is not surprising for, as evidenced by the Kermadec samples, the encrusting and erect phases of species of *Galeopsis* are so different as to appear to be in different genera. The encrusting phase of *G. pentagonus* is strikingly similar to Jullien's illustration of *G. rabidus* and it is significant that the zooids of his single small colony were semi-erect, irregularly disposed, and without ovicells. This arrangement is absolutely typical of the encrusting stage of species formerly included in *Spiroporina.* The erect stage of *G. rabidus* has not been identified. It is probably the form identified by Calvet (*in* Jullien and Calvet 1903 : 145) as *Haswellia auriculata* var. *fayalensis* Waters. Brown (1952 : 216) suggested that this is conspecific with *G. pentagonus,* but var. *fayalensis,* though similar, differs in having alternating orifices. Calvet (1931) commented on further, evidently neanic, specimens of *G. rabidus,* noting that ovicells were "hyperperistomial", with frontal pores. He illustrated only the operculum.

Some encrusting forms of *Galeopsis* from New Zealand closely resemble species of *Celleporina* and *Lagenipora* (Celleporidae) and for this reason I include *Galeopsis* (and the Galeopsidae) in the Celleporidae. Finally, inasmuch as Harmer (1957 : 878) regarded *G. pentagonus* (as *Haswellia auriculata*) as a *Buchneria.* his Buchneriidae is possibly also inclusive in the Celleporidae.

Galeopsis pentagonus (d'Orbigny) (Plate 46, A–C)

Vincularia pentagona d'Orbigny, 1847: 21.
[?] *Pustulipora porcellanica* Hutton, 1873: 102.
Haswellia auriculata Busk, 1884: 173 (*partim*); Hamilton 1898: 196.
Haswellina auriculata: Livingstone 1929: 78.
Spiroporina pentagona: Brown 1952: 213 (*cum syn.*); Moyano 1974: 15.
Haswellina pentagona: Uttley & Bullivant 1972: 33.
Buchneria auriculata: Harmer 1957: 878; Wass & Yoo 1975: 826.

MATERIAL EXAMINED: NZOI Stns K857, K858, K872.

DISTRIBUTION: Chatham Rise, also Lower Oligocene of Oamaru, Middle Miocene of Southland, Pliocene of Napier and Wanganui. Tasmania (Late Miocene to Recent), Juan Fernandez Island, magellanic South America, Falkland Islands.

DESCRIPTION: Colony erect. ca. 1 mm diameter, arising from an encrusting base, dichotomously branching. Zooids 0.62–0.75 × 0.30–0.35 mm, in whorls of about five; smooth-walled or finely textured, with usually only two pairs of small pores in the interzooidal areas. Primary orifice obliquely inclined, the sinus seemingly fairly deeply U-shaped but the actual sides of the sinus formed by stout condyles. A pair of lateral oral avicularia on a slight peristome, directed obliquely distally, not overarching the sinus or fusing to form a spiramen (except when heavy secondary calcification occurs, but this was not seen in the present specimens); the rostra short, acute; the pivot bar complete. No other avicularia seen. The encrusting stage of this species is quite different from the erect stage in the form of the peristome. Spinose processes fuse to form a peristomial bridge and large spiramen. Numerous basal kenozooids also occur.

REMARKS: The Kermadec specimens had only immature ovicells. In Chilean colonies ovicells are mostly immersed, appearing as flattened bulges frontally, with a subcircular imperforate tabula (Moyano 1974).

G. pentagonus is evidently subject to great

variability. Material described from New Zealand by Brown (1952) and Uttley and Bullivant (1972) had somewhat columnar avicularia in a thicker peristome, with the frequent forming of a peristomial bridge and spiramen by secondary calcification in erect parts of colonies. Marcus (1921a) also recorded the formation of spiramina in erect parts of colonies from Juan Fernandez Island. In addition, ovicells can occur in encrusting basal parts, though not in abundance. D'Orbigny's (1842, 1847) original specimens came from the Falkland Islands and the Kermadec specimens are certainly identical to Moyano's (1974) material from southern Chile.

Galeopsis polyporus (Brown) (Plate 46, D)

Spiroporina polypora Brown, 1952: 216.
Haswellina polypora: Uttley & Bullivant 1972: 34.

MATERIAL EXAMINED: NZOI: Stns K827, K851, K856. DPG: Colonies from Hauraki Gulf, Mount Maunganui, and Otago Shelf.

DISTRIBUTION: Hauraki Gulf, Mount Maunganui, Wanganui (Upper Pliocene to Recent), Chatham Rise, Otago Shelf; also Middle Miocene of Southland.

DESCRIPTION: Colony erect, stout, branching, to 2 mm diameter, thicker before bifurcation. Zooids 0.40–0.50 × 0.17–0.23 mm, arranged in whorls of 11–14 or more around a branch axis. Frontal wall initially smooth, convex, with clearly defined interzooidal boundaries and small marginal pores; or a pair of small frontal pores proximolateral to the orifice. Frontal calcification soon thickening to smooth the contours of zooids, obscuring zooidal boundaries, the marginal pores remaining open, however. Primary orifice immersed in a peristome, with deep V-shaped sinus and well developed condyles. A pair of peristomial avicularia, generally constricting the secondary orifice, making it pyriform, or just fusing at the tips of the rostra to form a peristomial bridge and spiramen. Additional small oval avicularia usually in the interzooidal areas and/or proximally on the frontal wall; occasional larger spatulate avicularia, directed obliquely proximally. Ovicell immersed in secondary calcification, visible externally by the crescentic or subcircular ectooecial opening with cervicorn ribbing; a short labellum also present.

REMARKS: Uttley and Bullivant (1972) remarked how the encrusting stage of *G. polyporus* differs so markedly from the erect ephebic stage. The encrusting stage (encountered in Chatham Rise samples and not uncommon intertidally at Leigh) is capable of breeding. It differs from the erect stage in the quincuncial arrangement of zooids, higher proximal peristomial rim, and frequent distal peristomial spine-like tubercles. The peristomial avicularia are more widely separated and never coalesce to form a bridge and spiramen. Spatulate avicularia do not occur. The form of the ovicell, the size and orientation of the small avicularia, and distribution of areolar pores are, however, the same.

Brown (1952 : 218) suggested that *Spiroporina immersa* Tenison-Woods, 1880 might be the present species. I have examined Tenison-Wood's type in the N.Z. Geological Survey and it is conspecific with *Cinctipora elegans* Hutton, 1873, an endemic cyclostome genus and species.

Buffonellaria Canu & Basler, 1917

Colony encrusting. Zooidal frontal wall with marginal pores only. Primary orifice with sinus and condyles; no oral spines. Avicularia adventitious, paired or single, near the orifice; often larger, spatulate avicularia also present. Ovicell prominent or subimmersed, with an imperforate tabulate area. Basal porechambers present.

TYPE-SPECIES: *Hippothoa divergens* Smitt, 1873

REMARKS: Ryland (1969) clarified the nomenclature of *Buffonellaria* and *Stephanosella*.

Buffonellaria biavicularis (Powell) (Plate 47, A,B)

Christinella biavicularis Powell, 1967a: 286.

MATERIAL EXAMINED: NZOI Stns $K826_3$, K837, K851, K856, K867.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Manawatu coast, Cook Strait.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.50 × 0.32–0.38 mm, with a grainy frontal wall when forming, rugose when older, imperforate frontally except for a few small marginal pores. Orifice as wide as long or slightly wider, sinus broad, curving the full width of the proximal rim, a small rounded condyle at each corner. Avicularia generally paired, one near each proximal corner of the orifice; oval in shape, with very thin complete pivot bar. Ovicell somewhat recumbent, smooth, with a broad tabula occupying most of the frontal surface. Large spatulate avicularia not seen.

REMARKS: Powell (1967a) established a new genus, *Christinella,* based on this species, the chief distinguishing features being a broad arcuate sinus, granular frontal wall, and especially the ovicell with a broad tabula. Surprisingly, he did not mention a resemblance to *Buffonellaria* (as *Stephanosella*) for the ovicells of *B. regenerata* (Powell) are of the same type. The granular frontal wall and broad sinus of *B. biavicularis* are superficially quite different from that of *B. regenerata* (*inter alia*) and generic separation on the basis of these two species alone is possibly justified. *Buffonellaria* is,

however, a variable genus. For example, *Stephanosella biaperta sensu* Osburn, 1952, *non* Michelin, 1848 is obviously congeneric with *B. biavicularis* for it also has a granular frontal wall with marginal pores as well as large frontal avicularia. The ovicells are of the same type. The sinus, while narrower than that of *B. biavicularis,* is nonetheless fairly broad.

The following species, *B. christinelloides* n.sp., is in many ways intermediate between *B. biavicularis* and *B. regenerata.* While it has the smooth imperforate frontal walls and lateral-oral avicularia of the latter species, it has the orifice and large frontal spatulate avicularia of the former. On the basis of the evident variability of characters, therefore, I include *Christinella* Powell in *Buffonellaria* Canu & Bassler. It is, in any case, convenient to be able to do this for *Christinella* Powell, 1967a is preoccupied by *Christinella* Malecki, 1964, another cheilostome bryozoan.

Buffonellaria christinelloides n.sp. (Plate 47, C)

MATERIAL EXAMINED: NZOI Stn K842.

DISTRIBUTION: Kermadec Islands, 325–370 m.

DESCRIPTION: Colony encrusting. Zooids 0.40–0.43 × 0.20–0.25 mm, with smooth imperforate frontal walls, each usually with a prominent V-shaped suboral ridge. Orifice with a fairly broad rounded sinus and a pair of small condyles in the corners. A pair of small oral avicularia at the level of the middle of the orifice, on slight prominences which may be continuous with the suboral ridge; oval, with thin complete pivot bar. A large spatulate avicularium on many of the zooids frontally, with a long rostrum and a narrow complete pivot bar. Ovicell prominent, thin-walled, wider than long with the tabula vertical, facing distally, and the ovicellular opening large, also vertical, facing proximally; no labellum.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–297.

TYPE-LOCALITY: NZOI Stn K842, Macauley Island, 30°10.2′S, 178°35.9′W, 325–370 m.

REMARKS: The relationship of *B. christinelloides* to *B. biavicularis* and *B. regenerata* has already been discussed. The ovicell is very like that of *B. depressa* (Philipps) (q.v.). The characteristic features are the prominent ovicells and large frontal avicularia.

Buffonellaria depressa (Philipps) (Plate 47, D)

Schizoporella depressa Philipps, 1900: 445.
Buffonellaria loculifera Canu & Bassler, 1929a: 308.

MATERIAL EXAMINED: NZOI Stns K797, K799, K801, K802, K812, K820, K836, K863, K871.

DISTRIBUTION: Philippines, Loyalty Islands.

DESCRIPTION: Colony encrusting. Zooids 0.25–0.33 × 0.25–0.33 mm, at the growing margin like those of *B. regenerata*, with smooth, imperforate glassy walls soon developing a V-shaped ridge proximal to the orifice; this ridge markedly produced, rising high above the frontal surface and projecting somewhat distally; zooids arranged in regular quincunx such that the proximally directed ends of each V overlap somewhat the slightly proximal adjacent zooids, meeting the bottom of the V of those zooids; the overall effect is that each orifice appears surrounded by a diamond-shaped bounding wall. Orifice with a fairly broad deep sinus and a pair of small rounded condyles. Paired oral avicularia small, oval; the rostrum frontally directed, with serrated rim; the pivot bar complete. Large frontal avicularia not uncommon, situated on an arm of a V-shaped ridge, directed obliquely proximally or distally; the rostrum somewhat spatulate, twice as long as wide; the pivot bar complete. Ovicell much raised, thin-walled, wider than long, with a large opening proximally and equally large ectooecial fenestra distally.

REMARKS: In spite of the extreme frontal modification this species is a typical *Buffonellaria*. The oral avicularia are more or less identical to those of *B. regenerata* and the ovicells resemble those of *B. christinelloides*.

"*Schizoporella*" *ludbrookae* Brown, 1956 from the Pliocene of South Australia resembles *B. depressa*. Brown mentions V-shaped ridges, delicate hyperstomial ovicells, and spatulate avicularia on the ridges.

Buffonellaria regenerata (Powell) (Plate 47, E)

Stephanosella regenerata Powell, 1967a: 278.

MATERIAL EXAMINED: NZOI: Stns K820, K837, K851, K855, K867. DPG: Colonies from Hauraki Gulf.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.43 × 0.30–0.33 mm, smooth, vitreous, with a low curved ridge proximal to the orifice; imperforate except for a minute pore each side of the ridge proximal to an avicularium. Orifice with rounded V-shaped sinus flanked by rounded condyles. An avicularium each side of the orifice; the rounded rostrum frontally directed, with serrated rim; the pivot bar complete. Ovicell somewhat immersed, smooth, with an imperforate semicircular tabula or minute marginal pores just visible under the rim of the tabula; a slight labellum proximally. Spatulate avicularia not seen.

REMARKS: Apart from the suborificial ridge the Kermadec specimens are identical to Powell's (1967a) material from Three Kings Islands.

Lagenipora Hincks, 1877

Colony typically encrusting, unilaminar. Zooidal frontal wall with marginal pores only, the pores often indistinct. Primary orifice orbicular, with or without a weakly defined sinus. Peristome well developed, usually tubular, often with spinose projections and small avicularia. Kenozooids present or absent. Ovicell distal to the peristome with a conspicuous tabula. Basal pore-chambers present.

TYPE-SPECIES: *Celleporella lepralioides* Norman, 1868

Lagenipora crenulata n.sp. (Plate 48, A)

MATERIAL EXAMINED: NZOI Stns K829, K854, K855, K856.

DISTRIBUTION: Kermadec Islands, 115–635 m.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.53 × 0.25–0.33 mm, with smooth, convex frontal walls. Peristome tall, relatively narrow; the secondary orifice flared, crenulated, with a pair of tiny avicularia. Avicularia with short acute rostra directed frontally toward each other and a pair of proximally deflected pivots; no pivot bar. Primary orifice completely hidden by the peristome, with a broad rounded sinus not clearly delimited from the anter; no condyles. The base of the peristome open distally, and occasionally a suture line extends up the distal mid-line where fusion of the peristomial margins is incomplete. Ovicell distal to the peristomial opening with a broad triangular or crescentic tabula with peripheral row of pores. Spatulate vicarious avicularia occasional, with complete pivot bar and fairly well developed palatal shelf.

HOLOTYPE: Colonies, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–298.

TYPE-LOCALITY: NZOI Stn K855, Curtis Island, 30°33.2′S, 178°31.6′W, 115–125 m.

REMARKS: Vicarious avicularia are not generally regarded as being present in *Lagenipora* (e.g., Hayward and Ryland 1979 : 280), which is otherwise characterised by well developed peristomes and tabulate ovicells. *L. crenulata* differs from the type-species in lacking a row of marginal pores [there are two distal pairs which give rise to the avicularia and which are obscured by the development of the peristome] and in having peristomial avicularia. In both of these features it resembles *L. pygmaea* from N.W. Europe.

L. nitens MacGillivray, from Victoria, also has vicarious avicularia, but there is only one peristomial avicularium and the secondary orifice is not fluted as in *L. crenulata*.

Lagenipora ferocissima n.sp. (Plate 48, B)

MATERIAL EXAMINED: NZOI Stns $K826_3$, $K828_1$, K872.

DISTRIBUTION: Kermadec Islands, 235–490 m.

DESCRIPTION: Colony encrusting, forming uni- to pluriserial linear or irregular growths. Zooids 0.50–0.70 × 0.36–0.50 mm, with convex frontal walls covered by numerous multibranched spinose tubercles. A few inconspicuous marginal pores. Peristome tall, cylindrical, smooth, with a slightly flared rim supporting a small avicularium. No vicarious avicularia. Primary orifice orbicular with a broad weakly developed sinus; no condyles. Ovicell with a conspicuous, marginally perforated tabula.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–285.

TYPE-LOCALITY: NZOI Stn $K826_3$, 28°48.0′S, 177°48.0′W, 390–490 m.

REMARKS: The spinose frontal wall is the most characteristic feature of this species, readily distinguishing it from all others.

Lagenipora hemiperistomata n.sp. (Plate 48, C,D)

MATERIAL EXAMINED: NZOI Stn K827.

DISTRIBUTION: Kermadec Islands, 260–318 m.

DESCRIPTION: Colony encrusting, pisiform to domed. Zooids 0.25–0.33 × 0.25 mm, smooth-walled with marginal pores, erect or suberect. Primary orifice orbicular, with a broad, weakly developed sinus; no condyles; obscured in mature zooids by a peristome which is tall proximally and curves around the sides of the orifice as a pair of processes arching distally without fusing; thus the peristome is open distally and is not tubular as in other species. A pair of peristomial avicularia present, fairly prominent, long, acute, directed proximally upward. Vicarious avicularia common, generally parallel-sided, with extensive palate and complete pivot bar. Ovicell recumbent, with smooth extensive tabula with a few marginal perforations.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–292.

TYPE-LOCALITY: NZOI Stn K827, 28°45.4′S, 177°46.5′W, 260–318 m.

REMARKS: In some ways this species resembles an *Osthimosia,* with its numerous vicarious avicularia and open peristome. The orbicular orifice is, however, characteristic of *Lagenipora*.

Lagenipora laevissima n.sp. (Plate 48, E)

MATERIAL EXAMINED: NZOI Stns K841, K842.

DISTRIBUTION: Kermadec Islands, 325–500 m.

DESCRIPTION: Colony encrusting. Zooids 0.75–0.90 × 0.55–0.65 mm, arranged in linear, frequently branching chains. Frontal wall smooth, with only a few marginal perforations. Peristome relatively thick-walled, obscuring the primary orifice, which has a broad U-shaped sinus delimited from the anter by a pair of small condyle-like processes. No vicarious avicularia. Ovicell with broad, flat, imperforate tabula.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–278.

TYPE-LOCALITY: NZOI Stn K842, Macauley Island, 30°10.2′S, 178°35.9′W, 325–370 m.

REMARKS: Because the ends of the peristomes are broken in all zooids in the Kermadec samples, the form of the presumed peristomial avicularia is unknown. A narrow shaft occurs in lateral walls of the peristome, implying that there are two such avicularia. The tabula of the ovicell is unusual in being imperforate or unsculptured.

Osthimosia Jullien, 1888

Colony encrusting, pisiform, nodular or erect, multilaminar. Orifice with a sinus; 1–2 peristomial avicularia. No oral spines. Additional spatulate avicularia typically present. Ovicell prominent, with an imperforate tabula.

TYPE-SPECIES: *Cellepora eatonensis* Busk, 1881

REMARKS: *Osthimosia* is very close to *Celleporina* and it is debatable whether or not it ought to be accepted as a full genus. Rogick (1959) accepted and redefined *Osthimosia,* particularly stressing the imperforate nature of the ovicell, and her treatment is followed here.

Osthimosia bicornis (Busk) (Plate 49, A)

Cellepora bicornis Busk, 1881: 354; Busk 1884: 202.
Osthimosia otopeta Jullien, 1888: 64.
Osthimosia bicornis: Rogick 1959: 14 (*cum syn.*); Uttley & Bullivant 1972: 50.

MATERIAL EXAMINED: NZOI Stn K855.

DISTRIBUTION: Chatham Rise; also magellanic South America, Prince Edward Island, Marion Island, Antarctica.

DESCRIPTION: Colony encrusting, pisiform to nodular. Zooids 0.25–0.46 × 0.25–0.45 mm, more or less erect. Primary orifice with deep sinus, V-shaped proximally and bordered by well developed condyles. Primary orifice obscured by a surrounding peristome which is much raised laterally, supporting a pair of avicularia; these oval in shape, the rostrum subacute, the pivot bar complete. Spatulate avicularia with broad, flat palatal surface and widely rounded rostral rim. Ovicell smooth, swollen basally, tapering frontally, with a very small circular fenestra.

REMARKS: The Kermadec colonies are more robust than those described by Rogick, but the primary orifice and tiny ovicellular fenestra are identical. This is the northernmost record of this species.

Osthimosia eatonensis (Busk) (Plate 49, B)

Cellepora eatonensis Busk, 1881: 351; Busk 1884: 201.
Osthimosia evexa Jullien, 1888: 65.
Osthimosia eatonensis: Rogick 1959: 18 (*cum syn.*); Uttley & Bullivant 1972: 49.

MATERIAL EXAMINED: NZOI Stn K822.

DISTRIBUTION: Chatham Islands; also magellanic South America, Kerguelen Island, Antarctica.

DESCRIPTION: Colony encrusting, multilaminar. Zooids 0.55–0.72 × 0.45–0.50 mm, erect, closely packed without discernible orientation. Frontal wall smooth, with small marginal pores. Primary orifice obscured by an aviculiferous peristome, the sinus a rounded V shape. Avicularium median, oval in shape, with complete pivot bar. Peristome short or tall, highest in the region of the avicularium, with lateral wings. Ovicell recumbent or immersed in secondary calcification, the broad frontal tabula imperforate but with faint ribbing marginally. Vicarious avicularia spatulate, with broad palate and raised rostral rim.

REMARKS: Only one colony was found in the Kermadec samples, but it agrees in detail with Rogick's (1959) redescription.

Osthimosia imperforata n.sp. (Plate 49, C)

MATERIAL EXAMINED: NZOI Stns K796, K803, K819, K829, K854.

DISTRIBUTION: Kermadec Islands, 70–635 m.

DESCRIPTION: Colony encrusting, small, circular, domed. Zooids 0.32–0.38 × 0.32–0.38 mm, recumbent to suberect, smooth-walled, with no marginal pores visible in ephebic zooids. Primary orifice with a wide U-shaped sinus bordered by narrow tapering condyles. A peristome variously developed around the orifice, generally low or not much higher than the frontal wall, either complete or interrupted where the ovicell occurs. A small suboral avicularium in the peristome, slightly

to one side of the mid-line, orientated transversely at an oblique angle to the frontal wall. Ovicell recumbent to partly immersed, with relatively small, oval, imperforate fenestra. Two other types of avicularia – small, adventitious avicularia with subacute rostra and complete pivot bars; and larger spatulate ones with the palatal surface rather extensive; the opesiae of these avicularia sometimes the sites of regenerative building of the smaller adventitious type of avicularium.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–293.

TYPE-LOCALITY: NZOI Stn K796, Esperance Rock, 31°20.8′S, 178°49.0′W, 70 m.

REMARKS: This species is near *O. mamillata* Moyano, 1974, which also has an asymmetrical aviculiferous peristome, a broad sinus and similar ovicell. That species, however, forms massive colonies up to 8.5 cm across and the vicarious avicularia are broader proximally than distally.

Osthimosia incomposita n.sp. (Plate 49, D,E)

MATERIAL EXAMINED: NZOI Stns K795, K854.

DISTRIBUTION: Kermadec Islands, 135–350 m.

DESCRIPTION: Colony erect, branching, with a jagged profile. Zooids 0.53 × 0.35 mm, immersed in secondary calcification, with boundaries not clearly recognisable. Surface smooth to faintly textured, with marginal pores. Primary orifice with broad deep sinus delineated from the anter by low rounded condyles; deeply immersed. A pair of lateral oral avicularia, sometimes columnar, small, oval, with complete pivot bar, facing frontally. Large spatulate avicularia with extensive palate and raised rostral rim. Ovicell completely immersed in secondary calcification, with large, subcircular, imperforate tabula frontally.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–296.

TYPE-LOCALITY: NZOI Stn K854, Curtis Island, 30°33.0′S, 178°31.7′W, 135–165 m.

REMARKS: *O. incomposita* resembles *O. magna* Moyano, 1974 from Chile in its erect growth but *O. magna* is much more robust, the orificial sinus is narrower and U-shaped, and there is only one suboral avicularium.

Osthimosia virgula n.sp. (Plate 49, F)

MATERIAL EXAMINED: NZOI Stn K842.

DISTRIBUTION: Kermadec Islands, 325–370 m.

DESCRIPTION: Colony erect, vincularian, to 2.5 mm diameter. Zooids 0.62–0.73 × 0.28 mm, immersed in secondary calcification when mature, obscuring boundaries. Frontal surface smooth but undulate, with a few marginal pores. Primary orifice with broad deep sinus delineated from the anter by narrow sloping condyles; immersed in a peristome which is not raised above the level of the frontal wall. Secondary orifice pyriform, with the surrounding rim partly granular; a lateral-oral avicularium set in the rim of the secondary orifice, oval in shape, with a toothed rostral rim and complete pivot bar. Numerous spatulate avicularia, orientated proximally at various angles, with broad, expanded palatal surface. Ovicell immersed in secondary calcification, with a broad, imperforate frontal tabula.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–295.

TYPE-LOCALITY: NZOI Stn K842, Macauley Island, 30°10.2′S, 178°35.9′W, 325–370 m.

REMARKS: *O. virgula* is in many ways similar to *Buchneria sinuata* Harmer, 1957 and the two species may be congeneric. Both are erect, with a broad orificial sinus, a lateral-oral avicularium in the secondary orifice, spatulate avicularia, and a frontal area on the ovicell. Harmer allied *B. sinuata* with *B. dofleini* (Buchner), the type-species of *Buchneria*, but there are significant differences between these two species. *B. dofleini* has, by contrast, a bell-shaped orifice, and numerous kenozooids making up parts of the branches, which may thus have abaxial and adaxial surfaces. *B. sinuata* lacks these two features and may not, in fact, be congeneric with *B. dofleini*. On the other hand, both *B. sinuata* and *O. virgula* differ somewhat from the type-species of *Osthimosia*. *O. eatonensis* is encrusting, not erect, and the sinus of the primary orifice is more sharply defined. Both of these characters are variable among bryozoans, however, and in the other features (spatulate avicularia. imperforate ovicellular tabula, single peristomial avicularium, and marginal pores) these erect species resemble *O. eatonensis*.

It is difficult to draw a conclusion on *B. sinuata* in the absence of actual specimens, but it is clear that both this species and *B. dofleini* need re-examining, especially in relation to one another. As already noted (p.116), Harmer's family Buchneriidae may be able to be accommodated in the Celleporidae.

Family SERTELLIDAE Jullien *in* Jullien & Calvet, 1903

Colony encrusting or erect. Zooidal frontal wall with small marginal pores only. Primary orifice variable, with or without a sinus, condyles present, the distal orificial border typically beaded. Oral spines present. Avicularia adventitious and/or vicarious. Ovicell

hyperstomial, prominent or immersed in secondary calcification; not closed by the zooidal operculum.

REMARKS: The Sertellidae is here regarded as including part of the Cleidochasmatidae Cheetham & Sandberg, 1964. Some species of *Cleidochasma* Harmer, for example, have typical sertellid features, viz., a smooth frontal wall with only marginal pores, oral spines, condyles, an imperforate ovicell and adventitious avicularia, and *C. contracta* (Waters) has a beaded orificial rim. The types of orifice that are thought to be characteristic of the Cleidochasmatidae (cleithridiate and lepralioid) also occur in the Sertellidae.

Hayward and Ryland (1979) included the genera *Hippoporella* Canu, *Hippoporidra* Canu & Bassler and *Hippopodinella* Barroso in the Cleidochasmatidae, but I agree with Powell (1967a : 382) that *Hippoporella* (here regarded as synonymous with *Lepraliella* Levinsen), which may also have a beaded orificial rim, is also a sertellid. There has been much inconsistency concerning the treatment of *Lepraliella* and *Hippoporella.* Levinsen (1917) included two species in his *Lepraliella* (without specifying a type), one of which was later chosen as the type of *Hippoporella* (Canu 1917). Levinsen included *Lepraliella* in the Sertellidae (as Reteporidae) but later authors, notably Canu and Bassler, left *Lepraliella* in the Sertellidae while including *Hippoporella* in the Hippoporininae Bassler, 1935 (i.e., Cleidochasmatidae). Osburn (1952) followed them in this. Harmer (1957) neglected to assign them to a family. Kluge (1962, 1975) put *Lepraliella* and *Hippoponella* Canu & Bassler (= *Hippoporella*) together in a new family Hippoponellidae. Only Powell (1967a) among modern authors has noted this inconsistency of treatment.

Finally, if the suite of genera presently held to be cleidochasmatids were to remain united, the family name would have to be changed, for if *Hippoporella* is kept in this family, *Lepraliella* must also be, and it is the type of Lepraliellidae Vigneaux, 1949. Although Vigneaux included an astonishingly heterogeneous suite of genera in this family, the name is nonetheless available for the genera presently included in the Cleidochasmatidae. The most logical course, however, is to dismantle this family. Genera like *Cleidochasma* and *Lepraliella* (syn. *Hippoporella*) go to the Sertellidae and *Hippoporidra* and *Hippopodinella* to Hippoporidrinae Vigneaux, 1949 (raised to family rank by Pouyet 1973).

Sertella Jullien, 1903

Colony erect, fenestrate; branches (trabeculae) anastomosing, leaving a series of open spaces (fenestrulae) between them. Zooids opening on one face only, the basal surface crossed by vibices. Frontal wall with a few marginal pores. Primary orifice variable, with or without a broad sinus. Peristome lyrulate or with a notch, fissure or pore. Oral spines in young zooids. Avicularia present. Ovicell prominent or subimmersed, with a median frontal fissure and the free edge produced into a labellum. Small multiporous septula present.

TYPE-SPECIES: *Retepora beaniana* King, 1846

Sertella concinna n.sp. (Plate 50, A,B)

MATERIAL EXAMINED: NZOI Stns $K826_2$, K827, K838.

DISTRIBUTION: Kermadec Islands, 115–635 m.

DESCRIPTION: Colony initially calyciform, widely or narrowly so, reticulate with fenestrulae to 3 mm long and 1 mm wide. Branches with two rows of zooids, their boundaries marked by thin raised lines. Frontal walls 0.35–0.50 × 0.17–0.25 mm, almost smooth, textured by shallow surface irregularities; with 1–2 small pores. Primary orifice deeply immersed, with low median lyrula flanked by a pair of shallow sinuses. Oral spines 7–8 in young zooids, the most distal spines broken off and their bases covered by secondary calcification in older zooids. A median suboral avicularium directed obliquely proximally with acutely triangular rostrum and thin pivot bar. A circular pore adjacent to the avicularium. Additional small frontal avicularia like the peristomial type, directed obliquely laterally. A giant avicularium on a number of zooids, projecting outwards from the frontal wall, with narrow tapering, acutely triangular rostrum with minutely serrated rim. Long intrafenestrular avicularia with low rim, tapering, serrated, the pivot bar complete; directed proximally lengthways in the fenestrulae and alternating with small, laterally flattened avicularia half their length. Ovicell with median longitudinal fissure. Dorsal surface of branches with lightly cobbled texture, and vibices marking zooidal boundaries. Intrafenestrular avicularia visible from basal surface; no other avicularia present.

HOLOTYPE: Parts of a colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–335.

PARATYPE: NZOI, type number P – 547, from same sample as holotype.

TYPE-LOCALITY: NZOI Stn $K826_2$, 28°48.0′S, 177°48.0′W, 160–210 m.

REMARKS: A second type of colony occurred at Stns K803, K825, K829, K854, and K855 : it was more robust with thicker trabeculae and smaller fenestrulae. Morphologically, individual zooids of this form resemble those of *S. concinna* very closely, the only clear distinction being that they lack a labial pore. The arrangement of intrafenestrular avicularia appears different also though it may be the result of secondary calcification. More material of both forms is needed

before a decision can be made on the status of this second type.

Sertella malleatia n.sp. (Plate 50, C)

MATERIAL EXAMINED: NZOI Stns K796, $K828_1$.

DISTRIBUTION: Kermadec Islands, 70–440 m.

DESCRIPTION: Colony erect, non-fenestrate when 3–4 mm high. Zooidal boundaries marked by thin raised lines. Frontal wall 0.32–0.50 × 0.27–0.30 mm, densely and regularly pitted with cupuliform punctuations; no marginal or other pores except for one small pore midfrontally in young zooids that is later occluded. Primary orifice with deep, wide U-shaped poster and short lateral condyles. Seven oral spines in young zooids, buried in older zooids. Secondary orifice non-lyrulate, with a closed labial pore adjacent to a small oval avicularium. The pivot bar of the avicularium ligulate. Another such avicularium often midfrontally. Mature ovicells not seen. Dorsal surface of branches smoother than frontal walls, with vibices delineating broad areas with occasional pores and/or more small avicularia with ligulate pivot bars.

HOLOTYPE: A colony, in collection of the N.Z. Oceanographic Institute, DSIR, Wellington, New Zealand, type number H–283.

TYPE-LOCALITY: NZOI Stn K796, Esperance Rock, 31°20.8′S, 178°49.0′W, 70 m.

REMARKS: In the absence of mature ovicells it is not possible to be certain of the genus, although it is otherwise *Sertella*-like. The unusual frontal wall is reminiscent of that of *Malleatia* Jullien, which also has a labial pore connected by a short suture to the secondary orifice. The primary orifice of *Malleatia* lacks a sinusoid poster, however, and the ovicell has a median longitudinal fissure as in *Sertella* (Calvet 1931). Calvet regarded *Malleatia* as a *Sertella*. The Kermadec colonies, although small, are distinctive enough to be established as a new species.

Lepraliella Levinsen, 1917

Colony encrusting. Zooidal frontal wall with marginal pores only. Orifice with broad poster and prominent lateral condyles, the distal arch smooth or beaded. Oral spines present. Avicularia adventitious, usually small. Basal pore-chambers present.

TYPE-SPECIES: *Cellepora ramulosa contigua* Smitt, 1867

REMARKS: *Lepraliella* Levinsen and *Hippoporella* Canu, 1917 have, as noted earlier (p.122), been treated as related but separate genera by Harmer (1957), Kluge (1962, 1975), and Powell (1967a). Osburn (1952), following Canu and Bassler (1920) and Bassler (1935), placed them in different families. The diagnosis of *Hippoporella,* however, as given by Hayward and Ryland (1979), is equally applicable to *Lepraliella* and one might also add that the types of both genera may have a smooth or beaded orificial arch (Osburn 1952, Powell 1967a). Both Harmer (1957) and Kluge (1962, 1975) seemed to place importance on the fact that the orifice is longer than wide in *Hippoporella hippopus* and wider than long in *Lepraliella contigua.* Considering the greater range of variation in the orifices of some other genera of the Sertellidae, this distinction seems of little consequence. Finally, Levinsen himself included the species *hippopus* in *Lepraliella.*

Lepraliella ?mooraboolensis (MacGillivray) (Plate 50, D)

cf. *Mucronella mooraboolensis* MacGillivray, 1895: 100.

MATERIAL EXAMINED: NZOI Stns K820, K837, K854, K855.

DISTRIBUTION: Moorabool, Tertiary of Victoria.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.50 × 0.25–0.45 mm, relatively thick-walled, smooth, porcellanous, imperforate centrally with 1–2 pairs of tiny marginal pores. Orifice widest proximally and dome-shaped overall, but divided by prominent condyles, the anter smoothly rounded distally with no beading, the poster wider with a straight or barely convex proximal rim. Oral spines 6–8, long. Avicularia usually paired, each placed beside the orifice or sometimes proximolaterally, directed laterally or obliquely proximally; oval in outline; the rostrum rounded, toothed; the pivot bar thin, complete. Ovicell subimmersed, imperforate, widely open proximally, with four of the oral spines remaining, the bases of the others evident inside the opening.

REMARKS: MacGillivray (1895) mentioned a "broad rounded mucro", which is not evident in the Kermadec specimens, but his illustration is equivocal on this point. The Kermadec colonies otherwise most closely resemble his Tertiary Victorian species, which Harmer (1957) considered to be *Hippoporella.* It also has paired or single oral avicularia, 6–8 oral spines and, judging from MacGillivray's illustration, an orifice which appears a little wider than long.

Lepraliella multidentata (Thornely) (Plates 50, E; 51, A)

Lepralia multidentata Thornely, 1905: 120.
Hippoporella multidentata: Harmer 1957: 1099 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stn unknown.

DISTRIBUTION: Indonesia, Sri Lanka, India.

DESCRIPTION: Colony encrusting. Zooids 0.17–0.28 × 0.22–0.33 mm, relatively thick-walled, smooth, porcellanous, imperforate centrally, with 1–3 tiny marginal pores. Orifice widest proximally and slightly wider than long, with prominent condyles, the distal arch beaded, the proximal rim shallowly concave. Oral spines six, long. Avicularia not seen. A stout suboral umbo on most zooids, partly overhanging the orifice. Ovicell subimmersed in frontal calcification, imperforate, widely open proximally, with four oral spines remaining, the bases of the other two visible inside the ovicellular opening. Pore-chambers high on lateral and distal walls, with slit-like openings.

REMARKS: The single Kermadec colony is fertile but without avicularia. It otherwise accords well with Harmer's (1957) redescription of Thornely's (1905) species. *Schizotheca mucronata* Powell, 1967a seems to be closely related and is better placed in *Lepraliella* than in *Schizotheca*, which is characterised by vicarious rather than adventitious avicularia.

Cleidochasma Harmer, 1957

Colony encrusting, suberect, or discoid and free. Zooidal frontal wall with marginal pores. Orifice generally elongate, cleithridiate, the sinus relatively large, with prominent condyles. Avicularia adventitious, small and/or large. Ovicell hyperstomial, often subimmersed; not closed by the zooidal operculum. Uniporous or multiporous septula or basal pore-chambers present.

TYPE-SPECIES: *Gemellipora protrusa* Thornely, 1905

Cleidochasma porcellanum (Busk) (Plate 51, B)

Lepralia porcellana Busk, 1860: 283.
Cleidochasma porcellanum: Cook 1964b: 11 (*cum syn.*).
Cleidochasma sp.: Harmelin 1969: 1202.

MATERIAL EXAMINED: NZOI Stns K797, K799, K812, K818, K819, K820, K822, K826$_3$, K837, K842, K844, K848, K871.

DISTRIBUTION: Indonesia, Galapagos Islands, Southern California to Peru, Florida, Brazil, Cape Verde Islands, Madeira, Tunisia; also Pleistocene of Japan.

DESCRIPTION: Colony encrusting, small, porcellanous. Zooids 0.17–0.28 × 0.22–0.30 mm, about as long as wide, smooth though irregularly surfaced, often with a suboral umbo and fine transverse striations. Orifice with a transversely oval to sublunate sinus bordered by a pair of proximally angled condyles. Oral spines six. Avicularia single, emplaced proximal to the orifice usually midlaterally, the zooidal wall protruding at this point; the rostrum lanceolate, the palate with a median suture, no pivot bar. A large pore in the corresponding position on the opposite margin; if no avicularium is present, a similar pore takes its place. Ovicell subimmersed in frontal calcification, often with a broadly triangular frontal area and a concave labellum flanked by lateral indentations; sometimes a small median pore near the edge of the labellum; one pair of oral spines always present and a second pair often visible in the lateral indentations.

REMARKS: Cook (1964b) has discussed the variability of the characteristics of this species. She recorded only three oral spines and stated that the avicularium has a pivot bar. Harmelin's (1969) *Cleidochasma* sp. from the Eastern Mediterranean has an identical ovicell, complete with labellum, indentations and median pore, though he does not depict a frontal area. On the basis of Cook's (loc. cit.) synonymy, Harmelin's species certainly appears to be *C. porcellanum*.

Rhynchozoon Hincks, 1895

Colony encrusting. Zooids recumbent to suberect, often in superposed layers. Zooidal frontal wall typically smooth, with marginal pores. Orifice suborbicular to cleithridiate, with a variable sinus, the distal border beaded, condyles present. Usually a peristome with an asymmetrical pseudosinus, and bearing a columnar mucro, a suboral avicularium, or both. Additional adventitious avicularia present. Ovicell typically subimmersed in frontal calcification, imperforate, with a smooth frontal area and often a labellum. Small basal pore-chambers present.

TYPE-SPECIES: *Lepralia bispinosa* Johnston, 1847

Rhynchozoon angulatum Levinsen (Plate 51, C)

Rhynchozoon angulatum Levinsen, 1909: 295; Canu & Bassler 1929a: 374; Powell 1967a: 362.

MATERIAL EXAMINED: NZOI Stn K836.

DISTRIBUTION: Three Kings Islands, Stewart Island; also Philippines.

DESCRIPTION: Colony encrusting. Zooids 0.32–0.43 × 0.25–0.35 mm, smooth-walled with marginal pores. Orifice with subcircular anter with beaded rim, and rounded, widely V-shaped sinus flanked by a pair of condyles: not obscured by the suboral avicularium. Oral spines not seen. Usually a small eminence either side of the orifice. Avicularian chamber large, emplaced lateroproximally to the orifice; the rostrum moderately long, acute, directed at a steep angle away from the frontal wall; the pivot bar complete. Usually a similar, slightly smaller avicularium more proximally situated on the zooid. Ovicells not seen.

REMARKS: This *Rhynchozoon* differs from most other species in that the suboral avicularium is not mucronate

and does not overhang the orifice. Ovicells were described by Levinsen (1909) in colonies from Stewart Island (the type-locality). They are narrow proximally and have a smooth triangular frontal area with a labellum.

Rhynchozoon crenulatum (Waters) (Plate 51, D,E)

Rhynchopora crenulata Waters, 1887c: 195.

MATERIAL EXAMINED: NZOI Stns K797, K837, K871.

DISTRIBUTION: Port Jackson (N.S.W.).

DESCRIPTION: Colony encrusting. Zooids 0.27–0.40 × 0.30–0.38 mm, often as wide as long even near colony margins, more heaped in the colony centre. Zooidal frontal wall smooth with only a few tiny marginal pores. Orifice widely cleithridiate, with beaded distal rim and broad rounded poster delimited from the wider anter by a pair of stout condyles. Oral spines 2–4 in marginal zooids, lacking in older zooids. A suboral avicularium extended into a high spinose mucro; the rostrum and opesia together very small, oval, with minutely serrated rim; the pivot bar complete; a small, angular projection by the opesia. Similar small avicularia may occur frontally on the zooid. Ovicell subimmersed, with a frontal area and no apparent labellum.

REMARKS: Three small Kermadec colonies evidently belong to this species. Waters's (1887c) illustration of several zooids shows the most marginal one with an identical orifice, four spines, and a spinose umbo with an associated small avicularium. The chief distinction between Waters's description and the Kermadec colonies lies in the absence of larger frontal avicularia in the latter, but this is not unlikely in small colonies.

Rhynchozoon paa Uttley & Bullivant (Plate 52, A,B)

Rhynchozoon paa Uttley & Bullivant, 1972: 48.

MATERIAL EXAMINED: NZOI: Stns K812, K827, K840, K842, K848, K872. DPG: Colonies from Hauraki Gulf.

DISTRIBUTION: Hauraki Gulf, Chatham Islands.

DESCRIPTION: Colony encrusting. Zooids 0.67–0.95 × 0.42–0.63 mm, with indistinct boundaries, commonly heaped and irregular in the centre of the colony. Frontal walls with crinkled surface, moderately thickened, imperforate centrally, 1–2 moderately sized pores along each margin. Orifice seen clearly only in marginal zooids; subcircular with beaded distal rim and broad shallow poster with adjacent prominent condyles. Oral spines 0–2. Suboral avicularium deeply hidden within the peristome of old zooids and best seen at colony margins; moderately large, orientated almost transversely, the palatal surface facing more or less distally, with a stout pivot bar and acutely tipped triangular rostrum; an uncinate process occurs adjacent to the opesial rim, with a pseudosinus between it and the lateral rim of the orifice; in older zooids a ring of 5–6 tubercles surrounds the secondary orifice. One to two small oval frontal avicularia on each zooid. Ovicell immersed, with smooth frontal area and very short wide labellum.

REMARKS: Uttley and Bullivant (1972) described 4–6 oral spines and occasional larger avicularia. These features are absent from the Kermadec colonies and from three paratype colonies in the NZOI collection.

Rhynchozoon tubulosum (Hincks) (Plate 52, C–E)

Mucronella(?) *tubulosa* Hincks, 1880c: 383.
Rhynchozoon tubulosum: Harmer 1957: 1064 (*cum syn.*).

MATERIAL EXAMINED: NZOI Stns K801, K812, K848.

DISTRIBUTION: Victoria, New South Wales, Great Barrier Reef, Torres Strait, Loyalty Islands, Indonesia, Sri Lanka, India.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.50 × 0.22–0.38 mm, recumbent and moderately elongate at the colony edge; the frontal surface almost smooth, to crinkled or coarsely granular. Marginal pores four on each side, conspicuous. Suboral mucro very long and often spinose. The associated avicularium somewhat above the level of the primary orifice, orientated more or less transversely, the palatal surface facing distally, with an acutely tipped rostrum and complete pivot bar; lacking an uncinate process. Often a prominence either side of the secondary orifice. Primary orifice almost circular, with beaded distal rim and wide, concave proximal rim. Frontal avicularia variable in size, usually short and triangular or long and parallel-sided with an extensive palatal shelf. Ovicell immersed, with broad, granular frontal area.

REMARKS: This seems to be Hincks's (1880c) species. Harmer (1957) noted that in his "Siboga" specimens the uncinate process was vestigial or wanting, the suboral mucro was very long, and the frontal area of the ovicell was granular. The Kermadec specimens agree in these features. Neither Hincks nor Harmer mentioned the conspicuous marginal pores, however.

Brodiella Uttley & Bullivant, 1972

Colony encrusting. Zooidal frontal wall with marginal pores only. Orifice with beaded distal arch and deep narrow sinus. Oral spines prominent. Peristomial avicularium and mucro lacking. Avicularia small or large, adjacent to the orifice and/or frontal.

Ovicell prominent, imperforate, with short labellum. Basal pore-chambers present.

TYPE-SPECIES: *Schizoporella longispinata* Busk, 1884

Brodiella longispinata (Busk) (Plate 52, F)

Schizoporella longispinata Busk, 1884: 163.
Schizoporella scintillans Hincks, 1885: 251.
"*Schizoporella*" *scissa* Brown, 1952: 245.
"*Schizoporella*" *butleri* Brown, 1952: 246.
Rhynchozoon scintillans: Powell 1967a: 360 (*cum syn.*).
Brodiella longispinata: Uttley & Bullivant 1972: 36.
Rhynchozoon cf. *butleri*: Gordon & Ballantine 1977: 127.

MATERIAL EXAMINED: NZOI: Stns K795, K818, K819, K837, K854, K855, K856, K863, K867. DPG: Colonies from Hauraki Gulf.

DISTRIBUTION: Three Kings Islands, Hauraki Gulf, Chatham Rise, Dusky Sound, Foveaux Strait; also Strait of Magellan.

DESCRIPTION: Colony encrusting. Zooids 0.37–0.63 × 0.30–0.75 mm, hyaline and glistening when young, opaque when old. Zooidal frontal wall smooth or lightly tubercular or granular, imperforate centrally, often with 1–3 pores along each margin. Orifice with beaded distal rim and deep narrow sinus flanked by a pair of smoothly rounded condyles. Oral spines 6–7, long; four spines remaining in ovicelled zooids. A low rounded peristome present. Avicularia variable, usually a small lateral-oral pair, oval, directed laterally, with minutely serrated rostrum and thin pivot bar; another such avicularium occasionally occurs mid-laterally on the frontal wall but a second type of avicularium commoner in this position, directed laterally, or obliquely so, with long tapering rostrum and thin pivot bar; occasionally emplaced centrally and orientated randomly. The small lateral-oral avicularia sometimes absent or one or both replaced by the same long avicularia, which are then directed distally. Ovicell prominent, smooth, with well developed labellum flanked by lateral indentations.

REMARKS: Uttley and Bullivant (1972) have discussed the variability of this species which, however, they placed in the Schizoporellidae in spite of the clear relationship with *Rhynchozoon* in the Sertellidae.

Brodiella was established on the basis of a single species from New Zealand and magellanic South America, and was therefore monotypic. It is clear, however, that *Lepralia armata* Hincks, 1862 from Britain and the Mediterranean also belongs to *Brodiella*. It likewise has a beaded orificial rim, oral spines, narrow sinus, lateral-oral avicularia of variable size and shape, and labellate ovicells. It has been variously placed in *Schizoporella, Rhynchozoon*, and *Buffonellaria* (*see* Hayward and Ryland 1979). *Brodiella* resembles the genus *Strophiella* Jullien which, however, has interzooidal avicularia.

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INDEX

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P. D. HASSELBERG, GOVERNMENT PRINTER, WELLINGTON, NEW ZEALAND—1984

PLATES

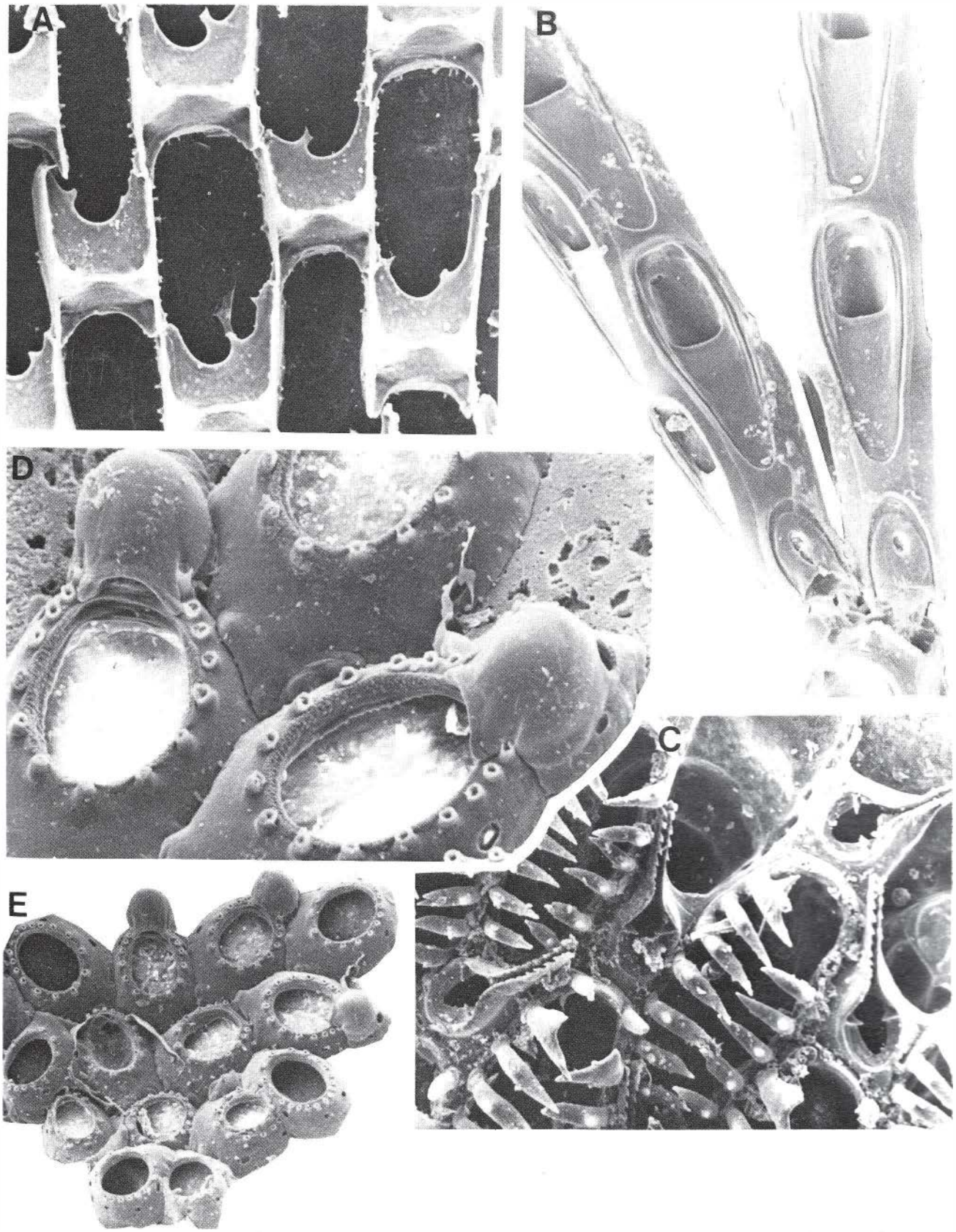

PLATE 1. A, *Membranipora tuberculata* (Bosc). B, *Quadricellaria bocki* (Silén). C, *Gregarinidra serrata* (MacGillivray). D,E, *Callopora precocialis* n.sp.: ancestrula present in E.

Sig. 10*

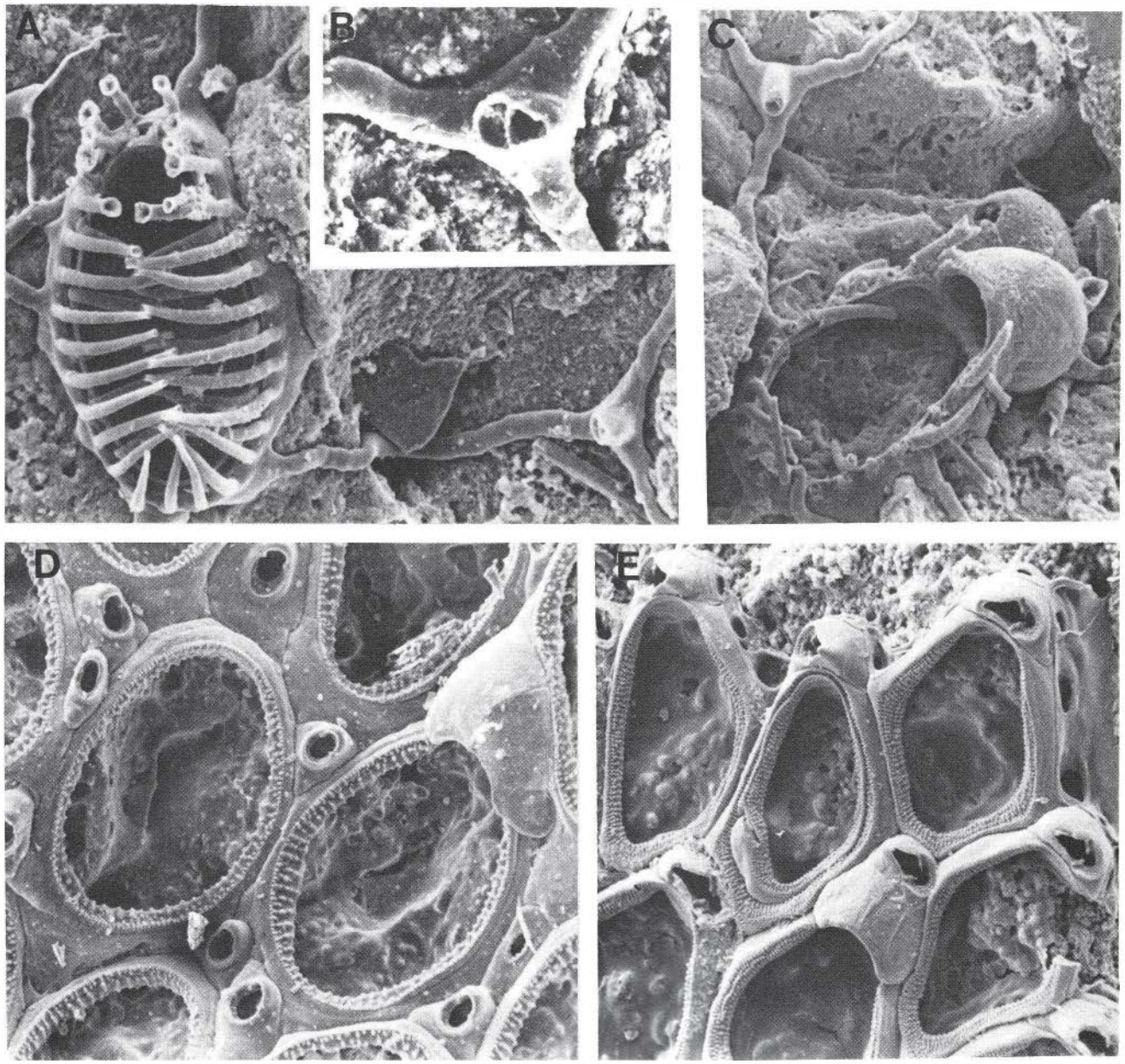

PLATE 2. A-C, *Marssonopora kermadecensis* n.sp.: the zooid in A appears to have double the normal complement of spines owing to the presence of a second, regenerated zooecium within the body wall of the original zooecium; B shows an interzooidal avicularium. D, *Retevirgula aggregata* n.sp. E, *Ellisina sericea* (MacGillivray).

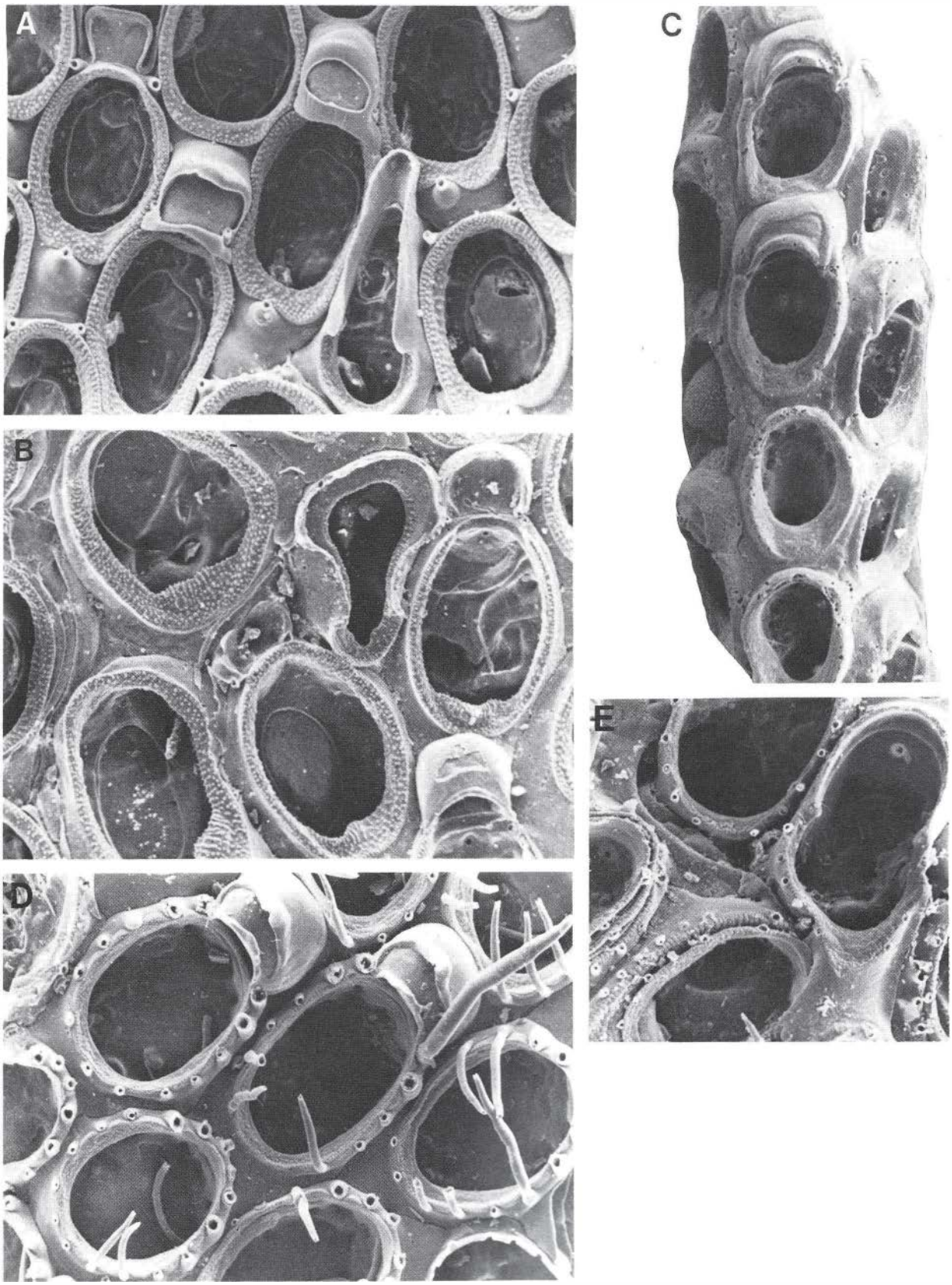

PLATE 3. A, *Crassimarginatella (C.) electra* n.sp. B, *Crassimarginatella (C.) spathulata* n.sp. C, *Crassimarginatella (C.) vincularia* n.sp. D,E, *Crassimarginatella (Corbulella) corbula* (Hincks): E shows vicarious avicularium.

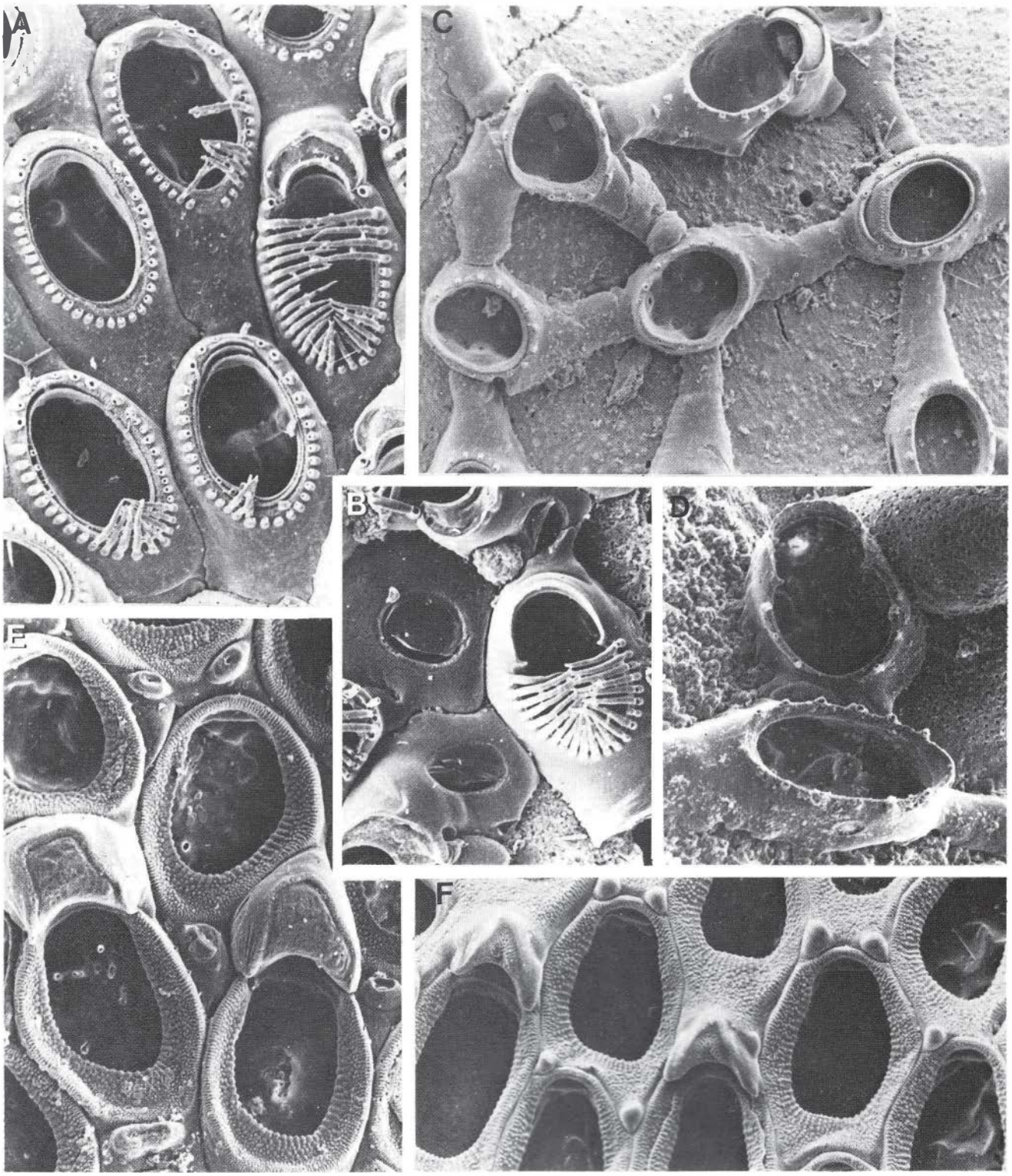

PLATE 4. A,B, *Crassimarginatella (Corbulella) spinosissima* n.sp.: B shows kenozooids and vicarious avicularium. C,D, *Crassimarginatella (Corbulella) translucens* (Harmer): in C one zooid is ovicellate; D shows vicarious avicularium. E,F, *Alderina tuberosa* (Canu & Bassler): showing variation in the form of the ovicell.

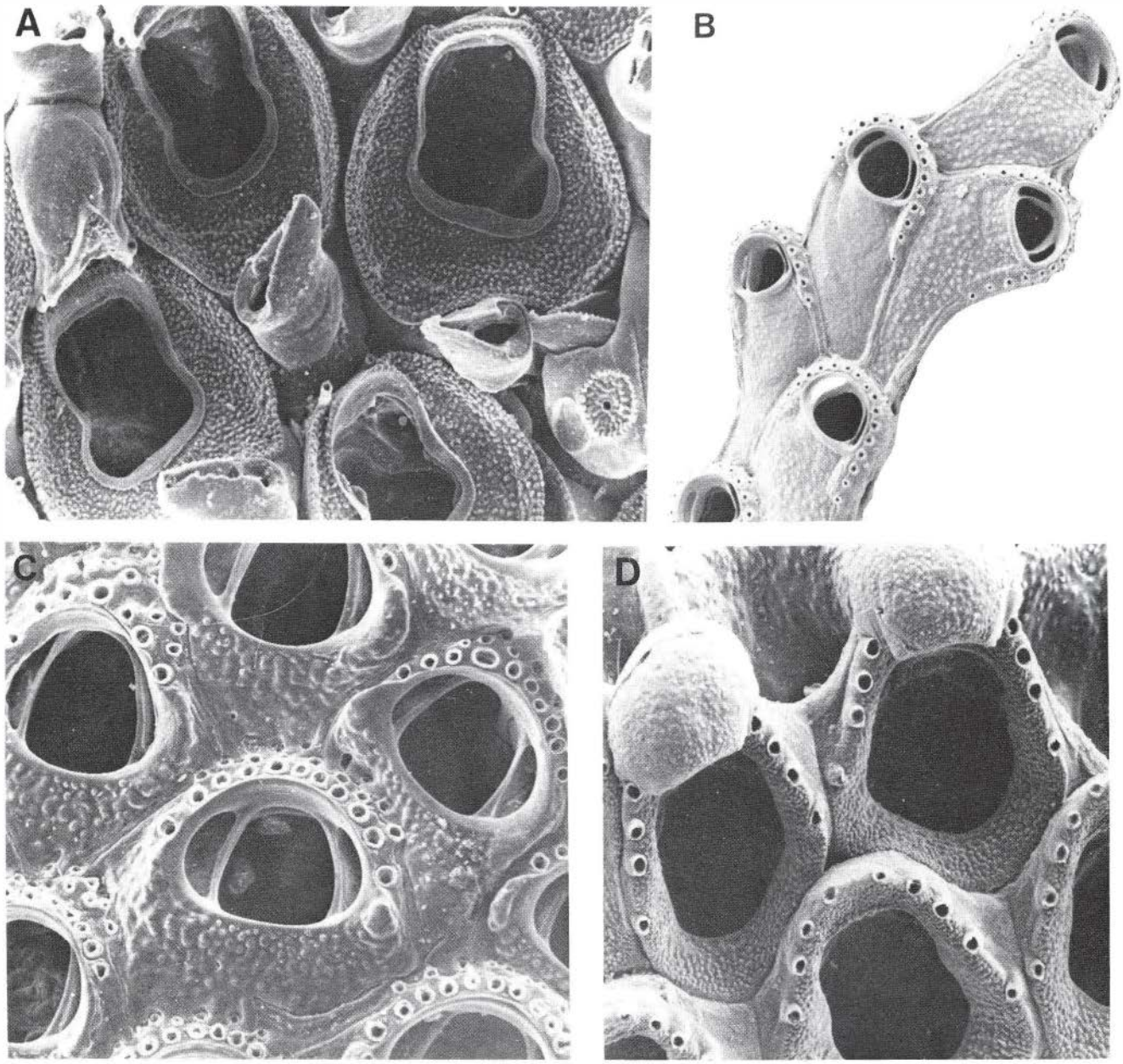

PLATE 5. A, *Amphiblestrum alcimum* n.sp.: the ovicell is generally broader than depicted here. B,C, *Chaperia multispinosa* n.sp.: B shows the biserial form. D, *Pyrichaperia pyriformis* (Canu & Bassler).

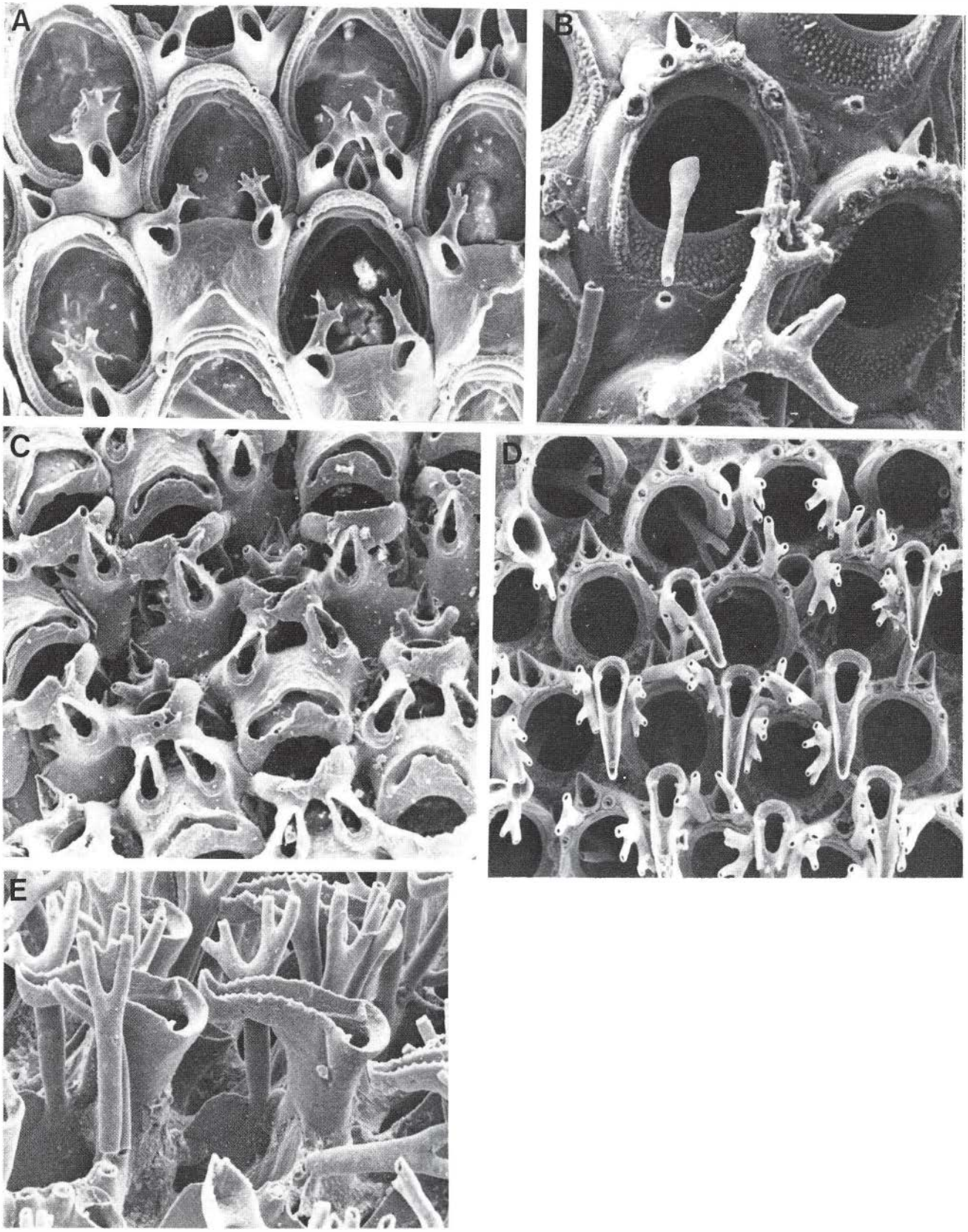

PLATE 6. A, *Chaperiopsis (C.) bispinosa* n.sp. B, *Chaperiopsis (C.) boninensis* (Silén). C. *Chaperiopsis (C.) intermediata* n.sp. D,E, *Chaperiopsis (C.) multifida* (Busk).

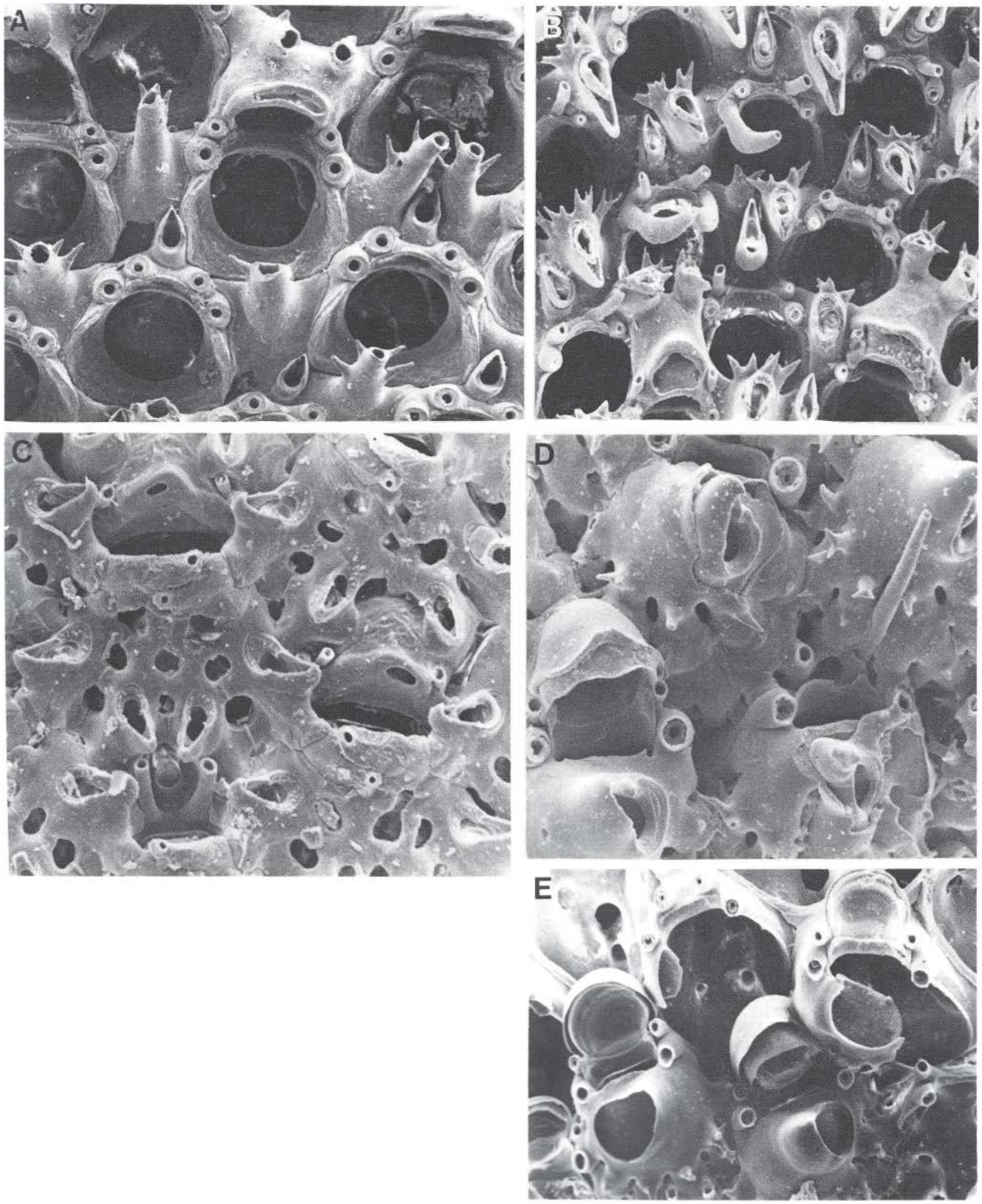

PLATE 7. A, *Chaperiopsis (C.) rubida* (Hincks). B, *Chaperiopsis (C.) spiculata* Uttley. C, *Chaperiopsis (Clipeochaperia) funda* Uttley & Bullivant. D,E, *Hiantopora jucunda* n.sp.: E shows stages in the development of the aviculiferous spine.

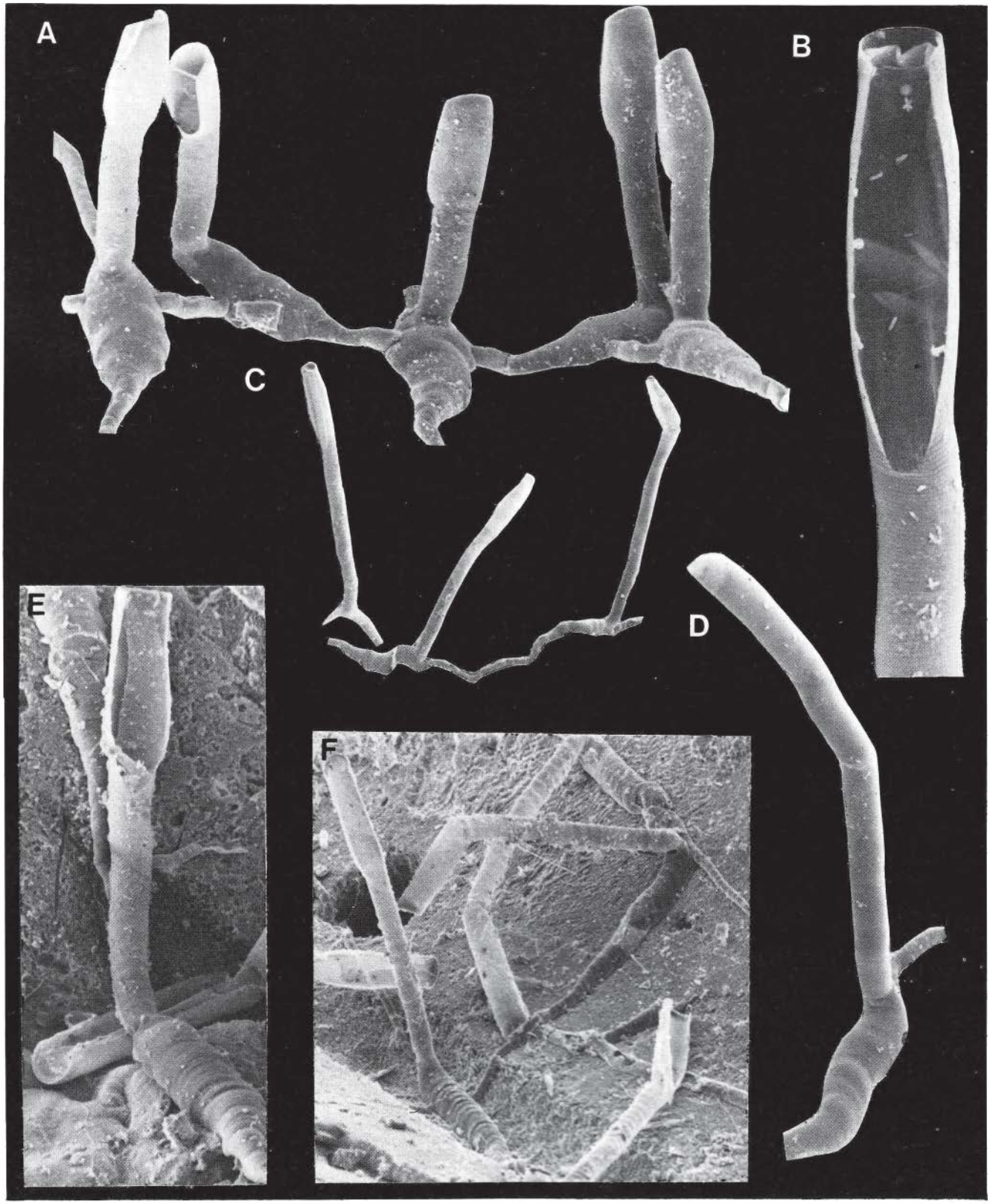

PLATE 8. A-D, *Aetea ?australis* Jullien: A-C, from shell: D. from alga. E.F, *Aetea ligulata* Busk.

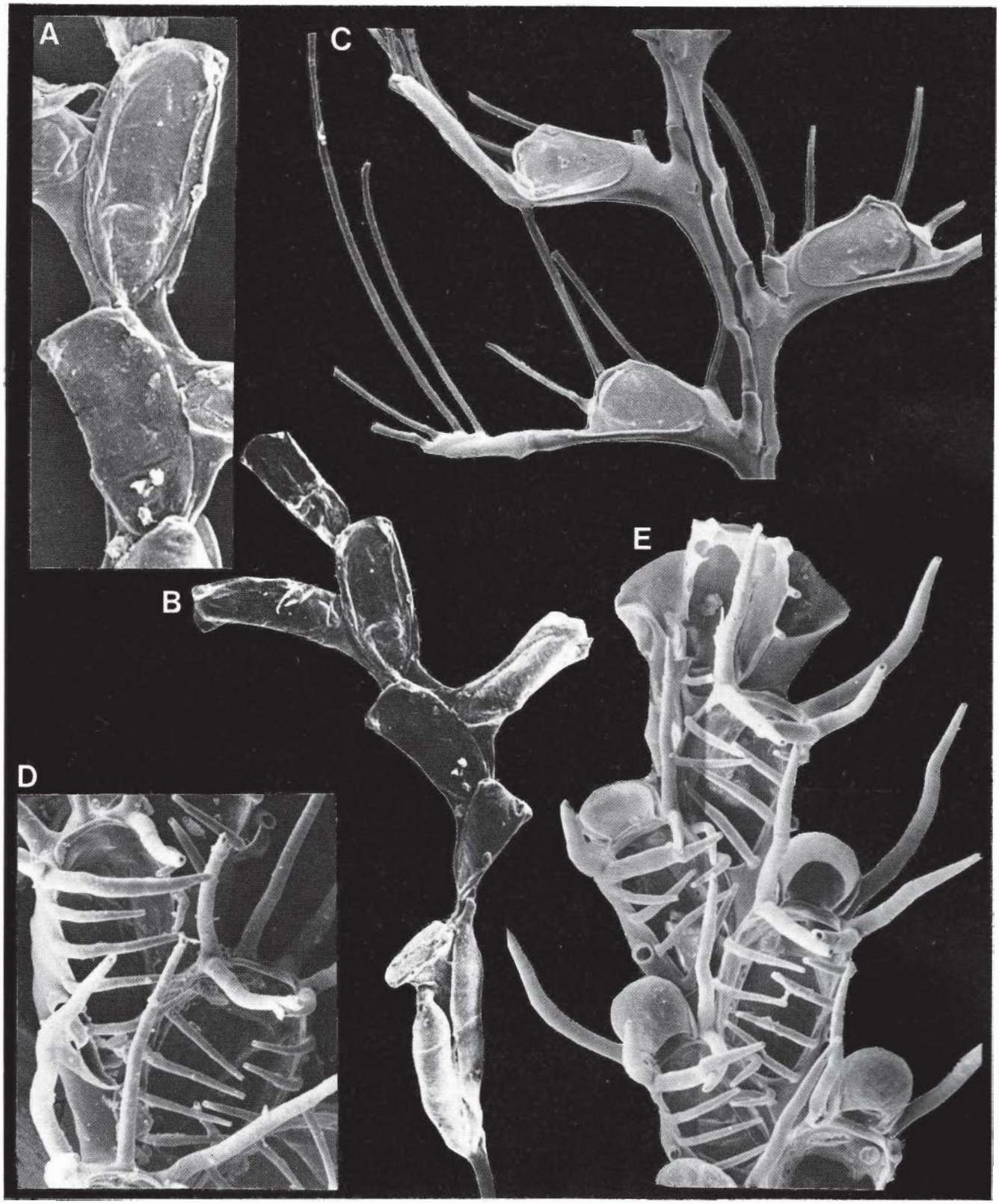

PLATE 9. A,B, *Bugula* sp.: ancestrula and first zooid with stout rhizoids. C, *Cornucopina geniculata* Harmer: note the avicularium on the right-hand zooid. D,E, *Dendrobeania (Luguba) sessilis* n.sp.: avicularium present on left-hand zooid in E.

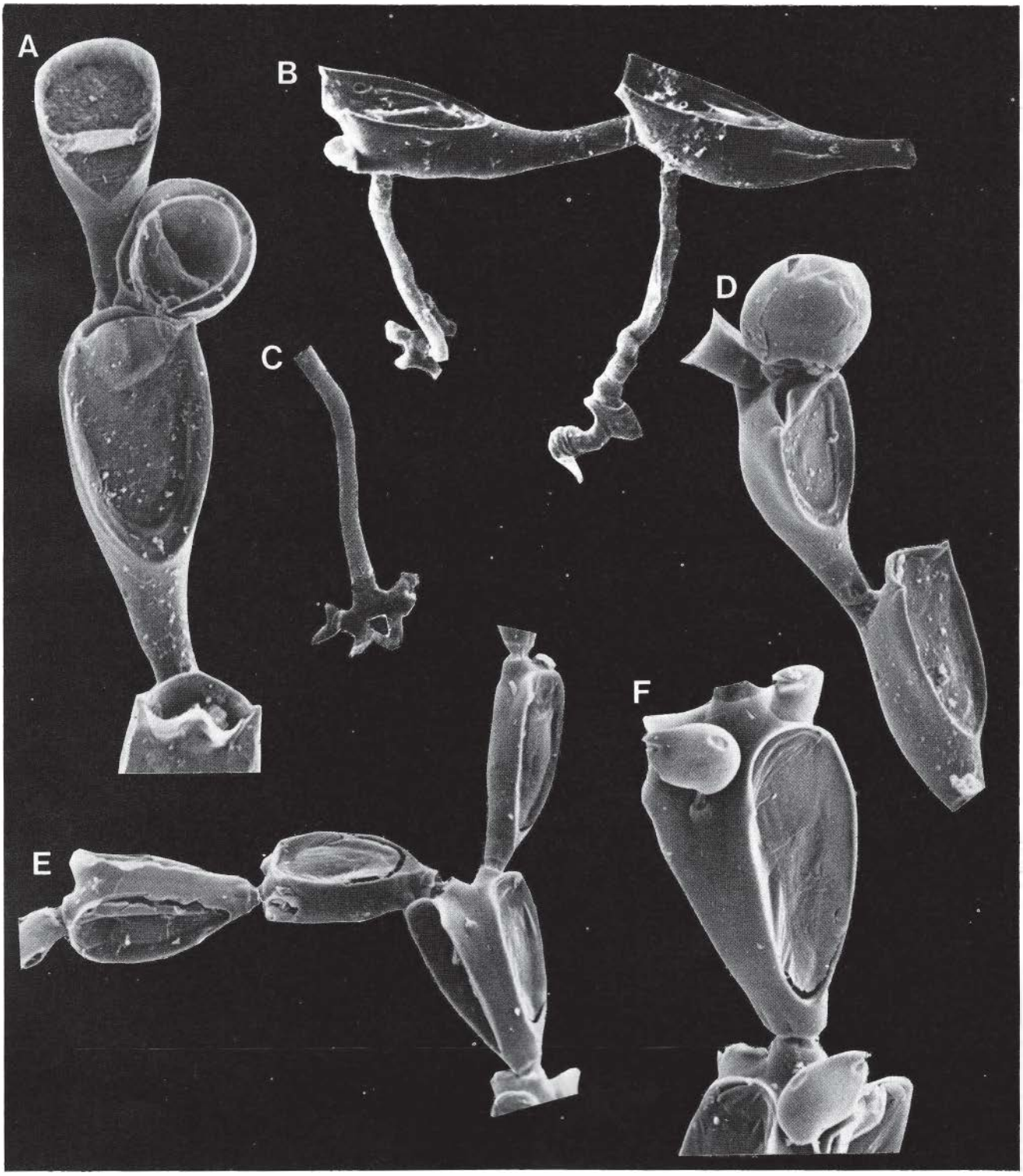

PLATE 10. A-D, *Brettiella ovicellata* n.gen., n.sp.: C, rhizoid. The distal zooid and ovicell in C are only partially developed. E,F, *Synnotum aegyptiacum* (Audouin).

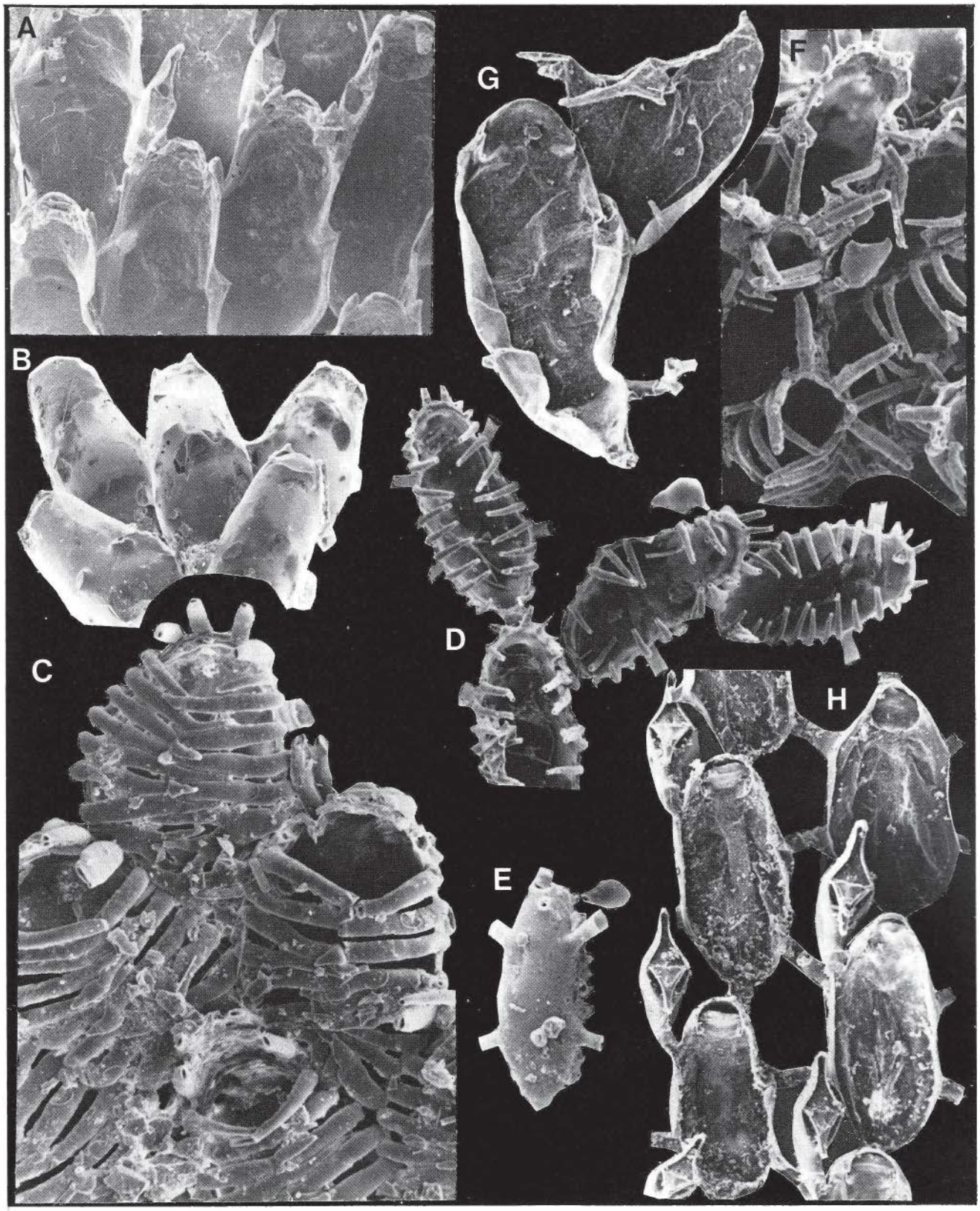

PLATE 11. A,B, *Beania bilaminata* (Hincks): A, from Leigh; B, a juvenile colony, lacking avicularia, from near Macauley Island, Kermadec Ridge. C, *Beania cribrimorpha* n.sp. D,E, *Beania discodermiae* (Ortmann): zooids from damaged colonies. F, *Beania elongata* (Hincks): from Macauley Island. G, *Beania gigantavicularis* n.sp.: single zooid and avicularium. H, *Beania magellanica* (Busk).

PLATE 12. A-C, *Beania plurispinosa* Uttley & Bullivant: A, from Leigh; B,C, from Curtis Island, Kermadec Ridge. Zooids in A and C are ovicellate. D,E, *Petalostegus bicornis* (Busk). F,G, *Scrupocellaria maderensis* Busk: G, dorsal view near a bifurcation, showing paired axillary vibracular chambers.

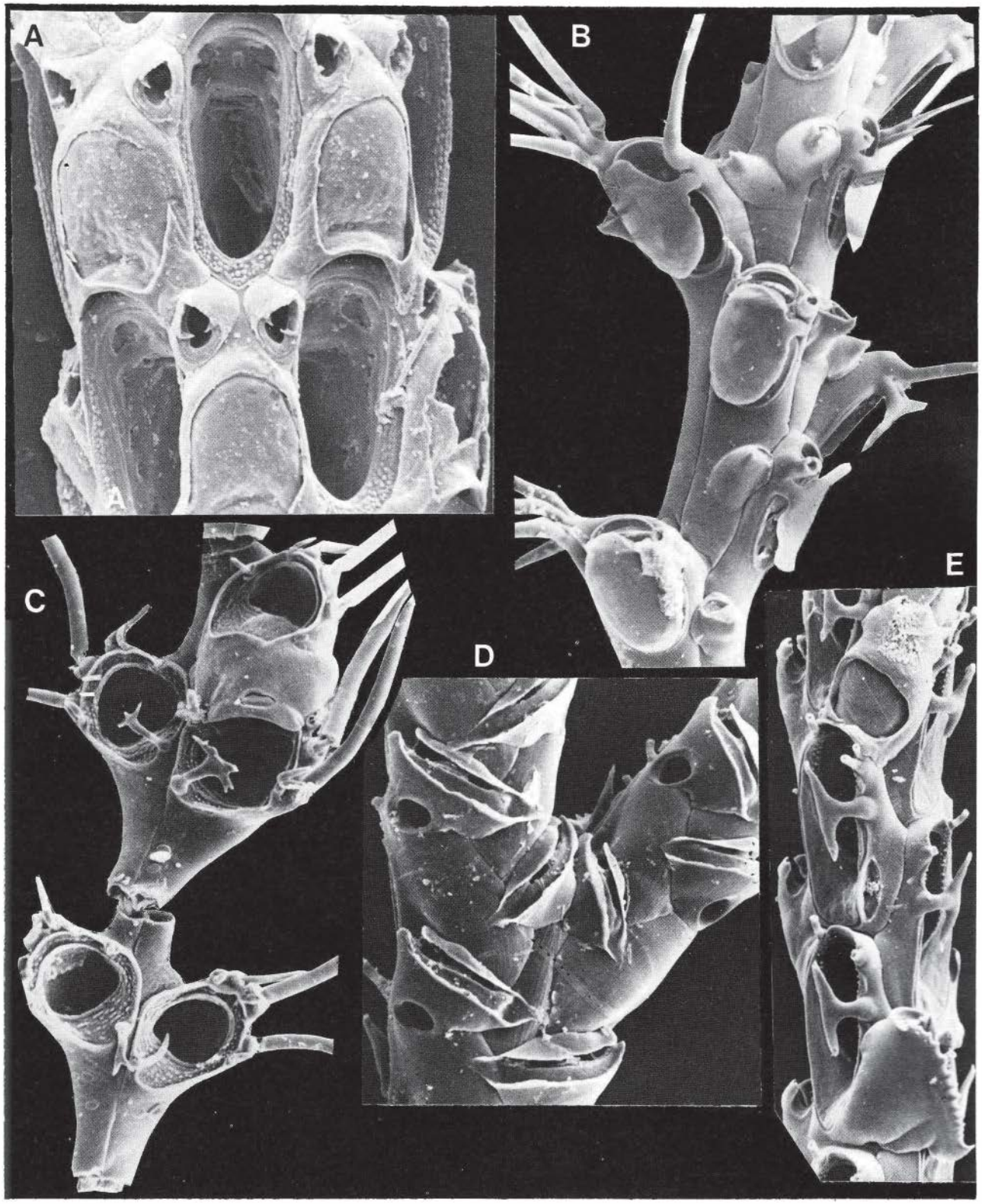

PLATE 13. A, *Amastigia antarctica subtropicalis* n.ssp. B, *Emma watersi* Hastings. C, *Notoplites longispinosus* n.sp. D,E, *Canda pecten scutata* Harmer: D, dorsal view; E, frontal view.

PLATE 14. A, *Caberea darwinii* Busk. B, *Caberea enzoi* n.sp. C,D. *Caberea glabra* MacGillivray. E, *Caberea helicina* Hastings. F, *Caberea rostrata* Busk.

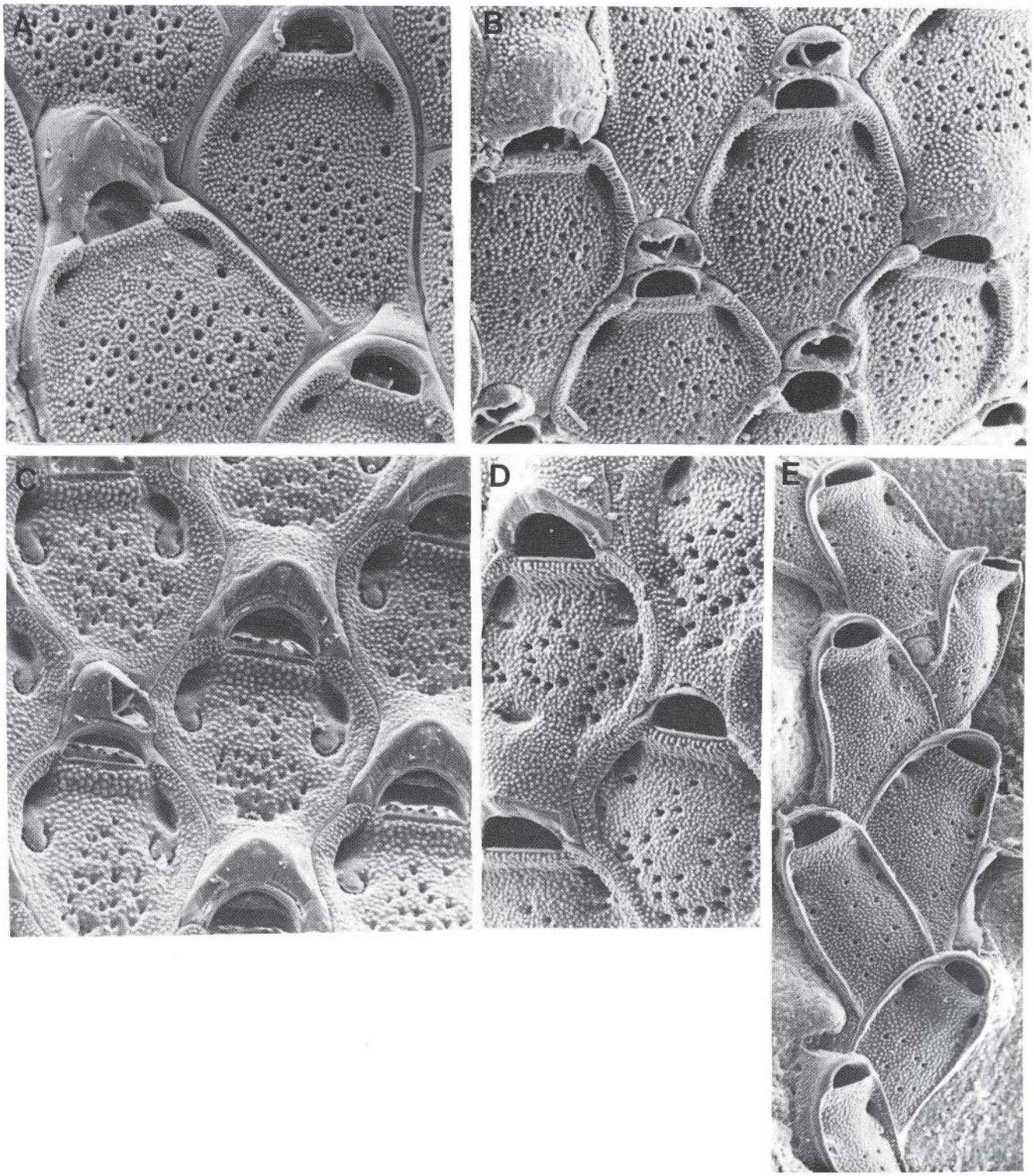

PLATE 15. A,E, *Micropora ?coriacea inarmata* Soule: E shows a biserial form. B, *Micropora elegans* Maplestone. C,D, *Micropora mortenseni* Livingstone: C, form with crescentic opesiules; D, form with transverse opesiules.

Sig. 11

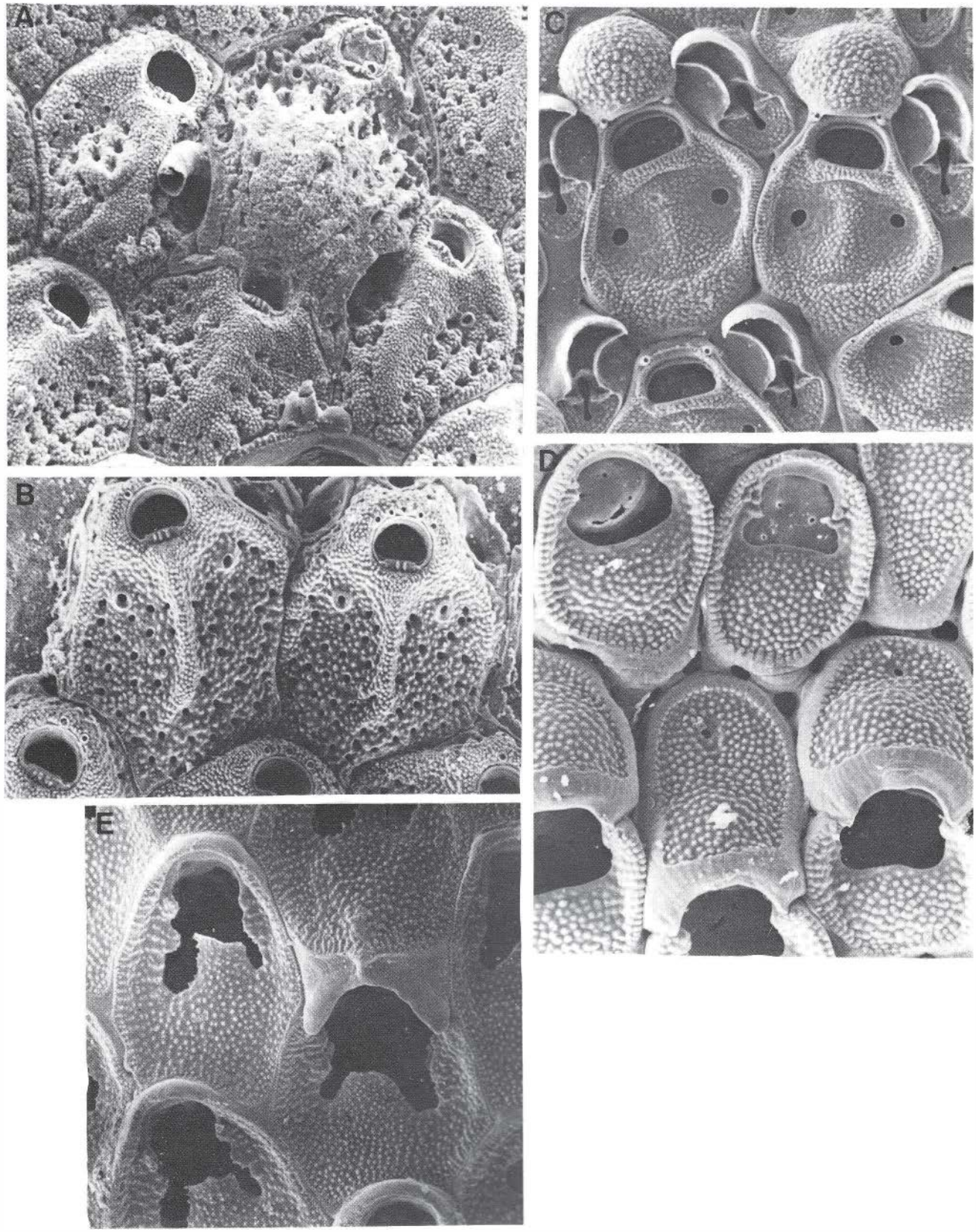

PLATE 16. A,B, *Monoporella nodulifera* (Hincks). C, *Manzonella monopia* (Brown). D, *Mollia multijuncta* (Waters): ovicellate zooids present. E. *Caleschara levinseni* Harmer.

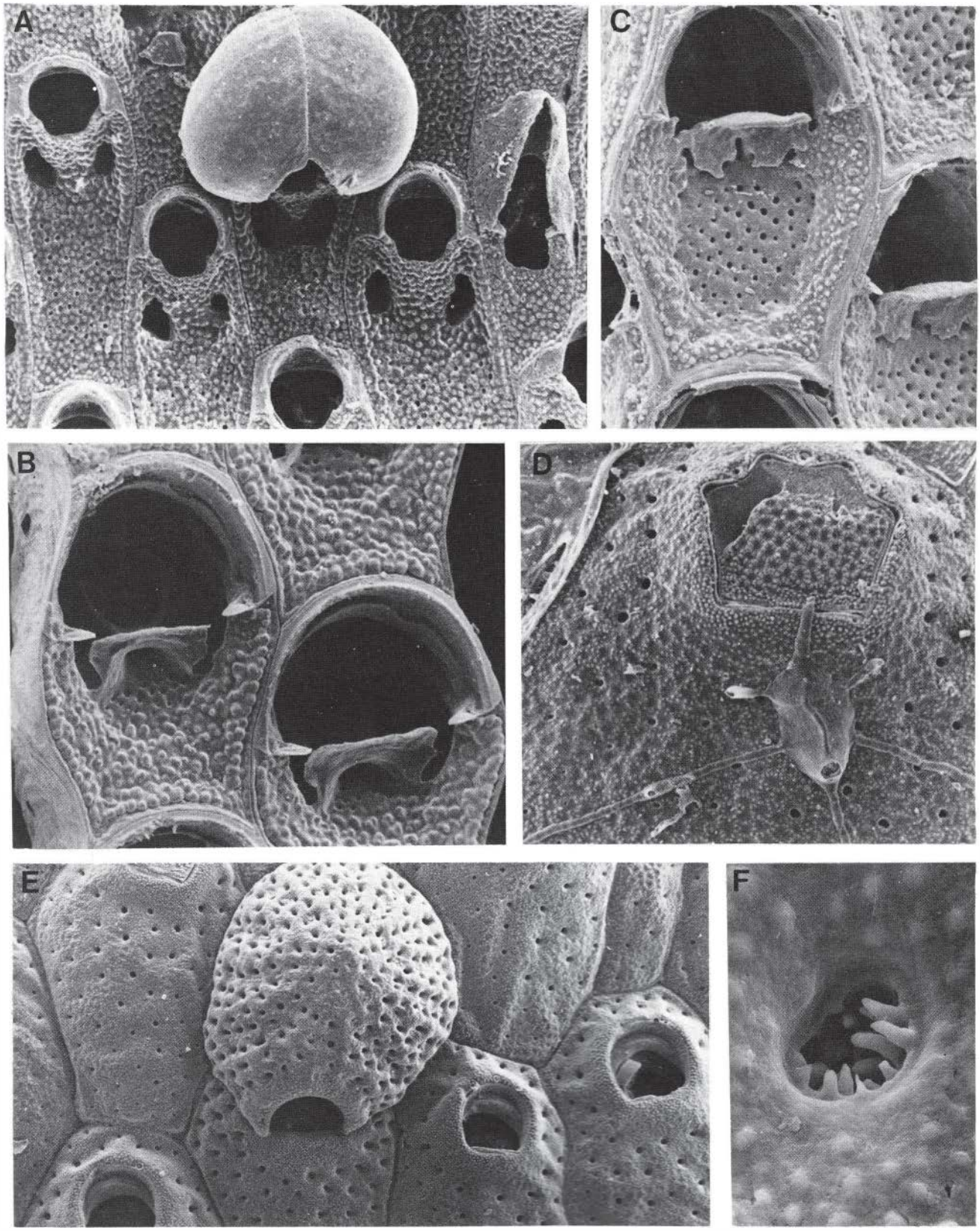

PLATE 17. A, *Thalamoporella quadrata* n.sp. B, *Steginoporella magnifica* Harmer. C, *Steginoporella neozelanica* (Busk). D-F, *Macropora grandis* (Hutton): D, with heteromorphic operculum in place (*Hippothoa divaricata pacifica* n.ssp. epizoitic on frontal wall); E, with an ovicell; F, an ovicellular pore.

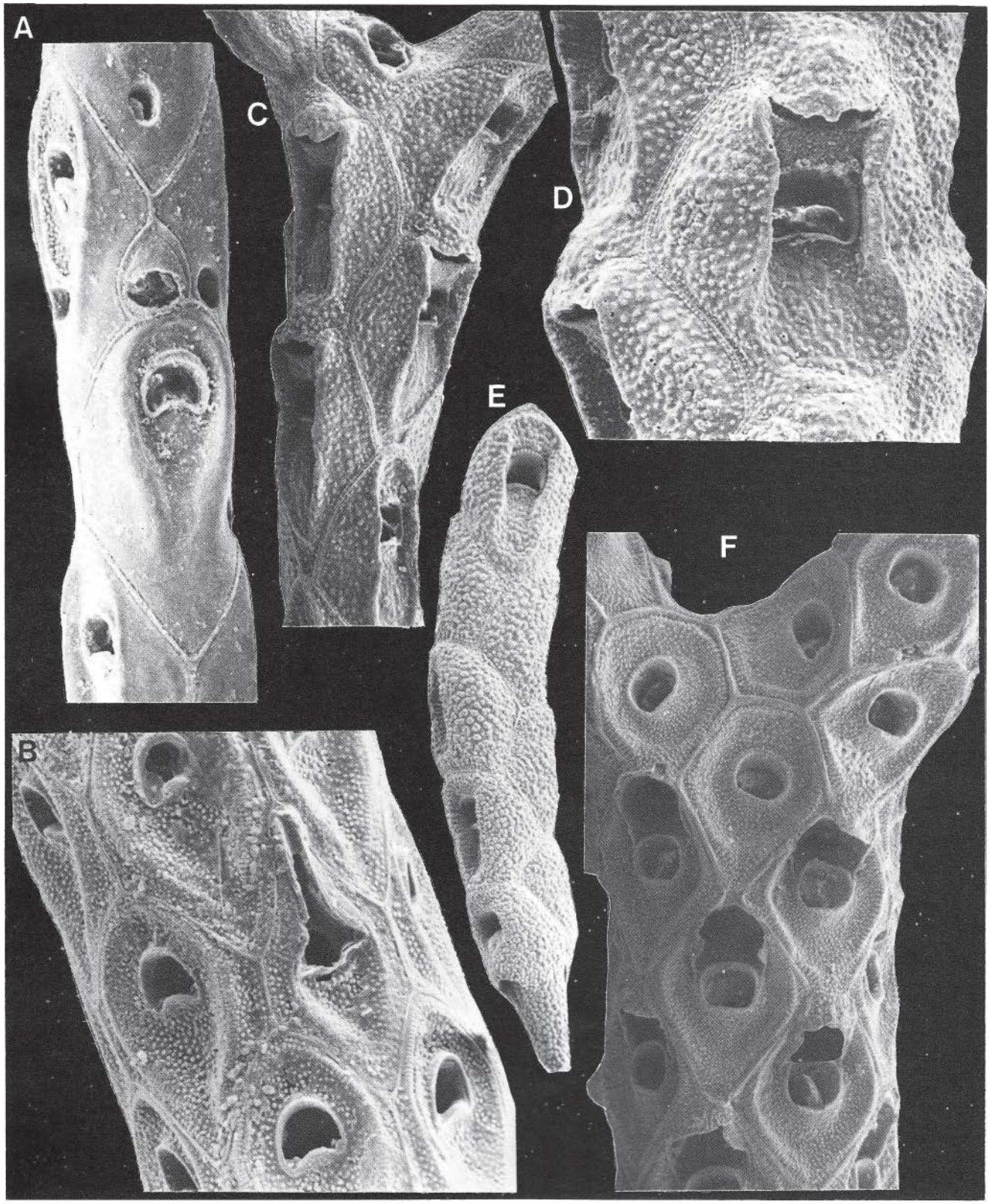

PLATE 18. A, *Cellaria humilis* Moyano. B, *Cellaria tenuirostris* (Busk). C-E, *Stomhypselosaria dupliforma* Canu & Bassler: D, ovicelled zooids; E, proximal part of colony with ancestrula. F, *Mesostomaria strictoramae* Canu & Bassler: branching stem with ovicells.

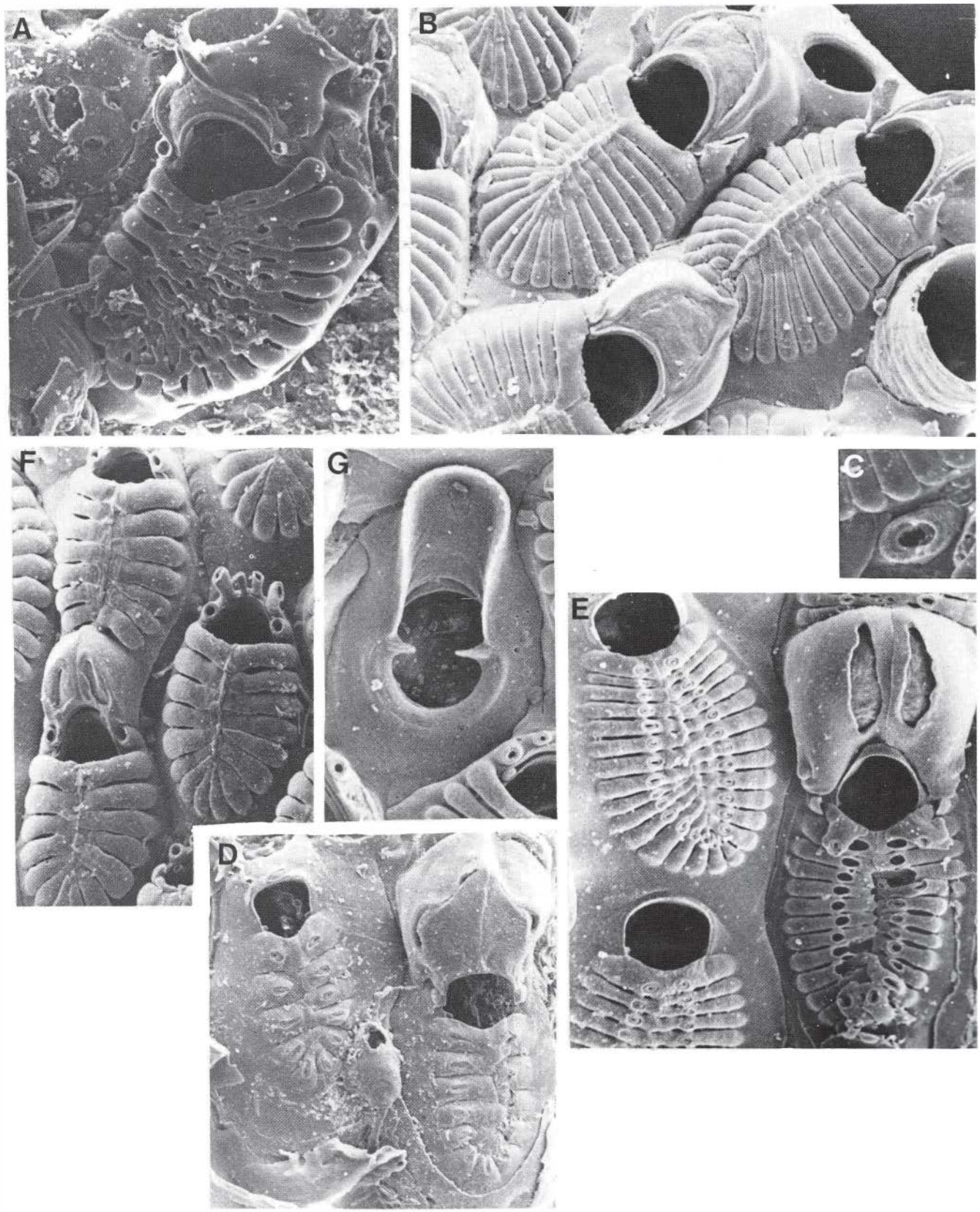

PLATE 19. A, *Membraniporella bifurca* Powell. B,C, *Membraniporella figularioides* n.sp.: C, adventitious avicularium. D, *Figularia carinata* (Waters). E, *Figularia pelmatifera* n.sp. F,G, *Figularia spinea* Brown: F, vicarious avicularium.

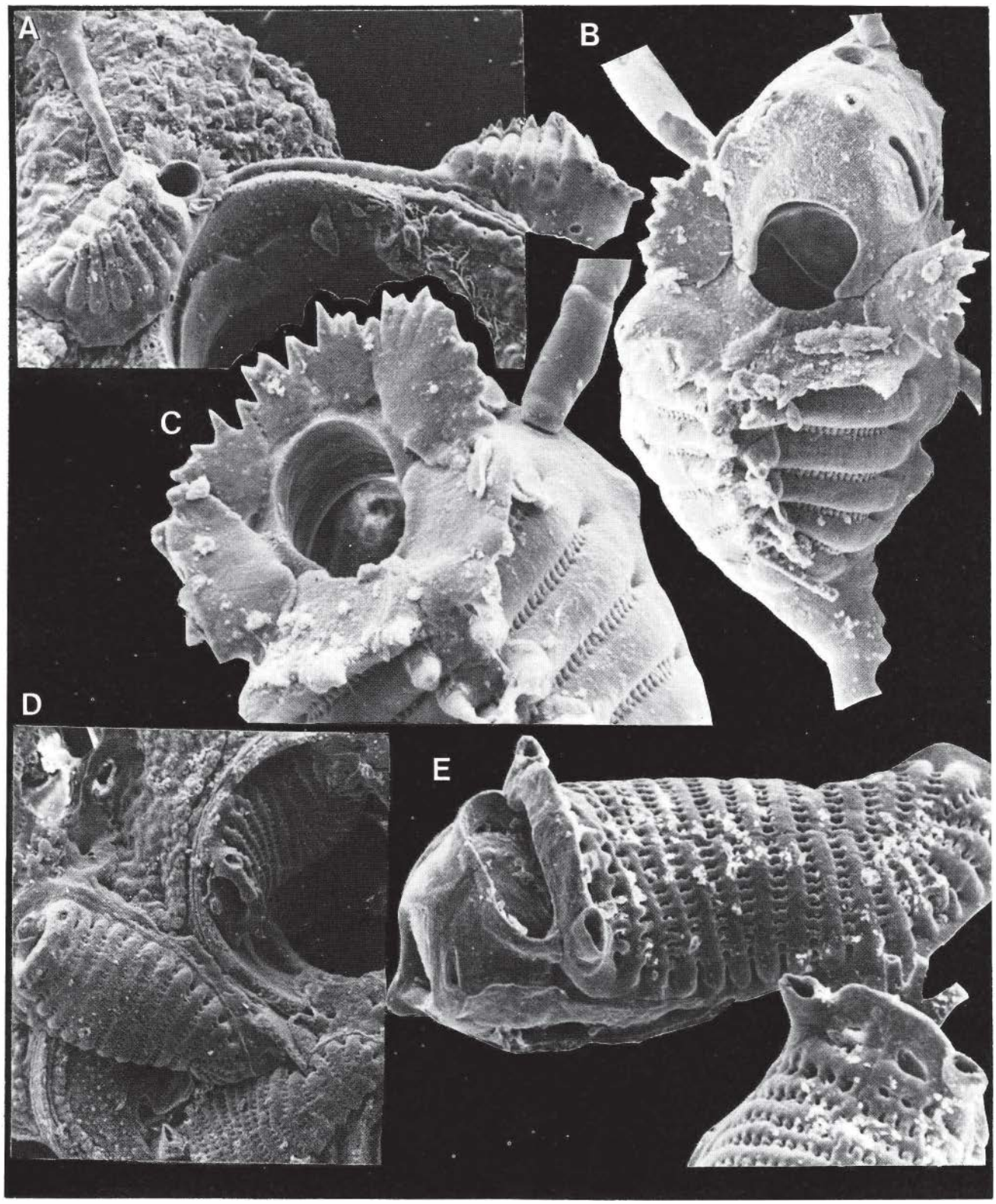

PLATE 20. A-C, *Reginella stolonifera* n.sp.: B, ovicelled zooid. D,E, *Reginella vas* (Brown).

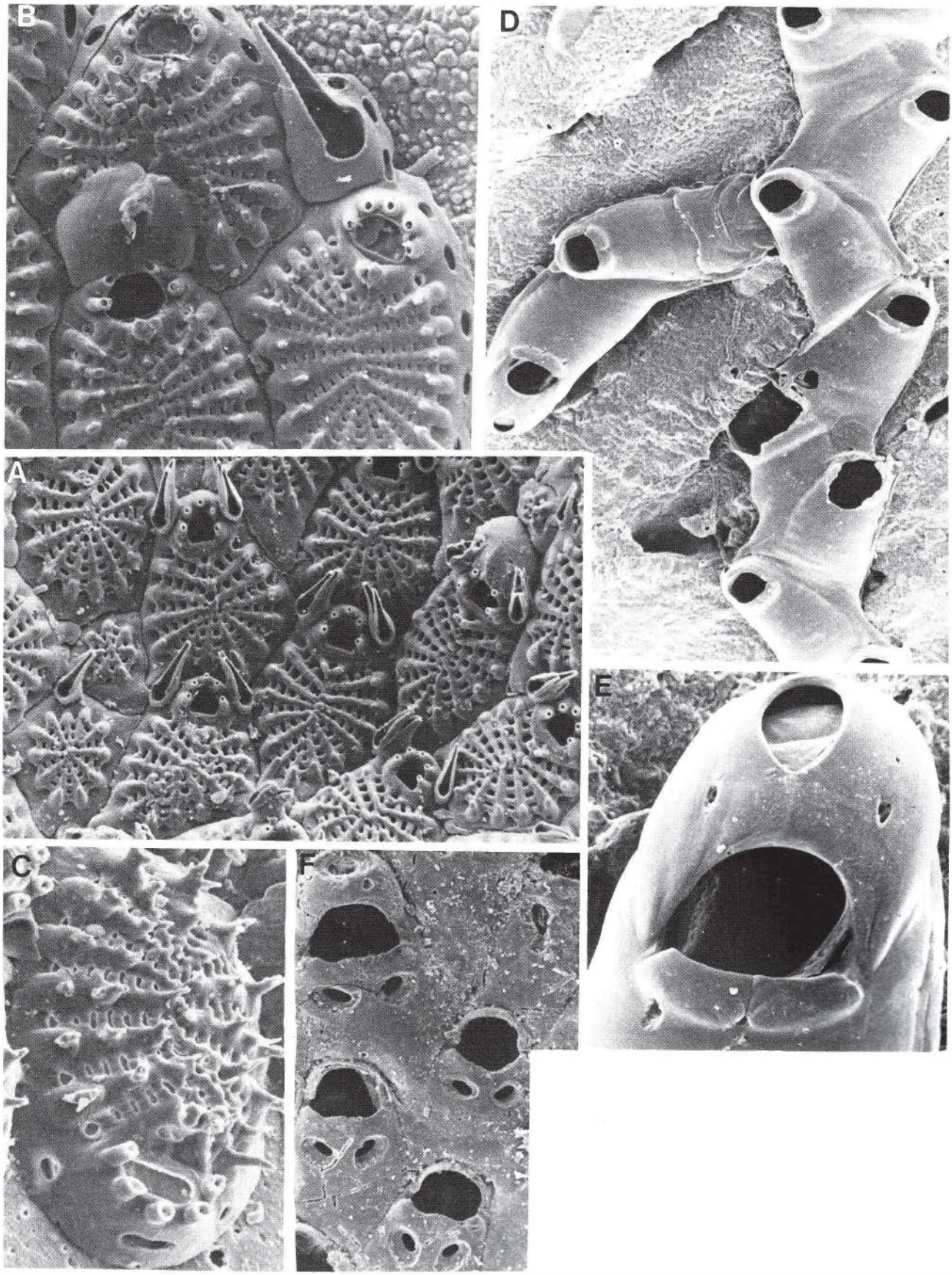

PLATE 21. A, *Puellina (Cribrilaria) biavicularia* Kataoka. B,C, *Puellina (Cribrilaria) innominata* (Couch): C shows excessive development of spinose projections. D,E, *Eurystomella crystallina* n.sp.: E, orifice of ovicellate zooid. F, *Eurystomella foraminigera* (Hincks).

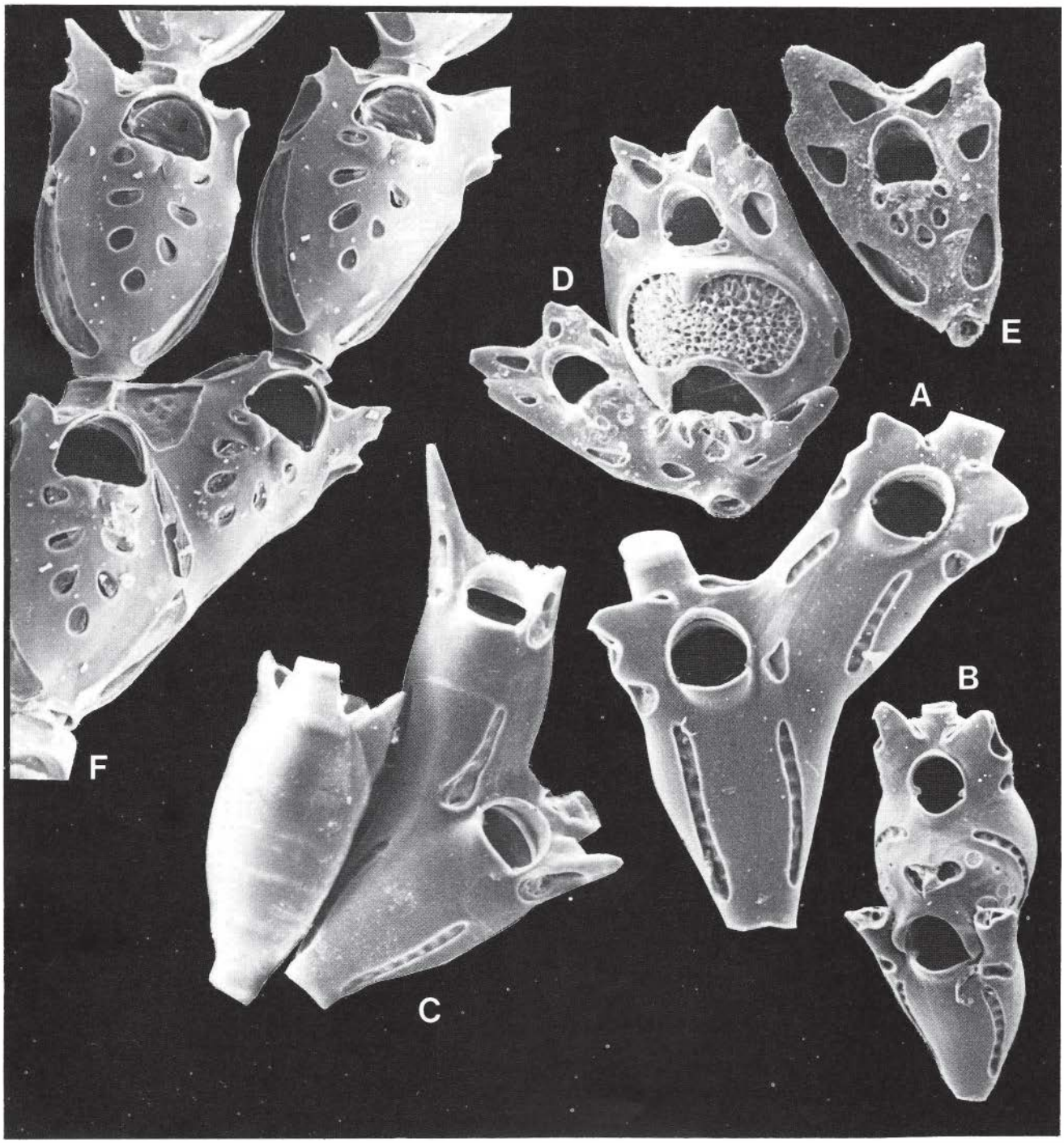

PLATE 22. A,B, *Catenicella elegans* Busk. C, *Catenicella ?venusta* MacGillivray. D,E, *Pterocella alata* (W. Thomson). F, *Orthoscuticella ventricosa* (Busk).

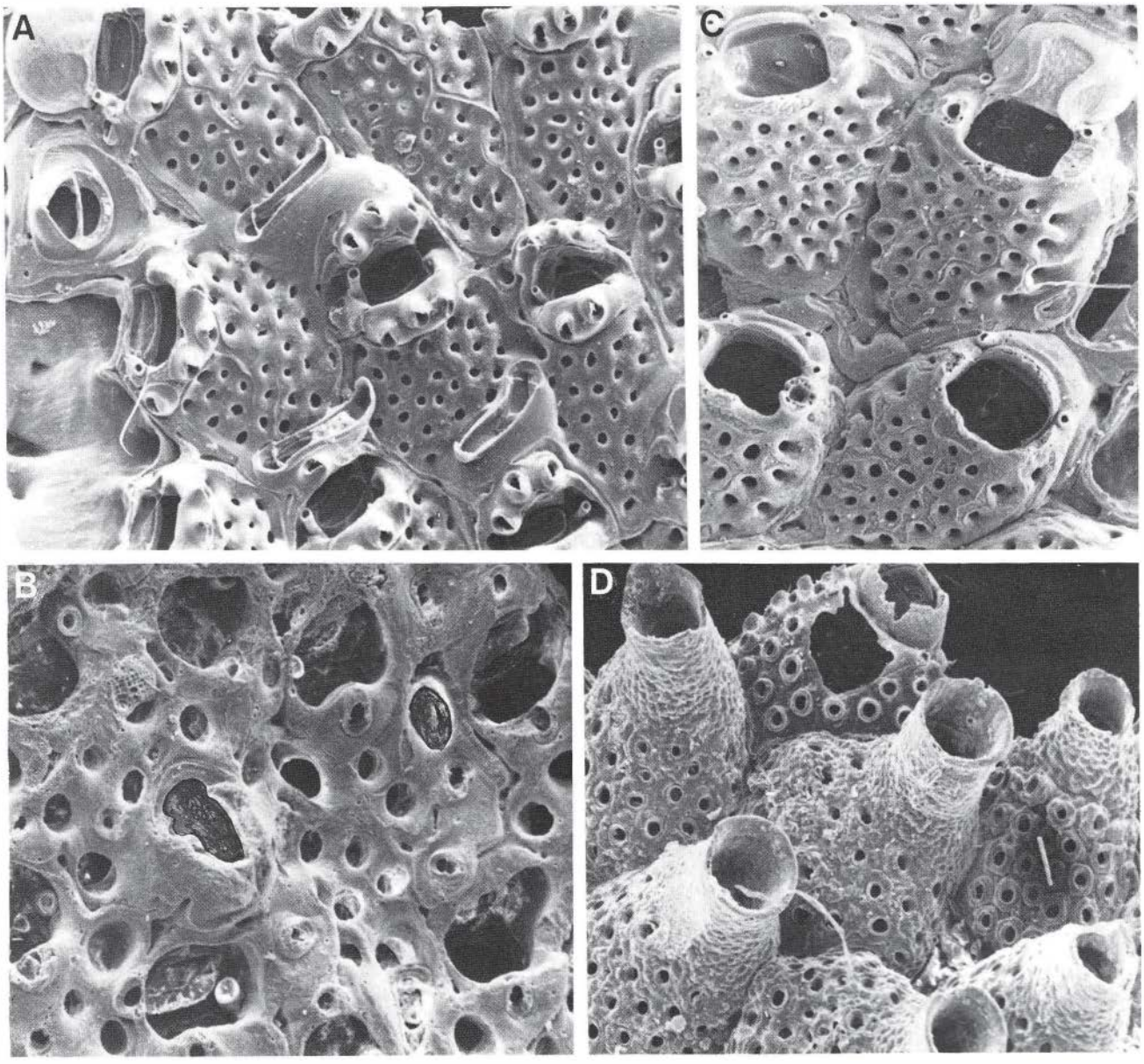

PLATE 23. A, *Arachnopusia perforata* (Maplestone). B, *Arachnopusia unicornis* (Hutton). C, *Briarachnia robusta* n.gen., n.sp. D, *Exechonella tuberculata* (MacGillivray).

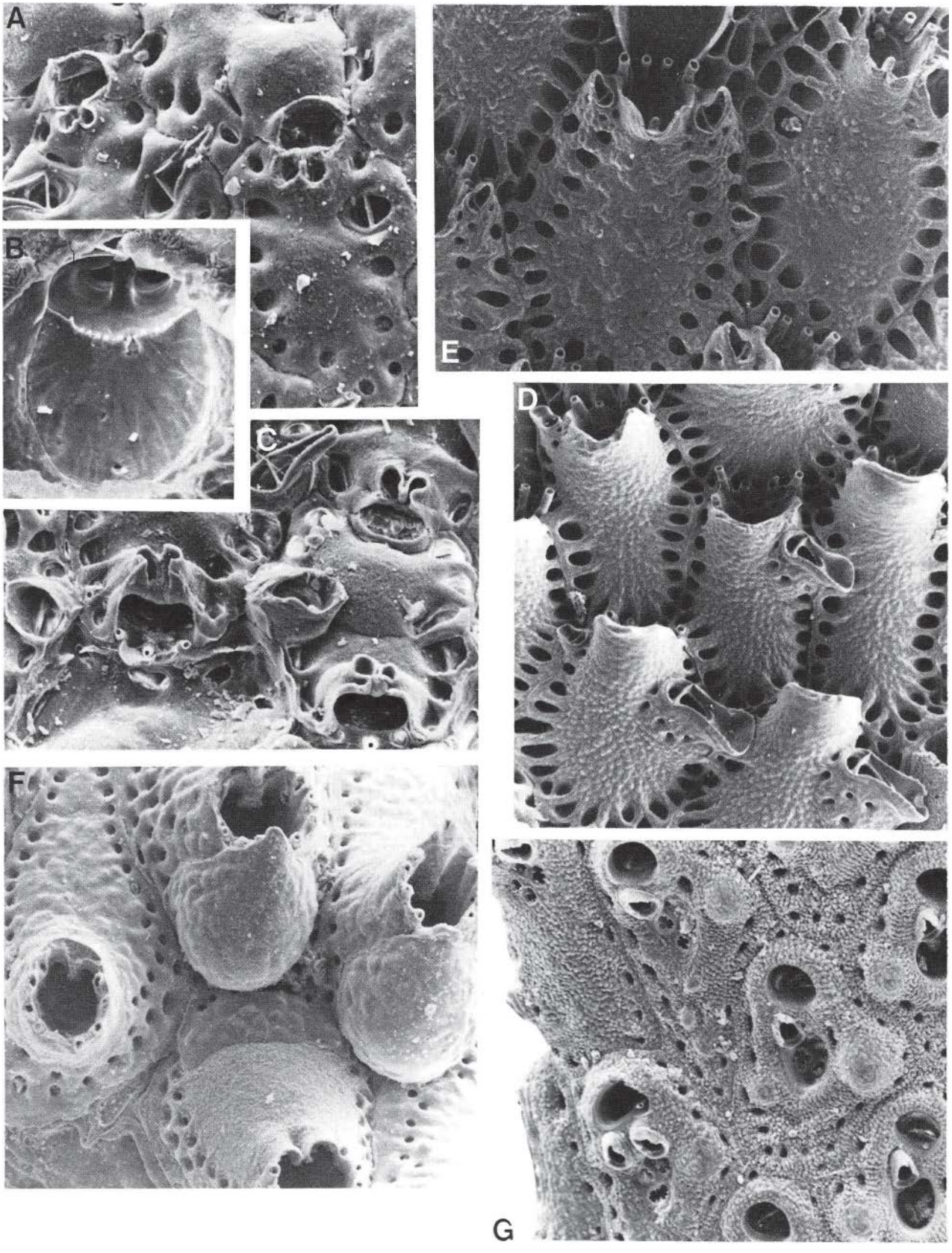

PLATE 24. A-C, *Exochella tricuspis* (Hincks): A, ovicellate zooids; B, interior surface of frontal wall showing "ring" in the calcification marking the boundary of the compensation space in life; C, growing margin of colony showing developing avicularia and a recumbent ovicell prior to development of secondary calcification. D, *Escharoides angela* (Hutton). E, *Escharoides excavata* (MacGillivray). F, *Elleschara bensoni* (Brown). G, *Adeonellopsis yarraensis* (Waters).

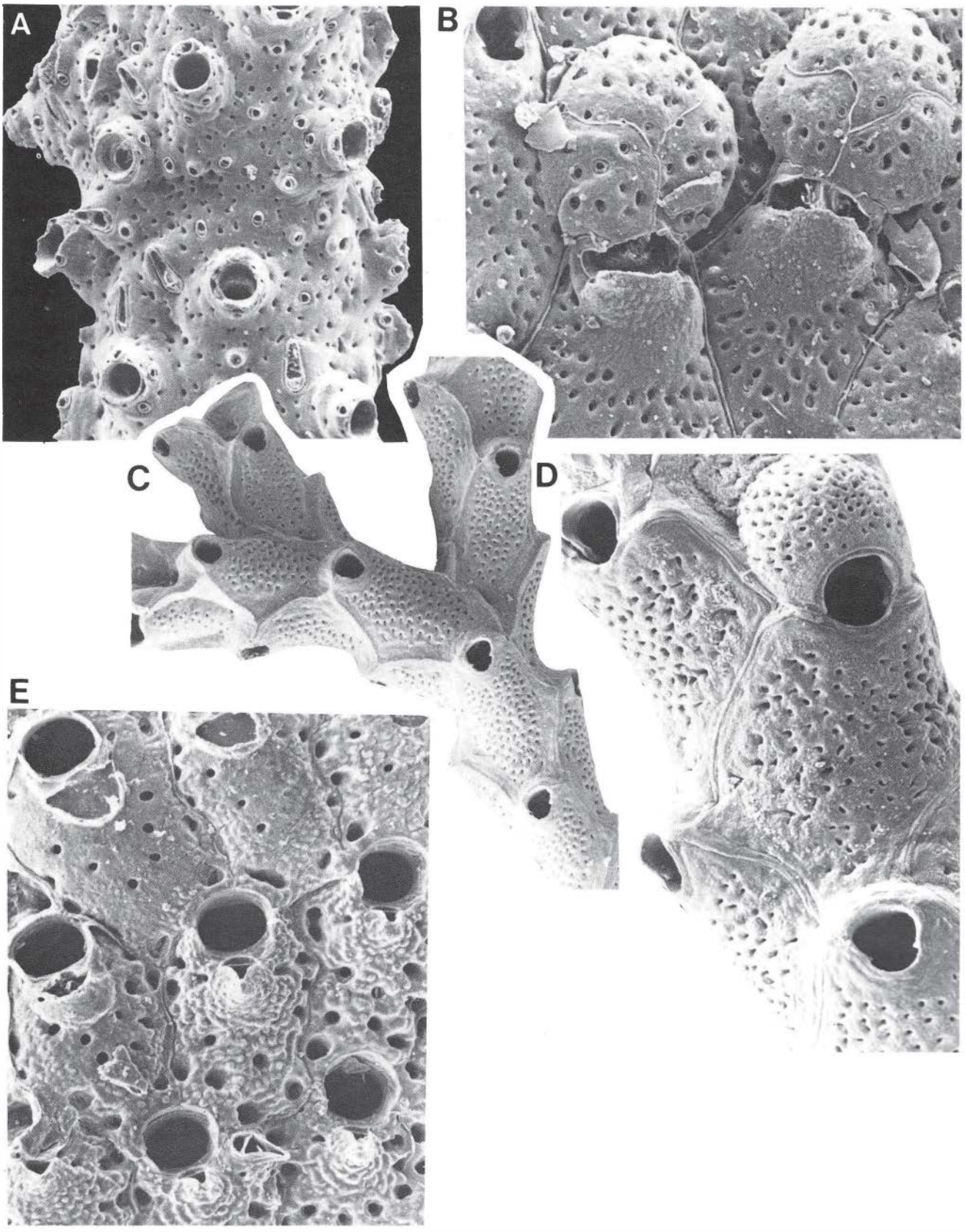

PLATE 25. A, *Haswellina multiaviculata* n.sp. B, *Hippoporina cincta* (Hincks). C,D, *Hippoporina epaxia* n.sp. E, *Hippoporina rostrata* (MacGillivray).

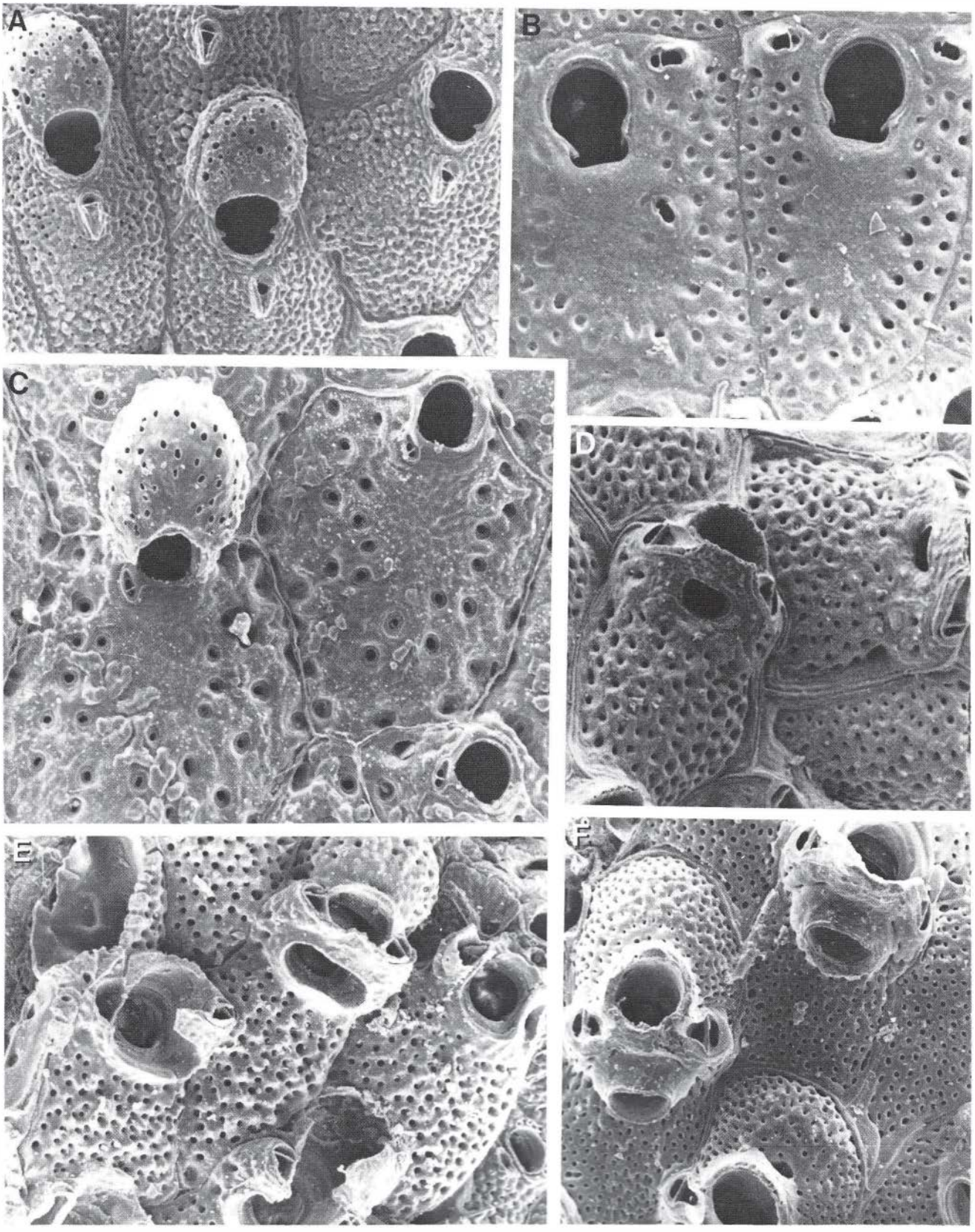

PLATE 26. A, *Codonellina montferrandii* (Audouin). B, *Hippomenella vellicata* (Hutton). C, *Hippothyris aganactete* n.sp. D, *Gigantopora polymorpha* (Busk). E, *Gigantopora proximalis* n.sp. F, *Gigantopora pupa* (Jullien).

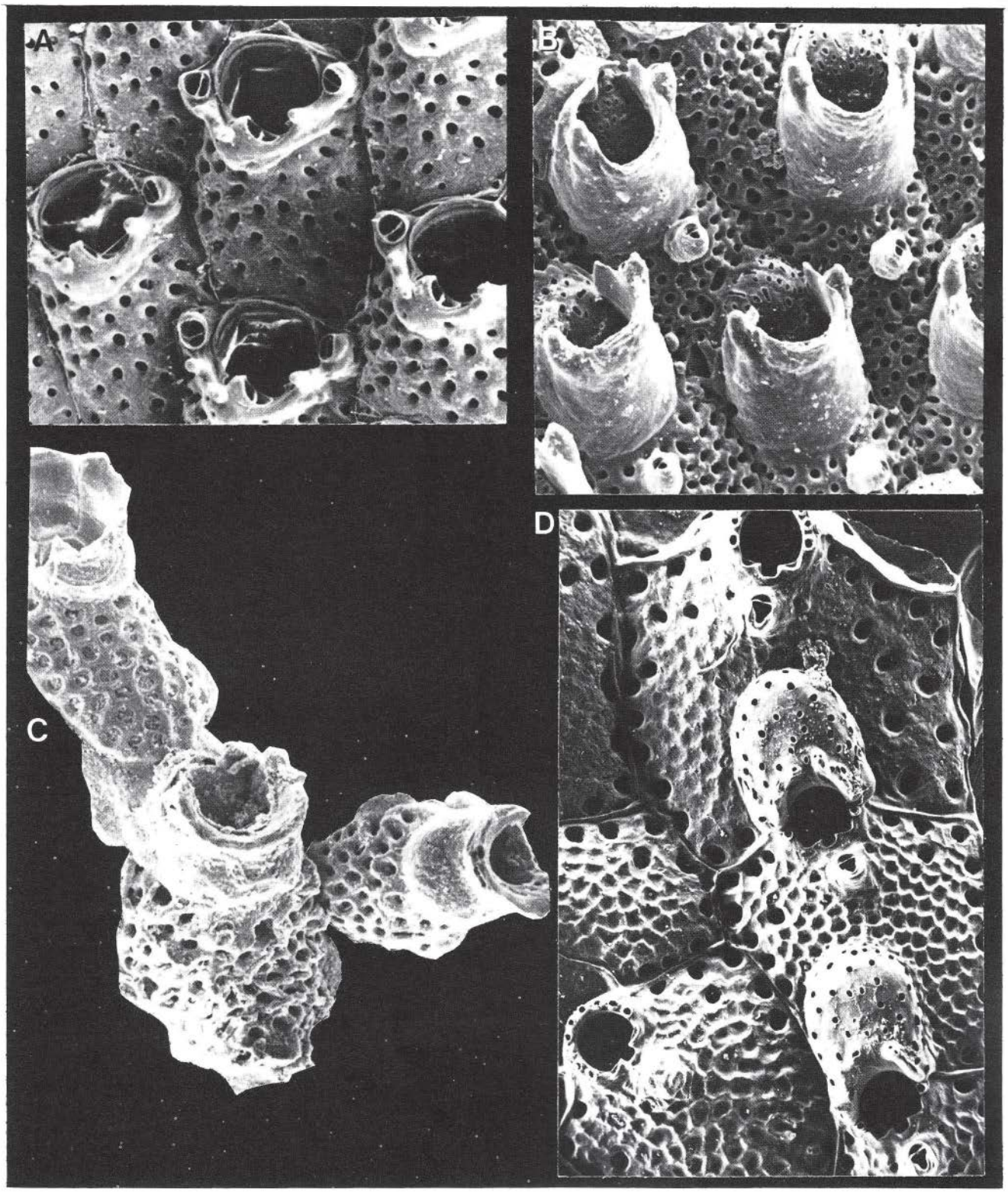

PLATE 27. A, *Discopora intermediata* n.sp. B, *Lagenicella exallos* n.sp. C, *Lagenicella lacunosa* (Bassler). D, *Schizomavella neptuni* (Jullien).

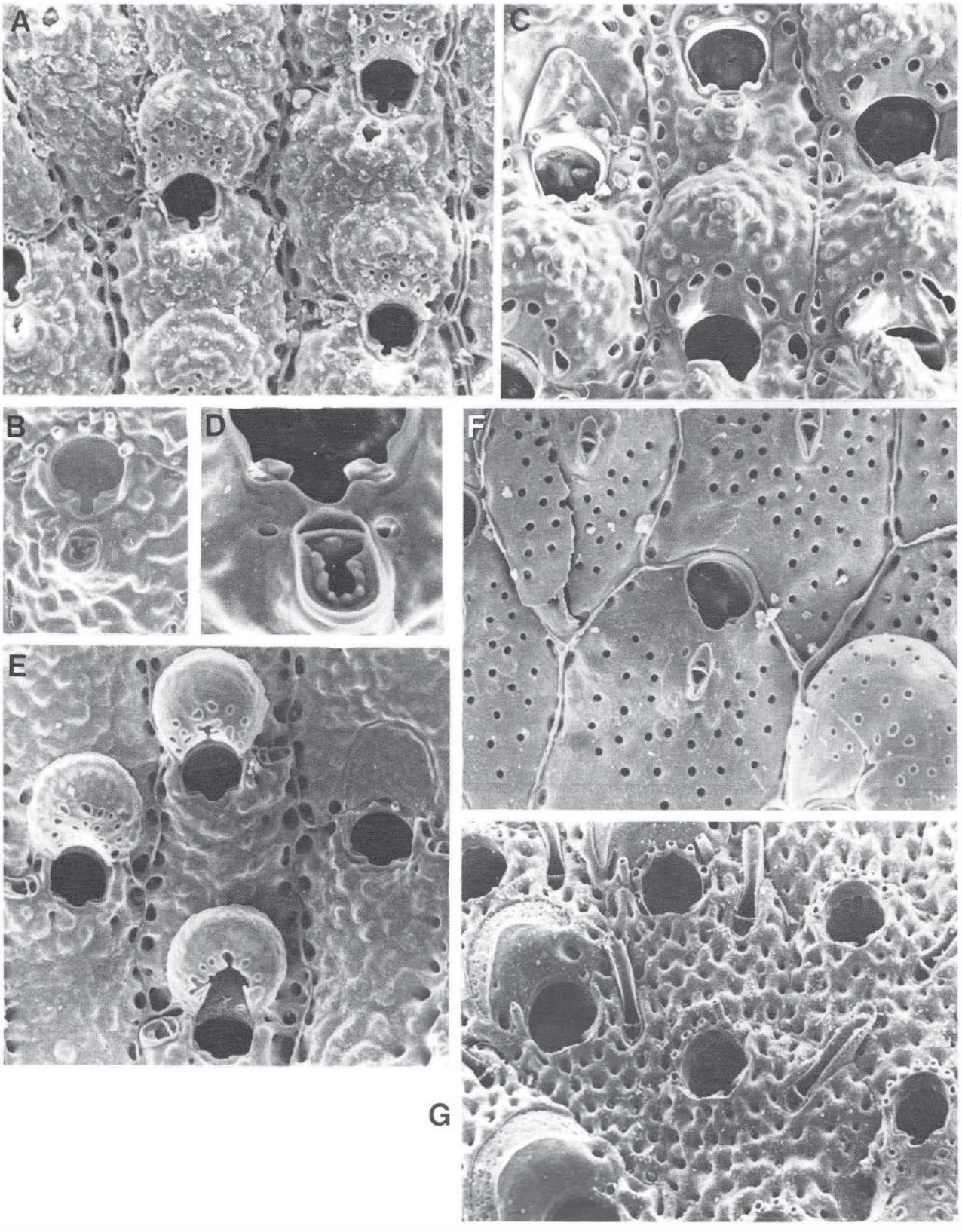

PLATE 28. A,B, *Schizomavella punctigera* (MacGillivray): from Kermadec Ridge. C,D, *Schizomavella auriculata* (Hassall): from Britain, for comparison with *S. punctigera*. E, *Schizomavella schizoporelloides* n.sp. F, *Metroperiella triangula* (Hincks). G, *Chiastosella longaevitas* Powell.

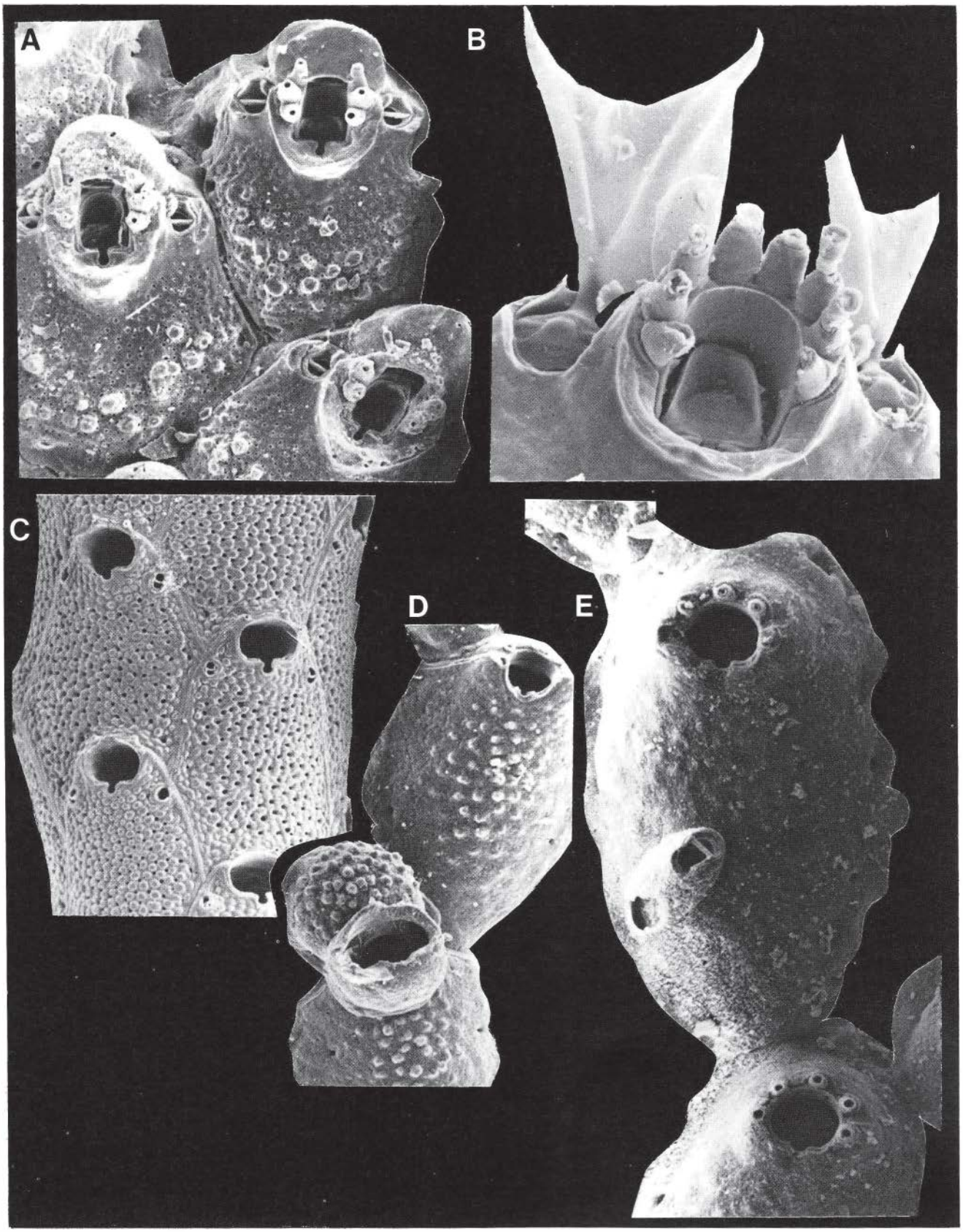

PLATE 29. A,B, *Escharina pesanseris* (Smitt): B, with avicularian mandibles. C, *Escharina waiparaensis* Brown. D,E, *Nimba terraenovae* (Powell).

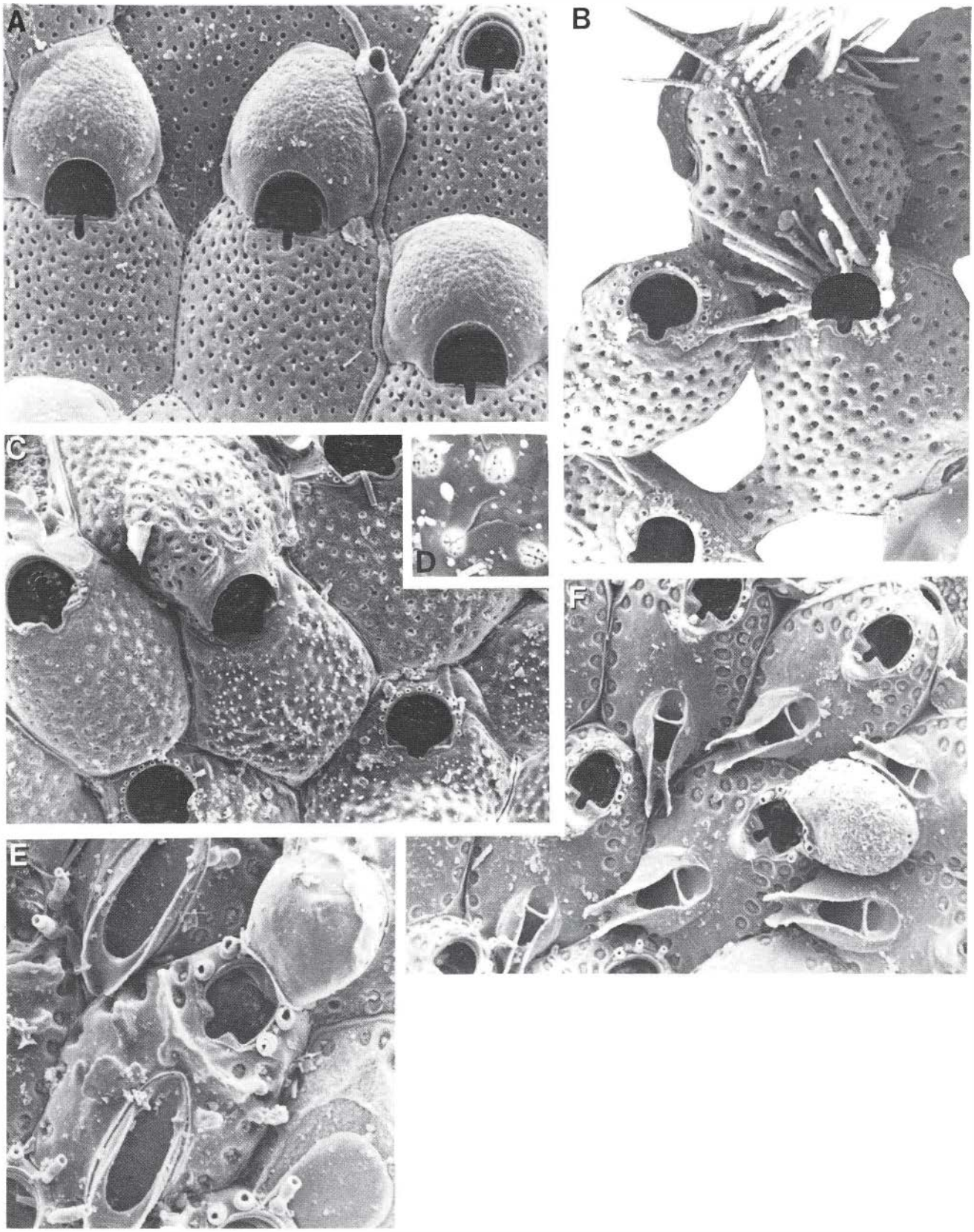

PLATE 30. A, *Arthropoma cecilii* (Audouin). B, *Rogicka biserialis* (Hincks). C,D, *Rogicka oceanica* n.sp.: D, frontal wall pores. E,F. *Phonicosia circinata* (MacGillivray): two forms of the species.

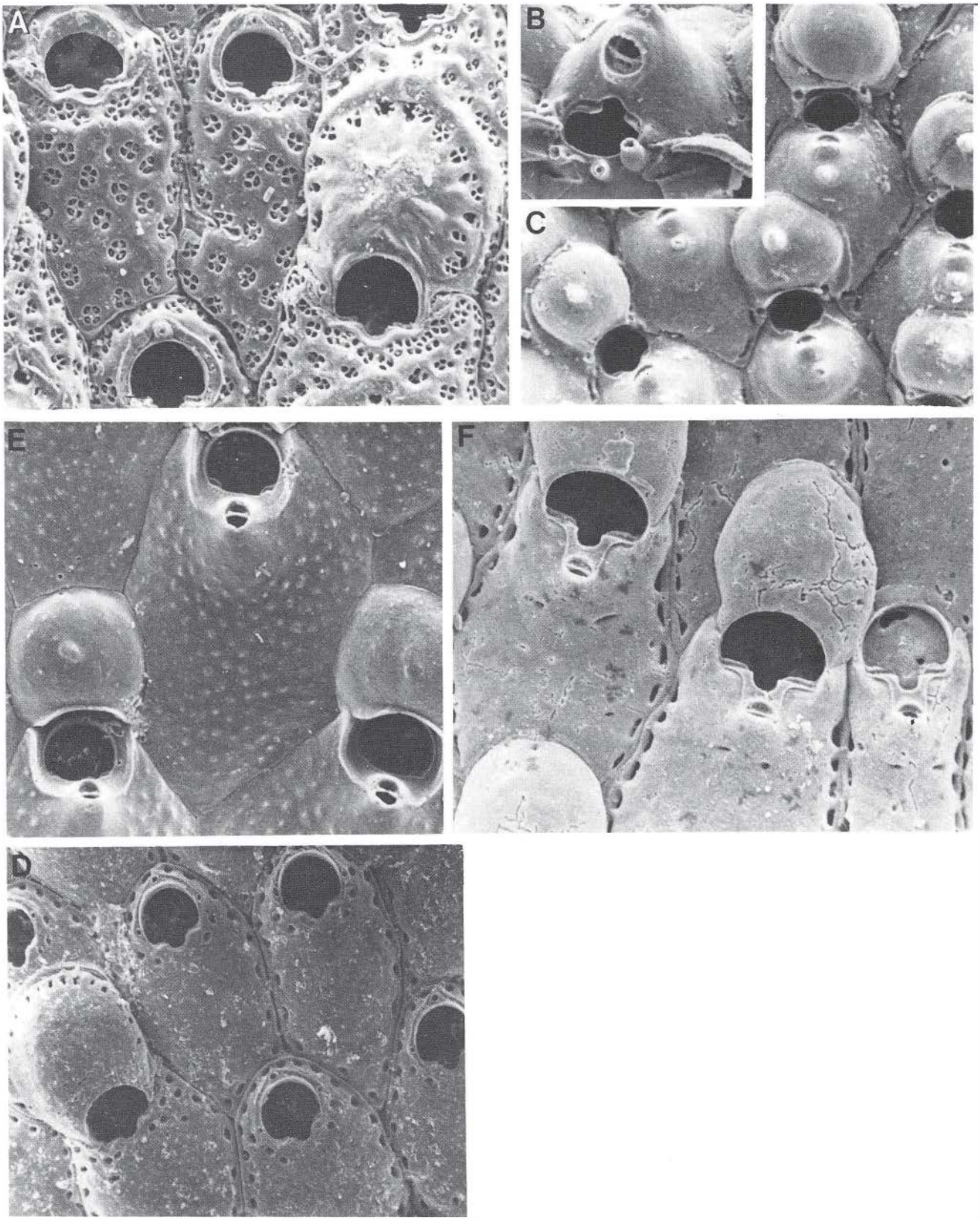

PLATE 31. A, *Cribellopora trichotoma* (Waters). B,C, *Buffonellodes rimosa* (Jullien): material of Uttley and Bullivant from the Chatham Rise for comparison with *B. ridleyi*. D, *Lacerna problematica* n.sp. E, *Buffonellodes marsupifera* (Busk). F, *Buffonellodes ridleyi* (MacGillivray).

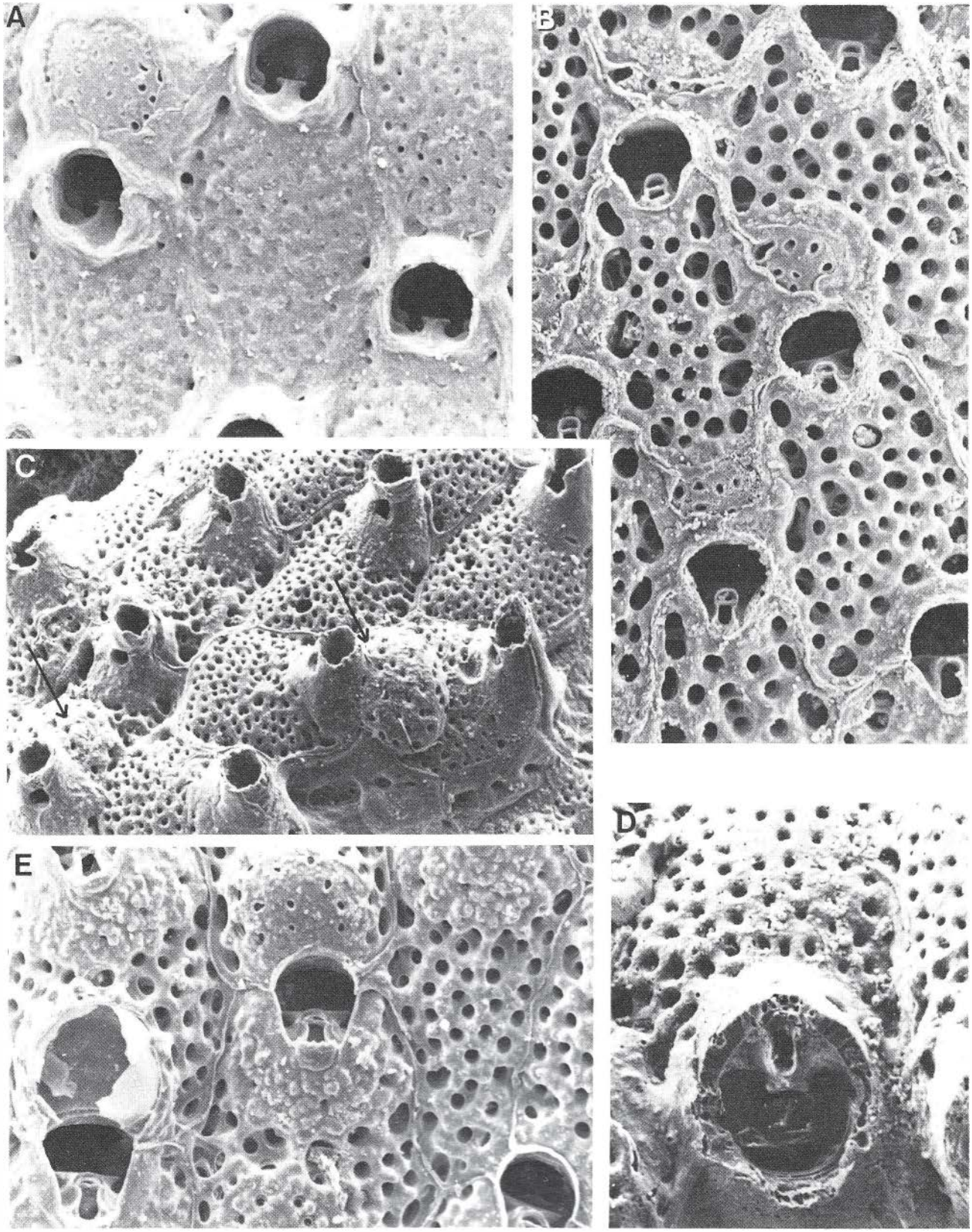

PLATE 32. A, *Smittina punctata* Powell. B, *Smittina rosacea* Powell: three zooids ovicellate. C,D, *Smittina spiraminifera* n.sp.: in C two ovicells are present (arrows); D, primary orifice with lyrula (peristome broken). E, *Smittina torques* Powell.

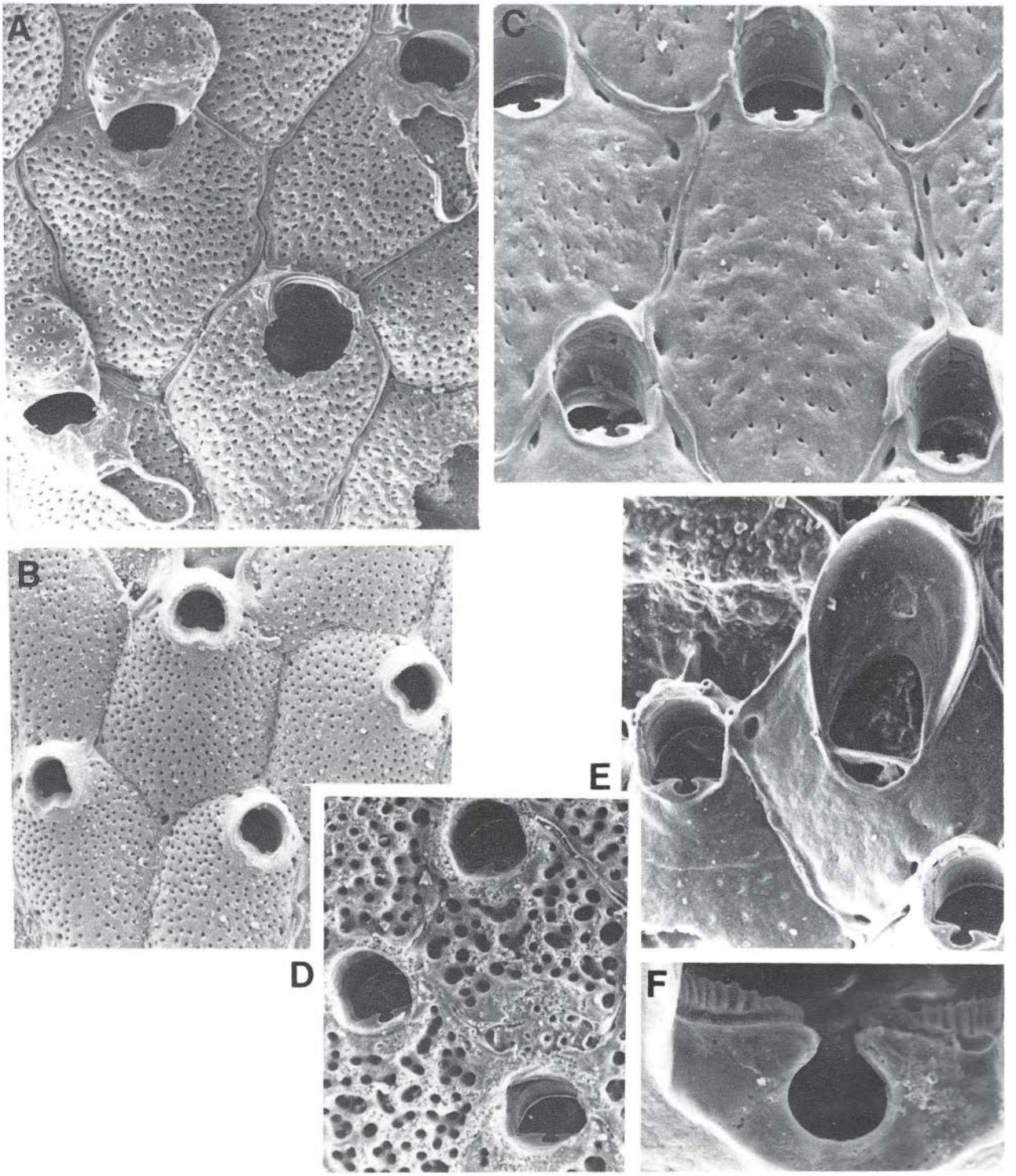

PLATE 33. A, *Emballotheca monomorpha* n.sp. B, *Emballotheca* sp. C-F, *Schizosmittina maplestonei* (MacGillivray): C, neanic zooids near growing margin; D, ephebic zooids from older part of a colony (one ovicell present); E, vicarious avicularium at growing margin; F, primary orifice.

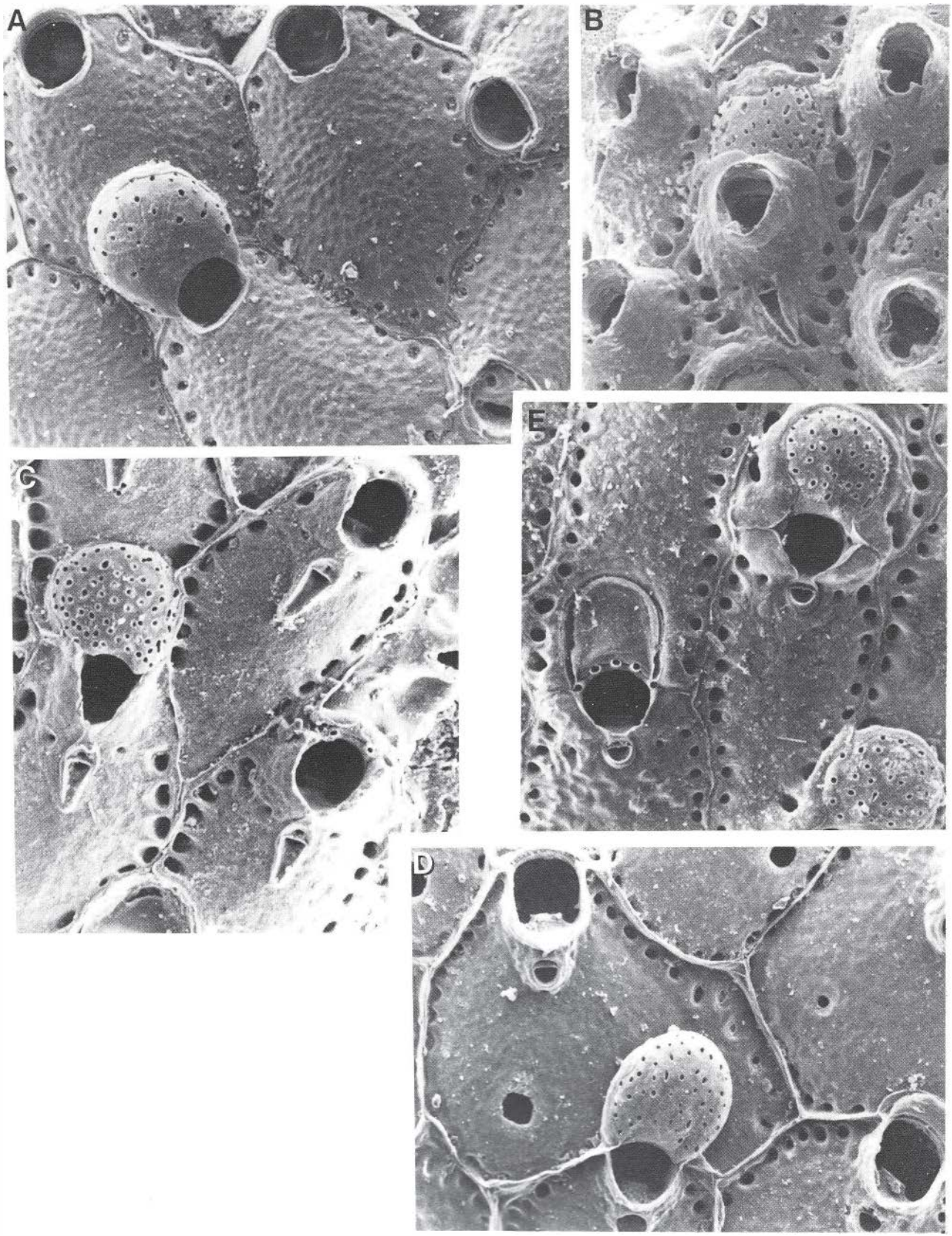

PLATE 34. A, *Hippomonavella gymnae* n.sp. B, *Smittoidea curtisensis* n.sp. C, *Smittoidea hyalina* n.sp. D, *Smittoidea magna* n.sp. E, *Smittoidea zelandiae* (Brown).

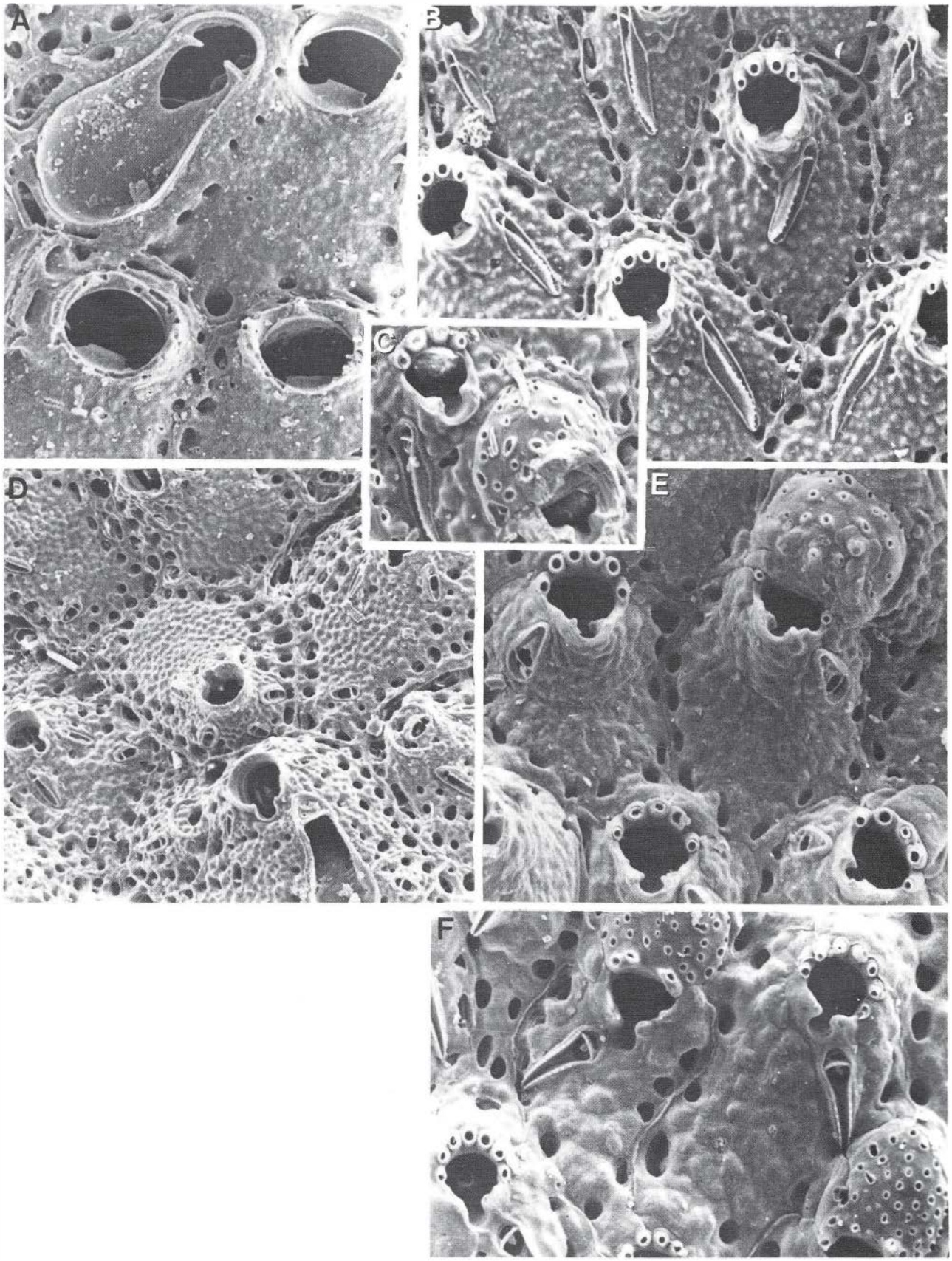

PLATE 35. A, *Parasmittina delicatula* (Busk). B,C, *Parasmittina serrula* Soule & Soule. D, *Parasmittina tropica* (Waters). E, *Parasmittina tubula* (Kirkpatrick). F, *Hemismittoidea hexaspinosa* (Uttley & Bullivant).

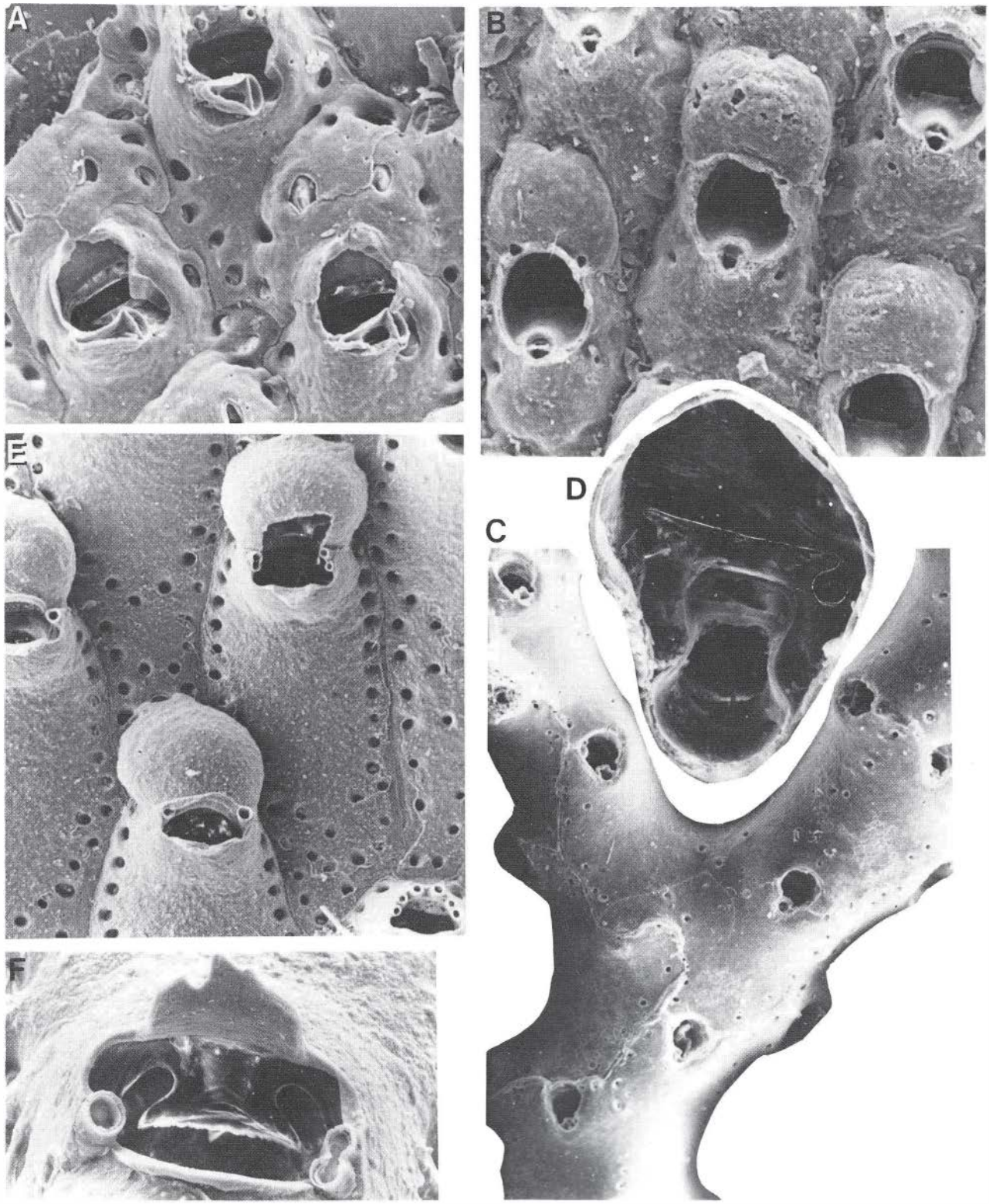

PLATE 36. A, *Rhamphostomella rogickae* (Brown). B, *Porella marsupium* (MacGillivray). C,D, *Porelloides glabra* n.sp. E,F, *Escharella incudifera* n.sp.

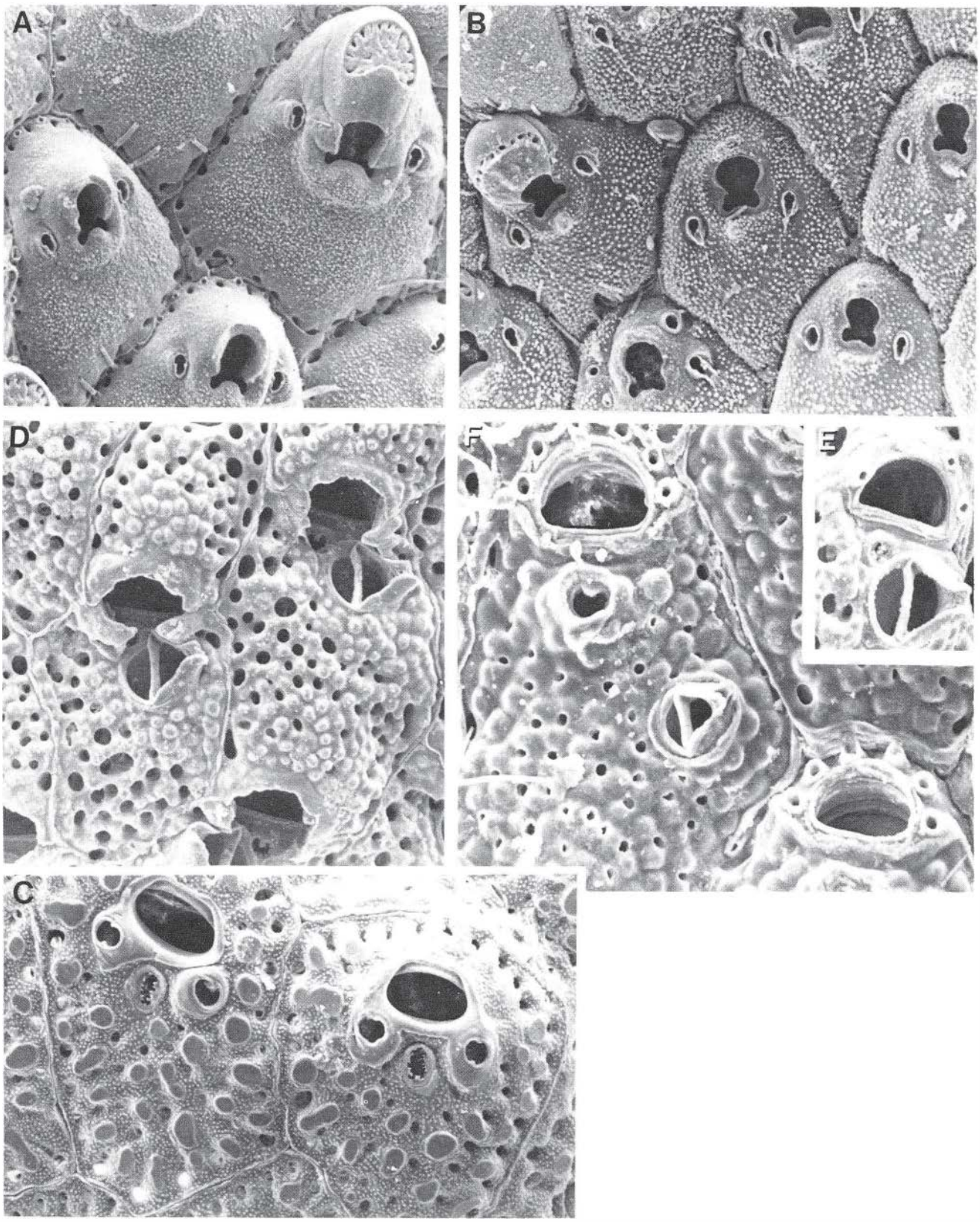

PLATE 37. A, *Crepidacantha bracebridgei* Brown. B, *Crepidacantha crinispina* Levinsen. C, *Inversiula fertilis* Powell. D,E, *Microporella agonistes* n.sp. F, *Microporella ciliata* (Pallas).

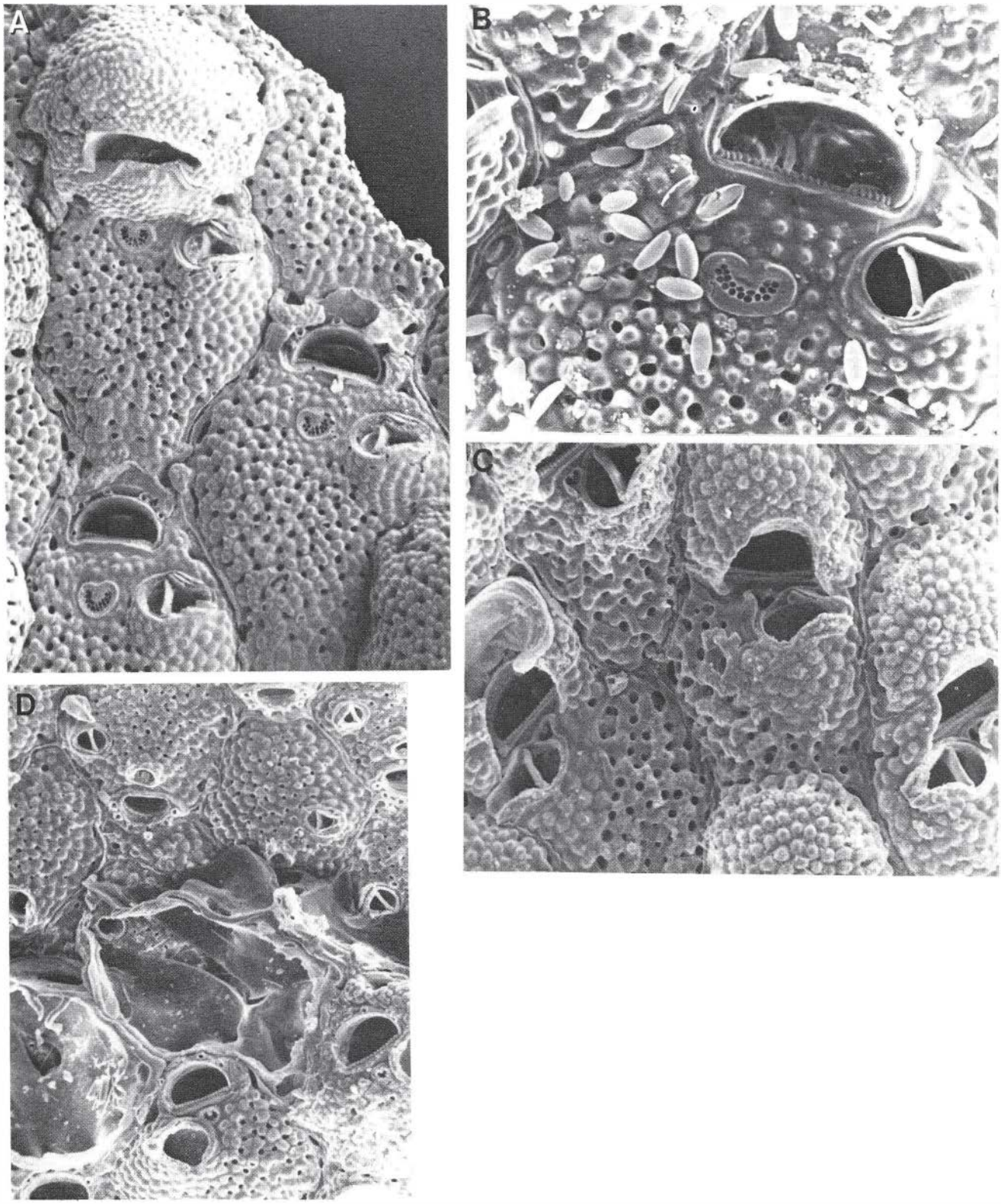

PLATE 38. A,B, *Microporella discors* Uttley & Bullivant: A is of an ovicellate colony from Puysegur Bank, South Island, for comparison; the oval objects in B are diatoms. C, *Microporella internedia* Livingstone. D, boundary interaction between colonies of *M. orientalis* Harmer (top) and *M. intermedia* (bottom).

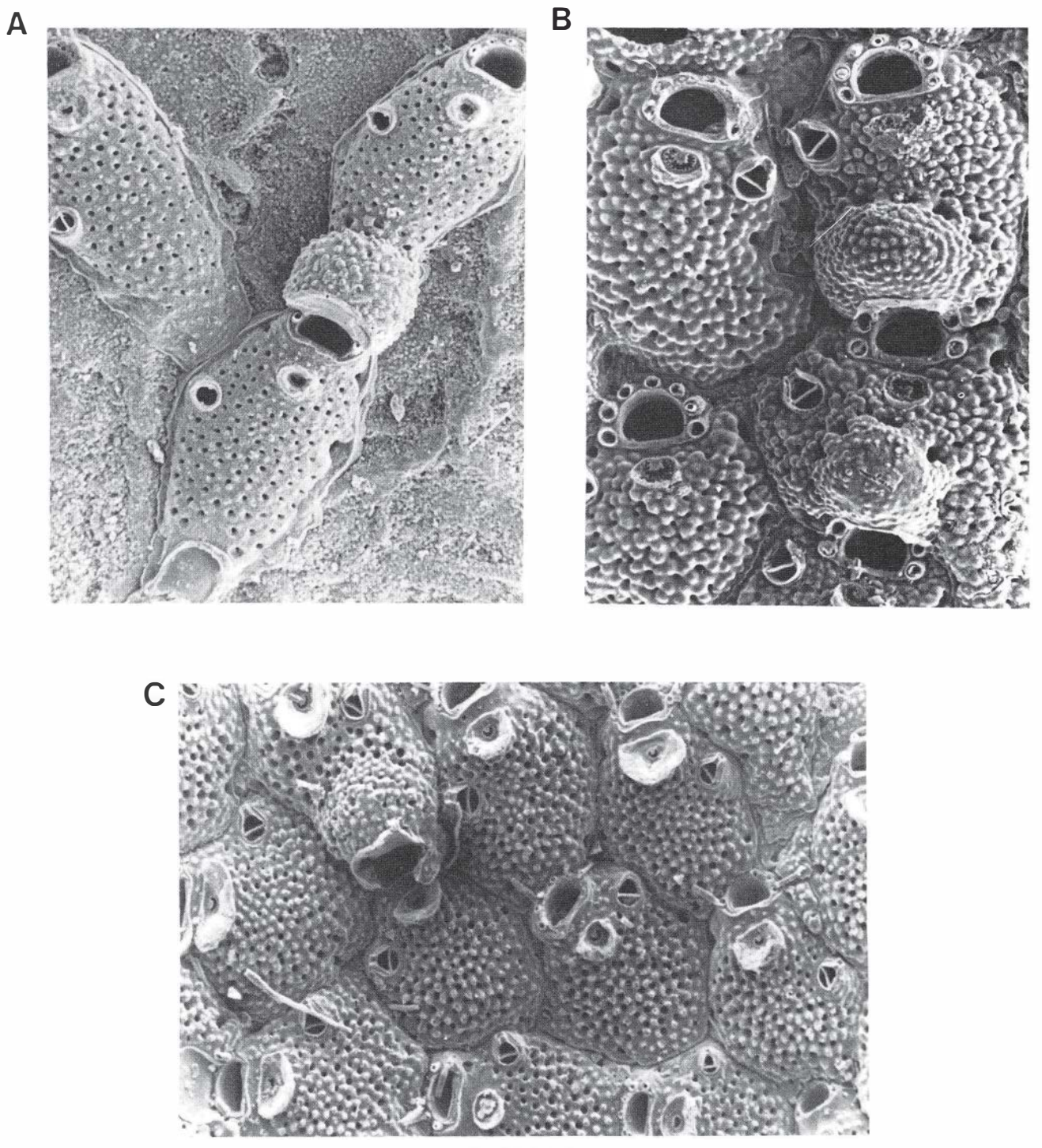

PLATE 39. A, *Microporella lineata* Canu & Bassler. B, *Microporella marsupiata* (Busk). C, *Microporella orientalis* Harmer.

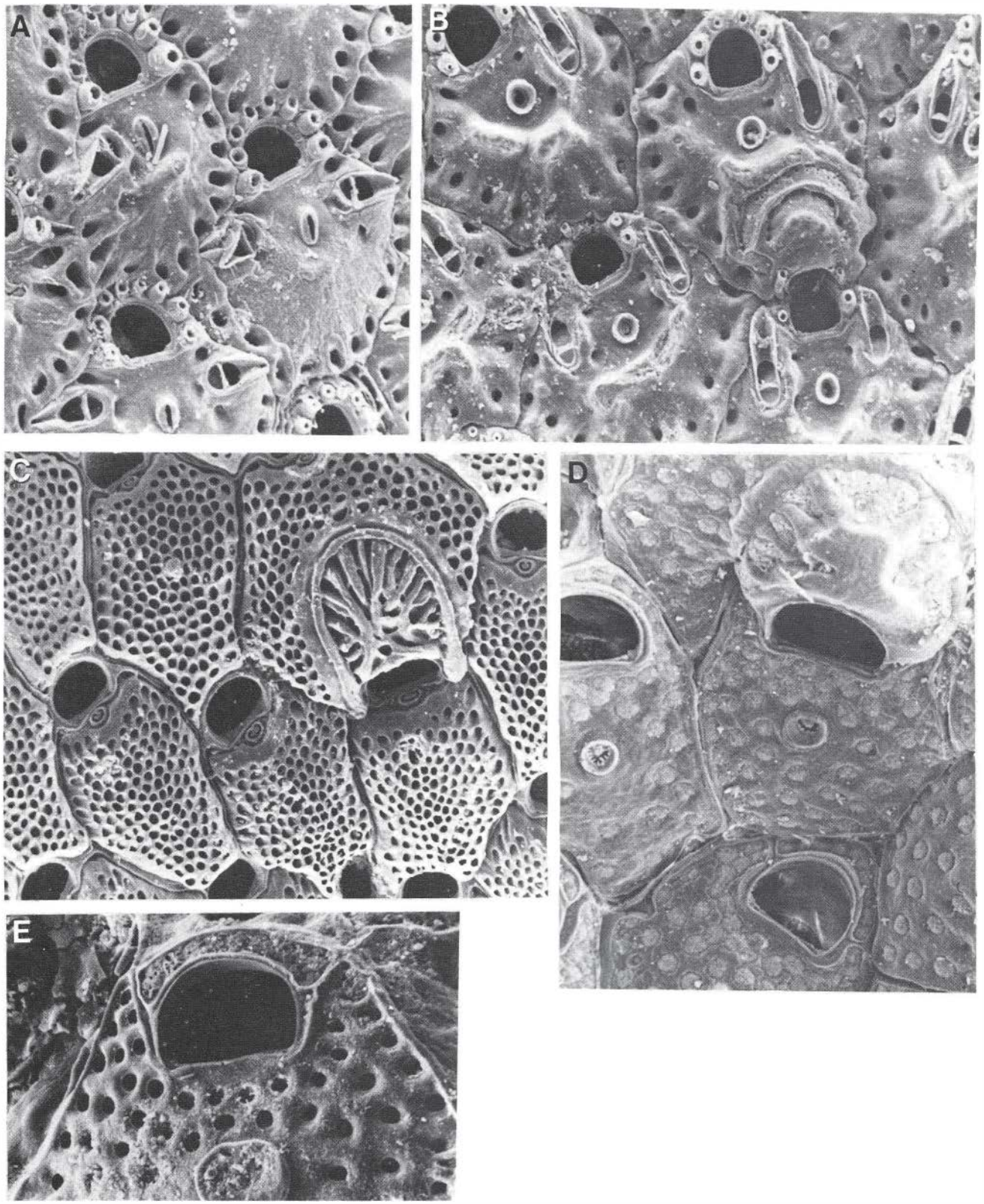

PLATE 40. A, *Calloporina angustipora* (Hincks). B, *Calloporina triporosa* Powell. C, *Tenthrenulina dispar* n.gen., n.sp. D,E, *Fenestrulina catastictos* n.sp.: E shows a neanic zooid at the growing edge before occlusion of frontal pseudopores.

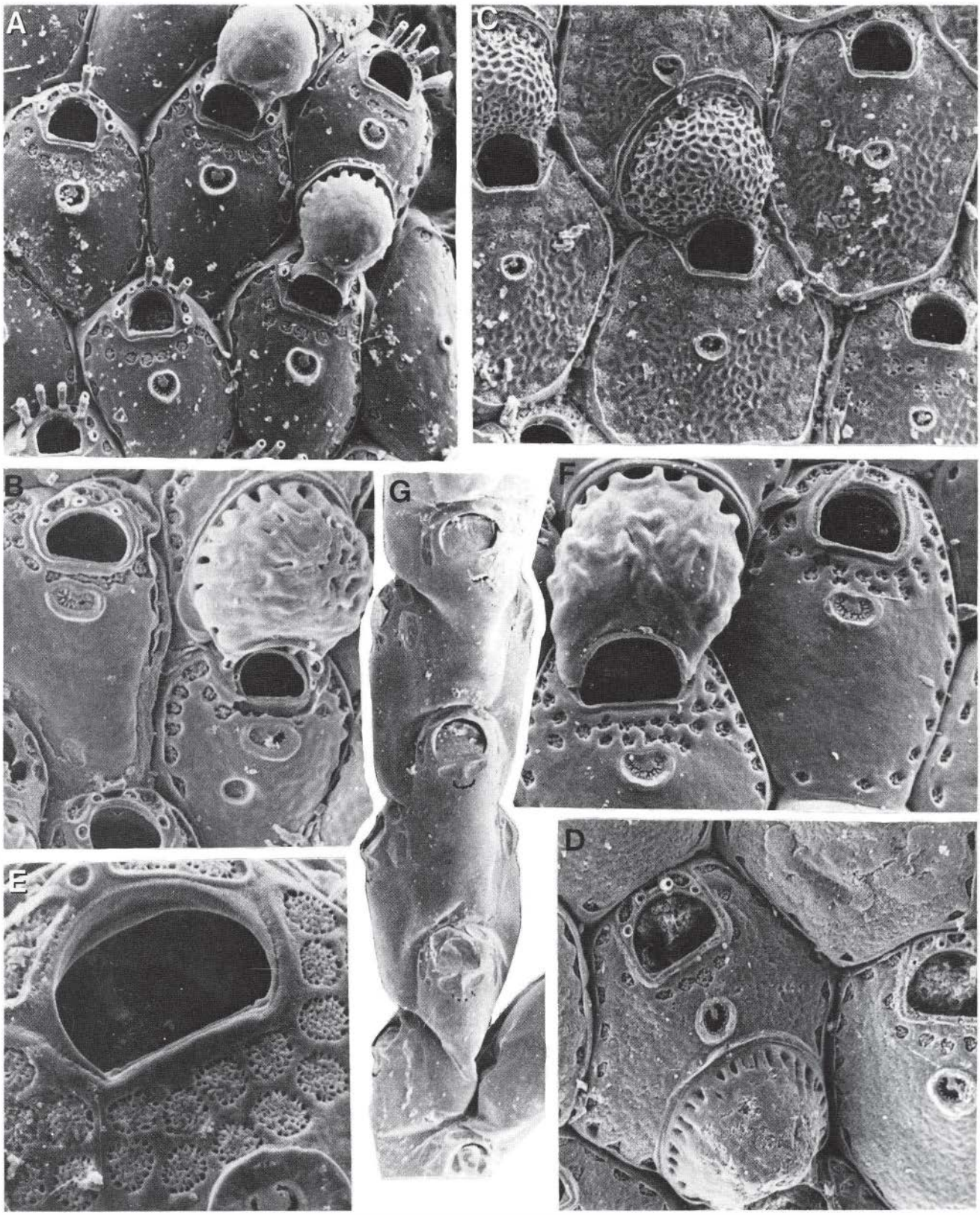

PLATE 41. A, *Fenestrulina disjuncta* (Hincks): note 5–6 oral spines on ordinary zooids, two on ovicelled zooids. B, *Fenestrulina* cf. *disjuncta*: note 3–4 oral spines on ordinary zooids, and two spine bases on the ovicelled zooid. C, *Fenestrulina gelasinoides* n.sp. D, *Fenestrulina malusii incompta* n.ssp. E, *Fenestrulina malusii pulchra* n.ssp.: part of a specimen from Leigh, New Zealand. F, *Fenestrulina malusii* s.s.: a specimen from Chios, Eastern Mediterranean, for comparison. Note the two oral spines on ordinary zooids, none on the ovicelled zooid. G, *Calwellia sinclairii* (Busk).

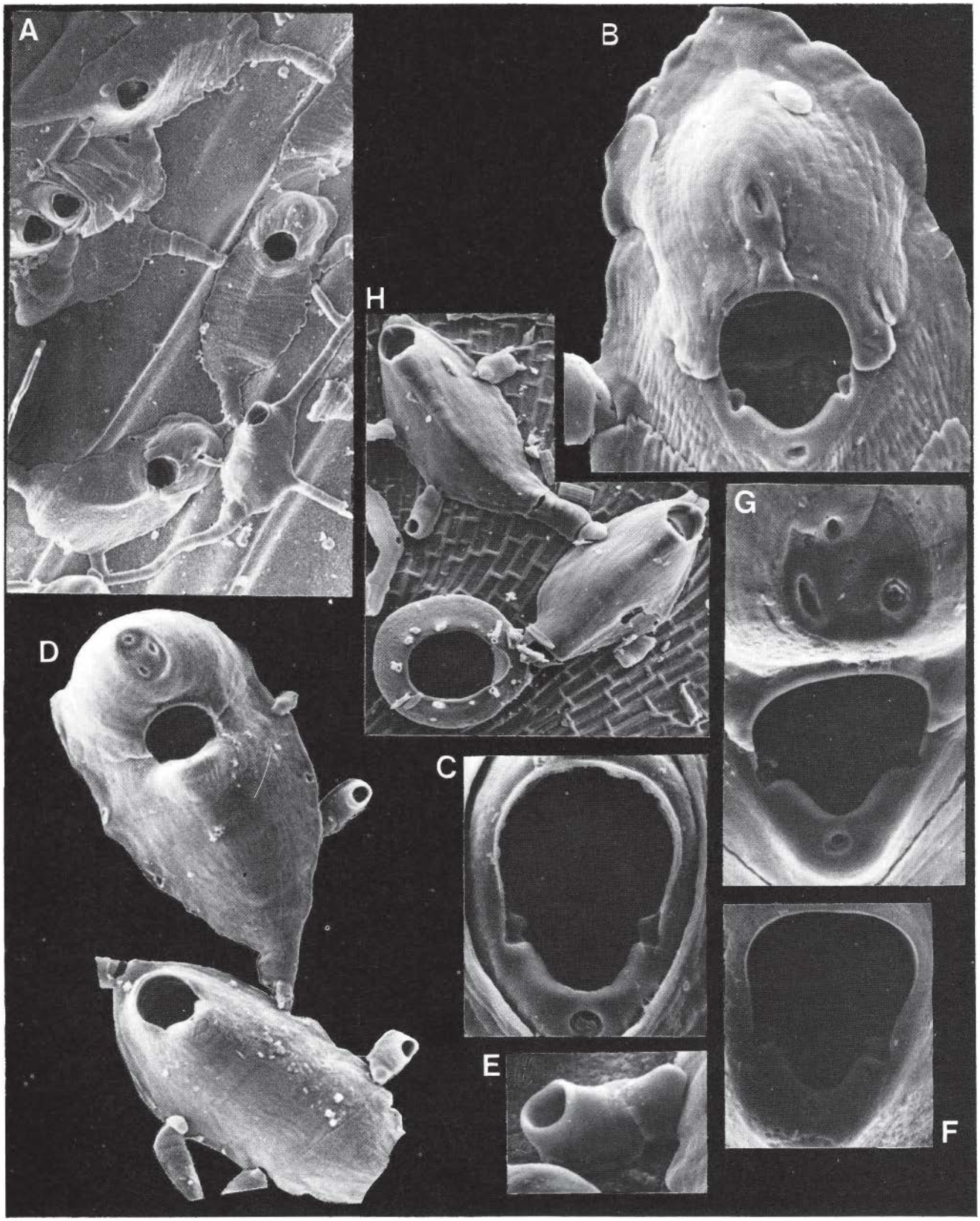

PLATE 42. A-C, *Hippothoa calciophilia* n.sp.: in A the zooid at lower right is of *H. flagellum* Manzoni; B, fertile orifice; C, autozooidal orifice. D-H, *Hippothoa distans* MacGillivray: D, autozooid, female zooid and zooeciules; E, zooeciule; F, autozooidal orifice; G, fertile orifice and part of ovicell; H, ancestrula and first zooids.

PLATE 43. A,B, *Hippothoa divaricata pacifica* n.ssp.: A, ancestrula and daughter zooids; B, kenozooidal ancestrula and first zooid. C,D, *Hippothoa flagellum* Manzoni: C, autozooid and female zooid; D, fertile orifice. E-G, *Hippothoa peristomata* n.sp.: E, three autozooids and a kenozooid; F, autozooid and female zooid; G, fertile orifice. H, *Celleporella delta* (Ryland & Gordon).

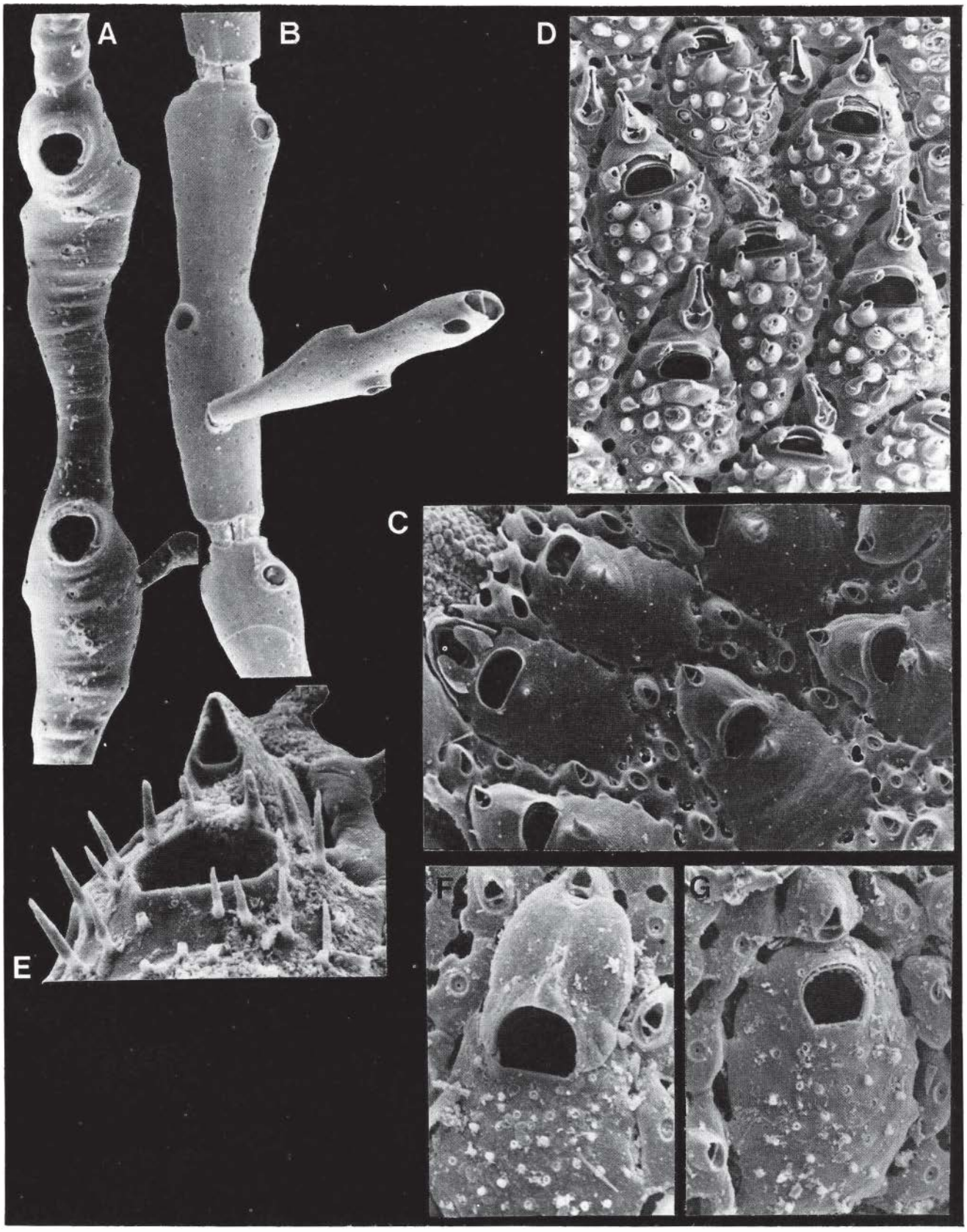

PLATE 44. A,B, *Gemellipora eburnea* Smitt: A, part of the hippothoiform encrusting portion of a colony; B, part of the erect portion. C, *Chorizopora brongniartii* (Audouin). D, *Chorizopora ferocissima* n.sp. E-G, *Chorizopora spicata* n.sp.

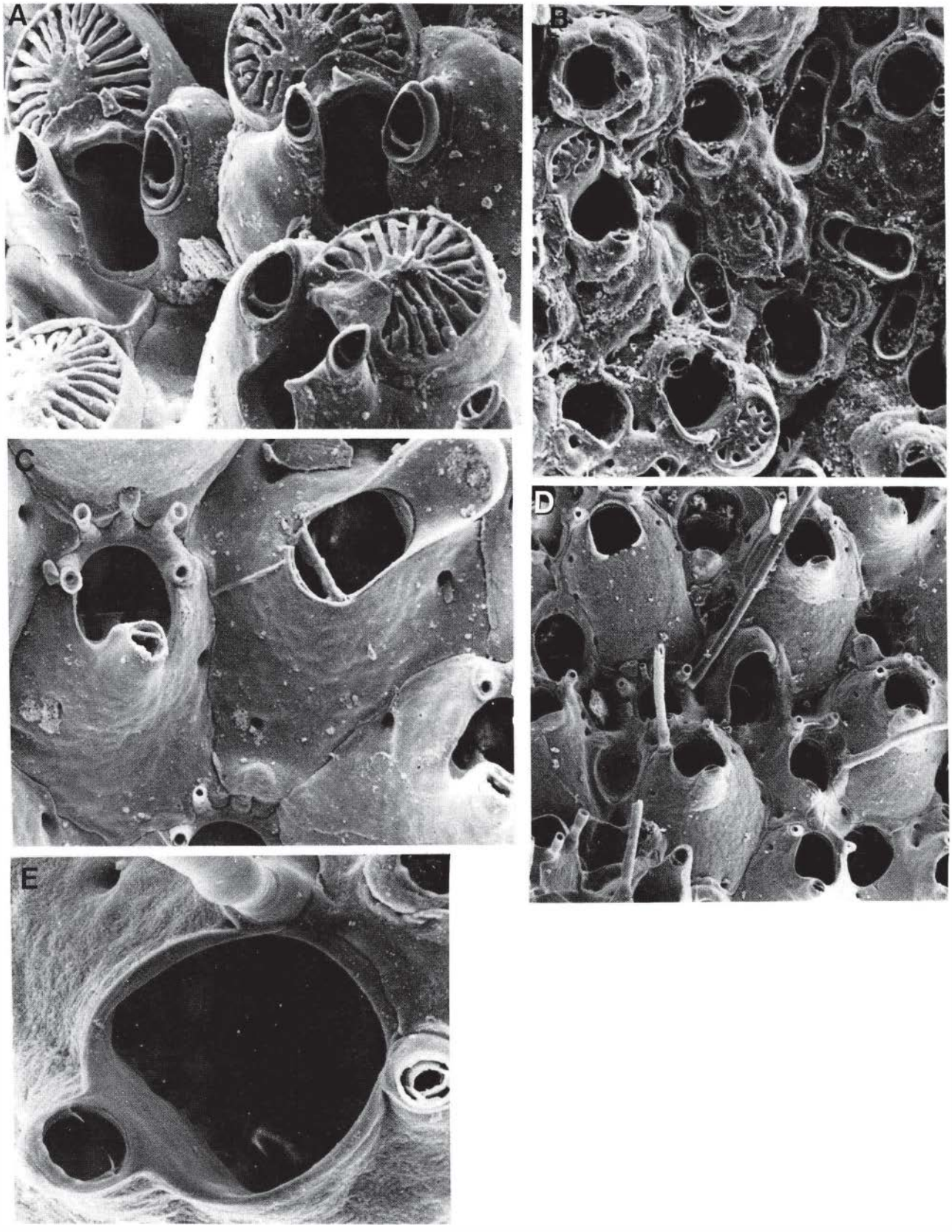

PLATE 45. A, *Celleporina costazii* (Audouin). B, *Celleporina spatula* MacGillivray. C-E, *Celleporaria tridenticulata* (Busk): E is a variety with much reduced oral denticles.

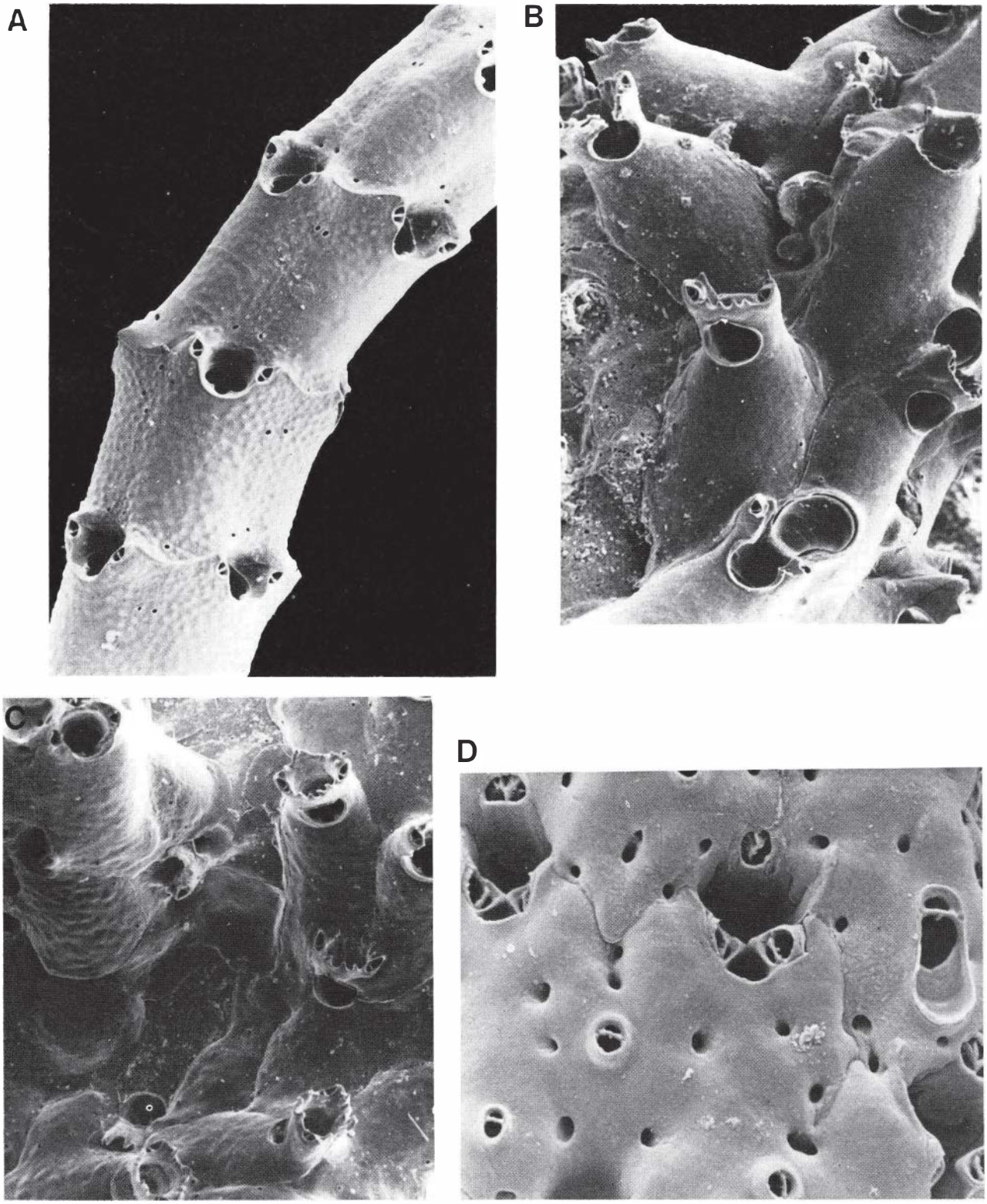

PLATE 46. A-C, *Galeopsis pentagonus* (d'Orbigny): A, part of erect branch; B, encrusting phase (note developing ovicells); C, beginning of an erect lobe from the encrusting phase. D, *Galeopsis polyporus* (Brown): part of erect branch.

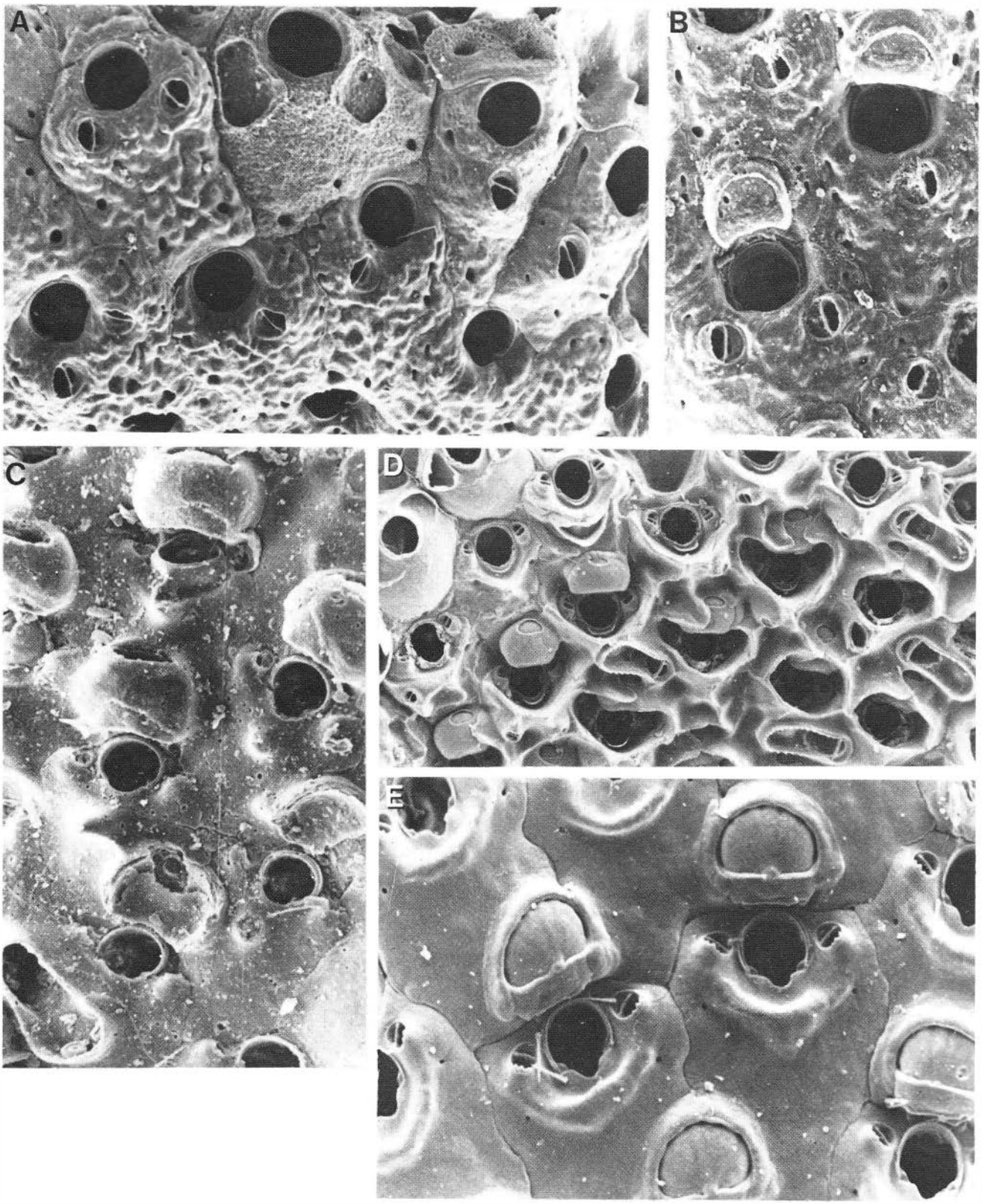

PLATE 47. A,B, *Buffonellaria biavicularis* (Powell). C, *Buffonellaria christinelloides* n.sp. D, *Buffonellaria depressa* (Philipps). E, *Buffonellaria regenerata* (Powell).

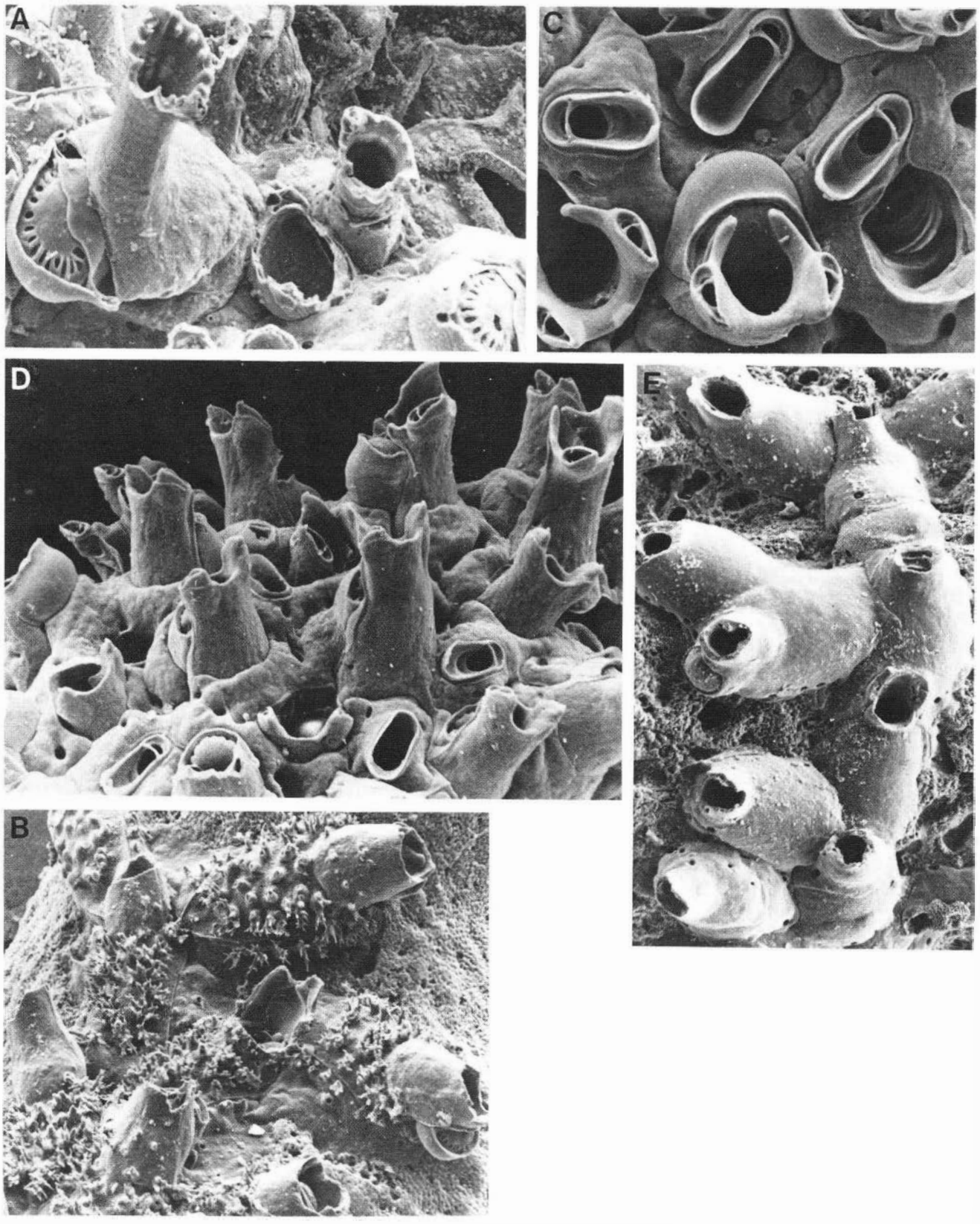

PLATE 48. A, *Lagenipora crenulata* n.sp. B, *Lagenipora ferocissima* n.sp. C,D, *Lagenipora hemiperistomata* n.sp. E, *Lagenipora laevissima* n.sp.

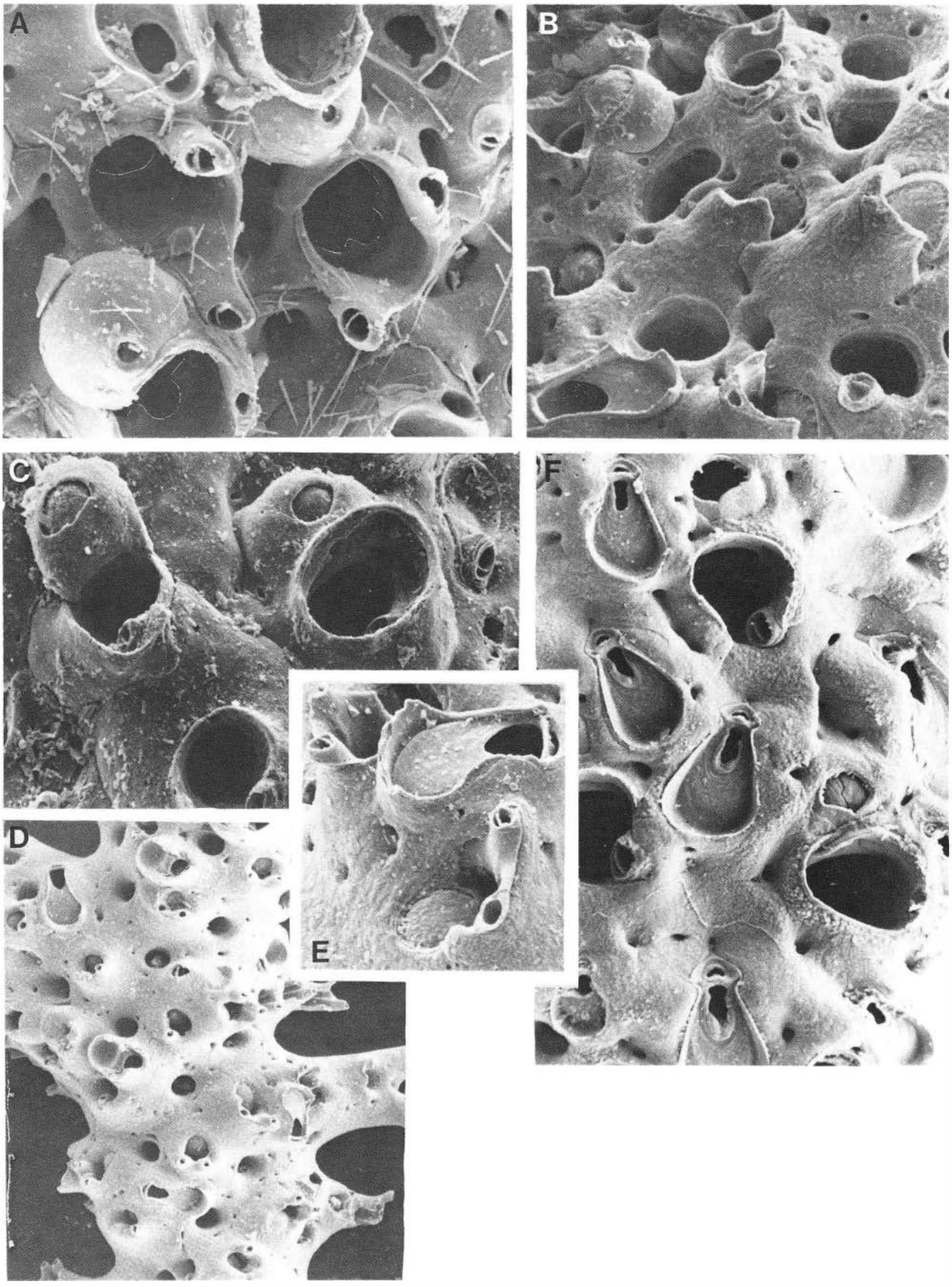

PLATE 49. A, *Osthimosia bicornis* (Busk). B, *Osthimosia eatonensis* (Busk). C, *Osthimosia imperforata* n.sp. D,E, *Osthimosia incomposita* n.sp. F, *Osthimosia virgula* n.sp.

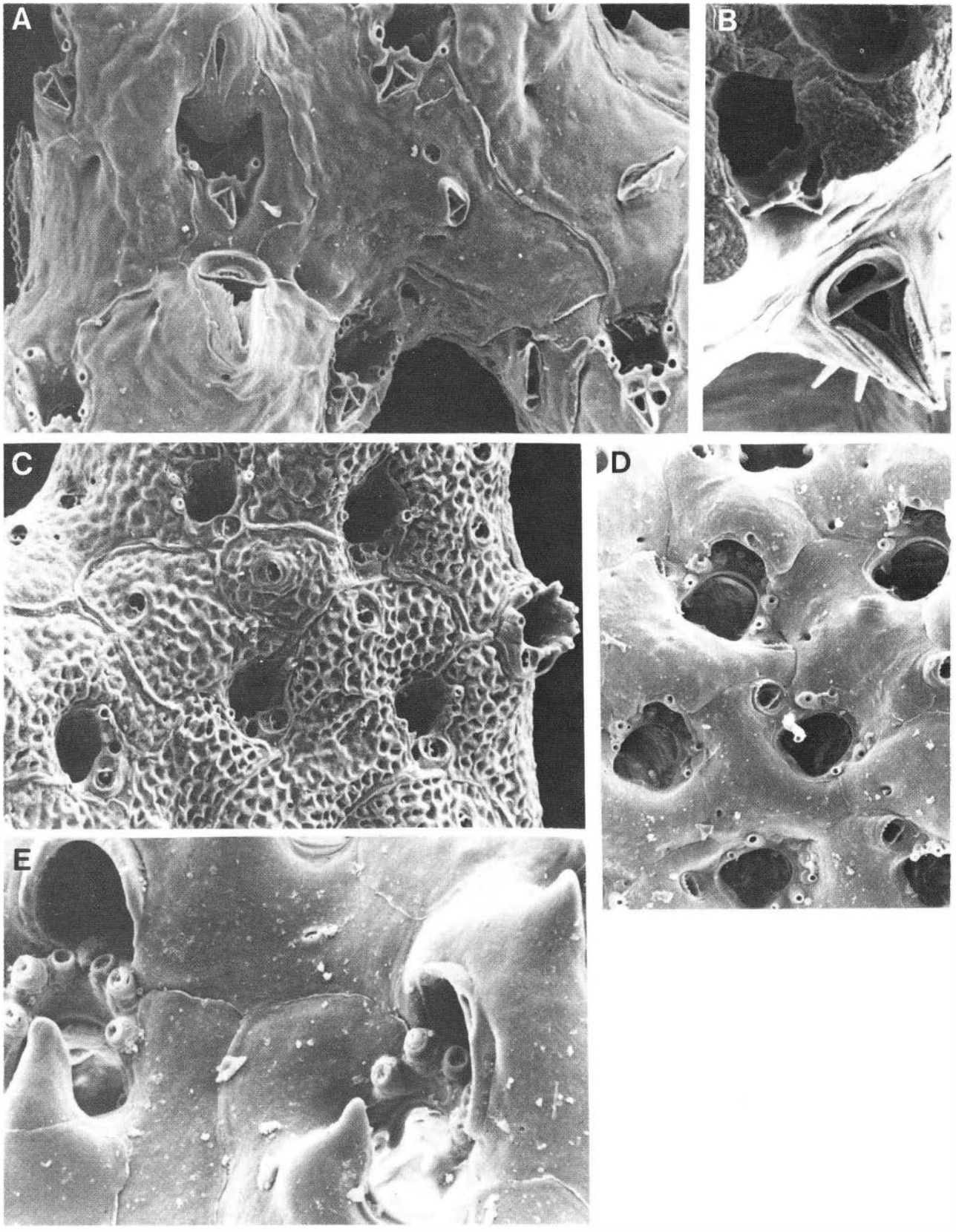

PLATE 50. A,B, *Sertella concinna* n.sp.: B shows lyrulate primary orifice. C, *Sertella malleatia* n.sp. D, *Lepraliella ?mooraboolensis* (MacGillivray). E, *Lepraliella multidentata* (Thornely): showing two fertile orifices, with broad ovicellular openings.

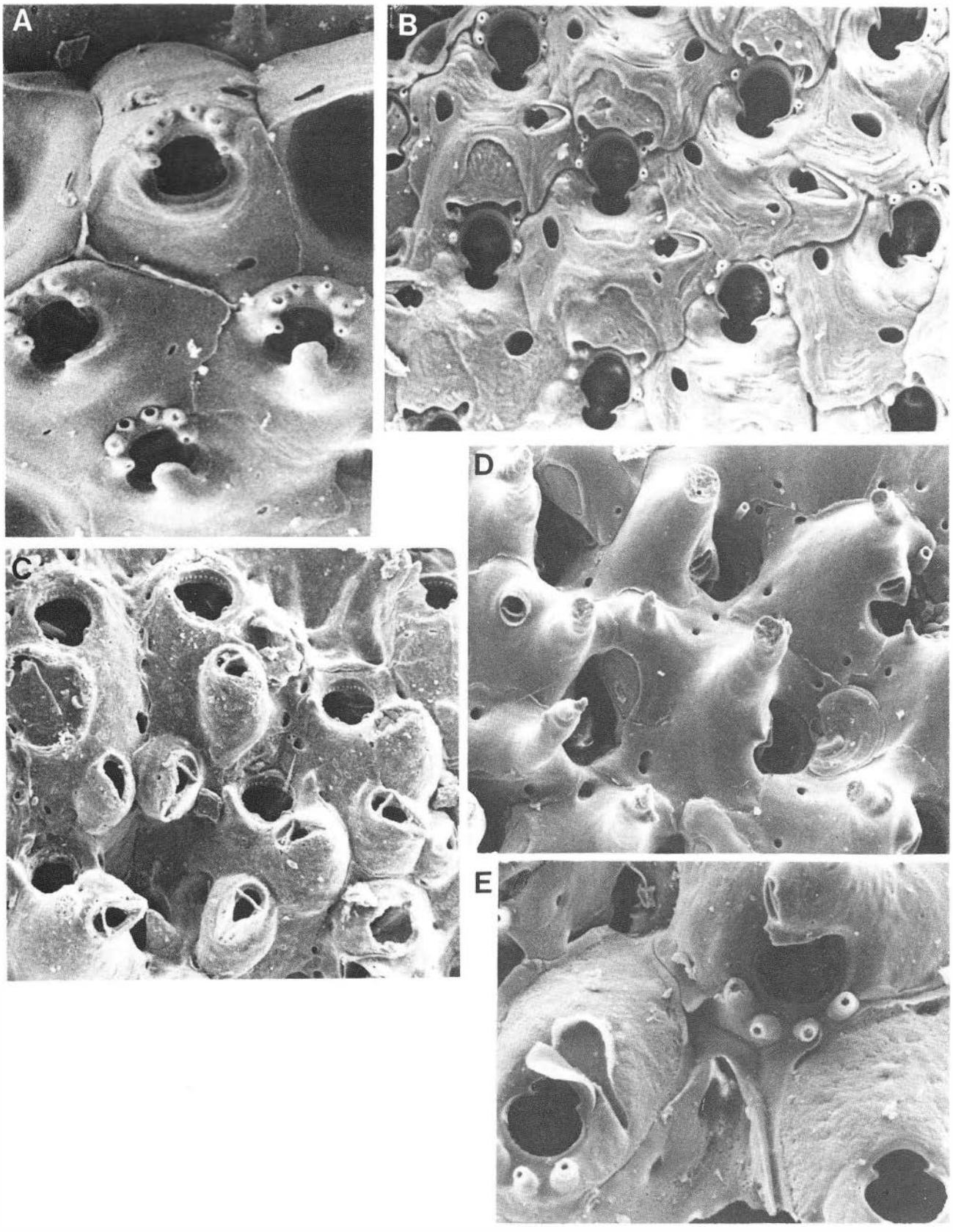

PLATE 51. A, *Lepraliella multidentata* (Thornely). B, *Cleidochasma porcellanum* (Busk). C, *Rhynchozoon angulatum* Levinsen. D,E, *Rhynchozoon crenulatum* (Waters).

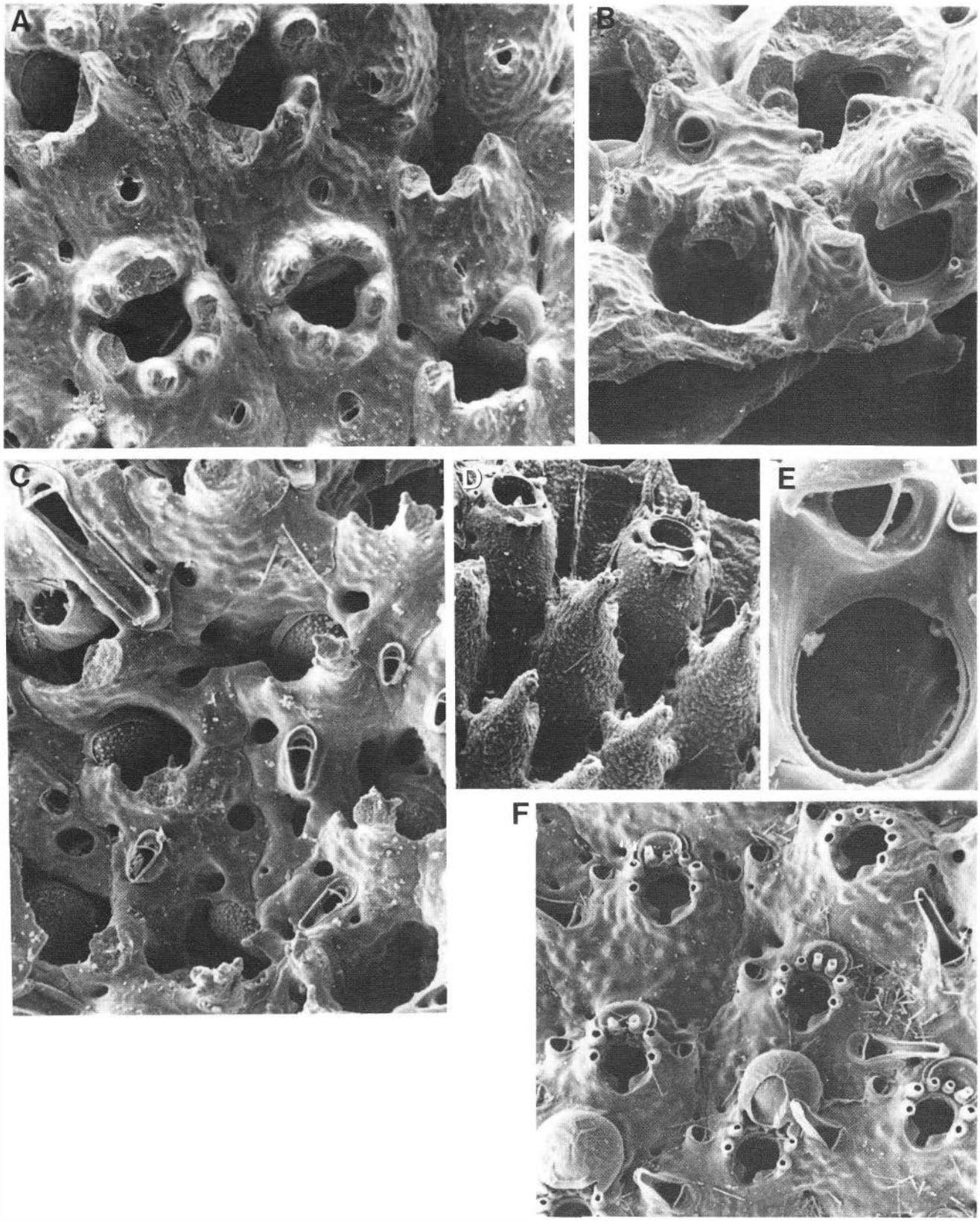

PLATE 52. A,B, *Rhynchozoon paa* Uttley & Bullivant: A, showing several ovicellate zooids; B, showing orifices and peristomial avicularia. C-E, *Rhynchozoon tubulosum* (Hincks): C, showing several ovicelled zooids; D, showing colony margin; E, showing primary orifice. F, *Brodiella longispinata* (Busk).